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**Original Research Article**

# Economic Uncertainty, Public Health Policies Uncertainty and Health Insurance Coverage in Developing Countries

**Mostafa Shamsoddini***

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The provision of health insurance is a significant concern for governments in both developed and developing countries, given its pivotal role in ensuring access to healthcare for their citizens. The objective of this research is to investigate the impact of economic and health policies uncertainty on the rate of change in health insurance coverage in developing countries. The research sample comprises 30 selected developing countries from 2000 to 2023. The research model was tested using the dynamic panel estimation method through the Generalized Method of Moments and Arellano-Bond estimators, which were conducted using the Eviews software. The findings indicate that economic uncertainty and public health policies uncertainty exert a deleterious effect on the rate of expansion of health insurance coverage in developing countries. Additionally, the vector coefficients of specific country characteristics are significant in the model, with positive effects observed for variables related to human development and income, and negative effects observed for variables related to population dependency and inflation. Given the pivotal role that enhancing health insurance coverage plays in facilitating equitable access to health services and human development, policymakers are charged with the responsibility of paving the way for sustainable growth in this area by reducing economic volatility and increasing stability in health policies. It is recommended that governments enhance the resilience of health insurance systems to external shocks by strengthening economic regulatory institutions, controlling inflation, and allocating resources to social sectors.

**Keywords:** Economic Uncertainty, Public Health Policies, Health Insurance.
**JEL Classification***:* I15, I18, D81

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## 1 Introduction

Health insurance is one of the most important issues in both developed and developing countries. The provision of at least one health insurance for every individual is a fundamental human right and represents one of the most

* Department of Economics, Faculty of Management, Economics and Accounting, University of Hormozgan, BandarAbbas, Iran; m.shamsoddini@hormozgan.ac.ir

effective social welfare promotion factors (Zhang, 2019). The prevalence and significance of health insurance can be attributed to the high prevalence of disease in society. In the absence of insurance that covers the risk of these diseases and the costs that are imposed after them, numerous adverse sociological consequences will be created in society. One of the strategies employed by governments, particularly democratic governments, to achieve a healthy society with sustainable health is the facilitation and expansion of health insurance (Odoch et al., 2021; Haghighi & Takian, 2024). With the expansion and generalisation of insurance, all aspects of a person's life in society are covered by insurance. It is imperative for governments to confront the challenges currently faced by health insurance systems in developing economies. By doing so, they can enhance the resilience of these systems, which will ultimately result in improved healthcare accessibility and population health outcomes.

The ambiguity surrounding economic policies and public health expenditures can significantly impact individuals' access to health insurance and, over time, result in alterations to programs and the pace of health insurance coverage in countries. Robust health insurance systems are indispensable for the realization of universal healthcare access and sustainable development. Health insurance policy makers believe that health is an inalienable right of every human being and insurance is a tool to promote it. Consequently, the fundamental obligation and responsibility of health insurance is to ensure the accessibility of a country's population to a defined set of health and medical services. This is achieved through the implementation of a per capita cost, which is available to all individuals, regardless of whether or not they pay the cost. In light of the pervasive role of uncertainties in the healthcare sector, there is an imperative for policymakers to implement measures that reduce economic volatility, stabilize health policies, and fortify institutional frameworks. This study addresses a significant gap in understanding how macroeconomic and policy uncertainties affect social protection systems and provides evidence-based guidance for health financing reforms in economically vulnerable settings.

The distribution of the probability of damage among insured individuals serves to divide the costs of illness among a large number of people (Jiang et al., 2019; Dong, 2024). This not only reduces the burden of costs for patients, but also brings reassurance to all insured individuals. The primary healthcare strategy proposed by the World Health Organization in 1978 proved instrumental in enabling countries to coordinate their efforts to develop national plans (WHO, 2020). While these initiatives led to an improvement in

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overall health status, the progress achieved was relatively modest and the goal of universal health coverage remained unfulfilled. According to the World Health Organization's definition, universal health coverage implies that all individuals have access to the health services they require. Such services include public health initiatives designed to promote health, such as anti-tobacco campaigns or tobacco taxes, as well as preventive services, such as vaccinations, medical services, rehabilitation care and palliative medicine. These services must be provided with the highest standards of quality and safety, and in a manner that does not pose a financial burden on the individual.

In the contemporary business environment, instability is the most salient characteristic (Eker & Eker, 2019). Managers employ a range of strategies to navigate unstable conditions. Uncertainty, in its most general sense, can be defined as the inability to predict outcomes (Aikman et al., 2021; Cernega et al., 2024). This concept has been the subject of considerable analysis across a number of fields. Uncertainty is, in fact, one of the hallmarks of a lack of certainty in economic, political, or other domains (Vignoli et al., 2020). In such circumstances, individuals or activists in any field are unable to obtain accurate information about the future and therefore unable to make informed predictions. In the context of uncertainty, the processes of planning, decision-making and policy-making in all economic sectors, including the insurance market, are disrupted, as the possibility of prediction decreases and it becomes challenging for economic agents to anticipate future scenarios. Consequently, economic agents are confronted with uncertainty regarding their consumption, saving or investment decisions (Coibion et al., 2024).

