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Impact of uncertainty on economic growth: The role of pro-market institutions in developing countries

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Abstract

Various shocks, including the Gulf War, the US recession, the 9/11 attacks, financial credit crunch, and domestic political shocks like coups, and revolutions, have contributed to the persistence of high uncertainty. This uncertainty has direct implications for economic activity, affecting both business investment and household consumption decisions. This article explores the mediating role of the quality of pro-market institutions in the relationship between economic performance and changes in the uncertainty. It also investigates whether reforming pro-market institutions during a period of uncertainty can mitigate the negative effects of the uncertainty on economic performance, while analyzing the channels through which the mediating effect of reforms during uncertainty manifests. Using a sample of 61 developing countries over the period 1990–2014, our results, robust to various tests, indicate that higher quality of pro-market institutions significantly reduces the negative effects of uncertainty on economic performance. Indeed, the reduction in GDP growth due to a change in uncertainty decreases by 93 percentage points with higher levels of pro-market institutional quality, and this variation depends on the nature of the pro-market institutions considered. Furthermore, implementing pro-market institutional

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liberalization reforms during a period of uncertainty could not only alleviate the negative effects of uncertainty but also contribute to medium-term economic growth. The analysis of channels suggests that this effect is mediated by the impact of reforms on household consumption and business investment. These results highlight how pro-market institutions and reforms in these institutions can enhance the resilience of economies facing high uncertainty or unexpected and substantial economic shocks.

KEYWORDS

economic growth, pro-market institutions, reforms, world uncertainty

1 | INTRODUCTION

In a statement dated January 24, 2020, the Managing Director of the International Monetary Fund (IMF), Kristina Georgieva, said: “If I had to identify a theme at the outset of the new decade it would be increasing uncertainty”. Indeed, recent years have been marked by global events, including the 2008 financial crisis, trade conflicts, political polarization, and the current context of the Covid-19 pandemic, dominated by the Russo-Ukrainian conflict and the Israel-Hamas War. These global events create an increasingly uncertain environment for political and individual choices (businesses and consumers). It is generally highlighted that an increase in uncertainty can lead to a temporary decline in economic activity (Arellano et al., 2019; Ahir et al., 2022; Bernanke, 1983; Bachmann et al., 2013; Bloom, 2014; Christiano et al., 2014; Gilchrist et al., 2014; Pindyck, 1991). Theoretically, there are three channels that can explain the effects of uncertainty on economic activity.

Firstly, fluctuations in uncertainty affect the economy through the irreversibility of investment. When investment projects cannot be “cancelled” or “modified” without very high costs, investors have the choice between the additional returns from the immediate launch of an investment project and the advantages of waiting to gather more information about the future. The literature considers the value of waiting as a real option value. Thus, when companies find themselves in an uncertain environment, they stop investing and hiring: This is called a “wait-and-see” effect. This “wait-and-see” effect leads the economy into a recession (Bernanke, 1983; Bachmann et al., 2013; Pindyck, 1991).

Secondly, fluctuations in uncertainty can affect the economy through the channel of precautionary savings. This channel dates back to the work of Leland (1968), who defined precautionary savings as “the extra saving caused by future income being random rather than determinate”. In periods of high uncertainty, when households are faced with a higher risk of poor outcomes, they protect themselves by saving more. The buildup of precautionary savings results in an additional reduction in consumption and therefore in demand. For example, when households make decisions about purchasing durable goods such as cars, houses, and furniture, due to fluctuations in uncertainty, they may postpone their purchasing decisions¹ (Eberly, 1994).

Thirdly, fluctuations in uncertainty can affect the economy through financial frictions. Financial intermediaries play a crucial role in the transmission of uncertainty fluctuations to the economy (Ferrara et al., 2018). Following the

¹However, the actual effects of uncertainty on non-durable consumption will be less as it is more difficult for households to postpone purchases of non-durable goods such as food and entertainment (Bloom, 2014).

Great Recession of 2008–2009, many theoretical models describing the interactions between financial markets and uncertainty fluctuations have emerged. In a theoretical general equilibrium model, Arellano et al. (2019), Christiano et al. (2014), and Gilchrist et al. (2014) study the impact of uncertainty fluctuations in an economy with debt contracts between lenders and entrepreneurs. In this model, the allocation of capital to the production process by entrepreneurs is either successful or not. The level of productivity is decided independently by each entrepreneur. When the cross-sectional dispersion of firms' productivity increases, extreme high and low productivity values are observed. Since more entrepreneurs choose low levels of productivity and then become unable to repay their debts, financial intermediaries protect themselves by charging a higher premium, leading to an increase in the cost of borrowing. The increase in the cost of borrowing results in a decrease in investment and real production by firms, which spreads to the entire economy in general equilibrium.

While many studies have focused on the relationship between uncertainty and economic performance, very few have examined the factors that can mitigate the negative effects of uncertainty on economic performance. Some studies have highlighted the importance of political institutions in mitigating the effects of uncertainty on growth. In a recent study, Ahir et al. (2022) show that the negative impact of uncertainty on economic performance is lower and of shorter duration in countries with high institutional quality. Conversely, the authors find that in countries with low institutional quality, the negative effect of uncertainty is high and persistent over time. In addition to institutional quality, some empirical studies have emphasized the importance of financial development in mitigating the effects of uncertainty on economic growth. Based on data from 50 countries (developed and developing), Karaman and Yıldırım-Karaman (2019) showed that countries with high levels of financial development are better able to mitigate the negative effects of uncertainty on economic performance.

In addition to the impact of uncertainty, research conducted by Tola and Waelti (2018) assesses the role that various types of structural reforms, including financial reforms, trade reforms, and product market reforms, play in reducing output losses resulting from financial crises. The authors find that certain reforms, but not all, contribute to reducing medium-term output losses during these crises, highlighting the need to avoid excessive generalization of the effectiveness of reforms.

At the same time, empirical studies regarding the potential role of pro-market institutions and their reforms in the specific context of uncertainty remain relatively scarce, despite their significance in the global political debate in the aftermath of the 2008–2009 global financial crisis. We examine the mediating effects of pro-market institutions and their reforms on the relationship between uncertainty and economic performance. We argue that pro-market institutions and their reforms alleviate the negative effects of uncertainty on growth by improving the efficiency and stability of the economic and financial systems. Indeed, pro-market institutions aimed at increasing transparency, reducing systemic risk, and mitigating financial frictions, for example, facilitate firms' access to capital and consumers' access to credit, which could support economic activity.

There are several channels through which pro-market institutions and their reforms can mitigate the impact of uncertainty on economic growth. Pro-market institutions can strengthen the resilience of the national economy, stimulate private investment, and improve the quality of institutions. In an open market economy, pro-market institutions can enhance the flexibility and adaptability of capital and product markets, reducing the vulnerability of the economy to external shocks such as geopolitical crises, commodity price shocks like oil shocks, financial and health crises, and so on. Pro-market institutions can also improve the business environment by simplifying regulations, protecting intellectual property rights, promoting competition, and reducing administrative costs, which stimulate business investment and improve the productivity of production factors.

This study contributes to the literature on the relationship between uncertainty and economic growth (Lensink et al., 1999; Bloom, 2009; 2014; Karaman & Yıldırım-Karaman, 2019; Lensink et al., 1999). Specifically, our study is related to that of Tola and Waelti (2018) and Bolen and Williamson (2019). Tola and Waelti (2018) assess the role that various types of reforms, including financial reforms (domestic and external), trade reforms, and product market reforms, play in reducing output losses resulting from financial crises. The study by Bolen and Williamson (2019) empirically examines the effects of institutional volatility on economic growth and finds that such volatility reduces

economic growth. Our study makes three main contributions to this literature, notably by being the first to explore the potential role of the quality of pro-market institutions in mitigating the effects of uncertainty on economic performance. According to the work of North (1991), institutions reduce uncertainty and create a stable structure for exchange. Therefore, improving economic institutions increases economic growth by reducing transaction and production costs and increasing gains from trade. Secondly, our study analyzes whether reforming pro-market institutions during periods of uncertainty could lead to beneficial economic performance. Our hypothesis is that improving institutions occurs through reforms aimed at addressing the shortcomings of poorly functioning pro-market institutions. Thus, a reform aimed at improving poorly functioning market institutions should, in theory, lead to a reduction in uncertainty (Ryan, 2020). The research conducted by Bonfiglioli et al. (2022) shows that during periods of uncertainty, countries implement reforms in pro-market institutions. Indeed, uncertainty can act as a smokescreen, providing politicians with greater leeway in their actions (Alesina & Cukierman, 1990). Additionally, Bonfiglioli and Gancia (2013) suggest that economic uncertainty can promote the adoption of liberalization policies, despite short-term costs, due to potential future benefits. This reduction in uncertainty could enable market forces to fully play their role in efficiently allocating resources such as labor and capital. Finally, our study provides empirical evidence on the channels through which pro-market institution reforms mitigate the negative effects of uncertainty on growth, primarily through the investment and consumption channels.

Indeed, reforms in pro-market institutions can boost consumer confidence and increase disposable income, leading to higher levels of consumption and economic growth through the consumption channel. Moreover, by reducing uncertainty and improving the labor market, these reforms in pro-market institutions can also boost employment and wages, further stimulating consumption. In addition, reforms in pro-market institutions can increase the productivity and competitiveness of firms, leading to higher levels of investment and economic growth. By reducing uncertainty and improving the business environment, reforms in pro-market institutions can also encourage firms to undertake longer-term investment projects, which can have a positive impact on economic growth.

Following the empirical literature, we define pro-market institutions as an increase in deregulation indices in financial and real sectors (Bonfiglioli et al., 2022; Giuliano et al., 2013; Gokmen et al., 2021). These indices, derived from the work of Alesina et al. (2023), primarily focus on four sectors in our study: trade pro-market institutions, domestic finance pro-market institutions, external finance (capital account liberalization) pro-market institutions, and product market pro-market institutions. Our uncertainty measure is based on the work of Ahir et al. (2022), using a new uncertainty measure, the World Uncertainty Index (WUI). This uncertainty measure has the advantage of being widely available for a significant panel of developing countries over an extended period, and Ahir et al. (2022) show a high correlation with other macroeconomic uncertainty proxies. Note that the uncertainty mentioned in this article does not pertain to uncertainty about the outcome of the reforms but rather to uncertainty related to the economic environment resulting from events such as the Gulf War, the US recession, the 9/11 attacks, financial credit crunch, and domestic political shocks like coups, revolutions. Our study analyzed a sample of 61 developing countries during the period 1990–2014, and we employed an identification strategy based on ordinary least squares (OLS), two-step system GMM (Generalized method of moments) estimator, and local projection method à la Jordà (2005).

Our analysis is divided into three distinct parts. Firstly, we examine the mediating effect of the quality of pro-market institutions on the relationship between economic performance (e.g., the annual growth rate of real GDP) and the change in the uncertainty index. In other words, we seek to determine whether countries with better-quality pro-market institutions, particularly in terms of market liberalization, more effectively mitigate the effects of uncertainty on macroeconomic performance. In the second part of our analysis, our objective is to explore whether a reform of pro-market institutions during a period of uncertainty can also mitigate the negative effects of this uncertainty on economic performance. Finally, we investigate the channels through which the mediating effect of reforms in pro-market institutions during a period of uncertainty operates.

Our main findings reveal that the quality of pro-market institutions plays a mediating role in the relationship between uncertainty and economic growth. Specifically, the conditional effect of pro-market institutions, particularly those related to trade, finance, and product markets, in conjunction with uncertainty on growth, is positive and

statistically significant. In essence, countries with higher-quality pro-market institutions are more adept at mitigating the negative impact of uncertainty on economic growth. Statistically, the reduction in GDP growth attributed to changes in uncertainty diminishes by 93% with elevated levels of pro-market institutional quality. The magnitude of this reduction varies based on the specific pro-market institutions considered. We have conducted robustness analyses, indicating that our results remain robust with the inclusion of control variables, consideration of structural factors, and the use of alternative identification methods. Additionally, we establish that implementing reforms in pro-market institutions during uncertain periods not only alleviates the impact of uncertainty on economic performance but also leads to statistically significant growth in the medium term. Finally, our study explores the channels through which reforms in pro-market institutions could mitigate the negative impact of uncertainty on growth. The results indicate that the mediating effect of reforms on the relationship between uncertainty and growth operates through the investment and consumption channels. Specifically, during periods of heightened economic uncertainty, adopting reforms aimed at enhancing competition by eliminating entry barriers for firms, improving the flexibility and adaptability of capital markets by addressing financial frictions, as well as eliminating barriers to international trade, fosters business investment and household consumption.

The main takeaway from this study underscores the significance of government prioritization in implementing reforms to fortify economic resilience in the face of uncertainty. Giving prominence to measures such as liberalizing product markets sector, the financial sector, and the trade sector can robustly enhance the economy's competitiveness, flexibility, and productivity, proving particularly valuable during periods of economic uncertainty. Moreover, although short-term stabilizing policies can be employed by governments to stimulate the economy, it is crucial to complement these policies with long-term reforms in pro-market institutions to ensure enduring and sustainable economic growth.

The remainder of the paper is organized as follows. Section 2 presents the data used with some stylized facts, Section 3 presents the empirical model by developing the identification strategy. While Section 4 presents the main results, Section 5 tests the robustness of the basic results. Finally, while Section 6 analyzes pro-market institutional reforms, Section 7 identifies the main channels, and Section 8 concludes the study.

2 | DATA AND STYLIZED FACTS

2.1 | WUI

Measuring uncertainty is a real challenge. Indeed, uncertainty is a fuzzy concept that can refer to the uncertainty in the minds of policy makers, consumers, as well as businesses about future events that may or may not occur. Thus, uncertainty covers both microeconomic and macroeconomic dimensions as well as other events such as wars, climate change, and elections (Ahir et al., 2022).

