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ECONOMIC UNCERTAINTY AND STRUCTURAL REFORMS[†]

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, terrorist attacks, 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, including political variables, economic variables, crisis indicators, and a host of country, reform and time fixed effects. These findings are broadly consistent with recent models suggesting that uncertainty promotes reforms by mitigating agency problems between policy makers and voters.

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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 observers 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, less information can sometimes improve agency problems and this insight has recently been used by Bonfiglioli and Gancia (2013) to show that uncertainty can alleviate political myopia. The argument is that in times of turmoil reelection depends more on luck rather than political actions, thereby leaving the government freer to invest in reforms with short-run costs and 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. Finally, although there is some consensus that reforms are more likely to occur during times of crisis (e.g., Tommasi and Velasco, 1996, and Alesina, Ardagna and Trebbi, 2006) 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 any increase

in deregulation indices available in six areas: domestic financial sector, capital account, product markets, agriculture, trade, and current account transactions. 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 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, including political variables, economic variables, crisis indicators, and a host of country, reform and time fixed effects. 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, terrorist attacks, political coups and revolutions as instruments for uncertainty. Finally, since a concern may still remain that these shocks are not entirely exogenous to policy choices in a given country, we also instrument uncertainty using disaster 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. In all cases, the second-stage results confirm the initial finding that uncertainty, measured by stock market volatility, promotes the adoption of structural reform.

We close the analysis with some additional robustness checks. We show that the results do not depend crucially on any specific subset of the six reform areas. Moreover, the effect of uncertainty is driven neither by EU countries nor by Central and Eastern European Countries. Interestingly, we find that the positive effect of uncertainty on the implementation of reforms is weaker in countries with better quality of information, which is consistent with the predictions of the agency model in Bonfiglioli and Gancia (2013).

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 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.¹ Rather, we briefly discuss some of the main theoretical channels

¹See Tommasi and Velasco (1996) and Drazen (2000) for some surveys.

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 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.

2.1.1 Negative Effects of Uncertainty

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. 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 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.² Finally, Alesina and Cukierman (1990) have shown that uncertainty allows

²Drazen (2000) discusses other reasons why reforms may be more likely in periods of crisis. 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). However, in this paper we restrict attention

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.

2.1.2 Positive Effects of Uncertainty

The notion that uncertainty can facilitate economic reforms is not commonly found in the literature. A recent exception is Bonfiglioli and Gancia (2013), who show that uncertainty can alleviate agency problems and mitigate political myopia in a model of electoral accountability.³ In their model, imperfect information induces an incumbent politician to underinvest in costly reforms with future returns in an attempt to signal high ability and increase his reelection probability. By making observable measures of performance worse signals of ability, economic uncertainty reduces this short-term bias.

To better understand this mechanism and obtain predictions that will be useful in interpreting the data, we sketch a simplified version of the model, which builds on Rogoff (1990) and Holmstrom (1999). There are two time periods: in the first, a politician of unknown ability makes an unobservable investment in reforms with a payoff in the second period.⁴ Between periods there is an election in which voters choose between the incumbent and a challenger. Expected utility of the representative citizen is

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

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 office. His expected utility is

$$U = W + \gamma + \beta p \gamma, \quad (2)$$

where p is the perceived probability of being reelected. Economic performance depends on the ability of the politician, θ_t , his choice of reforms, r , and a random shock ε_t :

$$\begin{aligned} y_t &= \theta_t - r + \varepsilon_t \\ y_{t+1} &= \theta_{t+1} + f(r) + \varepsilon_{t+1}. \end{aligned} \quad (3)$$

Investing in reforms, r , has an immediate cost and a future return $f(r)$, with $f'(r) > 0$,

to economic reforms in representative democracies.

³See Dewatripont, Jewitt and Tirole (1999), Holmström (1999), and Prat (2005) for other examples of agency models in which uncertainty may improve the equilibrium along some dimensions.

⁴The assumption that voters cannot observe investment in reforms is stronger than needed. If the voters could observe a noisy signal of the actual policy, the main results would still hold.

$f''(r) < 0$, $f'(0) = \infty$ and $f'(\infty) = 0$. Ability, θ_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, ε_t is an i.i.d. shock, $\varepsilon \sim N(0, \sigma_\varepsilon^2)$, uncorrelated to ability.

The model is solved backwards. First, we find the election rule that maximizes (1). Citizens face an inference problem: they want to reelect a politician with a high θ , but they only observe a noisy signal, $y_t = \theta_t - r + \varepsilon_t$. Thus, they must form expectations on ability conditional on y_t . Since voters know all distributions and can predict the equilibrium level of reforms, r^e , their optimal strategy is to reelect the incumbent if the expectation of his ability is above average, i.e., if $y_t \geq \bar{y} \equiv \bar{\theta} - r^e$. Thus, the election rule takes a simple threshold form: voters support the incumbent 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 (2), before observing the realization of θ_t and ε_t , and given the voting strategy of citizens. Since $\mathbb{E}[\theta_t] = \bar{\theta}$ and $\mathbb{E}[\varepsilon] = 0$, his problem is:

$$\max_r \left\{ \bar{\theta} - r + \gamma + \beta [\mathbb{E}\theta_{t+1} + f(r) + p\gamma] \right\} \quad (4)$$

subject to:

$$p = \Pr(y_t \geq \bar{y}) = 1 - G(\bar{y} + r), \quad (5)$$

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 and thus the probability to meet the threshold for reelection. The first-order condition for r is:

$$\beta f'(r) = 1 - \frac{\partial p}{\partial r} \beta \gamma. \quad (6)$$

The LHS of (6) 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 being reelected.⁵

Imposing rational expectations, $r = r^e$, implies $\partial p / \partial r = -g(\bar{\theta})$ so that (6) become:

$$\beta f'(r) = 1 + \beta \gamma [2\pi(\sigma_\theta^2 + \sigma_\varepsilon^2)]^{-1/2}, \quad (7)$$

because $G \sim N(\bar{\theta}, \sigma_\theta^2 + \sigma_\varepsilon^2)$. Equation (6) 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

⁵Note 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 $\partial \mathbb{E}\theta_{t+1} / \partial r = 0$.

