Structural Reforms and Fiscal Sustainability[*]

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[PRELIMINARY VERSION; DO NOT QUOTE OR CIRCULATE WITHOUT PERMISSION]

Abstract

This paper explores the short to medium-term output and public debt impact of deregulating several policy areas and how it varies with initial conditions. We apply a local projection method to a newly constructed "narrative" dataset of major reforms and regulatory changes in a sample of 90 advanced and developing countries spanning over four decades. Our results show that over the medium term—that is, four to six years after the reform takes place—financial reforms positively affect output and they also contribute to lower the debt-to-GDP ratio. Output also positively reacts to reforms in capital accounts, trade and product markets, while the debt ratio seems to contract following current account and product market reforms. Finally, initial indebtedness conditions at the time of the reform matter. These findings are consistent with theory and are robust to a broad range of robustness checks including inclusion of all reforms simultaneously, controlling for growth expectations and an instrumental variable approach using political economy drivers of reforms as instruments.

Keywords: public debt, growth, deregulation, impulse responses, local projection method, nonlinearities, instrumental variables.
JEL codes: C33, E62, H63, J08, O43

1. Introduction

A consensus across several economies has arisen on the desirability of making markets more efficient so as to increase competitiveness and improve future growth prospects (OECD, 2012; European Commission, 2013; IMF, 2013). Structural reforms have become fashionable as an alternative policy option to conventional fiscal and monetary policies in a context where many economies, following the Global Financial Crisis, lacked room for maneuver and were in desperate need to get the recovery going and propel potential growth. Many have written about the macroeconomic impacts of structural reforms (mainly labor and product market) with emphasis on their effects on output, productivity and employment. Moreover, these studies have generally focused on a sample of advanced economies due to lack of cross-sectional comparable data including countries from other income groups. Some have argued that structural reforms can raise output immediately by boosting aggregate demand through expectation effects (Draghi, 2015). However, this depends exactly on the type of reform considered.[1] Others have stressed the importance of time dynamics and that some liberalization and deregulation policies may produce modest – if any – gains in the short-run and pay off only very slowly (Rodrik, 2015), with most of the beneficial (and visible) impacts accruing only in the long-run (Andres et al., 2014).[2]

Growing focus is now placed on the link between structural reforms and public finances, (particularly in the context of implementing, e.g., the EU fiscal framework) and growing public indebtedness across the world which raises sustainability concerns.[3] Better knowledge on the implications of structural reforms for public finances is required for better fiscal surveillance in general and for better designing and prioritizing packages of growth-enhancing reforms. That being said, two key considerations must, nonetheless, be taken into account. First, the budgetary effects of structural reforms may materialize over different horizons, requiring an analysis of their impact over time. Second, the channels of transmission can be complex because reforms' effect on economic activity and fiscal positions may depend on initial conditions. These aspects warrant a systematic analysis of the interaction between fiscal policy and structural reforms, which is currently lacking in the literature.

Two broadly opposite views have been expressed in the recent debate on the relations between fiscal policy and structural reforms (Buti et al., 2007). There is a "either/or view": structural reforms and improvements in fiscal stance are hardly compatible, so that policy authorities may be left with a dilemma. According to this view, excessively tight constraints to fiscal policy may

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[1] Griffith and Harrison (2004) and Griffith et al. (2007) find that product market reforms significantly increase competition, raising innovation and employment. On the other hand, while strict job protection legislation has been found to reduce productivity (Eslava et al., 2004; Autor et al., 2007; Van Schaik and Van de Klundert, 2013), notably by reducing job turnover (Haltiwanger et al., 2010; Cingano et al., 2010), its impact on aggregate employment remains empirically unclear (Nickell et al., 2005; Bassanini and Duval, 2009; Boeri et al., 2011).

[2] In fact, some have argued that reforms may entail short-term costs (Bertola and Bentolila, 1990; Cacciatore and Fiori, 2016, Cacciatore et al., 2016a,b), particularly in the presence of economic slack and/or constrained policies (Eggertsson, Ferrero, and Raffo, 2014; Krugman, 2014; Duval and Furceri, 2017; Duval, Furceri, Jalles, 2017).

[3] It is often claimed that the Stability and Growth Pact neglects a possible trade-off between short-term budgetary objectives and the implementation of reforms that could improve public finances durably in a medium-to-long term perspective (Eichengreen and Wyplosz, 1998; Deroose and Turrini, 2005).

be incompatible with reform objectives. There is also the "Brussels-Frankfurt consensus" (Sapir et al., 2004): fiscal discipline and reforms not only are not incompatible, but tend to go hand in hand. According to this view, there are instances in which there may simply be no alternative, and any well-conceived policy package needs to include both measures to redress budgetary imbalances and to re-launch growth (Rodrik, 1996; Bean, 1998; Calmfors, 2001) – this is the so-called "there-is-no-alternative (TINA) argument".

This paper addresses the existing gap in the empirical literature. More specifically, we rely on Ostry et al.' (2009) cross-country "narrative" dataset of major regulatory policy changes for a sample of 90 countries (29 advanced and 61 developing economies) spanning over 40 years. We then estimate the dynamic response of output and public debt to these reform shocks using a local projection method (Jordà, 2005)—which has been used recently to study the dynamic impact of macroeconomic shocks such as financial crises (Romer and Romer, 2015) or fiscal shocks (Jordà and Taylor, 2016).

Our results show that over the medium-term financial reforms positively affect output and they also contribute to lower the debt-to-GDP ratio. Output also positively reacts to reforms in capital accounts, trade and product markets, while the debt ratio seems to contract following current account and product market reforms. Finally, initial indebtedness conditions at the time of the reform matter. These findings are robust to a broad range of robustness checks.

The remainder of the paper is organized as follows. Section 2 reviews the relevant literature. Section 3 presents the data and some stylized facts and it also outlines the empirical methodology. The following section discusses the empirical results, including the battery of sensitivity and robustness checks. The last section concludes.

2. Literature Review

The link between structural reforms and fiscal outcomes has been subjected to less attention. It is hard to judge on an ex-ante basis the effect of structural reforms on public finances. Not only can reforms have both direct and indirect effects but these can also vary depending on the precise reform being implemented. Several arguments have been developed to ascertain which reforms can yield negative or positive impacts on fiscal outcomes.

The first relates to the budgetary effects of structural reforms. On the one hand, the implementation of some structural reforms might entail direct budgetary costs, which will weigh negatively on fiscal sustainability (Razin and Sadka, 2002).[4] Some reforms could also negatively affect public finances indirectly through changes in prices (e.g. liberalization of the telecommunications sector could lower prices and reduce value-added tax revenues). There is also the possibility that structural reforms impact the cyclical components of budgets through their

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[4] Note however that usually such short-term budgetary costs of reforms are offset by the long term benefits they generate. For example, a deterioration of the deficit can arise from higher spending on active labor market policies (e.g. training programmes), lower labor taxation (such as a fiscal devaluation to increase competitiveness) or certain pension reforms. In addition, less strict employment protection legislation is likely to result in higher unemployment in the short-run, which is translated into additional budgetary costs.

temporary output effects (Hughes-Hallett et al., 2004). On the other hand, structural reforms can have direct budgetary saving effects, impacting positively on fiscal sustainability. This impact however can vary across types of reforms (IMF, 2016). They could also contribute positively to sounder public finances in an indirect manner, i.e., by strengthening incentives to work and invest over time and, thus, increasing potential output and growth. This generates a positive denominator effect, hence strengthening fiscal sustainability.[5]

The second argument relates to political economy considerations and how it can translate into worse budget deficits in the short-run (even if reforms could be beneficial in the long run).[6] In many instances, (arguably unpopular) structural reforms require a lot of political capital from the government which may not be always available (Eichengreen and Wyplosz, 1998). In this sense, some reforms (e.g. privatization of public enterprises and the restructuring that follows) can be politically costly as they may negatively affect certain special-interest groups (Saint-Paul, 1996; Blanchard and Giavazzi, 2003; and Boeri, 2005). The government in office may decide to incur into budgetary costs in two ways. One is by directly compensating reform-losers with targeted tax cuts and transfers/subsidies (Pierson, 2001)[7]. The other is by deciding to engage into an accommodating fiscal stance to help easing resistance for reforms (to the extent that expansionary fiscal policies are expected to positively impact output and employment in the short-run) (Deroose and Turrini, 2005).[8] Both these options, while easing the short-term costs of reforms in the transition dynamics, imply a short-run deterioration of the budget balance and so require sufficient fiscal space to be deemed feasible (IMF, 2016). The sign and magnitude of the budgetary effects can ultimately depend on reforms' credibility and design (Heinemann, 2005). A government can gain credibility by committing to medium-term budgetary discipline and by signaling seriousness to implementing tough policies (Tavares, 2004). This in turn could raise investors' and consumers' confidence, generating positive effects on economic activity, reducing the political cost of reforms, and eventually improving the fiscal stance both through numerator and denominator effects (Tavares 2004; Deroose and Turrini, 2005).[9]

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[5] Product market reforms could have beneficial effects on public finances in the medium-term. Moreover, the elimination of entry barriers and the enhancement of competition will boost innovation and growth contributing indirectly to better public finances, via the denominator effect.

[6] For some structural reforms, however, indirect long-run fiscal gains need to be weighed against their short-run direct fiscal costs, because those costs are only partly recouped over time as output rises (IMF, 2017). More importantly, according to Deroose and Turrini (2005) there is a trade-off between structural reforms and budgetary objectives: an excessive focus on short-term budgetary discipline could act as a constraint on the pursuit of reforms that could improve public finances in the long-run. This occurs when reforms worsen the budgetary position in the short-run while gains appear mainly after some time. Theoretical papers analyzing the trade-off between budgetary objectives and structural reforms include the works by Razin and Sadka (2002) and Beetsma and Debrun (2003, 2005).

[7] The liberalization and privatization of economic activities several Eastern European countries during the transition process was often followed by the temporary provision of government subsidies to permit the restructuring of firms. On the revenue side, economic reforms were quite often implemented together with tax cuts (IMF, 2004).

[8] A supportive fiscal stance may be needed in the short term to obviate to the temporary widening output gap associated with reforms (Saint-Paul, 2002; Hallett et al., 2004). This argument is strengthened by the claim that some reforms may lower the effectiveness of automatic stabilizers, thereby requiring discretionary fiscal policy to step in, in order avoid a sub-optimal degree of fiscal stabilization (Mabbett and Schelkle, 2005).

A few theoretical papers have directly studied the relationship between structural reforms and fiscal policy. Campoy and Negrete (2010) model the interrelations between budget deficits and structural reforms in a monetary union by considering the international spillovers generated by both policies. They show that efforts to achieve fiscal policy coordination within the Eurozone reduce member countries' incentives to carry out much-needed structural reforms and turn out to be welfare-reducing. Papageorgiou and Vourvachaki (2017) set-up a dynamic general equilibrium model calibrated for the Greek economy to study the impact of product and labor market reforms. Results show that reforms produce important long-run GDP gains that materialize earlier, the faster the reforms are implemented. When implemented jointly with fiscal consolidations, structural reforms may amplify the short-run costs of fiscal tightening. Muller, Storesletten and Zilibotti (2016) constructed a dynamic theory of sovereign debt and structural reforms with interacting frictions. According to them, higher debt levels deter reforms because most of the gains accrue to foreign lenders in the form of capital gains on the outstanding debt. Finally, Sajedi's (2018) model suggests that the fiscal costs and benefits of reforms are generally small, although larger reforms entail larger rises in deficit-to-GDP in the short run. Moreover, reforms in labor markets have little effect on public finances in the long run, but their short run costs can be counterbalanced if combined with product market reforms. Furthermore, reforms implemented when monetary policy is constrained can be contractionary in the short run resulting in higher deficit-to-GDP ratios.