To measure economic policy uncertainty, our study relies on a new uncertainty measure constructed by Ahir et al. (2022)—analysts working for a private intelligence firm, the Economist Intelligence Unit. Thus, the WUI² is a measure that tracks uncertainty around the world by leveraging country reports from the Economist Intelligence Unit. The construction of the index follows an approach similar to Romer and Romer ((1989),(2010))³ by counting the number of times the word “uncertainty” (or the variant) is used relative to the total number of words. The index is available for 143 countries over a long period going back 60 years. This measure of uncertainty has become an official measure used by organizations such as the IMF and the Federal Reserve Bank of St. Louis for the

²The World Uncertainty Index (WUI) represents a three-quarter weighted moving average. The three-quarter weighted moving average is calculated as follows: $1996Q4 = (1996Q4 * 0.6) + (1996Q3 * 0.3) + (1996Q2 * 0.1) / 3$. According to Ahir et al. (2022), this smoothed version of the index is preferred for country-level data.

³The authors use official documents from government meetings to identify changes in the direction of monetary and fiscal policy.

United States. Unlike other measures of uncertainty⁴, WUI has the advantage of not only covering a broad sample of developed and developing countries but also constituting the first comparable uncertainty index across countries (Gozgor et al., 2019). The WUI has a range of values between 0 and 1, where 1 represents the highest level of uncertainty.

2.2 | Pro-market institutions indicators

Our measure of pro-market institutions is derived from the research conducted by Alesina et al. (2023). The authors created pro-market institutions indicators that span a broad sample of 90 countries over the period from 1973 to 2014. These data encompass countries at various stages of economic development: 29 advanced economies (AEs), 45 emerging markets (EMs), and 19 low-income countries (LICs). The pro-market institutions indicators are multi-dimensional, encompassing both the financial sector and the real sector. Pro-market institutions in the financial sector pertain to domestic financial markets (banking and securities markets) as well as external financial markets (capital accounts). Pro-market institutions in the real sector cover product markets (telecommunications and electricity markets) as well as trade measures (average tariff rates, current account). We summarize in Table A3 the different economic dimensions covered by the pro-market institutions used in this study.

- i. **Trade institutions:** They measure tariffs at the product level by aggregating tariff data for each product through simple weighted averages (where the weights represent the share of exports for each product) and current account liberalization. These averages are then normalized, ranging from 0 (closed to trade) to 1 (fully open to trade).
- ii. **Domestic finance institutions:** This comprises six subindicators: Credit Controls, Interest Rate Controls, Bank Entry Barriers, Banking Supervision, Privatization, and Security Market Development. The overall index, obtained through principal component analysis (PCA), is normalized to a range between 0 and 1, with higher values signifying a higher degree of liberalization.
- iii. **External finance institutions:** They provide information on policies across six categories: payments for imports, receipts from exports, payments for invisibles, receipts from invisibles, capital flows by residents, and capital flows by nonresidents. The aggregate index of external finance is a composite of an index on capital outflow restrictions and an index on capital inflow restrictions. The index is normalized to a range between 0 and 1, where higher values indicate a higher level of liberalization.
- iv. **Product market institutions:** These encompasses liberalization in the telecommunications sector (competition, state ownership, presence or absence of an independent regulator, and degree of government intervention in access to telecommunications) and the electricity sector (consolidation or unbundling of generation, transmission, and distribution, state ownership, presence or absence of an independent regulator, and degree of liberalization). For each of these dimensions, the product market indicator ranges from 0 to 1, where 0 represents a country with a higher degree of repression and 1 represents a fully liberalized country. The aggregated index is constructed as the sum of the two subindicators and is normalized to range between 0 and 1, with higher values indicating a greater degree of liberalization in this sector.

⁴Th most empirical work has relied on the volatility of key financial and economic indicators to measure uncertainty (Asamoah et al., 2016; Bloom, 2009). However, the measurement of uncertainty could not be done by focusing only on one variable. Uncertainty is a multidimensional concept and the use of financial and economic indicators alone does not take into account the different aspects of uncertainty. To address this limitation of using the volatility of financial indicators as a measure of uncertainty, Baker et al. (2016) have developed the Economic Policy Uncertainty Index (EPU). To measure uncertainty, the authors use government spending and inflation forecasts, media coverage of policy uncertainty, and the provision of the federal tax code for one year. The economic policy uncertainty index (EPU) has the disadvantage of covering only developed countries, which does not allow for an extension of empirical studies of the macroeconomic effects of uncertainty in developing countries.

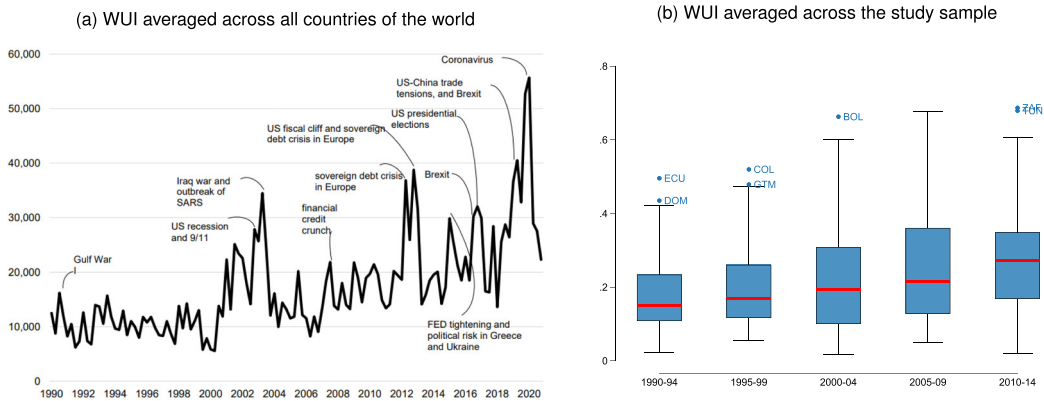
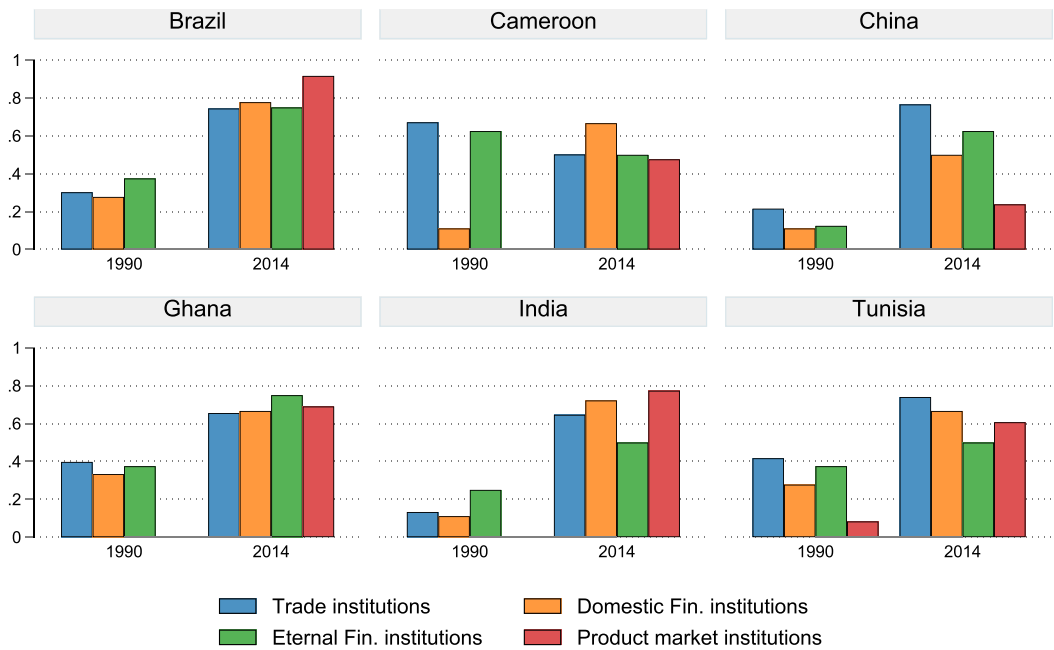


FIGURE 1 World Uncertainty Index (WUI) over time, 1990-2014. *Note:* According to Ahir et al. (2022), the World Uncertainty Index (WUI) is computed by counting the occurrences of the term “uncertain” (or its variants) in EIU country reports. The resulting count is then normalized by the total number of pages and rescaled by multiplying by 1000 (as presented in panel a of Figure 1). A higher numerical value indicates greater uncertainty, and conversely, a lower value suggests lower uncertainty. Panel b of Figure 1 displays a boxplot of the World Uncertainty Index (WUI) normalized between 0 and 1 [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com/doi/10.1111/kyk.12408)]

Figure A1 illustrates the progression of the pro-market institutions index over 5-year averages. We observe an improvement since the 1990s, indicating a trend towards stronger pro-market institutions and increasingly liberalized markets. In Figure 2, we present the evolution of pro-market institutions for six selected countries in 1990 and 2014. It is crucial to note that the level of economic liberalization was relatively low in 1990 compared with 2014. Specifically, Brazil, Cameroon, China, Ghana, and India had a zero level in product market institutions in 1990, while in 2014, the level of economic liberalization reached 0.91, 0.47, 0.24, 0.69, and 0.77, respectively. For example, India initiated the liberalization of its telecommunications sector in 1997 with the establishment of the Telecom Regulatory Authority of India (TRAI), fully opening the market to competition. In 1998, India created the Central Electricity Regulatory Commission (CERC) as an independent regulator. The establishment of these institutions allowed India to make significant progress in liberalizing the telecommunications and electricity markets. The evolution of pro-market institution indices helps understand how countries have multiplied their efforts in recent years to make markets much more flexible through the adoption of liberalization policies.

2.3 | Other variables

In the main specification, our dependant variable is GDP per capita growth, measured as the log difference of the real GDP per capita. We control for the effect of uncertainty on GDP per capita growth by using control variables commonly used in the endogenous growth literature. Specifically, we control for human capital (measured by human capital index), capital stock (measured as capital formation as a share of GDP), trade openness (measured as the sum of exports and imports as a percentage of GDP), foreign direct investment, net inflow (% of GDP), and population size. In order to correct for the bias of variables omitted in the baseline model, we develop a robustness analysis by incorporating other variables including total natural resources rents, institutional quality (captured by rule of law), financial crisis (banking, currency, or debt crisis), Inflation (consumer prices, annual %), the level of inequality (captured by the gini index), executive constraints in the political system, government expenditure on education (% of GDP), financial development Index, and a dummy variable indicating the presence of an IMF program active for five or more



Graphs by country

FIGURE 2 Pro-market institutions index for selected country. [Colour figure can be viewed at wileyonlinelibrary.com]

months. The sources of the data and countries used in this study are presented in Tables A4 and A5, respectively, in Appendix A⁵.

2.4 | Summary statistics

Descriptive statistics on the variables are presented in Table 1. All pro-market institutions indicators have a value ranging from 0 to 1. Trade institutions have a relatively higher mean (0.72) compared with other institutions. The uncertainty index has a mean of 0.2 and ranges from 0 to 1. The average growth rate of GDP per capita is 0.028. Annex Figure A2 shows the dynamic evolution of the uncertainty index and aggregate reforms. It appears that both have been increasing since 1990. There is a negative correlation between uncertainty and GDP per capita growth.

3 | EMPIRICAL ANALYSIS

In this section, we describe the empirical strategy used to estimate the conditional effect of pro-market institutions on the relationship between uncertainty and economic performance. First, we specify the basic model. Then, we discuss the estimators that can be used to estimate the empirical model.

⁵Our sample comprises 61 countries due to the availability of data on pro-market institutions.

TABLE 1 Descriptive statistics and correlation matrix.

Variables	N	Mean	Std. dev.	Min	Max						
Trade pro-market institution	1532	0.722	0.187	0.000	1.000						
Domestic finance pro-market institution	1629	0.622	0.214	0.000	1.000						
External finance pro-market institution	1628	0.610	0.272	0.125	1.000						
Product market pro-market institution	1650	0.373	0.304	0.000	1.000						
World uncertainty index	1638	0.201	0.178	0.000	1.000						
GDP per capita growth	1498	0.028	0.071	-0.573	0.374						
log(Population)	1585	16.873	1.374	14.089	21.034						
Trade (% of GDP)	1549	68.030	31.909	13.753	217.569						
Foreign direct investment net inflows (% of GDP)	1549	3.171	4.516	-15.989	55.076						
Gross capital formation (% of GDP)	1600	22.512	7.797	-0.691	58.497						
Human capital index	1493	2.221	0.584	1.028	3.553						
Correlation matrix	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
[1] GDP per capita growth	1.000										
[2] World uncertainty index	-0.329**	1.000									
[3] Trade pro-market institution	0.129***	0.162***	1.000								
[4] Domestic finance pro-market institution	0.154***	0.171***	0.596***	1.000							
[5] External finance pro-market institution	0.070*	0.126***	0.759***	0.433**	1.000						
[6] Product market pro-market institution	0.187***	0.193***	0.483***	0.643***	0.381***	1.000					
[7] log(Population)	0.061*	0.040	-0.411***	-0.196***	-0.435***	-0.069*	1.000				
[8] Trade (% of GDP)	0.083*	0.014	0.327***	0.279***	0.171***	0.155***	-0.417***	1.000			
[9] Foreign direct investment net inflows (% of GDP)	0.175***	-0.060*	0.244**	0.224***	0.135***	0.242***	-0.165***	0.330***	1.000		
[10] Gross capital formation (% of GDP)	0.267***	-0.099***	-0.036	-0.087**	-0.164***	0.023	0.191***	0.200***	0.288***	1.000	
[11] Human capital index	0.160***	0.111***	0.515***	0.416**	0.364***	0.430***	-0.165***	0.419***	0.242***	0.110***	1.000

Source: Author's calculations based on study data.