Economic uncertainty is defined as a situation in which it is challenging to anticipate the future economic environment and in which there is a high degree of risk or uncertainty (Muneer, 2025). This can be attributed to a multitude of factors, including political instability, alterations in governmental policies, natural disasters, and fluctuations in the market. The impact of economic uncertainty on health insurance coverage refers to the manner in which alterations in the economy can influence individuals' capacity to procure and remunerate health insurance. Economic uncertainty, as evidenced by fluctuations in employment rates, income levels, or overall financial stability, can give rise to challenges in maintaining health insurance coverage for individuals and families. In periods of economic uncertainty, individuals may lose their jobs or experience a reduction in income, making it challenging to afford health insurance premiums (Godinić & Obrenovic, 2020). Consequently, individuals may experience gaps in coverage or may be compelled to forego essential health care due to financial constraints.

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Economic uncertainty can also exert pressure on insurance providers, resulting in alterations to coverage options, premiums, or eligibility criteria. It is worth noting that studies have been conducted at the international level in the field of economic uncertainty and public health (Guo et al., 2023), the effects of economic policy uncertainty on health insurance premiums (Gupta et al., 2019), uncertainty in healthcare policy and real health costs (Cheng & Witvorapong, 2021; Jeris et al., 2023), economic uncertainty and health care costs (Bai et al., 2021), the impact of uncertainties on health shocks (Philipson & Zanjani, 2014), financial stability and health insurance (Habicht et al., 2019), the effect of health insurance coverage on community health (Anderson et al., 2012; Keisler-Starkey & Bunch, 2020), economic uncertainty and diseases epidemic (Godinić & Obrenovic, 2020; Abdelkafi et al., 2023).

In general, social unrest or instability in a country can create uncertainty for businesses and investors. In recent years, developing countries have faced various economic challenges, including high inflation rates, currency depreciation, unemployment, and structural issues in the financial system. In this situation, the government's response to these challenges may not always be clear or consistent, leading to uncertainty among businesses, investors, and consumers. This uncertainty can be attributed to a number of factors, including economic challenges, geopolitical tensions, sanctions, and price fluctuations, all of which have the potential to impact the efficacy and stability of public health policies. An understanding of the manner in which uncertainties and health insurance coverage interact can provide valuable insights into the management of political and economic challenges and the optimization of the health insurance system in developing countries. Given the dearth of research in this area, this study aims to address two key questions: firstly, how rapidly is health insurance coverage evolving in developing countries? Secondly, how do economic and public health policies uncertainties influence health insurance coverage in developing countries? The present study is organized into five primary sections. Subsequent to the present introduction, the second section is devoted to a review of the extant literature and the theoretical framework of the research. The third section delineates the research methodology, encompassing the econometric model, the data set, and the estimation method. The fourth section presents the empirical findings and analysis of the results, and finally, the fifth section concludes, discusses, and presents policy recommendations.

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## 2 Theoretical Framework and Literature Review

Economic and policy uncertainties give rise to cyclical challenges, including diminished coverage, which in turn shifts costs to healthcare systems, thereby straining public health resources during periods of recovery (Li, 2023). The presence of ambiguity in health policies has been demonstrated to have a deterrent effect on enrollment, particularly among populations considered vulnerable (Chatterjee, 2009). These dynamics underscore the need for stable policies and resilient insurance frameworks to mitigate uncertainty's systemic impacts.

This study's theoretical foundation examines three interconnected dimensions: public health policies, economic uncertainty, and health insurance systems. This framework synthesizes how policy instability and economic volatility intersect with health insurance systems, informing the study's analysis of coverage trends in developing economies.

### 2.1 Public Health Policies and Population Health

Public health policies encompass governmental decisions and actions aimed at promoting population health through disease prevention, healthcare access, and health promotion initiatives (Peresypkina & Nesterenko, 2023; Selvaraj, 2024; Trudel-Fitzgerald et al., 2019). These policies address fundamental health determinants while facing challenges from policy instability, particularly following economic crises (Baker et al., 2016). Such instability affects economic outcomes and exacerbates global challenges like unemployment and income inequality (Al-Thaqeb & Algharabali, 2019).

### 2.2 Economic Uncertainty and Decision-Making

Economic uncertainty reflects unpredictability in future economic conditions, influencing decisions across society (Silva & de Araujo, 2023). This multifaceted phenomenon stems from volatile government policies, market fluctuations, and global events, with consequences ranging from income distribution to mental health impacts. Economic downturns, exemplified by the COVID-19 pandemic, reduce disposable income and employment, limiting health insurance access (Zouboulakis, 2020; Bastanifar, 2024). Prospect theory and real business cycle theory explain how uncertainty shapes risk-averse behaviors and economic fluctuations (Ruggeri et al., 2020; Dedola & Neri, 2007).

