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Capital Control Taxes in an Emerging Market Economy

Bir Yükselen Piyasa Ekonomisinde Sermaye Kontrolü Vergileri

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Abstract

Historically, Emerging Markets (EMs) that own foreign debt and exhibit a high degree of dollarization have demonstrated vulnerability to a range of both real and financial shocks. Governments often use a range of capital control measures, particularly in nations burdened with external debt, with the aim of mitigating sudden swings in both inflows and outflows of capital. These policies are implemented to lessen exchange rate volatility and prevent dollarization. This study employs second moments analysis, impulse response functions and the welfare analysis to investigate the impact of a tax policy that restricts international capital flows on several macroeconomic variables in an emerging economy. A dynamic stochastic general equilibrium (DSGE) model is employed to examine the impact of the tax imposed on foreign borrowing on the economy, besides both real shocks such as technology and growth, as well as financial shocks such as country risk premium. The findings of the study indicate that capital control taxes have a diminishing effect on the variability of significant macroeconomic variables, such as investment and consumption, when imposed at lower levels. Conversely, these taxes exhibit a stabilizing impact on the volatility of the trade balance-to-output ratio when implemented at higher levels. Moreover, quantitative evidence reveals that country risk premium shocks exert a substantial influence on variations in both the trade balance-to-output ratio and the level of investment, accounting for around 25% and 50% of the fluctuations, respectively. Finally, the existence of such a taxation enhances the intertemporal utility function at the steady state and reduces its volatility in the case of technology and growth shocks.

Jel Codes: *C68, E17, E30, E32, E37, F41*

Keywords: *Business Cycles, Emerging Economy, Dynamic Stochastic Optimization, Capital Control Tax, Welfare Analysis*

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Öz

Tarihsel olarak, dış borcu olan ve yüksek derecede dolarizasyon sergileyen Yükselen Piyasalar (EMs), hem reel hem de finansal şoklara karşı kırılganlık göstermişlerdir. Hükümetler, özellikle dış borç yükü altında olan ülkelerde, sermayenin hem giriş hem de çıkışlarındaki ani dalgalanmaları azaltmak amacıyla sıklıkla bir dizi sermaye kontrol önlemi kullanmaktadırlar. Bu politikalar döviz kuru oynaklığını azaltmak ve dolarizasyonu önlemek amacıyla uygulanmaktadır. Bu çalışma, yükselen bir ekonomide uluslararası sermaye akışlarını kısıtlayan bir vergi politikasının çeşitli makroekonomik değişkenler üzerindeki etkisini araştırmak için ikinci-momentler analizini, etki tepki fonksiyonlarını ve refah analizini kullanmaktadır. Dış borçlanmaya uygulanan verginin ekonomi üzerindeki etkisini incelemek için hem teknoloji ve büyüme gibi reel şokları hem de ülke risk primi gibi finansal şokları içeren dinamik bir stokastik genel denge (DSGE) modeli kullanılmıştır. Çalışmanın bulguları, sermaye kontrol vergilerinin daha düşük seviyelerde uygulandığında yatırım ve tüketim gibi önemli makroekonomik değişkenlerin oynaklığı üzerinde azaltıcı bir etkiye sahip olduğunu göstermektedir. Tersine, bu vergiler daha yüksek seviyelerde uygulandığında ticaret dengesinin üretime oranının oynaklığı üzerinde dengeleyici bir etki göstermektedir. Dahası, niceliksel kanıtlar, ülke risk primi şoklarının hem ticaret dengesi/çıktı oranındaki hem de yatırım seviyesindeki değişimler üzerinde önemli bir etkiye sahip olduğunu ve dalgalanmaların sırasıyla yaklaşık %25 ve %50'sini oluşturduğunu ortaya koymaktadır. Son olarak, böyle bir vergilendirmenin varlığı, zamanlar arası fayda fonksiyonunun durağan durum seviyesini arttırmakta ve zamanlar arası fayda fonksiyonunun oynaklığını teknoloji ve büyüme şokları durumunda azaltmaktadır.

Jel Kodları: *C68, E17, E30, E32, E37, F41*
Anahtar Kelimeler: *İş Çevrimleri, Yükselen Ekonomi, Dinamik Stokastik Optimizasyon, Sermaye Kontrolü Vergisi, Refah Analizi*

1. Introduction

The fluctuations in macroeconomic indicators have been the subject of extensive research over a prolonged period of time. The fluctuations in economic activity, commonly referred to as business cycles, exhibit distinct characteristics in each country owing to their individual structural attributes. Several variables, including a country's openness to international markets and their level of income, are pivotal in determining the outcome of this kind of situation. Despite those differences, upon categorizing countries into income levels, a number of common characteristics become prominent. The level of wave magnitude and volatility is significantly lower in advanced economies compared to the emerging markets (EMs).[2] The significant fluctuations observed in EMs have drawn considerable attention, particularly during the past quarter century, leading to the appearance of an important amount of literature on this topic.

Besides, there exists a separate field of literature that focuses on the establishment of a variety of financial policies aimed at mitigating the adverse consequences of economic fluctuations, after their structure and impacts have been comprehensively grasped. EMs, particularly those with foreign debt and a high degree of dollarization, typically exhibit susceptibility to various real and financial shocks. For the purpose of creating a more stable economic environment, governments in countries burdened by foreign debt adopt various capital control policies to reduce the extreme volatilities of the flow of capital in both in and out directions.[3]

The adoption of the floating exchange rate regime following the breakdown of the Bretton Woods system generated significant debate due to the multitude of issues it has caused. According to Tobin (1978), the velocity of capital flows and its valuation relative to labor and product prices have an adverse effect on the factors of production. He also claims that the speculative foreign exchange transactions resulted in substantial changes in the exchange rate, hence adversely impacting the real economy. He emphasizes the necessity of implementing a fiscal policy aimed at limiting speculative purchases, asserting that such measures would lead to a decrease in exchange rate volatility and enhance economic predictability. As a solution, he proposes a one-percentage-point tax on foreign exchange buying as well as selling in the spot market. The taxation policy primarily aims to deter speculative foreign exchange transactions, while concurrently bolstering the monetary authority's influence and enhancing the country's tax capacity.

While Tobin's proposal primarily pertains to foreign exchange transactions, the broader application of taxation to financial transactions has been adopted by multiple countries.[4] Various tax policies have been introduced in different nations across the spot foreign currency market, stock market, bond market, and derivative instruments markets with the aim of managing capital flows and mitigating the adverse consequences arising from sharp fluctuations.[5]

[2] See Mendoza (1995), Agenor et al. (2000), Uribe & Schmitt-Grohé (2017).
[3] See Brunnermeier et al. (2009), Claessens et al. (2010), Ostry et al. (2011) and De Mooij & Keen (2016).
[4] See McCulloch & Pacillo (2011), Damette et al. (2022) and Yin et al. (2022).
[5] See Hvozdyk & Rustanov (2016), Becchetti et al. (2014) and Capelle-Blancard & Havrylchyk (2016).

This study aims to analyze the impact of capital control taxes on an emerging economy within a theoretical framework, utilizing the second moments and welfare comparisons as a tool for analysis. In order to achieve the intended objective, a dynamic stochastic general equilibrium (DSGE) methodology is employed to construct a model of an emerging economy that possesses external debt. In the present model, there exists a bond that operates over a singular time period and is risk-free. Households acquire this bond from external sources by returning a specified interest rate and thereafter reimbursing it with interest throughout the period that followed. A government with concerns over the potential impact of capital inflows on economic stability may consider implementing taxation measures on such inflows. The implementation of capital control taxes is intended to mitigate volatility in key macroeconomic variables.

The theoretical model is subjected to simulation in scenarios both with and without capital control taxes. The focus of the analysis is primarily on the second moments of fundamental macroeconomic variables, including the trade balance-to-output ratio and the levels of output, investment and consumption. In the scenario where lower capital control taxes are implemented, it is seen that the standard deviations of investment and consumption are comparatively lower than in a condition where no tax is imposed. Nevertheless, it is noteworthy that the volatility of the trade balance-to-output ratio is higher under the lower capital control tax policies. The findings suggest that higher tax rates result in a decrease in the fluctuation of the trade balance-to-output ratio, in comparison to the scenario without taxes. Upon analyzing the output, it has been concluded that there is no statistically significant disparity detected between the low-tax condition and the scenario without any tax. Nevertheless, in the circumstances of heavy taxation, there is an observed decrease in the fluctuation of output's level.

