

# Economic Uncertainty and Structural Reforms\*

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## Abstract

Does economic uncertainty promote the implementation of structural reforms? We answer this question using one of the most exhaustive cross-country panel data set on reforms in six major areas and measuring economic uncertainty with stock market volatility. To address endogeneity concerns, we propose various identification strategies, instrumenting uncertainty with world shocks to volatility and with natural disasters, political coups and revolutions. Across all specifications, we find that uncertainty has a positive and significant effect on the adoption of reforms. This result is robust to the inclusion of a large number of controls, such as political variables, economic variables, crisis indicators, and a host of country, reform and time fixed effects.

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## 1 INTRODUCTION

The Great Recession has been accompanied by an enormous increase in macroeconomic volatility, which has stimulated a new literature on how uncertainty impacts economic activity and especially investment decisions (e.g., see Bloom, 2009 and 2014). Despite the growing attention of both economists and policy makers on the topic, little effort has been devoted to studying the effect of uncertainty on public choices. Such an omission is unfortunate, because the recent crisis has also exposed the urge for structural reforms. The aim of this paper is to fill this gap, namely, to investigate empirically the effect of economic uncertainty on the adoption of structural reforms.

Why governments often fail to adopt reforms even when they are believed to be needed and welfare-improving is one of the fundamental questions in political economy. For instance, although most economists tend to agree that promoting product market competition, providing free access to markets and reducing public debt are often essential to preserve economic growth, the extent to which such measures are adopted varies enormously across countries. While the literature has identified several explanations for an anti-reform bias, with many of them placing distributional conflict as the cornerstone, until now the role of economic uncertainty has received little attention. As a result, existing theories often lack sharp predictions.

In some instances, uncertainty can be an obstacle to the adoption of reforms. For example, uncertainty about the distribution of costs and benefits may lead to a *status quo* bias (e.g., Fernandez and Rodrik, 1991) or to a war of attrition between parties resulting in inefficient delays (Alesina and Drazen, 1991). Other theories suggest that the opposite result may also hold. For example, more noise can sometimes improve agency problems and this insight has recently been used by Bonfiglioli and Gancia (2013) to show that economic uncertainty can alleviate political myopia. The argument is that in times of turmoil re-election depends more on luck rather than political actions, thereby leaving the government freer to invest in reforms whose short-run costs are more visible than their future payoffs. On the empirical side, while there is some evidence that uncertainty discourages private investment, little is known about its effect on public investment and policy. Although there is some consensus that reforms are more likely to occur during times of crisis (e.g., Tommasi and Velasco, 1996, Alesina, Ardagna and Trebbi, 2006, and Ranciere and Tornell, 2015) and that recessions are associated with higher uncertainty, there is to date no attempt to isolate empirically the effect of the latter.

In this paper, we use one of the most exhaustive cross-country panel dataset on reforms together with recent measures of macroeconomic uncertainty and various identification strategies to show that economic uncertainty promotes the implementation of structural

reforms. As in Giuliano, Mishra and Spilimbergo (2013), we define a reform as an increase in deregulation indices available in six areas: domestic financial sector, capital account, product markets, agriculture, trade, and current account transactions. One advantage of focusing on these structural reforms is that they are not affected by automatic stabilizers, which react directly to fluctuations in income. Following a rapidly-expanding literature (e.g., Bloom, 2014), we proxy macroeconomic uncertainty with stock market volatility, built whenever possible from daily data. The resulting dataset spans 6 reforms in 56 countries with yearly observations over the period 1973-2006.

As a preliminary step, we show that economic uncertainty is positively and significantly correlated to the adoption of reforms and that this finding is robust to the inclusion of a large number of controls such as political variables, economic variables, crisis indicators, and a host of country, reform and time fixed effects. Moreover, we show that the results do not depend crucially on any specific subset of the six reform areas, and they are robust to using more stringent definitions of reforms. Next, we propose several identification strategies to tackle the issue of the potential endogeneity of our measure of uncertainty. First, to isolate world shocks that are unlikely to be affected by the adoption of reforms in a single country, we instrument uncertainty in a given country with average stock market volatility in the rest of the sample. Second, we follow Baker and Bloom (2013) in using natural disasters, political coups, revolutions and terrorist attacks as instruments for uncertainty. Finally, since a concern may still remain that these shocks are not entirely exogenous or may affect directly policy choices in a given country, we also instrument uncertainty using disasters and political unrest shocks in the rest of the sample. In all cases, the first-stage regressions indicate that our instruments are strong predictors of stock market volatility and the over-identification tests find no evidence to reject them. The second-stage results confirm the initial finding that economic uncertainty, measured by stock market volatility, promotes the adoption of structural reform.

We continue the analysis with some additional robustness checks. In particular, we show our results to hold if we focus on a country average of the six reforms, if we add further controls capturing the cycle and economic growth, and if we account for the adoption of reforms in other countries of the same geographical area. Moreover, the effect of uncertainty is driven neither by the waves of reforms in EU countries nor by those in Central and Eastern European Countries.

Next, we investigate further aspects of the relationship between uncertainty and reforms that can shed more light on the underlying mechanism. First, we study how our results depend on information frictions. We find that the positive effect of uncertainty on the implementation of reforms is weaker in countries with better quality of information, as measured by newspaper circulation. Second, we explore the role of electoral motives. We find

that volatility has a stronger impact on reforms in countries that do not impose a limit to the number of terms in office, i.e., where electoral motives are stronger. Third, we compare the effects of alternative proxies for uncertainty. While measures of economic volatility are robustly associated to reforms, indicators that may be driven more by policy uncertainty are not. Fourth, we show that economic volatility promotes liberalizations (i.e., a positive change in the deregulation indexes) and not their reversals (i.e., a negative change in the deregulation indexes). Finally, we find that volatility has no effect on social reforms such as the softening of abortion laws. While not conclusive, these pieces of evidence are consistent with agency models in which economic shocks mask the electoral costs of liberalizations.

The remainder of the paper is organized as follows. In section 2 we review the existing theoretical and empirical literature on reforms and uncertainty. In section 3, we describe the data and our identification strategies. In section 4, we present the empirical results, including robustness tests and an investigation of the mechanism. Section 5 concludes.

## 2 ECONOMIC UNCERTAINTY AND REFORMS: A LOOK AT THE LITERATURE

The literature on the political economy of reforms is vast and summarizing it goes beyond the scope of this section.<sup>1</sup> Rather, we briefly discuss some of the main theoretical channels through which economic uncertainty may affect the incentives to implement reforms and then review the existing empirical evidence.

### 2.1 THEORY

The term “reform” usually refers to a major change in policy, and common examples of structural reforms are liberalization of markets for goods or services and changes in the regulatory environment. Even when considered welfare improving, reforms are often difficult to implement because of the unequal distribution of their costs and benefits. The costs may arise from relative price changes, implying adjustment costs, transitional unemployment and redistribution of income between different agents in the society. Frequently, the time profile is also troubling, with costs being paid up-front and benefits accruing with time (see Tommasi and Velasco, 1996, for a more extensive discussion). In the absence of efficient compensation and incentive schemes, the conflict of interest between winners and loser or between voters and policy makers can lead to institutional inertia. In such settings, how does economic uncertainty affect the political viability of reforms? Since existing theories often do not answer explicitly this question, we now use some of the leading approaches to discuss possible effects of uncertainty.

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<sup>1</sup>See Tommasi and Velasco (1996) and Drazen (2000) for some surveys.

There are several reasons why uncertainty may block or delay the adoption of reforms. In the influential paper by Fernandez and Rodrik (1991), uncertainty regarding the distribution of gains and losses of a policy change may lead to a *status quo* bias. Similarly, aggregate uncertainty about the economic effects of reforms may make gradualism more appealing, this leading to slow adoption of reforms. Although in these cases uncertainty is about the consequences of reforms rather than on the state of the economy, it may be difficult to distinguish the two.

Alesina and Drazen (1991) have instead shown that reforms may be postponed due to a war of attrition between two groups in the society with veto power. The key assumption is that each group would like to charge to the other a larger fraction of the adjustment cost, but is uncertain about the evaluation of this cost by the other group. The passage of time is needed to reveal who is stronger, since the group with the higher cost of waiting will concede first. In this model, uncertainty may delay the resolution of the war of attrition, if it regards the relative strength of the two groups. On the contrary, negative economic shocks, which could be more likely in turbulent times, may anticipate the reform by increasing the cost of waiting. Thus, the model predicts that crises, rather than economic volatility per se, can trigger reforms.<sup>2</sup> Finally, Alesina and Cukierman (1990) have shown that uncertainty allows the politicians to follow their most preferred policy, even at the expenses of voters, and this may explain why some reforms that would benefit the society at large are not implemented.

The notion that uncertainty can facilitate economic reforms is not commonly found in the literature. There are however instances in which uncertainty may alleviate agency problems (e.g., Dewatripont, Jewitt and Tirole, 1999, Holmström, 1999, and Prat, 2005). Building on this insight, Bonfiglioli and Gancia (2013) show that uncertainty can promote the adoption of reforms in a model in which elections serve the purpose of selecting the most competent politicians. As in Rogoff (1990), information frictions prevent citizens from perfectly disentangling the economic effect of competence, reforms and exogenous shocks. The second key premise is that reforms have short-run costs and future benefits. These assumptions imply that the costs of reforms are more visible than the benefits thereby inducing an incumbent politician to underinvest in reforms in an attempt to appear competent and increase his probability to stay in power. Higher economic uncertainty makes this probability depend more on luck rather than political actions and hence reduces the myopic, or “opportunistic”, bias against reforms.

The model formalizes the idea that politicians perceive a political cost at implementing welfare-improving but unpopular reforms. It is also consistent with the observations that

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<sup>2</sup>Drazen (2000) discusses other reasons why reforms may be more likely in periods of crisis. See also Ranciere and Tornell (2015). A recent literature has also shown that (adverse) economic shocks may speed up the transition towards more democratic political regimes (e.g., Acemoglu and Robinson, 2006).

the probability that a government is replaced depends on economic conditions, but not on reforms.<sup>3</sup> It is important to stress that the model does not require reforms to be unobservable, but only the milder assumption that citizens cannot fully separate the true cost of a reform from the effect of the competence of the politician undertaking it.<sup>4</sup> Yet, since the agency problem does depend on informational asymmetries, the model predicts the impact of uncertainty to be stronger if citizens are less informed. We demonstrate these results in the Appendix, where we present a simplified version of the model.

Economic uncertainty may promote reforms also through other channels. For example, although we are not aware of explicit formalizations, it is conceivable that aggregate volatility reduces the support for the status quo. Or it could be that economic uncertainty signals the need for economic reforms. In light of this, our primary goal in this paper is to establish if there is any significant relationship between economic uncertainty and reforms. Nevertheless, we will also explore further aspects of this relationship that may help to shed light on the possible explanations.

## 2.2 EVIDENCE

There is a large literature on the empirical determinants of reforms. Although many papers have studied how various economic conditions affect the likelihood of the adoption of reforms, the role of uncertainty has received so far little attention. After reviewing the experiences of developing countries with market-oriented reforms, Tommasi and Velasco (1996) argue that there is a broad consensus in favor of the hypothesis that crises facilitate economic reforms. Recent evidence by Ranciere and Tornell (2015) shows that trade liberalization, as measured by the Sachs and Warner (1995) index, tends to follow periods of severe crises. Systematic empirical work (see, among others, Alesina and Ardagna, 1998, Drazen and Easterly, 2001, Hamann and Prati, 2002) confirm that the adoption of stabilization plans aimed at reducing inflation, government deficit and the black market premium, is more likely in periods when inflation, deficit and black market premium are particularly high. Moreover, Alesina, Ardagna and Trebbi (2006) provide evidence from a large panel of countries that fiscal reforms are more likely to occur during times of inflationary and budgetary crisis, when new governments take office and when governments are “strong.” On the other hand, Mian, Sufi and Trebbi (2014) show that crises may hinder the adoption of financial reforms by

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<sup>3</sup>Since citizens are rational, the equilibrium choice of reform is known. For evidence that reelection probability is not negatively affected by reforms see Peltzman (1992), Alesina, Perotti and Tavares (1998), Alesina et al. (2013) and Brender and Drazen (2008).

<sup>4</sup>Also, although Bonfiglioli and Gancia (2013) develop the argument using a model of democratic elections, the logic can be applied to systems where a politically powerful group can oust an under-performing incumbent.

raising polarization, which weakens incumbent governments.<sup>5</sup>

Although crisis and volatility are typically correlated, there is almost no evidence on the relationship between reforms and economic uncertainty. The only exception is Bonfiglioli and Gancia (2013), who find preliminary evidence that economic uncertainty, measured by the standard deviation of the output gap, is positively correlated with deficit stabilization in a panel of 20 OECD countries observed between 1975 and 2000. However, their analysis is limited to a restricted sample, one indicator of reform only, and provides no evidence on causality.

Other political variables that have been found to be associated with more reforms include the presence of left-wing governments (e.g., Alesina, Ardagna and Trebbi, 2006, Bonfiglioli and Gancia, 2013), and democracy (e.g., Giavazzi and Tabellini, 2005, and Giuliano, Mishra and Spilimbergo, 2013). We contribute to this literature by separating for the first time the effect of economic uncertainty from that of crises, and offering various empirical strategies to identify causality. We do so using a relatively new and extensive dataset on structural reforms and controlling for the economic and political variables usually considered in previous work.

### 3 DATA AND EMPIRICAL STRATEGY

In this section, we describe first the data, with special emphasis on the indicators of structural reforms and on our proxy for economic uncertainty, and then the empirical strategy.

#### 3.1 MEASURING STRUCTURAL REFORMS AND ECONOMIC UNCERTAINTY

We base the empirical analysis on two recent datasets which provide useful information for measuring structural reforms and economic uncertainty. For structural reforms, we rely on data that were collected and codified by the Research Department of the IMF, and consist of regulation indices covering six sectors. In particular, these indices are available for the domestic financial sector and the external capital account, for trade and the current account, and for product markets and agriculture. These measures are available for 150 countries with annual observations between 1960 and 2006.

The indices of regulation, from which we derive our measures of reforms, are constructed as means or sums of a series of subindices, aimed at capturing the extent of regulation of a sector in different respects. As in Prati, Onorato and Papageorgiou (2012) and Giuliano, Mishra and Spilimbergo (2013), we normalize all indices between 0 and 1, with one corre-

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<sup>5</sup>Other papers (see Broz, Duru and Frieden, 2016 and Forbes and Klein, 2015) show that governments often react to balance-of-payment crises by imposing restrictions to capital flows and trade, and that this may depend on the visibility of the costs of such policies.

sponding to the maximum level of liberalization, and measure structural reforms for each sector as the annual change in its index. Since the values of these variables increase with the degree of de-regulation, hereafter, we refer to them as liberalization indices. In the Appendix, we provide a description of the liberalization index of each sector, along with the other variables used in the analysis. Here, we report some of the aspects that are taken into account when compiling the indices, and refer to Ostry, Prati and Spilimbergo (2009) for more details.<sup>6</sup>

The index for *domestic finance* takes into account restrictions imposed to banks in setting interest rates, amounts and conditions on credit, and in opening branches; the presence of government ownership of banks; and the quality of bank supervision. It also assesses the policies put in place to develop stock, bond and securities markets and to encourage access of foreign actors in these markets.