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 by voters as a sign of low ability. However, when ability and shocks are highly dispersed, the reelection probability depends more on the realization of θ and ε , rather than on the choice of r , so that there is a lower incentive to inflate current performance.⁶

What is the effect of having better-informed voters? To address this question, we now assume that voters can observe r with some probability. In particular, let ν be the probability that the majority of voters has no information on political actions. Uninformed voters behave as before. Informed voters, however, observe the sum, $\theta + \varepsilon_t$, and will keep the politician in office if this is higher than $\bar{\theta}$. Then, the perceived probability of reelection becomes:

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

Substituting (3) and $\bar{y} \equiv \bar{\theta} - r^e$ and rearranging we obtain:

$$p = \frac{1 + \nu}{2} - \nu G(\bar{y} + r). \quad (8)$$

The marginal effect of changes in r on the chance of reelection is now weighted by the probability that the median voter is uninformed, ν . This is intuitive, since informed voters cannot be fooled. As a result, the incentive to inflate current performance at the expenses of reforms, and hence also the disciplining effect of uncertainty, is weaker the lower is ν .

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. 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. Recently, Alesina, Ardagna and Trebbi (2006) provide evidence from a large panel of countries that

⁶Note that in equilibrium the reelection probability is just the unconditional probability that the incumbent be more able than the population average, which is not affected by the choice of reform. This is consistent with the evidence that reelection prospects do not seem to be negatively affected by reforms (e.g., Peltzman, 1992, Alesina, Perotti and Tavares, 1998, Alesina et al. 2013, Brender and Drazen, 2008).

fiscal reforms are more likely to occur during times of crisis, when new governments take office and when governments are “strong.” Periods of economic crisis are also found to favor the adoption of structural reforms targeted to the markets for goods and services, and labor (Høj et al., 2006).

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 direct 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, 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-

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.⁷

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 telecom 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 has 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).

Following the recent literature started by Bloom (2009), we take the volatility of stock market returns, reflecting the variability in investors' expectations over the future sales of firms, as our 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

⁷In particular, we use the data made publicly available by Prati, Onorato and Papageorgiou (2012).

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).

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 about 6400 observations.

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 by far the product market, as column two 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

$$reform_{s,c,t} = \beta_1 lib_{s,c,t-1} + \beta_2 vol_{c,t-1} + \beta_3 \mathbf{X}_{c,t-1} + \eta_{s,c} + \eta_t + \epsilon_{s,c,t} \quad (9)$$

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 η_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 ($\beta_1 > 0$).

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 β_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 (9) 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 show in the robustness analysis how sensitive the results are to specific groups of reforms.

3.2.1 Estimation Methods and Identification Strategies

We start by estimating equation (9) 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, we cluster the residuals at the sector-country level.

Next, we recognize that, although volatility enters with one lag, the estimates for β_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 degree of uncertainty 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 (9) plus the following ancillary equation for volatility:

$$vol_{c,t-1} = \gamma\mathbf{Z}_{c,t-1} + \nu_c + \nu_{t-1} + \varepsilon_{c,t-1}, \quad (10)$$

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

First, we argue that, given the degree of international integration of stock markets and the importance of world-level shocks, there are some common factors driving volatility in all countries. Such a world component of volatility is most likely to be independent of the political debate over reforms that is taking place in each single country, and hence seems a good instrument for country-specific volatility. Hence, we 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. 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 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 increase in 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.

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 being or becoming a member of the European Union (EU) may provide an extra incentive to adopt reforms, we include a dummy that equals 1 if a country in a given year is a member of the EU.

4 EMPIRICAL EVIDENCE

Before proceeding to estimate equation (9), 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).

4.1 OLS ESTIMATES

Table 3 reports the results from the OLS estimation of equation (9) under the assumption of AR(1) residuals. The first column shows reforms to be positively and significantly correlated with lagged 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. 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 and good economic conditions (log GDP per capita) 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, 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.⁸ 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 sector-country level. The coefficient estimates for volatility and initial liberalization do not change much relative to Table 4, neither in size nor in significance. Also financial crises, especially banking crises and sovereign defaults, preserve their strong negative correlation with reforms.

⁸The 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.

4.2 IV ESTIMATES

The results in Tables 3 and 4 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 (9)-(10) with two-stage least squares. Columns 1 and 2 of Table 5 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 averages in the rest of the sample we never 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.⁹ 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 and the log of real GDP per capita, which correlate positively with reforms, and the dummies for recessions and financial crises, whose signs are negative. The F-test of 257 proves the instrument to be strong even after adding more exclusion restrictions. Note, finally, that the IV coefficients are higher than the OLS, which suggests the presence of an attenuation bias. This may be due to the fact that reforms, even before being enacted, have a stabilizing role on expectations, or to measurement error.

