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ABSTRACT

We use financial reforms as a case study to understand the temporal clustering of policy changes across countries, shedding light on the broader phenomenon of global policy contagion. We constructed a comprehensive database of domestic financial reforms spanning 90 countries from 1973 to 2014. Using this dataset, we estimate a semi-structural model that incorporates key factors identified in the literature. We find that (1) geopolitical influence and cross-country learning drove the global surge in reforms during the 1990s, and (2) reversals of financial reforms in developing countries after the global financial crisis reflected shifting beliefs about their growth effects.

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1. Introduction

Policy contagion—characterized by the temporal clustering of policy changes—has been a defining force in global policymaking across diverse countries. Policymakers frequently learn from, emulate, or adapt policies implemented by other countries, leading to waves of synchronized reforms. For example, many countries in Latin America, Africa, and Asia reduced trade barriers and opened their economies during the 1980s and 1990s, marking a widespread wave of trade liberalization. Similarly, the privatization of state-owned enterprises, initiated by the Thatcher-era reforms in the United Kingdom, rapidly spread across Eastern Europe and Latin America during the 1990s. Inflation targeting became the dominant monetary framework for central banks worldwide within a short period of time. Beyond economic policies, policy contagion is evident in areas like social reforms, tax strategies, environmental regulations, and technology governance, with its impact long lasting.

One of the most significant waves of synchronized policy changes in recent decades is the global transformation of financial systems, transitioning from predominantly government-controlled to market-oriented structures. Concentrated between the late 1980s and the late 1990s, this shift spanned countries across diverse regions and economic conditions, offering a compelling case for policy contagion. Using financial reforms as a case study, this paper aim to understand the underlying mechanisms driving such contagion. Is it driven by global events, such as waves of democratization or economic crises, that spur collective shifts (Abiad and Mody, 2005)? Does geopolitical influence lead countries to emulate policies of ideologically aligned peers (Bennett, 1991)? Or are reforms primarily motivated by learning, as countries draw lessons from the growth experiences of financially liberalized nations (Meseguer, 2005; Buera, Monge-Naranjo and Primiceri, 2011)? By addressing these questions, we aim to shed light on the dynamics of policy contagion and provide insights applicable not only to financial reforms but also to broader global policy trends.

In this paper, we first extend the influential database on domestic financial reforms by Abiad, Detragiache and Tressel (2010), expanding its coverage to include 90 countries over the period from 1973 to 2014. We then develop and estimate a dynamic semi-structural model that incorporates a variety of explanations from the existing literature. This approach enables a comprehensive analysis of the roles played by early reformers and the factors driving reform reversals. While our

model builds on the learning framework introduced by Buera et al. (2011), it takes in account additional sources of reform contagion. We conduct a horse race analysis to evaluate the relative importance of various factors, including geopolitical influence, economic crises, and trends in global interest rates (Bartolini and Drazen, 1997; Abiad et al., 2010). To measure geopolitical alignment between countries, we utilize the "ideal point distance" metric proposed by Bailey et al. (2017), which assesses the similarity of voting patterns in the United Nations General Assembly.

Understanding the impact of financial reforms on economic growth is fundamentally different from merely emulating the decision to reform. Countries that liberalized their financial sectors early are viewed as reform leaders. Later adopters may have learned about the relationship between financial reforms and economic growth from these leaders or may have simply emulated them without necessarily grasping this relationship. Without a theoretical framework to delineate these processes, it is challenging to empirically distinguish between learning about the effects of reforms and imitating the decisions of ideologically aligned countries.

We develop a model that incorporates various factors identified in the literature. We then use the model to conduct a comprehensive analysis of the significance of different factors in driving global waves of financial reforms. Among the factors incorporated into the model, one key consideration is the political cost of implementing financial reforms, given the uncertain economic outcomes of such reforms (Alesina et al., 2024). The political cost decreases when a country aligns more closely its financial liberalization level with ideologically similar nations (Mian, Sufi and Trebbi, 2014; Rancière and Tornell, 2016). Another crucial factor is learning from the experiences of other countries, as well as from a country's own historical experiences. As depicted in Figure 1, financial reforms tend to accelerate when countries with liberalized financial systems experience faster economic growth than those with less liberalized systems. This observation underpins a fundamental assumption in our model. Policymakers revise their beliefs of the economic consequences of financial reforms by reflecting on past experiences both domestically and internationally. In weighing the trade-off between growth benefits and political costs, policymakers determine the optimal level of financial liberalization.

The model fits the heterogeneous reform experiences across countries remarkably well, measured by the mean absolute errors of both in-sample and out-of-sample one-step forecasts. Its estimation yields several key findings. First, our findings reveal geopolitical influence and learning as the

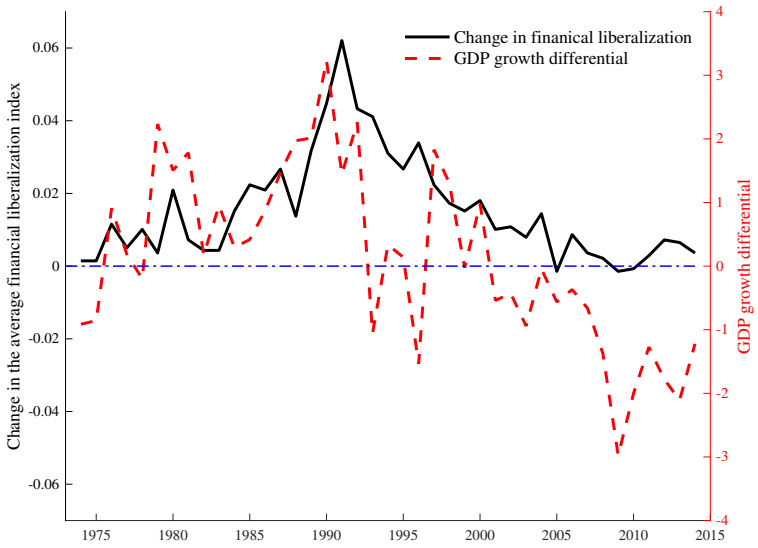


Figure 1: Global financial reform versus GDP growth differential

Note: The left y-axis measures changes in the average financial liberalization index across all countries. The right y-axis shows the GDP growth differential: the difference between the average growth rate of financially liberalized countries (those with an index above the median) and the average growth rate of financially repressed countries (those below the median).

twin drivers of financial reform contagion, both playing an equally vital role in the observed global liberalization wave. Removing either channel would significantly diminish the intensity and number of reforms worldwide. The strong economic performance of developed countries with liberalized financial sectors sent a powerful signal about the effectiveness of reforms. This informational diffusion, amplified by geopolitical influence and learning mechanisms, created the rapid clustering of reforms during the 1990s. By contrast, we find that democratization and other factors having a relatively minor role in the spread of financial reforms across time and space.

Second, during the 1990s, developing countries learned from the reform experiences of developed nations to carry out their financial reforms. In addition to such learning, we find that geopolitical influence within developing countries was critical for their financial reforms before 2000. As some developing countries started their financial reforms, others with similar ideologies had a stronger urge to follow suit, influenced by geopolitical connections. As more developing countries implemented financial reforms, this geopolitical influence spread further. In this cycle, countries with similar political views propelled each other to reform financial sectors. The largest impact of this influence was in the 1990s—a period of massive financial reforms—more than at other times.

Geopolitical influence helped developing countries learn from each other, raising the level of financial liberalization and improving how they communicated about the benefits of financial reforms from their growth experiences. We find that geopolitical influence both facilitated and reinforced the learning channel in spreading financial reforms among developing countries in the 1990s.

Third, the 2008 global financial crisis (GFC) led to significant reversals of financial reforms, particularly in developing countries. Our counterfactual experiments reveal that, absent the GFC, the number of reform reversals would have decreased by 39.2 percent on average, and the wave of reversals would have subsided more quickly. Although the crisis originated in the U.S., its impact created a ripple effect, causing reform reversals to spread rapidly from developed to developing countries as the latter learned from the experiences of the former. During the GFC, developed countries with highly liberalized financial systems experienced poor growth performances, prompting a reassessment of the benefits of financial liberalization. This reassessment, in turn, influenced developing countries, which perceived an excessive degree of financial liberalization as potentially harmful to economic growth. As developed countries slowed down or reversed their financial reforms, developing countries followed suit, reducing their level of financial liberalization. This movement underscores the significant role of learning from other countries' experiences in driving reform reversals.

Our paper advances the study of global policy contagion by employing a novel panel dataset of domestic financial reforms as a case study, offering new insights into the dynamics of reform diffusion and reversal. Unlike binary measures, such as those used by Buera et al. (2011), our index-based data captures the incremental and sometimes rapid changes in financial liberalization over time and across countries. As Buera et al. (2011) acknowledge, binary measures cannot differentiate between varying degrees of liberalization or capture partial reforms and reversals, limiting their ability to reflect the dynamic evolution of financial policies. By contrast, our dataset tracks these variations with precision, allowing us to document both the rapid rise in financial liberalization from the late 1980s to the late 1990s and the subsequent partial reversals following the GFC. This richer, non-binary structure of our dataset enables analysis of the varying speeds and patterns of reform clustering across countries and time. This innovation not only enhances the empirical tractability of our model but also addresses gaps in the literature on the dynamic clustering and adjustments of financial reforms.

Another key strength of our approach is its reliance on a data-driven framework to disentangle the various drivers of financial reforms, such as macroeconomic crises, learning mechanisms, and geopolitical influence. While macroeconomic crises—such as currency, debt, and banking crises—are expected to influence policymakers' decisions, our model incorporates these along with other factors without assigning a priori weight to any specific driver. Indeed, our estimation allows the data to determine the relative importance of each factor, ensuring an unbiased assessment. The significance of geopolitical influence, for instance, emerges directly from the model's estimation rather than pre-determined assumptions. This data-driven approach reveals that learning and geopolitical influence are the two dominant channels driving the clustering and contagion of financial liberalization across countries.

The rest of the paper is organized as follows. Section 2 places our contribution within the existing literature. Section 3 explains the construction of our financial liberalization dataset and describes the observed contagion of financial reforms. Section 4 details the model and presents the estimation results. Section 5 conducts a comprehensive horse race analysis to assess the relative importance of various channels in explaining global reform contagion. Section 6 examines how the GFC triggered reversals of financial reforms worldwide, with a particular focus on developing countries. Section 7 provides further analysis of the model's broader implications for financial reforms in developing countries. Section 8 offers concluding remarks.

2. Brief Literature Review

This paper contributes to the extensive body of literature examining the economic and political forces that potentially shape financial reforms, including works by Alesina and Roubini, 1992, Bartolini and Drazen, 1997, Rajan and Zingales, 2003, Giavazzi and Tabellini, 2005, Abiad and Mody, 2005, Mukand and Rodrik, 2005, Giuliano et al., 2013, and Alesina et al., 2024, among others. These studies generally employ reduced-form panel regressions to assess the significance of various factors in driving financial reforms worldwide. However, such an approach is limited for horse-race analysis because it does not support counterfactual exercises. Our semi-structural model addresses these limitations by fitting the data to account for the diverse relationships between growth and reforms and by distinguishing between active learning processes and passive factors,

such as geopolitical influence or catch-up effects, highlighted in previous literature. Moreover, our approach enables the quantification of policy learning's contribution, a task made difficult by the unobservable nature of learning and beliefs across different countries and periods. Unlike some previous studies, we demonstrate that country-specific events and characteristics, including democracy and economic crises that could trigger policy changes, were not the predominant factors in explaining the spread of reforms.

Structural models with learning have been widely applied to address a variety of economic and financial issues.[2] There is a growing body of literature that emphasizes the significance of learning in policymaking (Primiceri, 2006; Sargent et al., 2006; Buera et al., 2011; García-Jimeno, 2016; Williams, 2019; Abramson and Montero, 2020). Our model builds on Buera et al. (2011), who study the worldwide evolution of beliefs and their impact on market-oriented policies, as measured by the binary trade openness indicator developed by Sachs et al. (1995).[3] Our index of financial liberalization tracks the magnitude of changes in domestic financial policies over time, and our model captures the timing, pace, and scale of financial reforms across countries. Importantly, it also integrates the influence of geopolitical factors, which, according to our findings, play a role as crucial as that of learning in determining policy outcomes.

Last, our paper relates to the concept of policy diffusion in the political science literature (Dobbin et al., 2007; Simmons and Elkins, 2004), documenting the rapid and wide geographic reach of certain political and economic reforms globally. This literature proposes various mechanisms for policy diffusion, such as emulation, coercion, and learning. Unlike our approach, however, these mechanisms have not been formalized in a model with an explicit policymaking process, and empirical evidence on the specifics of how, when, and why these channels affect policy adoption is scarce. Our model explores and applies the main explanations proposed to understand the spread of domestic finance reforms.