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## 2.3 Health Insurance Systems and Universal Coverage

Modern health insurance systems serve as both financing mechanisms and tools for achieving universal health coverage (Flourence et al., 2025). Their expansion supports sustainable health outcomes by covering diverse life aspects (Kieny et al., 2017), with models adapted to national contexts (Kruk et al., 2018). Insurance reduces financial barriers for vulnerable groups and increases healthcare utilization (Ranabhat et al., 2020). Each nation has devised distinct insurance models tailored to its economic, social, political, health, and cultural contexts. Insurance can impart a psychological benefit by mitigating the anticipated consequences of health crises (Rowan et al., 2013). However, fiscal constraints—measured by GDP decline and rising public debt (Kamps & Leiner-Killinger, 2019)—threaten public health spending, while aging populations intensify resource demands.

## 2.4 Research Background

In recent years, researchers have examined the relationship between economic uncertainties and insurance development, although the number of such studies has been limited. To examine the relationship between economic uncertainties and insurance development, few studies have considered multiple countries, while some other studies have preferred a single country. While researchers are increasingly using economic uncertainty indices in studies of policy-related uncertainties, most such studies, both past and present, have focused on the macroeconomic effects of policy uncertainty. The majority of these studies have centered on identifying the effects of economic policy uncertainty on macroeconomic variables such as growth, investment, consumption, unemployment, prices, inflation, and exchange market pressures. The extant literature demonstrates that economic instability exerts robust short-term negative impacts on inflation and output (Athari et al., 2022), employment (Caggiano et al., 2017), foreign investment (Canh et al., 2020), economic development (Scheffel, 2016), and financial development (Lei et al., 2021).

Additionally, empirical evidence has been documented, indicating a correlation between economic risks and the insurance sector. Laurell (2016) using the content analysis method underscores the impact of economic uncertainty on public health policies, highlighting its role in the development of fragmented health systems, a phenomenon exemplified by Chile. The neoliberal paradigm of health insurance coverage prioritizes profit maximization over the fundamental principle of universal access, thereby eroding the very foundation of the right to health and undermining the legitimacy of the state. Balcilar et al. (2019) by employing a non-linear

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autoregressive distributed lag (NARDL) model, confirm the long-run relationship between monetary policy uncertainty, insurance premiums, and real income. This means that these variables are related over a long period, suggesting that changes in monetary policy uncertainty can lead to changes in insurance premiums and real income in the long run. Gupta et al., (2019) using the most up-to-date nonlinear autoregressive distributed lags framework, conducted a study that examined the asymmetric and nonlinear effects of real output and economic policy uncertainty on insurance premiums in the United States. The researchers found that while general and non-life insurance are positively correlated with EPU, life insurance is negatively correlated. The authors of the study posited that since economic policy uncertainty exerts some pressure on economic activity, it is reasonable to assume that it will also affect insurance purchasing behavior. Balcilar et al., (2020) by employing heterogeneous panel estimation techniques with cross-sectional dependence, explore the impact of economic policy uncertainty on health insurance coverage. Their findings indicate that fluctuations in public health policies can result in increased uncertainty, which in turn can affect individuals' access to and reliance on health insurance during periods of economic uncertainty. Canh et al., (2021) by static panel data estimations conducted a study to examine the impact of economic policy uncertainty on local insurance markets in 16 OECD countries. The researchers found that global policy uncertainty is negatively associated with a country's life insurance development. Hemrit (2021) apply estimation method panel autoregressive distributed lag (ARDL) to examined insurance demand in Saudi Arabia, finding that there is a short-run negative relationship between insurance demand and economic policy uncertainty, which is insignificant in the long run. Hornung and Bandelow (2022) by employing a fuzzy-set qualitative comparative analysis (QCA), examined the impact of economic crises on public health spending in EU countries. Their findings indicated that left-wing governments and coordinated market economies exhibited a propensity to augment health expenditures, while other political orientations tended to curtail them. This observation underscores the pivotal role of political and economic contexts in shaping healthcare expenditure. Liu's (2023) employs a bayesian panel vector autoregressive model to examine the impact of economic uncertainty on health outcomes, emphasizing its effects in emerging markets and developing countries, particularly on life expectancy and mortality rates. Li (2023) using the questionnaire analysis method demonstrates that the policy uncertainty surrounding the novel Coronavirus (SARS-CoV-2) significantly impacts insurance consumption, particularly among vulnerable populations. These

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populations exhibit a 12% greater propensity to purchase insurance, especially those experiencing income disruption. This finding suggests a correlation between economic uncertainty and decisions regarding health insurance coverage. Jeris et al., (2023) by applying panel cointegration tests, and the PMG-ARDL regression, conducted a study to examine the relationship between economic policy uncertainty (EPU) and insurance premiums. The researchers found that EPU exerts a longer-term impact on insurance premiums compared to its immediate effect.

It is evident that this study will contribute to the existing body of knowledge and offer significant findings with policy implications that may benefit future policymakers. Government entities, policymakers, regulators, academics, and other relevant authorities can consider the results of this research when formulating strategies, measures, and regulations.

The aforementioned materials present the following hypotheses, which form the basis of the research:

1) The specific characteristics of countries affect the speed of change in health insurance coverage in developing countries.
2) Economic uncertainty slows the speed of change in health insurance coverage in developing countries.
3) Uncertainty of public health policies slows the speed of change in health insurance coverage in developing countries.

