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Accounting for the Effects of Fiscal Policy Shocks on Exchange Rates through Markup Dynamics

Hyungsuk Lee and Junsang Lee

Abstract

This study investigates how fiscal policy shocks affect the external sector through markup dynamics in advanced and developing economies. We focus on the role of markup dynamics as a channel through which fiscal policy has a distinct effect on real exchange rates. Using panel data from 32 countries, we employ a local projection to evaluate the impact of expansionary fiscal policy shocks on real exchange rates, markups, and current accounts. Our empirical findings show distinct responses to the shocks among advanced and developing countries regarding the real exchange rate, due to different markup dynamics. Expansionary fiscal measures result in an appreciation of the real exchange rate and an increase in markup for developing countries, whereas advanced economies experience a decrease in markup and a depreciation of the real exchange rate. Markup dynamics vary between advanced and developing economies due to differences in firms' entry and exit conditions in their institutions. In advanced economies, expansionary fiscal policy shocks promote competition and new firm entry, resulting in a reduced markup. On the other hand, unfavorable conditions in developing countries maintain or increase existing firms' market power. Our research highlights the heterogeneous effects of fiscal policy shocks on the external sector, emphasizing the need for policymakers to consider institutional and entry conditions while designing and implementing fiscal policies.

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1. INTRODUCTION

In recent decades, fiscal policy has emerged as a pivotal instrument for governments worldwide to stimulate economic growth and maintain stability. Fiscal policy entails the strategic deployment of government expenditure and taxation to steer the economy toward desired objectives, such as achieving full employment, controlling inflation, and promoting equitable income distribution. However, the effectiveness of fiscal policy is not uniform among all countries and is influenced by factors such as institutional architecture, market entry conditions, and the level of competition among firms. For example, the institutional environment may shape the responsiveness of fiscal policy through factors such as governance quality, legal and regulatory frameworks, and fiscal decentralization (Acemoglu, Johnson, and Robinson, 2001; Rodrik, 2008; Avellán, Galindo, and Leon-Diaz, 2020). Market entry conditions and level of competition among firms can also influence how fiscal policy permeates through the economy (Djankov et al., 2002; Blanchard and Giavazzi, 2003; Aghion et al., 2005; Klapper, Laeven, and Rajan, 2006).

We concentrate on examining the role of markup dynamics in assessing the impact of fiscal policy shocks on the external sector, such as the real exchange rate and current accounts, among countries based on their

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level of development. Previous studies have suggested that markup variability can explain real exchange rate dynamics. Specifically, a rise in markup results in an appreciation of the real exchange rate, whereas a decrease in markup leads to a depreciation of the real exchange rate (Bouakez, 2005; Gust, Leduc, and Vigfusson, 2010; Ravn, Schmitt-Grohe, and Uribe, 2012). Our study explores whether markup dynamics can be a key determinant in how expansionary fiscal policy shocks affect real exchange rate dynamics. Our study suggests that if aggregate markups increase (decrease) in response to a government expenditure shock, the real exchange rate will appreciate (depreciate).

The response of markup dynamics to expansionary fiscal policy shocks differs among advanced economies and developing countries, primarily due to differences in institutional and firm entry conditions. Advanced economies typically provide a more favorable and conducive business environment with lower regulatory burdens and greater competition, leading to firm growth and market entry. Expansionary fiscal policy shocks in these economies tend to intensify competition and lead to a decline in markup. On the other hand, in developing countries, firms with market power may exploit increased demand during economic booms, resulting in an increase in markup due to a lack of competition. The relationship between fiscal policy shocks and markup dynamics depends on the underlying institutional and entry conditions in both economies. To substantiate the claim that favorable institutional and entry conditions foster a competitive business environment, we use data from the World Bank's Global Entrepreneurship and Development Index (GEDI). This index reflects how such favorable conditions enable new firms to enter the market and compete with existing firms, which tends to result in a decline in overall markup. In contrast, elevated entry barriers and unfavorable institutional conditions hinder new firms from entering the market, thereby allowing established firms to preserve or even augment their market power.

Our study provides a comprehensive understanding of the intricate and diverse effects of fiscal policy shocks on the external aspects of both advanced countries and developing economies. Our empirical results highlight the fundamental importance attributed to institutional and entry conditions in shaping real exchange rate dynamics, emphasizing the importance of considering these factors in policy design and implementation. Our research contributes significantly to the previous literature on fiscal policy implications for the external sector, examining the varied changes in the real exchange rate and markup and identifying potential mechanisms driving these responses.

We propose a novel explanation for the distinct real exchange rate dynamics observed between advanced and developing nations by investigating the effect of markup dynamics on fiscal policy shocks. Miyamoto, Nguyen, and Sheremirov (2019) highlight the discrepancy between the theoretical results of canonical international business cycle models and the empirical evidence regarding real exchange rate dynamics. While these models can account for the appreciation of the real exchange rate in less developed nations, they inaccurately predict real exchange rate appreciation for advanced countries when empirical data indicate depreciation. Our empirical analysis suggests that the divergent markup dynamics in advanced and developing economies contribute significantly to the differing real exchange rate dynamics between these groups. In particular, we emphasize the pivotal role of institutional and entry conditions in shaping the behavior of real exchange rates to expansionary fiscal policy shocks, underscoring the need to consider these elements during the formulation and execution of policy initiatives.

In addition, we use variations in military or defense spending as instrumental variables (IVs) to identify government expenditure shocks, following Hall (2009), Barro and Redlick (2011), Ramey (2011), and Miyamoto, Nguyen, and Sheremirov (2019). The underlying assumption is that military spending is not correlated with the overall economic state, such as the business cycle, monetary policy, or private sector financial conditions. By instrumenting fiscal policy shocks with defense expenditure, we attribute government spending shocks to unanticipated variations in military spending, which neither output, fiscal policy, nor other control variables can predict.

The rest of the article is organized as follows. Section 2 discusses the previous literature. Section 3 provides details on the dataset used in our analysis, and Section 4 explains the empirical methodology. Section 5 presents the main empirical findings, and Section 6 concludes.

2. RELATED LITERATURE

In this section, we examine several studies relevant to our research. These include investigations into the effect of fiscal policy shocks on markup dynamics, the connection between markup and real exchange rates, and the responses of real exchange rates to fiscal policy.

2.1 Markup Dynamics

While some empirical studies such as Morrison (1994), Hall (2009), Anderson, Rebelo, and Wong (2018), and Nekarda and Ramey (2021) suggest that markups increase in response to expansionary fiscal policy shocks, other studies such as Marchetti (2002) report no discernible patterns or even suggest that markups decrease following positive demand shocks. For advanced economies, Bils, Klenow, and Malin (2018) observe that price markups in the US are countercyclical. Similarly, Juessen and Linnemann (2012) show that a positive government spending shock yields a decline in price markups. Our study aligns with these findings; however, methodologically, we employ a local projection method and use military spending as an IV to investigate the influence of fiscal expenditure shocks on markups in advanced economies.

From a theoretical perspective, nominal rigidities and deep habit formation mechanisms offer plausible explanations for the observed decline in markups following expansionary fiscal policy measures. In the context of many New Keynesian models, an uptick in government expenditure shock enhances both output and marginal cost. Due to short-term price rigidities preventing firms from immediately adjusting prices, this scenario leads to a reduction in markup. Ravn, Schmitt-Grohe, and Uribe (2006) introduce an alternative explanation through their deep habit model, which suggests that government expenditure shocks contribute to a reduction in price markup due to an escalation in the price elasticity of demand. This phenomenon can be attributed to the persistent consumption patterns of households concerning particular goods and services, which shape their demand preferences.

Others explain a plausible mechanism for the procyclical markup. Stroebel and Vavra (2019) argue that wealth effects result in buyers exhibiting reduced price sensitivity, inducing firms to increase their markup. As buyers' elasticity decreases in response to expansionary fiscal policy shocks, aggregate markup increases. Additionally, within a framework based on search theory, Alessandria (2009) illustrates that markups increase after positive demand shocks. This increase occurs as workers dedicate less time to price-searching activities due to the rising opportunity cost of search (wage rate), leading households to exhibit diminished price sensitivity.