Next, since we proved 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 (9) 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 for the same specifications at the country-sector level. All estimates for volatility are positive and significant, and very close in size to the IV coefficients of columns 2 and 4. Among the other controls, democracy 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

⁹For convenience, we never not report the coefficients for excluded instruments, which are, however, available upon request.

natural disasters, political coups, revolutions, and terroristic attacks proposed by Baker and Bloom (2013). As a final step, to tackle possible endogeneity of these shocks with respect to policy, we use as a third set of instruments the average shocks in the rest of the sample, weighted by real GDP per capita.

Tables 6 and 7 report results from the second and first stage, respectively. In columns 1 to 3 of both tables, we estimate our baseline and complete specifications, 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 and drop the year fixed effects. First, note that the statistical validity of both sets of instruments is supported by the F-tests (between 27 and 65), and by the p-values for the Hansen J-test of overidentifying restrictions (between 0.19 and 0.75). 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 and real GDP per capita remain significant covariates of reforms. Finally, the first-stage coefficients in Table 7 suggest that the instruments are significant determinants of economic uncertainty, with a prominent role played by political shocks, both nationally and internationally.

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 reforms and countries.

First, 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 8. The estimated coefficients confirm that there is a positive and significant correlation between reforms and average returns in most of our specifications. However, the effect of volatility remains positive and highly significant (at 1 or 5 per cent) in all of them.

Next, we explore whether our results are driven by some reforms in particular. To this end, we re-estimate the complete specification excluding one of the following groups of reforms at a time: *real openness*, including trade and the current account; *market*, comprising product and agricultural sectors; and *finance*, consisting of domestic finance and the capital account. The results are reported in Table 9. The lower power due to the loss of observations makes the estimates slightly less precise. Nevertheless, the results suggest that the relationship between reforms and volatility, with seven positive and significant coefficients out of nine, is rather uniform across all types of reforms.

We continue by splitting our sample in two more 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 and undermine the evidence shown so far, if CEE countries were the main drivers of the main results. To address this concern, we replicate the analysis excluding CEE countries from the sample. The results, reported in columns 1 to 4 of Table 10, 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, 2008) and may correlate (positively or negatively) with volatility. This may induce a bias in the coefficient for volatility. To also address this concern, we exclude from the estimation sample countries that were EU members. Columns 5 to 8 of Table 10 confirm that the effect of volatility on reforms holds equally strong in the restricted sample.

4.4 INVESTIGATING THE MECHANISM

So far, we have shown a new robust pattern in the data, suggesting that economic uncertainty, measured by stock market volatility, positively affects the adoption of structural reforms aimed at liberalizing a number of sectors of the economy. As shown in section 2, this may be explained by a model where imperfect information and electoral motives induce a suboptimally low level of reforms. Uncertainty may mitigate this opportunistic bias by making the reelection probability depend more on luck and less on policy choices, thereby leaving the politician freer to take the socially optimal action. Moreover, according to the model, uncertainty should promote reforms more the less voters are informed about policy choices.

We test this prediction by estimating our baseline and complete 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.¹⁰ As an alternative way to identify countries in which voters are more likely to be informed, we use OECD membership. The idea behind this is that more advanced countries usually have a longer tradition of free press and circulation of information. We then run separate regressions for the countries that were OECD members back in 1973 (core OECD), and compare them with the rest of the sample. The results in the top panels

¹⁰An 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.

of Tables 11 and 12 refer to the baseline specification, while those in the bottom panels refer to the complete one. As predicted by the model and despite the loss in power due to the smaller number of observations, the coefficients for volatility in Table 11 are positive and significant in low-information countries. Instead, they are less precisely estimated and smaller in magnitude in the other group. A similar picture emerges from Table 12, where the coefficient for volatility is barely significant for core OECD countries and more positive and significant for the other countries.

Overall, these results suggest that the effect of volatility on reforms is stronger when information is poorer. These findings are consistent with the agency model reviewed in Section 2, in which an incumbent politician underinvests in costly reforms in an attempt to manipulate voters' expectations. 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 reelection probability especially in less developed countries.

4.5 SUMMARY AND DISCUSSION

The empirical evidence presented so far documents a novel and robust pattern in the data, suggesting that economic uncertainty, captured by the volatility of stock market returns, has a positive effect on the adoption of structural reforms in six sectors of the economy. While the causal link seems to be rather uniform across sectors, and independent of the transition process undergone by certain countries, it seems to be stronger among countries with worse information.

The results on the effects of economic uncertainty on liberalizations are not only novel and robust, but 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 β_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. Finally, 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.

In addition to this novel piece of evidence, our analysis provides a series of additional results that can be compared with those found in the empirical and theoretical literature on reforms. First, as in Giuliano, Mishra and Spilimbergo (2013), democracy is proved

to be a robust determinant of structural reforms, even in a restricted sample of relatively more democratic countries. Left-wing governments turn out to be significantly more reformist than center and right-wing parties in power. This result is in line with previous evidence by Abiad and Mody (2005) on financial liberalization reforms, and with the theory in Cukierman and Tommasi (1998). Crisis episodes, such as recessions and, even more robustly, banking and currency crises and sovereign defaults, are associated to reversals or slow-downs in reforms. Although this result seems in contrast with the findings in the literature on fiscal and macroeconomic stabilization (see, among others, Alesina, Ardagna and Trebbi, 2008), it is not directly comparable to it. In those papers, the relevant crisis episodes were high government deficit and hyperinflation, which called for reforms stabilizing those macroeconomic variables. Here, crises are episodes which set the economy under stress and may therefore make politicians more reluctant to undertake reforms, especially if these have short-run costs. Consistently with our results, Abiad and Mody (2005) find evidence that banking crises lower the likelihood of reform adoption and increase that of reversals.