In addition, an examination is conducted to assess the model's sensitivity to changes in the magnitude of country risk premium shocks. Under the tax scenario, the trade balance-to-output ratio volatility falls as the severity of country risk premium shock rises, but the volatilities of variables of investment and consumption are lower under the lower severity of the country risk premium shocks. Essentially, when the magnitude of the country risk premium shock is lower than a specific threshold, implementing taxes leads to a decrease in the fluctuations observed in investment and consumption. In the same manner, when confronted with a considerable amount of the country risk premium, the impact of taxation policy on the trade balance-to-output ratio volatility is exclusively positive. Hence, the impact of capital control taxes on economic indicators is contingent upon the current conditions and the magnitude of the shocks encountered.

Afterwards, the intertemporal utility function is established and a welfare analysis is conducted. Based on the welfare analysis, it is found that the implementation of capital control taxation results in a greater level of intertemporal utility at the steady state. In addition, the taxation provides lower volatility in intertemporal utility under transitory technology and growth shock processes. Regarding the occurrence of a country premium shock, although the responses are in the opposite direction, there is no statistically significant disparity in volatilities between the scenarios with no-tax and those with taxes.

When looking through the literature on financial transaction taxes, there are only a few studies of EMs that directly tax foreign borrowing and subject to various real and financial shocks. In the literature, several studies examine the impact of these types of taxes on the steady-state levels of key variables, and the potential loss of welfare resulting from the imposition of such taxes. The aim of this research is to evaluate the effects of introducing taxes on capital controls by quantitatively determining the fluctuations in key macroeconomic indicators and the welfare effects of the taxation in a theoretical framework and to recommend a suitable policy to the decision-makers. When developing a theoretical framework, the fundamental features of EMs are substantially considered. Consequently, this work has developed a simplified theoretical model that imposes direct taxation on foreign borrowing in an emerging economy. This study attempts to improve the Aguiar & Gopinath (2007) model by incorporating a capital control tax and the country risk premium shock. The method is to compare the volatilities of key macroeconomic variables under different degrees of taxation and to examine the impact of the country premium shock in scenarios with and without taxation. Furthermore, the impact of the capital control tax policy on welfare is also investigated.

The subsequent section of the paper provides a comprehensive discussion of the relevant literature. Section 3 of the paper introduces the stochastic growth model and describes the process of parameter calibration. Section 4 focuses on the comparison of certain stylized facts pertaining to the model and EMs. Section 5 presents an analysis of the variance decomposition of the constructed model, along with further sensitivity studies. Section 6 is the welfare analysis. Lastly, Section 7 is the concluding remarks.

2. Literature

This section provides an overview of the existing literature pertaining to EMs and the policies of capital control taxes. One of the pioneering studies on real business cycles (RBC) within EMs is the work of Mendoza (1995). Mendoza conducts an analysis encompassing a total of 30 countries, which comprised both G7 nations and 23 EMs from diverse geographical regions. Based on the findings of the study, volatility in macroeconomic indicators has been greater in EMs, but correlations and serial correlations between indicators are similar in both types of country groups. Mendoza's findings indicate that fluctuations in the terms of trade contribute to approximately 50% of the volatility observed in gross domestic product (GDP). However, Agenor et al. (2000) highlight the challenges associated with performing theoretical investigations on EMs. These challenges include limitations in length and quality of data in EMs, as well as the inherent turbulence observed in their economies. EMs have a higher frequency of crises compared to the advanced economies, and experience significant fluctuations in macroeconomic variables. Due to the influence of these factors, the researchers observe varying outcomes in their investigations. For instance, although the average production volatility in EMs tends to be higher, a closer examination of individual countries reveals that certain nations surprisingly exhibit lower levels of output volatility compared to the advanced economies.

The study conducted by Aguiar & Gopinath (2007) examine the impact of trend shocks within their theoretical framework, including the short-term nature of cycles and the long-lasting and decisive nature of trends. Their findings demonstrate a noteworthy alignment between the outcomes of the model and the empirical data. Garcia-Cicco et al. (2010) have conducted an analysis over a longer time frame using data from Argentina and Mexico, in order to address concerns regarding the limited temporal scope of the sample employed in the research Aguiar and Gopinath did. They have ultimately demonstrated that the study is insufficient in capturing long-term phenomena. Subsequently, they make some improvements to the existing model by incorporating shocks related to country risk premiums and financial frictions. They assert that the extended model provides a more comprehensive explanation for the fluctuations in EMs.

Neumeyer & Perri (2005) argue that the magnitude of fluctuations in EMs surpasses that of advanced economies, with the foreign interest rate ("external" or "world" interest rate can be used interchangeably in the literature) identified as the primary driver of those fluctuations. In a distinct manner, Neumeyer and Perri introduce a working capital constraint into the problem of the firm. This inclusion ensures that shocks to the external interest rate influence both labor demand and labor supply, hence resulting in a reduction in employment. The primary result of the study pertains to the significant influence of borrowing costs on economic fluctuations, with borrowing costs accounting for nearly 50% of output fluctuations.

Due to the model, they created, Uribe & Yue (2006) criticize Neumeyer & Perri's findings. They argue that the explanatory capacity of the interest rate surpasses what is expected on the basis the research conducted by Neumeyer & Perri. This discrepancy arises due to the definition of domestic interest rates and the external interest rates as an autoregressive process in their work. Uribe & Yue discover that the world interest rate shock could explain 20% of the volatility in production using their modified model.

The literature about capital regulations has shown significant growth since Tobin's initial contributions. The literature related to the taxation of financial transactions has shown continued growth due to the rising volume and variety of such transactions. Sweden and the United Kingdom represented notable instances of such tax policies throughout the latter part of the 1980s. Sweden has enacted a taxation policy on share purchases, whereas the United Kingdom has opted to require corporations seeking registration on the stock exchange market to pay stamp duty. Despite the Swedish application's lack of success and subsequent abandonment, the stamp duty levied by the United Kingdom continues to be in effect up to the current time.[6]

When considering the most recent developments, it is worth mentioning that Italy introduced a measure in 2013 with the objective of reducing abrupt movements in financial markets through the imposing taxes on high-frequency trading activities. According to Hvozdyk & Rustanov (2016), the effectiveness of this policy is questionable as it does not appear to have resulted in a decrease in volatilities in the market. Several countries, such as France, India, Brazil, Spain, Greece, and Chile, employ similar tax policies as a result of the shared objectives. In their empirical investigation on the impact of a stock tax, Becchetti et al. (2014) find that

[6] See Umlauf (1993) and Raffer (1998).

the implementation of a French-style financial transaction tax resulted in a decrease in both the volume of transaction and price volatility in the stock market. In contrast to the prior research, Capelle-Blancard & Havrylchyk (2016) argue that the imposition of taxes on transactions in securities in France leads to a decrease in stock transactions, but does not yield a substantial impact on market volatility.

Berentsen et al. (2016) employ a tax on bond transactions in the secondary market as a means of illustrating the potential enhancement of household welfare through the implementation of the optimal tax level. The optimum tax rate of 1.6% is determined by an analysis of data obtained from the United States. The study conducted by Agapova & Volkov (2021) reveals that the reactions of market participants to fluctuations in tax rates in the stock market are contingent upon their focus on taxation. The findings of the study suggest that investors exhibit a higher level of trading activity and display a more favorable reaction in response to the tax reductions instead of the increment in taxes. According to Buss et al. (2016), Tobin-type taxes serve as a specific capital control approach within the stock market, that is claimed to enhance the overall welfare of the household. According to the findings of Adam et al. (2015), the implementation of a tax on the stock market has the effect of reducing the magnitude of price fluctuations. However, it is crucial to consider that implementing such a tax also introduces the potential for increased price volatility.

Korinek (2018) highlights the importance of implementing capital control tax policies based on the debt composition. He argues that while imposing taxes on foreign debt is beneficial for the domestic economy, taxes on foreign direct investments should be minimal. In addition to emphasizing the significance of debt composition, Shin & Submanian (2016) propose that the implementation of a capital control tax is contingent upon the degree of flexibility and substitutability displayed by foreign and domestic goods. If there is no distinction between local and foreign goods in terms of their interchangeability, the implementation of taxation is ineffective under the fixed exchange rate system, leading to a decrease in the overall welfare of the economy.

Deng et al. (2018) conduct an analysis comparing the effectiveness of capital control taxes in developed countries versus less developed countries. Their findings reveal that while these taxes are found to be ineffective in developed economies, they demonstrate the efficacy in EMs. In their study, Jeanne & Korinek (2010) perform an analysis of emerging economies that implemented a certain form of taxation. This taxation policy aims to limit the capital inflows during the periods of economic expansion, and conversely, restricts the capital outflows during the periods of economic contraction. Their analysis demonstrates that the application of capital controls has a substantial impact on reducing macroeconomic instability and considerably enhancing the household welfare. Jin & Xiong (2023) investigate the effectiveness of macroprudential policies in a theoretical framework. Although they find a negative correlation between the openness of a country and the effectiveness of the macroprudential policies, they assert that capital controls should be taken into account regardless of the country's openness. Implementing capital controls as a macroprudential policy leads to a higher level of welfare. Furthermore, capital controls effectively stabilize the economy by decreasing the fluctuations of macroeconomic variables.

