

# The Hidden Economy in Myanmar based on a MIMIC Model

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**Abstract**— This study estimated the size of Myanmar’s hidden economy from 2000 to 2023 using the MIMIC model. It included indicators like GDP growth, employment, and currency circulation, with causes such as unemployment, GDP per capita, inflation, self-employment, tax burden, and political changes. This study filled an empirical gap in seeking to explore how the hidden economy changed under different political regimes. The results revealed that the hidden economy was smaller during semi-democratic periods compared to military coup regimes. Despite the limitations in this study, the findings still contribute to a knowledge on how political regime shifts affect the size of Myanmar’s hidden economy.

**Keywords:** Hidden Economy, Multiple Indicators and Multiple Causes, Myanmar.

## I. MOTIVATION

The size of formal economy countries is seen by official statistics such as trade, investment and output (H.Fleming et al, 2000). However, people always have been believing in hidden forces or economic activities beyond the official statistics that drive the size of unofficial economy recognized as “Hidden, Black, Shadow, Informal, Underground, Illegal and Gray” [J. Thomas, 1997]. The true state of economy may not be presented as long as the size of the hidden economy is unrecorded. So, shall effective monetary policies be practical if inaccurate national accounting? The short answer is “no”. Besides, the growth of the hidden economy not only indicates that current national policies are inadequate but also reflects a society facing uncertainty and instability. Myanmar, formerly known as Burma, has experienced significant political and economic changes including regime shifts, currency depreciation and rising inflation. These factors have motivated us to measure the size of its hidden economy. Each political transition brings with it new economic policies that influences how much the economy operates in the shadows. Businesses and individuals may choose to operate unofficially thus it potentially results economic instability.

Many studies have been observed the shadow or hidden economies of various countries for specific periods, including (M.Tedds, 1998; Alañón-Pardo et al. 2005; Bajada and Schneider, 2005; Dell’s Anno et al, 2007; Dell’s Anno, 2007; Schneider and Hametner, 2007; Schneider and Montenegro, 2010; Buehn and Schneider, 2012; Schneider and H.Enste, 2013; Trebicka, 2014; Vo and Ly, 2014; Hassan and Schneider, 2016; Mazhar and Méon, 2017; Remeikiene et al, 2018; EI Aziz Mansour et al, 2019; Gauci et al, 2020; P.Makananisa et al, 2020; Gauci and Rapa, 2020; Jabbar and Iqbal, 2021; Koufopoulou et al, 2021; Abu Alfoul et al., 2022). These studies found both positive and negative coefficients of certain causes to the size of hidden economies in many different countries. The selection of causal variables and indicator variables in seeking of the hidden economy in Myanmar were in accordance with these cited articles above.

However, no previous study has applied MIMIC models to investigate the size of the hidden economy in Myanmar alone. Therefore, this study aims to fill this empirical gap by measuring the size of the hidden economy in Myanmar for periods from 2000 to 2022. This study begins with the motivation for the study followed by an explanation of methodology. It then describes the data used and discusses the results. Finally, the conclusion appears in the last section of this paper.

## II. DATA AND METHOD OF STUDY

We collected the secondary data for measuring the size of the hidden economy from 2000 to 2022, and the collection of these data and variables were grounded on the existing literature. The data was sourced from three reliable and publicly available databases; World Bank, Central Statistical Office of Myanmar, and Asia Development Bank. Table 1 provides notation and sources of variables, their sources, and relevant existing literature that used these causes and indicators in their findings across different regions and nations.