The *capital account* index captures the degree of controls and restrictions imposed to residents and non-residents when borrowing or lending across the border, and to firms doing Foreign Direct Investment in the country.

The index for *trade* is based on actual, or imputed, average tariff rates and captures the degree of restrictions applied to imports. It takes value zero if tariffs are above 60 per cent.

The *current account* index measures restrictions imposed on the proceeds from international transactions (both imports and exports) in goods and services that may be visible and invisible (e.g., finance). It therefore captures additional regulations to trade.

The index for *product market* focuses on the electricity and telcom sectors, and assesses to what extent these are competitive and free of the direct control of the government. For instance, it contains subindices taking into account the extent of privatizations, the regulatory power of the government and the degree of competition in the electricity wholesale market and in the local telecom services.

As regards *agriculture*, the index captures the degree of government regulation in the market for the main agricultural export commodities of the country (e.g., wheat, soybeans and cotton for the US or coffee and sugar for Brazil).

Liberalizations in all these sectors are widely considered to be beneficial by economists, since they are believed to improve efficiency and promote economic growth. Yet, these reforms often find harsh resistance. For instance, opponents of financial deregulation argue that it may induce excessive risk taking and may lead to a costly restructuring of the banking system. Among the downsides of trade liberalizations, reallocations and job losses are often mentioned. Privatization are often blamed to have a regressive distributive impact and lead to job losses and lower wages. In all cases, the potential costs are often much more visible

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<sup>6</sup>In particular, we use the data made publicly available by Prati, Onorato and Papageorgiou (2012).



than the expected benefits for the society at large, which often take the form of future economic growth.

Following the recent literature started by Bloom (2009), we take the volatility of stock market returns, reflecting the variability in investors' expectations over sales of firms, as our preferred measure of economic uncertainty. Since we are interested in uncertainty about macroeconomic conditions, we proxy it with the volatility of returns on the overall stock market index. In particular, we use the data compiled by Baker and Bloom (2013), which cover a sample of 60 countries with daily observations of stock market indices from 1973 to 2012. The series we use is computed as the standard deviation of daily returns on the stock market index over non-overlapping quarters. For better cross-country comparability, stock market indices are taken from the same source, the Global Financial Database. In case daily data are not available (for seven countries in the early 80s and 90s), weekly or monthly observations are used instead. In the analysis, we take annual averages of quarterly observations. More details on the construction of this variable is provided in Baker and Bloom (2013). In Section 4.4, we will introduce alternative measures of uncertainty such as the volatility of the exchange rate and of the bond yield, and the standard deviation of GDP growth.

After merging these datasets, we are left with a sample of 56 developed, emerging and developing countries, with annual observations between 1973 and 2006, and data on structural reforms in 6 sectors. This means that, after excluding missing data, our dataset contains an unbalanced panel of about 6700 observations. The annual change in the liberalization index is different from zero in nearly 30 per cent of the observed sector-country-year triplets (about 7 per cent negative and 23 per cent positive). Reforms may take place over more than a year: out of 1771 reform observations, 450 correspond to reforms taking place over at least two consecutive years (non-zero changes for at least two consecutive years) and 174 to reforms spanning at least three consecutive years.

Table 1 reports some statistics on the liberalization indices in our sample. As shown in the first column, there are between 1043 and 1169 country-year observations for each index. The sectors related to international markets integration (trade, current and capital account) are on average the least regulated ones, while the most regulated is the product market, as column 2 suggests. Yet, the latter, joint with domestic finance, is the sector that experienced the largest de-regulations between 1973 and 2006, as shown in column 6. The right-hand panel of Table 1 reports pairwise correlations between liberalization indices, which are all positive and significant at 1 per cent level.

### 3.2 EMPIRICAL STRATEGY

We perform the analysis on sector-country-year observations. This approach allows us to fully exploit the information contained in our rich dataset to estimate the overall relationship between uncertainty and reforms.

We define reform (*reform*) in sector  $s$ , country  $c$  and year  $t$  as the annual change in the liberalization index (*lib*):

$$reform_{s,c,t} = lib_{s,c,t} - lib_{s,c,t-1}.$$

For *reform* we estimate, with various methodologies, the following equation:

$$reform_{s,c,t} = \beta_1 lib_{s,c,t-1} + \beta_2 vol_{c,t-1} + \beta_3 \mathbf{X}_{c,t-1} + \eta_{s,c} + \eta_t + \epsilon_{s,c,t}, \quad (1)$$

where  $vol_{c,t-1}$  is stock market volatility and  $\mathbf{X}_{c,t-1}$  a vector of control variables observed in country  $c$  in year  $t - 1$ ,  $\eta_{s,c}$  is a sector-country specific fixed effect and  $\eta_t$  a year fixed effect. In addition to  $vol_{c,t-1}$ , we always include  $lib_{s,c,t-1}$  and sector-country fixed effects, and gradually add controls and year fixed effects.

The lagged liberalization index is aimed to account for the fact that initial conditions may affect the benefits and costs of reforms. For instance, the benefits of liberalization may be perceived as higher when starting from a higher degree of regulation, which would lead to convergence ( $\beta_1 < 0$ ). Alternatively, the cost in terms of rents may be higher in presence of higher regulation, thereby making liberalization more difficult and inducing divergence ( $\beta_1 > 0$ ). Its inclusion also helps comparability with the empirical literature on both structural and fiscal reforms, where this term is standard.

Sector-country fixed effects make sure that the estimated coefficients do not suffer from country and sector specific omitted variables, for instance because, for unknown reasons, more volatile countries systematically adopt more reforms, possibly in a certain sector. Their inclusion means that coefficients are estimated out of the time variation within each country and sector. Year fixed effects account for common factors that in a given period may have induced all countries to adopt reforms. Note that volatility is typically highly correlated across countries and hence might be confounded with a year specific component. Therefore, to estimate  $\beta_2$ , we consider specifications with and without year fixed effects.

Note also that, as in Giuliano, Mishra and Spilimbergo (2013) and to maximize power, the specification in equation (1) imposes the coefficients for country-specific variables on the right-hand side to be the same for all reforms. Given the strong positive correlations between indices reported in Table 1, this assumption does not seem too restrictive. Moreover, we will show that there is little evidence for heterogeneous effects across different reform areas and that results are similar when using country averages.

### 3.2.1 Estimation Methods and Identification Strategies

We start by estimating equation (1) with OLS. To account for persistence in the regulation index at yearly frequency, we allow the  $\epsilon_{s,c,t}$  residuals to be autocorrelated of order one as follows:

$$\epsilon_{s,c,t} = \rho\epsilon_{s,c,t-1} + u_{s,c,t},$$

with  $\rho \in (0, 1)$  estimated from the data, and  $u_{s,c,t}$  white noise. As an alternative, given that  $vol_{c,t-1}$  does not vary across sectors, we cluster the residuals at the country level.<sup>7</sup>

Next, we recognize that, although volatility enters with one lag, the estimates for  $\beta_2$  may not capture a causal link from uncertainty to reforms. Volatility may be higher in the year prior to the adoption of reforms due to the expectations generated by the political debate over the design and approval of the reform itself. This would induce reverse causality. Alternatively, other factors, missing in our specifications, may affect in the same direction both volatility and reforms, thereby generating an omitted variable bias. To identify causality in this relationship, we follow three alternative instrumental variable strategies. In particular, we estimate with two-stage least squares equation (1) plus the following ancillary equation for volatility:

$$vol_{c,t-1} = \gamma\mathbf{Z}_{c,t-1} + \nu_c + \nu_{t-1} + \varepsilon_{c,t-1}, \quad (2)$$

where  $\mathbf{Z}$  is an instrument (or a vector thereof).

First, we build on the well-known result in the finance literature that stock market volatility is correlated across countries, and especially so when volatility is high (see for instance, King and Wadhvani, 1990, Rigobon and Forbes, 2002 and Bonfiglioli and Favero, 2005). This suggests that there may be some common component driving volatility in all countries, which is most likely independent of the political debate over reforms that is taking place in each single country, and makes world volatility a good instrument for country-specific volatility. We therefore instrument  $vol_{c,t-1}$  with the average volatility observed in  $t-1$  in all countries but  $c$ , weighted by their real GDP per capita.<sup>8</sup> This allows us to take into account that shocks to Wall Street are internationally more relevant than equally sized shocks to the stock exchange in Istanbul, for instance.

As an alternative set of instruments for stock market volatility, we borrow from Baker and Bloom (2013) four indicators capturing exogenous events such as natural disasters, political shocks, and terroristic attacks. All indicators are constructed as dummies accounting for the occurrence of (at least) a shock in a given country and quarter, weighted by a measure

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<sup>7</sup>Clustering the residuals at the sector-country level does not affect the results significantly.

<sup>8</sup>The results are virtually unchanged if we weight volatility by total GDP or by the bilateral trade share of each country in the rest of the sample.

of attention devoted by world media to the country around the day of the shock. We take annual averages for these indicators. The dummies for the occurrence of shocks are coded as follows.

*Natural disasters.* This dummy takes value 1 if any of the extreme events, such as major earthquakes, recorded by the Center on Epidemiology of Disasters (apart from industrial and transportation accidents) occurred during the quarter.

*Political shocks.* Two dummies accounting for political shocks, depending on the actors involved and their motives, are coded based on data from the Center for Systemic Peace (CPS), Integrated Network for Societal Conflict Research. *Coups* takes value one if the executive authority is seized through force or military action by an opposition group within the government. *Revolutions* takes value one if revolutionary wars or violent uprising occur, whereby politically organized groups within the country seek to overthrow the government.

*Terroristic Attacks.* This dummy takes value one in case of a terrorist bombing resulting in more than 15 deaths, as coded by the CSP, High Casualty Terrorist Bombing list.

The measure of media coverage is compiled based on information contained in the Google News Archives. In particular, Baker and Bloom (2013) count how many articles cite a certain country (coverage) in the 15 days before it suffers a shock and in the following 15 days, and construct their weight as the percentage change in the coverage before and after. We refer to Baker and Bloom (2013) for more details on the construction of these instruments.

Finally, we recognize that, while natural disasters are certainly exogenous with respect to structural reforms, political shocks and terroristic attacks, may be endogenous to economic and political conditions in a country. To address this concern, we isolate the world component of volatility by using as a third set of instruments the average shocks occurred in the rest of the sample, weighted by real GDP per capita. On the one hand, it is highly implausible that events in a single country can affect the average occurrence of disaster and unrest shocks in the rest of the world. On the other hand, although these foreign shocks are an important determinant of economic uncertainty in a country, they are unlikely to have a direct effect on the choice of reforms in that country.

### 3.2.2 Other Controls

Following the empirical literature on reforms, we include three groups of control variables. First, we consider four salient features of the political system, next we account for four types of crisis episodes, and finally we include three indicators of economic development.

*Political controls.* We control for the degree of democracy using the polity2 index from the Polity IV database, which takes values between -10 (high autocracy) and 10 (high democracy). We normalize the index so that high autocracy scores zero and high democracy one.

Given the results in Giuliano, Mishra and Spilimbergo (2013), we expect this variable to enter with a positive sign in our regressions. The ideology of the ruling party may also affect the adoption of reforms, as pointed out by Cukierman and Tommasi (1998), among others. Hence, we control for a dummy taking value 1 if the party leading the government has a left-wing orientation with respect to economic policy, as coded by the World Bank in the Database on Political Institution (DPI). Presidential systems are argued to be better suited to overcome the resistance of small interest groups and hence to adopt more reforms (see for instance Persson and Tabellini, 2002). Therefore, we include a dummy equal to 1 if the political system is coded as presidential according to the DPI. Finally, to account for the fact that incentives to postpone a costly reform may be particularly strong in the eve of an election, we control for a dummy that equals 1 in years in which a legislative and/or executive election takes place, as recorded by the DPI.

*Economic and financial crises.* It is often argued that crises promote the adoption of reforms by reducing their political cost or increasing the cost of inaction (see for instance Alesina and Drazen, 1991). Alternatively, crises, by reducing the resources available to compensate losers, may make reforms more difficult to adopt. To address these arguments, we include in our regressions four dummies: one for recessions, taking value 1 in years of negative growth rate of real GDP per capita; two dummies indicating the year of the onset of a banking and a currency crises, respectively, as coded by Laeven and Valencia (2012); and another dummy for the year in which a country declared default on sovereign debt.

*Development indicators.* To further control for the first moment of economic conditions and account for the fact that countries at different stages of development may have different incentives to adopt liberalizations, we include the log of real GDP per capita and a dummy that equals 1 if a country, in a given year, is an OECD member. Finally, to take into account that the prospective accession into the European Union (EU) may provide an extra incentive to adopt reforms, we include a dummy that equals 1 at time  $t$  if a country is a member of the EU two years later (i.e., at time  $t + 2$ ).<sup>9</sup>

#### 4 THE EVIDENCE: ECONOMIC UNCERTAINTY AND STRUCTURAL REFORMS

Before proceeding to estimate equation (1), we report in Table 2 pairwise correlations between reforms in each sector and all the covariates described above. Our measure of economic uncertainty stands out as the variable that is most strongly associated with reforms: its unconditional correlations are positive for all sectors, and significant at 1 per cent level for four of them (trade, current account, agriculture and domestic finance).

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<sup>9</sup>We find that the effect of joining the EU is strongest 2 year before accession. However, the results are not very sensitive to changing this time window.

## 4.1 OLS ESTIMATES

Table 3 reports the results from the OLS estimation of equation (1) under the assumption of AR(1) residuals. The first column shows reforms to be positively and significantly correlated with stock market volatility when sector-country fixed effects are accounted for. The second column proves this correlation to be robust to controlling for the initial level of liberalization. The latter enters with a negative and significant coefficient, which suggests that countries and sectors that start highly regulated tend to undergo stronger liberalization reforms. The negative autoregressive coefficient is consistent with previous findings in the empirical literature on reforms and lends support to the view that liberalizations tend to be enacted when they are needed the most.

In columns 3, 4 and 5, we separately add each group of control variables (political, crisis and development indicators) to the specification. The results confirm the significant coefficients for volatility and initial liberalization, and show that democracies, left-wing governments, presidential systems, good economic conditions (log GDP per capita) and prospective EU membership are positively and significantly correlated with structural reforms. On the contrary, the coefficients for all crisis indicators are negative and significant. In column 6, we include all controls, and in column 7 we also add year fixed effects. The coefficients for initial liberalization, volatility, presidential systems, future EU membership and all financial crises remain significant and preserve their sign across all specifications.