Kitano & Takaku (2017) develop various scenarios in a small open economy. Those scenarios are designed to examine the presence or absence of a financial accelerator mechanism, while also considering different exchange rate regimes. Additionally, the researchers incorporate the imposition of taxes on external borrowing within each scenario. The implementation of a fixed exchange rate system has the potential to enhance social welfare when combined with the existence of a financial accelerator mechanism. The floating exchange rate regime, conversely, enhances wellbeing in the absence of a financial accelerator mechanism. Furthermore, Yin et al. (2022) focus their research on China, a prominent emerging economy. A DSGE model has been created to analyze the dynamics of an emerging economy that incorporates capital controls and monetary policy coordination. Based on the established model, two separate ideal scenarios have been identified for the prevention of capital outflows. One key aspect is that entrepreneurs are required to fulfill their obligations for capital control tax payments, while concurrently experiencing a reduction in interest rates. An alternative course of action includes implementing a capital control tax on households and increasing interest rates. They discover that imposing capital control taxes on the entrepreneurs leads to a decrease in welfare loss. Consequently, they assert that the capital control tax policy might effectively reduce certain adverse consequences associated with the monetary policy.

This study contributes to the theoretical studies and the qualitative analyses in the existing literature. A theoretical model is constructed to represent the stylized facts of EMs. This model is extended by incorporating a tax on capital controls and a country risk premium shock. The introduction of second moments analysis provides a fresh perspective on the existing literature. Furthermore, when discussing the variations in emerging economies, it has been discovered that in EMs; (i) the transitory technology shock is not as impactful as previously believed, (ii) the trend shock is the most significant explanatory factor, and (iii) the country risk premium shock has been identified as a crucial explanatory factor, particularly in relation to the fluctuations in the trade balance-to-output ratio and the level of investment. On the other hand, the welfare analysis also makes a significant contribution to the existing body of literature while it is being conducted on EMs with capital control taxes. According to the simulation results, it is found that the capital control taxation leads to an increase in the overall welfare of the economy.

3. Stochastic Growth Model

3.1. Benchmark Model

In this section, a business cycle model that reflects the main characteristics of an emerging economy is constructed. The model draws significant inspiration from the research conducted by Aguiar & Gopinath (2007). The inclusion of a governmental agency that takes into account the dynamics of capital flows has been added to their model. In the subsequent discussion, a comprehensive analysis will be provided regarding the concerns of the government and the limitations imposed by its budgetary constraints. Moreover, the model incorporates a shock in the country risk premium, which is absent in the original analysis.

The model is a standard small open economy model with a single good and a single asset. Time is discrete and the model horizon is infinite. A representative firm uses capital (K_t) and labor (L_t) as inputs in order to produce the final goods (Y_t). The production function is as follows:

$$Y_t = e^{z_t} {K_t}^{1-\alpha} (\Gamma_t L_t)^{\alpha} \tag{1}$$

where $\alpha \in (0,1)$. Here, z_t is a transitory technology shock. It is presumed that the law of motion for the transitory productivity shock follows a first-order autoregressive process (AR(1)):

$$z_t = \rho_z z_{t-1} + \epsilon_t^z \tag{2}$$

where $\rho_z \in (0,1)$ and $\epsilon_t^z \sim N(0, \sigma_z^2)$. In other respects, Γ_t is the cumulative product of growth shocks. Γ_t can be shown as:

$$\Gamma_t = \mathrm{g}_t \Gamma_{t-1} = \prod_{s=0}^{t} g_s \tag{3}$$

$$\ln \mathrm{g}_t = (1-\rho_g) \log \mu_g + \rho_g \ln \mathrm{g}_{t-1} + \epsilon_t^g \tag{4}$$

where $\rho_g \in (0,1)$ and $\epsilon_t^g \sim N(0, \sigma_g^2)$. Here, μ_g is the long-run productivity growth rate. For simplicity of explanation and calibration, it is employed that different notation for shock processes to the level of production (z_t) and to the productivity growth (g_t) in the original study.

Since a realization of g has a permanent influence on Γ, the output exhibits nonstationary due to the presence of a stochastic trend. A hat is set up to represent the detrended counterpart regarding any variable x:

$$\widehat{x_t} \equiv \frac{x_t}{\Gamma_{t-1}} \tag{5}$$

By this method, it is worth noting that it is normalized by trend productivity over period $t-1$. This guarantees that if x_t is contained within the agent's information set at time $t-1$, then $\widehat{x_t}$ is as well. Nevertheless, the solution of the model is independent of the normalization method used.

The representative agent's preference depends on consumption (C_t) and labor (L_t) and is chosen as GHH preferences[7]:

$$u_t = \frac{(C_t - \varsigma \Gamma_{t-1} L_t^{v})^{1-\sigma}}{1-\sigma} \tag{6}$$

where $v > 1$ and $\varsigma > 0$. The cumulative growth is included in labor disutility to ensure that the supply of labor remains limited along the growth path in parallel with the related literature. In order for detrended consumption to exhibit suitable behavior in the steady-state, it is needed that $\beta(1+r^*)^{\frac{1}{\sigma}} = \mu_g$, where r^* is the world interest rate.

[7] See Greenwood et al. (1988).

The equilibrium is defined by optimizing the present discounted value of the utility function subject to the production function (Equation (1)) and the following budgetary constraint:

$$C_t + K_{t+1} = Y_t + (1-\delta)K_t - \frac{\phi}{2}\left(\frac{K_{t+1}}{K_t} - \mu_g\right)^2 K_t - B_t + q_t B_{t+1} + G_t \tag{7}$$

It would like to draw your attention to three issues with this equation. The first one is the cost of quadratic capital adjustment. The other factor is the availability of risk-free and single-period external borrowing, B_t. Finally, there is a transfer of income collected by the government to the households, G_t, which is the main extension of this paper. The price of bonds (q_t) includes the tax rate and domestic interest rate:

$$q_t = \frac{1-\tau}{1+r_t} \tag{8}$$

where $\tau \in [0,1]$ is the rate of capital control tax and r_t is the domestic interest rate. $\tau = 0$ means that the government does not imply any taxation to the foreign debt. Increasing the tax rate is a policy of the government to discourage capital inflows. If $\tau = 1$, it indicates that all capital inflows are taxed, and in this case, the long-term external debt in this economy trivially will be equal to zero.

Eventually, the price of bonds can be written as (Schmitt-Grohe & Uribe (2003)):

$$\frac{1}{q_t} = 1 + r^* + \psi\left(e^{\frac{B_{t+1}}{\Gamma_t} - b} - 1\right) + e^{\eta_t - 1} - 1 \tag{9}$$

As it can be seen, the price of debt is determined by the deviation of a detrended measure of aggregate debt from the debt to output ratio at the steady-state (b). Interest rate elasticity to deviations in borrowing is denoted by ψ. Another extension of this model is the introduction of an exogenous stochastic country risk premium shock (η_t) following the AR(1) process (Garcia-Cicco et al. (2010)):

$$\ln \eta_t = \rho_\eta \ln \eta_{t-1} + \epsilon_t^\eta \tag{10}$$

where $\rho_\eta \in (0,1)$ and $\epsilon_t^\eta \sim N(0, \sigma_\eta^2)$.

