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The output effects of reforms: empirical evidence from 90 countries

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Abstract
Utilising a new dataset of structural reforms covering 90 countries from 1973 to 2014, we investigate the long-term effects of major deregulation shocks on growth. By applying the local projection method and addressing reform endogeneity with the Augmented Inverse Probability Weighted estimator, we find that liberalisation has a positive long-term effect on growth. Advanced countries reap the benefits of reforms in the long term, while emerging countries benefit in the short to medium term. Low-income and lower-middle-income countries experience fewer positive effects. Counter-reforms in their majority have negative effects except in the case of low to lower middle-income countries.

Keywords: structural reforms, growth, deregulation, market liberalisation
JEL Classification Codes: E52, H30, J65, K10, L51

1. Introduction

Several empirical studies have examined the short-term effects of structural reforms on output, with most concluding that reforms have delayed but overall positive effects (Duval and Furceri 2018; de Haan and Wiese 2022; Alesina et al. 2024). These delayed effects are often related to short-term costs in economic activity (Blanchard and Giavazzi 2003; Bassanini and Cingano 2018). While, Mavrogiannis and Tagkalakis (2022) find that countries with better governance quality can reap significant benefits from structural reforms.

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Boikos et al. (2022), in a study of 81 countries, emphasised the critical role of financial reforms in fostering economic growth. Earlier work by Ostry et al. (2009) explored structural reforms across advanced and developing economies, focusing on domestic and external finance, trade, and product markets, finding generally positive effects on economic performance. Quinn and Toyoda (2008) also identified a positive association between capital account liberalisation and economic growth.

Furthermore, Christiansen et al. (2013) analysed data from 90 countries and concluded that domestic financial and trade reforms positively impact growth, particularly in middle-income countries. Some studies have estimated the long-run effects of reforms by using DSGE models (e.g., Cacciatore and Fiori 2016; Eggertsson et al. 2014).

Alesina et al. (2024) evaluated the short-term effects of different major reforms across 90 countries, however it remains to be seen how such policies affect output within different country groups and in the long run, while effectively addressing reform selection bias.

In contrast with the existing empirical literature which concentrates on the short-term effects of structural reforms, this paper's key contribution is to explore the longer-term impact of structural reforms. Understanding the long-term effects is essential because policymakers need a comprehensive view of how reforms unfold over time to make well-informed decisions. For example, if policymakers focus solely on short-term outcomes, they risk overlooking critical long-term dynamics that could significantly influence the success of reforms. In some cases, reforms may yield substantial long-term benefits despite unclear or even negative immediate impacts. For example, a negative impact in the short term could arise from the reactions of vested interests affected by the changes. Perhaps the attempt to compensate those affected or limit the negative impact on them could undermine the reforms. By analyzing both short- and long-term effects, this study provides evidence that enables policymakers to design and implement more balanced and sustainable reforms.

Therefore, building on the new structural reform database of Alesina et al. (2024), we add to the existing literature in two ways. First, we estimate the long-term effects of reforms and counter-reforms in all 90 countries and subgroups: advanced, emerging, and low to lower middle-income countries.[1] Second, we address reform endogeneity with the Augmented Inverse Probability Weighted (AIPW) estimator, as suggested by Jordà and Taylor (2016), and applied by Wiese et al. (2024), de Haan and Wiese (2022), and Bordon et al. (2018).

The Augmented Inverse Probability Weighting (AIPW) method is considered "doubly robust" because it protects against bias from model misspecification in either the propensity score model (Probit) or the outcome model (LP). As long as one model is correctly specified, the estimator remains consistent for the Average Treatment Effect (ATE). AIPW also addresses selection bias by assigning inverse weights to treated and non treated units using estimated treatment probabilities. This dual protection against bias and correction for selection bias makes AIPW a reliable method for estimating treatment effects in causal analysis.

We find that addressing reform selection bias is necessary within the different country

[1] We separate countries based on the country classification in the *World Economic Outlook* that divides countries into two major groups: advanced economies and emerging and developing economies. We also estimate the effects on low and lower-middle-income economies see supplementary material Appendix A for the detailed list of countries.

subgroups which shows the timing of reform benefits in growth. More specifically major deregulation reforms yield positive outcomes across all countries. Advanced countries see the greatest benefits in the long run, while emerging economies experience gains in the short to medium term. In low to lower-middle-income countries, the positive impact tends to weaken over time and becomes negative. Counter-reforms generally have a negative effect, except in low to lower-middle-income countries, where a positive effect is observed.