* $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

3.1 | Model specification

Our study aims to investigate the moderating effect of structural reforms on the relationship between world uncertainty and economic growth. Thus, the starting point of our empirical analysis is to estimate an initial regression model estimated by Lensink et al. (1999) through the following equation:

$$g_{i,t} = \beta_0 + \sum_{j=1}^l \beta_j g_{i,t-j} + \delta \Delta WUI_{i,t} + \alpha X_{i,t-1} + v_i + \gamma_t + \varepsilon_{i,t} \quad (1)$$

where the subscript i indicates a country ($i=1,2,\dots, 61$) and t indicates the time period ($t=1990, 1991,\dots, 2014$). $g_{i,t}$ is the growth rate of real output, measured by the annual change in the log of the the real GDP per capita in country i at year t . To account for the regular patterns of the growth rate of real output and other factors that are serially correlated and might impact short-term the growth rate of real output, the equation also incorporates past the growth rate of real output, denoted as $g_{i,t-j}$, for a duration of j periods. $\Delta WUI_{i,t}$ is the change in WUI (higher value of WUI means higher uncertainty and vice versa). $X_{i,t-1}$ is a vector of the control variables (logarithm of population, capital stock measured as gross capital formation as a share of GDP, Trade in % of GDP, Foreign direct investment net inflows in % of GDP, and Human capital index). v_i and γ_t are, respectively, country and time-fixed effects that capture omitted variable bias (global shocks, differences in countries' average growth rates, etc...). $\varepsilon_{i,t}$ denotes the error term and assumed to be independently and identically distributed with mean zero and constant variance.

To examine the moderating effect of pro-market institutions on the relationship between growth rate of real output and the change in world uncertainty, we consider the following equation:

$$g_{i,t} = \beta_0 + \sum_{j=1}^l \beta_j g_{i,t-j} + \delta \Delta WUI_{i,t} + \mu^k (\Delta WUI_{i,t} * Inst_{i,t-1}) + \lambda^k Inst_{i,t-1} + \alpha X_{i,t-1} + v_i + \gamma_t + \varepsilon_{i,t} \quad (2)$$

where $\Delta WUI_{i,t} * Inst_{i,t-1}$ denotes the interaction between the change in world uncertainty and pro-market institutions index ($Inst_{i,t-1}$) and $k \in \{\text{Overall pro-market institutions}^6, \text{trade, domestic finance, capital account liberalization, product market}\}$. To mitigate any reverse causality, the pro-market institutions index enters the regression with one lag. We expect that δ is negative and μ is positive. This implies that the change in world uncertainty decreases the growth rate of real output when the pro-market institutions index is at its low level and increases it when it is at its high level. In other words, we conjecture that countries that are more liberalized are better able to mitigate the negative effects of uncertainty on growth rate of real output.

From Equation (2), we can derive the effect of uncertainty on growth rate of real output by the following:

$$\frac{\partial g_{i,t}}{\partial \Delta WUI_{i,t}} = \delta + \mu Inst_{i,t-1} \equiv \omega_{it} \quad (3)$$

Thus, Equation (3) describes the complete relationship between real output growth and world uncertainty at different levels of pro-market institutions. The standard deviation of the coefficient ω_{it} is obtained through the following Equation (4):

$$var(\omega_{it}) = var(\delta) + var(\mu) Inst_{i,t-1}^2 + 2 * Inst_{i,t-1} Cov(\delta, \mu) \quad (4)$$

⁶Overall pro-market institution is the arithmetic average of all the pro-market institutions index. We conduct a robustness analysis in Subsection 5.4 using the PCA method to aggregate the four indicators of pro-market institutions quality.

3.2 | Identification strategy

To estimate (2) and in line with previous research, we initially use a parsimonious approach through estimation by the OLS estimator. However, using the OLS estimator as an estimation method poses a number of econometric challenges that are likely to lead to bias in the estimated coefficients. Thus, we raise the problem of endogeneity in our basic model which could come from three main sources: first, there could be an inverse causality between uncertainty and economic growth. Indeed, if uncertainty affects economic development, an economic period with low economic growth could be a source of increased uncertainty. Second, unobserved characteristics may jointly affect the rate of economic growth and economic uncertainty. Finally, another source of endogeneity may arise from measurement errors in the uncertainty indicator. Given these econometric challenges, it is difficult to obtain a causal relationship between uncertainty and macroeconomic performance using the OLS estimator.

To deal with these endogeneity problems, we develop a robustness analysis using a two-stage GMM system approach developed by Arellano and Bover (1995) and Blundell and Bond (1998)⁷. Indeed, our data have a more important individual dimension than the temporal dimension. The two-stage estimation method relies on internal instruments through the use of lagged values (internal transformation) in order to mitigate the various sources of endogeneities mentioned above. The two-stage GMM model has the advantage of avoiding unnecessary data loss. The principle of the two-stage GMM estimator is based on the use of “orthogonal forward deviations.” In other words, rather than subtracting previous observations of a variable from its current value, the two-step GMM estimator subtracts the average of all available future observations of a particular variable from the current value (Roodman, 2009; Ullah et al., 2018). Thus, the two-step GMM system stacks the model in level and first difference, instrumenting the first differences by the level variables and instrumenting the level variables by the first difference variables.

When using the two-stage GMM system estimator, according to Blundell and Bond (1998), the dependent variable and thus real gdp per capita growth must be stationary on average. To reduce any noise associated with short-term economic fluctuations, we create 4-year average data for seven nonoverlapping periods. We consider all regressors as endogenous except for the time fixed effects. Thus, the two-stage GMM system estimator has the advantage of dealing with the endogeneity problem resulting from reverse causality and measurement error and also allows for the bias induced by the potential correlation between the lagged gdp per capita variable and the time-invariant country-specific effects. Estimation by the GMM system method requires the optimal choice of the number of lags. Since there is no specific test for the choice of the number of lags, we follow Roodman's rule which suggests the use of a number of instruments lower than the number of countries. Indeed, the presence of too many internal instruments may over-adjust the endogenous variables. However, a low number of internal instruments can lead to concerns about low instrumentation. In our different estimations, each explanation variable other than the time fixed effects is instrumented using its first to third lags. Since our panel data set is balanced, the use of a two-stage GMM model allows for more efficient and consistent estimates (Arellano & Bover, 1995).

⁷In general, the specification of econometric models on dynamic panel data use the lags of the dependent variables as explanatory variables, which is consistent with our specification under Equation 2. Thus, the relationship between real gdp per capita and uncertainty is dynamic over time. To control for this endogenous relationship, the GMM estimator uses the lagged values of the dependent variables as instruments (we call them internal instruments). In other words, in the presence of a source of endogeneity, notably unobserved heterogeneity, dynamic endogeneity and simultaneity, the use of a GMM estimator allows us to have consistent results (Wintoki et al., 2012). Concretely, the GMM estimator removes the endogeneity by doing an “internal transformation of the data”. According to Roodman (2009), the internal transformation consists in subtracting the past value of a variable from its current value. There are two methods of “internal data transformations”: first difference transformation (one-step GMM estimator) and second order transformation (two-step GMM estimator). Because of the limitations in the first data transformation method, we do not use the one-step GMM estimator. Indeed, as pointed out by Roodman (2009), the first-difference transformation could result in the loss of too many observations if the recent value of a variable is missing.

4 | EMPIRICAL FINDINGS

4.1 | Main results

We present the basic results in Table 2. As discussed earlier, we use the OLS estimator as the baseline estimator. In column [1], we present the impact of uncertainty on per capita gdp growth while controlling for country and time fixed

TABLE 2 Benchmark estimates.

Dependent variable: GDP pc growth	(1) WUI	(2) Overall	(3) Trade	(4) Dom. finance	(5) Ext. finance	(6) Product market
World uncertain index	-0.054*** (0.016)	-0.130*** (0.019)	-0.094*** (0.018)	-0.120*** (0.035)	-0.103*** (0.018)	-0.074*** (0.016)
World uncertainty index # Overall institutions		0.121*** (0.016)				
Overall institutions		0.058*** (0.019)				
World uncertainty index # Trade institutions			0.069*** (0.021)			
Trade institutions			0.022 (0.013)			
World uncertainty index # Domestic Fin. institutions				0.099*** (0.033)		
Domestic Fin. institutions				0.065*** (0.020)		
World uncertainty index # Eternal Fin. institutions					0.076*** (0.009)	
External Fin. institutions					0.015 (0.010)	
World uncertainty index # Product market institutions						0.054*** (0.011)
Product market institutions						-0.020** (0.009)
Linear combination S.E		-0.009 (0.230)	-0.025** (0.012)	-0.020*** (0.002)	-0.027** (0.030)	-0.020** (0.031)
Main controls	Yes	Yes	Yes	Yes	Yes	Yes
Country and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1111	1103	1069	1102	1103	1103
Number of country	56	56	56	56	56	56
R-square (within)	0.335	0.327	0.325	0.331	0.325	0.323

Note: Standard errors in parentheses.

*** $p \leq 0.01$, ** $p \leq 0.05$, and * $p \leq 0.1$.

effects with other control variables. We find that uncertainty has a significant individual negative effect on gdp per capita growth. A change in uncertainty of one standard deviation leads to a reduction in per capita GDP of 0.119 percentage points. These results are consistent with previous empirical evidence (Ahir et al., 2022; Lensink et al., 1999).

To assess the mediating impact of pro-market institutions quality on the link between uncertainty and output growth, we introduce an interaction term between uncertainty and the overall pro-market institutions quality (aggregate pro-market institutional quality) in column [2]. The positive coefficient of overall pro-market institutions indicates that an increase in pro-market institutions has a positive effect on the growth of real GDP per capita. Consistent with our core hypothesis, the results show a positive and statistically significant coefficient at 1% level for the interaction term, as well as a negative and significant coefficient at 1% level for the uncertainty index. These findings support the idea that countries with higher levels of pro-market institutional quality are more effective at mitigating the growth-reducing impacts of uncertainty. When we combine the two effects linearly (i.e. the growth impact of a marginal change in uncertainty implied from Equation (3)), we observe a negative impact on output growth, but it is not statistically significant. We see that the decrease in GDP growth attributed to uncertainty change is less pronounced when pro-market institutions reach higher levels. Although the coefficient for the change in uncertainty stands at -0.130 , upon inclusion of the interaction term, the coefficient value diminishes ($-0.130 + 0.121 = -0.009 < -0.130$). Statistically, the reduction in GDP growth due to uncertainty change decreases by 93 percentage points with higher levels of pro-market institutional quality.

In columns [3] to [6], we apply the same approach to trade, domestic, external (capital account opening), and product market pro-market institutions. We arrive at the same conclusion that countries with higher levels of pro-market institutional quality in their financial (both domestic and external) and real sectors (product market and trade) are more effective at mitigating the growth-reducing impacts of uncertainty. In fact, for all of these pro-market institutional quality index, the effect of the linear combination of the estimated coefficients remains negative and is lower than when pro-market institutional quality is not included in the model. These results indicate that the quality of pro-market institutions significantly alters the relationship between output growth and uncertainty by reducing the negative impact of the latter on the former.

The mitigating effects of the adverse consequences of economic uncertainty on growth, through pro-market institutions, vary across sectors. Indeed, pro-market institutions focused on international trade, domestic finance, capital account liberalization, and product markets, respectively, contribute to reducing the negative effects of uncertainty on economic growth by 73, 83, 74, and 73 percentage points. It is worth noting that pro-market institutions focused on liberalizing domestic financial markets play a more significant role in reducing the adverse effects of uncertainty on growth. These results corroborate the potential role of the quality of pro-market institutions in improving economic conditions (Gomado, 2023; Marrazzo & Terzi, 2017; Terzi & Marrazzo, 2020; Ostry et al., 2021).

4.2 | Marginal effects

We contextualize our estimates by assessing the calculated value of $\delta + \mu * Inst_{i,t-1}$ under reasonable pro-market institutions quality indicator values. Here, $\delta + \mu * Inst_{i,t-1}$ represents the incremental impact of uncertainty, which is equal to the estimated uncertainty coefficient (δ) added to the estimated coefficient of the interaction term between uncertainty and the pro-market institutions indicators (μ), multiplied by the level of the pro-market institutions quality indicator. These results are presented in Table 3.

For the period 1990–2014, we compute $\delta + \mu * Inst_{i,t-1}$ at various thresholds, including the minimum, mean, median, 75th percentile, and maximum values of the market institutions quality indicators. As expected, we observe that $\delta + \mu * Inst_{i,t-1}$ at different pro-market institutions indicator thresholds is significantly negative, but its magnitude substantially decreases as the pro-market institutions indicators shift from the minimum value (fully repressed) to the maximum value (fully liberalized). The results indicate that countries with strong pro-market institutions are less vulnerable to uncertainty.

TABLE 3 $\partial g_{i,t}/\partial \Delta WU_{i,t} = \delta^k + \mu^k Inst_{i,t-1}$, evaluated at various pro-market institution values.

	Minimum	Mean	Median	P(75)	Max
$\delta^T + \mu^T$ *Trade institutions	-0.094*** (0.018) [0.000]	-0.044*** (0.008) [0.722]	-0.043*** (0.008) [0.736]	-0.034*** (0.008) [0.876]	-0.025* (0.009) [1]
$\delta^D + \mu^D$ *Domestic finance institutions	-0.120** (0.035) [0.000]	-0.059** (0.016) [0.622]	-0.053** (0.014) [0.667]	-0.042*** (0.011) [0.778]	-0.020** (0.006) [1]
$\delta^E + \mu^E$ *External finance institutions	-0.094*** (0.017) [0.125]	-0.057*** (0.014) [0.610]	-0.065*** (0.015) [0.50]	-0.037** (0.012) [0.875]	-0.027* (0.012) [1]
$\delta^P + \mu^P$ *Product market institutions	-0.074*** (0.016) [0.000]	-0.055*** (0.013) [0.373]	-0.058*** (0.013) [0.357]	-0.042*** (0.011) [0.619]	-0.020* (0.009) [1]

Note: Standard errors in parentheses. The minimum, mean, median, 75th percentile, and maximum values for trade, financial (domestic and external), and product market pro-market institution are shown in brackets.