Above all, it is assumed that government has no consumption and its revenue from the capital control tax should be rebated to the public as transfers. Thus, the subsequent expression is the budget constraint of the government:

$$G_t = \tau \frac{B_{t+1}}{1+r_t} \tag{11}$$

The problem of the representative agent is indicated recursively in the normalized form:

$$V(\hat{K}_t, \hat{B}_t, z_t, g_t, \eta_t) = \max_{\{\hat{C}_t, L_t, \hat{K}_{t+1}, \hat{B}_{t+1}\}} \{u(\hat{C}_t, L_t) + f(\beta, g_t) E_t V(\hat{K}_{t+1}, \hat{B}_{t+1}, z_{t+1}, g_{t+1}, \eta_{t+1})\} \tag{12}$$

Since the preference is chosen as GHH preferences, $f(\beta, g_t) = \beta {g_t}^{1-\sigma}$. The optimization problem is subject to the following budget constraint:

$$\widehat{C}_t + g_t\widehat{K}_{t+1} = \hat{Y}_t + (1-\delta)\widehat{K}_t - \frac{\phi}{2}\left(g_t\frac{\widehat{K}_{t+1}}{\widehat{K}_t} - \mu_g\right)^2 \widehat{K}_t - \hat{B}_t + g_t q_t \hat{B}_{t+1} + \hat{G}_t \quad (13)$$

The first order conditions (FOCs) with respect to $\{\widehat{K}_{t+1}, \hat{B}_{t+1}, L_t\}$ are as follows respectively:

$$u_c(\widehat{C}_t, L_t)\left(g_t + \phi\left(g_t\frac{\widehat{K}_{t+1}}{\widehat{K}_t} - \mu_g\right)g_t\right) = f(\beta, \mathrm{g}_t)\mathrm{E}_t\frac{\partial V}{\partial \widehat{K}_{t+1}} \quad (14)$$

$$u_c(\widehat{C}_t, L_t)g_t q_t + f(\beta, \mathrm{g}_t)\mathrm{E}_t\frac{\partial V}{\partial \hat{B}_{t+1}} = 0 \quad (15)$$

$$u_L(\widehat{C}_t, L_t) + u_c(\widehat{C}_t, L_t)\frac{\partial \hat{Y}_t}{\partial L_t} = 0 \quad (16)$$

Given the initial values of the levels of debt and capital, the economy's behavior can be defined by these FOCs.

3.2. Parameter Calibration

Most of the parameters utilized in this study have been calibrated based on the relevant literature. The primary objective of calibration is to protect the fundamental characteristics of emerging economies. In the model, a period represents a quarter. The majority of the parameters utilized in this study originated from the initial research conducted by Aguiar & Gopinath (2007); such as the subjective discount factor, labor exponent (both utility and production functions), labor coefficient, steady-state level of debt-to-GDP ratio, coefficient on interest rate premium, the risk aversion coefficient, volatility of technology, volatility of growth, depreciation rate and the long-run productivity growth rate. Most of these parameters have also been used in the related literature (see also Mendoza (1991), Uribe & Yue (2006), Correia et al. (1995), Neumeyer & Perri (2005)).

Table 1: Model Parameters

Subjective discount factor	β	0.98
Exponent of labor in utility function	v	1.60
Coefficient of labor in utility function	ς	1.40
Steady-state level of debt-to-GDP ratio	b	0.10
Coefficient on interest rate premium	ψ	0.001
Exponent of labor in production function	α	0.68
Risk aversion coefficient	σ	2
Depreciation rate	δ	0.03
Adjustment Cost Parameter	ϕ	1
Long-run productivity growth rate	μ_g	1.006
Autocorrelation of z	ρ_z	0.75
Autocorrelation of g	ρ_g	0.85
Autocorrelation of η	ρ_η	0.37
Volatility of z	σ_z	0.004
Volatility of g	σ_g	0.011
Volatility of η	σ_η	0.005

The adjustment cost parameter is assigned a value of 1 to address the higher level of the investment volatility compared to the output volatility. There are differences observed among distinct articles in terms of the parameters associated with persistency (ρ_z, ρ_g, ρ_η). There exists an instinct for growth shocks to demonstrate a higher degree of persistence in comparison to the transitory technology shocks. Thus, it is assumed as $\rho_z < \rho_g$. Additionally, autocorrelation of country premium shocks has a significantly lower value than the others. Hence, ρ_η is set to 0.37 (see Andre et al. (2023)). All parameters can be seen in Table 1. In the benchmark model, the tax rate for capital controls is assumed to be zero. Subsequently, an examination will be conducted on various rates and their corresponding impacts. The forthcoming section will address the impacts indicated above.

4. Some Stylized Facts and the Impulse Response Functions

The normalized model is numerically solved by log-linearizing the first order conditions and the resource constraints around the deterministic steady-state. The uniqueness of the equilibrium is established under the premise of the first-order approximation. Subsequently, numerical simulations are performed to validate the fulfillment of the essential stylized facts regarding emerging economies. Each simulation comprises a total of 1000 time periods. The beginning and the last 300 observations are excluded during the calculation of the second moments. For the benchmark model, the capital control tax rate is set to zero. Next, the second moments of a set of chosen variables, the level of output (Y), the level of investment (I), the level of consumption (C), and the trade balance-to-output ratio (TB/Y), are computed.

Table 2 shows some statistics about the benchmark model in terms of these selected variables. The first row of Table 2 displays the standard deviation of each variable in percentage points. The study continually reports the standard deviations in percentage points. As it is seen, standard deviation of output, 6.19%, is less than consumption's, 8.99%, investment's, 10.16%, and trade balance-to-output ratio's, 11.07% ($std(Y) < std(C) < std(I) < std(TB/Y)$).

Table 2. Benchmark Model Statistics ($\tau = 0\%$)

Statistics	Y	C	I	TB/Y
Standard Deviation (std(.))	6.19	8.99	10.16	11.07
Correlation with Y (corr(Y,.))	-	0.89	0.35	-0.45
Correlation with TB/Y (corr(TB/Y,.))	-0.45	-0.59	-0.93	-
Serial Correlation (corr(X,X(-1)))	0.89	0.95	0.64	0.69
Steady State (SS) Level	1.078	0.877	0.198	0.003

The correlation coefficients of the level of output with the other parameters reflects the general stylized facts about emerging economies. As it is seen, the correlation coefficient between consumption and output is positive and higher than the correlation coefficient between output and investment ($corr(Y,C) = 0.89 > corr(Y,I) = 0.35 > 0$). Most importantly, the correlation coefficient between the trade balance-to-output ratio and output is negative, $corr(TB/Y,Y) = -0.45$. Additionally, the correlation coefficients of the trade balance-to-output ratio with investment and consumption are also negative as expected. Lastly, the serial correlation coefficients of each variable are positive, *e.g.* $corr(Y,Y(-1)) =$

0.89. The final row in Table 2 displays the levels of each variable in the deterministic steady state (*SS*).

Table 3 shows the standard deviations of the same selected variables at different tax levels. At the start, tax rates are selected at 1%, 2.5%, 5%, 10%, 25%, and 50% to observe the impacts of different tax levels on the volatilities of the selected variables. However, when the tax rate goes extremely high, it is seen that some variables, which should be non-negative, becomes negative such as domestic interest rates.

In addition to this, it is found that the lower levels of relative volatilities are encountered at lower tax rates. Therefore, our objective is to analyze the lowest levels of tax rates ranging from 0% to 3%. The extended version of Table 3 can be found in Appendix. It is found that 1.9% tax rate gives the lowest relative volatility of investment ($std(I)/std(Y)$), 1.610. Hence, the inclusion of this ratio in the table is explained by this rationale. Moreover, the 1.9% tax rate will be compared to the benchmark model, which has a zero-tax rate, as an indicator of tax policy in the next subsections.

Table 3 displays the second moments of selected variables under different tax rates. The initial rise in the tax rates leads to an immediate increase in the volatility of Y, which then diminishes over time. Similarly, the volatility of TB/Y exhibits a comparable situation. However, the introduction of taxation leads to a decrease in the fluctuations of I and C. At extremely high tax rates, the volatility of both variables experiences an increase. Briefly, Table 3 demonstrates that the capital control tax has varying impacts on the volatilities of the variables.

Table 3. Standard Deviations and the Relative Volatilities at Different Tax Rates for Selected Variables

	Standard Deviations				Relative Volatilities	
Tax Rate (τ)	Y	C	I	TB/Y	$\frac{Std(C)}{Std(Y)}$	$\frac{Std(I)}{Std(Y)}$
0%	6.19	8.99	10.16	11.07	1.452	1.641
1%	6.24	8.14	10.11	11.34	1.304	1.620
1.9%	6.25	7.45	10.06	11.56	1.192	1.610
2.5%	6.22	7.05	10.04	11.67	1.133	1.614
5%	5.84	6.23	10.02	11.66	1.067	1.716
10%	5.19	6.35	10.30	10.67	1.224	1.985
25%	4.79	6.84	10.80	7.98	1.428	2.255
50%	4.73	7.75	11.07	5.00	1.638	2.340

Figure 1 shows the impulse response functions (IRFs) of Y, I, C and TB/Y to different shock processes. Figure 1a shows the IRFs to 1% transitory technology shock. Figure 1b shows the IRFs to 1% growth shock. Lastly, Figure 1c shows a 1% country premium shock. Each graph is generated according to the selected tax levels, which are 0%, 1%, 2.5%, 5% and 10%. Here, 1% shock refers to a scenario when the standard deviation of the error term in a shock process, which are σ_z, σ_g and σ_η, experiences a 1% change.