**Table 1.** Notation and Sources of Variables used in this study

Notation	Description	Source	Related Literature
<b>Causes</b>			
UNEMP	Unemployment Rate (% total population)	“WDI, <a href="http://www.data.worldbank.org">http://www.data.worldbank.org</a> ”	[3, 14, 16,19]
GDPC	GDP Per Capita (US\$ Million)	“WDI, <a href="http://www.data.worldbank.org">http://www.data.worldbank.org</a> ”	[14,19,28]
INR	Inflation Rate (%), Consumer Price Index	“CSO, <a href="http://www.csostat.gov.mm">http://www.csostat.gov.mm</a> ”	[14,17,18,20]
SEMP	Self-employed (% of total employment)	“WDI, <a href="http://www.data.worldbank.org">http://www.data.worldbank.org</a> ”	[8,25,27]
AGEMP	Employment Rate (%) in Agriculture	“CSO, <a href="http://www.csostat.gov.mm">http://www.csostat.gov.mm</a> ”	[6,16,24]
TAXB	Tax Burden (Total Tax Paid/GDP) *100	“CSO, <a href="http://www.csostat.gov.mm">http://www.csostat.gov.mm</a> ”	[9,12,14,27]
PD	Political Dummy (0 and 1)	“Political Stability=0 & Instability=1”	[1,7,20]
<b>Indicators</b>			
GDPR	GDP Annual Growth Rate (%)	“WDI, <a href="http://www.data.worldbank.org">http://www.data.worldbank.org</a> ”	[5,8 12,23]
EMP	Employment Rate (%), (aged 15+)	“WDI, <a href="http://www.data.worldbank.org">http://www.data.worldbank.org</a> ”	[3,8,12,22]
CURR	Currency Circulation (MMK: Billion)	“ADB, <a href="http://www.data.adb.org">http://www.data.adb.org</a> ”	[2,4,18,19]

Based on these variables, the following hypotheses have been developed to be tested.

H<sub>1</sub>: Higher unemployment rates lead to a larger hidden economy.

H<sub>2</sub>: Larger GDP per capita leads to a smaller hidden economy.

H<sub>3</sub>: Higher inflation rates lead to a larger hidden economy.

H<sub>4</sub>: Increased self-employment rates lead to a larger hidden economy.

H<sub>5</sub>: Higher agriculture employment rates lead to a larger hidden economy.

H<sub>6</sub>: Higher tax burden relative to GDP leads to a larger hidden economy.

H<sub>7</sub>: Political instability leads to a larger hidden economy.

H<sub>8</sub>: Larger hidden economy leads to lower real GDP annual growth rates.

H<sub>9</sub>: Larger hidden economy leads to larger employment rates.

H<sub>10</sub>: Larger hidden economy leads to lower currency circulation outside the banks.

This study used a MIMIC multiple-causes model which is a type of structural equation modeling (SEM), first introduced by Goldberger (1972) and Jöreskog and Goldberger (1975). This model is considered as one of the most comprehensive methodologies to estimating the size of hidden economy [Gaspareniene et al, 2018]. It treats the hidden economy as a latent variable (unobservable) influenced by a set of observed exogenous variables, indicated by observed endogenous variables. Essentially, it's a multivariate regression model with specific constraints. In this model, the variable representing the hidden economy is linked to observable variables in a measurement model. Then, their relationships are determined using the structural equation model. This model applies to time series data for the estimation of hidden economy but one problem is that most macro variables may not have stationarity. Nevertheless, the overall fitness of model is evaluated with the model-implied covariance within the range of sampled population. The equations of this model can be summarized as follows:

$$\eta = \gamma\hat{x} + \zeta \quad (1)$$

$$\gamma = \lambda\eta + \varepsilon \tag{2}$$

Where, eq.1=structural equation model; eq.2=measurement model;  $\lambda$  = vector of regression coefficients;  $\gamma(\gamma_1, \gamma_2, \dots, \gamma_p)$ =indicators of latent variable ( $\eta$ );  $x(x_1, x_2, \dots, x_q)$ =causes of  $\eta$ ;  $(p \times 1)$ =vector of latent indicators;  $(q \times 1)$ =vector of causes;  $\varepsilon$  = white noise disturbances;  $\zeta$ = scalar random noise; and those two noises supposed to be mutually uncorrelated. Assuming  $E(\zeta\varepsilon) = 0, E(\zeta^2) = \sigma^2, \text{ and } E(\varepsilon) = \Theta^2, \text{ where } \Theta \text{ is } p \times p \text{ diagonal matrix with } \nu \text{ on its diagonal.}$  Then, the model can be jointly expressed in a reduced form:

$$\gamma = \lambda(\gamma x + \zeta) + \varepsilon = \Pi x + \nu \tag{3}$$

Where,  $\Pi = \lambda\gamma, \text{ and } \nu = \lambda\zeta + \varepsilon.$  This way, the matrix of the covariation of the model is developed as follows:

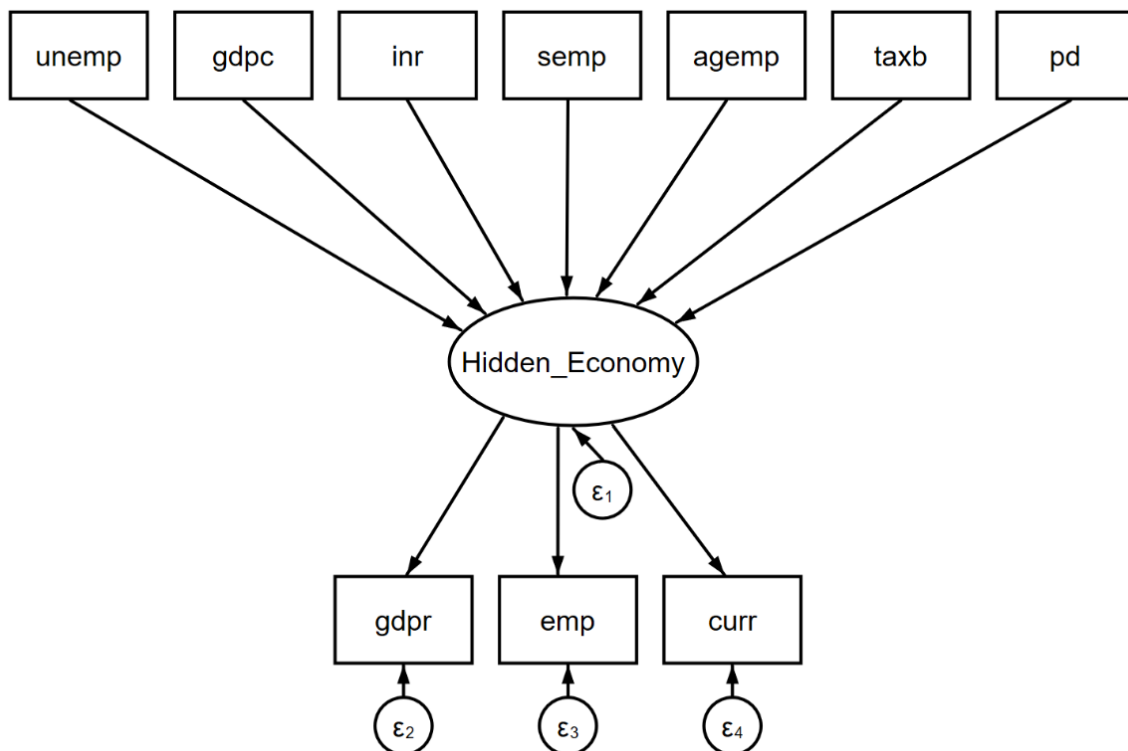
$$\Sigma = \frac{\lambda(\gamma\Phi\gamma + \Psi)}{\Phi\gamma\lambda + \Theta\varepsilon\lambda\gamma\Phi/\Phi} \tag{4}$$

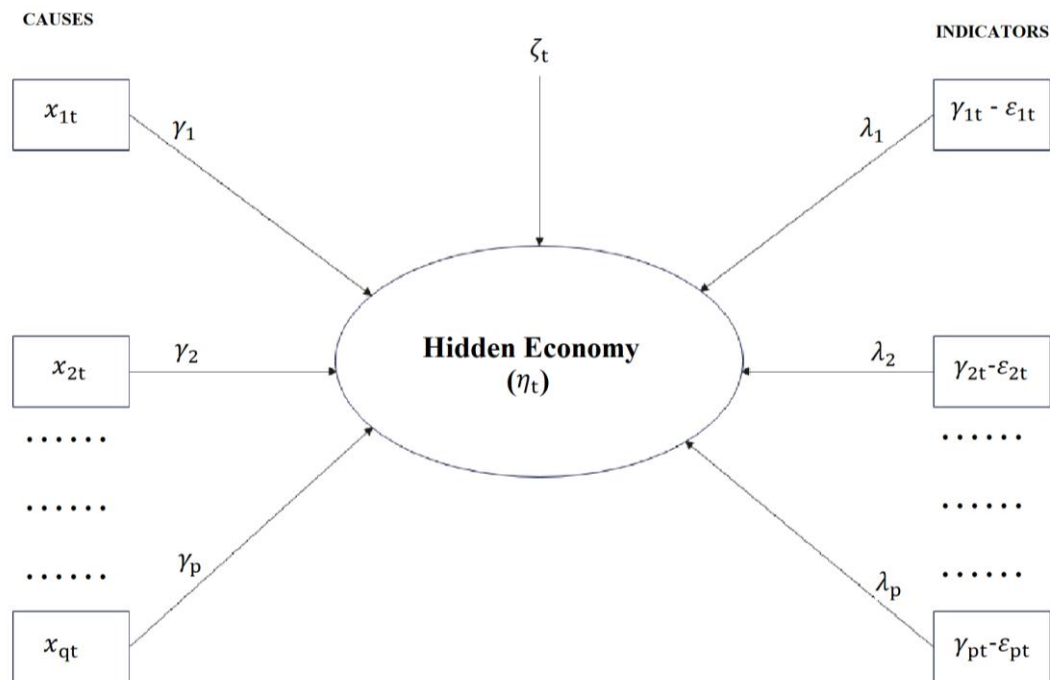
The latent variable  $\eta$  is invisible, and its value also remains unknown. This primary purpose is to determine the values of other parameters ( $\gamma, \lambda, \text{ and } \Sigma$ ) by analyzing the relationships between observed variables in the dispersion and covariation equations. And, the basic structural equation model form written in equation 5 below by considering a random variable  $\zeta$ . Considering random errors ( $\varepsilon$ ), the estimation model connects to unobservable variable ( $\eta$ ) with its indicators ( $\gamma$ ) is expressed in equation 6. Figure 1 shows the general structure of the MIMIC model. Figure 2 represents the conceptual framework for this study is based on this structure.