Empirically some papers have related structural reforms to fiscal adjustment programs. Kumar et al. (2007) found that structural reforms in the areas of health care, unemployment benefits and pensions have supported fiscal consolidations. Tagkalakis (2009) investigates the role played by labor and product market institutions in determining the likelihood of initiating and of successfully concluding a fiscal adjustment. Using data for 16 OECD countries he found that a less generous unemployment benefit system contributes to the success of fiscal consolidation. On the other hand, product market deregulation and more flexible employment protection legislation do not contribute positively to fiscal consolidation. Heylen et al. (2013) found that consolidation policies are more successful when they are accompanied by product market deregulation.

More closely related to our paper, Deroose and Turrini (2005) do not find strong empirical support to the view that labor market, product market, or pension reforms were associated with short-term budgetary costs. Evidence points to a slight deterioration in budgets which is not always statistically different from zero. Moreover, recent empirical analysis on a sample of advanced economies over 40 years, suggests that most labor and product market reforms can create fiscal space over the medium term (IMF, 2017). Across advanced economies, major episodes of deregulation of retail trade, professional services, and network sectors led to large increases in GDP and higher government revenues, which in turn lowered public-debt-to-GDP ratios. In contrast, major reforms of job protection for regular workers had a limited impact on public finances reflecting their small and statistically insignificant effects on output, as well as the absence of up-front fiscal costs.

3. Data Issues and Methodology

3.1 <u>Structural Reforms Database</u>

This paper's analysis relies on Ostry et al.'s (2009) structural reforms dataset which identifies major policy changes for a sample of 90 countries, 29 advanced and 61 developing economies over the past 40 years – country groups according to the IMF WEO classification.[9] This narrative database of regulation and major reforms covers the following policy areas: domestic finance, external finance, trade and product market.[10] The dataset has two main advantages compared to existing datasets.[11] First, it is to date the most comprehensive dataset of its kind covering a larger set of policy areas and country-time observations. Second, it provides and documents the nature and date of major reforms. Having precise and accurate narrative-based information on major reform events is extremely useful for our purpose as we want to correctly identify and trace the dynamic (short- and medium-term) impact of reforms on fiscal sustainability.

More specifically, the indicators of regulation available in Ostry et al. (2009) database cover both the realm of the "financial sector" and the "real sector". Financial sector indicators pertain to domestic financial markets—including banking and securities markets—as well as the external capital account. Real sector structural indicators include measures of trade (average tariff rates, current account) and product markets (telecommunications and electricity markets). All indicators are scaled to vary between zero and unity, with higher values representing greater liberalization.

Figure 1 sums up the different structural reforms' cross-country and time-series patterns for the entire sample. On average, trade reforms display a gradual liberalizing trend throughout the entire period, while both capital and current account reforms tightened slightly in the late 1970s and early 1980s. Both domestic finance and product market reforms witnessed relatively little action until the late 1980s, but they picked up a liberalizing path very fast afterwards.

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[9] Of the 90 countries in the dataset, 17 are from Asia and Pacific, 29 are from Europe, 11 are from the Middle East and Central Asia, 14 are from Sub-Saharan African, and the rest of the 19 countries are from the Western Hemisphere. Full country coverage list is provided in the Appendix.

[10] The underlying he methodology is related to the "narrative approach" used by Romer and Romer (1989, 2004, 2010) and Devries et al. (2011) to identify monetary and fiscal shocks and periods of high financial distress.

[11] Another database that provides narrative information on major reform events is Duval et al. (2017), but its focus is only on a set of 26 advanced economies and on product and labor market reforms.

**Figure 1. Evolution of all Structural Reform Indicators, full-sample**
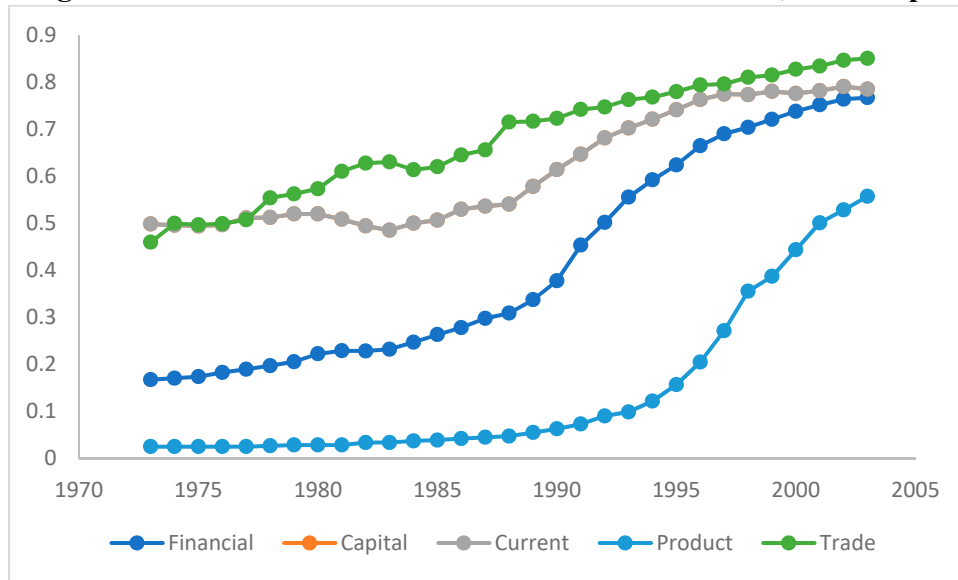
Source: Ostry et al. (2009).

The average patterns shown in Figure 1 hide several heterogeneities between income groups. For domestic finance and product market reforms, the aggregate average patterns translate well the behavior of the different income groups. However, capital account reforms, show different trends: in advanced economies liberalization has been the norm since the early 1970s, while in emerging and low-income countries, this movement only began more seriously in the later 1980s and mid-1990s, respectively. A similar picture emerges from current account reforms. The time dynamics of trade reforms is more volatile but in all income groups the trend has been towards increased liberalization particularly since after the early 1980s, after a turbulent 1970s marked by oil price shocks.

Figure 2. Evolution of all Structural Reform Indicators by Income Group

Financial indicator   Capital account indicator

Current account indicator

Trade (average tariff) indicator

Product market indicator
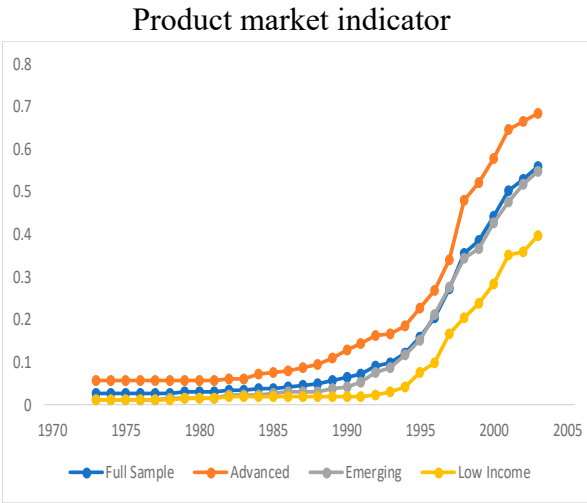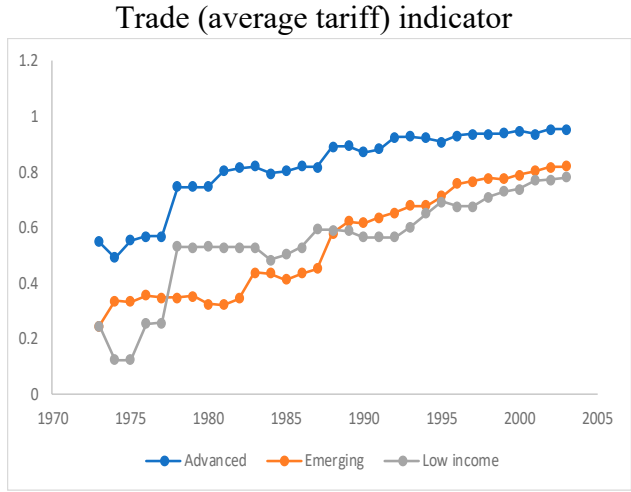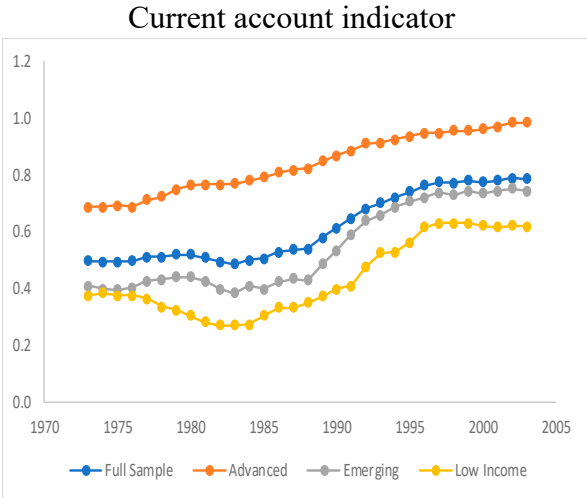
Source: Ostry et al. (2009).

To examine whether changes in the reform indicators are the result of gradual or large scale reforms, the dataset classifies policy changes in 5 categories: status quo, when there is no change in the composite indicator; major liberalizing (tightening) reforms when the change in the indicator falls in the top (bottom) 15 percent of the distribution of overall changes; reform (tightening) when the change in the indicator is higher (lower) than zero and below the top (bottom) 15 percent of the distribution of overall changes. Table 1 shows the distribution of reforms according to this classification. For domestic finance, liberalization reforms and large reforms constitute about 18 and 3 percent, respectively of the observations in the sample, while tightening and major tightening reforms are rare events. A similar picture can be observed with respect to both current account and capital account reforms. Compared to domestic and external finance reforms, in the case of product markets, major liberalization reforms are rarer. However, in trade related reforms, tightening and major tightening constitute 41 percent of the observations in the sample.

Table 1. Distribution of Structural Reforms, Full Sample

	Domestic Finance	Current Account	Capital Account	Trade Indicator	Product Market Indicator
Major Liberalization	3.1	2.7	2.0	28.4	1.8
Liberalization	18.1	9.7	4.9	3.0	11.3
Status Quo	74.9	82.0	90.5	27.3	86.7
Tightening	3.4	4.5	2.0	17.0	0.2
Major Tightening	0.6	1.0	0.7	24.4	0.0
Total	100.0	100.0	100.0	100.0	100.0

Source: Ostry et al. (2009).

3.2 Debt and Other Data

Our main dependent variables comprise of real GDP growth (in percent) and the (gross) public debt-to-GDP ratio (in percent) as a proxy for fiscal sustainability. These variables are retrieved from the IMF's WEO database. Summary statistics are presented in the Appendix Table A.1.