[2] See, for example, the literature on culture change (Bikhchandani et al., 1992), technology adoption (Foster and Rosenzweig, 1995), female labor force participation (Fogli and Veldkamp, 2011; Fernández, 2013), the equity premium puzzle (Cogley and Sargent, 2008), financial crises (Boz and Mendoza, 2014), the business cycle (Van Nieuwerburgh and Veldkamp, 2006; Boz et al., 2011), and macroeconomic persistence (Milani, 2007).

[3] Sachs et al. (1995) provides a single date of reform for each country, which requires judgment on how much the relevant indicators need to change to define the reform date.

3. Financial Liberalization in the Past Four Decades

This section describes the construction of the domestic financial liberalization dataset and documents the key facts from the data that motivate our empirical applications and discussions in Section 6 and 7.

3.1. Data Construction

Our database extends the scope of the database on domestic financial regulations introduced by Abiad et al. (2010), now encompassing 90 countries from 1973 to 2014 and creating the most comprehensive dataset of financial reforms to date. This significant expansion, a multi-year effort involving manual data collection, processing, and evaluation, adheres closely to the original narrative approach (assessment methods, questionnaires, and coding rules) employed by Abiad et al. (2010) for the period 1973-2005.[4]

Unlike other datasets that focus on liberalizations of cross-border capital flows (Edison and Warnock, 2003; Kaminsky and Schmukler, 2003; Henry, 2000), our database provides a different indicator of financial sector liberalization, with a particular emphasis on *domestic* reforms, such as reducing state control over credit allocation, relaxing financial regulations, removing interest rate controls, and privatizing state-owned banks. This focus is distinct from studies on financial globalization or integration by Kose et al. (2010), who examine reductions in capital controls and cross-border capital flows.

The key advantage of our dataset lies in its extensive time coverage, which spans over four decades, and its broad sample of countries at different stages of development, including the period the late 1980s to the late 1990s and the period before and after the GFC. With this extensive coverage, our dataset allows us to analyze the GFC's impact on the evolution of financial liberalization.

The database recognizes the multifaceted nature of changes in financial policy and records these

[4]The seminal work of Abiad and Mody (2005) developed the first version of the database, covering 36 countries from 1973-1996 and somewhat different reform categories. Compared to that study, our revised database adds two more aspects of financial policy—securities market policy and prudential regulations, while it removes measures of operational restrictions such as government control over staff appointments, restrictions on banks' operating procedures, and restrictions on international financial transactions due to their qualitative and substantial differences from country to country.

changes in six distinct dimensions: (i) credit controls, including subsidized lending, directed credit or credit ceilings towards certain industries, and excessively high reserve requirements; (ii) interest rate controls, such as floors, ceilings, and bands on interest rates; (iii) competition restrictions, including entry barriers that may take the form of restrictions on participation, the scope of activities, geographic operational areas, and excessively restrictive licensing requirements; (iv) the degree of state ownership as measured by the share of banking assets controlled by state-owned banks; (v) the quality of banking supervision and regulation (e.g., whether the risk-based capital adequacy ratio in accordance with Basel standards was adopted, and whether the banking supervisory agency was independent); and (vi) securities market policies, encompassing various policies that restricted or encouraged the development of the securities market.

In this database, domestic financial policies across different countries are evaluated on a scale from zero to three for each of the six dimensions above. These scores reflect varying degrees of financial liberalization: zero indicates a fully repressed policy, one denotes partially repressed, two largely liberalized, and three fully liberalized. The overall index of domestic financial liberalization is calculated as the average of these six subcomponents, with the final score normalized to range from zero to one. Thus, the database provides a comprehensive view of the extent and timing of reforms beyond what the typical binary measure of financial liberalization could capture.

Identifying changes in the six subcomponents of financial liberalization involves an extensive review of financial documentation, including academic journal articles, central bank publications, relevant websites, and various reports produced by the International Monetary Fund (IMF), such as Article IV Consultations, Financial System Stability Assessments, Global Financial Stability Reports, IMF Selected Issues Papers, and IMF Working Papers. IMF reports not only provide necessary country information about financial reforms but also help establish a unified scoring standard and consolidate evidence across countries and over time. The construction of our database ensures consistency and comparability in measuring financial policies across countries over time.[5]

Using Nigeria as an illustrative case, Figure 2 shows the contribution of each subcomponent to

[5] A significant aspect of the methodology is the narrative approach, which translates specific questions into textual descriptions that are then quantified into indicators, ensuring that current economic activities do not influence the indicators of financial liberalization for the same year. For detailed source information on each subindicator, refer to the IMF working paper version cited in Abiad et al. (2010).

its financial liberalization index over time. The period from the late 1980s to 2000 saw significant progress in Nigeria's financial reforms. However, the Nigerian government scaled back some liberalization measures in response to a credit crunch following the GFC and a subsequent domestic banking crisis. For example, in 2009, the government intervened by directing credit at reduced interest rates to specific sectors. The Central Bank of Nigeria guaranteed 300 billion Naira for new loans to small and mid-sized enterprises (SMEs) from domestic banks and other financial institutions, offering these guarantees at the banks' prime lending rates, about 4-5 percent lower than the regular rates (IMF, 2010). Furthermore, the Development Finance Directorate of the Central Bank expanded its lending to SMEs in favored sectors, with these loans being government-guaranteed at below-market interest rates. In July 2013, the Central Bank increased the cash reserve requirement for banks on public deposits from 12 percent to 50 percent (IMF, 2013). Consequently, the subcomponent "credit control" declined from three to one in 2009 and to zero in 2013, contributing to the overall decline in the index of domestic financial liberalization since 2009.

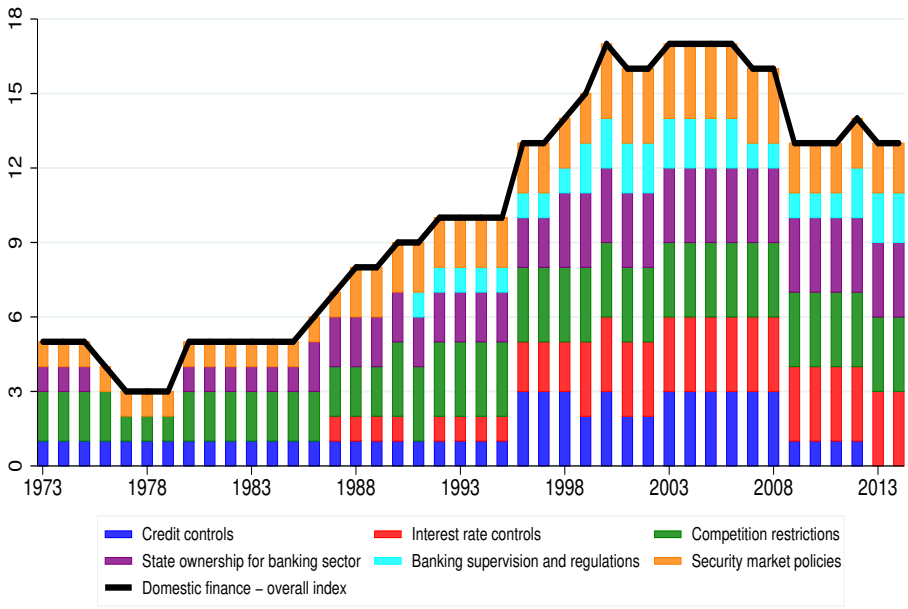
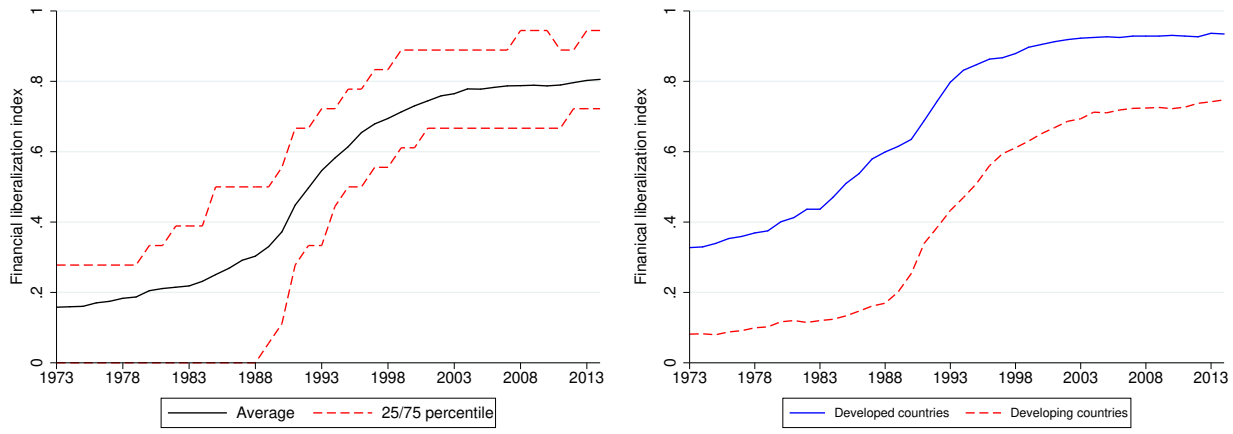


Figure 2: Nigeria: the unnormalized index of financial liberalization and its six subcomponents

Note: Each of the six subcomponents is scored from zero to three. The overall score, calculated by summing the subcomponent scores, ranges from zero to eighteen. For our model estimation, we normalize this aggregate index of domestic financial liberalization to be between zero and one.

3.2. Reform Contagion

Figure 3 presents the evolution of the average composite financial indicators over the period 1973-2014. For countries across all income groups, there was a strong, albeit intermittent, trend towards a fully liberalized financial system over the past four decades.[6] Before the 1980s, state interventions and government controls dominated both developed and developing countries. Credit allocation was largely under government control, interest rates were subject to ceilings or other regulatory forms, and the barriers to entering the financial system were high. Since then, particularly towards the end of the 1980s, many countries began adopting more liberal practices in the financial sector. However, these adoptions were far from complete. After the mid-2000s, especially post-GFC, the pace of liberalization began to slow, and in many countries, there was a reversal, mostly due to tighter credit controls.



(a) Average across all countries

(b) By income group

Figure 3: Financial liberalization over time

Note: Panel (a) displays the evolution of the cross-country average of financial liberalization indices over time (black line) with the 25th and 75th percentiles (dashed lines). Panel (b) displays this evolution by income group.

The most notable observation from Figure 3 is the rapid transition—a wave or contagion—towards a more liberalized financial system, especially in developing economies, concentrated within a specific period along the upward trend. That is, changes in financial liberalization (financial reforms) were relatively rare in the early and late periods of the sample, while the majority of reforms

[6] See Appendix A.1 for the list of countries and territories within each income group. This division follows the IMF's income group classification exactly.

occurred from the late 1980s to the late 1990s.

Another way to visualize reform contagion is through a heatmap, as displayed in Figure 4. This heatmap provides a visual representation of annual changes in financial policy for each country over time. The intensity and direction of financial reforms (changes in the financial liberalization index) are indicated by the brightness of color; red signals an advancement in liberalization, while blue indicates a reversal. Figure 4 confirms that the most intense reforms occurred from the late 1980s to the late 1990s, affecting all countries, whether considered collectively or grouped by income. In the following sections, we first present and estimate a model; we then unpack the mechanisms driving this reform contagion and discuss implications through the lenses of our model.