$$\eta = \gamma_1x_1 + \gamma_2x_2 + \dots + \gamma_nx_n + \zeta \tag{5}$$

$$\gamma_1 = \lambda_1\eta + \varepsilon_1; \gamma_2 = \lambda_2\eta + \varepsilon_2; \gamma_n = \lambda_n\eta + \varepsilon_n; \tag{6}$$

Fig. 1. General Structural of MIMIC 7-1-3 Model



**Fig. 2.** The conceptual framework of this study for a MIMIC 7-1-3 model

### III. RESULTS

We used the Multiple Indicators and Multiple Causes (MIMIC) model, which is a part of structural equation modeling (SEM) with maximum likelihood estimation, to estimate the hidden economy in Myanmar, utilizing specific causal variables and indicators. In this model, the hidden economy is treated as an unobservable latent variable, with causal variables serving as its predictors. Moreover, GDP annual growth rate was used as a constraint in the measurement equation.

The results showed that the predictors of the hidden economy have both significant positive and negative coefficients in relation to the unobservable hidden economy variable. Employment in the agricultural sector (% of total employment), tax burden relative to GDP, and political instability (represented by a dummy variable) have positive relationships with the size of the hidden economy, as indicated by the structural equation model. Therefore, an increase in these causal variables is likely to increase activities within the hidden economy in Myanmar.

In contrast, unemployment rate (% of total employment), GDP per capita, inflation rate (consumer price index), and self-employment (% of total employment) have negative coefficients, suggesting a negative interaction with the size of the hidden economy in the same structural equation model. The negative coefficients imply that a decrease in these variables could lead to an increase in underground economic activities and the expansion of the hidden economy in Myanmar.

In the measurement equation model of the MIMIC analysis, three indicators—GDP annual growth rate, employment rate (aged 15+), and currency circulation—were selected to assess the hidden economy. In this model, the positive coefficients indicate that a decrease (or increase) in the size of the hidden economy results in an increase (or decrease) in the employment rate and an increase (or decrease) in currency circulation outside the banks. The hidden economy in Myanmar has a significant and statistically meaningful relationship with GDP annual growth rate. Both employment rate and currency circulation are also statistically significant indicators.