*** $p \leq 0.01$, ** $p \leq 0.05$, and * $p \leq 0.1$.

To illustrate this with a specific example, let us consider a country like “Pakistan”, which has a minimum market institutions indicator value of zero (indicating a fully repressed economy). In such a scenario, a change in uncertainty significantly reduces its GDP per capita growth by 5.4%. Conversely, if “Pakistan” had fully liberalized its financial and real sectors (with a pro-market institutions indicator value of 1, indicating complete liberalization), the impact of uncertainty on output growth would have been negligible. Furthermore, a country with an average level of 0.62 during the studied period concerning pro-market institutions focused on domestic finance (which corresponds to countries like “Albania”, “Indonesia”, the “Dominican Republic”, and “Morocco” in our sample) sees a change in uncertainty reduce its growth rate by 5.9 percentage points instead of 12 percentage points, representing a reduction of approximately 51 percentage points. However, a country like “Jordan”, with an average level of 0.84 during the studied period in terms of pro-market institutions focused on domestic finance, observes a change in uncertainty decrease its growth rate by 2 percentage points instead of 12 percentage points, resulting in a reduction of over 83 percentage points. These different examples illustrate how the effects of uncertainty on economic growth vary depending on the level of pro-market institutions (or economic liberalization). Hence, economies characterized by a significant role of market institutions manage to better mitigate the effects of economic uncertainty.

5 | ROBUSTNESS CHECKS

Our basic results show that pro-market institutions quality mitigate the effect of uncertainty on output growth. In the following subsections, we test the robustness of these basic results through a series of robustness analyses.

5.1 | Alternative specifications

First, we assess the sensitivity of our results to the inclusion of additional factors influencing GDP per capita growth, aiming to control for potential omitted variable bias that could affect our findings. In this regard, we augment the initial set of variables with additional ones such as total natural resources rents (% of GDP), government expenditure

on education as a percentage of GDP, income inequality measured by the Gini index, and a dummy variable indicating the presence of an IMF program active for 5 or more months, financial crisis (banking, currency, or debt crisis), inflation (consumer prices, annual %), and financial development Index. These variables are frequently used in empirical literature to analyze the determinants of GDP growth rate (Bougheas et al., 2000; Evrensel et al., 2023; Pradhan et al., 2008; Vu et al., 2020).

The results obtained through OLS are presented in Table 4, spanning from columns [1] to [5]. Notably, our findings remain consistent across columns [1]–[5], indicating that our results are robust to the inclusion of these additional control variables, thus addressing potential omitted variable issues. However, it is essential to highlight that when the pro-market institutions indicator equals one, the impact of uncertainty on production growth no longer exhibits statistical significance across all regression models. This further supports our hypothesis that countries endowed with stronger pro-market institutions are more adept at mitigating the adverse effects of uncertainty on production growth, in contrast to those with less developed pro-market institutions.

Finally, we take into account that the impact of pro-market institutions' implementation is not immediate, and they may require some time to influence output growth. Therefore, we introduce a 2-year lags for each pro-market institutions indicators and re-estimate the baseline model. Specifically, we replace $Inst_{i,t-1}$ with $Inst_{i,t-2}$ in Equation 2. These results are presented in columns [6]–[10] of Table 4. Once again, the results remain robust both quantitatively and qualitatively compared to the base specifications.

5.2 | Alternative estimation method: System - GMM estimations

Our basic results are subject to several econometric concerns. As discussed in Subsection 3.2, in this section, we address two types of bias: the well-known bias identified by Nickell in dynamic fixed-effects panel models and the endogeneity bias related to uncertainty or pro-market institutions. To correct for these biases and test the robustness of our basic results, we employ an alternative method based on the two-step system-GMM approach.

The results, corrected for heterogeneity as well as small sample bias, are presented in Table 5. In columns [1]–[5], we display the estimated coefficients for overall, trade, domestic finance, external, and product market institutions, respectively, using the control variables from the baseline model. Then, in columns [6]–[10], we employ 4-year averages of the variables to reduce volatility and minimize the influence of strong cyclical factors in the data, a commonly used approach in empirical studies utilizing the GMM method as an identification strategy. Finally, from columns [11] to [15], we introduce a 2-year lag in the market institutions indicator, similar to what was done in Table 4, to account for the fact that the establishment of pro-market institutions may take time.

Before discussing the estimated coefficients, we review some tests regarding the validity of the two-step system-GMM estimator. First, across columns [1]–[15], the Arellano–Bond test confirms the presence of first-order serial correlation (the p -values associated with the AR(1) tests in columns [1]–[15] are all less than 1%) and the absence of second-order autocorrelation in the error term (the p -values associated with the AR(2) tests in columns [1]–[15] are all greater than 10%). Additionally, we present the Sargan–Hansen test of overidentifying restrictions (OID) to assess the validity of the internal instruments. The p -values associated with the Sargan–Hansen statistic all exceed 10%, confirming the null hypothesis of the validity of the internal instruments.

Using the two-step GMM estimator, our results appear robust to potential sources of endogeneity. The uncertainty indicator remains negative and significant at the 1% level in columns [1]–[15]. Furthermore, our interaction variables between uncertainty and various pro-market institutions are positive and statistically significant, corroborating our hypothesis that the quality of pro-market institutions can mitigate the negative effects of uncertainty on output.

In Figure 3 below, we present the marginal impact of uncertainty on production growth at different levels of pro-market institution quality while comparing the OLS estimators (Figure 3a) and system GMM estimators (Figure 3b). It is important to note that a low level of the pro-market institution quality indicator represents an

TABLE 4 Alternative specifications using OLS.

	(1)	(2)	(3)	(4)	(5)	Pro-market institutions (2 lag)				(10)				
	Additional controls					Overall	Trade	Dom. finance	Ext. finance	Product market	Overall	Trade	Dom. finance	Ext. finance
World uncertainty index	-0.164*** (0.031)	-0.157*** (0.055)	-0.155*** (0.025)	-0.124*** (0.035)	-0.074*** (0.019)	-0.179*** (0.032)	-0.170*** (0.051)	-0.194*** (0.024)	-0.128*** (0.036)	-0.079*** (0.018)				
World uncertainty index # Overall institutions	0.172*** (0.030)					0.192*** (0.032)								
Overall institutions	0.028 (0.031)					0.046 (0.029)	0.168***							
World uncertainty index # Trade institutions		0.152*** (0.052)												
Trade institutions		-0.010 (0.017)					-0.052* (0.030)							
World uncertainty index # Domestic Fin. institutions			0.150*** (0.027)					0.209*** (0.026)						
Domestic Fin. institutions			0.057** (0.021)					0.066*** (0.020)						
World uncertainty index # External Fin. institutions				0.103*** (0.029)					0.105*** (0.031)					
External Fin. institutions				0.002 (0.016)					0.019 (0.016)					
World uncertainty index # Product market institutions					0.052*** (0.016)					0.058*** (0.017)				

TABLE 4 (Continued)

(1)	(2)		(3)	(4)		(5)	(6)			(7)	(8)		(9)	(10)
	Additional controls			Dom. finance	Ext. finance		Product market	Pro-market institutions (2 lag)			Dom. finance	Ext. finance		
Overall	Trade		Dom. finance	Ext. finance	Product market	Overall	Trade	Dom. finance	Ext. finance	Product market	Dom. finance	Ext. finance	Product market	
Product market institutions					-0.032***									-0.026*
					(0.009)									(0.013)
Linear combination	0.008	-0.005	-0.005	-0.021	-0.022	0.013	-0.001	0.014	-0.023					-0.021
S.E	(0.515)	(0.555)	(0.797)	(0.245)	(0.280)	(0.307)	(0.868)	(0.352)	(0.210)					(0.315)
Main controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	632	615	631	632	632	632	618	632	632	632	632	632	632	632
Number of country	53	53	53	53	53	53	53	53	53	53	53	53	53	53
R-square (within)	0.369	0.367	0.373	0.367	0.365	0.371	0.373	0.375	0.368					0.364

Note: Standard errors in parentheses. **Baseline controls:** The control variables used in this table are the same as those used in Table 2.

***, $p \leq 0.01$, **, $p \leq 0.05$, and *, $p \leq 0.1$.

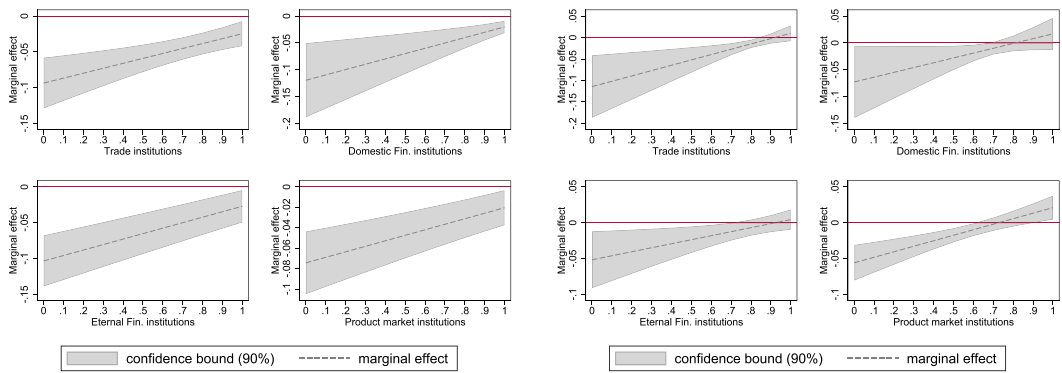


FIGURE 3 (a, b) Marginal effects of uncertainty on output growth for different levels of market institutional: ordinary least square (OLS) versus GMM. *Note:* These figures illustrate the marginal effect of the World Uncertainty Index on GDP per capita growth, depending on the level of pro-market institution quality for each of the four measures used in the estimation equations. The dashed line represents δ_{it} as defined in Equation (3) (we evaluate the different thresholds based on the results in Table 2, columns [1]–[4] for the OLS estimator and Table 5 for system-GMM from columns [1]–[5]), and the 90% confidence bound is computed based on its standard deviation as defined in Equation (4). *Source:* Author's based on study's datasets. [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com/doi/10.1111/kyk.12408)]

economy where the state intervenes significantly, while a high value indicates a liberalized economy where the market operates with minimal state intervention. We observe that as the pro-market institutions index increases, the impact of uncertainty on production growth becomes less significant. This result suggests that liberalized economies are more resilient to uncertainty compared with less liberal or nonliberal economies. Furthermore, unlike OLS estimators, the results obtained through the system GMM method reveal that countries with a better quality of pro-market institutions even manage to generate a positive effect on growth during periods of uncertainty⁸.

5.3 | Alternative pro-market institution quality index

Unlike the pro-market institution indicators used in this study, we rely on empirical literature employing the Economic Freedom of the World (EFW) Index (Bolen & Williamson, 2019; Bolen & Sobel, 2020). This economic freedom indicator is sourced from the Fraser Institute's database. The EFW assigns each country in the dataset an overall economic freedom score ranging from 0 to 10, derived from a fair weighted average of five distinct components: the size of government, legal systems and property rights, monetary stability, trade policies, and regulations. Data for each component are publicly accessible. It is noteworthy that the EFW was initially developed at 5-year intervals between 1970 and 1995, then updated annually since the year 2000. To make the panel cyclical, we compute a 5-year average for each variable. Additionally, we utilize the Heritage Foundation's Economic Freedom Index. According to the research of Murphy (2016), despite differences between the two indices, a significant correlation (0.88) exists between the Economic Freedom Index of the Heritage Foundation and that of the Fraser Institute⁹. The Heritage Foundation's Economic Freedom Index is defined as the average of the following components: (i) property rights, (ii) freedom of business, (iii) labor market freedom, (iv) monetary freedom, (v) trade freedom, (vi) investment freedom, and (vii) financial freedom. This index ranges from 0 to 100, where 100 represents a more economically free society.

⁸We provide in the appendix analyses of heterogeneity considering the specific dimensions of each pro-market institution (see Figure A3, Figure A4, Figure A5, and Figure A6).