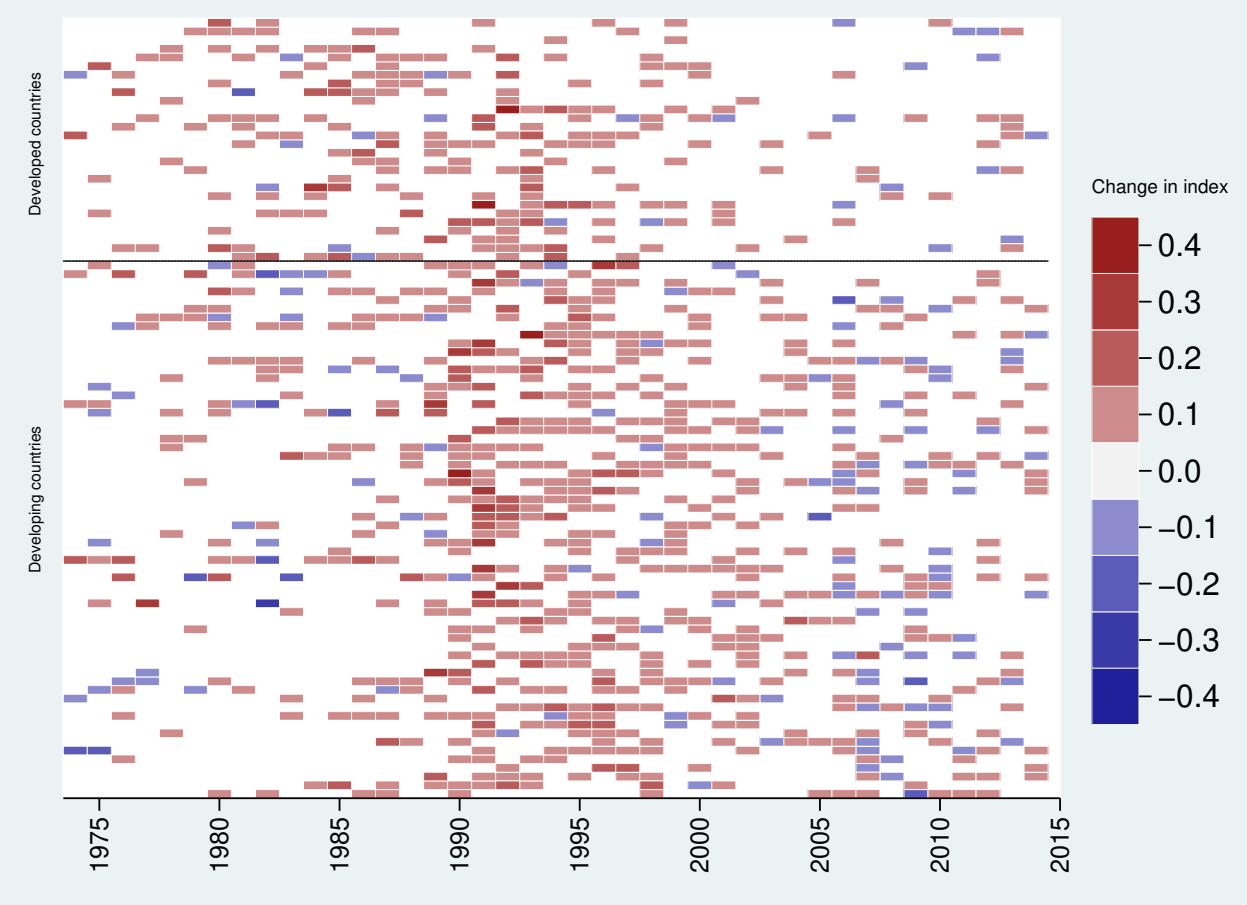


Figure 4: Heatmap: Magnitude of financial reforms by income group

Note: This heatmap represents annual changes in the level of financial liberalization (financial reforms) over the sample period in all 90 countries. The color indicates the size and direction of changes; red represents an advancement of liberalization while blue represent a reversal.

4. The Model

In this section, we propose a semi-structural model for policymakers' choices of financial policy and identify the channels of reform contagion.

4.1. Policymakers' Problem

Following Prati, Onorato and Papageorgiou (2013), we assume that the true data generation process for GDP per capita growth is related to the liberalization level in the financial sector, as in the following hierarchical linear model:

$$g_{i,t+1} = c_i + \alpha_i y_{i,t} + \beta_i r_{i,t} + \xi_{i,t+1}, \ t = 0, \ldots, T \tag{1}$$

where $g_{i,t+1}$ is GDP per capita growth in country i at time $t+1$ (annually in our data), $y_{i,t}$ is the log of a one-year lag of GDP per capita, and $r_{i,t}$ is the level of financial liberalization.

Each country's growth depends on its own country-specific factor (c_i), the country-specific effects of lagged GDP level (α_i), and the financial liberalization level (β_i). In this hierarchical linear model, we assume that the growth shock vector $\xi_t \equiv [\xi_{1,t}, \ldots, \xi_{n,t}]' \overset{\text{i.i.d.}}{\sim} \mathcal{N}(0, \Omega)$, where n is the number of countries, and $\mathcal{N}$ represents a Gaussian distribution. The shock $\xi_{i,t}$ ($i \in \{1, \ldots, n\}$) is exogenous to $g_{i,t}$ but correlated with shocks in other countries.[7]

Policymakers have perfect knowledge of the model parameters c_i, α_i, and the covariance matrix of growth shocks Ω. But they do not know the country-specific effect of financial policy on growth (β_i) and believe that the effects are potentially correlated across countries. Their perceived growth process for time $t+1$ is

$$g_{i,t+1} = c_i + \alpha_i y_{i,t} + \beta_{i,t+1|t} r_{i,t} + u_{i,t+1},$$

where $u_{t+1} \equiv [u_{1,t+1}, \ldots, u_{n,t+1}]' \overset{\text{i.i.d.}}{\sim} \mathcal{N}(0, \Omega)$ and $\beta_{i,t+1|t} \equiv \hat{E}_t \beta_i$ is their belief of the effect of

[7] See Appendix A.2 for detailed estimation results for the above equation. We also add policy reforms in other countries to this equation, and our main results continue to hold. These estimation results are available upon request.

financial reforms. Define $z_{i,t+1} \equiv g_{i,t+1} - c_i - \alpha_i y_{i,t}$. The perceived process can be rewritten as

$$z_{i,t+1} = \beta_{i,t+1|t} r_{i,t} + u_{i,t+1}, \tag{2}$$

$$r_{i,t} = r^*_{i,t} + \eta_{i,t}, \tag{3}$$

where $r^*_{i,t}$ is the financial policy chosen by policymakers, and $\eta_{i,t} \overset{\text{i.i.d.}}{\sim} \mathcal{N}(0, \lambda_i)$ is a shock that is independent across countries and time and uncorrelated with the growth shock $\xi_{i,t}$. The shock $\eta_{i,t}$ represents errors in the implementation of financial reforms and potential statistical discrepancies in the financial reforms indices. The assumption of its independence is supported by several considerations. First, the model incorporates country-specific effects through the liberalization norm $\bar{r}_{i,t}$, which accounts for time-invariant differences in financial liberalization and persistent heterogeneity. Second, the explicit modeling of the learning mechanism and geopolitical influence channel captures cross-country interdependence, rendering additional correlation for $\eta_{i,t}$ unnecessary. Third, maintaining independence ensures model tractability without compromising its ability to capture key dynamics. Fourth, we test the pairwise correlation between the estimated series $\eta_{i,t}$ and $\xi_{i,t}$, finding a correlation of -0.01 with a p-value of 0.59, which confirms the assumption of no significant correlation.

Following the learning literature (Sargent, 1999; Primiceri, 2006; Sargent et al., 2006; Buera et al., 2011), we posit that policymakers' objective is to maximize economic growth and, at the same time, minimize political costs by choosing $r^*_{i,t}$ that solves the following:

$$\max_{r^*_{i,t}} \hat{E}_t \left[z_{i,t+1} - \frac{\psi}{2} (r^*_{i,t} - \kappa r^p_{i,t} - \bar{r}_{i,t})^2 \right],$$

subject to (2) and (3), where $\hat{E}_t$ denotes policymakers' subjective expectations, and $r^*_{i,t}$, $\bar{r}_{i,t}$, and $r^p_{i,t}$ are predetermined at time t. Coefficient ψ represents the magnitude of the political cost, which is a quadratic function of the distance between the optimal policy choice $r^*_{i,t}$ and the socially acceptable "norm" of financial liberalization.

The norm of financial liberalization includes two components. The first is the effect of geopolitical influence from other countries, quantified as the coefficient κ times the geopolitical influence $r^p_{i,t}$. This geopolitical influence captures the desire of policymakers to align with the (weighted) average

financial liberalization levels of other countries, where the weights are related to ideological similarity. Specifically, the geopolitical influence for country i in year t satisfies $r^p_{i,t} = \sum_{j \neq i} w_{ij,t} r_{j,t-1}$. The weight $w_{ij,t}$ is proportional to $\exp(-\chi d^p_{ij,t})$, while $\sum_{j \neq i} w_{ij,t} = 1$, where $d^p_{ij,t}$ is the ideology distance between countries i and j in year t.[8] The nonnegative parameter χ determines the relationship between geopolitical influence and ideology similarity, and it is to be estimated with data. A large value of χ implies a preference among countries to align their liberalization efforts with those of ideologically similar countries, while downplaying the importance of countries with different ideologies. On the contrary, a small χ value suggests a desire to follow the global average in financial liberalization without significantly differentiating countries according to ideological similarities. The coefficient κ determines the strength of the geopolitical influence and is to be estimated.

The second component, as a function of various observables—the known drivers for financial reforms—includes a country-specific factor (δ_i) and a vector of time-varying political and economic variables ($\nu_{i,t}$), such as the level of democracy, GDP per capita relative to that of the U.S., indicators for various economic crises, and the global interest rate, all of which are known at period t. The influence of other factors takes the following functional form:

$$\bar{r}_{i,t} = \frac{\exp\left(\delta_i + \nu'_{i,t}\phi\right)}{1 + \exp\left(\delta_i + \nu'_{i,t}\phi\right)}, \tag{4}$$

where the parameters δ_i and ϕ are to be estimated, and $\bar{r}_{i,t}$ is bounded between 0 and 1.

In Appendix A.3, we provide reduced-form evidence showing that policymakers respond to the successes and failures of economically and geopolitically aligned peers. The results reported in Table A.3 show that average levels of financial liberalization in geopolitically aligned countries significantly influence domestic reforms and that reforms accelerate when liberalized peers experience faster growth. These findings justify the policymakers' objective function and motivate the selection of variables used to formulate their problem.

One potential enhancement to our model is to allow policymakers to learn and update their beliefs about the probability of future crises. We explore this possibility by testing for evidence of

[8] The ideology distance between any two countries in each year is calculated using the ideal point distance measurement from Bailey et al. (2017), which is widely used in the political science literature.

learning about the volatility effects of $\beta_{i,t+1|t}$. As shown in Table A.4 in Appendix A.3, the volatility effect is statistically insignificant. By contrast, learning about the growth effect of reforms remains highly significant. Although we do not explicitly include the perceived volatility of economic crises in the policymaker problem, we allow three types of crises—currency, debt, and banking—to directly influence the political cost of reforms.

Solving the policymaker problem leads to the optimal financial liberalization level for country i at time t as

$$r^*_{i,t} = \max\{0, \kappa r^p_{i,t} + \bar{r}_{i,t} + \psi^{-1}\beta_{i,t+1|t}\}. \tag{5}$$

The optimal policy decisions in our model depend on depends on both observables (i.e., geopolitical influence and the impact of other variables) and unobservables (i.e., policymakers' beliefs about the growth outcomes of financial reforms). Policymakers are more likely to adopt more liberal financial policies when geopolitical pressures to liberalize increase, when other influencing factors gain prominence, or when their confidence in the positive growth effects of financial reforms strengthens.

Our framework is not a fully micro-founded structural model, as it does not derive policymakers' objective functions from first principles. However, it goes beyond a reduced-form econometric model by incorporating explicit optimization behavior by policymakers. This approach enables the framework to capture the trade-offs and learning processes inherent in policy decisions, providing a richer and more behavioral interpretation of the data than standard econometric models. Our model, termed "semi-structural," emphasizes its use of a decision-making structure to guide specification while ensuring empirical tractability. This approach highlights the model's ability to balance theoretical rigor with practical applicability.

The model takes in account the potential endogeneity between financial reforms and economic growth, as reforms are rarely exogenous to GDP growth. Policymakers adjust reforms in response to macroeconomic conditions and these reforms, in turn, affect future economic performance. Our model captures this bidirectional relationship by linking decisions on reforms to economic performance while modeling GDP growth as a function of these reforms. This dynamic interaction, central to policymakers' iterative decision-making and learning processes, captures the inherent feedback loop between reforms and growth.

4.2. Channels of Reform Contagion

Equation (5) highlights three potential channels through which the observed contagion of financial reforms can be explained. The first potentially important channel is geopolitical influence. When other countries increase their liberalization levels, especially those with similar ideologies, country i is more likely to adopt financial reforms (assuming a positive value of κ). This phenomenon stems from policymakers' desire to reduce political costs by aligning with prevailing ideologies and minimizing the potential cost of being perceived as lagging behind their peers. Rather than emulating success, policymakers are motivated to avoid political nonconformity.