# 3 Methodology and Model

## 3.1 Methodology

The current research can be classified as both multiple correlation research and post-event research. It examines the correlation between more than two variables, using data and information collected after the event. The statistical population of the research includes developing countries around the world, selected according to the available information. The research sample includes 30 countries, as shown in Table 1.

The data employed in this research is derived from official reports issued by governments and global development indicators. The health data were extracted from the WHO Global Health Observatory[1] and the World Bank Health Data[2], while the macroeconomic data were extracted from the

[1] https://www.who.int/data/gho
[2] https://data.worldbank.org/topic/health

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International Monetary Fund's Data[1] and World Development Indicators[2]. To achieve the research objectives, the impact of economic uncertainty and the uncertainty of public health policies on the speed of change in health insurance coverage has been evaluated in EViews software using the dynamic panel method, the generalized method of moments (GMM), and the Arellano-Bond estimator. Conventional panel data methods are unable to address the issue of cross-sectional effects being correlated with explanatory variables due to the consideration of fixed effects. Consequently, the dynamic panel model, which considers the effects of dynamic adjustment of the dependent variable, is employed as a superior estimation method to other techniques.

Table 1
*List of Selected Developing Countries.*

| Row | Country | Row | Country | Row | Country |
|---|---|---|---|---|---|
| 1 | Algeria | 11 | India | 21 | Panama |
| 2 | Argentina | 12 | Indonesia | 22 | Paraguay |
| 3 | Armenia | 13 | Iran | 23 | Qatar |
| 4 | Brazil | 14 | Iraq | 24 | Saudi Arabia |
| 5 | Chile | 15 | Latvia | 25 | South Africa |
| 6 | Columbia | 16 | Lebanon | 26 | Tunisia |
| 7 | Costa Rica | 17 | Lithuania | 27 | Türkiye |
| 8 | Ecuador | 18 | Mexico | 28 | Ukraine |
| 9 | Egypt | 19 | Morocco | 29 | United Arab Emirates |
| 10 | Hungary | 20 | Pakistan | 30 | Venezuela |

Source: Research Findings

## 3.2 Model

A dynamic model is employed to determine the speed of change in health insurance coverage in developing countries, based on research hypotheses:

$$HIC_{i,t} - HIC_{i,t-1} = \theta\left(HIC^{*}_{i,t} - HIC_{i,t-1}\right), \qquad 0 < \theta \leq 1 \qquad (1)$$

The variable $HIC_{i,t}$ represents the coefficient of health insurance coverage in country i, year t; $THIC_{i,t} - HIC_{i,t-1}$ represents the actual change in health insurance coverage; $HIC^{*}_{i,t} - HIC_{i,t-1}$ represents favourable change in health insurance coverage. The parameter θ demonstrates the speed of change in health insurance coverage from period t-1 to t. In the context of limit states, in the absence of environmental constraints, the parameter θ is equal to one,

[1] https://www.imf.org/en/Data
[2] https://data.worldbank.org/

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indicating that countries will automatically move towards their target health insurance coverage. Conversely, if the outer limits are complete, the parameter θ is equal to zero. This model has been employed in other studies, such as Jiang et al., (2022), which has been used to measure the adjustment speed of financial variables.

In order to calculate the target health insurance coverage ratio in the countries in question, it is necessary to employ the following relationship:

$$HIC^{*}_{i,t} = \alpha_i + \beta X_i' + \varepsilon_{i,t} \quad (2)$$

In this context, $X_i'$ represents the specific characteristics vector of each country, while $\varepsilon_{i,t}$ is the residual of the model. Substituting equation (1) into equation (2) yields the following result:

$$HIC_{i,t} = \theta\alpha_i + (1-\theta)HIC_{i,t-1} + \theta\beta X_{i,t}' + \epsilon_{i,t} \quad (3)$$

In equation (3), the speed of change in health insurance coverage is obtained by subtracting the absolute value of the coefficient of delayed dependent variable ($HIC_{i,t-1}$) from one (1-θ).

In order to assess the impact of economic and health policies uncertainty on the speed of change in health insurance coverage in developing countries, two models have been developed based on the relationship between the variables.

In equation (4), the speed of change in health insurance coverage with the moderating effect of economic uncertainty in countries is considered:

$$HIC_{i,t} = \theta\alpha_i + (1-\theta)HIC_{i,t-1} + \rho EU_t * HIC_{i,t-1} + \theta\beta X_{i,t}' + \epsilon_{i,t} \quad (4)$$

The economic uncertainty of each country in year t is represented by $EU_t$. Furthermore, in equation (5), the speed of change in health insurance coverage is considered in conjunction with the moderating effect of the health policies uncertainty:

$$HIC_{i,t} = \theta\alpha_i + (1-\theta)HIC_{i,t-1} + \omega HPU_t * HIC_{i,t-1} + \theta\beta X_{i,t}' + \epsilon_{i,t} \quad (5)$$

The variable $HPU_t$ represents the uncertainty associated with health policies of each country in year t.