3.3 Empirical Methodology

The empirical analysis consists in estimating and tracing out the average evolution of output and public debt-to-GDP ratio in the aftermath of major policy changes. The statistical method follows the approach proposed by Jordà (2005) to estimate impulse-response functions. This approach has been advocated by Auerbach and Gorodnichencko (2013) and Romer and Romer (2017), among others, as a flexible alternative to vector autoregression (autoregressive distributed lag) specifications since it does not impose dynamic restrictions. It is also particularly suited to estimating nonlinearities in the dynamic response.

Our main regression specification is estimated as follows:

$$y_{i,t+k} - y_{i,t-1} = \alpha_i + \mu_t + \beta_k R_{i,t} + \theta X_{i,t} + \varepsilon_{i,t} \tag{1}$$

in which $y_{i,t+k}$ is either the log of real GDP or the public debt-to-GDP ratio in country i in period $t+k$; α_i are country fixed effects included to control for unobserved cross-country heterogeneity; μ_t are time effects to control to control for global shocks; $R_{i,t}$ is our reform shock indicator. As detailed in Section 3.1, $R_{i,t}$ can translate reforms in the areas of domestic finance, external finance, trade and product market. $X_{i,t}$ is a set of controls including two lags of the dependent variable, two lags of the reform variable and two lags of real GDP growth.[12] $\varepsilon_{i,t}$ is an i.i.d. disturbance term satisfying standard assumptions of zero mean and constant variance. Equation (1) is estimated via Ordinary Least Squares (OLS) for each k=0,..,6 with robust standard errors clustered at the country

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[12] Results remain qualitatively unchanged to alternative lag structure specifications.

level. Impulse response functions are computed using the estimated coefficients β_k, and the confidence bands associated with the estimated impulse-response functions are obtained using the estimated standard errors of the coefficients β_k. While we believe that our empirical set-up addresses endogeneity concerns related to omitted variable bias, in order to further mitigate such concerns, we also re-estimate our specifications using an Instrumental Variable (IV) approach, drawing our instruments from the political economy literature on the drivers of reforms (refer to Section 4.2 for further details).

4. Empirical Results
4.1 Baseline

Figures 3a and 3b present the results obtained by estimating equation (1) for our five types of structural reforms for real GDP growth and public-debt-to-GDP ratio, respectively. It shows that over the medium term—that is, four to six years after the reform takes place—financial reforms, positively (and statistically significantly) affect output in the medium term and they also contribute to lower the debt-to-GDP ratio (although for the former, estimates are marked with some slight uncertainty). Output also positively reacts to reforms in capital accounts, trade and product markets (Figure 3.a). The debt ratio seems to contract following current account and product market reforms (Figure 3.b). Following Auerbach and Gorodnichenko (2017) we also redid the estimations by measuring the debt ratio with respect to lagged GDP. Lagging the denominator by one period is done to ensure that the contemporaneous reaction of the ratio to a structural reform shock is driven by changes in debt rather than output. Results are displayed in Figure A1 in the Appendix and yield qualitatively similar results to those presented in Figure 3.b.
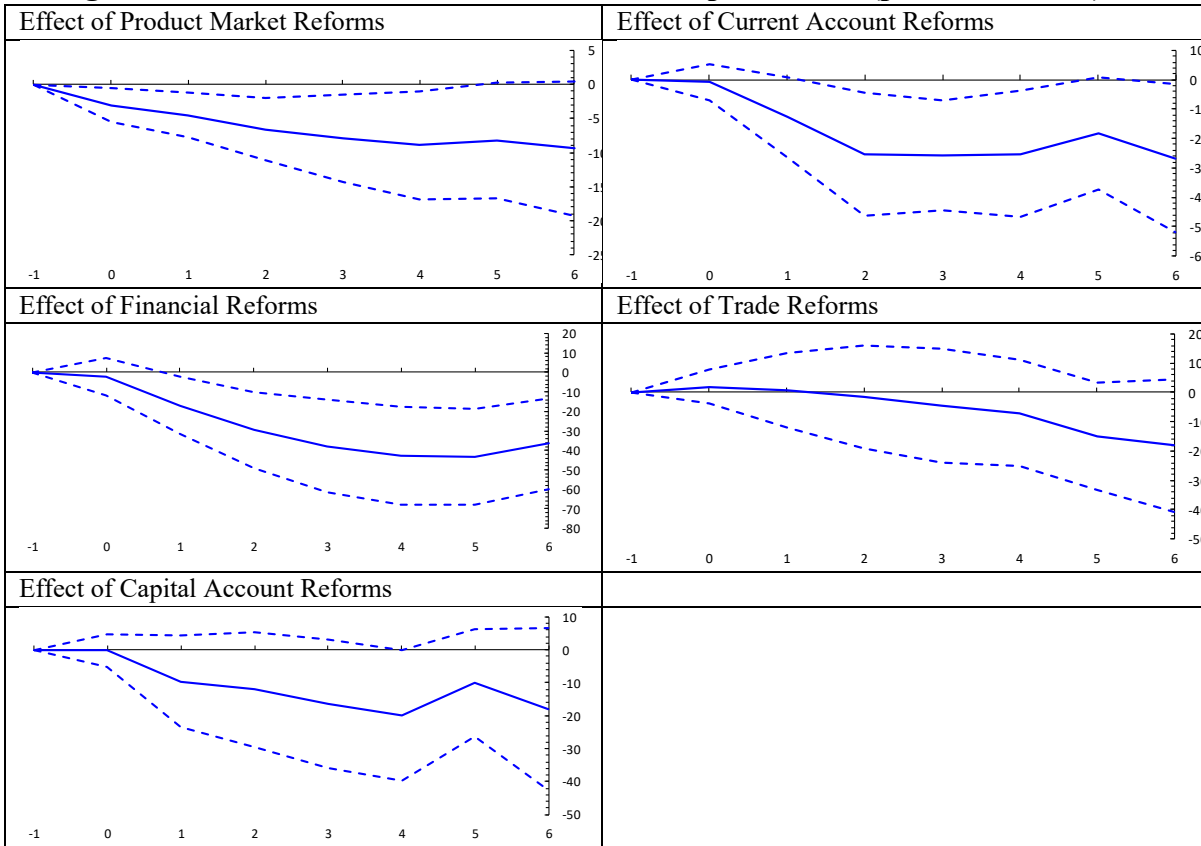
Figure 3.a The Effect of Structural Reforms on real output growth (%)
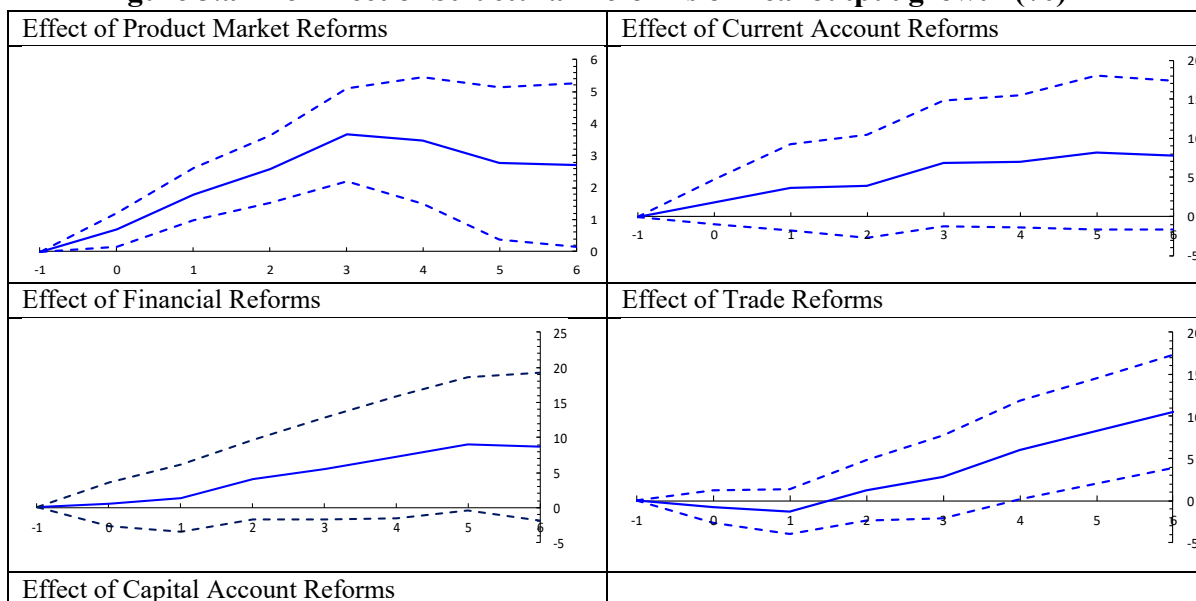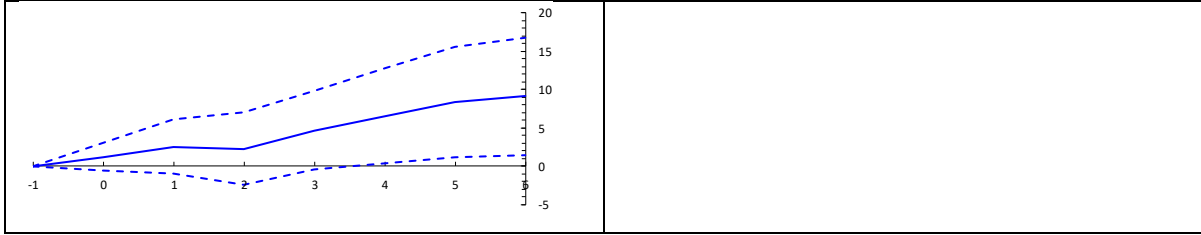
10

Note: estimates based on equation (1). Solid line denotes the real output growth effect of reforms. Dotted lines indicate 90 percent confidence interval based on standard errors clustered at country level.