⁹In this study, the correlation between the two indices is 0.82

TABLE 5 (Continued)

Dependent variable: GDP pc growth	Panel[A]: Nonoverlapping sample			Panel[B]: overlapping sample				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
S.E.	Overall (0.0136)	Trade (0.01)	Dom. finance (0.0176)	Ext. finance (0.0072)	Product market (0.0099)	Overall (0.0457)	Trade (0.0379)	Dom. finance (0.0629)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Main controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1111	1074	1109	1110	1111	208	208	208
Hansen OID (<i>p</i> -value)	0.6628	0.4655	0.2233	0.5621	0.5765	0.3317	0.4977	0.5479
AR1 (<i>p</i> -value)	10.2e-07	90.5e-08	50.2e-08	10.5e-07	10.7e-07	20.9e-04	20.4e-04	40.2e-04
AR2 (<i>p</i> -value)	0.1898	0.7818	0.1564	0.1885	0.1157	0.2142	0.1465	0.2129
Number of instruments	54	54	54	54	54	42	42	42
Number of countries	56	56	56	56	56	56	56	56

Note: Standard errors in parentheses. *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$. Baseline controls: Additional controls:

TABLE 5 (Continued)

Dependent variable: GDP pc growth	Panel[B]: overlapping sample			Panel[C]: 2 lags of market institutions			
	(9)	(10)	(11)	(12)	(13)	(14)	(15)
World uncertainty index	Ext. finance (0.0685)	Product market (0.0577)	Overall (0.0808)	Trade (0.1052)	Dom. finance (0.1397)	Ext. finance (0.0591)	Product market (0.0471)
World uncertainty index # Overall institutions	-0.2769*** (0.0685)	-0.2855*** (0.0577)	-0.54*** (0.0808)	-0.429*** (0.1052)	-0.829*** (0.1397)	-0.3537*** (0.0591)	-0.1999*** (0.0471)
World uncertainty index # Trade institutions			0.7309*** (0.1144)				
Overall institutions			0.1811** (0.0756)				
World uncertainty index # Trade institutions			0.4583*** (0.1365)				
Trade institutions			0.0179				

TABLE 5 (Continued)

Dependent variable: GDP pc growth	(9)		(10)		(11)		(12)		(13)		(14)		(15)	
	Panel[B]: overlapping sample		Product market		Overall		Trade		Dom. finance		Ext. finance		Product market	
World uncertainty index # Domestic Fin. institutions										10.097***				
										(0.1927)				
Domestic Fin. institutions										0.165*				
										(0.0877)				
World uncertainty index # External Fin. institutions			0.2645***								0.3984***			
			(0.0881)								(0.0725)			
External Fin. institutions			0.0366								0.0803*			
			(0.045)								(0.0449)			
World uncertainty index # Product market institutions				0.4008***										0.2768***
				(0.1013)										(0.0826)
Product market institutions				0.0292										0.0579
				(0.0435)										(0.0402)
Linear combination			-0.0124	0.1153**	0.191***	0.0294	0.2684***	0.0447*	0.0769*					
			(0.032)	(0.0529)	(0.0411)	(0.0421)	(0.0613)	(0.0267)	(0.0458)					
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Main controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	208	208	208	208	208	205	208	208	208	208	208	208	208	208
Hansen OID (<i>p</i> -value)	0.3988	0.4383	0.234	0.0997	0.5994	0.449	0.418	0.418	0.418	0.418	0.418	0.418	0.418	0.418
AR1 (<i>p</i> -value)	30.8e-04	90.0e-05	80.3e-04	50.0e-04	0.0018	90.4e-04	20.2e-04	20.2e-04	20.2e-04	20.2e-04	20.2e-04	20.2e-04	20.2e-04	20.2e-04
AR2 (<i>p</i> -value)	0.1811	0.111	0.2036	0.0752	0.1092	0.2645	0.0947	0.0947	0.0947	0.0947	0.0947	0.0947	0.0947	0.0947
Number of instruments	42	42	42	42	42	42	42	42	42	42	42	42	42	42
Number of countries	56	56	56	56	56	56	56	56	56	56	56	56	56	56

Note: Standard errors in parentheses. *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$. Baseline controls: Additional controls:

We replace the variable $Inst_{it-1}$ in Equation (1) with the one-period lag of the Economic Freedom Index (EFW). Through the use of the system-GMM method, our results, presented in Table 6, align with our initial findings. Indeed, while the effect of uncertainty on production growth remains negative and significant, the Economic Freedom Index and its interaction with the uncertainty index demonstrate a positive and significant effect, thereby confirming the notion that an improvement in institutional quality could mitigate the negative effects of uncertainty on growth.

5.4 | Further analysis: Using factor analysis

In this section, we follow the work of Giuliano et al. (2013) by conducting a PCA to aggregate the four indices of pro-market institutional quality. This approach allows us to account for the possibility that pro-market institutions may constitute a unique and common process across all sectors (real and financial). We extract the first principal component from the entire dataset related to the quality of pro-market institutions for each sector, as previously described. The results are presented in Table A1. In column 1, we use the indicator directly derived from the PCA (“PCA-index”), while in column 2, we normalize the indicator between 0 and 1 (“Normalized PCA-index”) to make the results comparable with those previously presented. It emerges that the quality of pro-market institutions mitigates the negative effects of uncertainty on economic growth, which is consistent with the baseline results.

6 | REFORMS IN PRO-MARKET INSTITUTIONS MATTER?

In this section, we examine the potential role of pro-market institution reforms in mitigating the effects of uncertainty on the output growth rate. While the literature has often suggested that reforms in pro-market institutions might increase uncertainty, our hypothesis is rather that poorly functioning of pro-market institutions generate excessive uncertainty, and pro-market institutional reform, namely, the improvement of pro-market institutions,

TABLE 6 Alternative pro-market institution quality and uncertainty index.

	(1) EFW-Fraser Institute	(2) EFW-Heritage Foundation
World uncertainty index	-.7447** (0.3508)	-.8518*** (0.2507)
Economic freedom (EFW)	0.0323* (.0174)	4.9e-04 (.0018)
World uncertainty index # Economic freedom (EFW)	0.1309** (.0563)	0.0134*** (.0041)
Constant	-0.3833 (.3529)	-0.2349 (.425)
Main controls	Yes	Yes
Observations	140	205
Hansen OID (<i>p</i> -value)	0.6986	.3862
AR1 (<i>p</i> -value)	0.0428	5.1e-04
AR2 (<i>p</i> -value)	.	0.2422
Number of instruments	38	39
Number of countries	52	56

could help reduce uncertainty. This hypothesis is based on the concept drawing from North's (1991) work that "throughout history, institutions have been designed by humans to create order and reduce uncertainty in exchanges." Therefore, a reform aimed at improving poorly functioning market institutions should, in theory, lead to a reduction in uncertainty (Ryan, 2020). This reduction in uncertainty could enable market forces to fully play their role in efficiently allocating resources such as labor and capital.

Assessing the effect of reforms poses a complex challenge, primarily due to the difficulty in quantifying the benefits they offer (Bordon et al., 2018). Furthermore, the benefits of reforms may require a considerable amount of time to manifest concretely (Dabla-Norris et al., 2016). In the short term, some reforms could impact demand due to improved confidence and anticipated wealth effects stemming from positive future income prospects (Kerdrain et al., 2010). However, the supply-side benefits derived from these reforms typically materialize in the medium to long term, owing to the adjustment costs associated with the costly reallocation of labor and capital resources, as well as corporate restructuring (Dabla-Norris et al., 2016).

6.1 | Reforms identification

Our objective is to test whether changes in pro-market institutions through reforms mitigate the negative impact of uncertainty on production growth. To achieve this, we follow recent literature on the macroeconomic effects of structural reforms by identifying reform episodes—significant changes in the pro-market institutions index (Bernal-Verdugo et al., 2013; Furceri & Loungani, 2015; Dabla-Norris et al., 2016; de Haan & Wiese, 2020). This literature identifies reform episodes as a change in the pro-market institutions indicator above two standard deviations of the average change in the indicator. Alesina et al. (2023) employ the same definition to identify reform episodes in their database. We expand the threshold for identifying reform episodes by following the methodology of Larrain and Stumpner (2017), Tola and Waelti (2018), and David et al. (2022).

Specifically, for each of the six indices, we calculate the average annual change in the index across the entire set of countries for which data are available, along with its standard deviation. Then, we identify pro-market institutions reforms if, for a given country in a specific year, the annual change in the pro-market institutions index exceeds one standard deviation.

We present the distribution of various significant changes in market institution indicators for both aggregate reforms and each sector in the Table 7. It is noteworthy that reform episodes account for the vast majority of observations, representing over 17% of the entire sample. When considering sector-specific reforms, the data show that there are more reform episodes in the domestic finance sector, accounting for approximately 28%. This trend can be attributed to the increasing desire of developing countries to develop their financial sector.

Conversely, the data indicate that there are fewer significant reversals in reforms. Thus, across the entire sample and in all sectors combined, significant reversals account for only 1.32%. For example, concerning product market institutions, six countries experienced significant reversals, including Ghana in 2005, Nigeria in 2009, Jordan in 2011, Uganda in 2011, Ukraine in 2004, and Venezuela in 2008.

6.2 | Quantifying the role of reforms in pro-market institutions

We employ Jordà, Jordà's (2005) local projections method to examine the role of reforms in the relationship between uncertainty and output growth. This method offers several advantages over the traditional vector autoregressive approach (Auerbach & Gorodnichenko, 2013; Romer & Romer, 2015). It allows for calculating impulse responses while considering precise model specifications, without imposing constraints on the shape of the impulse response function. Furthermore, it requires estimating only one equation and accommodates state dependence. In summary, this method provides a robust and flexible framework for our analysis, addressing challenges related to model

TABLE 7 Market institutions reforms in 61 developing countries, 1990–2014.

	Overall institutions	Trade	External finance	Domestic finance	Product market
Major changes (# of obs.)	281	188	160	505	322
of which: reforms	261	142	117	423	316
of which: reversals	20	46	43	82	6
Share in the sample	18.38%	13.19%	10.51%	33.27%	21.06%
of which: reforms	17.07%	9.96%	7.68%	27.87%	20.67%
of which: reversals	1.31%	3.23%	2.82%	5.40%	0.39%
Threshold	0.0415	0.0463	0.0711	0.0497	0.0594
No changes (# of obs.)	143	246	1353	1013	1206
Total (# of obs.)	1529	1425	1523	1518	1529

Note: Reforms are calculated as episodes during which the change in the pro-market institutions quality index in Alesina et al. (2023) exceeds 1 standard deviation. Thus, reforms correspond to positive changes in the index. Reversals correspond to negative changes in the pro-market institutions index. The index categories include trade reforms, external finance reforms, domestic finance reforms, and product market reforms. Overall institutions represent an average of the 4 pro-market institutions indicators. Source: Author's calculation based on Alesina et al. (2023)'s database.

specification and enabling parsimonious estimation. Moreover, the impact of reforms may not be immediate, or reforms may have short-term negative effects and medium to long-term benefits. Using the local projection method allows us to analyze the growth dynamics of output following reform episodes. This method is particularly suitable for capturing nonlinearities in dynamic responses, such as interactions between uncertainty and reform episodes in our context.

Our approach proceeds in two steps. In the first step, we estimate the unconditional effect of uncertainty on output growth by rewriting Equation (1) using the following specification:

$$\Delta G_{i,t+h} = \beta_0^h + \sum_{j=1}^l \beta_j^h \Delta G_{i,t-1} + \delta^h \Delta WUI_{i,t} + \alpha_k^h X_{i,t-1} + v_i^h + \gamma_t^h + \varepsilon_{i,t+h} \quad (5)$$

where $\Delta G_{i,t+h}$ represents the cumulative change between $t-1$ and $t+h$ in 100 times the log of real output of country i . Here, $h \in [0,4]$ denotes the time horizon.

The role of positive institutional change is tested for by introducing state dependence in the response of output growth to uncertainty change.

$$\Delta G_{i,t+h} = \beta_0^h + \sum_{j=1}^l \beta_j^h \Delta G_{i,t-1} + \mu^h \Delta WUI_{i,t} * Reform_{i,t-1} + \lambda^h \Delta WUI_{i,t} * (1 - Reform_{i,t-1}) + \alpha_k^h X_{i,t-1} + v_i^h + \gamma_t^h + \varepsilon_{i,t+h} \quad (6)$$

where $Reforms_{i,t-1}$ is a binary indicator variable that captures the stance of the adoption of a reform in pro-market institutions in country i at year t . $Reforms_{i,t}$ takes a value of 1 if the annual variation of the pro-market institutions index exceeds one standard deviation from the average annual variation, and 0 otherwise.

To make the results more accessible, we present them in Figure 4. First, we examine the results for the aggregated reform indicator. In Panel A, we display the unconditional responses of production growth to uncertainty using the model in Equation (5). The responses of production growth to uncertainty are illustrated by a black line,

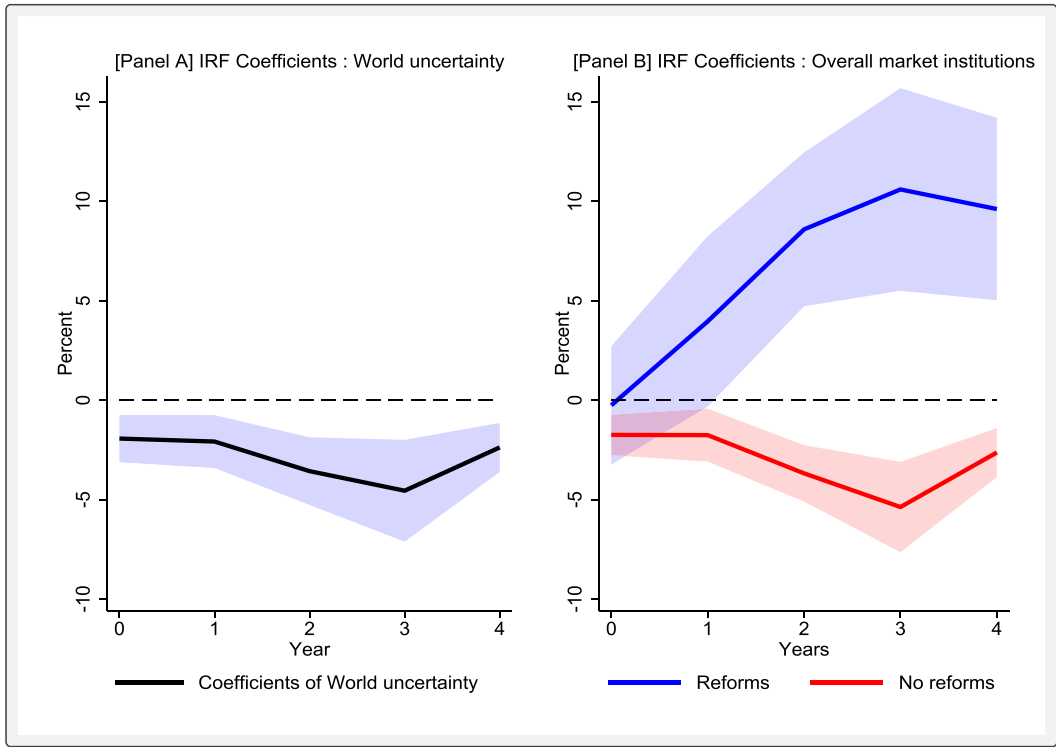


FIGURE 4 Effects of uncertainty on output growth: The role of structural reforms (aggregate reforms). *Note:* Reforms (—) are calculated as episodes during which the change in the pro-market institutions quality index in Alesina et al. (2023) exceeds 1 standard deviation. Thus, reforms correspond to positive changes in the index. No reform (—) denotes reversals (which correspond to negative changes) or no change in the pro-market institutions index. *Source:* Author's illustration based on study data. [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com/doi/10.1111/kykl.12408)]

accompanied by a 95% confidence interval. Consistent with the baseline results, we observe that the effects of uncertainty on production growth are immediate and persist over time. Indeed, a one-unit change in uncertainty leads to a reduction in production growth of 1.93% to 2.38%, respectively, in the first and fifth years (the estimated coefficients are presented in Table A2 in the appendix). These results are consistent with those found by Ahir et al. (2022).