The remainder of the paper is structured as follows. Section 2 presents the data and methodology. The third section presents the results and section 4 concludes.

2. Data and methodology

The dependent variable, real GDP, as well as control variables such as human capital, capital stock, and employment, are sourced from Feenstra et al. (2015). The KOF index is obtained from ETH. Political variables are sourced from Cruz et al. (2021). The remaining macroeconomic variables are derived from the IMF and World Bank. We use the major reform shocks identified by Alesina et al. (2024) as a 1-standard-deviation change in the aggregate reform indicator. These include reforms in the areas of the domestic financial sector, current and capital account, trade, product, and labor markets see Tables A1 and A4 (Appendix A).

As an estimation strategy we follow Jorda (2005) to estimate the cumulative effect of reforms on growth. To this end we estimate:

$$y_{i,t+h} - y_{i,t-1} = \beta_0^h + \beta_1^h R_{i,t} + \beta_2^h X_{i,t-1} + \alpha_i^h + \gamma_i^h + \varepsilon_{i,t+h}, \; for \; h = 0,1,2,\dots,9 \quad (1)$$

In this context h=0,…,9 is the forecast horizon, and , $y_{i,t+h} - y_{i,t-1}$ denotes the cumulative change in log real GDP over the forecast horizon. The terms α_i^h and γ_i^h are time and country fixed effects to account for unobserved heterogeneity, $\varepsilon_{i,t+h}$ is the error term and β_0^h is a vector of constants. The reform shock (treatment) is denoted by $R_{i,t}$, while $X_{i,t-1}$ is a set of control variables including the Δlog(capital stock), Δlog(employment), the percentage change from year to year in the human capital index, as well as the KOF globalisation index, to account for key structural and external factors influencing economic growth. Changes in capital stock and human capital capture the effects of physical investment and workforce productivity, respectively, these Solow variables account for the influence of changes in the capital stock on economic growth, which could also be driven by reforms, see de Haan and Wiese (2022). Employment changes reflect labor market dynamics critical to GDP fluctuations, while the KOF globalisation index controls for the impact of global integration on growth, ensuring that the estimated effects of reforms are not confounded by external shocks or globalisation trends. In addition, we include as control variables 6 lags of the dependent variable 5 lags of the reform variable, the so called Teuling and Zubanov (2014) correction to account for future reform shocks.

Since reforms do not occur at random (de Haan and Parlevliet 2018; Duval et al., 2021) we conduct a balance test for the difference in means of the covariates for the treatment and the control group. The results of the balance test (see Table A1, Appendix A) indicate significant differences in covariates between the treatment and control groups in our sample.

To address endogeneity from implementation selection bias, we employ a "doubly robust" estimator, i.e. the AIPW method as in Jorda and Taylor (2016).

In the first stage, the treatment probability of having a major reform is modeled as a function of the lagged values of GDP growth, output gap, trade as % GDP, change in human capital, gross capital formation, Chinn Ito (2006) index, KOF Globalization index, political variables and past reform shocks. In the second stage, we estimate the average treatment effect by considering the reweighted observations.[2] This is then used simultaneously with local projections to study the dynamic responses of reforms, as in Jorda and Taylor (2016) and de Haan and Wiese (2022).