Figure 3.b The Effect of Structural Reforms on public debt (percent of GDP)

Effect of Product Market Reforms	Effect of Current Account Reforms

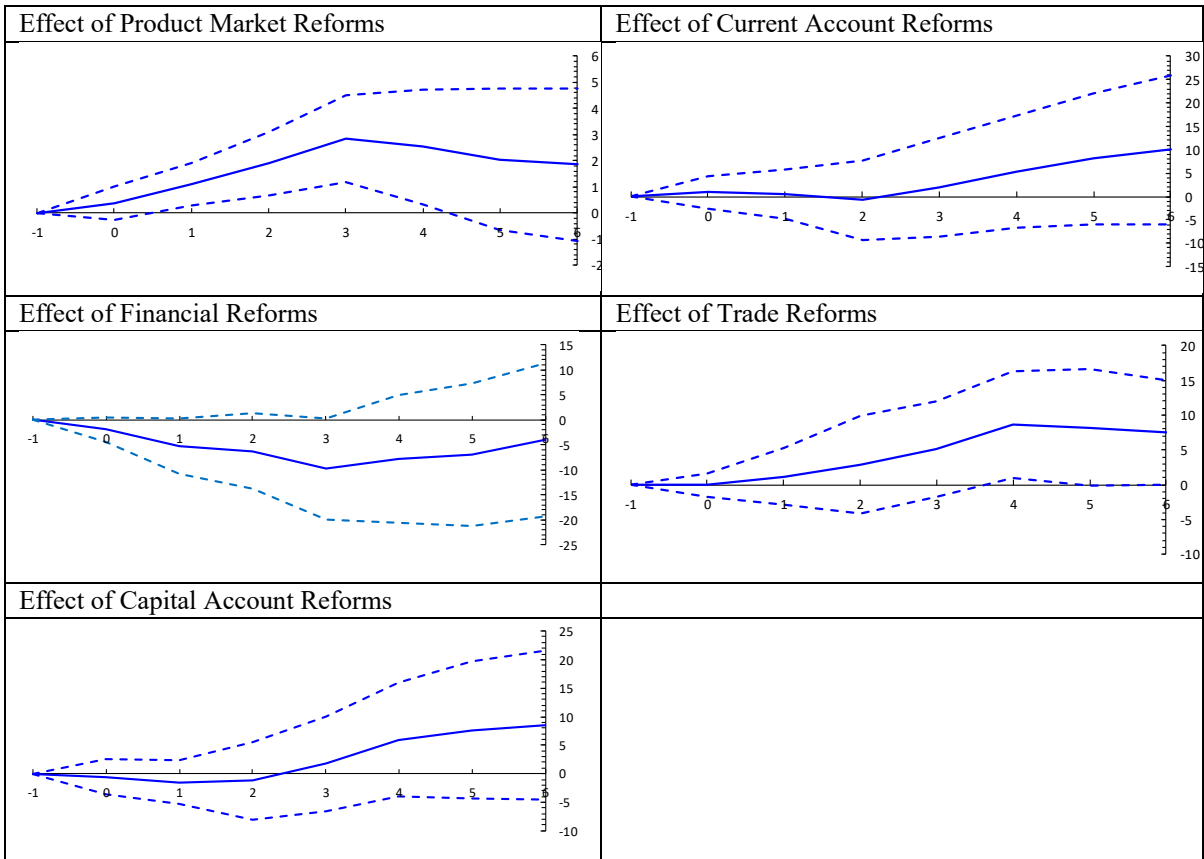| Effect of Financial Reforms	Effect of Trade Reforms

Effect of Capital Account Reforms	

Note: estimates based on equation (1). Solid line denotes the public debt effect of reforms. Dotted lines indicate 90 percent confidence interval based on standard errors clustered at country level.

The previous set of effects mask, however, considerable variation depending on the income group under scrutiny, as shown by the OLS separate estimation of equation (1) for advanced economies and developing countries, reported in Figures 4a-d. On the one hand, financial reforms seem to negatively affect advanced economies' output (even though the effect is imprecisely estimated as the time horizon increases) – Figure 4.a. Both trade and product market reforms yield a statistically significant positive response of output. On the other hand, capital account, current account, trade and product market reforms are associated with a decline in the debt ratio in the medium term. In developing countries, both financial and product market reforms positively
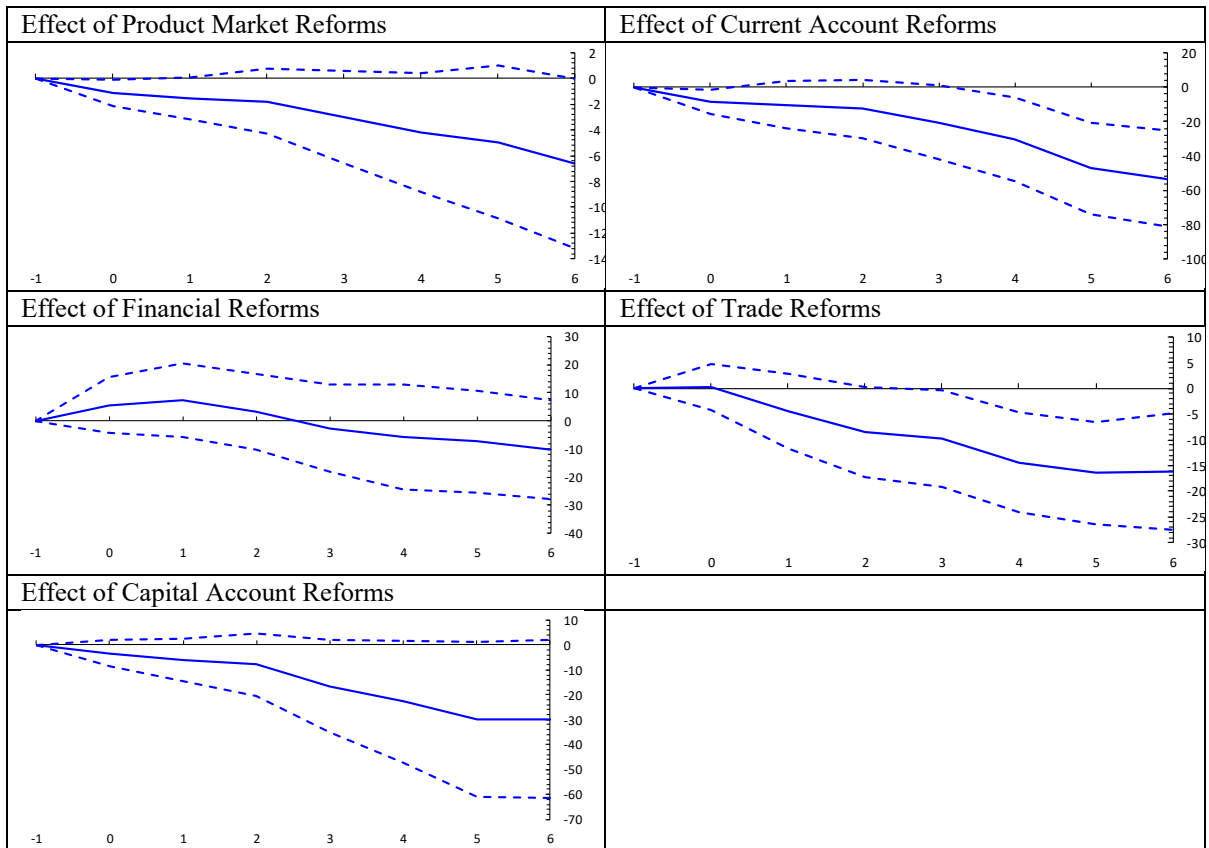
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impact output in these economies (Figure 4.c). In this group of countries, only financial and product market reforms contribute to lower the debt ratio in the medium term (Figure 4.d).

Figure 4.a The Effect of Structural Reforms on real output growth (%), Advanced Economies

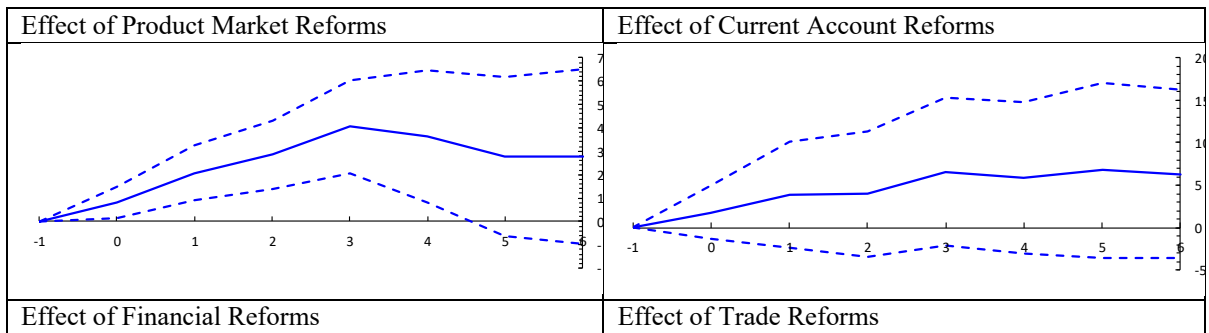| Effect of Product Market Reforms	Effect of Current Account Reforms
Effect of Financial Reforms	Effect of Trade Reforms
Effect of Capital Account Reforms	

Note: estimates based on equation (1). Solid line denotes the real output growth effect of reforms. Dotted lines indicate 90 percent confidence interval based on standard errors clustered at country level.

Figure 4.b The Effect of Structural Reforms on public debt (percent of GDP) (%), Advanced Economies

Effect of Product Market Reforms	Effect of Current Account Reforms

Effect of Financial Reforms	Effect of Trade Reforms

Effect of Capital Account Reforms	

Note: estimates based on equation (1). Solid line denotes the public debt effect of reforms. Dotted lines indicate 90 percent confidence interval based on standard errors clustered at country level.

Figure 4.c The Effect of Structural Reforms on real output growth (%), Developing countries

Effect of Product Market Reforms	Effect of Current Account Reforms

Effect of Financial Reforms	Effect of Trade Reforms

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Effect of Capital Account Reforms

Note: estimates based on equation (1). Solid line denotes the real output growth effect of reforms. Dotted lines indicate 90 percent confidence interval based on standard errors clustered at country level.
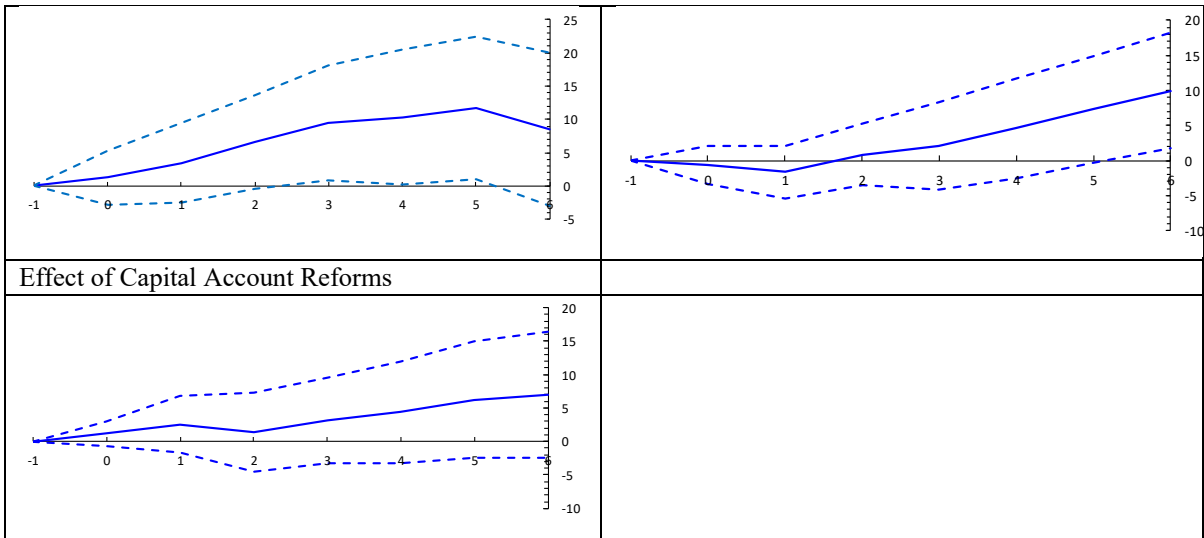
Figure 4.d The Effect of Structural Reforms on public debt (percent of GDP) (%), Developing countries