The Durbin-Watson statistics (modified as in Bhargava, Franzini and Narendranathan, 1982), reported at the bottom of Table 3, suggest that residuals are mildly autocorrelated, and hence the correction for AR(1) is appropriate.<sup>10</sup> Nevertheless, in Table 4, we repeat the exercise of Table 3 without estimating the autocorrelation coefficients for residuals, but clustering the standard errors at the country level. The coefficient estimates for volatility and initial liberalization do not change much relative to Table 4, neither in size nor in significance. The level of development and future EU membership remain positively and significantly correlated with reforms, while financial crises, especially banking crises and sovereign defaults, preserve their negative coefficients.

Before addressing causality, we consider a number of potential concerns on the definition of our dependent variable and the timing of reforms. First, we assess whether the correlation with volatility varies significantly across reform types, which may imply that imposing common coefficients is a strong restriction. To this end, in Table 5, we re-estimate both with AR(1) residuals and clustered standard errors two specifications including volatility

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<sup>10</sup>The estimated autoregressive coefficients take values between 0.05 and 0.10. Moreover, the critical values for rejecting the null of non-autocorrelated residuals, tabulated by Bhargava, Franzini and Narendranathan (1982) lay between 1.93 and 1.92, given our sample size and number of covariates.

interacted with dummies for five reform types. Columns 1 and 3 only control for lagged liberalization, country-sector and year fixed effects, while columns 2 and 4 include all controls of column 7 of Tables 3 and 4. The results suggest that the estimates for volatility do not vary significantly across reform types, with the only exception of capital account liberalization, which features a lower correlation in two specifications. This might be consistent with the notion that countries may want to restrict capital flows in period of turmoil in the attempt to stabilize financial markets.

Next, we focus on large reforms only. To do so, we construct four alternative versions of the dependent variable. The first two are major reforms, defined as changes in the liberalization index above the median and above the 80th percentile in the sample of all positive reforms. The other two are dummies equal to one when there is a major reform, as defined above. We re-estimate the specifications of column 7 of Tables 3 and 4 for the continuous indicators of major reforms, and perform both probit and logit regressions for the reform dummies including the same controls and fixed effects. We also cluster by country the standard errors from probit specifications. The results reported in Table 6 confirm that volatility is indeed positively correlated both with the intensity and the likelihood of major reforms.<sup>11</sup>

Finally, we recognize that reforms may take more than a year to be completed, and hence the correlation with one-year lagged uncertainty may not fully capture the relationship between the two variables. To address this concern, we control for earlier values of uncertainty and alternatively, we modify the dependent variable to consider consecutive changes in the liberalization index as part of the same reform. In columns 1-4 of Table 7, we replicate the regressions of column 7 of Tables 3 and 4 replacing  $vol_{c,t-1}$  with  $vol_{c,t-2}$  and  $vol_{c,t-3}$ , and show that the correlation with reforms remains positive and significant.<sup>12</sup> In columns 5 and 6, we define the dependent variable as the 3-year change in the liberalization index conditional on a non-zero change in the first year, so that

$$\begin{aligned} reform_{s,c,t} &= lib_{s,c,t+2} - lib_{s,c,t-1} \text{ if } lib_{s,c,t} - lib_{s,c,t-1} \neq 0 \\ reform_{s,c,t+1} &= reform_{s,c,t+2} = 0 \text{ if } lib_{s,c,t} - lib_{s,c,t-1} \neq 0. \end{aligned}$$

The estimates confirm the strong and positive correlation between uncertainty and reforms.

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<sup>11</sup>The specifications in columns 7 and 8 are particularly demanding due to the limited number of country-sector pairs that ever experienced reforms above the 80th percentile over the sample period. This may explain the drop in significance for the coefficient of volatility in the FE probit estimates with clustered residuals (column 7).

<sup>12</sup>In one case the coefficient is significant at 11 per cent.

## 4.2 IV ESTIMATES

The results presented so far show structural reforms to be strongly and positively correlated with economic uncertainty, as measured by past stock market volatility. To identify causality in this relationship, we first instrument volatility of country  $c$  at time  $t - 1$  with the average volatility observed in  $t - 1$  in all countries but  $c$ , weighted by their real GDP per capita, and estimate equations (1)-(2) with two-stage least squares. Columns 1 and 2 of Table 8 report coefficients for the first and second stage, respectively, excluding all controls in  $\mathbf{X}$ , and including country-sector fixed effects (henceforth, the baseline specification). Note that when we instrument country volatility with the average in the rest of the sample we do not include year fixed effects because they would almost entirely capture the variation in the world component of stock market shocks and hence invalidate our identification.

The first-stage coefficient for volatility of the rest of countries is positive, significant and large (indicating a correlation of about 0.6), and the F-test over 500 confirms that our instrument is a statistically relevant one. The second-stage estimates suggest that (instrumented) volatility has a positive and significant effect on reforms. In columns 3 and 4, we repeat the exercise including all controls in the specification (henceforth, the complete one), and obtain similar results both for volatility and initial liberalization. The controls that enter with a significant coefficient are the democracy indicator, the dummy for left-wing governments, the log of real GDP per capita and future EU membership, which correlate positively with reforms, and the dummies for recessions and financial crises, whose signs are negative. The F-test of 270 proves the instrument to be strong even after adding more excluded instruments.

Note that the IV coefficients are higher than the OLS, which suggests the presence of an attenuation bias. There are several possible explanations for this finding. It could be that reforms, even before being enacted, have a stabilizing role on expectations. Another possibility is that liberalizations are more likely to be undertaken by governments who can also instill more confidence and hence reduce volatility in markets. Attenuation bias may also be due to measurement error.

Next, since we found our instrument to be strong and given that we have more observations for the volatility of the rest of the sample than for the country-specific volatility, we exploit this additional information to re-estimate equation (1) with OLS replacing  $vol_{c,t-1}$  with its instrument. Columns 5 and 6 report the results for the baseline and the complete specifications under the assumption of AR(1) residuals, while in columns 7 and 8 we cluster standard errors at the country level. All estimates for volatility in this reduced-form regression are positive and significant, and very close in size to the IV coefficients of columns 2 and 4. Among the other controls, democracy, EU membership and financial crises preserve



their sign and significance as in the previous specifications.

We continue our analysis using as an alternative set of instruments the four indicators of natural disasters, political coups, revolutions, and terroristic attacks proposed by Baker and Bloom (2013). As a final step, we use as a third set of instruments the average shocks in the rest of the sample, weighted by real GDP per capita. This alleviates remaining concerns about endogeneity of some of these domestic shocks as well as the possibility that they may have a direct effect on reforms.

Tables 9 and 10 report the results from the second and first stage, respectively.<sup>13</sup> In columns 1 to 3 of both tables, we estimate our baseline and complete specifications, clustering standard errors by country, and instrumenting a country's stock market volatility with its own shocks, while in columns 4 and 5 we use the instruments from the rest of the sample.<sup>14</sup> First, note that the statistical validity of both sets of instruments is supported by the Kleibergen-Paap F-tests for weak instruments, and by the p-values for the Hansen J-test of overidentifying restrictions. Given that both sets of instruments include natural disasters, which are most likely exogenous and unable to affect policy through other channels than volatility, the fact that the overidentifying restrictions are satisfied is reassuring about the validity of our empirical strategy. Next, turning to second-stage coefficients, we find, once again, that the estimates for volatility are positive and significant throughout all specifications, and that democracy, left-wing governments, recessions, financial crises, real GDP per capita and future EU membership remain significant covariates of reforms. As in the previous case, the IV coefficient is higher than the OLS estimates confirming that the latter suffer from attenuation bias. The first-stage coefficients in Table 10 suggest that political shocks and natural disasters at world level are significant determinants of economic uncertainty, while both domestic and international terrorist attacks have little predictive power. Hence, in the rest of the analysis, we will only instrument volatility with coups, revolutions and natural disasters.<sup>15</sup>

### 4.3 ROBUSTNESS

In this section, we assess the robustness of the effect of economic uncertainty on reforms by adding further controls and splitting the sample by groups of countries. We also investigate

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<sup>13</sup>To save space, we do not report the coefficients for the other covariates, which are, however, available upon request.

<sup>14</sup>As for volatility in the rest of the sample, we do not control for year fixed effect, which would absorb most of the variation in the instruments.

<sup>15</sup>Dropping terrorist attacks from our sets of instruments has no bearings on the estimated coefficients. However, it improves both the F-test for weak instruments (which becomes always greater than 34) and the Hansen J-test for overidentifying restrictions (which becomes always greater than 0.28). Results are available upon request.

more the role of economic volatility and crises, both when included together and in isolation.

First, we re-estimate the complete specifications (both OLS and IV) using as dependent variable the country-average of the six reforms indices, which can be interpreted as a measure of the overall liberalization effort in a country. In doing so, we cannot control anymore for sector-country fixed effects and we lose power. Nonetheless, the results reported in Table 11 show that the coefficients for economic volatility are very similar both in size and significance to those previously found. Also the coefficients for crises and future EU membership maintain their sign and significance.

Furthermore, we notice that the first and second moments of stock market returns may be correlated. Although we already control in various ways for the first moment of economic activity (including GDP and crises), such correlation may still confound the effect of uncertainty with that of the cycle. To account for this possibility, we re-estimate our main specifications controlling also for the average stock-market returns. The results are reported in Table 12. The estimated coefficients show that there is a positive and sometimes significant correlation between reforms and average returns. However, the effect of volatility remains positive and highly significant (at 1 or 5 per cent) in all of them. Note that, once we control for stock market returns, the coefficient for the log of real GDP per capita sometimes changes sign probably due to collinearity.

In Table 13, we further explore the effect of the level of economic activity and crises on reforms using alternative proxies and comparing specifications with and without volatility. Holding average stock market returns in all specifications, in columns 1 and 2 we re-estimate the most complete OLS specification of column 3 of Table 12, and in columns 3 and 4 we replace the recession dummy with the growth rate of GDP per capita. In columns 5 to 8 we repeat the exercise using volatility of the rest of the sample. Throughout all specifications, the coefficients for recession and for GDP growth are small and insignificant. Hence, although volatility and economic downturns are positively correlated, as column 3 in Table 8 suggests, it is the former rather than the latter that seems to have a significant impact on reforms. We still find that banking, currency and sovereign crises tend to be an obstacle to liberalizations, which is consistent with Abiad and Mody (2005) and Mian, Sufi and Trebbi (2014).

To better understand whether the effect of uncertainty is driven by episodes of high volatility coinciding with crises, in the first three columns of Table 14 we add to the complete specification the interactions of volatility with dummies for crises and recessions. The coefficients, not significantly different from zero, suggest that uncertainty plays a role in the adoption of reforms that is independent of whether a country is going through a crisis. Severe crises are often accompanied by the intervention of international institutions, such as

the IMF, which may also prompt government to adopt reforms.<sup>16</sup> To control for this possibility, in columns 4-8 of Table 14, we add to our baseline specification three dummies for the country-year pairs in which a Standby Arrangement (SAB), an Extended Fund Facility Arrangement (EFF) or a Structural Adjustment Facility Arrangement (SAF) with the IMF were in effect for at least 5 months. These series are sourced from Dreher (2006), updated in 2012. While these programs may have helped governments to adopt reforms (most coefficients are positive but only a few are significant), the results for volatility and the other main determinants are unaffected.

Overall, these results are not in contrast with the existing evidence that fiscal and macroeconomic stabilization are more likely during crisis episodes (see, among others, Alesina, Ardagna and Trebbi, 2008). Similarly to structural reforms, stabilizations are enacted when they are needed the most, an effect captured by the negative autoregressive term. However, differently from structural reforms, high government deficit and hyperinflation calling for fiscal correction happen during economic downturns.

Next, we include as a further control the reforms that are simultaneously adopted in countries of the same geographical area.<sup>17</sup> In doing so, we address the potential concern that the effect of uncertainty may be confounded with regional trends in reforms. World trends are already controlled for by the time effects. Table 15 reports the results from both OLS and IV estimations. As expected, we find robust evidence in favor of a regional trend in reforms, which could also be driven by common trends in economic uncertainty. More importantly, even controlling for reforms in the region, the coefficients for volatility and the other covariates maintain their size, sign and significance. These results, especially those for the IV specifications, also reassure that international shocks do not affect reforms in a country through their effects on reforms in the rest of the region.

Finally, we continue by splitting the countries in our sample in two ways. First, there might be a concern that Central and Eastern European (CEE) countries were more active reformers and had at the same time more volatile economies due to their transition from communist to market economy. This would induce spurious correlation between volatility and reforms. To address this concern, we replicate the analysis excluding CEE countries from the sample. The results, reported in columns 1 to 4 of Table 16, are very similar to those found for the full sample. Second, membership of the European Union (EU) may provide additional incentives to adopt reforms (see, among others, the evidence in Alesina, Ardagna and Galasso, 2011) and may correlate (positively or negatively) with volatility. To

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<sup>16</sup>Liberalizations are often specified as a requisite for receiving funds from the IMF.

<sup>17</sup>We consider the following geographical areas: North America, Latin America and the Caribbean, Western Europe, Eastern Europe, South Asia, East Asia and Pacific, Middle East and North Africa, Sub-Saharan Africa.

also address this concern, we exclude from the estimation sample countries that were EU members. Columns 5 to 8 of Table 16 confirm that the effect of volatility on reforms holds equally strong in the restricted sample.

In sum, our analysis has unveiled a positive effect of economic uncertainty, measured by the volatility of stock returns, on the adoption of structural reforms. These effects are robust and also quantitatively relevant. In particular, the OLS coefficients, between 0.4 and 0.7, suggest that an increase in volatility by a standard deviation (0.0086) raises the size of a generic reform by between 4 to 7 per cent of the average reform size (0.089), defined as the mean across changes in any liberalization index. Using IV estimates for  $\beta_2$ , the increase in reform size is between 16 and 19 per cent, if the shocks by Baker and Bloom (2013) are used as instruments, and between 27 and 33 per cent, if the instrument is the world component of volatility. Moreover, the OLS coefficients for the volatility of the rest of the sample imply that a standard deviation increase in this measure of economic uncertainty (0.0062) is associated to a reform which is 16 to 24 per cent larger than the average. Finally, probit estimates from Table 6 also suggest that a standard deviation increase in volatility above the mean raises by 1.5 times the probability of observing a major reform.

#### 4.4 PROBING DEEPER: SOME ADDITIONAL EVIDENCE

We now provide some additional evidence on the relationship between uncertainty and reforms with the aim of gaining further insight on the underlying mechanism linking them. As argued in Section 2, imperfect information and electoral motives can discourage investment in reforms whose economic costs are more visible than future benefits. Economic uncertainty may mitigate this opportunistic bias by making the re-election probability depend more on luck and less on policy choices, thereby leaving politicians freer to take the socially optimal action. Guided by this hypothesis, we now explore the role of imperfect information, electoral motives, alternative measures of uncertainty, and the effect on reforms with no economic costs.