In the face of a positive transitory technology shock, there is observed to be a simultaneous increase in output, consumption, and investment by around 2%, 1%, and 1% respectively.[8] Subsequently, it can be observed that all variables exhibit a slow reduction over the period of time. Remarkably, the impact of tax rates on output and investment IRFs is negligible. When the tax rate is increased, consumption tends to go back to its initial steady-state level instead of exceeding it. Moreover, in comparison to the other variables, the impulse response of the trade balance-to-output ratio exhibits a delay. The ratio has a temporary increase before subsequently declining below the level of its steady-state. An increase in the tax rate results in a more rapid convergence of this ratio towards its steady-state level. Over the long term, irrespective of the prevailing tax rates, the ratio ultimately reaches its steady-state level.

In the case of the growth shock, it is observed increases of around 1% in output, 2.5% in consumption, and 3% in investment. An increase in tax rates accelerates the achieving of steady-state levels for both output and consumption. In the absence of taxation, the tax rate being equal to 0%, both output and consumption persistently remain below the levels observed in the steady-state for a longer period of time. When considering investment, the tax level has a negligible impact on the initial response. Nevertheless, when the tax rate rises, it remains above the steady state level and achieves that level more quickly compared to the scenario without any taxation. This scenario holds relevance in the context of TB/Y. As the tax rates increase, the time required for the convergence also decreases.

When the model encounters a country premium shock, the subsequent movements of output, investment and consumption are in the opposite direction compared to the preceding shock processes. The observed fluctuations in levels of output, consumption, and investment exhibit a marginal increase of around 0.8%, 0.04%, and 5% respectively. The magnitude of the investment change is considerably larger compared to the other variables. This scenario occurs due to the greater sensitivity of investment to the country premium shocks. Furthermore, it is important to highlight that the steady-state levels of all these variables converge within a maximum of 20 periods of time. The ratio of trade balance-to-output exhibits a notable increase of approximately 6% in response to the shock. The observed substantial rise in value suggests that there exists a strong correlation between TB/Y and the impact of country premium shocks, indicating a high level of sensitivity. Afterwards, there is a substantial decrease observed, ultimately, after the elapse of 15 time periods, it reaches its steady-state level.

[8] In fact, Garcia-Cicco et al. (2010) and Aguiar & Gopinath (2007) investigate IRFs of the ratios of consumption to output and investment to output instead of the levels of these variables. However, the movements of the "levels" of these variables in this model coincide with the findings of those studies with regards to the all shock processes.