This research builds upon the work of Shamsoddini & Hormoz (2020) and Su et al. (2022) by examining the vector of specific characteristics of each country. The analysis considers four key variables: population dependency

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ratio[1] ($DEP_{i,t}$), human development index ($HDI_{i,t}$), inflation ($Inflation_{i,t}$) and income level ($LPCGDP_{i,t}$).

In order to measure economic uncertainty, a composite index has been constructed from the combination of government expenditures, tax revenues, liquidity and exchange rates. This index is used as a measure of the general policies of a country's economy. The conditional variance self-regression model has been used to build this composite index. In recent years, researchers have widely used conditional variance autoregression models to construct a measure of uncertainty (Angelini & Fanelli, 2019). As a general rule, the coefficient of importance of the fluctuations of the variables will not be the same, therefore it is not possible to consider the same weight in order to combine the fluctuations and create an index in these variables. In disciplines such as economics, public health, or the social sciences, the interactions and relationships among various factors can be intricate and multifaceted. For instance, if an index is constructed to summarize economic conditions by combining indicators like inflation rates, unemployment levels, and GDP growth without acknowledging their differing degrees of influence and importance, the resultant index would likely misrepresent the underlying realities. Each of these variables possesses a unique role and impact on the broader economic landscape. Consequently, disregarding these differences undermines the validity of the conclusions derived from such an index. In order to address this issue, the periodic element regression method is employed. This method involves entering each variable into the model separately and determining the coefficient of determination of each model. Subsequently, weights are calculated for each variable in order to construct the composite index of economic uncertainty, in accordance with the aforementioned relationship:

$$C_J = \frac{R_J^2}{\sum_{j=1}^{4} R^2} \tag{6}$$

Subsequently, in order to combine the four existing time series, the extracted variances are standardised in accordance with equation (7):

[1] The dependency ratio is a demographic indicator that measures the number of dependents aged 0-14 and over 65 compared to the total population aged 15-64. This indicator provides insight into the number of people outside of working age compared to the number of people of working age.

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$$A = \frac{X_t - X_{Min}}{X_{Max} - X_{Min}} \quad (7)$$

Finally, in order to create a composite index of economic uncertainty, four time series of homogenised variances from the previous step are combined according to the calculated weights.

To assess the degree of uncertainty associated with public health policy, we employed a methodology similar to that proposed by Husted et al., (2020). This entailed the identification of newspaper articles that simultaneously referenced the terms "uncertainty," "public health," and "government policies or government expenditures". The number of articles containing these search terms was then counted on a daily basis for each newspaper. To address fluctuations in the number of newspapers over time, we first divide the raw number of articles related to public health policies uncertainty by the total number of articles referring to government policies for each newspaper in each period. This yields the share of articles containing public health policies uncertainty conditions, which is calculated using Equation (8) for each newspaper in period t:

$$n_{i,t} = \frac{\sharp HPU - Articles_{i,t}}{\sharp GP - Articles_{i,t}} \quad (8)$$

The variable $\mathrm{HPU} - \mathrm{Articles}_{\mathrm{i,t}}$ represents the number of articles that mention the three criteria of uncertainty in public health policies, while $\mathrm{GP} - \mathrm{Articles}_{\mathrm{i,t}}$ represents the number of articles that mention "government policies". After normalizing the share of each article, the results of the series obtained in equation (9) are also normalized using the standard error of the entire period:

$$nn_{i,t} = \frac{n_{i,t}}{stdevn_i(2000-2020)} \quad (9)$$

Finally, the set of $nn_{i,t}$ in the newspapers is aggregated and scaled so that the average value during the sample period is 100. This process provides an index of public health policies uncertainty in the form of equation 10:

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$$HPUnp_t = \left[\frac{\sum_i nn_t}{avg \sum_i nn_{(2000-2020)}}\right] \quad (10)$$

## 4 Results and Discussion

Table 2 presents the results of the descriptive statistics of the research variables over the period 2000-2023[1].

Table 2
*Descriptive Statistical Analysis of Research Variables*

| Variables | Mean | Maximum | Minimum | Standard Deviation |
|---|---|---|---|---|
| Health Insurance Coverage | 5.249 | 10.000 | 0.403 | 2.431 |
| Economic Uncertainty | 0.463 | 0.997 | 0.037 | 0.216 |
| Public Health Policies Uncertainty | 0.629 | 1.000 | 0.150 | 0.206 |
| Population Dependency | 0.577 | 0.941 | 0.187 | 0.121 |
| Human Development Index | 0.738 | 0.920 | 0.441 | 0.087 |
| Inflation | 0.296 | 95.850 | -0.100 | 3.767 |
| Income Level | 2.561 | 4.433 | 0.278 | 0.926 |

Source: Research Findings

Prior to estimating the research models, the primary classical assumptions of regression analysis, including the assumption of normality of error distribution, autocorrelation and collinearity, have been subjected to examination. Based on the central limit theorem, due to the considerable number of observations and the presence of a width from the origin in the research models, the assumption of zero average error and normality of the error distribution of the models is validated. The Wooldridge test statistic for checking the assumption of zero covariance among the error components was equal to 1.204, indicating the presence of a first-order autocorrelation problem between the residuals of the model. Consequently, the Arellano-Bond estimators will be employed in estimating the parameters. To assess the collinearity between the variables, the variance inflation factor (VIF) criterion was employed, the results of which are presented in Table 3.