5 CONCLUSIONS

How does economic uncertainty affect the adoption of structural reforms? This paper is the first to address and 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, terroristic attacks and political unrest occurred in the country, and finally with the same shocks in the rest of the sample. Moreover, we have shown that the causal link between uncertainty and structural reforms is uniform across sectors, and is not driven by Central and Eastern European countries or EU members.

Guided by a model based on Bonfiglioli and Gancia (2013), we have investigated the mechanism linking uncertainty to reforms. In particular, the evidence suggests that the positive effect of stock market volatility is stronger in countries with more limited access to information. This is consistent with our theory, arguing that uncertainty promotes reforms by alleviating the agency problem between incumbent politicians and voters, and more so

where information on policy making is poorer.

We conclude by discussing some implications of our findings. Understanding why countries often fail to adopt reforms is one of the most debated questions in political economy. One view is that elections, which are the fundamental instrument of political accountability in modern democracies, may provide myopic incentives and hence a tendency to avoid costly adjustments. As Jean-Claude Juncker famously said, “We all know what to do, but we don’t know how to get reelected once we have done it.” In light of this view, the results of this paper are important in at least two respects. 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, if the myopic bias is indeed driven by poor information, as hinted by our last findings, it would imply that promoting transparency, guaranteeing media independence and educating voters are important factors to make democracies work well.

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A 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.1 Dependent variables: 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 Explanatory 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 the country is a member of the EU in a given year.
- *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.

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	-0.013	0.037	0.059	-0.018	-0.019	0.041
presidential	0.012	0.023	0.009	0.053	0.013	-0.009
left	-0.013	0.047	0.095***	0.031	0.0633**	0.057
election year	0.009	0.019	0.020	-0.018	-0.009	-0.019
recession	0.015	-0.052	-0.035	0.003	0.079***	-0.070**
bank crisis	0.006	-0.069**	0.055	-0.016	-0.007	-0.081***
currency crisis	0.032	-0.024	-0.039	-0.016	-0.027	-0.009
sovereign crisis	-0.012	-0.123***	-0.017	-0.008	0.013	-0.096***
log GDP p.c.	-0.089***	-0.041	0.031	0.020	-0.059	-0.008
EU member	-0.051	-0.012	0.061**	0.011	-0.018	-0.024
OECD member	-0.067**	-0.018	0.036	0.002	-0.023	0.017
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]	-0.109*** [0.006]	-0.122*** [0.007]	-0.149*** [0.007]
volatility	0.705*** [0.138]	0.504*** [0.138]	0.431*** [0.150]	0.695*** [0.143]	0.397*** [0.139]	0.476*** [0.156]	0.473*** [0.165]
democracy			0.026*** [0.007]			0.016** [0.007]	0.005 [0.007]
presidential			0.015** [0.006]			0.015** [0.006]	0.014** [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]	0.000 [0.002]
recession				-0.005** [0.002]		-0.002 [0.003]	-0.004 [0.003]
bank crisis				-0.011** [0.005]		-0.011** [0.005]	-0.012** [0.005]
currency crisis				-0.013** [0.005]		-0.011** [0.005]	-0.011** [0.005]
sovereign crisis				-0.038*** [0.010]		-0.037*** [0.010]	-0.040*** [0.010]
log GDP per capita					0.036*** [0.005]	0.025*** [0.006]	-0.026*** [0.009]
EU member					0.009 [0.006]	0.010 [0.007]	0.002 [0.007]
OECD member					-0.011 [0.008]	-0.013 [0.009]	-0.004 [0.009]
Country-sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE							Yes
Observations	6,402	6,402	5,565	6,269	6,402	5,529	5,529
Durbin-Watson	1.917	1.852	1.850	1.846	1.836	1.839	1.824

Notes. All regressors are lagged one year. 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*** [0.008]	-0.092*** [0.010]	-0.078*** [0.008]	-0.094*** [0.009]	-0.106*** [0.010]	-0.126*** [0.011]
volatility	0.692*** [0.220]	0.519** [0.233]	0.441* [0.244]	0.668** [0.261]	0.442* [0.241]	0.481* [0.276]	0.500* [0.297]
democracy			0.024*** [0.007]			0.013 [0.008]	0.003 [0.007]
presidential			0.012 [0.007]			0.011 [0.008]	0.010 [0.008]
left			0.008*** [0.003]			0.006** [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]		-0.003 [0.003]	-0.003 [0.003]
bank crisis				-0.010* [0.005]		-0.010* [0.005]	-0.012** [0.005]
currency crisis				-0.009 [0.006]		-0.010 [0.006]	-0.008 [0.006]
sovereign crisis				-0.033 [0.020]		-0.031 [0.021]	-0.035* [0.021]
log GDP per capita					0.032*** [0.005]	0.027*** [0.006]	-0.016 [0.010]
EU member					0.008 [0.007]	0.010 [0.009]	0.003 [0.010]
OECD member					-0.010 [0.008]	-0.010 [0.008]	-0.002 [0.009]
Country-sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE							Yes
Observations	6,725	6,725	5,880	6,588	6,725	5,840	5,840

Notes. All regressors are lagged one year. Standard errors, clustered by country and reform sector, are reported in brackets. *, ** and *** denote significance at 10, 5 and 1 per cent, respectively.