The contagion effect is likely to be strongest among nations sharing similar ideological outlooks. Reforms undertaken by ideologically aligned nations carry greater weight, signaling their likely success and reducing the potential stigma associated with liberalization within country i. Moreover, the geopolitical influence channel is not unidirectional. Country i's increasing liberalization reciprocally provides political incentives for ideologically similar counterparts to follow suit. This feedback loop is a potentially powerful mechanisms through which the contagion of financial reforms takes hold and reinforces itself, leading to widespread and rapid adoption of financial reforms.

The second channel is policymakers' evolving beliefs about the benefits of reform. We specify how policymakers' beliefs evolve over time in the Bayesian framework. Denote $z_t \equiv [z_{1,t}, \ldots, z_{n,t}]'$, $\beta \equiv [\beta_1, \ldots, \beta_n]'$, and $R_{t-1} \equiv diag([r_{1,t-1}, \ldots, r_{n,t-1}])$. We rewrite equation (1) in compact form:

$$z_t = R_{t-1}\beta + \xi_t, \quad \xi_t \sim \mathcal{N}(0, \Omega). \tag{6}$$

The prior on β at the beginning of the sample is:

$$\beta \sim \mathcal{N}\left(\beta_{1|0}, \Sigma_{1|0}^{-1}\right),$$

where $\beta_{1|0}$ is the prior mean and $\Sigma_{1|0}$ is the precision matrix, which takes the form of

$$\Sigma_{1|0}^{-1} = V \cdot L \cdot V,$$

where the diagonal elements of $V = diag([\sigma_{1,1|0}, \ldots, \sigma_{n,1|0}])$ are a priori standard deviations and L is

a priori correlation matrix. Policymakers have a prior belief that the effect of financial liberalization on growth of a country is more correlated with that of nearby countries and less correlated with distant countries. To implement this idea in a tractable way, we follow Buera et al. (2011) and assume that the prior correlation between the effects of financial reforms on growth of countries i and j is a parametric function of geographic distance between those two countries:

$$L_{ij} = \exp[-d_{ij}\gamma],$$

where we restrict γ to be nonnegative and d_{ij} is the geographic distance between countries i and j.

Given initial belief $\beta_{1|0}$ and precision matrix $\Sigma_{1|0}$, policymakers adopt Bayesian learning to optimally update the mean and precision matrix of the distribution of β as

$$\Sigma_{t+1|t} = \Sigma_{t|t-1} + R'_{t-1}\Omega^{-1}R_{t-1}, \tag{7}$$

$$\beta_{t+1|t} = \beta_{t|t-1} + \Sigma^{-1}_{t+1|t}R'_{t-1}\Omega^{-1}\left(z_t - R_{t-1}\beta_{t|t-1}\right), \tag{8}$$

where $\beta_{t+1|t} \equiv \hat{E}_t\beta = [\beta_{1,t+1|t}, \ldots, \beta_{n,t+1|t}]'$. Because beliefs are potentially correlated, country i's economic performance is a signal for all countries and thus it affects not only $\beta_{i,t+1|t}$ but also $\beta_{j,t+1|t}$.

The third channel captures the influence of factors beyond geopolitical pressures and policymakers' beliefs (as captured by $\nu_{i,t}$). When these factors exhibit common trends across countries, policymakers may independently arrive at similar reform decisions. For example, the global spread of democratization could drive the observed contagion of financial reforms. Similarly, a decline in global interest rates reduces the cost of implementing financial reforms, potentially leading to converging policy decisions across countries.

To disentangle the contributions of these channels, our model leverages the rich panel structure of our dataset, spanning 90 countries. Unlike a single time series, the panel data enables us to exploit variations across both countries and time, even within the limited time frame of the late 1980s to the late 1990s. By combining the Bayesian updating procedure with controls for observable variables such as geopolitical influence, the model quantifies the relative effects of external pressures, a country's own experiences, and those of others. This approach allows us to identify and estimate

the relative contributions of each channel, revealing the key channels that drove reform adoption.

4.3. Estimated Parameter Values and Model Fit

Our estimation method follows Buera et al. (2011), employing a Bayesian procedure to reduce computational burden.[9] Table 1 reports posterior estimates of the correlation parameter (γ), the political cost parameter (ψ), the geopolitical influence coefficient (κ), the ideology distance parameter (χ), and parameters in the liberalization norm function (ϕ). The column titled "M1" reports estimates for the baseline model, most of which are statistically significant.

Table 1: Estimation results for the semi-structural model and two reduced form models

Coefficients	M1 Benchmark	M2 No learning and no geopolitical influence	M3 No learning and no geopolitical influence
Prior correlation			
Geographic distance (γ)	0.0618		
	(0.0266)		
Political cost			
Deviation from norm (ψ)	7.8690		
	(0.6468)		
Geopolitical influence			
Influence coefficient (κ)	0.4194		
	(0.0184)		
Ideology distance (χ)	1.4875		
	(0.2259)		
Effects from other factors			
Relative GDP (ϕ_1)	-0.2899	-0.0706	0.1586
	(0.0718)	(0.0561)	(0.0742)
Polity2 (ϕ_2)	0.0086	0.0228	-0.0021
	(0.0032)	(0.0041)	(0.0037)
Currency crisis (ϕ_3)	0.0241	-0.1031	-0.0394
	(0.0224)	(0.0382)	(0.0348)
Debt crisis (ϕ_4)	0.0090	-0.1748	-0.0942
	(0.0366)	(0.0692)	(0.0686)
Banking crisis (ϕ_5)	-0.0296	-0.0081	-0.0400
	(0.0245)	(0.0431)	(0.0373)
Global interest rate (ϕ_6)	-0.0299	-0.3257	
	(0.0071)	(0.0059)	
Country FEs	Yes	Yes	Yes
Time effect	No	No	Yes
Mean absolute error (MAE)	0.055	0.080	0.068
BIC	-15300.4	-13123.1	-14132.7

Note: M1 denotes our benchmark model, M2 a model without learning and geopolitical influence, and M3 a model with the time fixed effect. When the time fixed effect is included, the global interest rate time series is removed in M3. Standard errors are in parentheses. MAE (mean absolute error) measures the average absolute differences between the model's in-sample one-step predictions and actual data.

[9] We exclude former Soviet Union countries in our estimation. Computational details are provided in Appendix A.4.

The estimate of γ implies that cross-country correlation in prior beliefs decreases with geographic distance (in thousands of kilometers). The average belief correlation among all countries in 1980 is estimated to be about 0.20. The estimate of ψ suggests that a 0.1 deviation of optimal financial reform policy from its norm equates to a 0.039 percentage point loss in GDP growth. The estimate of κ indicates positive spillovers of financial liberalization through geopolitical influence; a 0.1 increase in a country's ideological neighbors' liberalization levels would increase its optimal financial reform policy by 0.042. The estimate of χ demonstrates the importance of ideological similarity in determining geopolitical influence weights. For example, in 2013, Vietnam had an ideology distance of 0.59 from China and 3.79 from the U.S. These estimates imply that China's influence on Philippine financial reform decisions was about 116.9 times greater than that of the U.S. due to the channel of geopolitical influence.

We control for country-specific fixed effects. Following the established literature, we select political and economic variables as other determinants of financial reforms, as specified in equation (4). We discover that the norm for financial liberalization exhibits a negative correlation with GDP per capita relative to the US. This observation aligns with findings in cases absent of learning and geopolitical influence, as indicated in the column labeled "M2". A country with a relatively high GDP level, compared to the U.S., possesses sufficiently mature economic development, diminishing the need for further financial liberalization. As a country's income increases, the momentum for financial reforms gradually declines.

We also control for the degree of democracy in a country using the "polity2" index from the Polity IV database (Marshall et al., 2019). Consistent with findings in Giuliano et al. (2013) and Giavazzi and Tabellini (2005), a positive relationship exists between democracy (measured by polity2) and the adoption of financial reforms. An increase of one unit in the polity2 score (which ranges from -10 to 10) is associated with an increase of 0.002 in the country's liberalization norm. For example, the difference in the democracy index between Argentina and the United States in 2014, which was 2, would translate to a difference of 0.004 in their liberalization norms.

Furthermore, we control for occurrences of currency, sovereign debt, and banking crises, with dates sourced from Laeven and Valencia (2020), covering all countries and periods in our sample. Additionally, we consider the global nominal interest rate, as provided by Schmelzing (2020). Each crisis indicator is assigned a value of one during the three years following the onset of a crisis and

zero otherwise. The coefficient for the global interest rate is negative and statistically significant, indicating that lower interest rates incentivize countries to pursue financial reforms to attract international capital.

We assess the fit of our model by comparing its predictions with the observed dynamics of financial reforms over time and across countries. Figure 5 displays the average of observed financial reforms (black solid line) and the model's prediction (blue dashed line). The predicted series consists of one-step-ahead predictions. The model successfully captures the contagion dynamics of global financial reforms, particularly the rapid worldwide increase in the 1990s. Importantly, the model produces a good fit not just at the aggregate level, but also when disaggregated. Figure 6 illustrates the model's fit to the path of actual reforms in each of the seven geographical regions.[10] Furthermore, the evolution of policymakers' beliefs is discussed in Appendix A.6. It shows that in the beginning of the sample, policymakers had a pessimistic view of the growth impact of financial liberalization in a majority of countries and underestimated the effectiveness of financial liberalization. Belief uncertainty was reduced through learning over time, but still high by the end of the sample. As countries accumulated more information about the efficacy of the reforms, the perceived growth effects get closer to the actual effects.

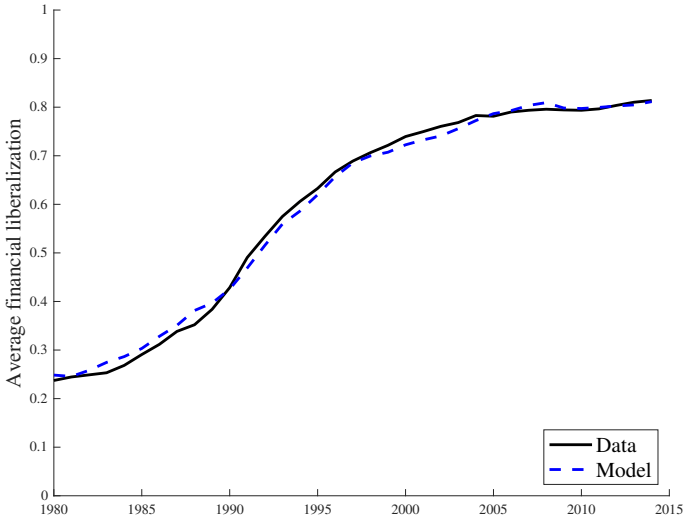


Figure 5: Actual versus model-predicted average level of financial reforms across countries

To assess the importance of the endogenous channels, we modify our analysis by excluding the geopolitical influence and learning components and re-estimate this alternative model (column

[10] In fact, the model fits the experience of each individual country remarkably well (Appendix A.5).

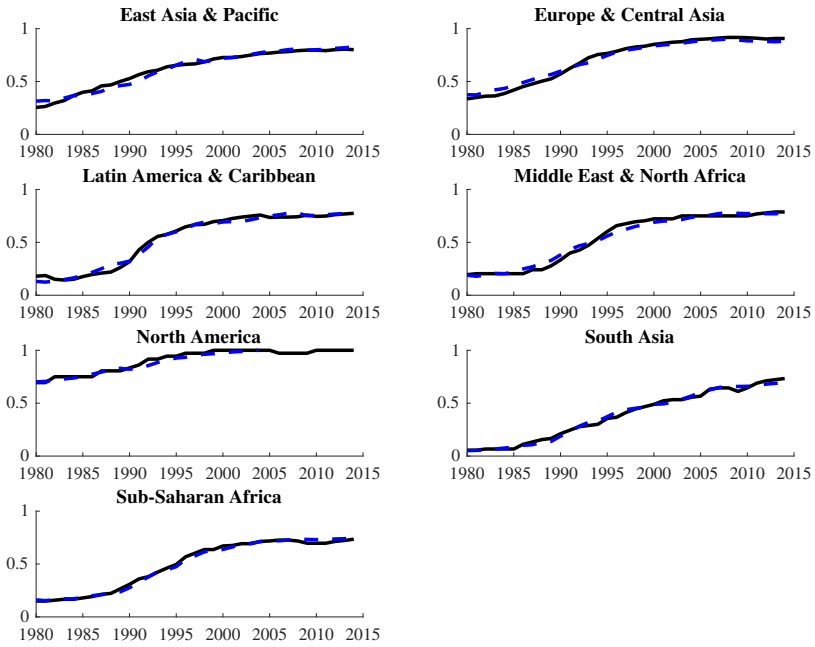


Figure 6: Actual versus model-predicted average level of financial reforms across countries within each region

labeled "M2" in Table 1). The mean absolute error (MAE) of one-step predictions increases to 0.08, 1.45 times larger than that of our baseline model. Introducing a time fixed effect (column "M3" in Table 1) still yields a worse fit with an MAE of 0.068. While time fixed effects can partially account for the contagion aspect in a reduced-form, it confounds the distinct impacts of learning and geopolitical influence. Moreover, it fails to capture the heterogeneous effects of cross-country contagion that are key to understanding the trajectory of financial liberalization in different countries. Overall, our benchmark model is favored by the Bayesian information criterion (BIC), which penalizes models for having a greater number of parameters.[11]

To address potential concerns about overfitting, a common issue in highly-parameterized models, we perform an out-of-sample forecasting exercise. We estimate the model with data up to 2002, generating forecasts of financial liberalization between 2003 and 2014. Our model predicts the average financial liberalization between 2003 and 2014 closely (Figure 7), with an out-of-sample MAE of 0.023. Models without geopolitical influence and learning fare much worse in out-of-sample predictions: the MAE is 0.064 for model M2 and 0.035 for model M3.[12]

[11] A formal model comparison should be based on marginal data density (MDD). Given the large number of parameters, computing the MDD for our model is computationally infeasible with our current computing power.