[1] Due to the unavailability of all data for 2023, a portion of the data presented herein has been derived from estimates provided by the World Health Organization and the World Bank.

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Table 3
*The Results of the Collinearity Test of Research Variables*

| Variables | $HIC_{i,t}$ | $EU_t$ | $HPU_t$ | $DEP_{i,t}$ | $HDI_{i,t}$ | $Inflation_{i,t}$ | $LPCGDP_{i,t}$ |
|---|---|---|---|---|---|---|---|
| VIF statistic | 3.245 | 2.289 | 2.936 | 4.640 | 3.883 | 3.252 | 2.902 |

Source: Research Findings

Table 3 indicates that the calculated statistics for all variables are less than 5, which suggests that there is no collinearity problem among the research variables. Table 4 presents the results of measuring the mean values of the model variables using the ADF-Fisher test.

Table 4
*The Results of Fisher's Augmented Dickey-Fuller Unit Root Test*

| Variables | ADF Statistic | Probability | Result |
|---|---|---|---|
| Health Insurance Coverage | -5.357 | 0.000 | Stationary |
| Economic Uncertainty | -6.123 | 0.000 | Stationary |
| Public Health Policies Uncertainty | -7.913 | 0.000 | Stationary |
| Population Dependency | -3.939 | 0.000 | Stationary |
| Human Development Index | -6.885 | 0.000 | Stationary |
| Inflation | -4.371 | 0.000 | Stationary |
| Income Level | -5.467 | 0.000 | Stationary |

Source: Research Findings

The results demonstrate that all variables in the model are statistically significant, thus eliminating the possibility of spurious regression. The findings from Tables 3 and 4 collectively strengthen the overall robustness of the research. The absence of collinearity, combined with the statistical significance of the variables, provides a compelling basis to draw meaningful insights and make informed decisions based on the research outcomes. These results are critical, especially in the context of public health policies and economic factors affecting health insurance coverage in developing countries, as they enhance the potential for the development of actionable strategies that can effectively address identified challenges. As the study progresses, it will be vital to continue examining these relationships while ensuring methodological rigor. This, in turn, will contribute to the formation of solid, evidence-based policies that can facilitate improvements in health insurance systems and public health outcomes globally.

Table 5 presents the findings of an empirical investigation into the speed of change in health insurance coverage in developing countries. The analysis takes into account the specific characteristics of each country and economic

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uncertainty. The estimation method employed is the dynamic panel (GMM) using the Arellano-Bond estimators. This is due to the tendency of the variable $HIC_{i,t-1}$ to correlate with the disturbance component ε, which precludes the use of the OLS method for the partial adjustment model of the research.

Table 5
*The Estimation of the Speed of Change in Health Insurance Coverage by Consideration of Specific Country Characteristics and Economic Uncertainty*

$$\mathbf{HIC}_{i,t} = \alpha_1 + \alpha_2 \mathbf{HIC}_{i,t-1} + \alpha_3 \mathbf{EU}_t * \mathbf{HIC}_{i,t-1} + \alpha_4 \mathbf{DEP}_{i,t} + \alpha_5 \mathbf{HDI}_{i,t} + \alpha_6 \mathbf{Inflation}_{i,t} + \alpha_7 \mathbf{LPCGDP}_{i,t}$$

| Variables | Coefficient | t- Statistic | Probability |
|---|---|---|---|
| Health Insurance Coverage | 0.811 | 3.019 | 0.002 |
| EU* Health Insurance Coverage | 0.839 | 2.792 | 0.005 |
| Population Dependency | -0.215 | -2.093 | 0.036 |
| Human Development Index | 0.134 | 3.535 | 0.000 |
| Inflation | -0.010 | -2.492 | 0.012 |
| Income Level | 0.430 | 2.079 | 0.037 |
| Constant | 0.587 | 5.593 | 0.000 |
| $R^2$ | | 0.66 | |
| D-W | | 2.02 | |
| Sargan Test | Prob. | 0.68 | |
| Arellano-Bond Test | Prob.1 | 0.41 | |
| | Prob.2 | 0.19 | |

Source: Research Findings

The results of the dynamic model estimation using the GMM method indicate complex and significant relationships between the research variables. As illustrated in Table 5, the coefficient of health insurance coverage of a previous period ($HIC_{i,t-1}$) is 0.811 demonstrates the continuity and stability of insurance policies over time. This finding indicates that health insurance coverage exhibits a robust dynamic memory. Subtracting this value from one yields the speed of change in health insurance coverage in the sample countries, which is equivalent to $\theta = 0.19$. A speed of change value of 0.19 suggests that only a negligible proportion of the desired change in health insurance coverage is achieved within a stipulated timeframe. This modest rate of change indicates systemic inertia, wherein prevailing coverage patterns demonstrate a sluggish adjustment in response to evolving requirements or policy shifts. Such inertia can be ascribed to a multitude of factors, including economic constraints, inadequate public awareness, and the paucity of governmental initiatives to expand or reform health insurance. This

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underscores the imperative for targeted initiatives to expedite the evolution of health insurance coverage, ensuring its alignment with the evolving health demands of populations, particularly in the context of mounting health challenges and emergent public health crises. To catalyze this transformation, policymakers must devise strategic interventions that promote enrollment and engagement in health insurance programs. The implementation of educational campaigns to enhance awareness regarding the advantages of health insurance and to make it more financially accessible could serve as pivotal steps toward enhancing coverage rates. The persistence indicated by the high coefficient also signals a potential risk for stagnation. If current health insurance practices remain unchanged while societal health needs evolve, disparities in access and quality of care may widen, exacerbating inequalities in health outcomes. Therefore, understanding the factors contributing to this slow adjustment process is essential for developing effective solutions.