Effect of Product Market Reforms	Effect of Current Account Reforms

Effect of Financial Reforms	Effect of Trade Reforms

Effect of Capital Account Reforms

Note: estimates based on equation (1). Solid line denotes the public debt effect of reforms. Dotted lines indicate 90 percent confidence interval based on standard errors clustered at country level.
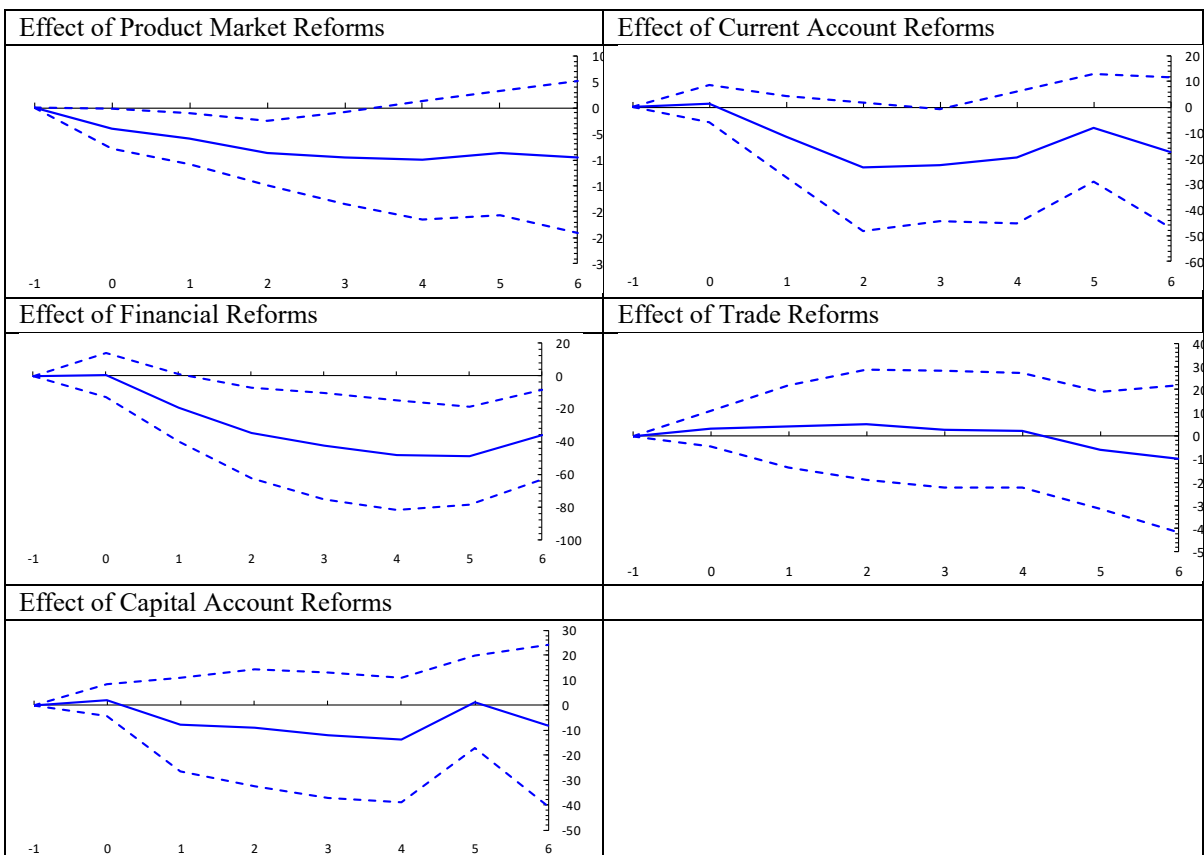
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4.2 Robustness Checks
Omitted Variable Bias

The previous analysis considers the impact of structural reforms one at a time, raising potential concerns about omitted variables—reforms could be carried out across different areas at the same time. We re-estimate our main regression equation (1) by including reforms in all areas simultaneously. [13] Figure 5 shows the effects on public debt and confirms that such augmentation of the vector of controls does not change the basic thrust of our results.[14]

Figure 5. The Effect of Structural Reforms on public debt (percent of GDP), controlling for reforms in all other areas
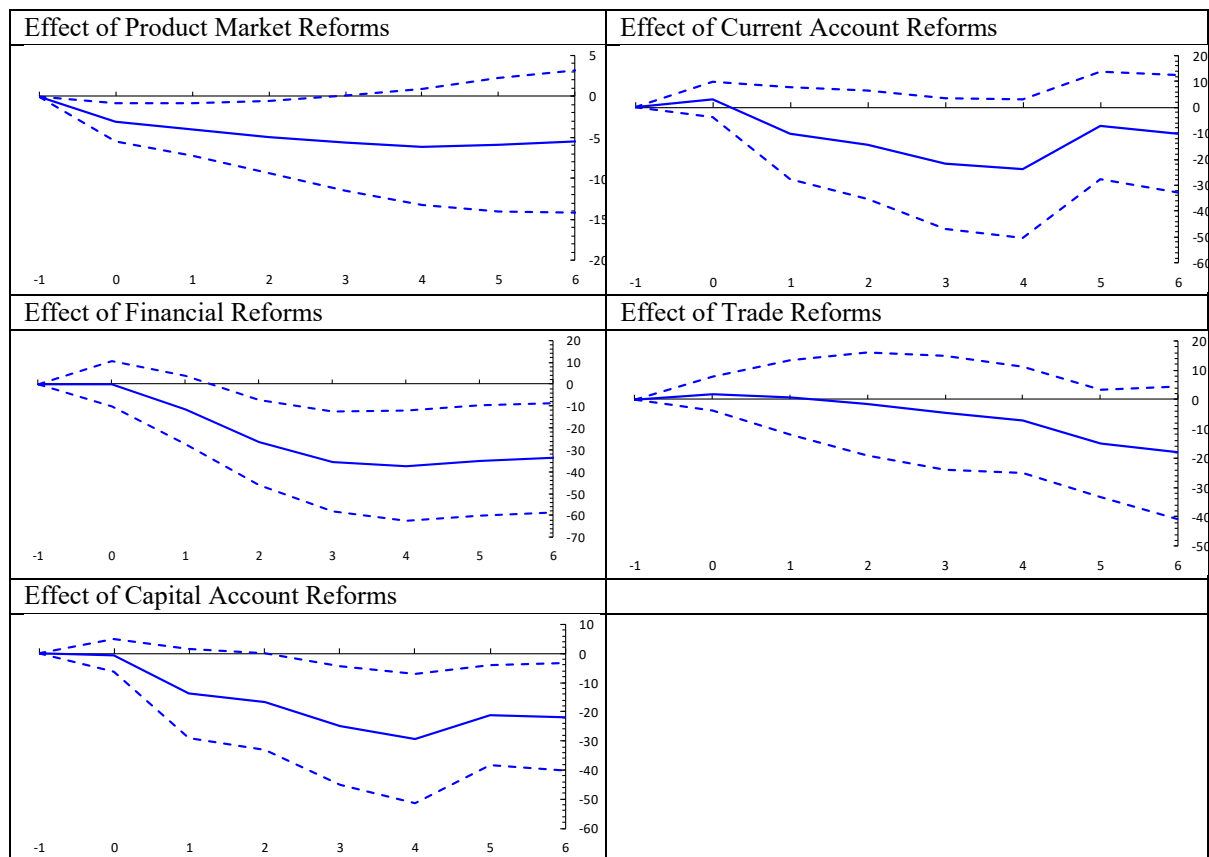
Note: estimates based on equation (1). Solid line denotes the public debt effect of reforms. Dotted lines indicate 90 percent confidence interval based on standard errors clustered at country level.

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[13] The vector $X_{i,t}$ in equation (1) was augmented to include up to two lags of all other reforms.

[14] Estimates could also be biased in the event of reform reversals (i.e. tightening or major tightening). In practice, however, this bias is negligible, as there are only a very few such cases as illustrated in Table 1. Furthermore, the results are robust to focusing exclusively on reform episodes (and excluding reform reversals).

Controlling for Growth Expectations

A possible concern regarding the analysis is that the probability of structural reform is influenced not only by past economic growth (IMF, 2016), but also by expectations of future growth. However, this is unlikely to be a major issue, given the long lags associated with the implementation of structural reforms and that information about future growth is likely to be largely embedded in past economic activity. Most important, controlling for expectations of current and future growth (to address potential reverse causality) delivers results that are very similar to, and not statistically significantly different from, those reported earlier (Figure 6).

Figure 6. The Effect of Structural Reforms on public debt (percent of GDP) controlling for growth expectations
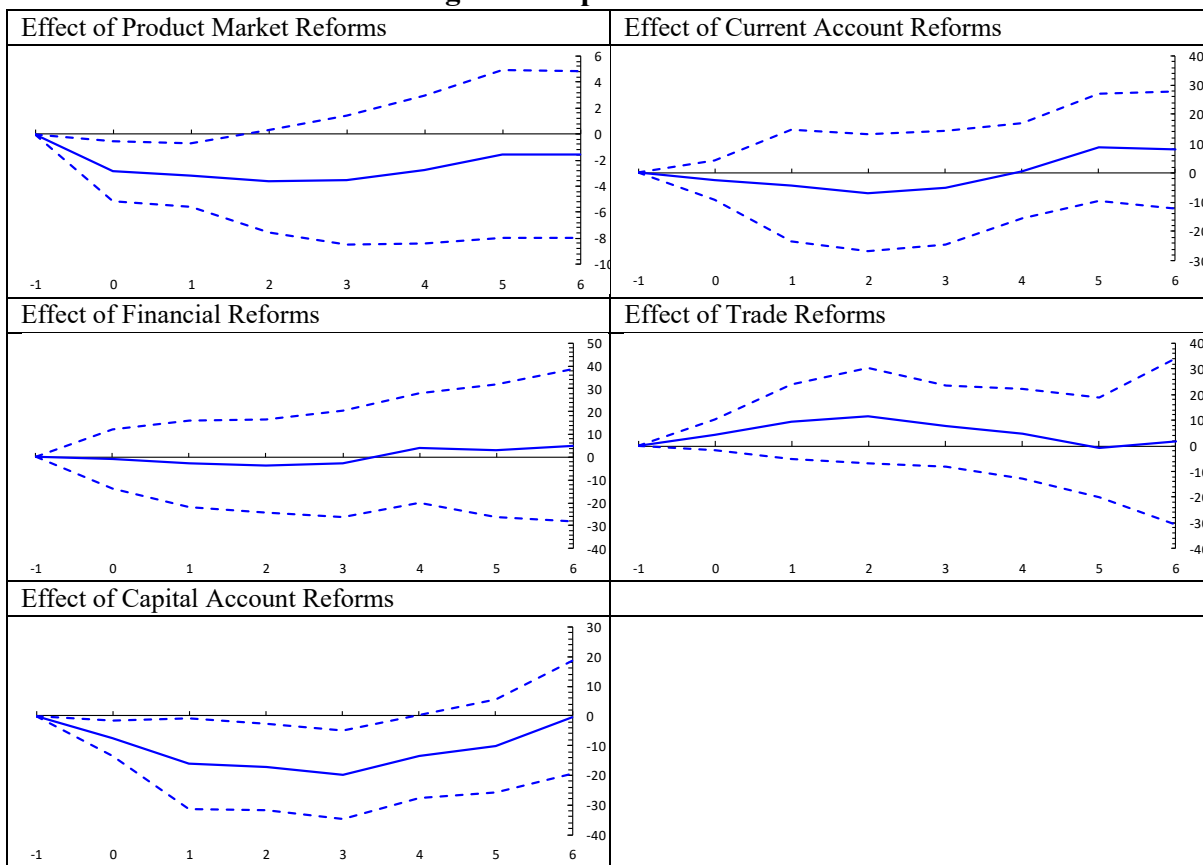
Note: estimates based on equation (1). Solid line denotes the public debt effect of reforms. Dotted lines indicate 90 percent confidence interval based on standard errors clustered at country level.