We start asking whether uncertainty promotes reforms more when voters are less informed about policy choices. To this end, we estimate our specifications on two groups of countries, characterized by high and low (i.e., above and below sample mean) circulation of daily newspapers per thousands inhabitants in 1996, as reported by the UNESCO Institute for Statistics.<sup>18</sup> The results are reported in Table 17 for the complete specification.<sup>19</sup> Given the

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<sup>18</sup>An alternative approach could be adding to our specifications for the full sample an interaction between volatility and the circulation of news papers in 1996. Splitting the sample has the advantage of not restricting the coefficients of the other covariates to be equal across the two subsamples. Moreover, an interaction term poses some additional difficulties when using the IV strategy.

<sup>19</sup>Since countries with high newspaper circulation did not experience coups nor revolutions, we are unable

loss in power due to the smaller number of observations, the coefficients for volatility are less precisely estimated, but they are larger and more significant in low-information countries.

Second, we study the role of re-election motives for incumbent politicians. To this purpose, notice that an official who cannot run for re-election would be less subject to an opportunistic bias against costly reforms. If economic uncertainty alleviates this bias, the effect should be weaker when politicians cannot be re-elected. To test this hypothesis, we split the sample between country-years in which there were legal limits to the number of terms in office for either the Head of State or the Head of the Executive, and country-years in which no limits were formally in place. The results reported in Table 18 show that the effect of volatility on reform adoption is always positive and significant only when a term limit is not in place. Moreover, the constant term, positive and significant only for countries with a term limit in place, suggests that these countries are more inclined to adopt reforms.

Third, we compare the effects of alternative measures of uncertainty. In particular, we consider the volatility of the exchange rate vis-à-vis the U.S. Dollar, the volatility of the 10-year bond yield, and the standard deviation of the quarterly growth rate of GDP on an annual basis (all sourced from Bloom and Baker, 2013).<sup>20</sup> The OLS results are reported in Table 19.<sup>21</sup> The coefficients show that the volatilities of exchange rate and GDP growth rate have a positive impact on the adoption of structural reforms. The coefficients for bond yield volatility, instead, are not stable. This finding may be due to the fact that bond yield volatility is more directly linked to fiscal sustainability and may thus be driven by policy uncertainty, which in turn may have a negative effect on reforms.

Fourth, if the effect of economic uncertainty depends on a myopic bias, it is unlikely to apply to reversal of reforms, i.e., a decrease in the liberalization index. Such reversals constitute a relatively small fraction of the observations in the sample and thus focusing on these episodes alone may not be very informative. Instead, we estimate our main specifications using the absolute value of changes in the reform indexes as the dependent variable. This allows us to test whether economic uncertainty is associated with any change in regulations rather than liberalizations. As Table 20 shows, the coefficient for volatility is now smaller in magnitude and less precisely estimated. This confirms that economic uncertainty promotes liberalizations, not their reversal.

As a final check, we also assess whether economic volatility is associated with non-economic reforms. This exercise can be interpreted as a falsification test. In the agency

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to estimate the specifications with domestic shocks as instrumental variables.

<sup>20</sup>The standard deviation of GDP growth rate is computed using quarterly data on GDP sourced from Baker and Bloom (2013).

<sup>21</sup>Results are not reported for the IV specifications because, as already shown in Bloom and Baker (2013), disasters and political shocks are not valid instruments for exchange rate and bond yield volatility. This is one of the reasons why stock market volatility is our preferred measure.

model discussed in Section 2, economic shocks are confounded with the costs of liberalizations and should not matter for, say, social reforms. A positive effect of volatility on the latter would instead lend support to a different mechanism, for instance, that uncertainty lowers political resistance to any legislative change. To test this hypothesis, we estimate our main specifications using as the dependent variable changes in an index of how restrictive abortion laws are, from Bloom et al. (2009). In our sample, this index exhibits variation that is comparable to that of our measures of liberalization: its mean increased from 0.52 in 1973 to 0.71 in 2006, with a standard deviation across countries around 0.34. However, it reflects social values and should be orthogonal to economic fluctuations. The results, reported in Table 21, show that there is no statistically significant association between changes in abortion laws and economic uncertainty, even when both positive and negative changes are considered as reforms (columns 7 and 8).

While not conclusive, these results are broadly consistent with the view that office-motivated politicians postpone costly reforms in an attempt to manipulate citizens' expectations over the state of the economy. Other pieces of evidence in support of this mechanism are Shi and Svensson (2006), who show that political budget cycles take place mainly in countries where voters cannot effectively monitor fiscal policies, and Brender and Drazen (2008), who show that high growth during the term in office increases the re-election probability especially in less developed countries.<sup>22</sup>

## 5 CONCLUSIONS

How does economic uncertainty affect the adoption of structural reforms? This paper is the first to answer this question empirically. Using the most exhaustive cross-country panel dataset on structural reforms and widely-used data on stock market volatility, we have shown that economic uncertainty is positively correlated with liberalizations in six sectors of the economy. This positive correlation is robust to the inclusion of a wide host of controls accounting for political institutions, economic and financial crises, and the degree of development of the countries in the sample, as well as fixed effects for countries, sectors and years.

To identify causality, we have followed three alternative strategies. We have instrumented stock market volatility of each country, first, with the world component of uncertainty as captured by the average volatility of the rest of stock markets in the sample, next with natural disasters and political unrest shocks occurred in the country, and finally with the

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<sup>22</sup>Media scrutiny has been found to improve both the selection and the incentives of politicians (e.g., Snyder & Strömberg, 2010), but its effect on reforms has not been studied extensively. Ponzetto (2011) shows that more information promotes trade liberalization.

same shocks in the rest of the sample.

These results have important implications. First, they suggest that times of market turmoil, which are characterized by a high degree of uncertainty, may provide an opportunity to implement reforms that would otherwise not pass. Second, they beg the question of what is the exact mechanism linking uncertainty to reforms. Our findings that the positive effect of stock market volatility is more significant in countries with lower newspaper circulation and stronger electoral incentives, and that it is limited to economic liberalizations, rather than any type of reforms, are consistent with the hypothesis that uncertainty mitigates agency problems driven by poor information. If confirmed, this would suggest that promoting transparency, guaranteeing media independence and educating voters could play an important role at making welfare-improving but often unpopular reforms more politically viable. More effort directed at testing this hypothesis seems therefore a desirable avenue for future research.

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## A APPENDIX

### A.1 MODEL

We present here a simplified version of the model in Bonfiglioli and Gancia (2013), which builds on Rogoff (1990) and Holmstrom (1999). There are two periods: in the first, a politician of unknown type  $\theta$  makes an investment in reforms  $r$  with a payoff in the second period. At the end of the first period and after observing noisy signals of  $\theta$  and  $r$ , citizens can replace the incumbent with a new draw. Elections serve the purpose of ousting bad politicians.<sup>23</sup> We use the word citizens to denote the set of individuals holding the political power to change the government, but it could equally be an elite. Expected utility of the representative citizen is

$$W = \mathbb{E}[y_t + \beta y_{t+1}], \quad (3)$$

where  $y_t$  is a measure of economic performance in period  $t$ , which depends on political actions, and  $\beta \in (0, 1]$  is the discount factor. At time  $t$ , a citizen is randomly selected to conduct economic policy and for this he receives a reward  $\gamma > 0$  for each period in power. His expected utility is

$$U = W + \gamma + \beta p \gamma, \quad (4)$$

where  $p$  is the perceived probability of staying in power in the second period. Economic performance depends on the type of the politician,  $\theta_t$ , his choice of reforms,  $r$ , and a random shock  $\varepsilon_t$ :

$$\begin{aligned} y_t &= \theta_t - r + \varepsilon_t \\ y_{t+1} &= \theta_{t+1} + f(r) + \varepsilon_{t+1}. \end{aligned} \quad (5)$$

Investing in reforms has an immediate cost  $-r$  and a future return  $f(r)$ , with  $f'(r) > 0$ ,  $f''(r) < 0$ ,  $f'(0) = \infty$  and  $f'(\infty) = 0$ . Type,  $\theta_t$ , is unknown both to the citizens and to the incumbent, it is persistent and is drawn from a known distribution  $\theta \sim N(\bar{\theta}, \sigma_\theta^2)$ . Finally,  $\varepsilon_t$  is an i.i.d. shock,  $\varepsilon \sim N(0, \sigma_\varepsilon^2)$ .

The model is solved backward. Citizens face an inference problem: they want to keep a politician with a high  $\theta$ , but they only observe a noisy signal,  $y_t = \theta_t - r + \varepsilon_t$ . Thus, they must form expectations on  $\theta$  conditional on  $y_t$ . Citizens can also observe a signal of  $r$ , equal to the actual policy plus an additive i.i.d. Normal disturbance. However, since they know all distributions, they can predict with no mistake the equilibrium level of reforms,  $r^e$ . Hence, their optimal strategy is to keep the incumbent if the expectation of his type is

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<sup>23</sup>In Bonfiglioli and Gancia (2013) politicians also choose effort and elections have an additional disciplining effect, consistently with Aruoba, Drazen and Vlaicu (2015).

above average, i.e., if  $y_t \geq \bar{y} \equiv \bar{\theta} - r^e$ . Thus, the incumbent stays in office if current economic performance exceeds a critical level.

We now turn to the problem of the politician. The incumbent chooses investment in reforms,  $r$ , so as to maximize his expected utility (4), before observing the realization of  $\theta_t$  and  $\varepsilon_t$ , and given the voting strategy of citizens. Since  $\mathbb{E}[\theta_t] = \bar{\theta}$  and  $\mathbb{E}[\varepsilon] = 0$ , his problem is:

$$\max_r \{ \bar{\theta} - r + \gamma + \beta [\mathbb{E}\theta_{t+1} + f(r) + p\gamma] \} \quad (6)$$

subject to:

$$p = \Pr(y_t \geq \bar{y}) = 1 - G(\bar{y} + r), \quad (7)$$

where  $G(\cdot)$  is the c.d.f. of the realization  $(\theta + \varepsilon_t)$ , which is normally distributed with mean  $\bar{\theta}$ , variance  $\sigma_\varepsilon^2 + \sigma_\theta^2$  and density  $g(\cdot)$ . Note that  $p$  is a decreasing function of reforms, because a marginal increase in  $r$  lowers the observed realization of  $y_t$ . The first-order condition for  $r$  is:

$$\beta f'(r) = 1 - \frac{\partial p}{\partial r} \beta \gamma. \quad (8)$$

The LHS of (8) represents the marginal benefit of reforms, equal to the discounted marginal product of  $r$ . The RHS is the marginal cost, which comprises the social cost of  $r$  due to foregone output today and the cost to the politician due to the lower probability of staying in power.<sup>24</sup>

Imposing rational expectations,  $r = r^e$ , implies  $\partial p / \partial r = -g(\bar{\theta})$  so that (8) becomes:

$$\beta f'(r) = 1 + \beta \gamma [2\pi(\sigma_\theta^2 + \sigma_\varepsilon^2)]^{-1/2}, \quad (9)$$

because  $G \sim N(\bar{\theta}, \sigma_\theta^2 + \sigma_\varepsilon^2)$ . Equation (8) shows that more economic uncertainty, measured by the variance of  $y$  (i.e.,  $\sigma_\theta^2 + \sigma_\varepsilon^2$ ), increases the equilibrium level of reforms by lowering their political cost. To see why, recall that incumbents are reluctant to embark in reforms because they are afraid that the short-run economic cost may be interpreted as a sign of low type. However, when shocks are highly dispersed, the replacement probability depends more on the realization of  $\theta$  and  $\varepsilon$ , rather than on the choice of  $r$ , so that there is a lower incentive to inflate current performance.<sup>25</sup>

What is the effect of having better-informed citizens? To address this question, we now let citizens observe  $\theta$  with some probability. In particular, assume that whether the incumbent

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<sup>24</sup>Note also that, by distorting the signal, reforms may also affect  $\mathbb{E}\theta_{t+1}$ . However, in equilibrium the election rule maximizes  $\mathbb{E}\theta_{t+1}$  given the choice of  $r$ . Therefore, an envelope argument guarantees that  $\partial \mathbb{E}\theta_{t+1} / \partial r = 0$ .

<sup>25</sup>This is true despite the fact that the equilibrium  $p$  is just the unconditional probability that the incumbent be more able than the average, which is not affected by the choice of reform.

is replaced or not is decided by the majority of citizens and let  $\nu$  be the probability that the majority does not observe  $\theta$ . Uninformed citizens behave as before. Informed citizens, however, observe  $\theta$  and will keep the politician if this is higher than  $\bar{\theta}$ . Then, the perceived probability of staying in power becomes:

$$p = \nu \Pr(y_t \geq \bar{y}) + (1 - \nu) \Pr(\theta \geq \bar{\theta}).$$

Substituting (5) and  $\bar{y} \equiv \bar{\theta} - r^e$  and rearranging we obtain:

$$p = \frac{1 + \nu}{2} - \nu G(\bar{y} + r). \quad (10)$$

The marginal effect of changes in  $r$  on the chance of re-election is now weighted by the probability that the majority is uninformed,  $\nu$ . This is intuitive, since informed citizens cannot be fooled. As a result, both under-investment in reforms and the disciplining effect of uncertainty are weaker the lower is  $\nu$ .

## A.2 VARIABLES AND SAMPLE COUNTRIES

In this Appendix, we describe the variables used in the empirical analysis, and we report in Table A the list of countries in our sample, joint with some of their characteristics.

### A.2.1 *Indices of liberalization*

The source for these variables is Ostry, Prati and Spilimbergo, 2009.

- *Trade* This index is based on average tariff rates, or, when missing, on implicit weighted tariff rates. The index is normalized so that it takes values between 0 (tariffs above 60 per cent) and 1 (zero tariffs).
- *Current Account* This index measures how free the proceeds from international goods and services are from government restrictions, in compliance with IMF's Article VII. It is the sum of two components, capturing the restrictions on trade in visibles and invisibles (e.g., financial services) for residents (on receipts for exports) and non-residents (on payments for imports). The original index, taking values between 0 (max restriction) and 8 (full compliance), is normalized to span from 0 to 1.
- *Product Market* This index captures the degree of liberalization in the Telecom and Electricity markets. It accounts for the degree to which: the government directly regulates these sectors; the generation, transmission and distribution of electricity are unbundled; the wholesale market for electricity and the telecoms interconnection changes

are liberalized; privatizations were made in both sectors; and the local telecom services markets are competitive. The original index, taking values between 0 (fully regulated) and 2 (fully liberalized), is normalized to the [0,1] interval.