We find that markups show divergent responses to fiscal shocks, decreasing in advanced economies, while increasing in developing countries. Our analysis indicates that these contrasting reactions arise from disparities in the institutional conditions pertaining to firm entry between these two classifications of countries. Our empirical findings suggest the need to develop supplementary theoretical models that can more effectively elucidate the heterogeneous dynamics of markups to the fiscal shocks.

To the best of our knowledge, we believe our research is among the first to explore the cyclicality of markups in developing countries. The majority of comprehensive analyses have primarily focused on advanced countries, such as the US and those within the OECD. A significant contribution of our article is presenting an understanding of markup dynamics in both advanced and developing economies.

2.2 Markup and Real Exchange Rate

Previous studies have highlighted the association between markup and real exchange rates, suggesting that when markup increases (decreases), the real exchange rate appreciates (depreciates). This supports our argument that it is crucial to consider markup behavior when analyzing the effect of fiscal stimulus on real exchange rates. Several studies have already explored the role of markup variability in explaining real exchange rate dynamics. For instance, Bouakez (2005) develops a model that considers variations in markup to explain the persistence of the real exchange rate. Similarly, Gust, Leduc, and Vigfusson (2010) construct a structural model that attributes fluctuations in markup to incomplete pass-through of exchange rate fluctuations into import prices. According to Ravn, Schmitt-Grohe, and Uribe (2012), the presence of deep habits implies that an increase in domestic government spending causes domestic markups to decrease relative to foreign markups, leading to a depreciation of the real exchange rate.

2.3 Real Exchange Rate Dynamics of Fiscal Policy

While the previous literature on the effect of government spending on real exchange rates has been vast, a unified consensus remains elusive. Auerbach and Gorodnichenko (2016) and Ferrara et al. (2021) suggest that government spending leads to real exchange rate appreciation. On the other hand, empirical research from Kim and Roubini (2008), Ravn, Schmitt-Grohe, and Uribe (2012), and Corsetti et al. (2012) indicates that expansionary fiscal policy leads to the depreciation of real exchange rate.

We offer a novel contribution to the ongoing debate by proposing a new explanation for the disparate real exchange rate dynamics between advanced and developing economies, with a focus on the effect of markup dynamics in response to fiscal policy shocks. Miyamoto, Nguyen, and Sheremirov (2019) demonstrate that canonical international business cycle frameworks can explain the appreciation of the real exchange rate in developing countries. However, these models fail to accurately predict the depreciation of the real exchange rate observed in advanced economies. Our analysis suggests that the contrasting markup dynamics in advanced

Table 1
Data Sources and Range of Coverage

Variable	N	Sample period	Source
Markups	32	1980:2016	De Loecker and Eeckhout (2021)
Government Spending	32	1980:2016	NAMAD
Real Exchange Rate	32	1980:2016	Bruegel
Current Accounts/GDP	32	1980:2016	NAMAD
Real GDP	32	1980:2016	NAMAD
Military Spending	32	1980:2016	Military Expenditure Database (SIPRI)
Financial Crises	32	1980:2016	Reinhart and Rogoff (2011)
War	32	1980:2016	UCDP/PRIO (2021)
Unemployment Rate	32	1980:2016	World Development Indicators
Inflation Rate	32	1980:2016	World Economic Outlook

NOTE: N refers to the number of countries, and NAMAD refers to the National Accounts Main Aggregates Database.

and developing economies play an important role in addressing this discrepancy. Specifically, we emphasize the significant influence of institutional factors and entry conditions in shaping the reaction of the real exchange rate to policies of fiscal expansion. This insight underscores the importance of considering these elements when analyzing real exchange rate dynamics and formulating policy strategies.

3. DATA

We collect data on aggregate markup, military spending, current accounts, real exchange rates, and other variables for 32 countries from 1980 to 2016. The data sources and coverage are presented in Table 1.

We obtain data on markups at the country panel level from De Loecker and Eeckhout (2021), who calculate markups specific to each country, drawing from the financial records distributed across 134 countries covering the years 1980–2016. We obtain real effective exchange rate (REER) data from Bruegel, with an increase signifying appreciation. Data on military spending come from the Stockholm International Peace Research Institute (SIPRI), encompassing expenditures related to ongoing military activities and forces, including salaries for personnel, acquisitions, operational costs, funds allocated for research and development in the military sector, and infrastructure development. We present all data points on a per capita basis and adjust them to the constant 2015 national currency units.

To consider other relevant factors, we include unemployment and inflation rates as control variables in our analysis. Unemployment rate data come from the World Bank's World Development Indicators dataset. Inflation rate data come from the International Monetary Fund's World Economic Outlook dataset, which provides annual consumer price index data. For the 32 countries, we use the average index over the period 1980–2016.

Our analysis also includes two dummy variables: financial crisis and a war index. Financial crises can impact the exogeneity of military spending, and our dataset covers various financial crises. We use crisis dates identified by Reinhart and Rogoff (2011), omitting all observations pertaining to banking crises, sovereign defaults, and stock market crashes, following the approach of Miyamoto, Nguyen, and Sheremirov (2019). We extract the war index from the UCDP/PRIO Armed Conflict Dataset, which contains details on the nations involved, the start and end dates of conflicts, and each conflict's fatality count.

Table 2
Country Characteristics

Country	Development	Sample period	Country	Development	Sample period
Australia	Advanced	1980:2016	Korea, Rep.	Advanced	1980:2016
Austria	Advanced	1980:2016	Mexico	Developing	1980:2016
Belgium	Advanced	1980:2016	Netherlands	Advanced	1980:2016
Brazil	Developing	1980:2009	Norway	Advanced	1980:2016
Canada	Advanced	1980:2016	Peru	Developing	1987:2016
Chile	Developing	1985:2016	Philippines	Developing	1988:2016
China	Developing	1989:2016	Portugal	Advanced	1985:2016
Colombia	Developing	1987:2016	South Africa	Developing	1982:2016
Denmark	Advanced	1980:2016	Spain	Advanced	1980:2016
Finland	Advanced	1980:2016	Sweden	Advanced	1980:2016
France	Advanced	1980:2016	Switzerland	Advanced	1980:2016
Germany	Advanced	1980:2016	Thailand	Developing	1987:2016
India	Developing	1989:2016	Turkey	Developing	1987:2016
Indonesia	Developing	1989:2016	United Kingdom	Advanced	1980:2016
Ireland	Advanced	1980:2016	United States	Advanced	1980:2016
Italy	Advanced	1980:2016	Japan	Advanced	1980:2016

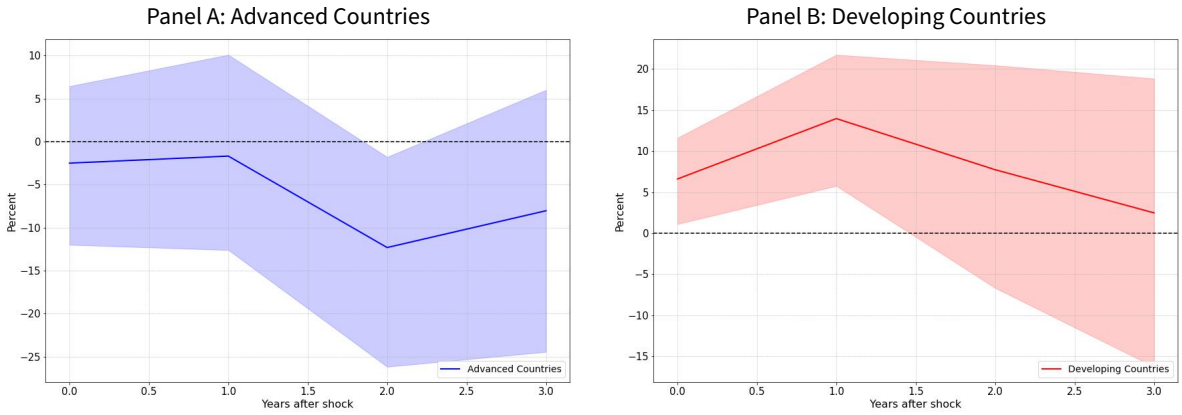
NOTE: Using the World Bank's 2000 gross national income as a reference, we categorize the sample into advanced and developing economies.