Instrumental Variables

Even though, as discussed earlier, we believe that our empirical set-up addresses endogeneity concerns, we still check the robustness of our results to an IV approach that instruments our structural reform indicators. The literature has put forward several theories to rationalize why and when reforms (do not) happen. We focus on one main broad factor examined in the literature:

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political institutions (see Duval, Furceri and Miethe (2018) for a recent contribution). Specifically, we use the following set of political economy variables as external instruments which we divide in four categories. First, we focus on ideology of the governing party/ies and we use discrete variables to distinguish between left, center and right (3, 2 and 1, respectively) (*Parties*).[15] Second, we investigate the importance of political system, by exploring whether reforms happened more often in the context of parliamentary, assembly-elected or presidential form of governments (using discrete variables: 2, 1 and 0, respectively) (*System*).[16] Third, we consider the role of party fragmentation and use a continuous variable bounded between 0 (no fragmentation) and 1 (maximum fragmentation) to capture the number of political parties in the lower house of the legislative assembly (*Fragmentation*).[17] Fourth, we investigate whether reforms are more likely to happen in an environment characterized by stronger democratic institutions (measured as polity IV and normalized between 0 and 1) (*Democ*).[18] Data on these variables are taken from the World Bank Database of Political Institutions.

By means of a two-stage least squares estimator, we re-estimate equation (1) using up to two lags of the four political economy exogenous instruments described above. To check the validity of our instruments and assess the strength of our identification, we rely on the Kleibergen-Paap and Hansen statistics. The underidentification test tests that the excluded instruments are "relevant" (meaning correlated with the endogenous regressors). Our obtained statistics generally reject the null that the different equations are unidentified (Stock-Yogo critical values were applied). Then the Hansen test statistics reveal that the instrument sets contain valid instruments (i.e., uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation) is not rejected. The results reported in Figure 7 are similar to, and not statistically different from those obtained using OLS, confirming that endogeneity is not a serious concern in our set-up.

Figure 7. The Effect of Structural Reforms on public debt (percent of GDP), Instrumental Variables

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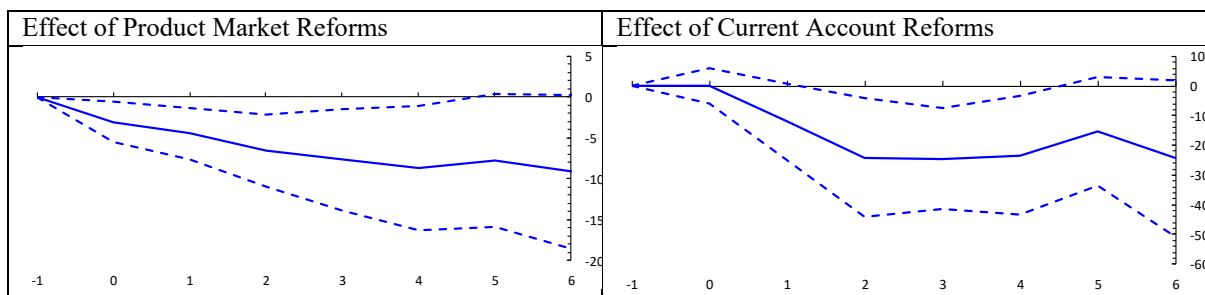
[15] Right-wing governments are more conductive to market-oriented reforms (Alesina and Roubini, 1992).

[16] Persson (2002) argues that in countries with presidential forms of government reforms face less effective opposition to implement reforms than in countries with a parliamentary system.

[17] In countries where with higher political fragmentation the government may find it more difficult to implement reforms (Haggard and Webb, 1994; Roubini and Sachs 1989).

[18] while democracy can hinder reforms if special interests prevail on the general welfare, democratic rulers are typically more sensitive to the interest of the public, and so more prone to implement reforms that benefit a large shar of the population (Giuliano et al., 2013).

Effect of Financial Reforms	Effect of Trade Reforms

Effect of Capital Account Reforms	

Note: estimates based on equation (1) with a two-stage least squares estimator. Instruments used comprised on four political economy variables (up to their second lag) – see main text for details. Solid line denotes the public debt effect of reforms. Dotted lines indicate 90 percent confidence interval based on standard errors clustered at country level.
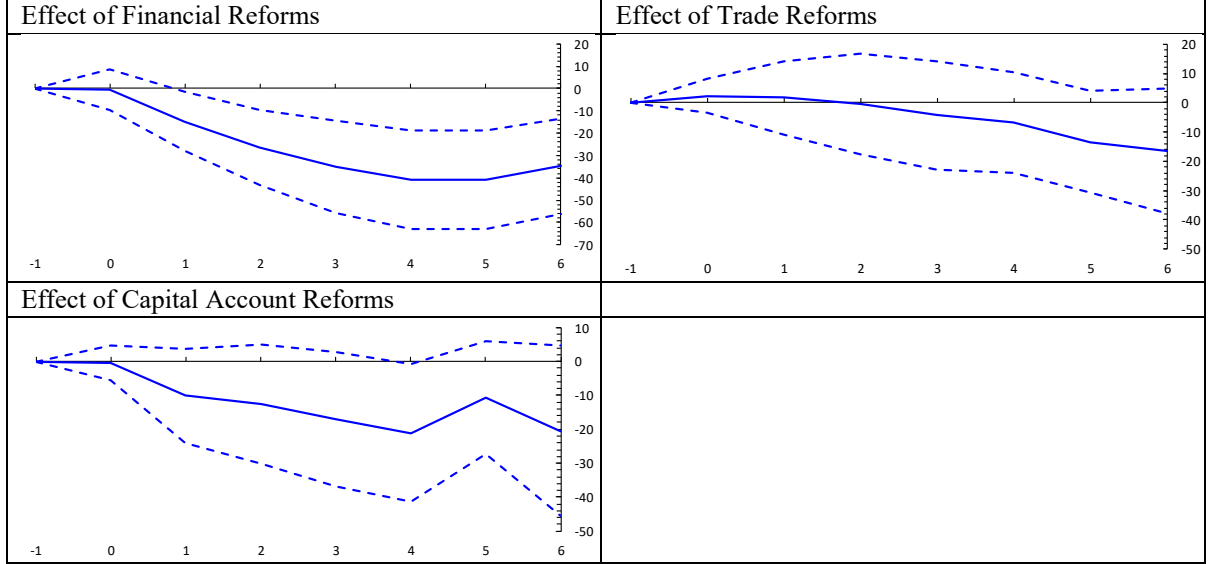
4.3 Non-Linearities

In this subsection we explore non-linearities since it is likely that the initial level of public indebtedness affects the magnitude of the response of structural reforms. In our second regression specification, the dynamic response is allowed to vary with the initial level of public debt-to-GDP ratio:

$$y_{i,t+k} - y_{i,t-1} = \alpha_i + \mu_t + \beta_k^L F(z_{i,t-1})R_{i,t} + \beta_k^H (1 - F(z_{i,t-1}))R_{i,t} + \theta M_{i,t} + \varepsilon_{i,t} \qquad (2)$$

with

$$F(z_{it-1}) = \frac{\exp(-\gamma z_{it-1})}{1+\exp(-\gamma z_{it-1})}, \quad \gamma > 0$$

in which z_{it} is an indicator of the initial level of public indebtedness (proxied by the public debt-to-GDP ratio) of the economy normalized to have zero mean and unit variance. F_{it} is a smooth transition function used to estimate the impact of reform shocks in low indebted versus high indebted countries. We set $\gamma = 1$. M is the same set of control variables used in the baseline specification, but now including also two lags of $F(z_{i,t-1})$. As before, Equation (2) is estimated using OLS for each k=0,..,6 with robust standard errors clustered at the country level and impulse response functions are computed using the estimated coefficients β_k.

This approach is equivalent to the smooth transition autoregressive model developed by Granger and Terävistra (1993). The advantage of this approach is twofold. First, compared with a model in which each dependent variable would be interacted with a measure of the level of

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public indebtedness, it permits a direct test of whether the effect of reforms varies across different regimes such as low and high initial debt. Second, compared with estimating structural vector autoregressions for each regime it allows the effect of reforms to change smoothly by considering a continuum of states to compute the impulse response functions, thus making the response more stable and precise.

Looking at Figure 8, we can observe that financial and product market reforms increase debt for low indebtedness levels, but decrease it if prior to enacting a reform, countries are characterized by high indebtedness. In the case of trade reforms, these have the largest impact (in terms of decreasing public debt) at low initial indebtedness levels. For the remaining reforms responses are surrounded by some (mild) degree of uncertainty.

Figure 8. The Effect of Structural Reforms on public debt (percent of GDP) depending on initial indebtedness level
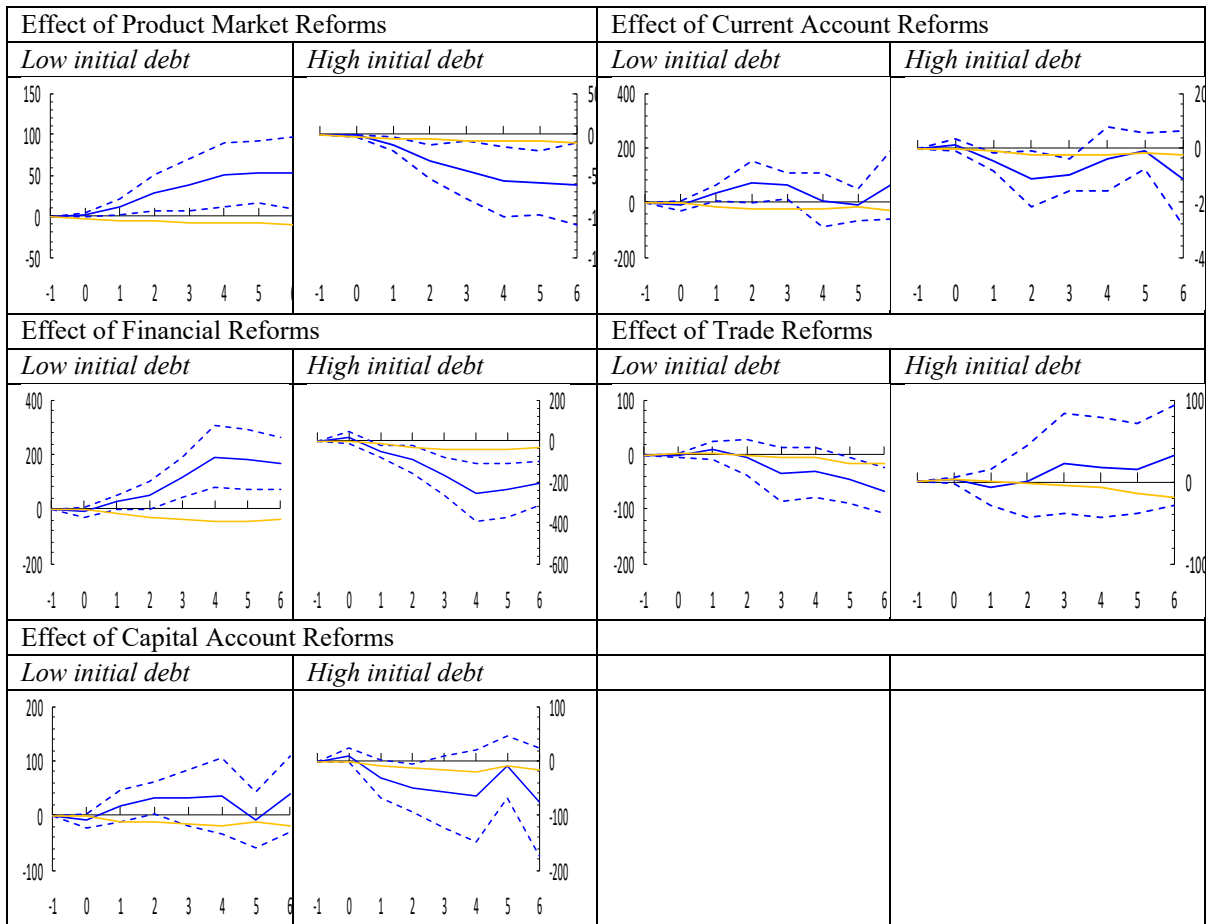
Note: estimates based on equation (2). Effects under low (high) initial indebtedness level are shown here using F=0 (F=1). Solid line denotes the public debt effect of reforms. Solid yellow line denotes the unconditional (baseline) public debt effect of reforms. Solid blue line denotes the conditional public debt effect of reforms. Dotted lines indicate 90 percent confidence interval based on standard errors clustered at country level.