In Panel B, we examine the conditional effect of uncertainty during reform periods. The blue line represents the effect of uncertainty when pro-market institutions reforms are implemented, while the red line represents the effect in the absence of reforms. The results indicate that during periods of uncertainty, pro-market institutions reforms mitigate the short-term effects of uncertainty on production growth (during the first 2 years) and promote medium-term growth (from the third year onwards). Indeed, when pro-market institutions reforms are implemented, the effect of uncertainty on production growth becomes nonsignificant in the short term. However, in the medium term, for example, in the third year, reforms manage to transform the negative effects of uncertainty into positive and significant effects of 8.59%. These results are similar to those obtained by Tola and Waelti (2018), who studied the role of structural reforms in mitigating the effects of financial crises on production growth. In conclusion, we can infer that implementing pro-market institutions reforms during periods of high uncertainty contributes to mitigating the negative impact of uncertainty on production growth.

Subsequently, we analyze the results based on specific pro-market institutions reforms in each sector, which are presented in Figure 5. More detailed information can be found in Table A2 in the appendix. As previously described,

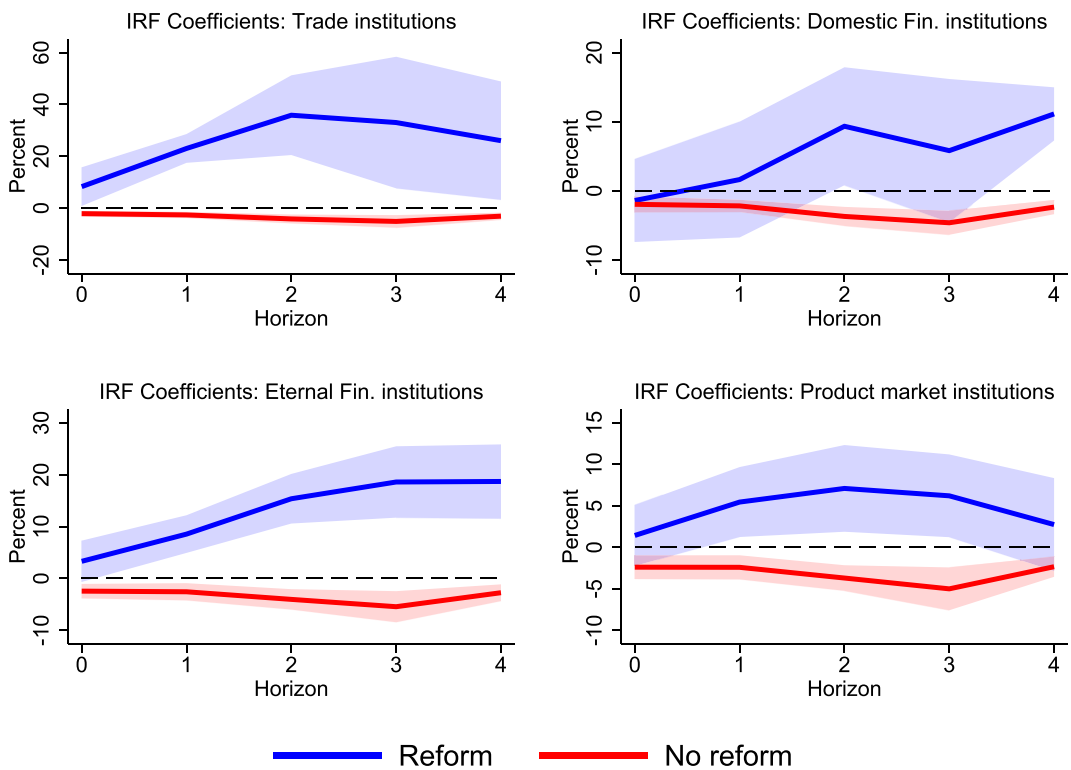


FIGURE 5 Effects of uncertainty on output growth: The role of structural reforms (sectoral reforms) *Note:* Reforms (—) are calculated as episodes during which the change in the pro-market institutions quality index in Alesina et al. (2023) exceeds 1 standard deviation. Thus, reforms correspond to positive changes in the index. No reform (—) denotes reversals (which correspond to negative changes) or no change in the pro-market institutions index. *Source:* Author's illustration based on study data. [Correction added on 17 October 2024, after first online publication: Figure 5 has been corrected in this version.] [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com/doi/10.1111/kyk.12408)]

the blue and red lines represent the estimated coefficients of uncertainty in the presence or absence of reforms, respectively. It is noteworthy that a reform in pro-market institutions related to international trade during periods of uncertainty leads to a significant increase in production growth as early as the second year. However, in the absence of this reform, uncertainty causes a significant decline in production by 1.82 percentage points in the first year.

Interestingly, reforms in external finance pro-market institutions play a crucial role in mitigating the effects of uncertainty on production growth. As early as the first year, the implementation of reforms in external finance pro-market institutions transforms the negative effect of uncertainty on production growth into a positive effect, and this positive effect intensifies over the years. This result underscores the importance of capital account liberalization in developing countries to facilitate capital flows and attract foreign direct investment, thus promoting production growth during periods of high uncertainty.

However, unlike reforms in external finance pro-market institutions, reforms in domestic finance pro-market institutions, although they mitigate the negative effects of uncertainty, do not have a significant effect on production growth over the entire time horizon considered. This result aligns with previous research that has examined the role of financial development in mitigating the negative effects of uncertainty on production growth (Choi et al., 2019; Lensink et al., 1999).

Finally, periods marked by reforms in product market pro-market institutions also help mitigate the effects of uncertainty on production growth. However, although these reforms attenuate the negative effect, they do not manage to generate significant production growth in the short and medium terms, except in the third year.

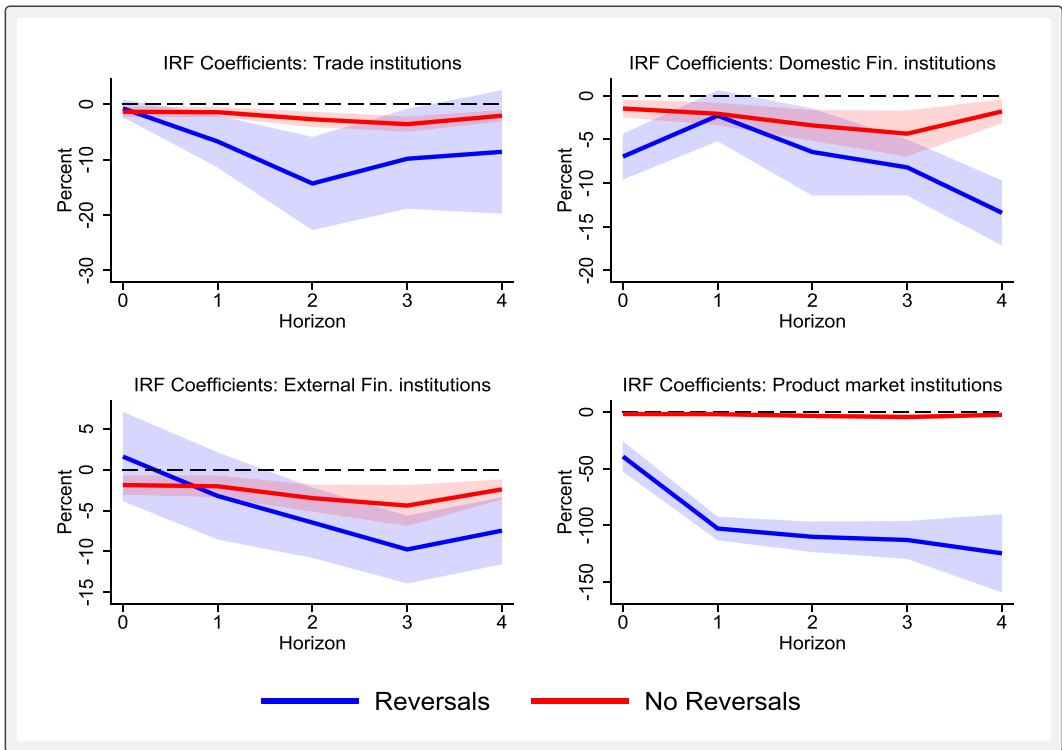


FIGURE 6 Effects of uncertainty on output growth: The role of pro-market institutions change (sectoral reversal). Source: Author's illustration based on study data. [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com/doi/10.1111/kyk.12408)]

In summary, we can conclude that overall, reforms in pro-market institutions contribute to mitigating the effects of uncertainty on production growth. However, some of these reforms enable greater resilience during periods of uncertainty by inducing a significant increase in production growth.

6.3 | Pro-market institutions reversal

In the previous section, our results show that reforms in pro-market institutions across different sectors mitigate the impact of uncertainty on productivity growth. In this section, we focus on the effect of reversals in pro-market institutions on the relationship between uncertainty and production growth¹⁰. Over the study period, there were 20 reversals in the overall (or aggregate) index of market institution quality, 46 reversals for goods and services market institutions, 43 for external finance institutions, 82 for domestic finance institutions, and 6 for product market institutions. The results of this analysis, presented in Figure 6, indicate that reversals in pro-market institutions (depicted by the blue line) do not diminish the impact of changes in the uncertainty indicator on economic growth. In other words, these findings highlight that, over the examined period and within the sample of countries considered, a reversal in pro-market institutions or an increase in support for market relationship control during a period of uncertainty amplifies the decline in production growth.

¹⁰Reversals correspond to negative changes in the index.

7 | TRANSMISSION CHANNELS: CONSUMPTION AND INVESTMENT

As discussed previously, the literature has identified three mechanisms through which uncertainty fluctuations affect the economy, notably irreversibility of investment mechanisms, incentives to build precautionary savings, and financial frictions. We have shown in previous section that reforms in pro-market institutions mitigate the negative effect of uncertainty on economic performance. In this section, we aim to document the potential channels. Based on the work of Karaman and Yıldırım-Karaman (2019), we capture the channel of precautionary savings through consumption and the two other channels of financial frictions and irreversibility of investment mechanisms through investment. In other words, we use the final consumption expenditure of households¹¹ and nonprofit institutions serving households (as a % of GDP)—denoting the market value of all goods and services, including durable goods (such as cars, washing machines, and personal computers), purchased by households. For investment, we rely on gross fixed capital formation (as a % of GDP).

We initially seek to estimate the impact of changes in consumption ($\Delta consumption_{i,t}$) and investment ($\Delta investment_{i,t}$) on the growth of GDP per capita by considering Equation (7). The coefficients are estimated using the local projection method over a 5-year time horizon. The results are presented in Table 8, panel A and reveal that consumption and investment have a positive and significant effect on the growth of GDP per capita. Consequently, we can consider them as channels through which structural reforms can mitigate the impact of uncertainty on growth.

$$\Delta G_{i,t+h} = \beta_0^h + \sum_{j=1}^l \beta_j^h \Delta G_{i,t-j} + \pi \Delta investment_{i,t} + \phi \Delta consumption_{i,t} + \mu^h \Delta WUI_{i,t} * Reform_{i,t-1} + \lambda^h \Delta WUI_{i,t} * (1 - Reform_{i,t-1}) + \alpha^h X_{i,t-1} + v_i^h + \gamma_t^h + \varepsilon_{i,t+h} \quad (7)$$

To analyze the impact of reforms in pro-market institutions on each of the channels, we consider Equation (8) below.

$$\Delta Channels_{i,t+h} = \beta_0^h + \sum_{j=1}^l \beta_j^h \Delta channels_{i,t-j} + \mu^h \Delta WUI_{i,t} * Reform_{i,t-1} + \lambda^h \Delta WUI_{i,t} * (1 - Reform_{i,t-1}) + \alpha^h X_{i,t-1} + v_i^h + \gamma_t^h + \varepsilon_{i,t+h} \quad (8)$$

where the variable *channels* denotes investment or consumption as previously defined. The results are presented in Table 8. In panel B, we examine the impact of reforms on changes in investment, while in panel C, we outline the impact of the absence of reforms (that is, the reversal or lack of change in the pro-market institutions index) on household consumption. The results indicate that during periods of uncertainty fluctuations, the adoption of reforms or countries that have embraced liberalization reforms—aiming to facilitate optimal allocation of resources in markets—witness an increase in their levels of investment and consumption. In other words, during times of high uncertainty, the implementation of structural reforms aimed at improving the economic environment and reducing uncertainty helps boost investment (or consumption) by bolstering business (or household) confidence and encouraging them to invest (or consume). These results are consistent with those of Aysan et al. (2009), showing that reforms significantly increase investment, while economic volatility reduces investment.

Indeed, implementing reforms during periods of uncertainty has a positive and statistically significant effect on household consumption within the first 3 years. As for investment, the impact of reforms is positive during the initial

¹¹Alternatively, we used household savings (as a % of GDP), and the results are qualitatively and quantitatively similar.

TABLE 8 Transmission channels.