Table 2 presents the country characteristics of our complete sample, which is divided into two categories: advanced and developing countries, aligning with our study's focus on the effect of fiscal policy shocks on external sectors across different economic classifications. Building upon the work of Ilzetzki, Mendoza, and Végh, 2013, Miyamoto, Nguyen, and Sheremirov, 2019, and Sheremirov and Spirovska (2019), we use gross national income as of the year 2000 to split countries. We recognize that countries such as Mexico and China have robust trade relations with advanced economies during our sample period. However, we classify them as developing countries for two reasons. First, the year 2000 serves as a midpoint reference for our sample. Second, our classification aligns with that of Ilzetzki, Mendoza, and Végh (2013), Miyamoto, Nguyen, and Sheremirov (2019), and Sheremirov and Spirovska (2019), ensuring our findings remain consistent and comparable with existing literature.

There are two main reasons for differentiating the effects of a fiscal expenditure shock on real exchange rates between developing and advanced countries. First, existing studies have also segregated their analysis between advanced and developing economies based on their level of economic development when examining the effects of fiscal policy shocks on the external sector. For example, Miyamoto, Nguyen, and Sheremirov (2019) segregate a sample of 125 countries into advanced and developing economies based on their level of developmental status. Miyamoto, Nguyen, and Sheremirov (2019) indicate that expansionary fiscal policy shocks generate a depreciation of the real exchange rate in advanced countries, whereas they cause an appreciation in developing countries. Similarly, in developing economies, Ilzetzki, Mendoza, and Végh (2013) find that the real exchange rate appreciates immediately in response to a fiscal expenditure shock, but this effect diminishes within a year.

Furthermore, from a country-specific local projection method in our constructed dataset, the impacts of expansionary fiscal policy shocks on the real exchange rate exhibit variation between developing and advanced countries. Specifically, we assess the country-specific impact of a fiscal expenditure shock on the real exchange rate by using equation (6) in Appendix Appendix 1.1. The results of our analysis are depicted in Figure 1, which presents the estimated result, denoted as β_h in equation (6), of the real exchange rate followed by a fiscal expenditure shock for each country. Note that confidence intervals have not been included. The blue shading represents responses of the real exchange rate resulting from the shock in advanced countries, while the red shading shows the response for developing countries. The solid lines, respectively, represent the average estimates for advanced (blue) and developing (red) countries.

Figure 1
Country-Specific Impulse Response: Real Exchange Rate



NOTE: The red shaded area represents the country-specific beta coefficient result from equation (3) for developing countries, while the blue shaded area shows the results for advanced countries. The solid lines, respectively, represent the average estimates for advanced (blue) and developing (red) countries.

As can be discerned from the analysis, the reactions of the real exchange rate to the fiscal expenditure shock differ between advanced and developing countries. In general, advanced countries show a depreciation in the real exchange rate, whereas developing countries show an appreciation. Considering these observations, it is evident that, within our sample set, the response of the real exchange rate to fiscal expenditure shocks varies between advanced and developing countries.

4. ECONOMETRIC SPECIFICATION

In this section, we explain the methodology used in our empirical analysis. We first discuss the local projection approach introduced by Jordá (2005) and then describe the identification strategy based on Miyamoto, Nguyen, and Sheremirov (2019).

4.1 Local Projection

To estimate the effects of fiscal policy shocks, our study uses a combination of Jordá (2005)'s local projection framework and an IV approach. This approach has been used in previous studies, including Ramey and Zubairy (2018), Miyamoto, Nguyen, and Sheremirov (2019), and Sheremirov and Spirovska (2019). We estimate impulse responses to government spending, instrumented by military spending shocks. The local projection method offers several advantages compared to the vector autoregression approach. For instance, it does not require linear restrictions on the impulse response function (IRF) dynamics, making it more flexible and accommodating variations among nations regarding stages of development and institutional structures. The method also allows for using different variables in each equation, accommodating cross-country residual correlations and facilitating the direct application of the IV approach.

We estimate an augmented beta term that is an interaction between the shock and the level of development dummy. All the countries are in the sample, but the beta varies across developing and advanced countries but not the coefficient on the controls. We estimate the following equations:

$$(1) \qquad \frac{x_{i,t+h} - x_{i,t-1}}{x_{i,t-1}} = \beta_h \frac{\triangle g_{i,t}}{y_{i,t-1}} + \beta_{h,dev} \frac{\triangle g_{i,t}}{y_{i,t-1}} dev_i + \phi_h(L) w_{i,t-1} + \alpha_{i,h} + \gamma_h z_{i,t} + \delta_{t,h} + \varepsilon_{i,t+h}$$
$$\text{for } h = 0, 1, 2, \ldots$$

For country i and year t, x_{it} is the variable of our interest, while g_{it} and $g^m_{i,t}$ denote government spending and military expenditure, respectively. dev_i is a dummy variable capturing the level of development, equaling 1 for advanced countries and 0 for developing countries. y_{it} denotes real GDP. The lagged controls based on information criteria are included in the vector $w_{i,t-1}$, and contemporaneous controls are included in z_{it}. $\varepsilon_{i,t}$ represents the error term. The specification's left-hand side shows the change in the real exchange rate. $\alpha_{i,h}$

Table 3
Descriptive Statistics

	Obs.	$\sigma\left(\frac{\triangle g}{g}\right)$	$\sigma\left(\frac{\triangle g^m}{g^m}\right)$	$\sigma\left(\frac{\triangle g}{g}, \frac{\triangle g^m}{g^m}\right)$	$\frac{g^m}{g}$
	(1)	(2)	(3)	(4)	(5)
Full	1,102	2.66	7.08	0.30	11.7%
		(1.53)	(4.14)	(0.18)	(6.32)
Advanced	735	1.79	4.68	0.28	9.86%
		(0.71)	(1.59)	(0.16)	(5.32)
Developing	367	4.10	11.08	0.35	14.86%
		(1.45)	(4.01)	(0.21)	(6.81)

NOTE: Column (1) displays the number of observations. Columns (2) and (3), respectively, display the mean standard deviations for the rate of change in government and military spending. The correlation between the change rates of government consumption and military spending is outlined in column (4). Column (5) illustrates the average ratio of military spending to total government expenditure. Numbers in parentheses represent the standard deviation observed among various countries.

and $\delta_{t,h}$ capture country and year fixed effects, respectively. $\phi_h(L)$ and γ_h represent vectors of coefficients on contemporaneous and lagged controls, respectively.

We estimate the equation using two-stage least squares (2SLS), where we instrument $\frac{\triangle g_{i,t}}{y_{i,t-1}}$ with $\frac{\triangle g^m_{i,t}}{y_{i,t-1}}$. We estimate equation (6) separately for each horizon h. β_h denotes the response of the variable x in h years after the government spending shock. The shock to government spending is defined as a 1-percentage-point increase in the ratio of government spending to GDP. Based on the Akaike and Schwarz information criterion, we establish the number of lags to be 1. To handle serial correlations, we cluster standard errors by country. The vector z_{it} includes a war index and a financial crisis dummy to control for the effect of wars and financial crises on military spending and government budgets, respectively. The vector $w_{i,t-1}$ encompasses lags of the dependent variable, adjusted changes in government spending, and real GDP.

Note that β_h signifies the estimated impulse response for the full sample, while $\beta_{h,dev}$ indicates the differential impulse response for advanced economies. The coefficient $\beta_{h,dev}$ captures the interaction between the shock and the development dummy variable. Specifically, it isolates and represents the impulse response of advanced economies. Given the construction of the dev_i dummy variable, equal to 1 for advanced countries and 0 for developing countries, by using the classification in Table 2, the term $\beta_{h,dev}\frac{\triangle g_{i,t}}{y_{i,t-1}}dev_i$ becomes non-zero solely for advanced economies. Hence, the component reflects the differential effect or response of a shock in these advanced countries relative to the base effect captured by β_h. On the other hand, β_h depicts the general estimated impulse response derived from the entire sample, incorporating both advanced and developing economies. It also illustrates the response to the shock across all countries in the sample, without distinguishing between their developmental status.