- *Agriculture* This index measures how free the main agricultural export commodity market is from government intervention. The index takes four possible values between 0 and 1: 0 if there is public monopoly or monopsony in production, transportation or marketing; 1/3 in presence of administered prices; 2/3 in presence of public ownership in relevant producers and/or of concession requirements; 1 if there is no public intervention.
- *Domestic Finance* This index measures the degree of liberalization of the domestic banking and security markets. For banks, it takes into account whether there are controls on interest rates and/or credit; competition restriction; state ownership; and the quality of supervision and regulation. For security markets, it evaluates the policies to develop equity and bond markets, and to open to foreigners the access to the domestic stock market. The original index, taking values between 0 (fully regulated) and 3 (fully liberalized), is normalized to the [0,1] interval.
- *Capital Account* This index captures the degree of restriction on financial credits and personal capital transactions of residents, on financial credits to the non-residents, and on the use of multiple exchange rates. The original index, taking values between 0 (fully restricted) and 3 (fully liberalized), is normalized to the [0,1] interval.

### A.2.2 *Other Variables*

#### *Stock market variables*

- *Volatility* Annual mean of the standard deviation of daily returns on the main stock market index (from the Global Financial Database) computed quarterly. Weekly or monthly returns are used for some countries in the absence of daily data. Source: Baker, Schott and Nicholas Bloom (2014).
- *Stock returns* Annual mean of daily returns on the main stock market index (from the Global Financial Database). Weekly or monthly returns are used for some countries in the absence of daily data. Source: Baker, Schott and Nicholas Bloom (2014).

#### *Political variables*

- *Democracy* Indicator of democracy based on the polity2 index. It takes values between 0 (max. autocracy) and 1 (max democracy) instead of -10 and 10. Source: Polity IV database.

- *Presidential* Indicator of presidential systems based on the classification provided in the DPI (2012). It takes value 1 if the country directly elects the president (system=pres), zero otherwise. Source: "Database of Political Institutions", The World Bank.
- *Left* Indicator of left-wing governments based on the classification provided in the DPI (2012). It takes value 1 if the main party in the executive has a left-wing orientation with respect to economic policy (execrlc=left), zero otherwise. Source: "Database of Political Institutions", The World Bank.
- *Election year* This indicator takes value 1 if any national election (legislative or executive) takes place during the year, zero otherwise. Source: "Database of Political Institutions", The World Bank.

#### *Crisis indicators*

- *Recession* This indicator takes value 1 if the growth rate of GDP per capita is negative, zero otherwise. Source: World Bank Development Indicators (2014).
- *Bank crisis* This indicator takes value 1 in the year of the onset of a banking crisis, based on the classification of Laeven and Valencia (2012). Source: Laeven and Valencia (2012).
- *Currency crisis* This indicator takes value 1 in the year of the onset of a currency crisis, based on the classification of Laeven and Valencia (2012). Source: Laeven and Valencia (2012).
- *Sovereign crisis* This indicator takes value 1 in the year of a sovereign debt default, based on the classification of Laeven and Valencia (2012). Source: Laeven and Valencia (2012).

#### *Development indicators*

- *log GDP p.c.* log of real GDP per capita. Source: World Bank Development Indicators (2014).
- *EU member* This indicator takes value 1 if 2 years later the country is a member of the EU.
- *OECD member* This indicator takes value 1 if the country is a member of the OECD in a given year.

- *CEE country* This indicator takes value 1 for Central and Eastern European countries.
- *High information* Dummy taking value 1 if the country had a daily newspapers circulation per 1000 inhabitants above the sample mean in 1996. Source: UNESCO Institute for Statistics.

*Other Variables*

- *Reforms in the region* Reform index averaged across the other countries in the same geographical area (out of North America, Latin America and the Caribbea, Western Europe, Eastern Europe, Middle East and North Africa, Sub-Saharan Africa, South Asia, East Asia and Pacific), weighted by real GDP per capita.
- *Abortion index* Average of 7 subindices specifying whether (value of 1) or not (value of 0) the law allows abortion under the following circumstances: intervention to save the life of the woman (life grounds); preservation of the physical health of the woman (narrow health grounds); preservation of the mental health of the woman (broad health grounds); termination of pregnancy resulting from rape or incest (juridical grounds); suspicion of fetal impairment (fetal defect); termination of pregnancy for economic or social reasons (social grounds); availability upon request. Source: Compiled by Bloom et al. (2009) from the United Nations Population Division Department of Economic and Social Affairs.



Table 1. Summary statistics and pairwise correlations of liberalization indices

	Summary statistics					Pairwise correlation with the liberalization of:				
	Obs.	Mean	Std. Dev.	Mean 1973	D(Mean)	Trade	Current Account	Product Market	Agriculture	Domestic Finance
Trade	1111	0.785	0.196	0.545	0.304	1				
Current Account	1169	0.787	0.235	0.528	0.308	0.610***	1			
Product Market	1153	0.275	0.298	0.021	0.573	0.310***	0.361***	1		
Agriculture	1043	0.582	0.349	0.333	0.302	0.302***	0.361***	0.182***	1	
Domestic Finance	1092	0.667	0.250	0.237	0.580	0.617***	0.667***	0.572***	0.325***	1
Capital Account	1168	0.725	0.247	0.470	0.287	0.640***	0.843***	0.395***	0.374***	0.682***

Notes. D(Mean) is the change in the mean level of liberalization between 1973 and 2006. For Trade and Domestic Finance, the last sample year is 2005. \*\*\* denotes significance at 1 per cent level.

Table 2. Pairwise correlations between reforms and covariates

	Trade	Current Account	Product Market	Agriculture	Domestic Finance	Capital Account
volatility	0.084***	0.079***	0.029	0.092***	0.098***	0.030
democracy	-0.008	0.037	0.132***	-0.019	0.014	0.040
presidential	-0.003	0.002	-0.016	0.025	-0.002	-0.023
left	-0.014	0.058**	0.052**	0.014	0.0501*	0.057**
election year	-0.001	0.024	0.021	-0.020	0.039	0.013
recession	0.024	-0.048**	-0.026	0.041	0.080***	-0.036
bank crisis	-0.021	-0.064***	0.047**	-0.017	-0.021	-0.082***
currency crisis	0.010	-0.007	-0.038	-0.005	0.002	0.009
sovereign crisis	-0.028	-0.094***	-0.024	-0.011	-0.007	-0.081***
log GDP p.c.	-0.057**	-0.026	0.082***	-0.010	-0.020	0.000
EU member	-0.043*	0.018	0.105***	-0.042	-0.022	0.019
OECD member	-0.033	-0.005	0.075***	-0.023	-0.032	0.034
stock returns	0.047	0.059**	0.030	0.019	0.050*	0.001

Note. Significance at 10, 5 and 1 per cent level are denoted by \*, \*\* and \*\*\*, respectively.

Table 3. OLS Regressions with AR(1) residuals

Dependent variable: annual change in liberalization indices							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
liberalization		-0.086*** [0.005]	-0.109*** [0.006]	-0.092*** [0.005]	-0.114*** [0.006]	-0.125*** [0.007]	-0.151*** [0.007]
volatility	0.705*** [0.138]	0.504*** [0.138]	0.431*** [0.150]	0.695*** [0.143]	0.395*** [0.146]	0.472*** [0.155]	0.442*** [0.164]
democracy			0.026*** [0.007]			0.017** [0.007]	0.005 [0.007]
presidential			0.015** [0.006]			0.016** [0.006]	0.015** [0.006]
left			0.008*** [0.002]			0.007*** [0.003]	0.004 [0.003]
election year			-0.000 [0.002]			0.001 [0.002]	0.001 [0.002]
recession				-0.005** [0.002]		-0.002 [0.003]	-0.003 [0.003]
bank crisis				-0.011** [0.005]		-0.010* [0.005]	-0.011** [0.005]
currency crisis				-0.013** [0.005]		-0.012** [0.005]	-0.012** [0.005]
sovereign crisis				-0.038*** [0.010]		-0.037*** [0.010]	-0.040*** [0.010]
log GDP per capita					0.035*** [0.005]	0.025*** [0.006]	-0.025*** [0.009]
EU member					0.024*** [0.006]	0.022*** [0.006]	0.018*** [0.006]
OECD member					-0.011 [0.009]	-0.013 [0.009]	-0.004 [0.009]
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No	No	Yes
Observations	6,402	6,402	5,565	6,269	5,875	5,529	5,529
R-squared	0.004	0.050	0.064	0.060	0.061	0.076	0.096
Durbin-Watson	1.917	1.852	1.85	1.846	1.839	1.839	1.824

Notes. All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead. AR(1) residuals are estimated with two-step procedure. The modified Bhargava et al. (1982) Durbin-Watson test for serially autocorrelated residuals is reported. Standard errors are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.

Table 4. OLS Regressions with clustered residuals

Dependent variable: annual change in liberalization indices							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
liberalization		-0.074*** [0.009]	-0.092*** [0.012]	-0.078*** [0.010]	-0.098*** [0.011]	-0.108*** [0.011]	-0.128*** [0.014]
volatility	0.692*** [0.159]	0.519*** [0.129]	0.441*** [0.138]	0.668*** [0.131]	0.433*** [0.162]	0.481*** [0.143]	0.478*** [0.136]
democracy			0.024** [0.009]			0.013 [0.011]	0.004 [0.007]
presidential			0.012 [0.011]			0.012 [0.012]	0.012 [0.008]
left			0.008*** [0.003]			0.006** [0.003]	0.004* [0.002]
election year			0.000 [0.002]			0.001 [0.002]	0.001 [0.002]
recession				-0.005*** [0.002]		-0.003 [0.002]	-0.003 [0.002]
bank crisis				-0.010* [0.005]		-0.009* [0.005]	-0.011** [0.005]
currency crisis				-0.009 [0.007]		-0.011 [0.008]	-0.009 [0.007]
sovereign crisis				-0.033* [0.018]		-0.031* [0.019]	-0.035** [0.017]
log GDP per capita					0.032*** [0.006]	0.027*** [0.007]	-0.015 [0.011]
EU member					0.022*** [0.007]	0.022*** [0.006]	0.018*** [0.007]
OECD member					-0.010 [0.006]	-0.011* [0.006]	-0.004 [0.006]
Country-sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	No	No	No	Yes
Observations	6,725	6,725	5,880	6,588	6,193	5,840	5,840
R-squared	0.005	0.045	0.056	0.051	0.055	0.068	0.086

Notes. All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead. Standard errors, clustered by country, are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.

Table 5. OLS Regressions - Heterogeneous coefficients for volatility

Dependent variable: annual change in liberalization indices				
	AR	AR	Clustered	Clustered
			SE	SE
	(1)	(2)	(3)	(4)
liberalization	-0.118***	-0.151***	-0.097***	-0.128***
	[0.006]	[0.007]	[0.010]	[0.014]
volatility	0.613*	0.953**	0.492*	0.869***
	[0.351]	[0.373]	[0.279]	[0.228]
volatility*Curr	0.051	-0.318	0.367	-0.039
	[0.479]	[0.512]	[0.930]	[0.774]
volatility*PM	-0.741	-0.909*	-0.633	-0.960
	[0.480]	[0.512]	[0.606]	[0.711]
volatility*AG	0.191	-0.037	0.360	0.067
	[0.484]	[0.517]	[0.742]	[0.918]
volatility*DF	-0.242	-0.510	0.135	-0.288
	[0.485]	[0.512]	[0.362]	[0.378]
volatility*Cap	-0.736	-1.262**	-0.559	-1.095***
	[0.479]	[0.512]	[0.437]	[0.358]
All Controls	No	Yes	No	Yes
Country-Sector FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	6,402	5,529	6,725	5,840
R-squared	0.073	0.098	0.065	0.088

Notes. All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead. Volatility is interacted with sector dummies for current account, product market, agriculture, domestic finance and capital account. AR denotes AR(1) residuals, estimated with two-step procedure. Clustering denotes standard errors clustered by country. Standard errors are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.

Table 6. Major reforms: OLS, Probit and Logit Regressions

	Dependent variable: positive annual changes in liberalization indices (reforms) - values and dummies							
	Reforms above median				Reforms above 80th percentile			
	AR	Clustered SE	Probit	Logit	AR	Clustered SE	Probit	Logit
	(1)	(2)	Clustered SE	(4)	(5)	(6)	Clustered SE	(8)
liberalization	-0.128***	-0.107***	-0.503***	-4.860***	-0.101***	-0.090***	-0.379***	-8.027***
	[0.006]	[0.011]	[0.059]	[0.408]	[0.006]	[0.010]	[0.087]	[0.728]
volatility	0.317**	0.344**	1.539*	14.493**	0.244*	0.271***	0.865	19.910*
	[0.145]	[0.130]	[0.786]	[7.116]	[0.133]	[0.098]	[0.779]	[11.353]
All Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,529	5,840	4,369	4,369	5,529	5,840	2,934	2,934
R-squared	0.092	0.077			0.072	0.062		

Note. The dependent variable is equal to the annual change in the liberalization index if this is larger than the median (80th percentile) positive annual change, in columns 1 and 2 (5 and 6); and it is a dummy taking value 1 if the annual change in the liberalization index is larger than the median (80th percentile) positive annual change, in columns 3 and 4 (7 and 8). All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead, and volatility where specified. AR denotes AR(1) residuals, estimated with two-step procedure. Clustering denotes standard errors clustered by country. The standard errors from Probit estimates are clustered by country. Standard errors are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.

Table 7. OLS Regressions: lagged volatility and cumulated reforms

	Dependent variable: annual/3-year (forward) change in liberalization indices					
	volatility(t-2)		volatility(t-3)		3-year cumulated reforms	
	AR	Clustered SE	AR	Clustered SE	AR	Clustered SE
	(1)	(2)	(3)	(4)	(5)	(6)
liberalization	-0.146***	-0.124***	-0.143***	-0.119***	-0.152***	-0.154***
	[0.007]	[0.015]	[0.007]	[0.014]	[0.008]	[0.016]
volatility	0.257	0.309***	0.408**	0.414***	0.289*	0.286**
	[0.162]	[0.109]	[0.162]	[0.146]	[0.173]	[0.134]
All Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,316	5,627	5,102	5,413	5,529	5,840
R-squared	0.091	0.083	0.092	0.080	0.089	0.089

Note. The dependent variable is the annual change in liberalization indices (columns 1-4), or the change in liberalization indices over the 3-year period starting with a non-zero annual change (columns 5-6). All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead, and volatility where specified. AR denotes AR(1) residuals, estimated with two-step procedure. Clustering denotes standard errors clustered by country. Standard errors are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.