	(1) Year 1	(2) Year 2	(3) Year 3	(4) Year 4	(5) Year 5
Panel A: Effect of channels on GDP growth					
$\Delta investment$	0.351*** (0.088)	0.558*** (0.089)	0.547*** (0.059)	0.418*** (0.069)	0.319*** (0.060)
$\Delta consumption$	0.169*** (0.022)	0.151*** (0.012)	0.159*** (0.015)	0.161*** (0.018)	0.089*** (0.012)
Observations	994	945	893	844	794
Number of country	53	53	53	52	51
R-square (within)	0.396	0.481	0.548	0.602	0.655
Panel B: Effect of pro-market institutions reforms on $\Delta investment$					
Coef (Overall institution reform= 1)	0.068 (1.014)	2.394 (1.466)	3.099** (1.175)	3.805*** (1.116)	3.428** (1.227)
Coef (Overall institution reform = 0)	-0.445* (0.259)	-1.399*** (0.465)	-1.408*** (0.413)	-1.239*** (0.397)	-0.960** (0.358)
Observations	1135	1081	1027	974	923
Number of country	55	55	54	52	52
R-square (within)	0.335	0.416	0.489	0.563	0.613
Panel C: Effect of pro-market institutions reforms on $\Delta consumption$					
Coef (Overall institution reform= 1)	0.501 (0.287)	2.410*** (0.548)	7.873*** (0.843)	-1.238 (0.748)	-0.627 (0.707)
Coef (Overall institution reform = 0)	-2.515*** (0.631)	-0.721 (0.676)	-1.484*** (0.302)	0.193 (0.523)	1.065* (0.578)
Observations	1084	1031	980	929	877
Number of country	54	53	53	52	51
R-square (within)	0.559	0.598	0.629	0.620	0.610

Note. Standard errors in parentheses. The control variables used in this table are the same as those used in Table 2. Time and country fixed effects are included in each specification.

*** $p \leq 0.01$, ** $p \leq 0.05$, and * $p \leq 0.1$.

2 years but does not reach a level of statistical significance. Therefore, reforms bring about a positive and statistically significant change in investment in the medium term.

These results are of crucial importance for developing countries. They confirm our hypothesis that a significant and positive change in pro-market institutions reduces uncertainty by decreasing transaction and production costs, while increasing gains from trade. The reduction in uncertainty restores confidence among households, leading to an increase in their demand for goods and services. This attracts the interest of businesses and investors seeking to capitalize on these profit opportunities arising from the surge in demand. These findings align with the research of Bonfiglioli et al. (2022), which shows that countries adopt structural reforms during periods of uncertainty, or economic uncertainty affects the incentives to implement reforms¹².

¹²We observed a negative correlation between the uncertainty index and periods of reforms as identified in Table 7.

8 | CONCLUDING REMARKS

This article explores how the quality of pro-market institutions and reforms within these institutions help mitigate the effects of uncertainty on economic growth, while also documenting the main channels.

Using a comprehensive database on four pro-market institutions from Alesina et al. (2023) (trade, domestic, and external finance, and product market reforms pro-market institutions) in 61 developing countries over the past 25 years, along with data on world uncertainty constructed by Ahir et al. (2022), our research has demonstrated that these four pro-market institutions have a significant impact on reducing the negative effects of uncertainty on economic growth. Robustness analyses were conducted, indicating that our results remain robust when alternative methods are used to minimize endogeneity biases. Alternative measures of pro-market institutions, such as the Economic Freedom Index from the Fraser Institute and the Heritage Foundation, confirm these findings. Furthermore, we have shown that a reform in pro-market institutions could not only help mitigate the effects of uncertainty but also contribute to significant economic growth in the medium term. These results suggest that reforms could foster more stable and resilient economic conditions in the face of uncertainty, enhancing the economy's ability to adapt to external shocks. Our study has documented two specific channels through which these pro-market institution reforms exert their effect. The first channel involves investment, where reforms can stimulate business investment by creating a more stable and predictable economic environment. The second channel concerns consumption, where reforms can enhance households' purchasing power by reducing the costs of goods and services and fostering competition. These two channels can contribute to improving economic growth and mitigating the negative effects of uncertainty on the overall economy.

The main implication of the results of this study is that governments must pay particular attention to the implementation of reforms to strengthen economic resilience in the face of uncertainty. Reforms, such as the liberalization of the product markets sector, financial sector, and trade sector, can help enhance the competitiveness, flexibility, and productivity of the economy, which is particularly crucial in the context of economic uncertainty. Additionally, while governments can implement short-term stabilizing policies to stimulate the economy, it is imperative that these policies be complemented by long-term structural reforms to ensure stable and sustainable economic growth.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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APPENDIX A

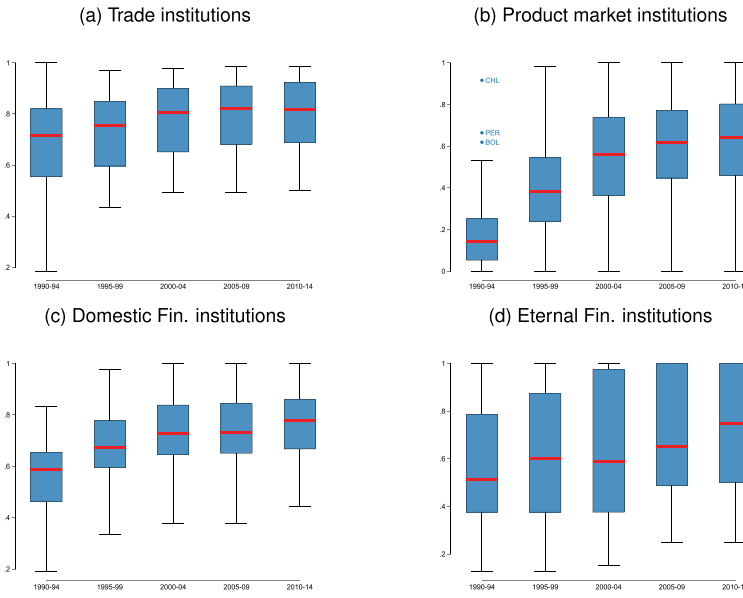
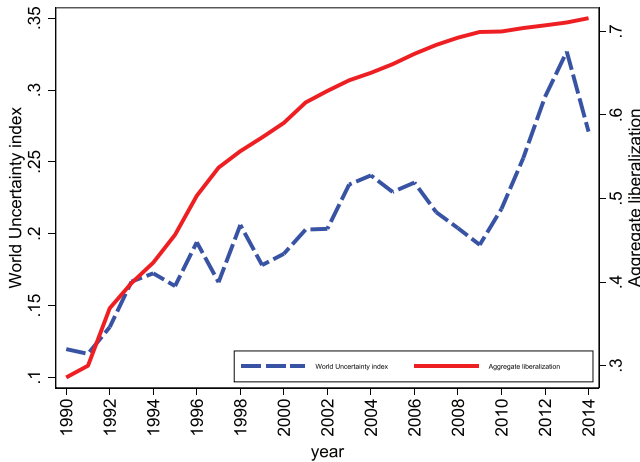


FIGURE A1 (a,b) Evolution of the pro-market institutions indices (5-year average) [Colour figure can be viewed at wileyonlinelibrary.com]



Source: author's illustration based on study data

FIGURE A2 World uncertainty index and overall pro-market institutions index over time, 1990–2014. Source: Author's illustration based on study data. [Colour figure can be viewed at wileyonlinelibrary.com]

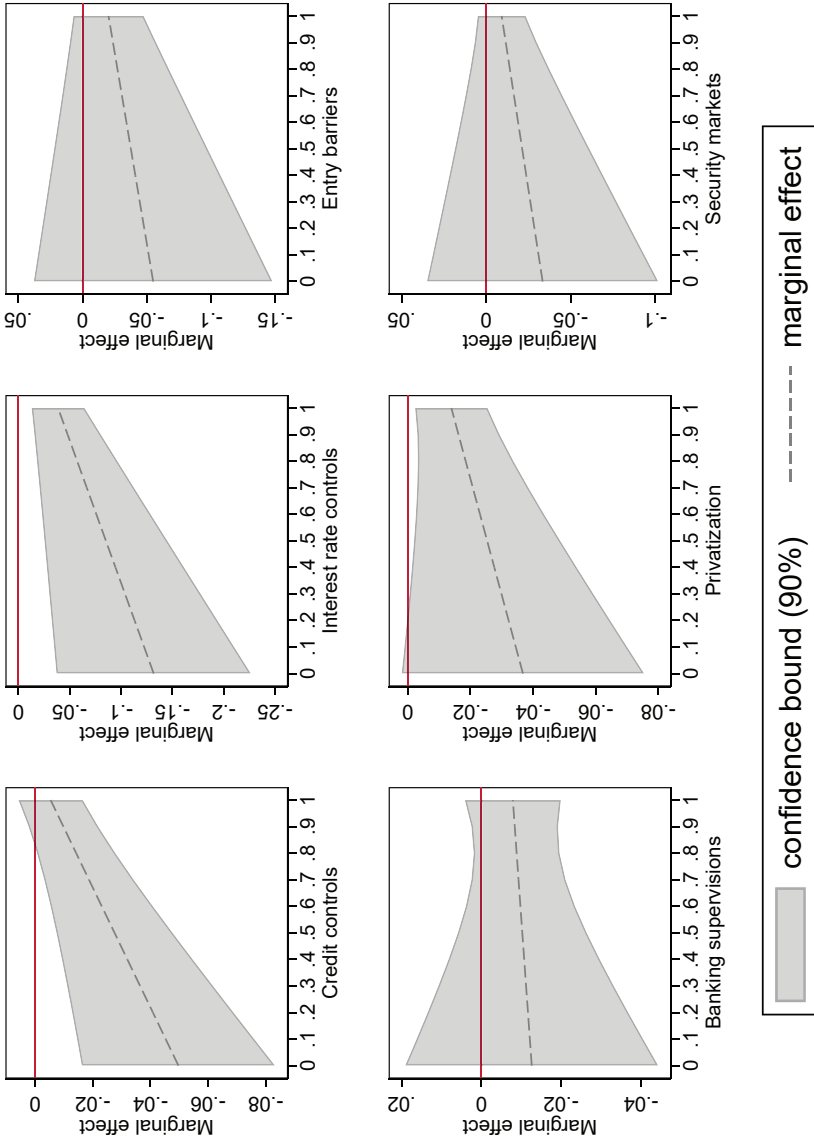


FIGURE A3 Marginal effects of uncertainty on output growth for different levels of domestic finance pro-market institutions. [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com/doi/10.1111/kyk.12408)]

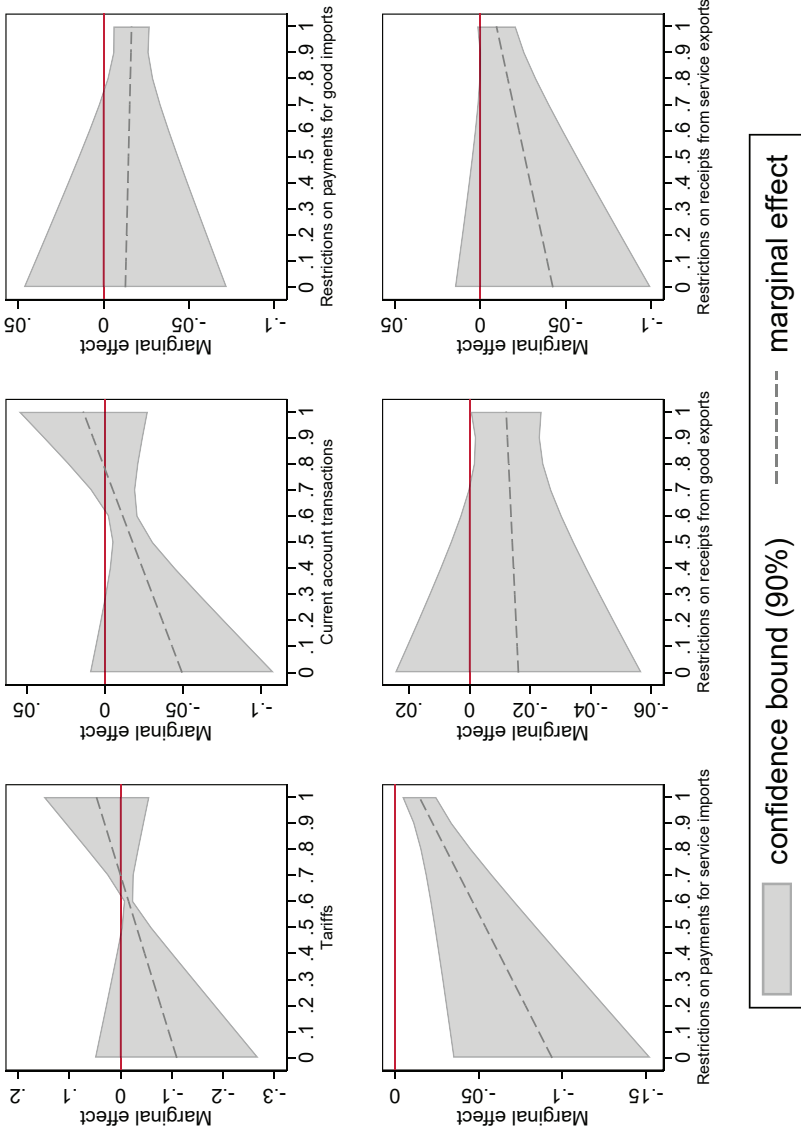


FIGURE A4 Marginal effects of uncertainty on output growth for different levels of trade pro-market institutions. [Colour figure can be viewed at wileyonlinelibrary.com]