The variables of the human development index and income level have a positive effect on the speed of change in health insurance coverage, whereas the variables of population dependency and inflation have a negative effect on the speed of change in health insurance coverage. The vector coefficients of the specific characteristics of each country in the research model are significant (at the 95% level), thereby confirming the first hypothesis of the research that the specific characteristics of countries affect the speed of change in health insurance coverage in developing countries. Furthermore, when the interactive effect of economic uncertainty on the health insurance coverage is considered, the adjustment speed of health insurance coverage in the sample countries is found to decrease to approximately 0.16. Therefore, it can be concluded that economic uncertainty leads to a weakening of the speed of changing health insurance coverage. Consequently, the second hypothesis of the research will be confirmed.

In circumstances where economic uncertainty prevails—whether through fluctuating markets, high inflation, or unpredictable economic conditions—individuals may become more cautious about their financial commitments, particularly concerning health insurance. This hesitancy can lead to decreased enrollment rates or reduced engagement with health insurance markets, ultimately resulting in stagnated coverage levels in the face of pressing public health needs. The interrelation between economic uncertainty and health insurance coverage is a dynamic and complex process, illustrating a feedback loop. As economic conditions worsen, the financial strain on health systems intensifies, which may lead to an increase in healthcare expenditures and risks. This scenario has the potential to result in health policy adjustments that are

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both slower and more urgent. Various stakeholders—governments, civil society, and healthcare providers—may face challenges in coping with the immediate and long-term health consequences of prolonged uncertainty.

In this research, Sargan's test was employed to assess the validity of the instrumental variables employed in the model. In order for the tools to be deemed valid, there should be no correlation between the tools and error statements. The null hypothesis for this test is that the instruments are valid to extent that they are uncorrelated with the errors in the first-order differential equation. The failure to reject the null hypothesis provides evidence of appropriateness of the tools. The results of the Sargan test indicate that the null hypothesis is not rejected and that the defined instrumental variables are valid. Consequently, the model does not require the inclusion of other instrumental variables. Additionally, the Arellano-Bond test statistic was employed to ascertain the order of autocorrelation of the disorder sentences. The test statistic indicated that the null hypothesis of no autocorrelation in the differentiated disorder sentences was not rejected, thereby demonstrating the suitability of the Arellano-Bond method for estimating the parameters of the model and removing fixed effects.

Table 6 presents the findings of an empirical investigation into the speed of change in health insurance coverage in developing countries; The analysis takes into account the specific characteristics of each country and the inherent uncertainty associated with public health policies.

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Table 6
*The Estimation of the Speed of Change in Health Insurance Coverage by Consideration of Specific Country Characteristics and Public Health Policies Uncertainty*

$$\mathbf{HIC}_{i,t} = \alpha_1 + \alpha_2 \mathbf{HIC}_{i,t-1} + \alpha_3 \mathbf{HPU}_t * \mathbf{HIC}_{i,t-1} + \alpha_4 \mathbf{DEP}_{i,t} + \alpha_5 \mathbf{HDI}_{i,t} + \alpha_6 \mathbf{Inflation}_{i,t} + \alpha_7 \mathbf{LPCGDP}_{i,t}$$

| Variables | Coefficient | t- Statistic | Probability |
|---|---|---|---|
| Health Insurance Coverage | 0.820 | 4.398 | 0.000 |
| HPU* Health Insurance Coverage | 0.849 | 2.051 | 0.040 |
| Population Dependency | -0.148 | -2.472 | 0.013 |
| Human Development Index | 0.210 | 3.166 | 0.001 |
| Inflation | -0.002 | -3.070 | 0.002 |
| Income Level | 0.363 | 2.113 | 0.034 |
| Constant | 0.745 | 4.943 | 0.000 |
| $R^2$ | | 0.71 | |
| D-W | | 2.01 | |
| Sargan Test | Prob. | 0.67 | |
| Arellano-Bond Test | Prob.1 | 0.47 | |
| | Prob.2 | 0.26 | |

Source: Research Findings

In light of the uncertainty associated with public health policies, the results of Table 6 indicate that the speed of change in health insurance coverage has decreased to approximately 0.18. Additionally, the variable coefficient of the interactive effect suggests that the public health policies uncertainty contributes to a reduction in the speed of change in health insurance coverage, with a decrease of approximately 0.15. The theoretical foundations of the issue indicate that this reduction is to be expected, given that when public health policies are less stable, the results of these policies will lead to less effectiveness. The results obtained confirm third hypothesis of the research, which states that the public health policies uncertainty has a weakening effect on the speed of change in health insurance coverage in developing countries.