[12] For model M3, we assume that the time fixed effect in 2003-2014 is the same as its 2002 estimate, the end of

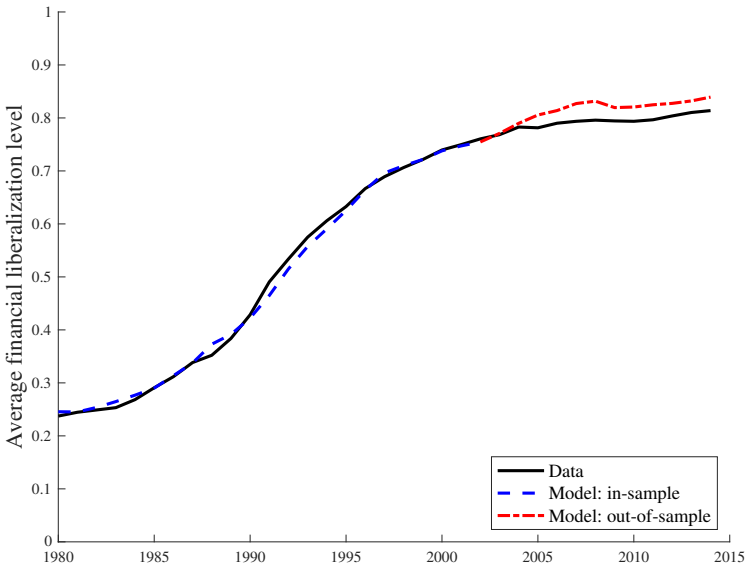


Figure 7: Actual versus model-predicted average financial liberalization

Note: The in-sample prediction (blue dashed line) is from 1980 to 2002; the out-of-sample prediction (red dot-dashed line) is from 2003 to 2014.

5. The Horse Race: Explaining Reform Contagion

In this section, we conduct a comparative analysis to evaluate the relative importance of different channels in explaining the observed contagion of financial reforms across countries and over time. We use the intensity of financial reforms, defined as the average change in financial liberalization across countries in a year (i.e. $\sum_{i=1}^{n}(r_{i,t} - r_{i,t-1})/n$), as one of our measures of reform contagion. From equation (5), we quantify the contributions of three key channels: (a) geopolitical influence—the extent to which policymakers are influenced by the liberalization levels of ideologically similar nations; (b) learning—the evolution of policymakers' beliefs about the benefits of financial reform, driven by their own country's experience and the observed successes of others; and (c) other factors that encompass a range of factors beyond geopolitics and learning.

5.1. Geopolitical Influence

We calculate the contribution of geopolitical influence as $\kappa \cdot \sum_{i=1}^{n}(r_{i,t}^{p} - r_{i,t-1}^{p})/n$. Figure 8 plots the financial reform intensity (solid black line) and its decomposition (colored bars). One can see

the sample for our out-of-sample forecasting.

that geopolitical influence (red bars) is a major force behind the dynamics of the financial reform intensity; its effects were more prominent from 1990 to 1998—an intensive reform contagion period. To further quantify the contribution of geopolitical influence, we calculate its average contribution share to the reform intensity over the entire sample period, which is 42 percent.[13]

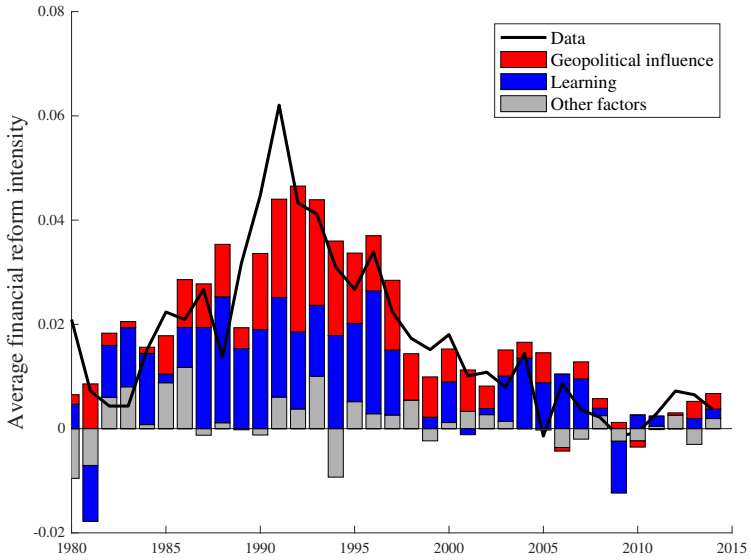


Figure 8: Decomposition for financial reform intensity

Note: This figure decomposes the average financial reform intensity (i.e., the average global change in financial liberalization). The black line represents actual data. Contributions from geopolitical influence, learning, and other factors are shown by the red, blue, and gray bars.

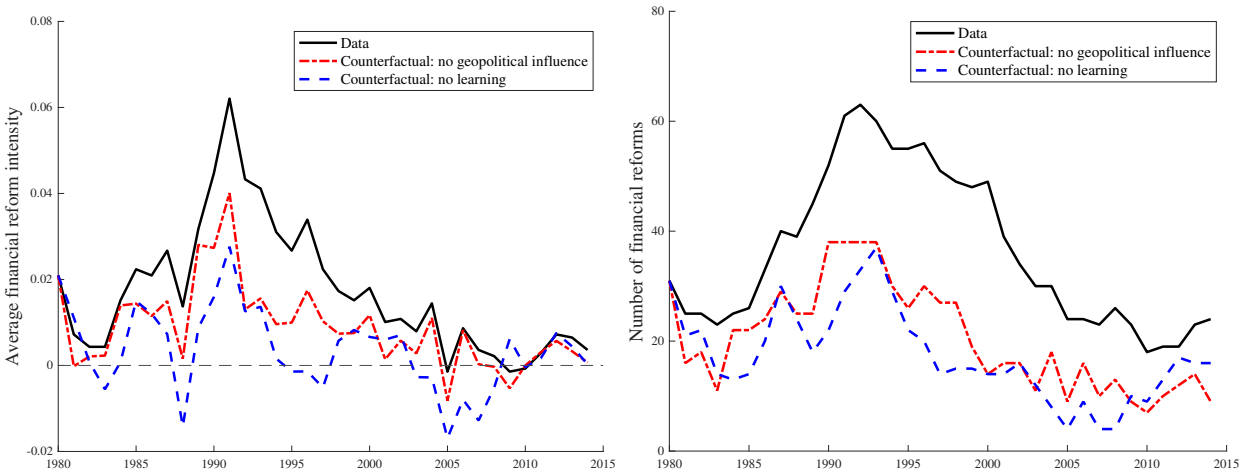
To evaluate the impact of geopolitical influence, we conduct a counterfactual experiment. We remove this channel from the model while allowing policymakers to update beliefs and make reform decisions. We then simulate the counterfactual paths of financial liberalization and output growth.[14]

We compare the average of counterfactual financial reforms with the average of the actual ones as in Figure 9a. It shows that when removing the geopolitical influence (red dash-dotted line), the counterfactual reform intensities are lower than actual data (black solid line) all the time. As a result, reform contagion would have been weakened in absence of geopolitical influence. When some

[13]The shares contributed by all factors do not sum to one hundred percent exactly; the difference comes from the model's prediction errors.

[14]In our counterfactual simulation exercise, we keep the influence of all other factors for financial liberalization the same as in the data, and growth and other shocks the same as their estimated values. The counterfactual level of financial liberalization is re-calculated. The counterfactual paths of GDP level and growth are generated from equation (1) but with the counterfactual path of financial liberalization.

countries became financially liberalized, geopolitical influence served as a propagating channel to facilitate the reforms of other ideologically similar countries, which further had a feedback impact on those initially liberalized countries. These propagating and feedback effects make the channel of geopolitical influence indispensable for the spread and contagion of financial reforms. Over the whole sample period, the average financial reform intensity would have been only 52 percent of the actual one if geopolitical influence had been absent. Thus, geopolitical influence is an important factor in driving the dynamics of the average financial reform.



(a) Average financial reform intensity (b) Number of financial reforms

Figure 9: The counterfactual contagion of financial reforms: removing the geopolitical influence or learning from the model

Note: Panel (a) displays the average financial reform intensity, while Panel (b) shows the number of countries conducting reforms within a 3-year window. Black lines represent actual data; red dash-dotted lines show the counterfactual scenario without geopolitical influence; and blue dashed lines, the counterfactual without learning.

Next, we explore how geopolitical influence affects reform contagion along the extensive margin, i.e., the number of countries pursuing financial reforms. The extensive margin measures the number of countries that adopt financial reforms at the same time. The higher the extensive margin, the stronger the contagion of financial reforms. In the data, we observe whether a certain country implements a financial reform within a year. To match the model with the data along the extensive margin, we adopt a 3-year window. Specifically, in the data, we count country i as implementing financial reforms in year t if the sum of changes in financial liberalization of the country between year $t-2$ and year t is positive.

In the counterfactual experiment, we adopt the same 3-year window to calculate the cumulative

change in financial liberalization, but count the country as implementing financial reforms if the value is equal to or larger than the threshold of 1/18.[15] From Figure 9b one can see that the number of reforms in the counterfactual exercise of removing geopolitical influence from the model is well below that in the actual data. In the data, there were 63 countries implementing financial reforms at the peak of reform contagion. In the counterfactual experiment, the correspondent number would have been 38, had geopolitical influence been removed from the model. During the period of intense reform contagion (1985–2000), the difference in the average number of financial reforms between actual and counterfactual data was about 21. Thus, geopolitical influence has persistent effects on reform contagion along the extensive margin.

5.2. Learning

The contribution of learning to reform contagion is calculated by the average change in belief across countries divided by the coefficient of political cost: $1/\psi \cdot \sum_{i=1}^{n}(\beta_{i,t+1|t} - \beta_{i,t|t-1})/n$. From Figure 8 one can see that learning (blue bars) is another major force behind the dynamics of reform intensity with its effects that were more prominent from 1988 to 1997. Furthermore, its average contribution share to the reform intensity over the entire sample period is 49 percent.

Since learning includes updating belief with own country's information and learning from other countries' experiences (cross-country learning), we can further decompose learning's contribution share into those two components. We find that cross-country learning plays a more important role than learning from own country's experiences, where the former accounts for about 60 percent of the contribution share for learning over the whole sample period. During the period of intensive reform contagion, the role of cross-country learning is even more dominant, which attributes to 70 percent of the learning's contribution. In the early period of the sample, most countries' own liberalization levels were very low, and their own growth performances did not contain much information about the effect of financial reforms. In this case, the policymakers had to rely on other more liberalized countries' experiences to learn about the growth effect of financial reforms. As a result, cross-country learning became crucial.

In our counterfactual experiment in which we remove learning from the model, we keep pol-

[15] According to our data construction method, the minimum change of financial liberalization for a country in one year is 1/18.

icymakers' beliefs unchanged but allow them to be affected by all other factors. Comparing the average of counterfactual reforms with the average of actual ones, Figure 9a shows that when removing learning from the model, the counterfactual reform intensities (blue dashed line) are lower than the actual data (black solid line) most of the time. At the beginning of the sample, most countries were very negative about financial liberalization. Over time, they gradually revised their opinions upward through the learning process and implemented financial reforms. Since policymakers' beliefs about the growth effects of financial liberalization are correlated, countries learned from experiences among themselves. As a result, the learning channel is important for the observed global contagion of financial reforms. Over the entire sample period, the average reform intensity would have been 21 percent of the actual one had learning been removed from the model.