3. Results

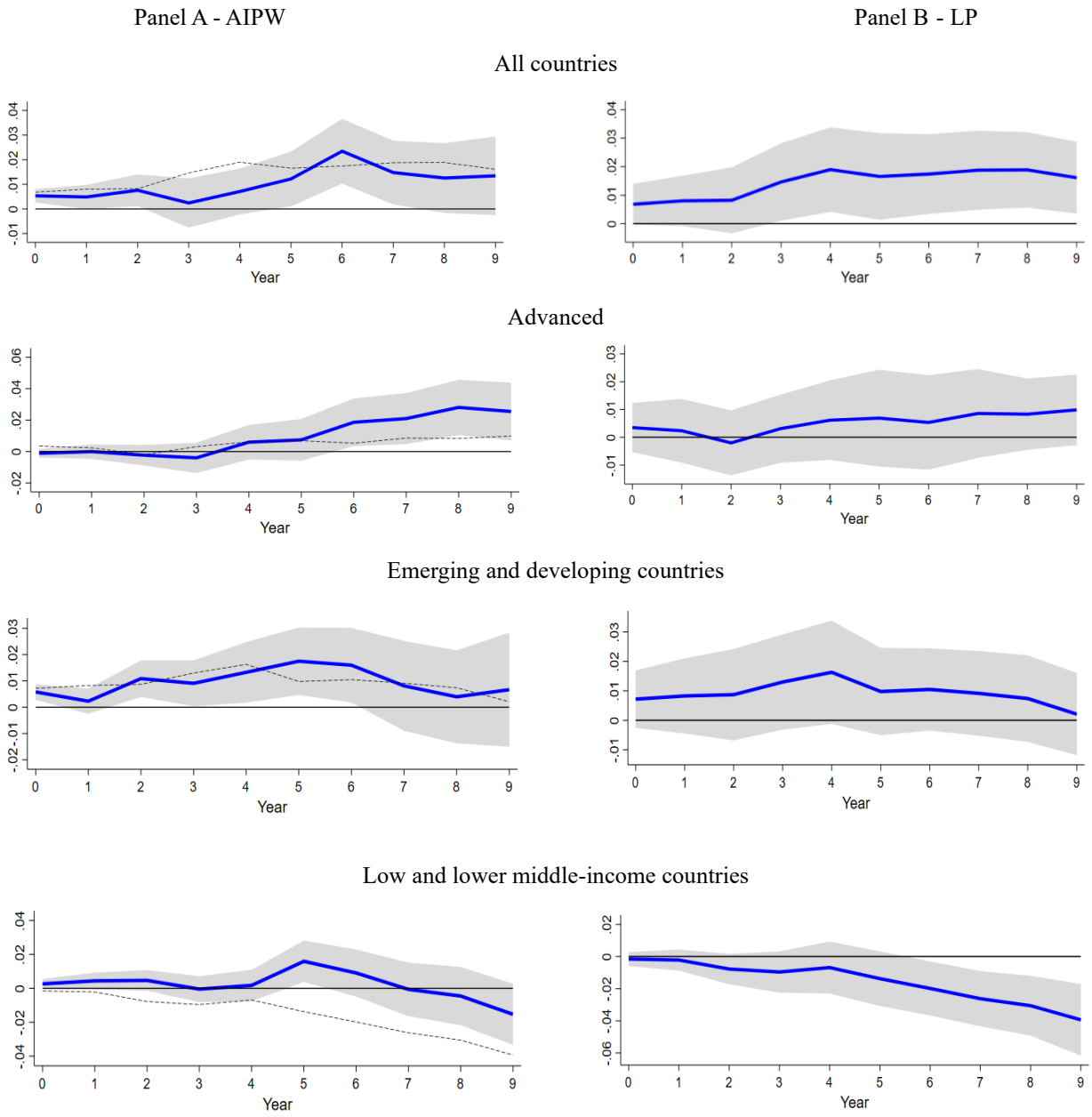
We present the baseline simple unweighted Local Projections (LPs) alongside the Average Treatment Effect (ATE) of reforms, derived using the Augmented Inverse Probability Weighting (AIPW) method. The complete estimates of the simple LPs are provided in the supplementary material Appendix A. We use major shocks from all types of deregulation reforms together, as in Alesina et al. (2024), because there are not enough major shocks in each category to extract valuable information for each sub-country group.

The unweighted Local Projection (LP) estimates indicate that deregulation has a positive effect in all countries even in the long run as shown in Alesina et al. (2024). Advanced and emerging countries show also positive but not statistically significant results. However, the response of low to lower middle-income countries is negative (see Figure 1, panel B).