Figure 1a: IRFs of the Selected Variables to the Transitory Technology Shock

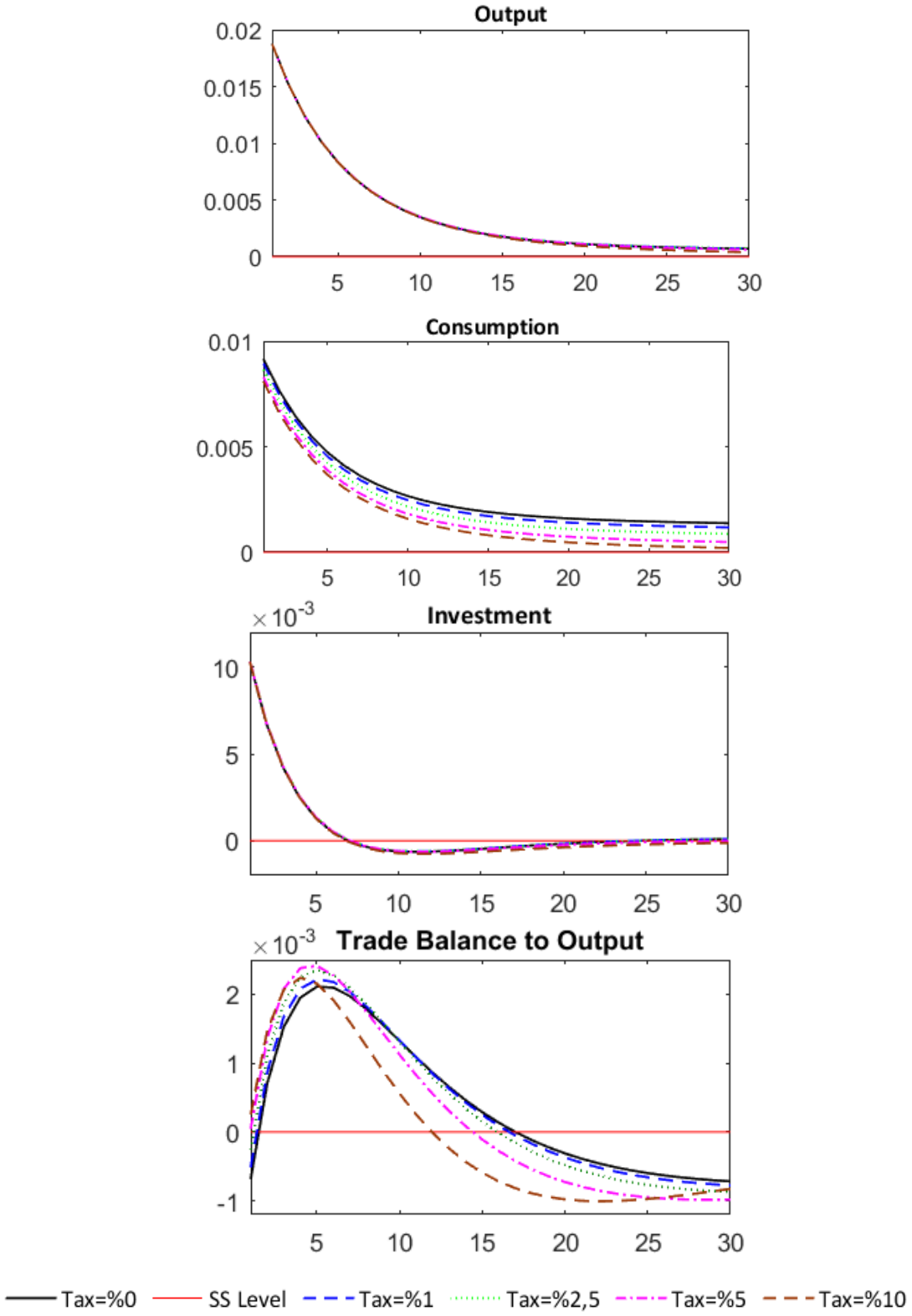


Figure 1b: IRFs of Selected Variables to the Growth Shock

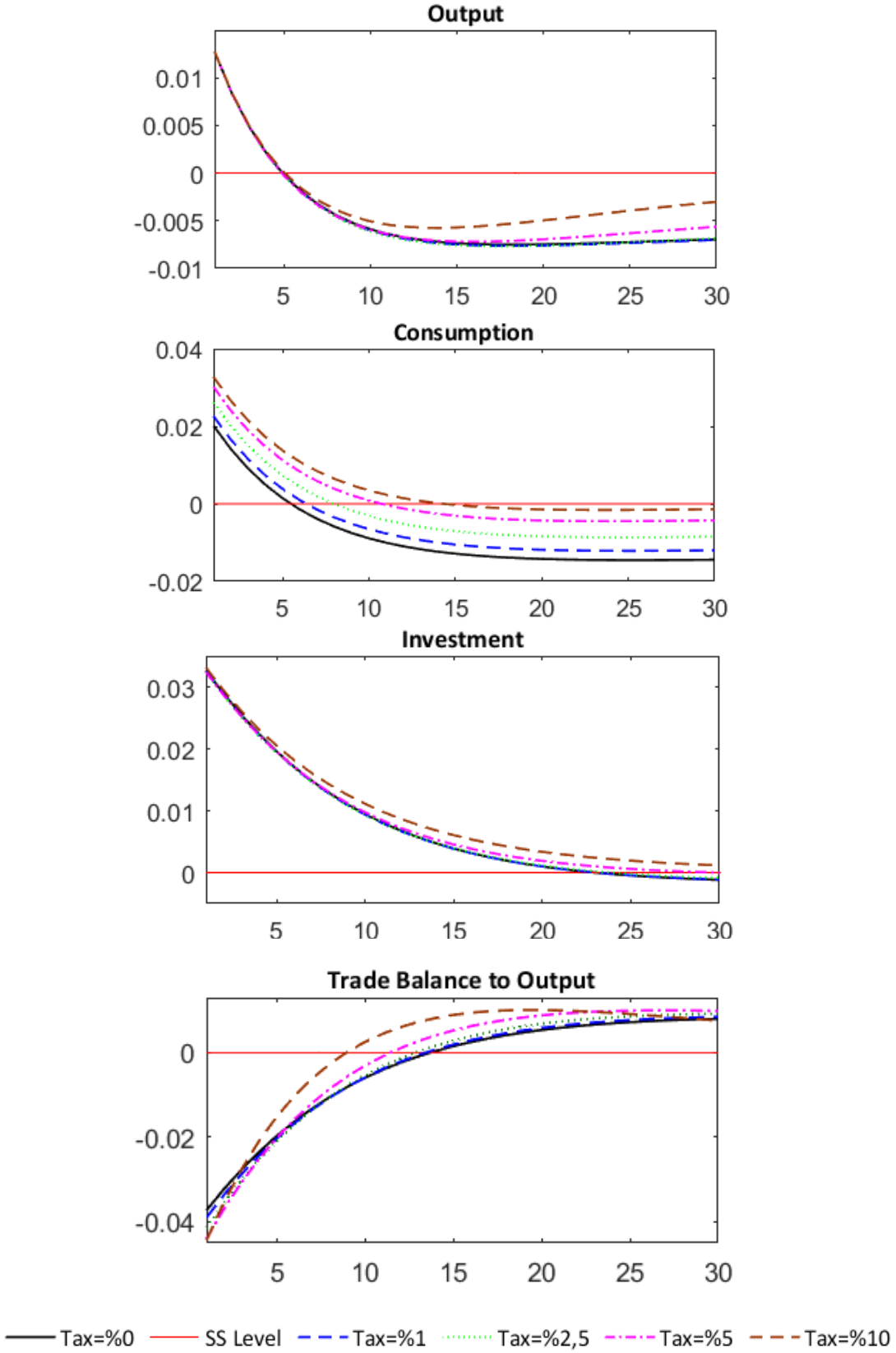
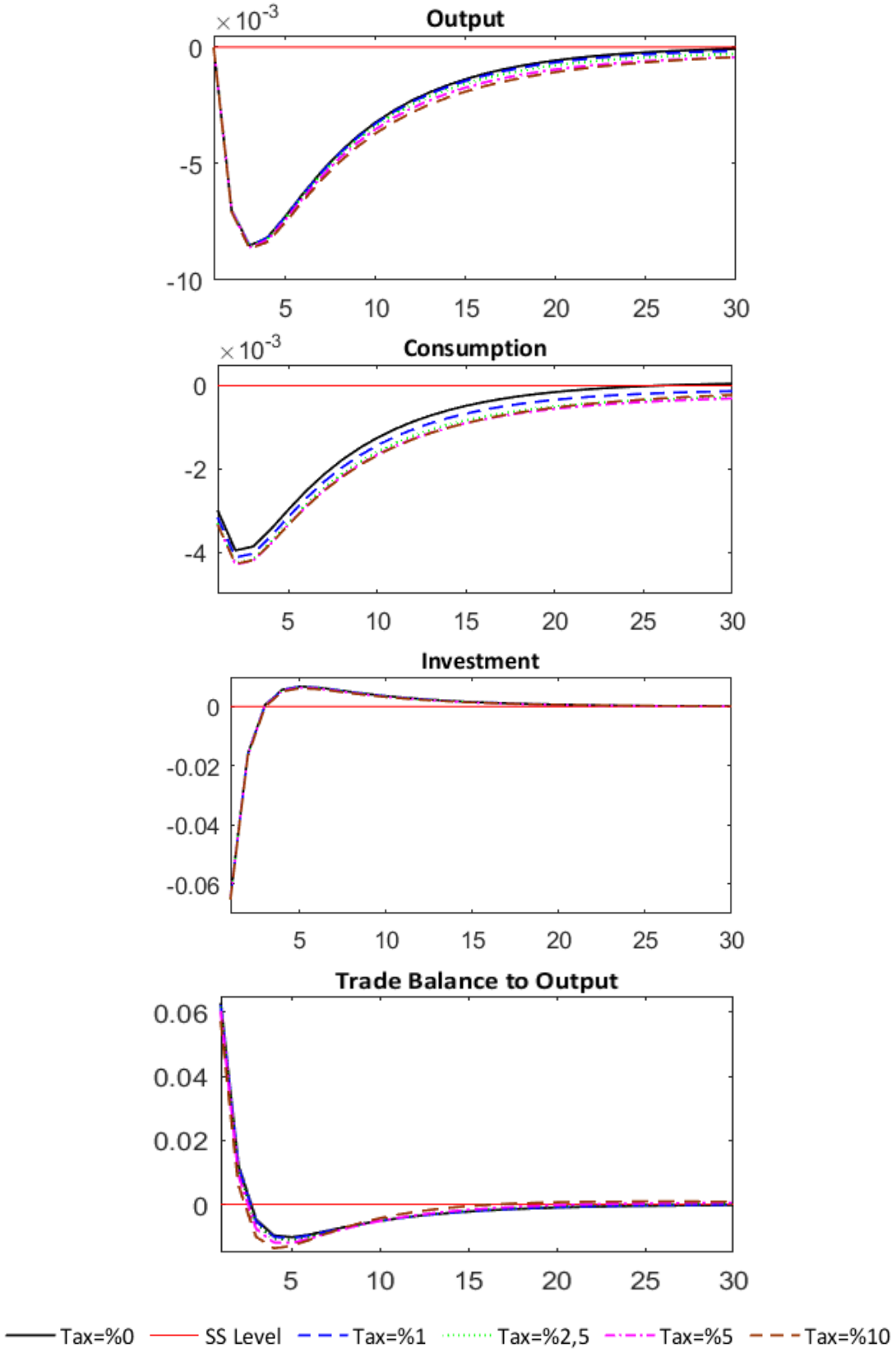


Figure 1c: IRFs of Selected Variables to the Country Risk Premium Shock



5. Variance Decomposition and Sensitivity Analyses

This section provides a discussion on the variance decomposition table and presents some sensitivity tests.[9] Table 4 displays the variance decomposition of the model in scenarios where there are no taxes and where a tax rate of 1.9% is applied, as an indicator of the taxation policy. The growth shock appears as the most prominent among the several shock mechanisms in each given scenario. The growth shock accounts for the majority of the observed fluctuations in all variables. For instance, 97.6% (95.1%) of the fluctuations of consumption can be explained by the growth shock process with no-tax scenario (with the capital control tax scenario).

The inclusion of the country risk premium shock in the model enhances the ability to explain the fluctuations observed in the trade balance-to-output ratio and the level of investment. Approximately 48.3% (or alternatively, 49.7% in conjunction with the presence of taxes) of the variation in investment can be attributed to the impact of the country premium shock. In addition, the result of the trade balance-to-output ratio is at 26.5% (or 28.0% considering the taxation scenario). One notable result of this model is that the explanatory power of technology shock process is insufficient in accounting for the observed variations in an emerging economy to a satisfying degree. This shock accounts for only 15.7% of fluctuations in the level of output (20.0% when considering the capital control tax scenario), while the explanations for other variables are quite negligible.

Table 4: Variance Decomposition of Selected Variables

	$\tau = 0\%$					$\tau = 1.9\%$			
Shock Process	Y	C	I	TB/Y		Y	C	I	TB/Y
Transitory Technology	15.7	2.1	1.9	0.6		20.0	3.8	1.9	0.5
Growth	79.0	97.6	49.8	73.0		73.0	95.1	48.4	71.5
Country Premium	5.3	0.3	48.3	26.5		7.1	1.2	49.7	28.0
Total	**100**	**100**	**100**	**100**		**100**	**100**	**100**	**100**

Thus far, the impact of a country premium shock on certain variables has been analyzed in the presence and absence of capital control taxes. The magnitude of the shock can be described as the percentage rise in volatility of η. Table 5 provides the simulation results justifying the computation of the second moments of the trade balance-to-output ratio and the levels of output, investment and consumption in relation to the percentage increase in σ_η under both scenarios.

Without country premium (CP) shock, taxation reduces the standard deviations of the levels of output, investment and consumption by 5.2%, 3.1% and 28.8% respectively. However, when CP shock occurs, taxation slightly increases the output volatility. Volatilities of the levels of investment and consumption have moderately diminished under the capital control tax scenario until the threshold level of the percentage increase in σ_η at 7.5%.

[9] For the purpose of the sensitivity analysis, we have conducted simulations at various SS levels of the debt-to-GDP ratio (*b*). The results do not change considerably.