For a more rigorous analysis, we split our samples into developing and advanced countries. We conduct separate analyses for each group to ensure robustness of the empirical results. Appendix Appendix 1.2 provides a detailed empirical specification and the results.

4.2 Identification Strategy for Government Spending

To identify the effects of fiscal policy shocks in an international context, we use military expenditure data as an IV for government consumption. This identification strategy satisfies the exogeneity and relevance conditions of the IV, which is necessary for obtaining unbiased estimates of the causal effects of a government expenditure shock. Using the exogeneity of defense expenditure as an instrument for fiscal policy is supported by studies such as Collier (2006) and Klein and Linnemann (2019), which demonstrate that military expenditure is primarily driven by foreign policy developments rather than by domestic economic factors and is often considered wasteful spending.

Table 3 illustrates that military expenditure serves as an IV capable of identifying fiscal expenditure shocks. Military expenditure constitutes roughly 11.7 percent of overall government expenditure in the sample, with a direct relationship observed between the expansion rate of government expenditure and that of military expenditure. The changes in military expenditure are also nearly twice as unstable as that of government expenditure, enhancing the precision in estimating the impacts of a positive shock in government expenditure on the dependent variable.

5. EMPIRICAL RESULTS

In this section, we present the empirical results of our study. We first provide an overview of the IRF results using the local projection method. We then investigate the possible mechanisms contributing to the different responses to fiscal policy shocks between advanced and developing countries.

5.1 Main Empirical Results

In Figure 2, we delineate the impulse responses resulting from equation (1) to a positive government expenditure shock. Panel A depicts the impulse response for the entire sample (β_h), encapsulating responses for the real exchange rate, markups, and current accounts. Panel B is specifically designed to focus solely on the responses seen within advanced economies ($\beta_{h,dev}$).

The responses to a positive government shock vary between the full sample and advanced economies, especially in terms of the real exchange rate and markups. In the full sample, the real exchange rate appreciates with statistically significant results. However, in advanced economies, the real exchange rate depreciates, again with statistically significant results.

Another notable difference lies in the markups. While the full sample's response shows an increase in markups, most of which are statistically significant, advanced economies present a contrast. In the advanced economies, markups tend to decrease, with 68 percent confidence within the level of significance. As for the current account, there is a discernible trend of decline in the full sample. This pattern is distinctly different when the lens is focused on advanced economies.

To test for robustness, we partition our sample into developing and advanced categories, analyzing each separately. The detailed empirical results of this division are presented in Appendix Appendix 1.2. The robustness analysis reveals distinct reactions of markup and real exchange rates between developing and advanced economies. In the developing countries, markups exhibit an increase and an appreciation of the real exchange rate. On the other hand, advanced economies show a decline in markups and a depreciation of the real exchange rate. These results reinforce the robustness of our main empirical results.

Our research indicates that the dynamics of markup are crucial for understanding how real exchange rates react to expansionary fiscal policy shocks. In developing countries, markups notably increase following a rise in government spending, whereas they decrease in advanced countries. This indicates that domestic economies in developing countries become relatively more expensive compared with foreign countries, leading to an appreciation of the real exchange rate. Conversely, the opposite effect emerges in advanced economies.

Previous studies have underscored the interplay between markups and real exchange rates. This focus was motivated by prior studies that consistently emphasized the link between markup and the real exchange rate. Specifically, when markup surges (or declines), the real exchange rate appreciates (or depreciates).

To validate our proposed mechanism, we use the local projection method to explore how the real exchange rate reacts to shocks in markup. The equation used to estimate the impulse responses for the real exchange rate to markup shocks at each horizon h is given by

$$REER_{i,t+h} = \alpha_h + \theta_h shock_{i,t} + \theta_{h,dev} shock_{i,t} \cdot dev_i + \varphi_{i,h}(L)\gamma_{i,t-1} + \epsilon_{i,t+h}, \tag{2}$$

where $REER$ is the real exchange rate and $shock_{i,t}$ is the identified shock. θ_h is the estimate of the impulse response of $REER$ at horizon h to a $shock_t$. γ_t is a vector of control variables, $\varphi_h(L)$ is a polynomial in the lag operator, and α_h is the constant. The variable dev_i serves as a dummy based on level of economic development by using the classification in Table 2. Figure 3 illustrates the IRF of the real exchange rate to markup shocks.

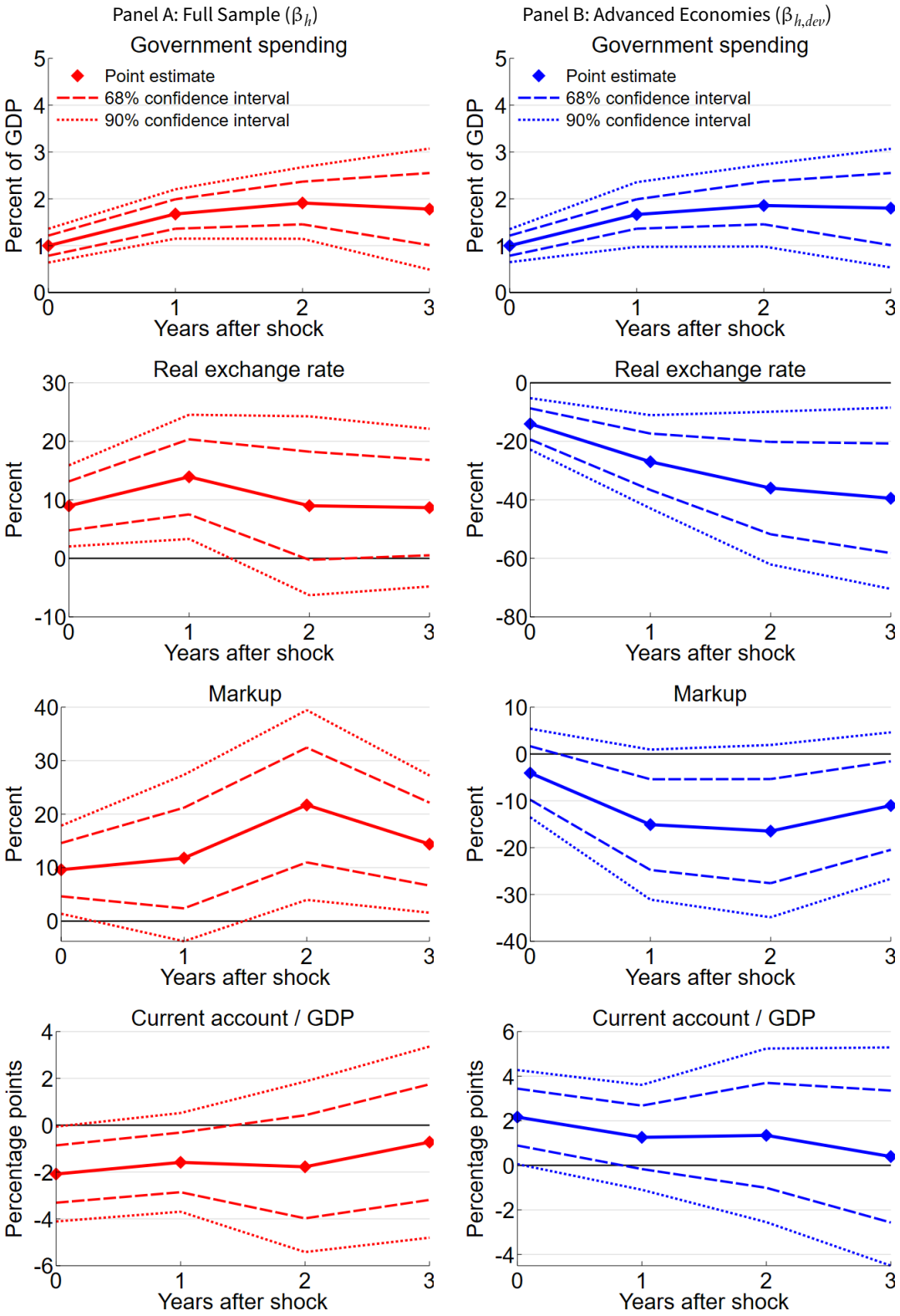
Our empirical analysis emphasizes that a surge in markup leads to the real exchange rate appreciating, irrespective of a country's developmental status. Panel A shows a conspicuous appreciation in the real exchange rate in the full sample. A similar appreciation response is observed when the data are adjusted using an interaction dummy, meaning that the markup shock is positively related with the appreciation of markup regardless of development status.