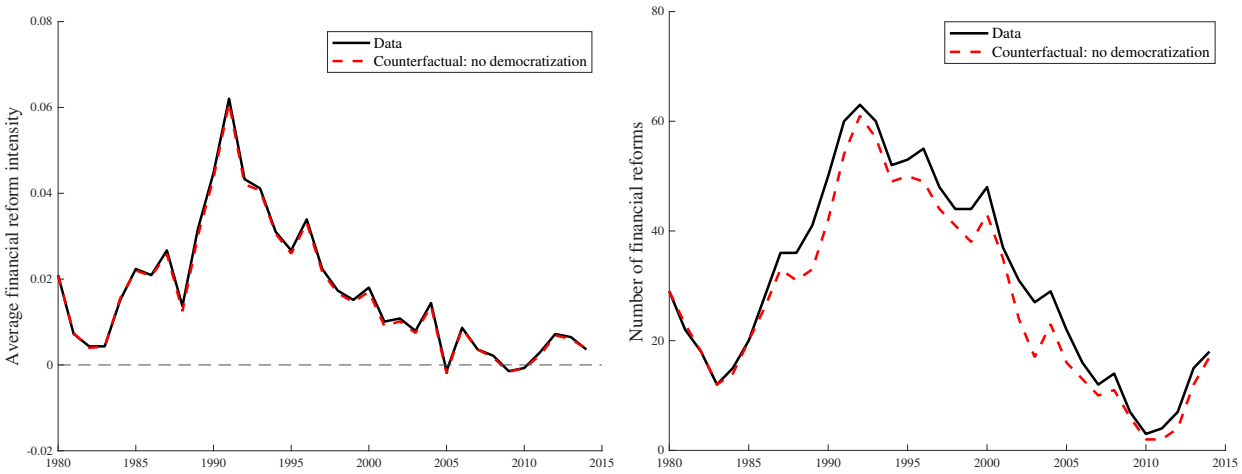
Along the extensive margin, Figure 9b shows that the number of reforms in the counterfactual experiment are well below that in the actual data. In contrast to 63 countries implementing reforms at the peak of reform contagion, the correspondent number in the counterfactual experiment is only 37. For the period of intense reform contagion (1985 - 2000), the difference in the average number of reforms between actual and counterfactual data is 27, implying the persistent effects of learning on reform contagion along the extensive margin.

5.3. Democracy and Other Factors

In our estimation of the model, the effect of democratization on financial liberalization is statistically significant. To evaluate whether the spread of democracy is an important channel to explain the observed global contagion of financial reforms, we run an experiment in which we remove the factor of democratization for all the countries and simulate the counterfactual paths of financial liberalization and output growth. Specifically, the democracy levels of all countries had stayed at the same level as those at the beginning of the sample.

Figures 10, 10a, and 10b compare the data and the counterfactual paths for both the average intensity of financial reforms and the number of reforms. Figure 10a shows that the average financial reform intensity without democratization is not much different from the data; Figure 10b, shows that that the absence of democratization would had reduced the number of countries implementing reforms, but only slightly. Clearly, removing the democratization factor from the model would not significantly alter the worldwide dynamics of financial reforms. Thus, the role of democratization

in the global contagion of reforms is very limited at most.



(a) Average financial reform intensity (b) Number of financial reforms

Figure 10: The counterfactual reforms without democratization

Note: Panel (a) displays average financial reform intensity. The black solid line represents actual data; the red dashed line shows the counterfactual scenario where democracy levels for all countries remained constant since 1980. Panel (b) displays the number of financial reforms within 3-year windows. The black solid line represents actual reforms; the red dashed line shows the counterfactual scenario with no changes in democracy levels for any country.

In fact, all other factors, including democratization and global interest rates, do not have a significant contribution to the spread of financial liberalization. The contribution of all other factors is measured by $\sum_{i=1}^{n}(\bar{r}_{i,t} - \bar{r}_{i,t-1})/n$. Over the whole sample period, the contribution share is only 7 percent. During the intensive reform contagion period, the contributions share falls even below 5 percent.

It is widely recognized that in the process of worldwide financial reforms, international financial institutions (IFIs), such as the IMF and the World Bank, have played a crucial role in advising countries about financial reforms and their effects. There are two prevailing views regarding the role of the IFIs. One view, advocated by numerous studies (e.g., Krueger, 1993), emphasizes the "leverage" IFIs have used in promoting market-oriented reforms, including domestic financial reforms, globally (e.g., the "Washington Consensus"). Specifically, financial reforms in certain countries were mandated as a condition for receiving loans from the IMF and the World Bank. The second view posits that IFIs served as global informational facilitators, or conduits for cross-country learning, through their annual multilateral surveillance missions and financial arrangements (Haas, 1959). The reform recommendations and knowledge disseminated by the IFIs were primarily based

on extensive research drawn from the experiences of other countries (Quirk et al., 1994).

To examine whether the IMF programs, as described in the first view, had a significant influence on our results, we introduced an IMF program dummy as an additional determinant of the influence of other factors ($\bar{r}_{i,t}$) in equation (4) and re-estimated the model with all other specifications intact. Results presented in Appendix A.7 indicate that IMF programs had a positive effect on countries' financial liberalization (although not significant at the 10 percent level), but they were not crucial for the observed global contagion of financial reforms. In fact, after controlling for IMF programs, our key findings remain unchanged. Specifically, geopolitical influence and learning continue to be the most significant explanations for the dynamics of financial liberalization across countries.

While our paper does not explicitly model the surveillance role of IFIs, the model is consistent with the second view that IFIs act as natural conduits for cross-country learning. IFIs have enabled countries to learn from each other's experiences by participating in international organizations. This perspective can be interpreted through the lens of our model as follows: Initially, policymakers in a majority of countries held pessimistic views or beliefs about the growth prospects of liberalizing their domestic financial sectors. Over time, however, new observations of the positive effects on growth from more liberalized financial sectors in developed economies encouraged other countries to update and reinforce their prior beliefs about these positive effects. Had the early reformers experienced significant negative growth shocks and, consequently, substandard economic performances, the path of global financial liberalization could have been markedly different.

5.4. Summary

Our analysis in previous subsections highlights the crucial importance of two channels in driving the dynamics of reform contagion: geopolitical influence and learning. Both channels play an equally essential role in the observed global spread of financial liberalization. Removing either channel would have significantly hindered the diffusion of reforms across countries. In contrast, democratization and other factors have a relatively minor role in the propagation and diffusion of financial reforms across time and space.

6. GFC Impacts and Developing Countries

The GFC raises questions about whether it triggered a slowdown or even a reversal in financial reforms, particularly in developing countries (Campos and Coricelli, 2012). Previous literature has documented a "great reversal" in financial reforms following the Great Depression of the 1930s (Rajan and Zingales, 2003). Buera et al. (2011) conducted a counterfactual experiment with their model by simulating a severe worldwide recession in 2002, comparable in magnitude to the Great Depression. They discovered that a substantial share (10 percent) of countries would have reverted from market-oriented policies to state-interventionist policies.

An advantage of our dataset is its coverage of the GFC period, which allows us to directly quantify its effects on reform reversals. Using the estimated model, we examine a counterfactual scenario in which the GFC had not occurred. We simulate growth shocks for 2008-2009 for all countries from the estimated distribution of growth shocks (i.e., the no-GFC scenario) to compare the actual number of reform reversals with the simulated one (counterfactual). Based on 1,000 simulations, we calculate the mean and the 95 percent probability interval for the counterfactual number of reform reversals averaged across countries. Figure 11 shows that the GFC led to more reform reversals than otherwise, with its impacts becoming statistically significant after 2009. Without the GFC, the number of reform reversals would have decreased by 39.2 percent on average, and the wave of reversals would have subsided more quickly.[16]

The initial reversals of financial reforms were triggered by negative growth shocks to developed countries during the GFC, which then caused a wave of global reform reversals. In fact, a vast majority of reform reversals occurred in developing countries, as compared in Figures 11 and 12. We conducted two counterfactual experiments to demonstrate that the contagion spread from developed to developing countries through two main channels: learning and geopolitical influence. The first experiment eliminated the learning channel by setting the belief correlation between developed and developing countries to zero at the beginning of the GFC. This setup ensured that policymakers

[16] We define a reform reversal as a decrease in a country's financial liberalization level. To account for short-term fluctuations, we use a 3-year window. Specifically, a country i is considered to have experienced a reform reversal in year t if the cumulative change in its financial liberalization between year $t-2$ and year t is negative. In the counterfactual experiment, we apply a threshold of -1/18 to identify a reversal.

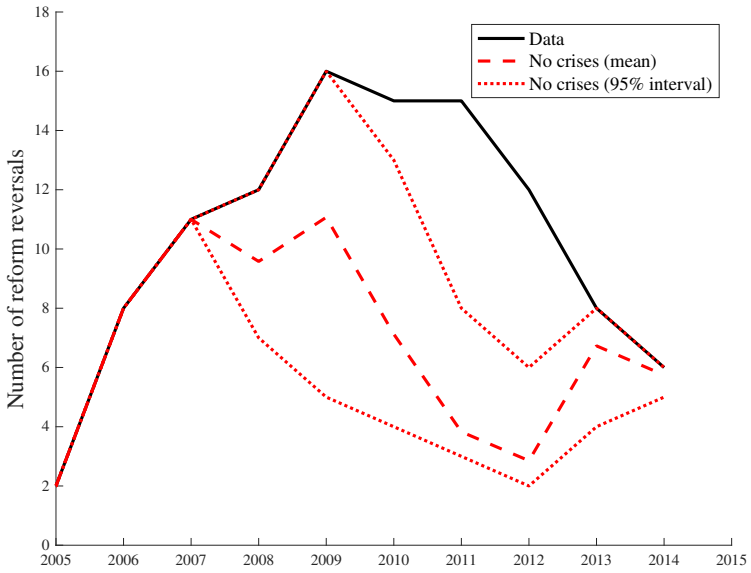


Figure 11: The counterfactual reform reversals during the GFC

Note: This figure illustrates a counterfactual experiment where the GFC had not occurred. The black solid line shows the number of reform reversals (within 3-year windows) in the actual data. The red dashed line represents the average counterfactual number of reversals, with the surrounding red dotted lines indicating the 2.5th and 97.5th percentiles from simulations.

in one group would not learn from the experiences of the other group. In the second experiment, we muted the geopolitical influence channel by keeping the geopolitical influence from developed to developing countries constant since the GFC. Consequently, changes in financial liberalization levels in one group would not directly affect the decision-making of policymakers in the other group through geopolitical influence.

Figure 12 reports the number of reform reversals in developing countries. First, developing countries would not have had as many reform reversals if the learning channel between developed and developing countries had been absent (red dotted line). Second, the number of reversals was heavily affected by learning from the experiences of developed countries during the GFC; geopolitical influence from developed to developing countries did not play a role in the wave of reform reversals. Note that the growth performance of developed economies with highly liberalized financial systems, which fared poorly during the GFC, gave developing countries the impression that excessive financial liberalization could harm rather than help growth. Thus, it reduced the desired level of financial liberalization in developing countries as a whole.

Figure 12: Influences of developed countries on developing countries' reform reversals

Note: This figure displays financial reform reversals in developing countries. The black solid line shows the number of actual reversals (within 3-year windows). The red dotted line represents the counterfactual scenario where learning from developed countries was removed from the model. The green dash-dotted line represents the counterfactual where geopolitical influence from developed countries was removed from the model.

7. Broader Implications for Developing Countries

At the beginning of the sample period, the average level of financial liberalization was relatively high in developed countries, while developing countries were mostly less liberalized. Financial reform contagion was observed to be more significant among developing countries. This section explores the dynamics of financial liberalization evolution in developing countries outside the GFC era and compares two forces that played an important role in reform contagion among developing countries: learning and geopolitical influence from developed countries and within their own group.

7.1. Contributions from Different Channels

Given that the global contagion of financial reforms slowed down considerably after 2000, our analysis focuses on the early period of the sample. We decompose the changes in financial liberalization of developing countries over this period into several components. Figure 13 presents the contributions from different components, where a contribution at each time point represents the average change over a 5-year rolling window. We differentiate between geopolitical influence and learning from developed to developing countries and those among developing countries themselves. Our analysis yields three key findings:

First, learning from developed countries was crucial for reform contagion in developing countries, especially at the onset (blue bar). During the early period, developed economies exhibited higher levels of financial liberalization and lower volatility in their growth shocks compared to developing countries. Consequently, their economic performances served as informative signals to other countries about the effects of financial reforms, especially at the start of the sample when the level of financial liberalization in developing countries was very low.