Table 5. 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	IV second stage	IV first stage	IV second stage	AR(1) residuals	AR(1) residuals	Clustered SE	Clustered SE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
liberalization		-0.065*** [0.005]		-0.093*** [0.007]	-0.079*** [0.004]	-0.101*** [0.005]	-0.070*** [0.006]	-0.089*** [0.007]
volatility		3.425*** [0.487]		2.830*** [0.690]				
volatility others	0.609*** [0.027]		0.609*** [0.038]		3.476*** [0.264]	3.453*** [0.361]	2.871*** [0.216]	3.270*** [0.372]
democracy				0.014** [0.007]		0.021*** [0.005]		0.020*** [0.006]
presidential				-0.005 [0.007]		0.002 [0.005]		0.000 [0.005]
left				0.006** [0.002]		0.004 [0.002]		0.003 [0.002]
election year				0.000 [0.002]		0.001 [0.002]		0.001 [0.002]
recession				-0.009*** [0.003]		0.002 [0.002]		0.002 [0.002]
bank crisis				-0.019*** [0.006]		-0.014*** [0.004]		-0.014*** [0.004]
currency crisis				-0.017*** [0.006]		-0.007* [0.004]		-0.006 [0.004]
sovereign crisis				-0.040*** [0.011]		-0.030*** [0.007]		-0.032*** [0.010]
log GDP per capita				0.018*** [0.006]		-0.004 [0.005]		-0.003 [0.005]
EU member				-0.004 [0.007]		0.008 [0.006]		0.008 [0.007]
OECD member				-0.006 [0.008]		0.009 [0.007]		0.006 [0.007]
Country-sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,720	6,721	5,839	5,840	9,673	8,090	9,998	8,408
F-test		501.1		256.7				
Durbin-Watson					1.889	1.885		

Notes. The dependent variable is lagged volatility in the first stage of the IV, and the annual change in the liberalization indices in the other specifications. All regressors are lagged one year. Volatility of other countries is the average of volatility of the other countries in the sample weighted by GDP p.c., and is computed for all country-years. First-stage coefficients are reported only for the instrument. F-tests for weak instruments are reported for the IV specifications. Where specified, AR(1) residuals are estimated with two-step procedure, and the modified Bhargava et al. (1982) Durbin-Watson test for serially autocorrelated residuals is reported. Where specified, standard errors are clustered at the country and reform sector level. For all specifications, standard errors are reported in brackets. *, ** and *** denote significance at 10, 5 and 1 per cent, respectively.

Table 6. 2SLS IV Regressions with shocks as instruments - Second stage

Dependent variable: annual change in liberalization indices					
	IV	IV	IV	IV	IV
			w/Years	others	others
	(1)	(2)	(3)	(4)	(5)
liberalization	-0.071*** [0.005]	-0.097*** [0.007]	-0.117*** [0.008]	-0.071*** [0.005]	-0.096*** [0.008]
volatility	1.578** [0.671]	2.005** [0.779]	1.943** [0.827]	1.421** [0.640]	2.212** [1.032]
democracy		0.014** [0.007]	0.005 [0.007]		0.014** [0.007]
presidential		0.001 [0.008]	0.000 [0.008]		-0.001 [0.009]
left		0.006** [0.002]	0.004* [0.002]		0.006** [0.002]
election year		0.000 [0.002]	0.000 [0.002]		0.000 [0.002]
recession		-0.007** [0.003]	-0.006** [0.003]		-0.007** [0.003]
bank crisis		-0.016*** [0.006]	-0.017*** [0.006]		-0.017** [0.006]
currency crisis		-0.014** [0.006]	-0.011** [0.006]		-0.015** [0.006]
sovereign crisis		-0.037*** [0.010]	-0.040*** [0.011]		-0.038*** [0.011]
log GDP per capita		0.021*** [0.006]	-0.020** [0.008]		0.020*** [0.007]
EU member		0.001 [0.008]	-0.006 [0.008]		-0.000 [0.009]
OECD member		-0.008 [0.008]	-0.001 [0.008]		-0.007 [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	0.731	0.745	0.672	0.357	0.185
F-test	59.36	48.48	46.38	65.23	27.38

Notes. All regressors are lagged one year. 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 at the country and reform sector level are reported in brackets. *, ** and *** denote significance at 10, 5 and 1 per cent, respectively.

Table 7. 2SLS IV Regressions with shocks as instruments - First stage

Dependent variable: volatility					
	IV	IV	IV	IV	IV
			w/Years	others	others
	(1)	(2)	(3)	(4)	(5)
natural disasters	-0.002*	-0.001	-0.002*	0.034***	0.018***
	[0.001]	[0.001]	[0.001]	[0.005]	[0.005]
coups	0.022***	0.020***	0.020***	-0.048**	-0.030
	[0.002]	[0.002]	[0.002]	[0.021]	[0.022]
revolutions	0.057***	0.046***	0.039***	2.878***	1.996***
	[0.007]	[0.007]	[0.007]	[0.197]	[0.202]
terrorist attacks	0.001	0.000	0.000	0.026***	0.001
	[0.001]	[0.001]	[0.001]	[0.006]	[0.006]
other controls	No	Yes	Yes	No	Yes
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 lagged one year. 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 at the country and reform sector level are reported in brackets. *, ** and *** denote significance at 10, 5 and 1 per cent, respectively.