Table 8. 2SLS IV and OLS Regressions with volatility of the other countries

Dependent variable: annual change in liberalization indices (except for IV first stage)								
	IV first stage (1)	IV second stage (2)	IV first stage (3)	IV second stage (4)	AR (5)	AR (6)	Clustered SE (7)	Clustered SE (8)
volatility		3.425*** [0.487]		2.756*** [0.668]				
volatility rest	0.609*** [0.027]		0.627*** [0.038]		3.476*** [0.264]	3.422*** [0.361]	2.871*** [0.310]	3.239*** [0.525]
liberalization	-0.008*** [0.000]	-0.065*** [0.005]	-0.008*** [0.001]	-0.097*** [0.007]	-0.079*** [0.004]	-0.102*** [0.005]	-0.070*** [0.007]	-0.090*** [0.009]
democracy			-0.002*** [0.001]	0.014** [0.007]		0.021*** [0.005]		0.020** [0.009]
presidential			0.006*** [0.001]	-0.002 [0.007]		0.003 [0.005]		0.002 [0.006]
left			0.000 [0.000]	0.005** [0.002]		0.003 [0.002]		0.002 [0.002]
election year			0.000 [0.000]	0.000 [0.002]		0.001 [0.002]		0.001 [0.001]
recession			0.002*** [0.000]	-0.008*** [0.003]		0.002 [0.002]		0.002 [0.003]
bank crisis			0.004*** [0.000]	-0.017*** [0.006]		-0.014*** [0.004]		-0.013*** [0.004]
currency crisis			0.002*** [0.000]	-0.017*** [0.006]		-0.008* [0.004]		-0.007 [0.004]
sovereign crisis			0.003*** [0.001]	-0.040*** [0.011]		-0.030*** [0.007]		-0.031*** [0.010]
log GDP per capita			-0.001 [0.001]	0.017*** [0.006]		-0.004 [0.005]		-0.003 [0.008]
EU member			0.002*** [0.001]	0.017*** [0.006]		0.018*** [0.005]		0.017*** [0.003]
OECD member			-0.001 [0.001]	-0.008 [0.008]		0.006 [0.007]		0.003 [0.006]
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,721	6,721	5,840	5,840	9,673	8,090	9,998	8,408
R-squared					0.0395	0.0550	0.034	0.050
F-test		501.1		269.9				

Notes. In columns (1) and (3), the dependent variable is stock market volatility, while in the other columns it is the annual change in the liberalization indices. All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead. IV specifications are estimated with 2SLS. AR denotes AR(1) residuals, estimated with a two-stage procedure. Clustered SE denotes standard errors clustered by country. The F-test for weak instruments is reported in the last row. Standard errors are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.



Table 9. 2SLS IV Regressions with shocks as instruments - Second stage

Dependent variable: annual change in liberalization indices					
	IV	IV	IV	IV others	IV others
	(1)	(2)	(3)	(4)	(5)
volatility	1.578*** [0.477]	2.001*** [0.463]	2.007*** [0.413]	1.421** [0.640]	2.312** [0.985]
liberalization	-0.071*** [0.009]	-0.101*** [0.011]	-0.108*** [0.012]	-0.071*** [0.005]	-0.099*** [0.008]
democracy		0.014 [0.012]	0.010 [0.009]		0.014** [0.007]
presidential		0.002 [0.010]	0.002 [0.009]		0.001 [0.008]
left		0.005 [0.004]	0.004 [0.003]		0.005** [0.002]
election year		0.000 [0.002]	0.001 [0.002]		0.000 [0.002]
recession		-0.006*** [0.002]	-0.007*** [0.003]		-0.007** [0.003]
bank crisis		-0.014** [0.006]	-0.016*** [0.006]		-0.016** [0.006]
currency crisis		-0.015** [0.007]	-0.014** [0.007]		-0.016*** [0.006]
sovereign crisis		-0.037** [0.016]	-0.038*** [0.014]		-0.038*** [0.011]
log GDP per capita		0.020*** [0.007]	0.004 [0.011]		0.019*** [0.007]
EU member		0.018** [0.008]	0.017* [0.009]		0.018*** [0.006]
OECD member		-0.009 [0.009]	-0.006 [0.010]		-0.008 [0.008]
Country-Sector FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	No	No
Observations	6,721	5,840	5,840	6,721	5,840
Hansen J p-value	0.628	0.511	0.400	0.357	0.110
F-test	39371	83.28	26.63	65.23	29.71

Notes. All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead. Volatility of stock market returns is instrumented, in columns (1)-(3), with natural disasters, terroristic attacks, political coups and revolutions, and in columns (4)-(5) with the average of the same shocks across the other countries in the sample, weighted by their GDP per capita. The p-value for the Hansen J-test of over-identifying restrictions and the F-test for weak instruments are reported. Standard errors, clustered by country, are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.

Table 10. 2SLS IV Regressions with shocks as instruments - First stage

Dependent variable: stock market volatility					
	IV	IV	IV	IV others	IV others
	(1)	(2)	(3)	(4)	(5)
natural disasters	-0.002 [0.002]	-0.001 [0.001]	-0.002 [0.001]	0.034*** [0.005]	0.017*** [0.005]
coups	0.022** [0.010]	0.021** [0.009]	0.020** [0.009]	-0.048** [0.021]	-0.034 [0.022]
revolutions	0.057*** [0.000]	0.047*** [0.003]	0.039*** [0.004]	2.878*** [0.197]	2.097*** [0.203]
terrorist attacks	0.001 [0.001]	0.000 [0.001]	0.001 [0.001]	0.026*** [0.006]	0.001 [0.006]
Country-Sector FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	No	No
Observations	6,721	5,840	5,840	6,721	5,840

Notes. All regressors are expressed in one-year lags. The instruments refer to each country in columns (1)-(3), to the average of the other countries in the sample, weighted by their GDP p.c. in columns (4)-(5). Coefficients for lagged liberalization and the other controls are omitted. Standard errors, clustered by country, are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.

Table 11. OLS and 2SLS Regressions for average reforms

Dependent variable: annual change in the country-level average liberalization index						
	AR	Clustered SE	AR	Clustered SE	IV	IV others
	(1)	(2)	(3)	(4)	(5)	(6)
liberalization	-0.165*** [0.018]	-0.134*** [0.019]	-0.071*** [0.010]	-0.061*** [0.010]	-0.060*** [0.023]	-0.062*** [0.017]
volatility	0.387** [0.184]	0.443*** [0.162]			2.048*** [0.466]	1.747* [1.005]
volatility rest			2.645*** [0.481]	2.413*** [0.420]		
democracy	0.008 [0.008]	0.008 [0.008]	0.022*** [0.006]	0.021*** [0.008]	0.012 [0.009]	0.013* [0.007]
presidential	0.018*** [0.007]	0.015 [0.009]	0.004 [0.005]	0.003 [0.006]	0.002 [0.009]	0.005 [0.009]
left	0.004 [0.003]	0.004* [0.002]	0.004 [0.003]	0.004** [0.002]	0.004 [0.003]	0.005* [0.003]
election year	0.001 [0.002]	0.001 [0.002]	0.002 [0.002]	0.002 [0.002]	0.001 [0.002]	0.001 [0.002]
recession	-0.003 [0.003]	-0.003 [0.002]	0.003 [0.002]	0.003 [0.003]	-0.005** [0.002]	-0.006 [0.003]
bank crisis	-0.011** [0.006]	-0.011** [0.005]	-0.014*** [0.005]	-0.014*** [0.004]	-0.017*** [0.006]	-0.014** [0.007]
currency crisis	-0.012** [0.006]	-0.009 [0.007]	-0.006 [0.005]	-0.005 [0.004]	-0.012* [0.007]	-0.013** [0.006]
sovereign crisis	-0.039*** [0.011]	-0.035** [0.017]	-0.028*** [0.008]	-0.030*** [0.010]	-0.038*** [0.014]	-0.036*** [0.012]
log GDP per capita	-0.028*** [0.009]	-0.017 [0.011]	-0.007 [0.006]	-0.004 [0.007]	0.000 [0.010]	0.007 [0.009]
EU member	0.017** [0.007]	0.016** [0.007]	0.011* [0.006]	0.012*** [0.004]	0.009 [0.009]	0.011 [0.007]
OECD member	-0.005 [0.010]	-0.004 [0.006]	-0.001 [0.008]	-0.003 [0.006]	-0.008 [0.009]	-0.010 [0.009]
Country-Setor FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	No	Yes	No
Observations	949	1,002	1,421	1,475	1,002	1,002
R-squared	0.180	0.167	0.0642	0.061		
Hansen J p-value					0.481	0.795
F-test					32.85	8.133

Notes. The dependent variable is the annual change in the country-level average of the liberalization indices. All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead. IV specifications are estimated with 2SLS and only second-stage coefficients are reported. AR denotes AR(1) residuals, estimated with a two-stage procedure. Clustered SE denotes standard errors clustered by country. The p-value for the Hansen J-test of over-identifying restrictions and the F-test for weak instruments are reported. Standard errors are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.

Table 12. OLS and 2SLS Regressions controlling for stock market returns

Dependent variable: annual change in liberalization indices							
	AR	AR	AR	AR	IV	IV	IV others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
liberalization	-0.087*** [0.005]	-0.125*** [0.007]	-0.151*** [0.007]	-0.138*** [0.007]	-0.101*** [0.011]	-0.120*** [0.013]	-0.098*** [0.008]
volatility	0.521*** [0.138]	0.472*** [0.155]	0.429*** [0.164]		1.854*** [0.429]	1.814*** [0.475]	2.464** [0.972]
volatility rest				2.315*** [0.441]			
stock market returns	0.026*** [0.009]	0.018* [0.010]	0.012 [0.012]	0.029*** [0.011]	0.018 [0.014]	0.008 [0.017]	0.017 [0.010]
democracy		0.017** [0.007]	0.006 [0.007]	0.012* [0.007]	0.014 [0.012]	0.006 [0.008]	0.014** [0.007]
presidential		0.016** [0.006]	0.015** [0.006]	0.019*** [0.006]	0.003 [0.010]	0.003 [0.008]	-0.001 [0.008]
left		0.007*** [0.002]	0.004 [0.003]	0.006** [0.003]	0.005 [0.004]	0.004 [0.003]	0.005** [0.002]
election year		0.001 [0.002]	0.001 [0.002]	0.001 [0.002]	0.000 [0.002]	0.001 [0.002]	0.000 [0.002]
recession		-0.002 [0.003]	-0.003 [0.003]	-0.003 [0.002]	-0.006*** [0.002]	-0.006** [0.003]	-0.007** [0.003]
bank crisis		-0.008 [0.005]	-0.010** [0.005]	-0.007 [0.005]	-0.013** [0.006]	-0.015** [0.006]	-0.015** [0.006]
currency crisis		-0.011** [0.005]	-0.011** [0.005]	-0.010* [0.005]	-0.014* [0.008]	-0.011 [0.007]	-0.015*** [0.006]
sovereign crisis		-0.036*** [0.010]	-0.039*** [0.010]	-0.034*** [0.010]	-0.036** [0.016]	-0.040*** [0.015]	-0.038*** [0.011]
log GDP per capita		0.026*** [0.006]	-0.024*** [0.009]	0.011 [0.007]	0.022*** [0.007]	-0.018 [0.014]	0.019*** [0.007]
EU member		0.021*** [0.006]	0.018*** [0.006]	0.021*** [0.006]	0.018** [0.008]	0.014 [0.009]	0.017*** [0.006]
OECD member		-0.013 [0.009]	-0.004 [0.009]	-0.009 [0.009]	-0.009 [0.009]	-0.002 [0.009]	-0.008 [0.008]
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	No	No	Yes	No
Observations	6,402	5,529	5,529	5,529	5,840	5,840	5,840
R-squared	0.0512	0.0763	0.0965	0.0802			
Hansen J p-value					0.360	0.332	0.753
F-test					87.68	33.30	40.91

Notes. All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead. IV specifications are estimated with 2SLS and only second-stage coefficients are reported. AR denotes AR(1) residuals, estimated with a two-stage procedure. The p-value for the Hansen J-test of over-identifying restrictions and the F-test for weak instruments are reported. Standard errors are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.

Table 13. OLS Regressions - volatility vs crises and GDP growth

Dependent variable: annual change in liberalization indices								
	AR	AR	AR	AR	AR	AR	AR	AR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
liberalization	-0.154*** [0.007]	-0.151*** [0.007]	-0.152*** [0.007]	-0.149*** [0.007]	-0.128*** [0.007]	-0.138*** [0.007]	-0.128*** [0.007]	-0.138*** [0.007]
volatility		0.429*** [0.164]		0.441*** [0.163]				
volatility rest						2.315*** [0.441]		2.322*** [0.441]
stock market returns	0.014 [0.012]	0.012 [0.012]	0.014 [0.012]	0.012 [0.012]	0.018* [0.010]	0.029*** [0.011]	0.018* [0.010]	0.029*** [0.011]
democracy	0.005 [0.007]	0.006 [0.007]	0.005 [0.007]	0.006 [0.007]	0.016** [0.007]	0.012* [0.007]	0.016** [0.007]	0.012* [0.007]
presidential	0.018*** [0.006]	0.015** [0.006]	0.018*** [0.006]	0.015** [0.006]	0.019*** [0.006]	0.019*** [0.006]	0.018*** [0.006]	0.018*** [0.006]
left	0.004 [0.003]	0.004 [0.003]	0.004 [0.003]	0.004 [0.003]	0.007*** [0.003]	0.006** [0.003]	0.007*** [0.003]	0.006** [0.003]
election year	0.001 [0.002]	0.001 [0.002]	0.001 [0.002]	0.000 [0.002]	0.001 [0.002]	0.001 [0.002]	0.001 [0.002]	0.001 [0.002]
recession	-0.002 [0.003]	-0.003 [0.003]			-0.002 [0.002]	-0.003 [0.002]		
growth GDP p.c.			0.036 [0.032]	0.047 [0.033]			0.027 [0.031]	0.040 [0.031]
bank crisis	-0.009* [0.005]	-0.010** [0.005]	-0.008 [0.005]	-0.010* [0.005]	-0.007 [0.005]	-0.007 [0.005]	-0.006 [0.005]	-0.006 [0.005]
currency crisis	-0.010* [0.005]	-0.011** [0.005]	-0.009* [0.006]	-0.010* [0.006]	-0.010* [0.005]	-0.010* [0.005]	-0.009 [0.005]	-0.010* [0.005]
sovereign crisis	-0.037*** [0.010]	-0.039*** [0.010]	-0.038*** [0.010]	-0.040*** [0.010]	-0.034*** [0.010]	-0.034*** [0.010]	-0.034*** [0.010]	-0.034*** [0.010]
log GDP per capita	-0.023*** [0.009]	-0.024*** [0.009]	-0.023*** [0.009]	-0.024*** [0.009]	0.028*** [0.006]	0.011 [0.007]	0.028*** [0.006]	0.011 [0.007]
EU member	0.019*** [0.006]	0.018*** [0.006]	0.019*** [0.006]	0.018*** [0.006]	0.022*** [0.006]	0.021*** [0.006]	0.022*** [0.006]	0.021*** [0.006]
OECD member	-0.003 [0.009]	-0.004 [0.009]	-0.003 [0.009]	-0.004 [0.009]	-0.013 [0.009]	-0.009 [0.009]	-0.012 [0.009]	-0.008 [0.009]
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	No	No	No	No
Observations	5,529	5,529	5,529	5,529	5,529	5,529	5,529	5,529
R-squared	0.0956	0.0965	0.0947	0.0956	0.0749	0.0802	0.0749	0.0802

Notes. All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead. AR denotes AR(1) residuals, estimated with a two-stage procedure. Standard errors are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.