Second, the contribution of geopolitical influence from other developing countries was also significant (red bar). Given the similarity in ideology within developing countries, the geopolitical channel effectively propagated financial reforms among them. When some developing countries began implementing reforms, often as a result of learning from developed countries, the desire of other developing countries with similar ideologies to implement financial reforms increased due to geopolitical influence. As more developing countries implemented financial reforms, geopolitical influence further spread to their peers. In this feedback loop, ideologically similar countries

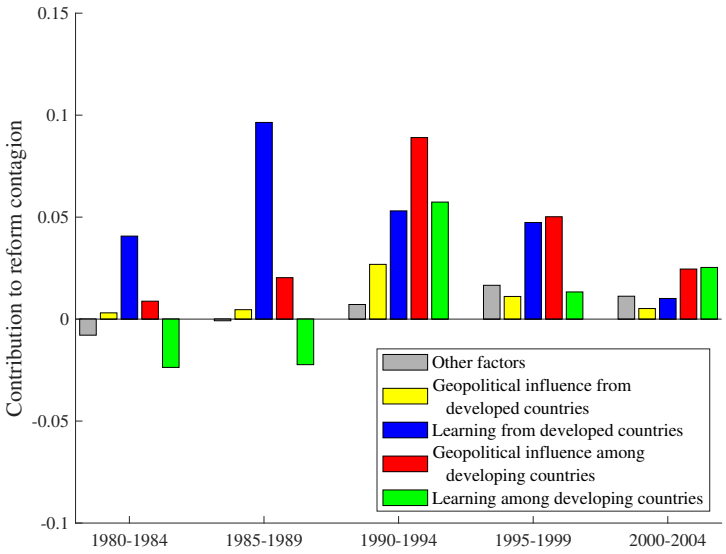


Figure 13: The decomposition of financial reform contagion for developing countries

Note: This figure decomposes financial reform contagion (i.e. the average change in financial liberalization) for developing countries from 1980 to 2004. Contributions are calculated using a 5-year rolling average. Red bars represent the contribution from geopolitical influence within developing countries; blue bars from learning from developed countries; green bars from learning within developing countries; yellow bars from geopolitical influence from developed countries; and gray bars from the contribution from other factors.

reinforced each other's implementation of financial reforms. The spillover effects among developing countries, driven by geopolitical influence, were more pronounced during the reform contagion period—especially amid the massive changes in financial liberalization that occurred in the early 1990s—compared to other periods.

Third, although other factors occasionally contributed to the financial liberalization of developing countries, their impacts were dominated by those of learning from developed countries and geopolitical influence within developing countries themselves, especially in the 1990s.

7.2. Counterfactual Experiments

To further explore the roles of learning from developed countries and geopolitical influence among developing countries in reform contagion, we conduct counterfactual experiments. In these experiments, we remove each channel—learning and geopolitical influence—and simulate counterfactual paths for financial liberalization and output growth.[17] From Figure 14, it is evident that the re-

[17] When removing learning from developed countries, developing countries are still able to learn among themselves. When removing geopolitical influence within their own group, developing countries are still influenced by geopolitical

duction in the number of reforms between 1985 and 1995 would have been similar had either of these two channels been removed. This period shows that learning from developed countries and geopolitical influence within developing countries were equally important for reform contagion.

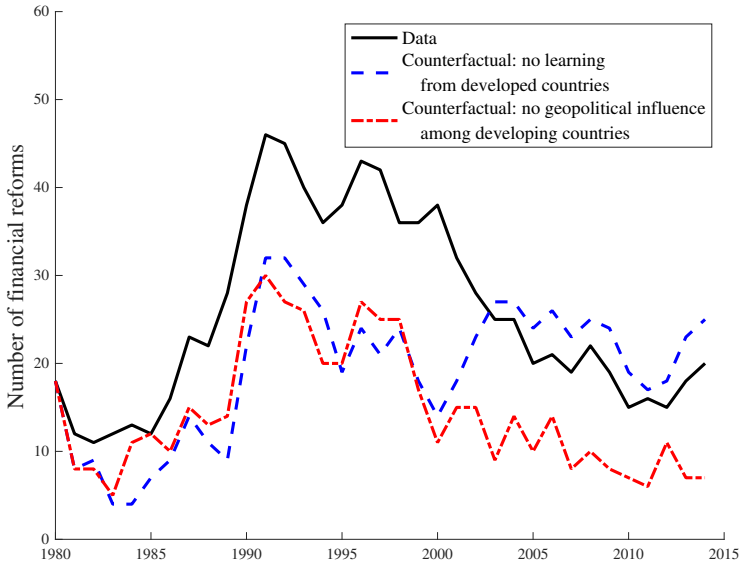


Figure 14: The financial reform contagion in developing countries

Note: This figure illustrates financial reform contagion in developing countries. The black solid line shows the number of actual reforms (within 3-year windows). The blue dashed line represents the counterfactual scenario without learning from developed countries. The red dash-dotted line represents the counterfactual where geopolitical influence among developing countries was removed from the model.

A particularly intriguing finding is the divergence in the counterfactual numbers of reforms under the two scenarios after the late 1990s. Without learning from developed countries, developing countries would have implemented financial reforms rather steadily since 1990. The lessons learned from developed countries were valuable in the initial period of financial liberalization, but as financial reforms in developing countries progressed, these nations began to rely more on their own experiences. This shift allowed them to sustain reform processes independently, as shown by the blue dashed line in Figure 14.

In the scenario without geopolitical influence among developing countries, the momentum of reform contagion gradually waned after the late 1990s. The absence of geopolitical influence had a lasting negative impact on their financial reforms, as indicated by the red dash-dotted line in Figure 14. Moreover, geopolitical influence facilitated the learning channel within developing countries

factors from developed countries.

by elevating the overall level of financial liberalization and enhancing communication about the impacts of financial reforms based on their own growth experiences. Thus, geopolitical influence within developing countries played a vital role in the spread of financial reforms among themselves.

8. Conclusion

We utilize a novel and comprehensive database to document and analyze the evolution of domestic financial liberalization across the world. Our research pinpoints a significant global contagion of financial reforms from the late 1980s to the late 1990s, during which financial liberalization surged, peaking around 2000 before leveling off towards the end of the sample period. We detail the reversals of financial reforms precipitated by the GFC. Based on these observations, we develop a unified framework to assess the relative impact of various factors identified, as highlighted in existing literature, in driving both the global contagion of financial reforms in the 1990s and the subsequent reversals during the GFC.

Our in-depth horse race analysis reveals that geopolitical influence and cross-country learning are the primary forces driving the spread of financial reforms. At the same time, we observe a limited role of democratization, economic crises other than the GFC, and global interest rates in driving the widespread adoption of financial reforms, particularly in developing countries. Our exploration of the GFC period underscores its significant influence on the rollback of financial reforms, with a pronounced impact on developing nations. In the early stages of our sample period, marked by a global surge in financial liberalization, geopolitical influence notably enhanced the learning channel, aiding the dissemination of financial reforms among developing countries in the 1990s.

Further studies on how subindices of the financial liberalization series interact with each other and with other series of reforms (e.g., product market and external sector reforms) would be informative. The model developed in this paper is designed to accommodate multiple series of reforms within a single framework. Estimating such an expansive model, however, would substantially increase the scale of parameterization, a task currently beyond our computational capabilities. We anticipate that our findings and framework will pave the way for such comprehensive studies as computational technologies evolve.

9. Data Availability Statement

The data that supports the findings of this study are available in the supplementary material of this article.

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A. Appendix

A.1. List of countries and territories

Table A.1: List of countries and territories

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

A.2. True data generating process

We assume that the true GDP is a hierarchical linear model, that is, the GDP growth per capita for country i follows

$$g_{i,t} = c_i + \alpha_i y_{i,t-1} + \beta_i r_{i,t-1} + \xi_{i,t},\ t = 1, \ldots, T,$$

where $g_{i,t}$ is the per capita GDP growth in country i at time t, $y_{i,t-1}$ is the log of a one-year lag of per capita GDP, and $r_{i,t-1}$ is the financial liberalization level. The vector of growth shocks across countries is $\xi_t \equiv [\xi_{1,t}, \ldots, \xi_{n,t}]' \sim \mathcal{N}(0, \Omega)$, which is uncorrelated across time. The structure for the covariance matrix is $\Omega = S \cdot Q \cdot S$, where $S = diag(s_1, \ldots, s_n)$ and $Q_{ij} = \exp[-d_{ij} \cdot \tau]$.

Each country's coefficients are drawn from a population with the following distribution:

$$\begin{aligned} c &\sim N(1_n \cdot \bar{c},\ \Omega_c), & \Omega_c &= \zeta_c^2 \cdot W_c. \\ \alpha &\sim N(1_n \cdot \bar{\alpha},\ \Omega_\alpha), & \Omega_\alpha &= \zeta_\alpha^2 \cdot W_\alpha. \\ \beta &\sim N(1_n \cdot \bar{\beta},\ \Omega_\beta), & \Omega_\beta &= \zeta_\beta^2 \cdot W_\beta. \end{aligned}$$

The population mean and standard deviation for the coefficients of financial liberalization (β) are $\bar{\beta}$ and ζ_β, respectively. The correlation matrix W_β is modeled as $W_{\beta,ij} = \exp[-d_{ij} \cdot \tau_\beta]$ for country i and j, which allows for potentially spatial correlation. The setup is similar for c and α.

The estimation results are reported in Table A.2. First, the growth shocks are not closely correlated in the spatial distance, and the average correlation across countries is 0.02. The average standard deviation for growth shocks is 3.46. Second, increase in financial liberalization by 0.1 would on average increase the country's growth rate by about 0.20 percentage points, but there exists large heterogeneity across countries with the correlation being approximately 0.47 for countries with a distance of 1000km. Third, the effect of GDP level on growth is overall negative, and the average correlation for this effect across countries is about 0.07. Finally, the dispersion of country-specific growth component is found to be large. The correlation for this country-specific growth component is about 0.80 for countries that are 1000km apart and 0.32 for those with 5000km apart.

Table A.2: Estimates of the hierarchical linear model for the true data generating process

τ	$\bar{\beta}$	ζ_β	τ_β	$\bar{\alpha}$	ζ_α	τ_α	$\bar{c}$	ζ_c	τ_c
1.8709	1.9639	1.7802	0.7587	-0.8792	0.5324	0.6818	1.2819	1.9008	0.2257
(0.2117)	(0.5032)	(0.3500)	(0.3065)	(0.3140)	(0.2416)	(1.1915)	(0.8283)	(0.4596)	(0.1262)

Note: The standard errors for the estimates are in the parentheses.

A.3. Reduced-form evidence for learning

In this section, we provide reduced-form evidence for learning and the geopolitical influence components in our semi-structural model. The approach used here is common in the existing literature (Abiad and Mody 2005; Giuliano et al. 2013).

We hypothesize that governments may learn from past "successes" (policies that induce growth) and also from reference groups (geographic neighbors or trading partners). That is, if the recent experiences in reference countries show that a higher level of financial liberalization increases economic growth, the government is likely to update their beliefs about the impact of these polices on their domestic growth and deregulate financial market further. On the contrary, if the evidence is in favor of the opposite effect, then the government is likely to tighten its financial regulation. At the same time, governments may be under the pressure of the geopolitical influence, i.e. their choices may be influenced by their ideological neighbors. The government is likely to conduct reforms when its neighbors become more liberalized. Following this narrative, we estimate the following regression specification:

$$r_{i,t} = \alpha_1 r_{i,t-1} + \alpha_2 r_{-i,t-1} + \alpha_3 g^{+}_{i,t-1} + \alpha_4 g^{-}_{i,t-1} + \boldsymbol{\gamma} \boldsymbol{X}_{i,t-1} + \varepsilon_{i,t}, \tag{A.1}$$

where the dependent variable, $r_{i,t}$, reflects the domestic financial liberalization index of country i at time t. To allow for persistence in the degree of liberalization, the lagged index, $r_{i,t-1}$, is included as the first control variable. The second term, $r_{-i,t-1}$, reflects the geopolitical influence, which is the (ideological distance-weighted) average level of liberalization of all other countries. It captures policy emulation, which is another mechanism of policy contagion but a distinct concept from learning as it does not require evaluating whether the emulated policy has shown success.