Table 8. Robustness - Control for stock market returns

Dependent variable: annual change in liberalization indices							
	AR(1) residuals	AR(1) residuals	AR(1) residuals w/Years	AR(1) residuals	IV	IV w/Years	IV others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
liberalization	-0.087*** [0.005]	-0.122*** [0.007]	-0.149*** [0.007]	-0.136*** [0.007]	-0.098*** [0.007]	-0.118*** [0.008]	-0.096*** [0.008]
volatility	0.521*** [0.138]	0.476*** [0.156]	0.459*** [0.165]		1.847** [0.784]	1.808** [0.887]	2.327** [1.015]
volatility others				2.312*** [0.443]			
stock returns	0.026*** [0.009]	0.020* [0.010]	0.013 [0.012]	0.031*** [0.011]	0.020* [0.010]	0.010 [0.014]	0.019* [0.010]
democracy		0.016** [0.007]	0.005 [0.007]	0.012* [0.007]	0.014** [0.007]	0.005 [0.007]	0.014** [0.007]
presidential		0.015** [0.006]	0.014** [0.006]	0.018*** [0.006]	0.002 [0.008]	0.001 [0.008]	-0.002 [0.009]
left		0.007*** [0.003]	0.004 [0.003]	0.007*** [0.003]	0.006** [0.002]	0.004* [0.002]	0.006** [0.002]
election year		0.001 [0.002]	0.000 [0.002]	0.001 [0.002]	0.000 [0.002]	0.001 [0.002]	0.000 [0.002]
recession		-0.003 [0.003]	-0.004 [0.003]	-0.003 [0.002]	-0.006** [0.003]	-0.006* [0.003]	-0.007** [0.003]
bank crisis		-0.009* [0.005]	-0.011** [0.005]	-0.008 [0.005]	-0.014** [0.006]	-0.016** [0.006]	-0.016** [0.007]
currency crisis		-0.010* [0.005]	-0.010* [0.005]	-0.009* [0.005]	-0.013** [0.006]	-0.011* [0.006]	-0.014** [0.006]
sovereign crisis		-0.036*** [0.010]	-0.039*** [0.010]	-0.034*** [0.010]	-0.035*** [0.011]	-0.039*** [0.011]	-0.037*** [0.011]
log GDP per capita		0.026*** [0.006]	-0.025*** [0.009]	0.011 [0.007]	0.023*** [0.006]	-0.019** [0.008]	0.021*** [0.007]
EU member		0.010 [0.007]	0.002 [0.007]	0.010 [0.007]	0.002 [0.008]	-0.005 [0.008]	-0.001 [0.009]
OECD member		-0.013 [0.009]	-0.004 [0.009]	-0.008 [0.009]	-0.008 [0.008]	-0.001 [0.008]	-0.007 [0.008]
Country-type 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
Hansen J p-value					0.800	0.705	0.230
F-test					47.63	40.41	28.38

Notes. All regressors are lagged one year. Volatility of other countries is the average of volatility of the other countries in the sample weighted by GDP p.c., and is computed for all country-years. Where specified, AR(1) residuals are estimated with two-step procedure. Volatility of stock market returns is instrumented, in columns (5)-(6), with natural disasters, terroristic attacks, political coups and revolutions, and in column (7) 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 F-test for weak instruments are reported for the IV specifications. In the IV specifications, standard errors are clustered at the country and reform sector level. For all specifications, standard errors are reported in brackets. *, ** and *** denote significance at 10, 5 and 1 per cent, respectively.