**Table 2.** Parameter Estimates using MIMIC model

Variable	Coefficient	Standard Error	Z-statistic (p-value)
<b>Structural Hidden Economy</b>			
Unemployment Rate	-4.832318	0.3140668	-15.39(0.000)
GDP Per Capita	-3.169059	1.018517	-3.11 (0.002)
CPI Inflation Rate	-0.0383887	0.0230532	-1.67 (0.096)
Self-Employment (% of total employment)	-1.127683	0.1886746	-5.98 (0.000)
Agriculture Employment Rate	1.564683	0.2472208	6.33 (0.000)
Tax Burden to GDP	0.476607	0.160191	2.98 (0.003)
Political Dummy (0 and 1)	7.763739	1.223292	6.35 (0.000)
<b>Measurement</b>			
GDP Growth; Hidden Economy	1 (constrained)		
Constant	15.23321	2.868022	5.31 (0.000)
<b>Employment Rate</b>			
Hidden Economy	0.6141187	0.0746049	8.23 (0.000)
Constant	64.98106	0.65222338	99.63 (0.000)
<b>Currency Circulation</b>			
Hidden Economy	-1181.061	145.1716	-8.14 (0.000)
Constant	7618.999	82111.4	0.09 (0.926)
<b>Model Statistic</b>			
Chi <sup>2</sup>	228.085		
Prob. (P-value)	0.0000		
Log Likelihood	-1696.039		

**Table 3.** The size of hidden economy in Myanmar from 2000 to 2022

Year	Predicted Hidden Economy	Official GDP (US\$ Million)	Size of Hidden Economy
2000	8.607	8905.066	0.097%
2001	7.296	6477.791	0.113%
2002	5.971	6777.632	0.088%
2003	5.721	10467.110	0.055%
2004	6.532	10567.354	0.062%
2005	5.828	11986.972	0.049%
2006	5.678	14502.553	0.039%
2007	4.562	20182.477	0.023%
2008	3.935	31862.554	0.012%
2009	4.155	36906.181	0.011%
<b>2010</b>	<b>3.412</b>	<b>49540.813</b>	<b>0.007%</b>
<b>2011</b>	<b>3.719</b>	<b>59977.326</b>	<b>0.006%</b>
<b>2012</b>	<b>1.059</b>	<b>59937.797</b>	<b>0.002%</b>

2013	0.182	60269.733	0.0003%
2014	1.624	65446.197	0.002%
2015	1.092	59687.412	0.002%
2016	0.182	63216.143	0.0003%
2017	1.736	66055.091	0.003%
2018	1.869	67855.845	0.003%
2019	0.834	75072.038	0.001%
2020	10.678	79045.695	0.014%
2021	17.087	66262.813	0.026%
2022	8.288	62263.466	0.013%

Table 3 presents data on the hidden economy (latent variable), official GDP, and the size of the hidden economy in Myanmar between 2000 and 2022. The size of the hidden economy is calculated as a percentage of official GDP (in US\$ million). According to the MIMIC model, the hidden economy ranges from 0.182 to 17.087. The findings indicated that the smallest size of the hidden economy in Myanmar ranging from 0.0003% to 0.007%, arose between 2010 and 2019. Conversely, the largest size of the hidden economy ranging from 0.011% to 0.113%, was recorded during the periods 2000-2009 and 2020-2022. These results revealed a significant correlation with changes in different political regimes in Myanmar. The smallest size of the hidden economy was observed during the semi-democratic period from 2010 to 2020. In contrast, the larger size of the hidden economy coincides with periods of military rule, which occurred from 2000 to 2009 and from 2021 to the present. Notably, a slight increase in the size of the hidden economy (from 0.01% in the previous year to 0.014%) was recorded in 2020, likely due to the effects of the COVID-19 pandemic.

## V. CONCLUSION REMARKS

This paper used a MIMIC model in order to quantitatively measure the size of hidden economy in Myanmar from 2000 to 2022. We assumed key input factors influence the hidden economy. All casual and indicator variables were found to be statistically significant in both structural and measurement models. Key determinants of the hidden economy included unemployment rate, GDP per capita, consumer price inflation, self-employment rate, agricultural employment rate, tax burden, and political regime shifts. The findings of the results showed the importance employment rate of agriculture sector, tax burden and political stability in guiding appropriate fiscal and monetary policies in Myanmar.