The observed positive correlation between markup and the real exchange rate underscores that the real exchange rate's response is predominantly driven by the markup's responsiveness to a fiscal expenditure shock. This situation translates to a scenario where a declining markup in advanced economies leads to the real exchange rate depreciating. In contrast, an augmenting markup in developing economies results in a corresponding appreciation.

5.2 Underlying Mechanisms

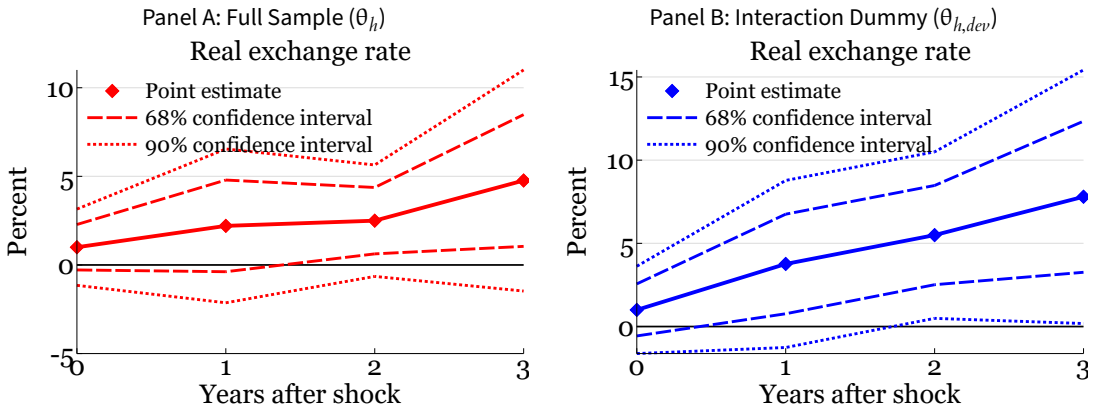
In this section, we present the underlying mechanisms and aim to discuss the variance in markup responses to fiscal policy shocks between developing and advanced countries. We propose that differences in institutional quality might be the driving force behind these distinct markup dynamics. We first show that the ease of

Figure 2
Impulse Response Analysis



NOTE: The figure shows the responses of government spending, real exchange rates, current account to GDP, and markup to a 1-percentage-point increase in the ratio of government spending to GDP within a timeframe of zero to three years. Dashed lines represent 68 percent confidence interval limits, while dotted lines represent 90 percent confidence interval limits.

Figure 3
Impulse Response Analysis



NOTE: The figure shows the responses of real exchange rates to markup shocks at horizons from zero to three years. Dotted lines represent 90 percent confidence interval bounds, and dashed lines represent 68 percent confidence interval bounds.

market entry for firms and superior institutional quality typically translates into diminished market power. Subsequently, we illustrate that in instances where institutional quality is elevated, the effect of fiscal expenditure shocks on markups is more subdued compared with scenarios with lower institutional quality.

5.2.1 Market Power and Institutional Quality

The different response of markup dynamics to fiscal policy shocks in developing and advanced economies highlights the importance of examining the roles played by entry and institutional conditions for firms. These conditions have a significant effect on market power, where low entry barriers and favorable institutional conditions facilitate new firms' entry and intensify competition, reducing incumbent firms' market power. Conversely, high entry barriers and unfavorable institutional conditions allow existing firms to maintain or increase their market power (Bain, 1956; Tirole, 1988; North, 1990; Sutton, 1991; Shleifer and Vishny, 1993; Cabral, 2000; Djankov et al., 2002).

Expansionary fiscal policy shocks that increase aggregate demand can encourage new firms to enter the market and intensify competition if favorable entry and institutional conditions are present. Incumbent firms try to incentivize to lower their prices or enhance their product quality to maintain their market share, leading to a decrease in the markup. However, limited competition resulting from unfavorable entry and institutional conditions may allow these firms to maintain or increase their market power. In this case, expansionary fiscal policy shocks might lead to less competitive pressure from new entrants, allowing incumbent firms to exploit the increased demand by raising their prices, resulting in an increase in the markup.

To examine the relationship between markups and institutional and firm entry conditions, we employ an empirical framework that uses data from GEDI. We use the institutional score and opportunity on startup score to test our plausible mechanism. The institutional score measures the quality and strength of the institutional environment for entrepreneurship, considering factors such as corruption levels, the legal system's effectiveness, and the ease of starting and registering a business. The opportunity on startup indicator measures the level of entrepreneurial opportunities available in a country, based on aspects such as market openness, competition levels, and innovative activity. By using these indicators, we try to gain insight into how institutional and firm entry conditions affect market competition and the potential for businesses.

Our baseline empirical framework is as follows:

$$ln(markup_{it}) = \alpha_0 + \alpha_1 Z_{it} + X_{it}T + \kappa_i + \Psi_t + \varepsilon_{it}, \tag{3}$$

where $ln(markup_{it})$ represents the natural log transformation of the markups attributed to country i in year t. Z_{it} represents our variables of interest, which include log of institutional scores and opportunity on startup scores. X_{it} is a vector of the control variables, which include the log of real GDP, inflation rates, unemployment rates, oil prices, and trade openness (sum of import and export to GDP). κ_i and Ψ_t denote country and year fixed effects, respectively, and ε_{it} represents the i.i.d error term.[1]

1. We use GEDI data from 2006 to 2016. We omit Pakistan, Austria, the Philippines, Indonesia, Brazil, China, and Canada due to their

Table 4
Panel Empirical Results: Institutional Quality and Markup

	Dependent variable: $log(Markup)$		
	(1)		(2)
log(Institutional Scores)	-0.392**	log(Opportunity on Startup)	-0.0417*
	(0.167)		(0.0211)
log(GDP)	-0.126	log(GDP)	-0.153
	(0.109)		(0.145)
Inflation	-1.098***	Inflation	-1.211***
	(0.310)		(0.303)
WTI	-1.269***	WTI	-1.320**
	(0.455)		(0.486)
Trade Openness	0.189**	Trade Openness	0.189**
	(0.0711)		(0.0702)
Unemployment Rate	-0.325	Unemployment Rate	-0.308
	(0.357)		(0.401)
R^2	0.413	R^2	0.399
Obs.	247	Obs.	247

NOTE: Robust errors are in parentheses. *, **, and *** denote significance levels at 10 percent, 5 percent, and 1 percent, respectively. The constant is included but not reported.

Table 4 presents the results of the panel estimation, focusing on the relationship between institutional scores, opportunity on startup, and markups. As the institutional environment becomes more favorable for the firm and more opportunities for startups become available, the aggregate markup decreases, meaning the competition among firms intensifies. We find a statistically significant negative association between institutional scores and markups, which becomes more significant as we add control variables. Additionally, the negative relationship between opportunity on startup and markups is also statistically significant. These results support our earlier argument that a competitive business landscape, facilitated by favorable institutional and entry conditions, reduces markups. Conversely, high entry barriers and unfavorable institutional conditions can hinder new firms from entering the market, allowing existing firms to maintain or increase their market power, leading to higher markups.