Table 14. OLS Regressions - volatility, crises and IMF programs

Dependent variable: annual change in liberalization indices								
	AR	AR	AR	AR	AR	AR	IV	IV Others
			volatility_rest			volatility_rest		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
liberalization	-0.125*** [0.007]	-0.151*** [0.007]	-0.102*** [0.005]	-0.126*** [0.007]	-0.151*** [0.007]	-0.102*** [0.005]	-0.120*** [0.013]	-0.100*** [0.008]
volatility	0.390** [0.188]	0.375* [0.199]	3.372*** [0.398]	0.474*** [0.156]	0.434*** [0.164]	3.432*** [0.361]	1.919*** [0.562]	2.352** [0.970]
recession	-0.005 [0.004]	-0.005 [0.004]	0.004 [0.006]	-0.002 [0.003]	-0.003 [0.003]	0.002 [0.002]	-0.006** [0.003]	-0.007** [0.003]
bank crisis (bc)	-0.010 [0.008]	-0.010 [0.008]	-0.032** [0.014]	-0.009* [0.005]	-0.011** [0.005]	-0.013*** [0.004]	-0.016*** [0.006]	-0.016** [0.006]
currency crisis (cc)	-0.010 [0.011]	-0.010 [0.011]	-0.016 [0.012]	-0.012** [0.005]	-0.012** [0.005]	-0.008* [0.004]	-0.012 [0.007]	-0.016*** [0.006]
sovereign crisis (sc)	-0.046* [0.027]	-0.074*** [0.028]	-0.023 [0.017]	-0.037*** [0.010]	-0.040*** [0.010]	-0.030*** [0.007]	-0.041** [0.016]	-0.039*** [0.011]
volatility*recession	0.171 [0.220]	0.131 [0.224]	-0.222 [0.643]					
volatility*bc	0.016 [0.308]	-0.039 [0.310]	1.982 [1.407]					
volatility*cc	-0.097 [0.396]	-0.113 [0.400]	0.899 [1.249]					
volatility*sc	0.316 [0.923]	1.237 [0.941]	-1.149 [2.039]					
IMF_sba5				0.005 [0.004]	-0.001 [0.004]	0.000 [0.003]	0.000 [0.004]	0.004 [0.004]
IMF_saf5				-0.006 [0.022]	-0.003 [0.022]	-0.006 [0.012]	-0.001 [0.009]	-0.004 [0.019]
IMF_eff5				0.002 [0.005]	-0.002 [0.005]	-0.003 [0.004]	0.001 [0.011]	0.004 [0.006]
All Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	No	Yes	No	Yes	No
Observations	5,529	5,529	8,090	5,529	5,529	8,090	5,840	5,840
R-squared	0.0759	0.0968	0.0553	0.0762	0.0964	0.0551	0.070	0.039
Hansen J p-value							.	0.798
F-test							15.71	41.34

Notes. All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead. IMF\_sba5, IMF\_saf5 and IMF\_eff5 denote dummy variables taking value 1 in year-country pairs with at least 5 months of, respectively, Standby Arrangement (SAB), Extended Fund Facility Arrangement (EFF) or Structural Adjustment Facility Arrangement (SAF) with the IMF. IV specifications are estimated with 2SLS and only second-stage coefficients are reported. AR denotes AR(1) residuals, estimated with a two-stage procedure. The p-value for the Hansen J-test of over-identifying restrictions and the F-test for weak instruments are reported. Standard errors are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.

Table 15. OLS and 2SLS Regressions - controlling for reforms in the region

Dependent variable: annual change in liberalization indices							
	AR	AR	Clustered SE	Clustered SE	IV	IV	IV others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
liberalization	-0.148*** [0.007]	-0.101*** [0.005]	-0.118*** [0.013]	-0.090*** [0.009]	-0.102*** [0.011]	-0.105*** [0.011]	-0.101*** [0.008]
volatility	0.448*** [0.162]		0.464*** [0.133]		1.941*** [0.415]	1.841*** [0.427]	2.088** [0.985]
volatility rest		3.314*** [0.360]		3.139*** [0.521]			
reforms in the region	0.092*** [0.028]	0.108*** [0.024]	0.097** [0.036]	0.120*** [0.029]	0.129*** [0.037]	0.096*** [0.035]	0.128*** [0.027]
democracy	0.005 [0.007]	0.021*** [0.005]	0.007 [0.008]	0.019** [0.009]	0.013 [0.012]	0.011 [0.011]	0.013* [0.007]
presidential	0.016** [0.006]	0.004 [0.004]	0.012 [0.011]	0.002 [0.006]	0.003 [0.010]	0.003 [0.010]	0.003 [0.008]
left	0.004 [0.003]	0.003 [0.002]	0.004* [0.002]	0.002 [0.002]	0.005 [0.004]	0.004 [0.003]	0.005** [0.002]
election year	0.000 [0.002]	0.001 [0.002]	0.001 [0.002]	0.001 [0.001]	0.000 [0.002]	0.001 [0.002]	0.000 [0.002]
recession	-0.003 [0.003]	0.002 [0.002]	-0.004 [0.002]	0.002 [0.003]	-0.006*** [0.002]	-0.005** [0.002]	-0.006* [0.003]
bank crisis	-0.011** [0.005]	-0.014*** [0.004]	-0.012** [0.005]	-0.014*** [0.004]	-0.015*** [0.006]	-0.017*** [0.006]	-0.016** [0.006]
currency crisis	-0.011** [0.005]	-0.008* [0.004]	-0.010 [0.007]	-0.007 [0.004]	-0.015** [0.007]	-0.013* [0.007]	-0.015*** [0.006]
sovereign crisis	-0.039*** [0.010]	-0.030*** [0.007]	-0.032* [0.017]	-0.031*** [0.010]	-0.036** [0.016]	-0.036*** [0.013]	-0.036*** [0.011]
log GDP per capita	-0.024*** [0.009]	-0.004 [0.005]	0.009 [0.008]	-0.003 [0.008]	0.021*** [0.007]	0.014 [0.009]	0.021*** [0.007]
EU member	0.018*** [0.006]	0.018*** [0.005]	0.021*** [0.006]	0.017*** [0.003]	0.019** [0.008]	0.018** [0.008]	0.019*** [0.006]
OECD member	-0.006 [0.009]	0.006 [0.007]	-0.007 [0.007]	0.003 [0.006]	-0.009 [0.010]	-0.008 [0.010]	-0.009 [0.008]
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No	No	Yes	No
Observations	5,529	8,090	5,840	8,408	5,840	5,840	5,840
R-squared	0.0970	0.0569	0.083	0.053			
Hansen J p-value					0.319	0.347	0.765
F-test					108.8	33.67	39.19

Notes. All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead, and the average reform in the region, weighted by real GDP per capita, which is contemporaneous. IV specifications are estimated with 2SLS and only second-stage coefficients are reported. AR denotes AR(1) residuals, estimated with a two-stage procedure. Clustered SE denotes standard errors clustered by country. The p-value for the Hansen J-test of over-identifying restrictions and the F-test for weak instruments are reported. Standard errors are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.

Table 16. OLS and 2SLS Regressions - Sample splits: no Central and Eastern Europe, no EU members

Dependent variable: annual change in liberalization indices								
	No CEE AR	No CEE AR	No CEE IV	No CEE IV others	No EU AR	No EU AR	No EU IV	No EU IV others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
liberalization	-0.147*** [0.007]	-0.101*** [0.005]	-0.115*** [0.013]	-0.092*** [0.008]	-0.188*** [0.009]	-0.114*** [0.006]	-0.150*** [0.017]	-0.120*** [0.012]
volatility	0.458*** [0.163]		1.978*** [0.486]	2.876** [1.123]	0.425** [0.184]		1.879*** [0.454]	2.167* [1.228]
volatility rest		3.205*** [0.364]				3.953*** [0.425]		
democracy	0.007 [0.007]	0.011* [0.006]	0.009 [0.008]	0.017** [0.007]	0.005 [0.008]	0.022*** [0.006]	0.005 [0.009]	0.015** [0.007]
presidential	0.015** [0.006]	0.003 [0.005]	0.003 [0.008]	-0.002 [0.009]	0.018*** [0.007]	0.005 [0.005]	0.006 [0.008]	0.005 [0.010]
left	0.002 [0.003]	0.004 [0.002]	0.001 [0.003]	0.003 [0.002]	0.007** [0.003]	0.004 [0.003]	0.008* [0.005]	0.011*** [0.003]
election year	0.001 [0.002]	0.001 [0.002]	0.001 [0.002]	0.000 [0.002]	0.000 [0.002]	0.001 [0.002]	0.001 [0.002]	0.001 [0.002]
recession	-0.003 [0.003]	0.001 [0.002]	-0.006** [0.003]	-0.008** [0.003]	-0.004 [0.003]	0.003 [0.002]	-0.007** [0.003]	-0.007 [0.004]
bank crisis	-0.011** [0.005]	-0.012*** [0.004]	-0.016** [0.006]	-0.017** [0.007]	-0.011** [0.005]	-0.014*** [0.005]	-0.016*** [0.006]	-0.016** [0.007]
currency crisis	-0.012** [0.005]	-0.007* [0.004]	-0.011 [0.007]	-0.016*** [0.006]	-0.013** [0.006]	-0.008* [0.005]	-0.014* [0.007]	-0.018*** [0.007]
sovereign crisis	-0.041*** [0.010]	-0.030*** [0.007]	-0.042*** [0.014]	-0.041*** [0.011]	-0.040*** [0.011]	-0.031*** [0.007]	-0.040*** [0.015]	-0.037*** [0.011]
log GDP per c	-0.025*** [0.008]	0.000 [0.005]	-0.019 [0.014]	0.016** [0.007]	-0.030*** [0.009]	-0.007 [0.006]	-0.024 [0.017]	0.021*** [0.007]
EU member	0.014* [0.007]	0.018*** [0.006]	0.006 [0.010]	0.013 [0.008]	0.022** [0.009]	0.017** [0.009]	0.023*** [0.009]	0.027*** [0.009]
OECD memb	-0.009 [0.010]	-0.002 [0.009]	-0.016*** [0.005]	-0.022** [0.009]	-0.001 [0.010]	0.007 [0.007]	-0.002 [0.009]	-0.007 [0.008]
Country-Sector	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No	Yes	No	Yes	Yes
Observations	5,343	7,624	5,630	5,630	4,017	6,326	4,267	4,267
R-squared	0.0959	0.0537			0.120	0.0626		
Hansen J p-val			0.398	0.903			0.340	0.681
F-test			34.56	30.49			25.46	23.42

Notes. All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead. IV specifications are estimated with 2SLS and only second-stage coefficients are reported. AR denotes AR(1) residuals, estimated with a two-stage procedure. The p-value for the Hansen J-test of over-identifying restrictions and the F-test for weak instruments are reported. Standard errors are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.



Table 17. OLS and 2SLS Regressions - low vs high newspapers circulation countries

Dependent variable: annual change in liberalization indices						
	AR		AR		IV others	
	low news	high news	low news	high news	low news	high news
	(1)	(2)	(3)	(4)	(5)	(6)
liberalization	-0.196*** [0.011]	-0.104*** [0.009]	-0.111*** [0.007]	-0.088*** [0.008]	-0.120*** [0.016]	-0.080*** [0.008]
volatility	0.402** [0.201]	0.471 [0.428]			2.273* [1.363]	1.719 [1.319]
volatility rest			3.899*** [0.484]	2.838*** [0.547]		
democracy	-0.001 [0.009]	-0.036 [0.033]	0.014** [0.006]	0.059*** [0.015]	0.017** [0.009]	-0.056** [0.028]
presidential	0.016* [0.009]	0.029** [0.014]	0.004 [0.006]	-0.001 [0.012]	0.010 [0.015]	0.032** [0.014]
left	0.002 [0.004]	0.005* [0.003]	0.004 [0.004]	0.004 [0.003]	0.007 [0.005]	0.004 [0.003]
election year	0.001 [0.003]	-0.000 [0.002]	0.002 [0.002]	0.001 [0.002]	0.001 [0.003]	-0.000 [0.002]
recession	-0.003 [0.004]	0.001 [0.004]	0.003 [0.003]	0.000 [0.003]	-0.007 [0.005]	-0.006 [0.004]
bank crisis	-0.013** [0.007]	-0.003 [0.009]	-0.017*** [0.005]	-0.003 [0.008]	-0.020** [0.010]	-0.003 [0.008]
currency crisis	-0.010 [0.007]	-0.026** [0.011]	-0.009* [0.005]	-0.012 [0.008]	-0.015* [0.008]	-0.021** [0.010]
sovereign crisis	-0.035*** [0.012]		-0.024*** [0.008]	-0.087*** [0.019]	-0.036*** [0.012]	
log GDP per capita	-0.035*** [0.013]	-0.009 [0.016]	0.001 [0.006]	-0.017* [0.010]	0.032*** [0.009]	0.016 [0.011]
EU member	0.033*** [0.012]	0.012 [0.007]	0.021** [0.009]	0.017*** [0.006]	0.033*** [0.011]	0.009 [0.006]
OECD member	0.005 [0.014]	-0.002 [0.013]	0.015* [0.009]	-0.010 [0.011]	0.010 [0.013]	-0.014 [0.011]
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	No	No	No
Observations	3,084	2,445	5,116	2,974	3,279	2,561
R-squared	0.126	0.0778	0.0614	0.0523		
Hansen J p-value					0.263	0.350
F-test					17.65	45.35

Notes. All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead. "low news" and "high news" denote countries with daily newspapers circulation below and above the sample mean in 1996, respectively. IV specifications are estimated with 2SLS and only second-stage coefficients are reported. AR denotes AR(1) residuals, estimated with a two-stage procedure. The p-value for the Hansen J-test of over-identifying restrictions and the F-test for weak instruments are reported. Standard errors are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.