**Table 4.** The summary of findings

Hypothesis	Results
H <sub>1</sub> : Higher unemployment rates, larger hidden economy.	Not Supported
H <sub>2</sub> : Larger GDP per capita, smaller hidden economy.	Not Supported
H <sub>3</sub> : Higher inflation rates, larger hidden economy.	Not Supported
H <sub>4</sub> : Increased self-employment rates, larger hidden economy.	Not Supported
H <sub>5</sub> : Higher agricultural employment rates, larger hidden economy.	Supported
H <sub>6</sub> : Higher tax burden relative to GDP, larger hidden economy.	Supported
H <sub>7</sub> : Political instability, larger hidden economy.	Supported
H <sub>8</sub> : Larger hidden economy, lower real GDP annual growth rates.	Supported
H <sub>9</sub> : Larger hidden economy, larger employment rates.	Supported
H <sub>10</sub> : Larger hidden economy, higher currency circulation outside the banks.	Not Supported

The summary of hypothesis testing outcomes is shown in Table 4. We acknowledged this study has several limitations. First, it has a small sample size and issues with non-stationarity in time series analysis. Second, the selection of causes and indicators was based on existing literature without fully exploring the nature of Myanmar's demographics and other factors. This may affect assumptions and endogeneity. Despite these limitations, this study contributes to the understanding of the hidden economy and its relation to different political regimes evidenced from Myanmar. Furthermore, another advantage of this study is that it supports as a reference for researchers and scholars in finance and national economics. Future studies are encouraged to include additional causal factors such as the government expenditure ratio to GDP, as well as the sizes of opium, mining, and agricultural sectors because these areas significantly impact Myanmar's hidden economy.

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## CONFLICTS OF INTEREST

Authors declare no potential completing conflict of interests regarding authorship and publication of this work.

## AUTHORS CONTRIBUTION

H. K. and W. W.: Writing and original draft preparation, data collection and formal analysis, H.K. and C.S.: methodology, validation, review and edition.

## DATA AVAILABILITY

The data used for the findings of the results in this study were collected from publicly available sources as reported in Section II. Please contact the corresponding author for data request.

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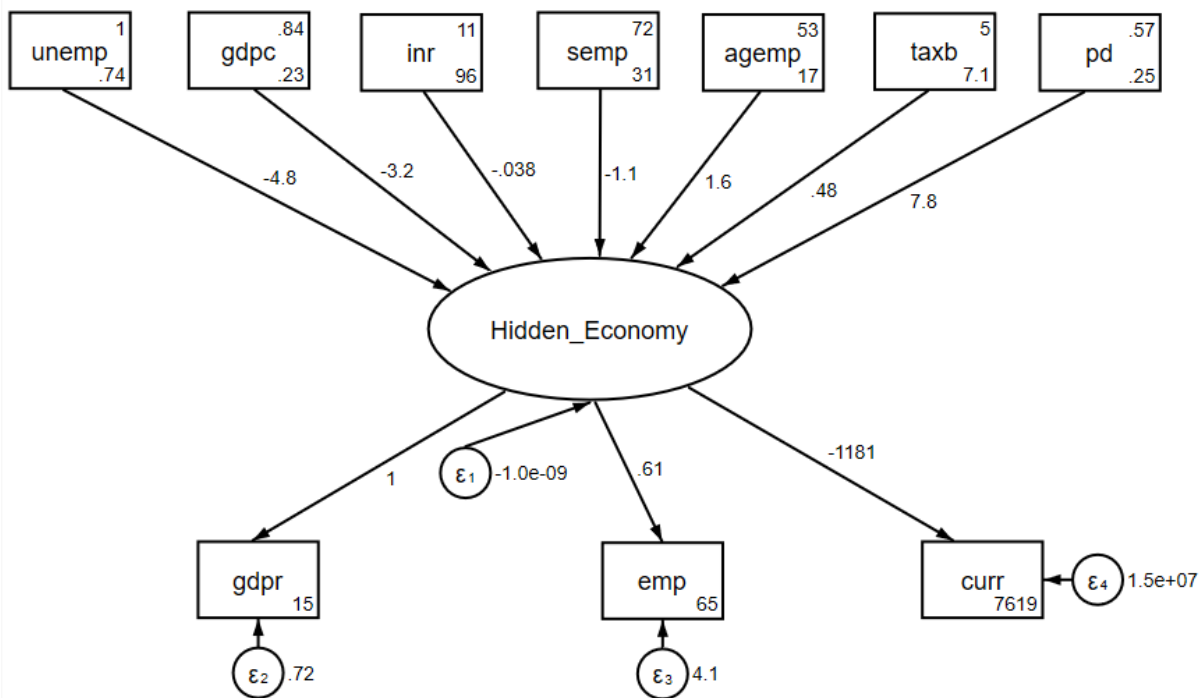
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**APPENDIX A. MIMIC ESTIMATION RESULTS OF THIS STUDY**



Source: Authors' own calculation