In our exploration of the effect of fiscal policy shocks on markup dynamics, we notice some distinct patterns between advanced and developing economies. We believe that these differences might be deeply influenced by their individual institutional and firm entry conditions. Advanced economies with a robust infrastructure, skilled labor, and a culture that values innovation seem to provide a more welcoming environment for businesses. This favorable environment for business and firm entry fosters competition, which could lead to a decrease in markup during economic booms. However, in developing countries, where the competitive landscape might be less intense, dominant firms might take advantage of their position during economic booms, possibly leading to an increase in markup.

Our t-test results further underscore these observations. Specifically, advanced economies have a notably higher mean institutional score of 0.83 compared with 0.52 for developing countries, with a significant t-statistic of 24.65 and a p-value of less than 0.0001. Similarly, the opportunity on startup score averages at 0.75 for advanced countries, contrasting with 0.31 for developing countries, backed by a t-statistic of 18.24 and a p-value of less than 0.0001. While these findings are compelling, they must be interpreted with caution, recognizing the intricate nuances that shape each region's economic landscape.

5.2.2 Institutional Quality: A Key Determinant in Fiscal Policy's Effect on Markup

To substantiate our mechanism, we use the local projections approach to discern the effect of fiscal expenditure shocks on markup, emphasizing the mediating role of institutional quality. We estimate the following equations:

$$(4) \qquad \frac{\mu_{i,t+h}-\mu_{i,t-1}}{\mu_{i,t-1}} = \beta_h \frac{\triangle g_{i,t}}{y_{i,t-1}} + \beta_{h,int} \frac{\triangle g_{i,t}}{y_{i,t-1}} int_i + \phi_h(L) w_{i,t-1} + \alpha_{i,h} + \gamma_h z_{i,t} + \delta_{t,h} + \varepsilon_{i,t+h}$$
$$\text{for } h = 0, 1, 2, \ldots$$

insufficient sample size.

Table 5
Results of Local Projection

		On Effect	1 Year	2 Years	3 Years	Obs.
All	(1)	7.18*	6.35	13.07**	10.39*	1,098
		(3.69)	(5.72)	(3.84)	(6.13)	
Institutional Dummy	(2)	-2.18	-7.40	-3.84	-2.25	1,065
		(4.65)	(6.43)	(7.11)	(8.75)	

NOTE: Robust errors are in parentheses. *, **, and *** denote significance levels at 10 percent, 5 percent, and 1 percent, respectively. The constant is included but not reported.

The research explores the fluctuations in the real exchange rate for country i in year t. Principal variables include markup μ_{it}, government spending g_{it}, and military expenditure $g^m_{i,t}$. The institutional quality is symbolized by a dummy variable, *int*. Countries with scores surpassing the average instantaneous score for the period are deemed to have "high institutional quality," suggesting favorable conditions for businesses. They are assigned a value of 1. In contrast, countries scoring below the average are labeled as having "low institutional quality" and are given a value of 0. The nation's real GDP is captured by y_{it}. The vectors $w_{i,t-1}$ and z_{it} account for lagged and contemporaneous controls, respectively. Country and year effects are represented by $\alpha_{i,h}$ and $\delta_{t,h}$, respectively, and $\varepsilon_{i,t}$ denotes the error term. In terms of interpretation, β_h indicates the impulse response for the complete dataset, whereas $\beta_{h,int}$ denotes the differential response for countries with high institutional quality.

Table 5 presents the analysis results, showing that as institutional quality increases, the markup's response to a fiscal policy shock decreases. As column (1) shows, the markup increases for the full sample. Excluding the response after one year, all the results are statistically significant. Conversely, in column (2), the markup decreases, indicating that it diminishes as the institutional quality improves.

To ensure robustness, we incorporate an interaction dummy variable for institutional quality. In our empirical methodology, using equation (Appendix 1.2), we substitute the level of development dummy with the institutional quality dummy. The results of our empirical analysis are in Appendix Appendix 1.3. These findings validate our main argument: In countries with strong institutional frameworks (i.e., high institutional quality), expansionary fiscal policy shocks are correlated with a decrease in markup and a depreciation in the real exchange rate. Such insights amplify the principal conclusions of our study, emphasizing the linkage between institutional conditions and the cyclicality of markup.

6. CONCLUSION

In this study, we analyze the effects of government spending on markups and external sectors, such as the real exchange rate and current accounts, in 32 countries from 1980 to 2016, accounting for the distinction between advanced and developing economies. We find that the responses of these variables to fiscal policy shocks vary significantly across these two categories of countries. The markup dynamics among advanced and developing countries contribute to the distinct behavior of real exchange rates in response to fiscal policy shocks. In developing countries, the markup increases following fiscal policy shocks, leading to real exchange rate appreciation. Conversely, in advanced economies, the markup decreases after positive fiscal policy shocks, leading to a depreciation of the real exchange rate. The current account declines in developing countries due to real exchange rate appreciation, while it increases in advanced economies.

We argue that favorable institutional and entry conditions in advanced economies contribute to the reduction in markup, while unfavorable conditions in developing countries enable incumbent firms to maintain or increase their market power. Consequently, the dynamics of markup in response to fiscal policy shocks are significantly influenced by the prevailing institutional and firm entry conditions in both advanced and developing economies.

Our research has important policy implications, highlighting the need for policymakers to consider institutional and market entry conditions when designing and implementing fiscal policies. Institutional conditions such as market entry conditions, which include barriers to entry and the overall business environment, can also shape how fiscal policy shocks affect the external side of the economy. By considering the unique institutional and market entry conditions, policymakers can better anticipate the potential effects of fiscal policy shocks on the current account balance and real exchange rate dynamics. This nuanced approach to fiscal policy design can

lead to more effective achievement of macroeconomic stability and sustainable economic growth. In particular, policymakers should be aware that in developing countries with high market entry barriers, expansionary fiscal policy shocks can lead to a decline in the current account balance.

REFERENCES

Acemoglu, Daron, Simon Johnson, and James A. Robinson. 2001. The colonial origins of comparative development: an empirical investigation. *American Economic Review, 91(5), 1369-1401.*

Aghion, Philippe, Nick Bloom, Richard Blundell, Rachel Griffith, and Peter Howitt. 2005. Competition and innovation: an inverted-u relationship. *The Quarterly Journal of Economics, 120(2), 701-728.*

Alessandria, George. 2009. Consumer search, price dispersion, and international relative price fluctuations. *International Economic Review, 50(3), pp. 803-829.*

Anderson, Eric, Sergio Rebelo, and Arlene Wong. 2018. Markups across space and time. *NBER Working Paper 24434.*

Auerbach, A. J., and Y. Gorodnichenko. 2016. Effects of fiscal shocks in a globalized world. *IMF Economic Review, Vol. 64, pp. 177-215.*

Avellán, Leopoldo, Arturo Galindo, and John Leon-Diaz. 2020. The role of institutional quality on the effects of fiscal stimulus. *IDB Working Paper Series No. IDB-WP-01113.*

Bain, Joe S. 1956. Barriers to new competition: their character and consequences in manufacturing industries. *Cambridge, MA: Harvard University Press.*

Barro, Robert J., and Charles J. Redlick. 2011. Macroeconomic effects from government purchases and taxes. *Quarterly Journal of Economics, 126 (1), pp. 51-102.*

Bils, Mark, Peter J. Klenow, and Benjamin A. Malin. 2018. Resurrecting the role of the product market wedge in recessions. *American Economic Review, Vol. 108, No. 4-5, pp. 1118-1146.*

Blanchard, Olivier, and Francesco Giavazzi. 2003. Macroeconomic effects of regulation and deregulation in goods and labor markets. *The Quarterly Journal of Economics, 118(3), 879-907.*

Bouakez, Hafedh. 2005. Nominal rigidity, desired markup variations, and real exchange rate persistence. *Journal of international Economics* 66(1):40–74.