Table 5: Second Moments of Selected Variables with respect to the Percentage Change in the Volatility of η

	Standard Deviations							
	$\tau = 0\%$					$\tau = 1.9\%$		
Percentage Change in σ_η	Y	C	I	TB/Y	Y	C	I	TB/Y
No CP Shock	6.91	12.42	8.20	10.51	6.55	8.84	7.95	10.67
1%	6.19	8.99	10.16	11.07	6.25	7.45	10.06	11.56
2.5%	6.76	8.84	18.49	19.01	6.92	7.52	18.44	19.26
5%	9.08	8.88	34.40	34.65	9.38	8.07	34.38	34.65
7.5%	12.24	9.29	50.78	50.91	12.64	9.06	50.78	50.74
10%	15.73	10.20	67.29	67.34	16.21	10.38	67.31	67.02

When subjected to a 10% rise in σ_η, the levels of volatility in both investment and consumption exhibit a decrease in the absence of taxation. When analyzing TB/Y, it is observed that its volatility increases at each level of taxation until a 5% increase in σ_η occurs. Once the threshold is reached, an increase in the percentage change is linked to a reduction in the volatility of TB/Y in the context of taxation. In summary, the implementation of taxation can contribute to the mitigation of fluctuations in investment and consumption when there are slight changes in σ_η. However, in the case of TB/Y, taxation may only effectively reduce its volatility if there is a substantial magnitude of change in σ_η.

After doing an analysis on various levels of σ_η effects, we proceed to examine the impact of the persistency level of CP shock (ρ_η) on the selected variables. Table 6 presents the second moments of the trade balance-to-output ratio and the levels of output, investment and consumption under with and without taxation scenarios.

In the context of taxation, it is generally observed that at lower levels of persistency, there is a decrease in the volatilities of the levels of investment and consumption, while there is an increase in the volatilities of the trade balance-to-output ratio and the level of output. At a higher level of persistency, specifically 0.95, it is observed that only the investment exhibits lower volatility (30.97 compared to 31.07). In this scenario, it can be observed that taxation leads to increased volatilities of the other variables. Therefore, it can be argued that the implementation of capital control tax policy should be contingent upon the duration and intensity of a CP shock.

Table 6: Second Moments under Different Persistence Level of CP Shock

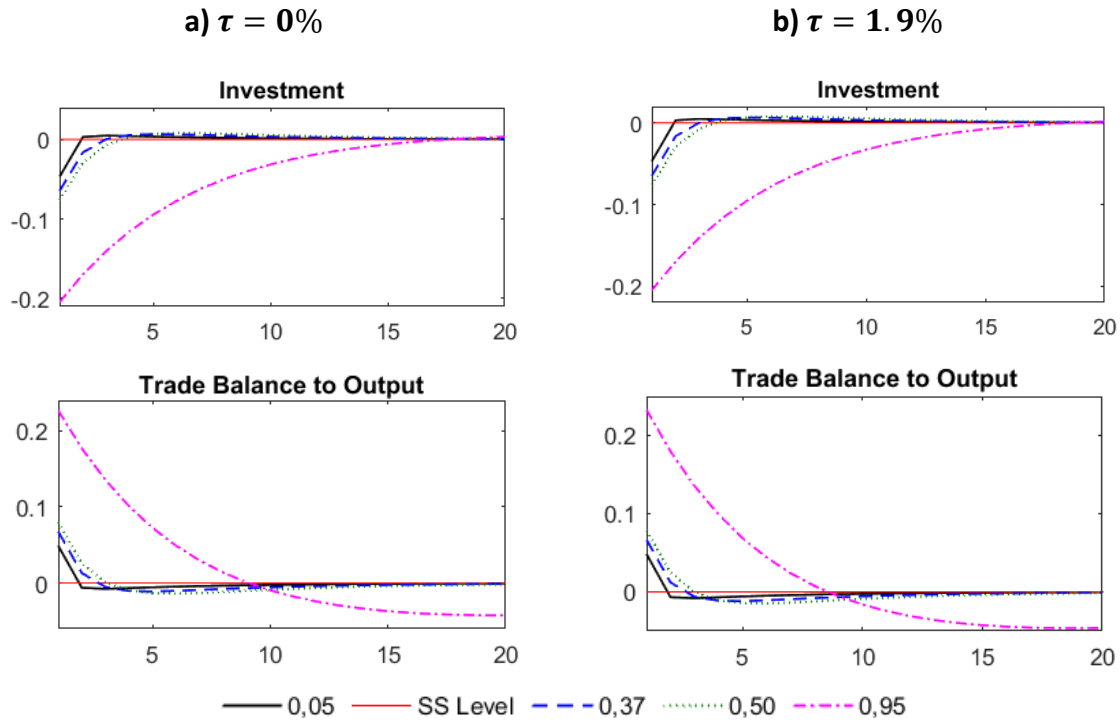
	Standard Deviations							
	$\tau = 0\%$					$\tau = 1.9\%$		
ρ_η	Y	C	I	TB/Y	Y	C	I	TB/Y
0.05	6.20	9.08	8.85	9.88	6.22	7.47	8.75	10.41
0.37	6.19	8.99	10.16	11.07	6.25	7.45	10.06	11.56
0.50	6.24	8.91	11.29	12.13	6.33	7.43	11.21	12.59
0.95	27.52	15.07	31.07	36.21	29.86	18.36	30.97	35.03

According to the findings shown in Table 4, it can be concluded that the CP shock has a crucial role in clarifying the volatilities observed in the trade balance-to-output ratio and the level of

investment. Therefore, these two factors are also examined for varying levels of persistency in the context of IRFs. Figure 2 displays the IRFs of I and TB/Y, considering various levels of the persistency parameter of the CP shock. Figure 2a depicts the scenario without taxation, whereas the other figure illustrates the case with capital control tax.

The impact of CP shocks remains unaffected by varying taxing systems, regardless of the extent of persistency. Nevertheless, as the persistency parameter increases, there is an observed rise in the magnitude of the bursting for both variables. It is noteworthy that I exhibits convergence towards its steady-state level across different scenarios. However, TB/Y experiences a decline below its steady-state level when the degree of persistence is significantly increased. In summary, a greater level of persistence in the CP shock leads to a trade deficit in this economy.

Figure 2: IRFs of the Level of Investment and the Trade Balance-to-Output Ratio with and without Taxation



6. Welfare Analysis under With and Without Taxation

Following the analyses of second moments and sensitivity, the intertemporal utility function has been examined in scenarios with and without taxation. The intertemporal utility function can be represented in the form that follows:

$$V_t = U_t + \beta V_{t+1} \tag{17}$$

where $\beta \in (0,1)$. Here, V denotes the intertemporal utility function, whereas U denotes the utility function. Based on the simulations, the taxation leads to higher consumption at the steady state and, as a result of this, this economy achieves a greater degree of utility. When analyzing the intertemporal utility function in the context of taxation, a greater value of the

intertemporal utility function is also observed at the steady state. Furthermore, the study also examines the volatilities of this variable when subjected to shocks using the impulse response functions (IRFs).

Figure 3 displays the IRFs for the intertemporal utility function (V) to the shock processes as previously stated. Figure 3a shows the IRFs to 1% transitory technology shock. Figure 3b shows the IRFs to 1% growth shock. Lastly, Figure 3c shows a 1% country premium shock.

The simulations demonstrate that the tax scenario results in a greater V. The steady state values (shown by the black and red solid lines) in each figure are identical, but the zoom levels are adjusted to enhance the visibility of the movements in the IRFs. When a transitory technology shock occurs (as seen in Figure 3a), the presence of a tax leads to reduced volatility. The response to the transitory technology shock decreases from around 28% to 17% when taxation is implemented. Furthermore, the process of taxing reaches the steady state value at a faster rate.

Figure 3a: IRFs of the Intertemporal Utility Function (V) to the Transitory Technology Shock