Table 18. OLS and 2SLS Regressions - countries with and without term limit

	Dependent variable: annual change in liberalization indices					
	AR		AR		IV others	
	No Term Limit	Term Limit	No Term Limit	Term Limit	No Term Limit	Term Limit
	(1)	(2)	(3)	(4)	(5)	(6)
L.lib	-0.118*** [0.010]	-0.185*** [0.011]	-0.096*** [0.008]	-0.108*** [0.007]	-0.094*** [0.008]	-0.128*** [0.015]
L.vol	1.009** [0.422]	0.301 [0.193]			3.014** [1.498]	0.705 [1.224]
L.vol_rest_w			3.021*** [0.576]	3.516*** [0.478]		
Constant	-0.113 [0.162]	0.490*** [0.087]	0.035 [0.079]	0.048 [0.047]		
democracy	-0.000 [0.015]	0.001 [0.009]	-0.003 [0.013]	0.028*** [0.006]	0.023 [0.022]	0.018** [0.009]
presidential	-0.020 [0.023]	0.019*** [0.007]	-0.021 [0.025]	0.005 [0.005]	-0.033* [0.019]	0.019* [0.011]
left	-0.001 [0.003]	0.008* [0.004]	0.001 [0.003]	0.007** [0.003]	-0.000 [0.003]	0.011*** [0.004]
election year	0.003 [0.003]	-0.002 [0.003]	0.003 [0.003]	0.000 [0.002]	0.004 [0.003]	-0.002 [0.003]
recession	0.001 [0.004]	-0.006 [0.004]	0.003 [0.003]	0.001 [0.003]	-0.005 [0.004]	-0.005 [0.005]
bank crisis	-0.014 [0.010]	-0.008 [0.007]	-0.011 [0.008]	-0.014*** [0.005]	-0.018* [0.010]	-0.006 [0.008]
currency crisis	-0.037*** [0.010]	-0.004 [0.007]	-0.022*** [0.007]	-0.004 [0.005]	-0.036*** [0.010]	-0.006 [0.007]
sovereign crisis	-0.052** [0.026]	-0.039*** [0.012]	-0.064*** [0.014]	-0.024*** [0.008]	-0.011 [0.026]	-0.036*** [0.013]
log GDP per capita	0.020 [0.018]	-0.040*** [0.010]	0.001 [0.010]	-0.005 [0.006]	0.031*** [0.011]	0.014* [0.008]
EU member	0.013 [0.009]	0.021** [0.009]	0.014 [0.010]	0.021*** [0.006]	0.009 [0.009]	0.021*** [0.008]
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	No	No	No
Observations	2,576	2,953	3,290	4,800	2,696	3,144
R-squared	0.0886	0.120	0.0523	0.0605	0.041	0.085
Hansen J p-value					0.331	0.538
F-test					41.33	18.97

Notes. All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead. "Term Limit" and "No Term Limit" denote, respectively, countries with and without a constitutional limit to the number of terms in office either for the head of State or for the Prime Minister. AR denotes AR(1) residuals, estimated with a two-stage procedure. IV specifications are estimated with 2SLS and only second-stage coefficients are reported. The p-value for the Hansen J-test of over-identifying restrictions and the F-test for weak instruments are reported. Standard errors are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.

Table 19. OLS and 2SLS Regressions - absolute change in liberalization indices

Dependent variable: absolute value of the annual change in liberalization indices								
	AR	AR	AR	Clustered SE	Clustered SE	Clustered SE	IV	IV others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
liberalization	-0.095*** [0.006]	-0.105*** [0.007]	-0.066*** [0.005]	-0.083*** [0.009]	-0.086*** [0.009]	-0.056*** [0.007]	-0.080*** [0.010]	-0.082*** [0.007]
volatility	0.186 [0.148]	0.262* [0.156]		0.186 [0.173]	0.266 [0.178]		1.432** [0.599]	0.316 [0.924]
volatility rest			1.569*** [0.347]			1.464*** [0.441]		
democracy	-0.016** [0.007]	-0.022*** [0.007]	0.006 [0.005]	-0.019*** [0.007]	-0.022*** [0.008]	0.005 [0.012]	-0.020*** [0.006]	-0.019*** [0.006]
presidential	0.012** [0.006]	0.012** [0.006]	-0.004 [0.004]	0.010 [0.009]	0.010 [0.009]	-0.005 [0.005]	0.002 [0.007]	0.009 [0.008]
left	0.005** [0.002]	0.003 [0.002]	0.000 [0.002]	0.004** [0.002]	0.003 [0.002]	-0.001 [0.002]	0.003 [0.003]	0.004* [0.002]
election year	0.002 [0.002]	0.001 [0.002]	0.002 [0.002]	0.001 [0.001]	0.001 [0.001]	0.002 [0.001]	0.001 [0.001]	0.001 [0.002]
recession	0.000 [0.002]	-0.000 [0.002]	0.004** [0.002]	0.001 [0.003]	0.001 [0.002]	0.005* [0.003]	-0.002 [0.002]	0.001 [0.003]
bank crisis	-0.002 [0.005]	-0.003 [0.005]	-0.002 [0.004]	-0.003 [0.005]	-0.005 [0.005]	0.000 [0.005]	-0.009 [0.006]	-0.004 [0.006]
currency crisis	0.002 [0.005]	0.002 [0.005]	-0.007* [0.004]	-0.003 [0.006]	-0.003 [0.006]	-0.006 [0.004]	-0.005 [0.007]	-0.003 [0.005]
sovereign crisis	0.003 [0.010]	0.003 [0.010]	-0.008 [0.006]	0.008 [0.014]	0.008 [0.017]	-0.009 [0.008]	0.004 [0.019]	0.007 [0.010]
log GDP per capita	0.029*** [0.006]	0.005 [0.008]	0.007 [0.005]	0.027*** [0.006]	0.018** [0.007]	0.007 [0.006]	0.015** [0.007]	0.027*** [0.006]
EU member	0.009 [0.006]	0.008 [0.006]	0.009* [0.005]	0.009* [0.005]	0.009* [0.005]	0.008** [0.004]	0.006 [0.007]	0.009 [0.006]
OECD member	-0.006 [0.009]	-0.002 [0.009]	0.007 [0.006]	-0.007** [0.003]	-0.004 [0.003]	0.005 [0.009]	-0.003 [0.004]	-0.006 [0.007]
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	No	Yes	No	Yes	No
Observations	5,529	5,529	8,090	5,840	5,840	8,408	5,840	5,840
R-squared	0.0468	0.0581	0.0235	0.045	0.054	0.020		
Hansen J p-value							0.363	0.238
F-test							34.03	39.62

Notes. The dependent variable is the absolute value of the annual change in the liberalization indices. All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead. IV specifications are estimated with 2SLS and only second-stage coefficients are reported. AR denotes AR(1) residuals, estimated with a two-stage procedure. Clustered SE denotes standard errors clustered by country. The p-value for the Hansen J-test of over-identifying restrictions and the F-test for weak instruments are reported. Standard errors are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.

Table 20. OLS Regressions - Alternative measures of uncertainty

Dependent variable: annual change in liberalization indices						
	AR	AR	AR	AR	AR	AR
	(1)	(2)	(3)	(4)	(5)	(6)
liberalization	-0.120*** [0.006]	-0.083*** [0.005]	-0.106*** [0.008]	-0.082*** [0.005]	-0.121*** [0.007]	-0.089*** [0.005]
X-rate volatility	0.003* [0.002]					
X-rate volatility_rest		0.023*** [0.006]				
bond volatility			0.146** [0.067]			
bond volatility_rest				-1.754*** [0.308]		
GDP growth volatility					0.371*** [0.090]	
GDP growth volatility_rest						4.672*** [0.744]
All Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No	Yes	No
Observations	7,553	8,090	3,743	8,090	5,129	8,090
R-squared	0.0767	0.0453	0.0717	0.0473	0.0795	0.0484

Notes. All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead. AR denotes AR(1) residuals, estimated with a two-stage procedure. X-rate volatility is the standard deviation of the daily exchange rate (vs U.S. Dollar) over the year, bond volatility is the standard deviation of daily 10-year bond yields over the year, GDP growth volatility is the standard deviation of quarterly growth rate of GDP over the year. Standard errors are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.

Table 21. OLS and 2SLS Regressions - abortion reforms

Dependent variable: annual change in the abortion index								
	AR	AR	Clustered SE	Clustered SE	IV	IV others	AR Abs. Change	AR Abs. Change
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
abortion_index	-0.265*** [0.018]	-0.226*** [0.014]	-0.214*** [0.031]	-0.176*** [0.038]	-0.215*** [0.029]	-0.219*** [0.016]	-0.263*** [0.018]	-0.117*** [0.014]
volatility	-0.278 [0.266]		-0.310 [0.376]		0.484 [0.358]	0.352 [1.715]	-0.288 [0.268]	
volatility rest		0.597 [0.659]		0.159 [0.465]				-1.301* [0.666]
democracy	-0.000 [0.013]	-0.010 [0.010]	0.004 [0.019]	-0.017 [0.020]	0.003 [0.017]	0.002 [0.013]	0.007 [0.013]	0.021** [0.010]
presidential	-0.011 [0.009]	-0.025*** [0.009]	-0.013 [0.013]	-0.022 [0.015]	-0.017 [0.013]	-0.014 [0.013]	-0.013 [0.010]	-0.010 [0.009]
left	0.002 [0.004]	-0.001 [0.004]	0.001 [0.003]	-0.002 [0.005]	0.001 [0.003]	0.001 [0.004]	0.000 [0.004]	-0.004 [0.004]
election year	-0.002 [0.003]	0.003 [0.003]	-0.003 [0.003]	0.005 [0.004]	-0.003 [0.003]	-0.004 [0.003]	-0.001 [0.003]	-0.001 [0.003]
recession	-0.003 [0.004]	0.002 [0.004]	-0.003 [0.004]	0.002 [0.004]	-0.004 [0.004]	-0.005 [0.005]	-0.003 [0.004]	0.003 [0.004]
bank crisis	-0.000 [0.009]	-0.008 [0.008]	0.001 [0.004]	-0.006 [0.006]	-0.003 [0.005]	-0.001 [0.012]	-0.001 [0.009]	0.005 [0.009]
currency crisis	0.003 [0.009]	0.005 [0.008]	-0.000 [0.004]	0.006 [0.009]	-0.002 [0.003]	-0.001 [0.010]	0.003 [0.009]	0.003 [0.008]
sovereign crisis	0.015 [0.019]	-0.003 [0.013]	0.018** [0.008]	-0.005 [0.006]	0.016 [0.010]	0.013 [0.019]	0.013 [0.019]	-0.010 [0.013]
log GDP per capita	0.000 [0.014]	0.010 [0.009]	0.009 [0.012]	0.018 [0.012]	0.009 [0.011]	0.006 [0.009]	-0.005 [0.015]	0.013 [0.009]
EU member	0.014 [0.009]	0.017* [0.010]	0.011 [0.009]	0.013 [0.014]	0.009 [0.008]	0.009 [0.009]	0.014 [0.010]	0.010 [0.010]
OECD member	0.002 [0.014]	-0.006 [0.013]	-0.001 [0.005]	-0.001 [0.007]	-0.000 [0.004]	0.000 [0.013]	0.001 [0.014]	-0.018 [0.013]
Country-Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No	Yes	No	Yes	No
Observations	941	1,408	994	1,462	994	994	941	1,408
R-squared	0.242	0.162	0.199	0.117			0.242	0.059
Hansen J p-value					0.481	0.732		
F-test					100.6	6.229		

Notes. The dependent variable in columns 1-6 is the annual change in the average index capturing in how many, out of 7 circumstances, abortion is legal. The dependent variable in columns 7-8 is the absolute value of the annual change in the average abortion index. All regressors are expressed in one-year lags, except for EU membership, which is 2-year lead. IV specifications are estimated with 2SLS and only second-stage coefficients are reported. AR denotes AR(1) residuals, estimated with a two-stage procedure. Clustered SE denotes standard errors clustered by country. The p-value for the Hansen J-test of over-identifying restrictions and the F-test for weak instruments are reported. Standard errors are reported in brackets. \*, \*\* and \*\*\* denote significance at 10, 5 and 1 per cent, respectively.

Table A. Countries and samples

country	data on reforms since	data on volatility since	EU member	CEE country	oecd member	high information
Argentina	1973	1973	No	No	No	No
Australia	1973	1973	No	No	Yes	Yes
Austria	1973	1985	since 1995	No	Yes	Yes
Bangladesh	1973	2005	No	No	No	No
Belgium	1973	1985	Yes	No	Yes	No
Brazil	1973	1973	No	No	No	No
Canada	1973	1976	No	No	Yes	No
Chile	1973	1975	No	No	No	No
China	1973	1991	No	No	No	No
Colombia	1973	1992	No	No	No	No
Czech Rep	1973	1994	since 2004	Yes	since 1995	Yes
Denmark	1973	1979	Yes	No	Yes	Yes
Ecuador	1973	1994	No	No	No	No
Egypt	1973	1993	No	No	No	No
Finland	1973	1987	since 1995	No	Yes	Yes
France	1973	1973	Yes	No	Yes	Yes
Germany	1973	1973	Yes	No	Yes	Yes
Greece	1973	1989	since 1981	No	Yes	No
Hungary	1973	1995	since 2004	Yes	since 1996	
India	1973	1979	No	No	No	No
Indonesia	1973	1983	No	No	No	No
Iran	1973	1991	No	No	No	No
Ireland	1973	1987	Yes	No	Yes	No
Israel	1973	1973	No	No	No	Yes
Italy	1973	1973	Yes	No	Yes	No
Japan	1973	1973	No	No	Yes	Yes
Kenya	1973	1991	No	No	No	No
Korea	1973	1973	No	No	since 1996	Yes
Luxembourg	1973	1985	Yes	No	Yes	Yes
Malaysia	1973	1980	No	No	No	No
Mexico	1973	1985	No	No	since 1994	
Morocco	1973	1995	No	No	No	
Netherlands	1973	1983	Yes	No	Yes	Yes
New Zealand	1973	1973	No	No	Yes	Yes
Nigeria	1973	1989	No	No	No	No
Norway	1973	1983	No	No	Yes	Yes
Pakistan	1973	1989	No	No	No	No
Peru	1973	1992	No	No	No	No
Poland	1973	1994	since 2004	Yes	since 1996	
Portugal	1973	1986	since 1986	No	Yes	
Romania	1973	1998	No	Yes	No	Yes
Russia	1973	1995	No	No	No	No
Saudi Arabia	1973	1994	No	No	No	No
Singapore	1973	1973	No	No	No	Yes
South Africa	1973	1986	No	No	No	No
Spain	1973	1973	since 1986	No	Yes	No
Sweden	1973	1980	since 1995	No	Yes	Yes
Switzerland	1973	1973	No	No	Yes	Yes
Thailand	1973	1973	No	No	No	No
Tunisia	1973	1998	No	No	No	
Turkey	1973	1988	No	No	Yes	No
United Kingdom	1973	1973	Yes	No	Yes	Yes
United States	1973	1973	No	No	Yes	Yes
Ukraine	1973	1998	No	No	No	
Venezuela	1973	1994	No	No	No	Yes
Viet Nam	1973	2001	No	No	No	