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4.4 Channels

In order to understand what drives the responses of the public debt-to-GDP ratio, we carry out a debt decomposition analysis. Equation (3) provides the standard equation for decomposing debt changes (see Escolano, 2010 for further details).

$$d_T - d_0 = \sum_{t=1}^{T} \frac{r_t - G_t}{1+G_t} d_{t-1} + \sum_{t=1}^{T} p_t + \sum_{t=1}^{T} s_t \tag{3}$$

$$d_T - d_0 = \sum_{t=1}^{T} \frac{r_t}{1+G_t} d_{t-1} - \sum_{t=1}^{T} \frac{\pi_t}{1+G_t} d_{t-1} - \sum_{t=1}^{T} \frac{g_t}{1+g_t} d_{t-1} + \sum_{t=1}^{T} p_t + \sum_{t=1}^{T} s_t \tag{4}$$

Equation (3) states that the total episode change in the debt-to-GDP ratio ($d_T - d_0$) is the sum of three components: (i) the product of the lagged debt ratio (d_{t-1}) and the differential between the nominal effective interest rate on debt (r_t) and the nominal output growth rate (G_t), cumulated over the episode years; (ii) the cumulative primary deficit to GDP (p_t); and (iii) a cumulative stock-flow adjustment (s_t) that captures valuation effects and "below-the-line" fiscal operations, as well as errors and omissions. Equation (4) decomposes the interest rate growth differential ($\frac{r_t - G_t}{1+G_t}$) further into the contributions from nominal effective interest rate, the growth rate of the GDP deflator (π_t), and real output growth (g_t). In what follows we will focus on the responses of structural reforms on nominal output growth (denominator effect), on nominal public debt (numerator effect) and on prices (price effect).

In Figure 9.a we can see that financial, current account and product market reforms lead to a fall in nominal debt levels, while other reforms do not seem to have a statistically significant impact on the numerator of the ratio. As far as the denominator is concerned, Figure 9.b shows that financial and current account reforms lead of a medium-term decline in nominal GDP growth. Finally, financial, capital and current account reforms contribute to a fall in the general price index (Figure 9.c).

Figure 9.a The Effect of Structural Reforms on nominal public debt (%)

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Effect of Capital Account Reforms
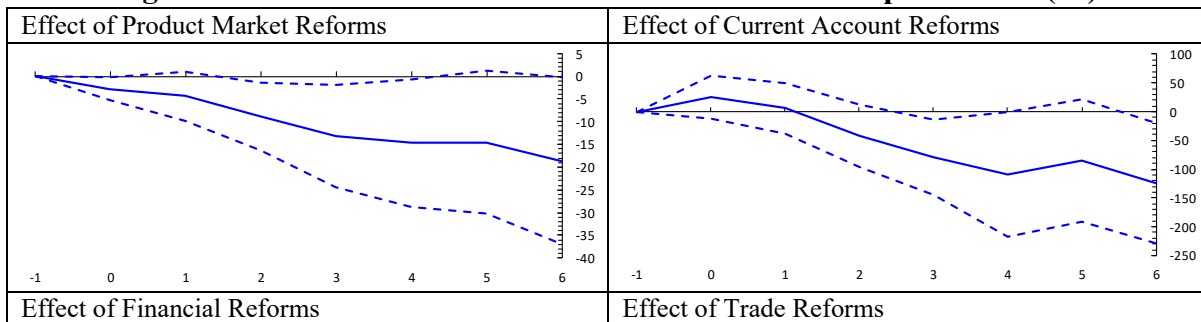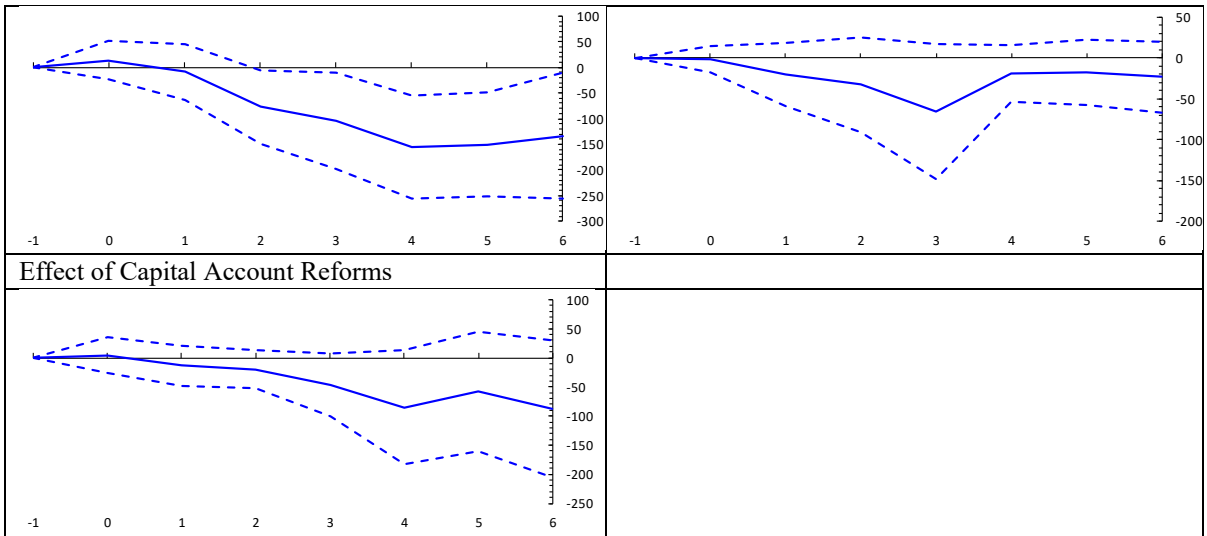
Note: estimates based on equation (1). Solid line denotes the nominal public debt effect of reforms. Dotted lines indicate 90 percent confidence interval based on standard errors clustered at country level.

Figure 9.b The Effect of Structural Reforms on nominal output growth (%)

Effect of Product Market Reforms

Effect of Current Account Reforms

Effect of Financial Reforms

Effect of Trade Reforms

Effect of Capital Account Reforms
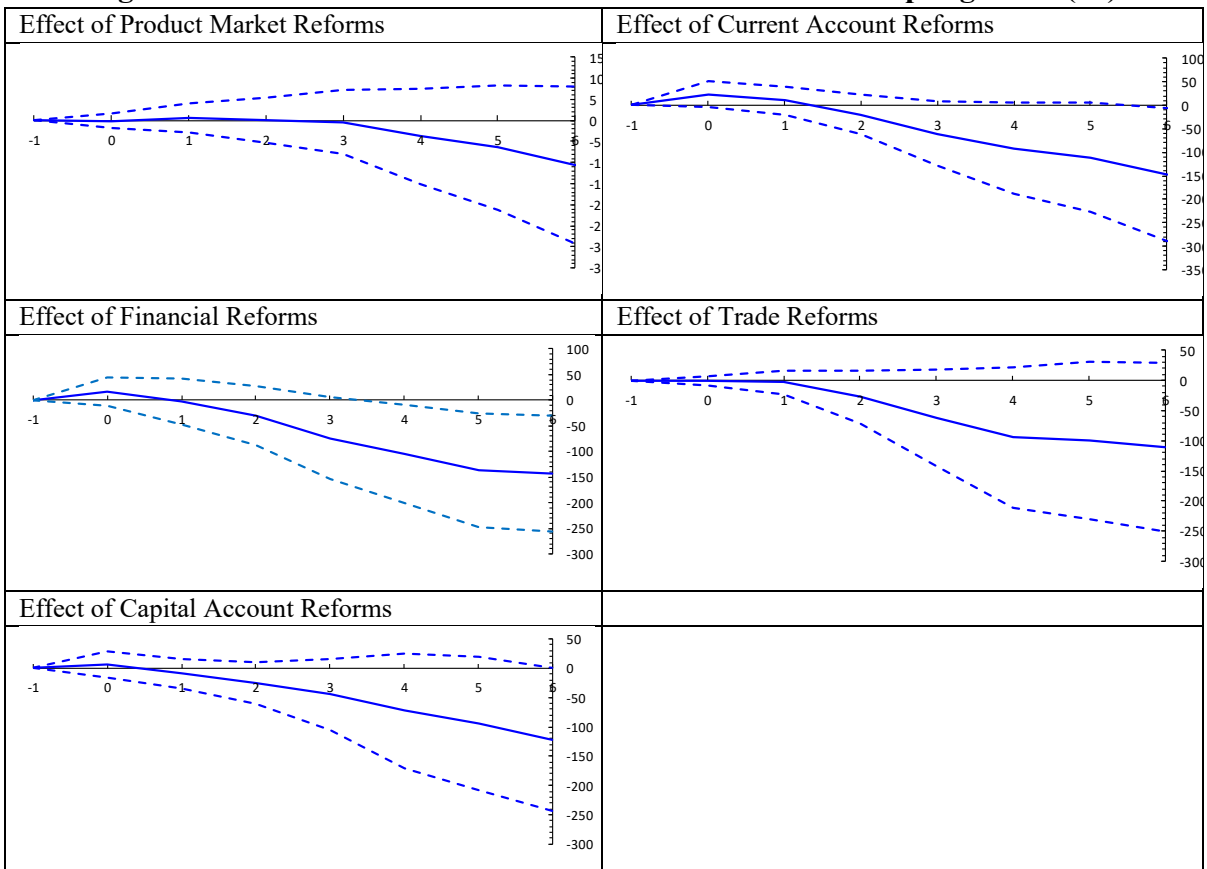
Note: estimates based on equation (1). Solid line denotes the nominal GDP effect of reforms. Dotted lines indicate 90 percent confidence interval based on standard errors clustered at country level.