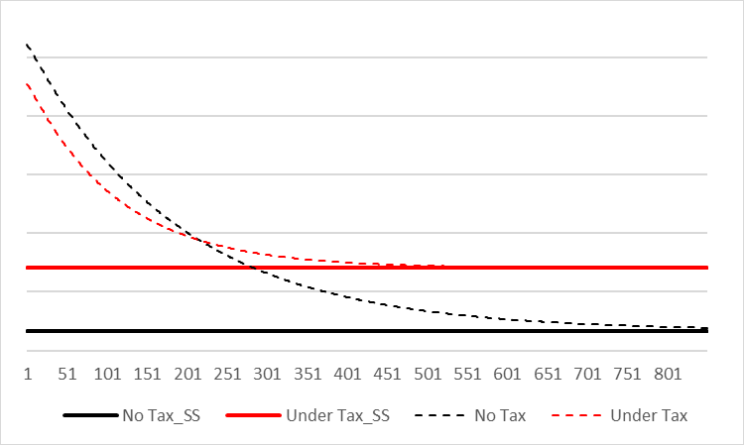


Figure 3b. IRFs of V to the Growth Shock

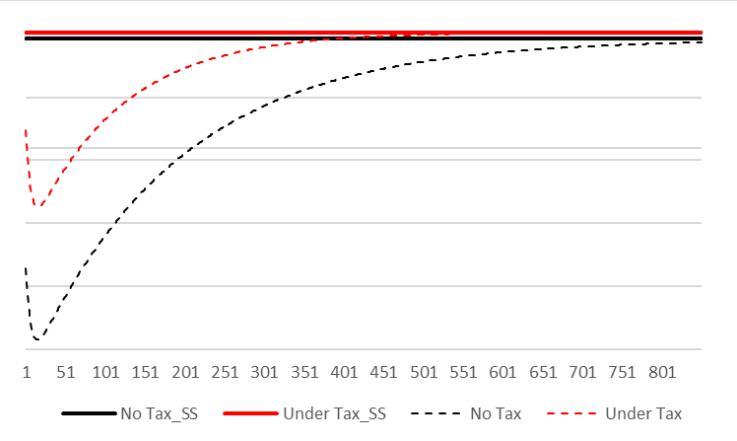
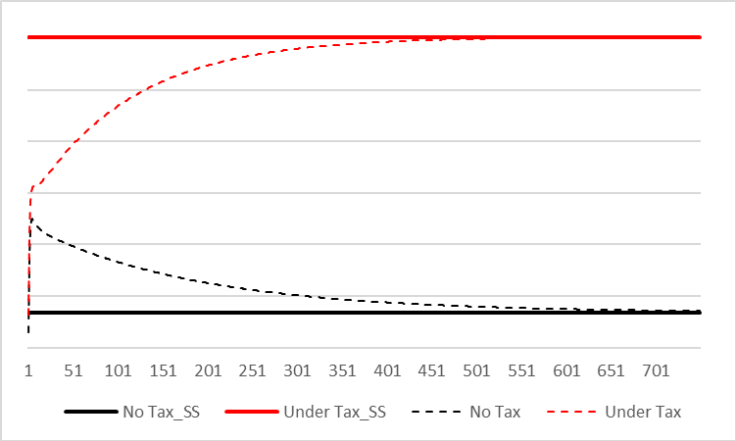


Figure 3c: IRFs of V to the CP Shock



Note: The IRFs in the no-tax scenario are shown by black dashed lines, but the results under taxation are represented by red dashed lines. The solid lines in various colors represent the steady state values, which are differentiated by taxation. The X-axis represents the time period.

An analogous relationship can be observed in the context of growth shock, as depicted in Figure 3b. The absence of taxes not only increases volatility compared to when taxes are imposed, but it also lengthens the duration required to reach the steady state level.

Figure 3c illustrates the notable distinctions in movements when there is a CP shock. Reduced volatility is apparent in the absence of taxation. Nevertheless, after receiving a negative response initially, there is a notable increase. Afterwards, it eventually achieves the steady state level. With regards to taxation, there is a noticeable decrease at the beginning. The figure demonstrates that when there are different movements, the existence of taxation in the case of a CP shock suggests a slightly higher level of volatility.

7. Conclusion

In this paper, a theoretical model describing general stylized facts of an emerging economy is built and examined utilizing the second moments, the impulse response functions (IRFs) and the welfare analysis. The government attempts to use the capital control tax policy in order to regulate capital flows in the model established. Thus, it aims to offset the adverse consequences of foreign capital inflows. The model results reveal that low-rate capital control taxes lower the volatilities of the levels of investment and consumption, whereas high capital control taxes decrease the volatility of the trade balance-to-output ratio. Furthermore, the existence of taxation guarantees an elevated level of utility at the steady state.

The country risk premium shock, a significant extension of the established model, proves its significance in explaining the fluctuations in the trade balance-to-output ratio and the level of investment. The analysis shows that as the country risk premium shocks become more severe, which means a higher percentage increase in σ_η, there is a decrease in the fluctuations of consumption and investment under the taxation scenario. Therefore, it is essential to take into account the current circumstances of an economy while implementing such a capital

control tax policy. In addition, this policy might be applied based on the prioritization of the most significant macroeconomic variable by the decision makers.

Based on the findings of the welfare analysis, the taxation policy not only results in increased the intertemporal utility in the long-run. This policy is highly effective in mitigating fluctuations in the intertemporal utility caused by the transitory technology and growth shocks. Hence, imposing capital control taxes is the essential for the long-term welfare enhancement in this economy.

Another finding is that the transitory technological shock does not sufficiently account for the fluctuations in macroeconomic indicators. According to the model created in this study, the growth shock is the most impactful shock process in explaining the volatilities compared to the other shocks. However, it is also crucial to consider the country risk premium shock when explaining the fluctuations in the trade balance-to-output ratio and the level of investment. This model has the potential to be applied to other shock processes discussed in the existing literature in the near future.

The main objective of this research is to construct a model that precisely depicts the fundamental attributes of an emerging economy and investigate the impacts of the capital control tax on significant economic factors in this economy. While pursuing this objective, the majority of the parameter set is derived from the multiple studies in the literature. A potential avenue for further research could be narrowing the scope to a particular country. This study would entail establishing a set of parameters derived from estimations generated using data specific to that country, and thereafter evaluating the model's efficacy in explaining the dynamics in that country.

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Appendix

Table 7: The Extended Version of Table 3

	Standard Deviations				Relative Volatilities		Steady State Levels	
	Y	C	I	TB/Y	$\frac{Std(C)}{Std(Y)}$	$\frac{Std(I)}{Std(Y)}$	C	V
Tax								
0.0%	6.19	8.99	10.16	11.07	1.452	1.641	0,877	-119,33
0.1%	6.19	8.91	10.15	11.10	1.439	1.640	0,877	-119,31
0.2%	6.20	8.82	10.15	11.13	1.423	1.637	0,877	-119,28
0.3%	6.21	8.74	10.14	11.16	1.407	1.633	0,877	-119,25
0.4%	6.21	8.65	10.14	11.18	1.393	1.633	0,877	-119,22
0.5%	6.22	8.56	10.13	11.21	1.376	1.629	0,877	-119,19
0.6%	6.22	8.48	10.13	11.24	1.363	1.629	0,878	-119,17
0.7%	6.23	8.39	10.12	11.26	1.347	1.624	0,878	-119,14
0.8%	6.23	8.31	10.12	11.29	1.334	1.624	0,878	-119,11
0.9%	6.23	8.23	10.11	11.32	1.321	1.623	0,878	-119,08
1.0%	6.24	8.14	10.11	11.34	1.304	1.620	0,878	-119,05
1.1%	6.24	8.06	10.10	11.37	1.292	1.619	0,878	-119,03
1.2%	6.24	7.98	10.10	11.39	1.279	1.619	0,878	-119,00
1.3%	6.25	7.90	10.09	11.42	1.264	1.614	0,878	-118,97
1.4%	6.25	7.82	10.09	11.44	1.251	1.614	0,878	-118,94
1.5%	6.25	7.74	10.08	11.47	1.238	1.613	0,878	-118,91
1.6%	6.25	7.67	10.08	11.49	1.227	1.613	0,879	-118,88
1.7%	6.25	7.59	10.07	11.51	1.214	1.611	0,879	-118,86
1.8%	6.25	7.52	10.07	11.54	1.203	1.611	0,879	-118,83
1.9%	6.25	7.45	10.06	11.56	1.192	1.610	0,879	-118,80
2.0%	6.24	7.38	10.06	11.58	1.183	1.612	0,879	-118,77
2.1%	6.24	7.31	10.05	11.60	1.171	1.611	0,879	-118,74
2.2%	6.24	7.24	10.05	11.62	1.160	1.611	0,879	-118,71
2.3%	6.23	7.17	10.04	11.64	1.151	1.612	0,879	-118,68
2.4%	6.22	7.11	10.04	11.65	1.143	1.614	0,879	-118,65
2.5%	6.22	7.05	10.04	11.67	1.133	1.614	0,879	-118,63
2.6%	6.21	6.99	10.03	11.68	1.126	1.615	0,880	-118,60
2.7%	6.20	6.93	10.03	11.70	1.118	1.618	0,880	-118,57
2.8%	6.19	6.88	10.02	11.71	1.111	1.619	0,880	-118,54
2.9%	6.18	6.82	10.02	11.72	1.104	1.621	0,880	-118,51
3.0%	6.17	6.77	10.02	11.73	1.097	1.624	0,880	-118,48

Etik Beyanı: Bu çalışmanın tüm hazırlanma süreçlerinde etik kurallara uyulduğunu yazar beyan eder. Aksi bir durumun tespiti halinde Fiscaoeconomia Dergisinin hiçbir sorumluluğu olmayıp, tüm sorumluluk çalışmanın yazarına aittir.

Ethical Approval: The author declares that ethical rules are followed in all preparation processes of this study. In the case of a contrary situation, Fiscaoeconomia has no responsibility, and all responsibility belongs to the study's author.