Table 9. Robustness: excluding sub-sets of reforms

Dependent variable: annual change in liberalization indices									
	No Real openness AR(1)	No Real openness AR(1)	No Real openness IV	No Markets AR(1)	No Markets AR(1)	No Markets IV	No Finance AR(1)	No Finance AR(1)	No Finance IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
liberalization	-0.133*** [0.009]	-0.090*** [0.006]	-0.100*** [0.010]	-0.203*** [0.010]	-0.116*** [0.006]	-0.163*** [0.012]	-0.143*** [0.009]	-0.103*** [0.006]	-0.113*** [0.009]
volatility	0.266 [0.208]		2.252** [1.050]	0.322* [0.183]		2.294** [0.930]	0.723*** [0.212]		1.304 [1.053]
volatility others		3.751*** [0.455]			3.111*** [0.399]			3.570*** [0.474]	
democracy	-0.007 [0.009]	0.016** [0.007]	-0.006 [0.009]	0.017** [0.008]	0.024*** [0.006]	0.019** [0.008]	0.003 [0.010]	0.022*** [0.007]	0.003 [0.009]
presidential	0.019** [0.008]	0.005 [0.006]	0.001 [0.010]	0.009 [0.007]	-0.003 [0.005]	-0.006 [0.008]	0.015* [0.008]	0.003 [0.006]	0.007 [0.010]
left	0.005 [0.003]	0.004 [0.003]	0.005* [0.003]	0.004 [0.003]	0.005** [0.002]	0.004 [0.003]	0.002 [0.003]	0.002 [0.003]	0.003 [0.003]
election year	-0.000 [0.002]	0.000 [0.002]	-0.001 [0.002]	0.001 [0.002]	0.003 [0.002]	0.001 [0.002]	0.001 [0.002]	0.001 [0.002]	0.002 [0.003]
recession	-0.004 [0.003]	0.002 [0.003]	-0.007* [0.004]	-0.001 [0.003]	0.002 [0.002]	-0.006* [0.003]	-0.006* [0.003]	0.001 [0.003]	-0.007* [0.004]
bank crisis	-0.008 [0.007]	-0.012** [0.005]	-0.015** [0.007]	-0.020*** [0.006]	-0.021*** [0.005]	-0.026*** [0.007]	-0.008 [0.007]	-0.009 [0.006]	-0.010 [0.007]
currency crisis	-0.015** [0.007]	-0.010** [0.005]	-0.018*** [0.007]	-0.009 [0.006]	-0.003 [0.005]	-0.009 [0.006]	-0.009 [0.007]	-0.008 [0.006]	-0.008 [0.007]
sovereign crisis	-0.026** [0.013]	-0.021** [0.008]	-0.032** [0.013]	-0.051*** [0.012]	-0.040*** [0.008]	-0.050*** [0.012]	-0.043*** [0.013]	-0.030*** [0.009]	-0.040*** [0.014]
log GDP per capita	-0.026** [0.011]	-0.005 [0.006]	-0.026** [0.010]	-0.014 [0.009]	0.000 [0.006]	-0.009 [0.009]	-0.032*** [0.011]	-0.005 [0.007]	-0.022** [0.011]
EU member	0.007 [0.009]	0.017** [0.008]	-0.007 [0.011]	-0.002 [0.007]	-0.002 [0.006]	-0.011 [0.008]	0.005 [0.009]	0.012 [0.008]	0.002 [0.011]
OECD member	-0.007 [0.012]	0.014* [0.008]	0.001 [0.010]	-0.005 [0.010]	0.004 [0.007]	-0.004 [0.009]	-0.004 [0.012]	0.008 [0.008]	-0.003 [0.010]
Country-sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
Observations	3,638	5,335	3,843	3,780	5,501	3,991	3,640	5,344	3,846
Hansen J p-value			0.344			0.752			0.700
F-test			30.07			31.98			30.63

Notes. All regressors are lagged one year. Volatility of others is the average of volatility of the other countries in the sample weighted by GDP p.c., and is computed for all country-years. Where specified, AR(1) residuals are estimated with two-step procedure. Volatility of stock market returns is instrumented with natural disasters, terroristic attacks, political coups and revolutions. The p-value for the Hansen J-test of over-identifying restrictions and F-test for weak instruments are reported for the IV specifications. In the IV specifications, standard errors are clustered at the country and reform sector level. For all specifications, standard errors are reported in brackets. *, ** and *** denote significance at 10, 5 and 1 per cent, respectively.

Table 10. Robustness: excluding groups of countries

Dependent variable: annual change in liberalization indices								
	No CEE AR(1)	No CEE AR(1)	No CEE IV	No CEE IV others	No EU AR(1)	No EU AR(1)	No EU IV	No EU IV others
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
liberalization	-0.147*** [0.007]	-0.100*** [0.005]	-0.114*** [0.008]	-0.116*** [0.007]	-0.192*** [0.010]	-0.113*** [0.006]	-0.149*** [0.011]	-0.152*** [0.010]
volatility	0.487*** [0.164]		2.005** [0.820]	1.726*** [0.614]	0.430** [0.184]		1.831** [0.876]	1.473** [0.625]
volatility others		3.254*** [0.364]				3.962*** [0.425]		
democracy	0.006 [0.007]	0.010* [0.006]	0.009 [0.007]	0.009 [0.007]	0.003 [0.008]	0.022*** [0.006]	0.004 [0.007]	0.004 [0.007]
presidential	0.014** [0.006]	0.001 [0.005]	0.001 [0.008]	0.003 [0.007]	0.017** [0.007]	0.004 [0.005]	0.005 [0.008]	0.008 [0.007]
left	0.002 [0.003]	0.004 [0.002]	0.001 [0.002]	0.001 [0.002]	0.007** [0.003]	0.004 [0.003]	0.009*** [0.003]	0.008*** [0.003]
election year	0.001 [0.002]	0.001 [0.002]	0.000 [0.002]	0.001 [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]	-0.006** [0.003]	-0.004 [0.003]	0.003 [0.002]	-0.007* [0.004]	-0.006* [0.003]
bank crisis	-0.011** [0.005]	-0.013*** [0.004]	-0.016*** [0.006]	-0.015*** [0.006]	-0.012** [0.005]	-0.014*** [0.005]	-0.016** [0.006]	-0.015** [0.006]
currency crisis	-0.011** [0.005]	-0.007 [0.004]	-0.011** [0.005]	-0.011** [0.005]	-0.011* [0.006]	-0.007 [0.005]	-0.012** [0.006]	-0.011** [0.006]
sovereign crisis	-0.041*** [0.010]	-0.030*** [0.007]	-0.042*** [0.010]	-0.041*** [0.010]	-0.040*** [0.011]	-0.032*** [0.007]	-0.040*** [0.011]	-0.039*** [0.011]
log GDP per capita	-0.026*** [0.008]	0.001 [0.005]	-0.020** [0.008]	-0.019** [0.008]	-0.039*** [0.010]	-0.007 [0.006]	-0.024*** [0.009]	-0.024*** [0.009]
EU member	0.002 [0.007]	0.008 [0.006]	-0.006 [0.008]	-0.004 [0.007]				
OECD member	-0.009 [0.010]	-0.002 [0.009]	-0.016* [0.009]	-0.015* [0.009]	0.000 [0.010]	0.009 [0.007]	0.000 [0.008]	0.000 [0.008]
Country-sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Observations	5,343	7,624	5,630	5,630	4,017	6,326	4,267	4,267
Hansen J p-value			0.677	0.189			0.685	0.197
F-test			45.96	83.73			37.92	76.71