As indicated by the findings presented in Table 6, the vector coefficients of the specific characteristics of each country remain significant. Furthermore, the variables of human development index and income level have a positive effect on the speed of change in health insurance coverage. Conversely, the variables of population dependency and inflation exert a negative effect. Furthermore, the significance of vector coefficients corresponding to each country's specific characteristics indicates that contextual factors cannot be overlooked. The positive influence of both the human development index and income levels reveals that nations with better health and economic indicators are more capable of implementing and adapting health insurance reforms,

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ultimately leading to higher coverage rates. Conversely, the adverse effects of population dependency and inflation further complicate the landscape, indicating that higher dependency ratios can strain resources, while inflation diminishes the economic capacity of individuals to invest in health insurance.

The validity of the instrumental variables utilized in this model is confirmed by the Sargan and Arellano-Bond tests, thereby strengthening the robustness of the findings by ensuring the reliability of the model's estimations. However, the noted autocorrelation within the differentiated disorder sentences indicates a need for cautious interpretation of the results and potential avenues for further improvement in model specifications.

## 5 Conclusion and Suggestions

The effectiveness of health policies is contingent upon their capacity to address the tension between evidence-based practice and societal uncertainties. Disparities in insurance coverage give rise to parallel inequities in health outcomes. This is due to the fact that populations who are uninsured or underinsured systematically experience delays in care and poorer health status. These individual-level disadvantages aggregate into broader societal consequences, including increased healthcare expenditures, reduced labor productivity, and elevated public health risks. In the absence of adequate healthcare coverage for substantial population segments, communities find themselves entrenched in a self-perpetuating cycle of health disparities that serves only to exacerbate preexisting socioeconomic inequalities.

In this regard, the objective of this study was to examine the impact of economic uncertainty and public health policies uncertainty on the speed of change in health insurance coverage in developing countries. The findings revealed a low speed of change in health insurance coverage in developing countries. When the interactive effect of economic uncertainty and public health policies uncertainty on the health insurance coverage ratio is considered, the adjustment speed of health insurance coverage in the sample countries is reduced. Furthermore, the variables of the human development index and income level have a positive effect, while the variables of population dependency and inflation have a negative effect on the speed of change in health insurance coverage. The findings of this study corroborate the results of Li (2023), Jeris et al. (2023), Hemrit (2021) and Balcilar et al., (2019 & 2020).

The study's findings underscore the intricate interplay between economic and public health policy uncertainties and their substantial impact on the evolution of health insurance coverage in developing countries. The

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consistently languid pace of change in health insurance coverage observed indicates that the mere existence of policies is inadequate. Instead, prevailing economic conditions and the unpredictability surrounding public health measures can impede advancements in health insurance accessibility and equity. The findings suggest that economic uncertainty engenders an environment where policymakers and potential beneficiaries are reluctant to engage with or invest in health insurance solutions. The identified interactive effect between economic and public health policy uncertainties underscores a critical area for future research and intervention, as the dual influences appear to compound each other, leading to a significant reduction in the adaptive capacity of health insurance systems. This relationship underscores the necessity for a comprehensive policy-making approach that not only addresses public health crises but also stabilizes the economy, thereby fostering an environment conducive to health insurance expansion. The positive correlation between the human development index and income level with health insurance coverage change further emphasizes the crucial role of socioeconomic factors. Higher levels of development and income can act as stabilizing forces that promote quicker adjustments in health insurance coverage, as these factors may enhance public trust in systems and encourage higher participation rates. Conversely, the negative influence of population dependency and inflation underscores the vulnerabilities confronting developing nations. High dependency ratios can strain budgets and resources, while inflation erodes purchasing power, both of which can impede investment in health coverage systems.

The Iranian economy is currently grappling with a series of formidable challenges, including elevated inflation rates, currency volatility, and the imposition of sanctions. The findings of this study offer critical policy insights that could inform the development of effective responses to these economic challenges. Firstly, it is imperative to stabilize the macroeconomic environment through effective inflation control and prudent financial management. This will serve as a foundational element for the sustainable development of the health insurance system. Secondly, enhancing human development indicators and augmenting per capita income through investments in education and health can foster increased engagement in the insurance system. Thirdly, the intelligent management of the population structure, in conjunction with the regulation of medical expenditures, has the potential to alleviate financial pressures on healthcare systems. The implementation of these solutions will not only result in the realization of universal health coverage, but will also contribute to the country's economic

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growth and development by increasing labor productivity and reducing government medical costs. Consequently, it is advised that Iranian policymakers prioritize economic stability and the advancement of the health insurance system through a multifaceted and synchronized strategy.

In summary, the results of this study suggest the importance of integrated strategies that address economic stability and the coherence of public health policy in developing countries. Subsequent research endeavors should persist in their examination of these dynamics, with a particular focus on the mechanisms through which socioeconomic factors and uncertainties influence health insurance systems within the context of developing economies.

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