Cabral, Luis M. B. 2000. Introduction to industrial organization. *MIT Press.*

Collier, Paul. 2006. War and military expenditure in developing countries and their consequences for development. *The Economics of Peace and Security Journal, 1(1), pp. 10-13.*

Corsetti, Giancarlo, André Meier, Gernot J. Müller, and Michael B. Devereux. 2012. What determines government spending multipliers? *Economic Policy, 27(72), 521-565.*

De Loecker, Jan, and Jan Eeckhout. 2021. Global market power. *Working Paper.*

Djankov, Simeon, Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer. 2002. The regulation of entry. *The Quarterly Journal of Economics, 117(1), 1-37.*

Ferrara, Laurent, Luca Metelli, Filippo Natoli, and Daniele Siena. 2021. Questioning the puzzle: fiscal policy, real exchange rate and inflation. *Journal of International Economics* 133.

Gust, Christopher, Sylvain Leduc, and Robert Vigfusson. 2010. Trade integration, competition, and the decline in exchange-rate pass-through. *Journal of Monetary Economics, 57(3), 309-324.*

Hall, Robert E. 2009. By how much does GDP rise if the government buys more output? *Brookings Papers on Economic Activity, 40(2), pp. 183-249.*

Ilzetzki, Ethan, Enrique G. Mendoza, and Carlos A. Végh. 2013. How big (small?) are fiscal multipliers? *Journal of Monetary Economics, 60(2), pp. 239-254.*

Jordá, Oscar. 2005. Estimation and inference of impulse responses by local projections. *American Economic Review 95, 1: 161-82.*

Juessen, Falko, and Ludger Linnemann. 2012. Markups and fiscal transmission in a panel of oecd countries. *Journal of Macroeconomics* 34(3):674–686.

Kim, Soyoung, and Nouriel Roubini. 2008. Twin deficit or twin divergence? fiscal policy, current account, and real exchange rate in the u.s. *Journal of International Economics, 74(2), 362-383.*

Klapper, Leora, Luc Laeven, and Raghuram Rajan. 2006. Entry regulation as a barrier to entrepreneurship. *Journal of Financial Economics, 82(3), 591-629.*

Klein, Mathias, and Ludger Linnemann. 2019. Tax and spending shocks in the open economy: are the deficits twins? *European Economic Review, 120, pp. 1-14.*

Marchetti, Domenico J. 2002. Markups and the business cycle: evidence from Italian manufacturing branches. *Open Economies Review, 13, pp. 87-103.*

Miyamoto, Wataru, Thuy Lan Nguyen, and Viacheslav Sheremirov. 2019. The effects of government spending on real exchange rates: evidence from military spending panel. *Journal of International Economics, Vol. 116, pp. 144-157.*

Morrison, Catherine J. 1994. The cyclical nature of markups in Canadian manufacturing: a production theory approach. *Journal of Applied Econometrics, 9, pp. 269-282.*

Nekarda, Christopher J., and Valerie A. Ramey. 2021. The cyclical behavior of the price cost markup. *Journal of Money, Credit and Banking 52, s2: 319-53.*

North, Douglass C. 1990. Institutions, institutional change and economic performance. *Cambridge University Press.*

Ramey, Valerie A. 2011. Identifying government spending shocks: it's all in the timing. *The Quarterly Journal of Economics, 126(1), pp. 1-50.*

Ramey, Valerie A., and Sarah Zubairy. 2018. Government spending multipliers in good times and in bad: evidence from US historical data. *Journal of Political Economy, 126(2), pp. 850-901.*

Ravn, Morten, Stephanie Schmitt-Grohe, and Martin Uribe. 2006. Deep habits. *Review of Economic Studies, 73, pp. 195-218.*

———. 2012. Consumption, government spending, and the real exchange rate. *Journal of Monetary Economics, 59(3), 215-234.*

Reinhart, Carmen M., and Kenneth S. Rogoff. 2011. From financial crash to debt crisis. *American Economic Review, 101(5), pp. 1676-1706.*

Rodrik, Dani. 2008. Second-best institutions. *American Economic Review 98, 2: 100-104.*

Sheremirov, V., and S. Spirovska. 2019. Fiscal multipliers in advanced and developing countries: evidence from military spending. *FRB of Boston Working Paper No. 19-3.*

Shleifer, A., and R. W Vishny. 1993. Corruption. *The Quarterly Journal of Economics, 108(3), 599-617.*

Stroebel, Johannes, and Joseph Vavra. 2019. House prices, local demand, and retail prices. *Journal of Political Economy, 127(3), pp. 1391-1436.*

Sutton, John. 1991. Sunk costs and market structure: price competition, advertising, and the evolution of concentration. *MIT Press.*

Tirole, Jean. 1988. The theory of industrial organization. *MIT Press.*

APPENDIX 1.

Section Appendix 1.1 provides a succinct explanation of the country-specific local projection method. In Section Appendix 1.2, we segment the sample based on the level of development and then use the local projection method to examine the effect of a fiscal expenditure shock on markups and the real exchange rate. Last, in Section Appendix 1.3 we further divide the sample according to institutional quality and conduct an analysis using the local projection method.

Appendix 1.1 Country-Specific Local Projection

In this section, we outline the equation used to analyze the effect of a fiscal expenditure shock on the real exchange rate for individual countries. Our empirical framework is

$$\frac{REER_{t+h} - REER_{t-1}}{REER_{t-1}} = \beta_h \frac{\triangle g_t}{y_{t-1}} + \phi_h(L) w_{t-1} + \alpha_h + \gamma_h z_t + \delta_{t,h} + \varepsilon_{t+h} \quad \text{for } h = 0, 1, 2, \ldots \tag{5}$$

The methodology and approach closely resemble that of equation (1): Both apply the 2SLS technique and use the same set of variables. Notably, in this analysis, the dependent variable is solely the real exchange rate and the level of interaction dummy is omitted. Furthermore, instead of dividing the sample, we estimate for each individual country and report the results accordingly.

Appendix 1.2 Local Projection Based on Development Level

We next segment the sample into two groups based on the development level and analyze the effect of a fiscal expenditure shock on markups, exchange rates, and current account balances for each group. We estimate the following equations:

$$\frac{x_{i,t+h} - x_{i,t-1}}{x_{i,t-1}} = \beta_h \frac{\triangle g_{i,t}}{y_{i,t-1}} + \phi_h(L) w_{i,t-1} + \alpha_{i,h} + \gamma_h z_{i,t} + \delta_{t,h} + \varepsilon_{i,t+h} \quad \text{for } h = 0, 1, 2, \ldots \tag{6}$$