Notes. All regressors are lagged one year. CEE denotes Central and Eastern European countries, EU denotes members of the European Union. Volatility of other countries is the average of volatility of the other countries in the sample weighted by GDP p.c., and is computed for all country-years. Where specified, AR(1) residuals are estimated with two-step procedure. Volatility of stock market returns is instrumented in columns (3) and (7) with natural disasters, terroristic attacks, political coups and revolutions, and in columns (4) and (8) 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 F-test for weak instruments are reported for the IV specifications. In the IV specifications, standard errors are clustered at the country and reform sector level. For all specifications, standard errors are reported in brackets. *, ** and *** denote significance at 10, 5 and 1 per cent, respectively.

Table 11. Low-information vs high-information countries

Dependent variable: annual change in liberalization indices						
	low-info AR(1)	high-info AR(1)	low-info AR(1)	high-info AR(1)	low-info IV	high-info IV
	(1)	(2)	(3)	(4)	(5)	(6)
liberalization	-0.155*** [0.009]	-0.081*** [0.008]	-0.088*** [0.005]	-0.061*** [0.006]	-0.122*** [0.010]	-0.046*** [0.015]
volatility	0.377** [0.182]	0.050 [0.338]			1.484* [0.844]	10.065 [7.728]
volatility other countries			4.070*** [0.355]	2.424*** [0.380]		
Country-sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	No	Yes	Yes
Controls	No	No	No	No	No	No
Observations	3,514	2,888	6,107	3,566	3,713	3,008
Hansen J p-value					0.739	0.807
F-test					35.03	2.842
	(33)	(34)	(35)	(36)	(37)	(38)
	low-info AR(1)	high-info AR(1)	low-info AR(1)	high-info AR(1)	low-info IV	high-info IV
liberalization	-0.193*** [0.011]	-0.101*** [0.009]	-0.111*** [0.007]	-0.085*** [0.008]	-0.156*** [0.012]	-0.078*** [0.009]
volatility	0.395* [0.202]	0.652 [0.430]			1.423 [0.899]	2.442 [3.162]
volatility other countries			3.895*** [0.486]	2.866*** [0.548]		
Country-sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	No	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,084	2,445	5,116	2,974	3,279	2,561
Hansen J p-value					0.807	0.174
F-test					33.32	15.04

Notes. All regressors are lagged one year. Volatility of other countries is the average of volatility of the other countries in the sample weighted by GDP p.c., and is computed for all country-years. Where specified, AR(1) residuals are estimated with two-step procedure. Volatility of stock market returns is instrumented with natural disasters, terroristic attacks, political coups and revolutions. The p-value for the Hansen J-test of over-identifying restrictions and F-test for weak instruments are reported for the IV specifications. In the IV specifications, standard errors are clustered at the country and reform sector level. For all specifications, standard errors are reported in brackets. *, ** and *** denote significance at 10, 5 and 1 per cent, respectively.

Table 12. Core-OECD vs other countries

Dependent variable: annual change in liberalization indices						
	no core OECD AR(1)	core OECD AR(1)	no core OECD AR(1)	core OECD AR(1)	no core OECD IV	core OECD IV
	(1)	(2)	(3)	(4)	(5)	(6)
liberalization	-0.168*** [0.010]	-0.076*** [0.007]	-0.091*** [0.006]	-0.057*** [0.006]	-0.129*** [0.011]	-0.054*** [0.012]
volatility	0.390** [0.192]	-0.529 [0.325]			1.510* [0.899]	3.365 [7.213]
volatility other countries			4.336*** [0.388]	2.095*** [0.329]		
Country-sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	No	Yes	Yes
Controls	No	No	No	No	No	No
Observations	3,054	3,348	5,571	4,102	3,238	3,483
Hansen J p-value					0.784	0.976
F-test					29.84	2.747
	no core OECD AR(1)	core OECD AR(1)	no core OECD AR(1)	core OECD AR(1)	no core OECD IV	core OECD IV
	(1)	(2)	(3)	(4)	(5)	(6)
liberalization	-0.218*** [0.013]	-0.099*** [0.009]	-0.117*** [0.007]	-0.075*** [0.007]	-0.175*** [0.015]	-0.072*** [0.009]
volatility	0.426* [0.219]	-0.216 [0.401]			1.392 [1.023]	4.932 [9.355]
volatility other countries			4.488*** [0.529]	1.352*** [0.506]		
Country-sector FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	No	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,642	2,887	4,635	3,455	2,822	3,018
Hansen J p-value					0.862	0.824
F-test					25.75	1.968

Notes. All regressors are lagged one year. Volatility of other countries is the average of volatility of the other countries in the sample weighted by GDP p.c., and is computed for all country-years. Where specified, AR(1) residuals are estimated with two-step procedure. Volatility of stock market returns is instrumented with natural disasters, terroristic attacks, political coups and revolutions. The p-value for the Hansen J-test of over-identifying restrictions and F-test for weak instruments are reported for the IV specifications. In the IV specifications, standard errors are clustered at the country and reform sector level. For all specifications, 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	

Table A. Countries and samples (continued)

country	data on reforms since	data on volatility since	eu member	CEE country	oecd member	high information
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	