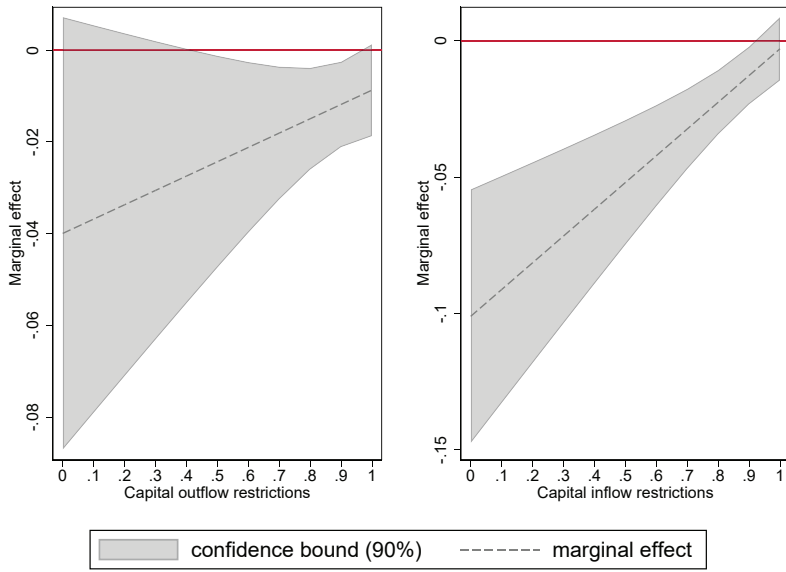


FIGURE A5 Marginal effects of uncertainty on output growth for different levels of external finance pro-market institutions. [Colour figure can be viewed at wileyonlinelibrary.com]

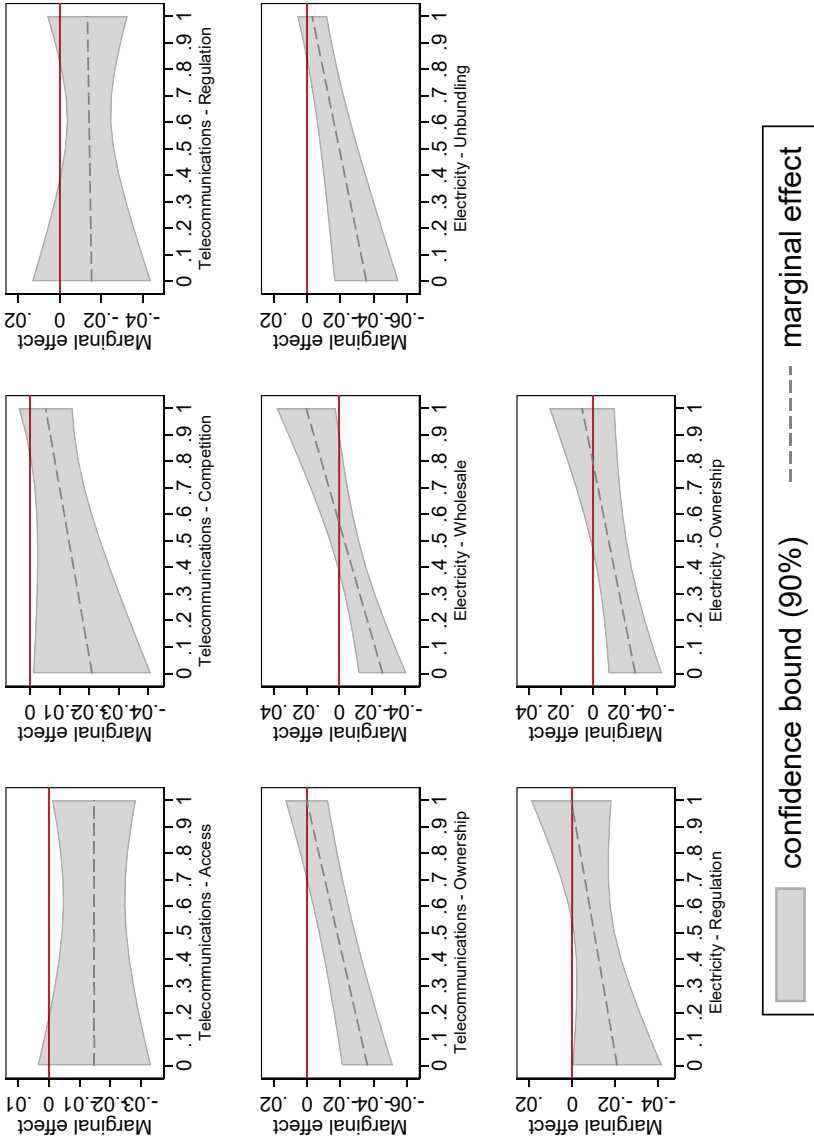


FIGURE A 6 Marginal effects of uncertainty on output growth for different levels of product pro-market institutions. [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com)]

TABLE A1 Further analysis: Principal component analysis.

	(1)	(1)
World uncertain index	-0.047***	-0.077***
	(0.008)	(0.010)
World uncertainty index # PCA-index	0.012***	
	(0.002)	
PCA-index	0.005**	
	(0.002)	
World uncertainty index # Normalized PCA-index		0.057***
		(0.007)
Normalized PCA-index		0.028**
		(0.010)
Main controls	Yes	Yes
Observations	1069	1069
Number of country	56	56
R-square (within)	0.327	0.328

TABLE A2 Economic growth and uncertainty: The role of reforms.

	(1) Year 1	(2) Year 2	(3) Year 3	(4) Year 4	(5) Year 5
[Panel A]: Unconditional local projection: Effect of WUI on output growth					
World uncertainty index	-1.933** (0.720)	-2.083** (0.807)	-3.572*** (1.033)	-4.557*** (1.556)	-2.379*** (0.749)
Observations	1103	1052	999	948	895
[Panel B]: Conditional local projections: The role of market institutions					
Coef (Overall institution reform = 1)	-0.260 (1.810)	3.963 (2.605)	8.591*** (2.352)	10.599*** (3.098)	9.614*** (2.789)
Coef (Overall institution reform = 0)	-1.749*** (0.615)	-1.759** (0.810)	-3.685*** (0.862)	-5.377*** (1.380)	-2.633*** (0.748)
F-statistic (p-value)	0.291	0.411	0.033**	0.169	0.021**
Observations	1052	1052	999	948	895
Coef (Trade institution reform = 1)	6.885 (4.493)	18.240*** (3.644)	26.238*** (5.240)	24.885** (9.997)	20.095* (9.986)
Coef (Trade institution reform = 0)	-1.821*** (0.592)	-2.083*** (0.731)	-3.669*** (0.830)	-4.384*** (1.149)	-2.794*** (0.572)
F-statistic (p-value)	0.24	0.000***	0.000***	0.037**	0.095*
Observations	1026	1026	973	922	869
Coef (Domestic finance institution reform = 1)	1.218 (2.363)	3.391 (3.454)	9.977** (4.681)	6.304 (5.256)	9.516*** (2.475)
Coef (Domestic finance institution reform = 0)	-1.924** (0.686)	-1.981*** (0.677)	-3.635*** (0.848)	-4.350*** (1.084)	-2.265*** (0.506)
F-statistic (p-value)	0.714	0.709	0.212	0.752	0.016**
Observations	1052	1052	999	948	895
Coef (External finance institution reform = 1)	3.684* (2.007)	8.970*** (1.841)	15.878*** (2.521)	18.681*** (3.756)	19.477*** (4.141)
Coef (External finance institution reform = 0)	-2.130*** (0.687)	-2.193** (0.976)	-3.915*** (1.128)	-5.066*** (1.717)	-2.834*** (0.880)
F-statistic (p-value)	0.507	0.006***	0.000***	0.002***	0.001***
Observations	1052	1052	999		895
Coef (Product market institution reform = 1)	1.498 (2.375)	4.838 (2.894)	6.407* (3.345)	4.814 (3.024)	0.892 (3.490)
Coef (Product market institution reform = 0)	-2.075*** (0.726)	-2.021* (0.974)	-3.607*** (0.871)	-4.640*** (1.541)	-2.426*** (0.713)
F-statistic (p-value)	0.787	0.249	0.363	0.938	0.675
Observations	1052	1052	999	948	895

Note: Standard errors in parentheses. **Baseline controls:** The control variables used in this table are the same as those used in Table 2. Reform variable takes a value of 1 if the annual variation of the pro-market institutions index exceeds one standard deviations from the average annual variation observed across all data. Otherwise, the value will be 0.

*** $p \leq 0.01$, ** $p \leq 0.05$, and * $p \leq 0.1$.

TABLE A3 Pro-market institutions dimensions description.

Market institutions	Dimension	Dimension description	Aggregate measure descriptions
Domestic finance	[1] Credit controls	It considers aspects of regulation related to the existence of reserve requirements, minimum amount of credit that is channeled to certain sectors, and credit subsidies	Aggregate index on domestic finance regulations is a composite of the six sub-indicators
	[2] Interest rate controls	It captures government interventions in setting deposit and lending rates.	
	[3] Bank entry barriers	It quantifies the degree of domestic competition to foreign and domestic banks, as well as the range of financial activity that a bank can engage with	
	[4] Banking supervision	It examines whether a country has adopted a capital adequacy ratio based on the Basel standards, and whether there is an independent banking supervisory agency.	
	[5] Privatization	It captures the market shares of state-owned banks in the domestic financial system.	
	[6] Security market development	It considers whether a country has taken measures to develop securities markets.	
External finance	[1] Foreign direct investment	It quantifies the degree of government restrictions on exchange payments (receipts) of capital classified as FDI outflows (inflows).	Aggregate index of external finance is a composite of an index on capital outflow restrictions and an index on capital inflow restrictions
	[2] Portfolio investment	It quantifies the degree of government restrictions on exchange (receipts) payments of capital classified as portfolio equity outflows (inflows)	
	[3] Bond market	It quantifies the degree of government restrictions on exchange payments (receipts) of capital through transactions of bonds or other debt securities.	
	[4] Money markets	It quantifies the degree of government restrictions on exchange payments (receipts) of capital through transactions of money market instruments.	
	[5] Finance and lending markets	It quantifies the degree of government restrictions on exchange payments (receipts) of capital through financial credits.	
Product Market	[1] Access (Telecommunication)	It captures the degree of government intervention in the access to electricity.	
	[2] Competition (Telecommunication)	“It captures the degree of the market competition by the number of existing companies that is, one (monopoly), two (duopoly), or three or more (competitive)”	

TABLE A3 (Continued)

Market institutions	Dimension	Dimension description	Aggregate measure descriptions
	[3] Regulation (Telecommunication)	It examines whether there is an independent regulatory agency	
	[4] Ownership (Telecommunication)	It quantifies the extent of state-owned firms in the market	
	[1] Wholesale (Electricity)	It examines whether there is a liberalized wholesale market	Aggregated index is constructed as the sum of two sub-indicators (telecommunication and electricity) and is normalized from zero to one.
	[2] Unbundling (Electricity)	“It captures the degree of vertical integration in the market that is, whether generation, transmission, and distribution are unbundled”	
	[3] Regulation (Electricity)	It examines whether there is an independent regulatory agency.	
	[4] Ownership Electricity	It quantifies the extent of state-owned firms in the market.	
Trade	[1] Tariff rates	It provides the simple average tariff rates across products.	Aggregate index of trade openness is the simple average of an aggregated index on tariff rates and an aggregated index on current account transactions
	[2] Current account transactions	It quantifies the degree of government restrictions on the payments for external trade.	

Note: Each subindex is coded from zero (fully repressed) to three (fully liberalized).

TABLE A4 Data sources.

Variables	Sources
Pro-market institutions Index	(Alesina et al., 2023)
Trade (% of GDP)	WDI
Foreign direct investment, net inflows (% of GDP)	WDI
Total natural resources rents (% of GDP)	WDI
Inflation, consumer prices (annual %)	WDI
IMF program active for 5 or more months	(Balima & Sy, 2021)
GDP per capita growth (annual %)	WDI
Total natural resources rents (% of GDP)	WDI
Government expenditure on education as % of GDP (%)	WDI
Legislative or executive election	Political Institutions 2020 (DPI2020)
Financial Crisis (banking, currency, or debt crisis)	(Laeven & Valencia, 2020)
Gini coefficient	UNU-WIDER (WIID)
Population, total	WDI
Human capital index	PTW
Rule of law index	V-Dem
Financial development index	IMF

TABLE A5 Countries list (61).

Albania (ALB)	Dominican Republic (DOM)	Kyrgyzstan (KGZ)	Romania (ROU)
Algeria (DZA)	Ecuador (ECU)		Russia (RUS)
Argentina (ARG)	Egypt (EGY)		Senegal (SEN)
Azerbaijan (AZE)	El Salvador (SLV)	Madagascar (MDG)	South Africa (ZAF)
Bangladesh (BGD)		Malaysia (MYS)	Sri Lanka (LKA)
Belarus (BLR)	Ethiopia (ETH)	Mexico (MEX)	Tanzania (TZA)
Bolivia (BOL)	Georgia (GEO)	Morocco (MAR)	Thailand (THA)
Brazil (BRA)	Ghana (GHA)	Mozambique (MOZ)	Tunisia (TUN)
Bulgaria (BGR)	Guatemala (GTM)	Nepal (NPL)	Turkey (TUR)
Burkina Faso (BFA)	Hungary (HUN)	Nicaragua (NIC)	Uganda (UGA)
Cameroon (CMR)	India (IND)	Nigeria (NGA)	Ukraine (UKR)
Chile (CHL)	Indonesia (IDN)	Pakistan (PAK)	Uruguay (URY)
China (CHN)	Jamaica (JAM)	Paraguay (PRY)	Uzbekistan (UZB)
Colombia (COL)	Jordan (JOR)	Peru (PER)	Venezuela (VEN)
Costa Rica (CRI)	Kazakhstan (KAZ)	Philippines (PHL)	Vietnam (VNM)
Cote d'Ivoire (CIV)	Kenya (KEN)	Poland (POL)	Zimbabwe (ZWE)