Turning to the AIPW results (see Figure 1, panel A; Table 1), we find that deregulation reforms have a positive effect in all countries over the 9-year horizon. Advanced countries seem to gain the most in the long run with an increase of 2% at GDP at the end of the 9th horizon. On the other hand, Emerging market economies can be positively affected by deregulation initiatives even in the short to medium term. Low to lower-middle income countries experience a somewhat positive effect that diminishes over time. Counter-reforms in low to lower-middle-income countries have a positive effect on growth (see Figure A2). This, in conjunction with the negative effect observed in simple LPs and the diminishing effect in the case of AIPW, indicates a negative relationship between deregulation and GDP in these countries in the long run and more research is needed in this part.

[2] After the re-weighting of the observations, we conduct a post balance test (see Table A3, Appendix A) that indicates no imbalance between treatment and control group.

Figure 1. The impact of major deregulation shocks on output



Notes: The solid blue lines represent the cumulative impulse response of GDP to major deregulation shocks using the (ATE- AIPW) (panel A) with bootstrapped standard errors in light blue shaded area (see Table 1) and the simple LP (panel B) using Spatial Correlation Consistent (SCC) standard errors based on equation 1 (see Tables A6-A9 (Appendix A) for the full set estimates of simple LPs.
Source: Authors' calculations.

4. Conclusion

In conclusion, this study finds that major deregulation reforms generally yield positive growth effects across countries, with advanced economies benefiting most in the long term and emerging economies gaining in the short to medium term. However, the diminishing positive effects in low- to lower-middle-income countries—and the unexpected positive impact of counter-reforms in these regions—underscore the need for tailored policy approaches. These findings are particularly important for policymakers in low-income economies, where reform outcomes can be more complex or delayed due to potential institutional quality challenges that hinder successful implementation.

This study faces some limitations, due to the limited observations for each reform subcategory[3], it is difficult to effectively apply the AIPW method and fully address selection bias (for each type of reform). Future research should focus on analyzing specific types of reforms (e.g., labor and product market reforms and current and capital account reforms) to provide more targeted policy recommendations.

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Table 1. The impact of major deregulation shocks growth using the (ATE- AIPW) method.

	Major deregulation reforms									
	(1) (h=0)	(2) (h=1)	(3) (h=2)	(4) (h=3)	(5) (h=4)	(6) (h=5)	(7) (h=6)	(8) (h=7)	(9) (h=8)	(10) (h=9)
All countries	0.0053***	0.0049	0.0076*	0.0024	0.0071	0.0122*	0.0235***	0.0148*	0.0126	0.0135
	(0.0017)	(0.0030)	(0.0039)	(0.0061)	(0.0057)	(0.0068)	(0.0080)	(0.0079)	(0.0086)	(0.0097)
Observations	2612	2612	2541	2469	2396	2323	2251	2279	2105	2031
Advanced countries	-0.0006	0.0013	-0.0008	-0.0021	0.0060	0.0082	0.0200**	0.0225**	0.0308***	0.0290**
	(0.0019)	(0.0034)	(0.0045)	(0.0060)	(0.0067)	(0.0080)	(0.0091)	(0.0098)	(0.0107)	(0.0114)
Observations	913	913	913	884	853	821	793	751	723	693
Emerging countries	0.0058***	0.0023	0.0109***	0.0091*	0.0133*	0.0175**	0.0160*	0.0081	0.0040	0.0067
	(0.0018)	(0.0029)	(0.0042)	(0.0053)	(0.0070)	(0.0078)	(0.0086)	(0.0104)	(0.0107)	(0.0132)
Observations	1746	1746	1703	1659	1614	1569	1525	1481	1435	1365
Low to lower middle-income countries	0.0023	0.0039	0.0038	-0.0015	0.0003	0.0152**	0.0070	-0.0030	-0.0073	-0.0185*
	(0.0017)	(0.0030)	(0.0037)	(0.0046)	(0.0056)	(0.0074)	(0.0084)	(0.0096)	(0.0104)	(0.0109)
Observations	907	907	886	864	841	818	785	751	722	697

Notes: The table shows the average treatment effect (ATE) - calculated via the AIPW method -of deregulation reform shocks on GDP growth. The estimates are based on model (1) bootstrapped standard errors in parenthesis. ***/**/* Indicate p-value 0.01/0.05/0.10.
Source: authors' calculations.