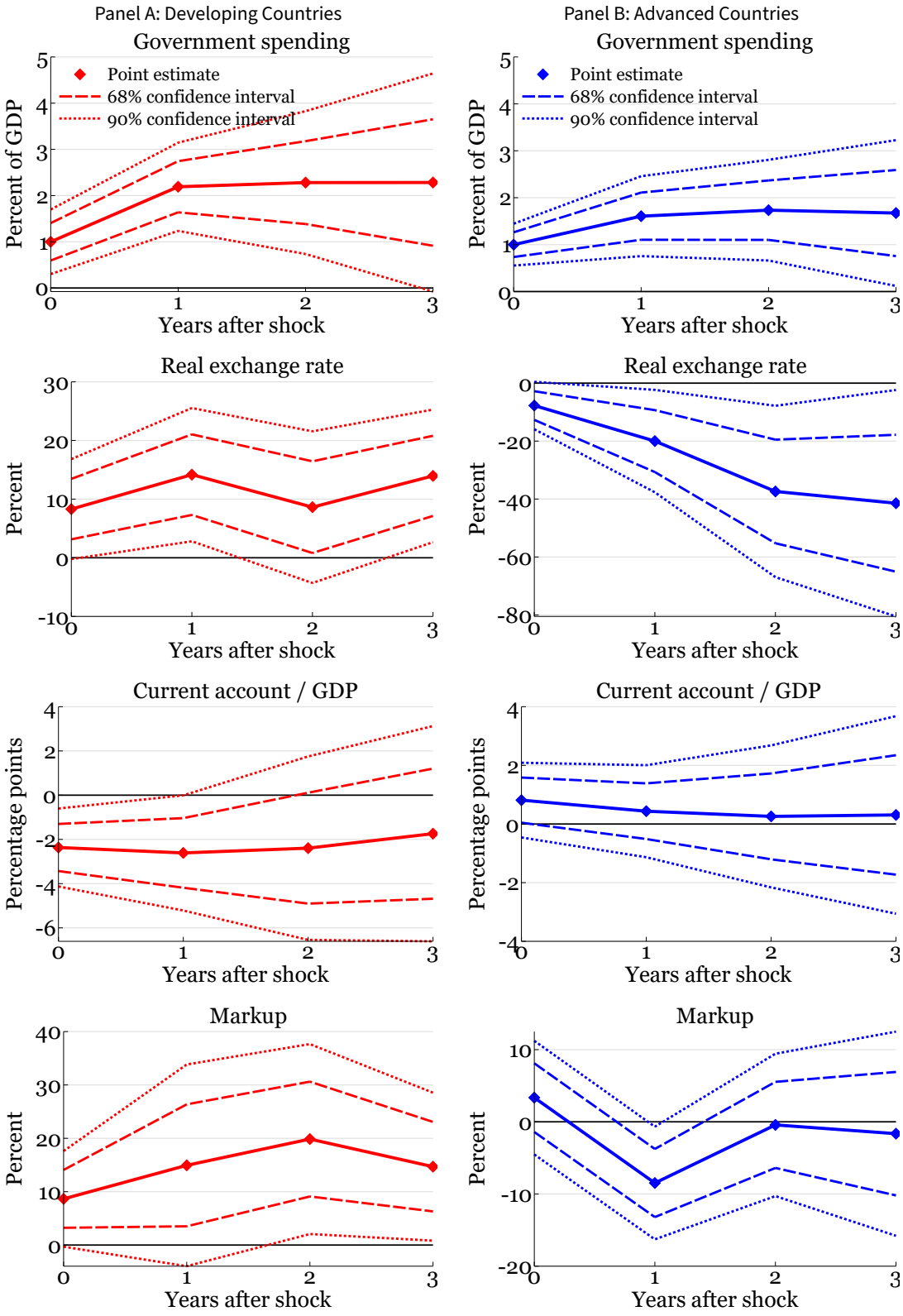
The methodology and approach are akin to equation (1): Both employ the 2SLS technique and use the same variables. However, in this analysis, we exclude the level of interaction dummy. Furthermore, we divide the sample into developing countries and advanced countries for separate analysis. Doing this allows us to analyze the effects of fiscal policy shocks on various aspects of the external sector in each group.

Figure 4 presents the results. Government spending exhibits persistence in response to government expenditure shocks up to a three-year horizon, with statistically significant estimates. The responses of the real exchange rate to positive government expenditure shocks differ between advanced and developing countries. In developing countries, the real exchange rate appreciates following fiscal policy implementation, while it depreciates in advanced economies. The current account responses to expansionary government consumption shocks also differ between the two groups. In developing countries, current accounts decline due to the appreciation of the real exchange rate, while in advanced economies, they increase due to depreciation.

Appendix 1.3 Local Projection with Institutional Quality Dummy

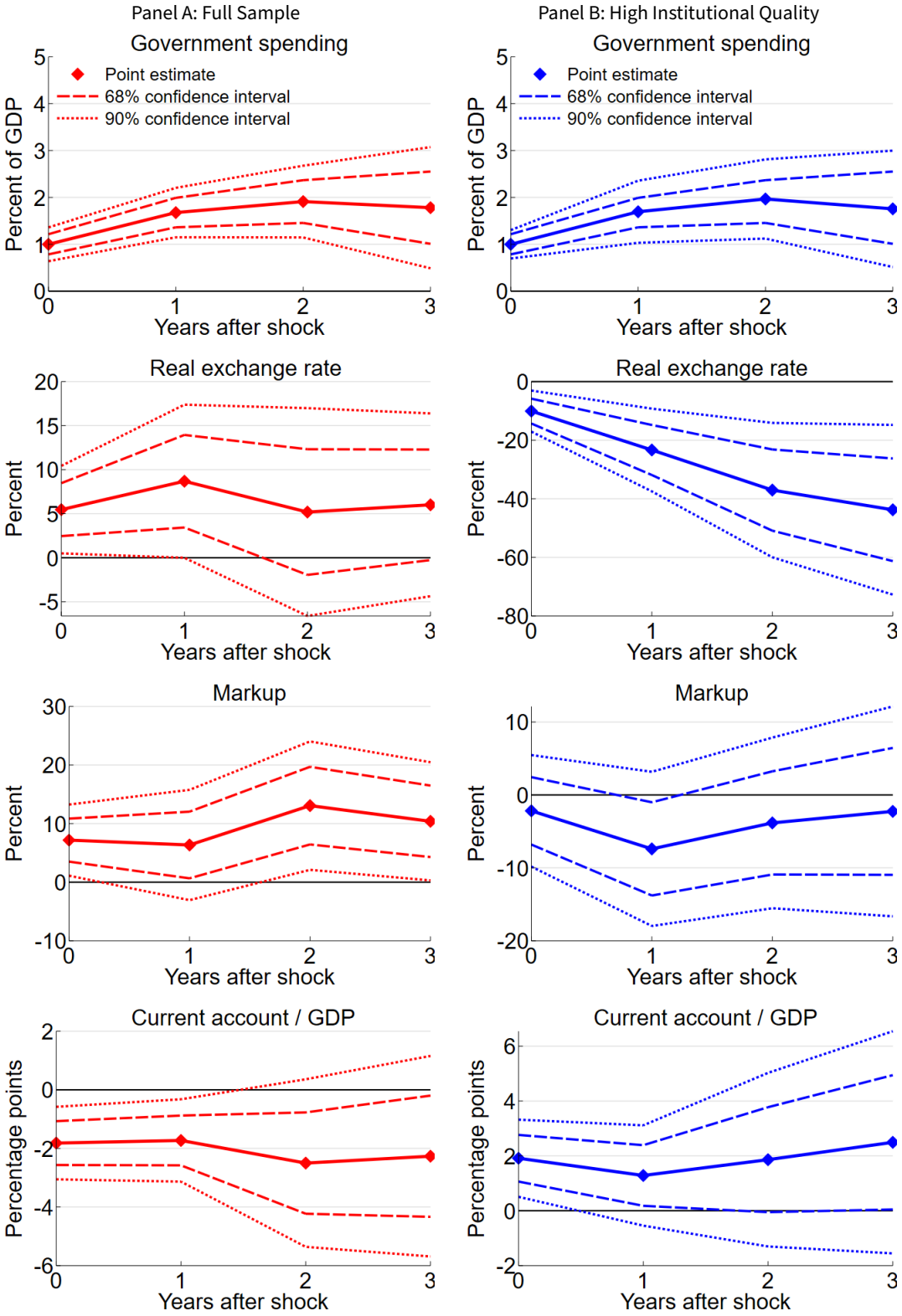
In this section, we use the interaction dummy for institutional quality. Our empirical method, paralleling equation (Appendix 1.2) in Section 4, previously determined the shock response function resulting from fiscal policies for each variable. However, here we substitute the level of development dummy with the institutional quality dummy. The results confirm our main findings: In countries with robust institutional frameworks (high institutional quality), expansionary fiscal policy shocks correlate with a reduction in markup and a depreciation in the real exchange rate. This analysis underscores the primary conclusions of our article, further cementing the relationship between institutional conditions and markup cyclicality.

Figure 4
Impulse Response Results



NOTE: The figure shows the responses of government spending, real exchange rates, current account to GDP, and markup to a 1-percentage-point increase in government spending to GDP within a timeframe of zero to three years. Dotted lines represent 90 percent confidence interval bounds, while dashed lines represent 68 percent confidence interval bounds.

Figure 5
Impulse Response Analysis



Note: The figure shows the responses of government spending, real exchange rates, current account to GDP, and markup to a 1-percentage-point increase in the ratio of government spending to GDP within a timeframe of zero to three years. Dotted lines represent 90 percent confidence interval bounds, while dashed lines represent 68 percent confidence interval bounds.