Figure 9.c The Effect of Structural Reforms on prices (%)

Effect of Product Market Reforms	Effect of Current Account Reforms

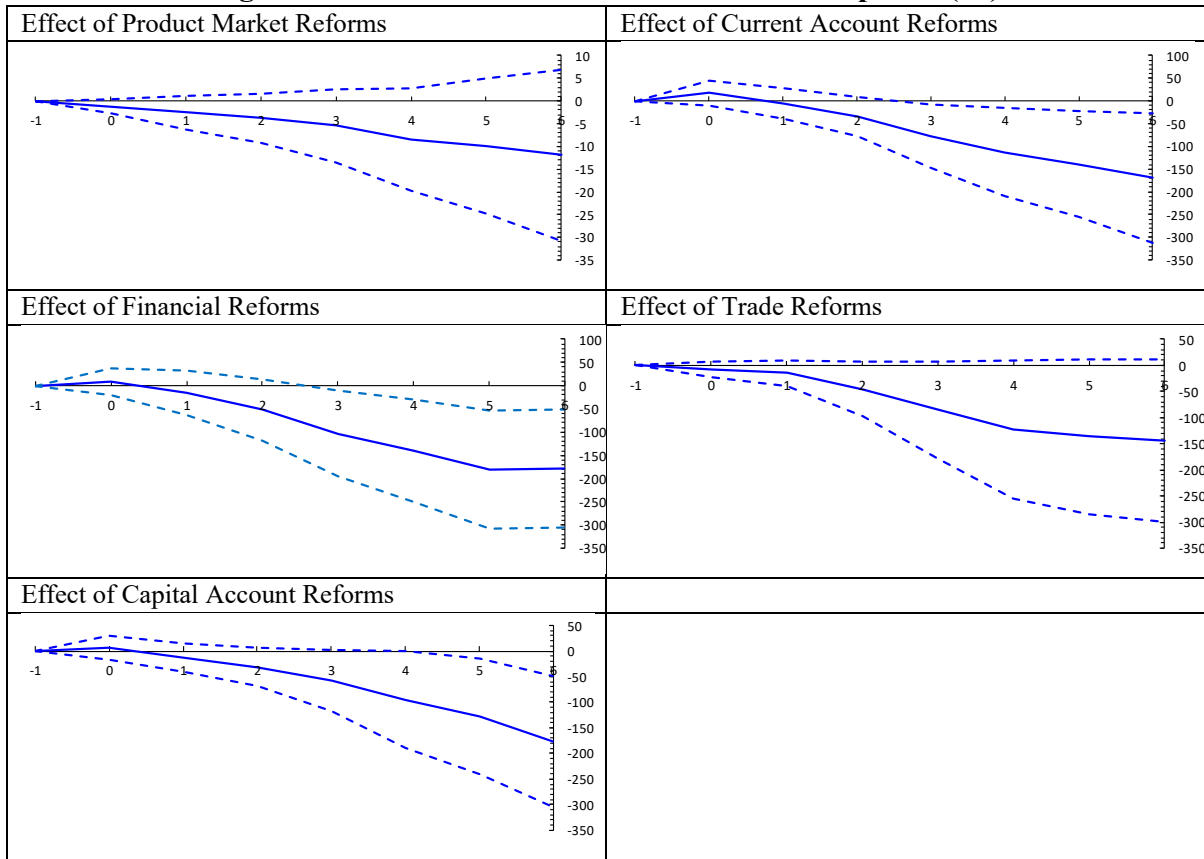| Effect of Financial Reforms	Effect of Trade Reforms

Effect of Capital Account Reforms	

Note: estimates based on equation (1). Solid line denotes the change in prices effect of reforms. Dotted lines indicate 90 percent confidence interval based on standard errors clustered at country level.

5. Conclusion

This paper estimated the short-term impact of structural reforms in different policy areas on output and public debt-to-GDP ratio applying a local projection method to a new dataset of major reforms in advanced and developing economies spanning over four decades.

Our results show that over the medium term—that is, four to six years after the reform takes place—financial reforms, positively affect output in the medium term and they also contribute to lower the debt-to-GDP ratio. Output also positively reacts to reforms in capital accounts, trade and product markets, while the debt ratio seems to contract following current account and product market reforms. Initial indebtedness conditions at the time of the reform matter: financial and product market reforms increase debt for low indebtedness levels, but decrease it if countries are characterized by high indebtedness. Our results are robust to a battery of sensitivity checks, including the inclusion of all reforms simultaneously, controlling for current and future growth expectations (to address potential reverse causality) and to an instrumental variables approach.

The empirical results should be treated with care: the set of structural reforms considered have often been accompanied by other fiscal and monetary measures that cannot be fully controlled for in the analysis. Moreover, the empirical estimates capture the average historical impact of major

reforms on a proxy of fiscal sustainability. As such, they do not explicitly account for inherent uncertainty and cross-country heterogeneity regarding key variables (for example, fiscal multipliers, government funding costs, etc.). Furthermore, our empirical analysis of the impact of structural reforms on fiscal sustainability suffers from an inevitable problem of self-selection bias: the reforms observed are only those that have not been blocked in the political process. However, many reforms projects may have been blocked exactly because of their (short-term direct) budgetary impact, but the analysis does not take into account of that. All in all, while some generalizations can be made in what concerns the link between structural reforms and fiscal sustainability in the short to medium-term, caution is warranted as there is no one size fits all.

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Figure A1. The Effect of Structural Reforms on public debt using lagged GDP as denominator (a la Auerbach and Gorodnichenko, 2017)
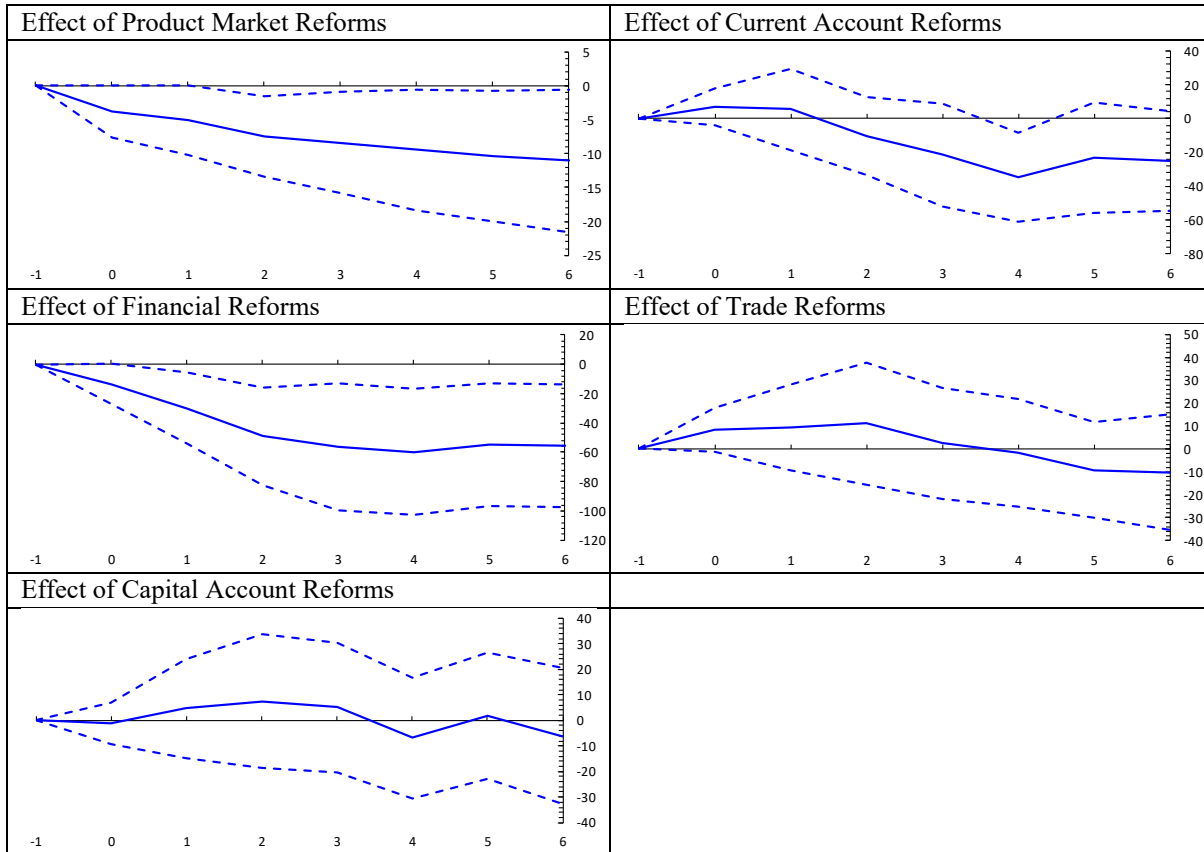
Note: estimates based on equation (1). Solid line denotes the public debt effect of reforms. Dotted lines indicate 90 percent confidence interval based on standard errors clustered at country level.

Table A1. Summary Statistics

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Public debt-to-GDP ratio	5515	51.28	36.52	0	246.17
Real GDP growth	5510	3.76	5.10	-96.95	71.53
Inflation rate	5467	9.40	18.40	-129.93	477.48
Financial reforms	2809	0.01	0.04	-0.28	0.33
Capital account reforms	2805	0.01	0.06	-0.50	0.50
Current account reforms	2805	0.01	0.06	-0.69	0.50
Trade reforms	2385	0.01	0.06	-0.64	0.84
Product market reforms	2809	0.02	0.14	-1	1.5
Growth expectations	3323	4.27	3.64	-6.32	122.59
Parties	4784	1.24	1.25	0	3
System	4844	0.83	0.95	0	2
Fractionalization	4256	0.79	0.27	0.02	1
Democ	4600	4.98	4.18	0	10

Country Coverage

Advanced economies	Emerging markets		Low-income countries
Australia	Albania	Namibia	Bangladesh
Austria	Algeria	Pakistan	Bolivia
Belgium	Argentina	Paraguay	Burkina Faso
Canada	Azerbaijan	Peru	Cameroon
Czech Republic	Belarus	Philippines	Côte d'Ivoire
Denmark	Botswana	Poland	Ethiopia
Estonia	Brazil	Romania	Ghana
Finland	Bulgaria	Russia	Kenya
France	Chile	South Africa	Kyrgyz Republic
Germany	China	Sri Lanka	Lesotho
Greece	Colombia	Swaziland	Madagascar
Hong Kong SAR	Costa Rica	Thailand	Malawi
Ireland	Dominican Republic	Tunisia	Mozambique
Israel	Ecuador	Turkey	Nepal
Italy	Egypt	Ukraine	Nicaragua
Japan	El Salvador	Uruguay	Nigeria
Korea	Georgia	Venezuela	Senegal
Latvia	Guatemala		Tanzania
Netherlands	Hungary		Uganda
New Zealand	India		Uzbekistan
Norway	Indonesia		Vietnam
Portugal	Jamaica		Zambia
Singapore	Jordan		Zimbabwe
Spain	Kazakhstan		
Sweden	Lithuania		
Switzerland	Malaysia		
United Kingdom	Mexico		
United States	Morocco		

Source: Ostry et al. (2009)