The third and fourth controls capture the concept of learning about the growth effect of financial liberalization. Specifically, $g^{+}_{i,t-1}$ denotes the (geographical distance-weighted) average growth rate over the previous three years of all countries that have more liberalized domestic financial market than country i. Similarly, $g^{-}_{i,t-1}$ denotes the (geographical distance-weighted) average growth in countries that have tighter regulation or state controls than country i over the past three years.[18]

A set of country characteristics, $\boldsymbol{X}_{i,t-1}$, are progressively controlled for in various specifications to absorb other time-varying determinants of reforms as suggested by existing studies. This includes a country's the degree of democracy (Giuliano et al., 2013; Giavazzi and Tabellini, 2005) and post-economic crises indicators (Abiad and Mody, 2005; Mian et al., 2014; Rancière and Tornell, 2016). In the regressions, we also include a country's initial economic condition captured by log GDP relative to the U.S. and global interest rates (Bartolini and Drazen, 1997; Abiad and Mody, 2005) as control variables. Besides, we control for country fixed effects and time trend to absorb time-invariant determinants of reforms and aggregate trends of reform in all specifications.

The OLS estimates of Equation (A.1) are reported in Table A.3. Across all specifications, the coefficients of lagged financial liberalization index are positive and statistically significant, implying a strong policy inertia or bias towards status quo. This is consistent with the stylized fact that majority (about 75 percent) of country-year observations are associated with no changes in the financial liberalization index. The coefficient of the geopolitical influence is also significantly positive, reflecting the strong desire to imitate policies or prevailing practices from countries with similar ideologies. Turning to the effect of learning, we find that α_3 is positive and α_4 negative, and both are statistically significant. That is, a country's own financial liberalization effort improves if its more liberalized neighbors grow faster, and reverses its course following periods of more rapid growth of its financially more restrictive neighbors. The findings are consistent with our hypothesis that policymakers, in making financial sector reform decisions, are influenced by both their ideological neighbors' liberalization choices and the past growth performance of different policy regimes.

[18] Formally, $r_{-i,t-1}=[\sum_{j\neq i}\exp(-p_{ij,t-1})r_{j,t-1}]/[\sum_{j\neq i}\exp(-p_{ij,t-1})]$ where $p_{ij,t-1}$ is the ideological distance between country i and j at time $t-1$, $g^{+}_{i,t-1}=[\sum^{3}_{s=1}\sum_{j:r_{j,t-s}>r_{i,t-s}}\exp(-d_{ij}/\delta)g_{j,t-s}]/[\sum^{3}_{s=1}\sum_{j:r_{j,t-s}>r_{i,t-s}}\exp(-d_{ij}/\delta)]$, and $g^{-}_{i,t-1}=[\sum^{3}_{s=1}\sum_{j:r_{j,t-s}\leq r_{i,t-s}}\exp(-d_{ij}/\delta)g_{j,t-s}]/[\sum^{3}_{s=1}\sum_{j:r_{j,t-s}\leq r_{i,t-s}}\exp(-d_{ij}/\delta)]$. We set $\delta = 2500$ (as in Buera et al. 2011).

The results are robust to including other covariates, each of which is of interest on its own merit. In Column (3)-(4), we account for a country's degree of democracy using the polity2 index sourced from the Polity IV database. In line with Giuliano et al. (2013) and Giavazzi and Tabellini (2005), democracy has a positive impact on the adoption of financial sector reforms. Columns (3)-(4) add additional controls of post-crises indicators which equals one in the three years following the initial onset year of respective crises. Currency, sovereign debt and banking crises dates are obtained from Laeven and Valencia (2020) which covers all our sample countries and periods. Our results suggest that currency crises are an impetus to financial reform, whereas external debt crises set back the reforms as governments may resort to financial repression as a way to draw down debt accumulation.[19]

[19]The effect of crises on reform is inconclusive in the literature. Crises induce reform are argued in earlier literature Drazen and Grilli (1993); Fernandez and Rodrik (1991). Abiad and Mody (2005) find only balance-of-payments crises improves financial liberalization. Mian et al. (2014) provide tentative evidence of an adverse effect.

Table A.3: Evidence for geopolitical influence and learning: reduced-form regression estimates

	(1)	(2)	(3)	(4)
$r_{i,t-1}$ (α_1)	0.868***	0.889***	0.888***	0.889***
	(0.014)	(0.013)	(0.013)	(0.013)
$r_{-i,t-1}$ (α_2)	0.134***	0.104***	0.099***	0.090***
	(0.014)	(0.016)	(0.012)	(0.016)
$g^{+}_{i,t-1}$ (α_3)	0.242***	0.173**	0.229***	0.175**
	(0.063)	(0.071)	(0.068)	(0.072)
$g^{-}_{i,t-1}$ (α_4)	-0.458***	-0.414***	-0.408***	-0.387***
	(0.054)	(0.067)	(0.064)	(0.068)
Democracy$_{i,t-1}$			0.001***	0.001***
			(0.000)	(0.000)
Post-currency$_{i,t-1}$			0.011**	0.011**
			(0.005)	(0.005)
Post-debt$_{i,t-1}$			-0.012**	-0.01
			(0.006)	(0.006)
Post-banking$_{i,t-1}$			-0.005	-0.005
			(0.005)	(0.005)
Control variables	No	Yes	No	Yes
Observations	2956	2681	2680	2680

Note: The dependent variable is the financial liberalization index $r_{i,t}$. All regressions control for country fixed effects and time trend. Control variables include log GDP relative to the U.S. and global interest rate. Robust standard errors are denoted in parentheses. *, ** and *** denote significant at the 10, 5 and 1 percent, respectively.

Some earlier studies discuss whether financial reforms may lead to crises and economic volatility (Bekaert et al., 2006; Kaminsky and Schmukler, 2008; Kose et al., 2010). When governments make reform decisions, they may not only learn about whether financial reforms spur growth but also whether reforms bring more volatility. That is, if the recent experiences show that a higher level of financial liberalization increase economic volatility, the government is likely to update its belief and tighten its financial regulation. On the contrary, if the evidence favors the opposite, the government is inclined to liberalize financial market further. To investigate learning about financial reforms'

volatility effects, we extend equation (A.1) and estimate the following specification:

$$r_{i,t} = \alpha_1 r_{i,t-1} + \alpha_2 r_{-i,t-1} + \alpha_3 g^+_{i,t-1} + \alpha_4 g^-_{i,t-1} + \alpha_5 vol^+_{i,t-1} + \alpha_6 vol^-_{i,t-1} + \boldsymbol{\gamma} \boldsymbol{X}_{i,t-1} + \varepsilon_{i,t}, \quad \text{(A.2)}$$

where the additional fifth and sixth terms capture the concept of learning about the volatility effect of financial liberalization. Specifically, $vol^+_{i,t-1}$ denotes the (geographical distance-weighted) average growth volatility of all countries that have more liberalized domestic financial market than country i at time $t-1$. Similarly, $vol^-_{i,t-1}$ denotes the (geographical distance-weighted) average growth volatility in countries that have tighter regulation or state controls than country i at time $t-1$.[20] If governments learn about the volatility effect of financial liberalization, we would expect the estimate α_5 to be negative and α_6 to be positive, and both coefficients should be statistically significant.

The OLS estimates of Equation (A.2) are reported in Table A.4. Across all specifications, the coefficients of $vol^+_{i,t-1}$ and $vol^-_{i,t-1}$ are statistically insignificant, so it does not support for learning about the volatility effect of financial liberalization. At the same time, the estimates for other coefficients are similar to the results in previous specification. Thus, it confirms our hypothesis that the geopolitical influence and learning about growth effect are two important determinants for financial liberalization.

A.4. Estimation methodology

The task is to fit the model to the data and thereby to estimate the model's parameters, including those governing the policymakers' beliefs. The unknown coefficients are (1) expectation of initial beliefs about the effect of financial liberalization, $\beta_{1|0}$;[21] (2) standard deviation of initial beliefs about the effect of financial liberalization, $\{\sigma_{i,1|0}\}_{i=1}^n$; (3) coefficient parameterizing the correlation

[20] Following Bekaert et al. (2006), growth volatility $\sigma_{i,t-1}$ for country i at time $t-1$ is calculated as the standard deviation of its growth rates between $t-5$ and $t-1$. Then, $vol^+_{i,t-1} = [\sum_{j:r_{j,t-1} > r_{i,t-1}} \exp(-d_{ij}/\delta)\sigma_{j,t-1}] / [\sum_{j:r_{j,t-1} > r_{i,t-1}} \exp(-d_{ij}/\delta)]$ and $vol^-_{i,t-1} = [\sum_{j:r_{j,t-1} \leq r_{i,t-1}} \exp(-d_{ij}/\delta)\sigma_{j,t-1}] / [\sum_{j:r_{j,t-1} \leq r_{i,t-1}} \exp(-d_{ij}/\delta)]$, where $\delta = 2500$.

[21] We set the initial expectation of beliefs to be the same across countries to reduce the number of estimated parameters and alleviate the overparameterization issues. Since beliefs are continuously updated during the training sample period, expected beliefs about the growth effect of financial liberalization across countries will be different at the beginning of the estimation period.

Table A.4: Evidence for learning about volatility effect: reduced-form regression estimates

	(1)	(2)	(3)	(4)
$r_{i,t-1}$ (α_1)	0.866***	0.887***	0.886***	0.887***
	(0.014)	(0.013)	(0.013)	(0.013)
$r_{-i,t-1}$ (α_2)	0.133***	0.101***	0.100***	0.089***
	(0.015)	(0.017)	(0.013)	(0.017)
$g^{+}_{i,t-1}$ (α_3)	0.211**	0.152*	0.194**	0.151*
	(0.085)	(0.090)	(0.090)	(0.091)
$g^{-}_{i,t-1}$ (α_4)	-0.415***	-0.382***	-0.385***	-0.364***
	(0.064)	(0.074)	(0.072)	(0.075)
$vol^{+}_{i,t-1}$ (α_5)	-0.141	-0.127	-0.151	-0.129
	(0.145)	(0.154)	(0.155)	(0.157)
$vol^{-}_{i,t-1}$ (α_6)	0.128	0.123	0.082	0.098
	(0.104)	(0.102)	(0.101)	(0.101)
Democracy$_{i,t-1}$			0.001***	0.001***
			(0.000)	(0.000)
Post-currency$_{i,t-1}$			0.011**	0.011**
			(0.005)	(0.005)
Post-debt$_{i,t-1}$			-0.012*	-0.01
			(0.006)	(0.006)
Post-banking$_{i,t-1}$			-0.005	-0.005
			(0.005)	(0.005)
Control variables	No	Yes	No	Yes
Observations	2919	2648	2647	2647

Note: The dependent variable is the financial liberalization index $r_{i,t}$. All regressions control for country fixed effects and time trend. Control variables include log GDP relative to the U.S. and global interest rate. Robust standard errors are denoted in parentheses. *, ** and *** denote significant at the 10, 5 and 1 percent, respectively.

of initial beliefs, γ; (4) coefficient for political cost, ψ; (5) country-specific component of financial liberalization, $\{\delta_i\}_{i=1}^n$; (6) coefficients of time-varying influence of other factors, ϕ; (7) coefficient for the geopolitical influence, κ; (8) coefficient parameterizing the relationship between ideology similarity and relative weights for the geopolitical influence, χ; (9) variance of financial liberalization implementation shocks, $\{\lambda_i\}_{i=1}^n$.

Group all the unknown parameters in the vector Θ. Denote the entire financial liberalization data by $R \equiv \{r_{1,t}, \ldots, r_{n,t}\}_{t=1}^T$, and the entire data on growth component and countries' political and economic characteristics by $D \equiv \{z_{1,t}, \ldots, z_{n,t}, \nu'_{1,t}, \ldots, \nu'_{n,t}\}_{t=1}^T$. The Bayes rule delivers

$$p(\Theta \mid R, D) \propto \mathcal{L}(R \mid \Theta, D)\pi(\Theta),$$

where $p(\Theta \mid R, D)$, $\mathcal{L}(R \mid \Theta, D)$, and $\pi(\Theta)$ represent the posterior pdf, likelihood, and prior pdf respectively.

A.4.1. Priors

Since our model has many parameters, we use informative priors to prevent overfitting concerns, as in Buera, Monge-Naranjo and Primiceri (2011).

The prior distribution of ψ takes the Gamma form. We choose the shape hyperparameter to be 1 so zero reform cost is allowable. We pick the scale hyperparameter as 1 so that the probability of $\psi > 3$ is about 5 percent for the prior distribution. In this way, the prior distribution covers a relatively wide range.

The prior distribution of $\beta_{1|0}$ takes Gaussian form. As we are agnostic of the value of this parameter, we set the prior mean at 0 and the prior standard deviation at 0.5. If all coefficients related to financial liberalization norm are zero, this prior distribution implies an average liberalization level of 0.5 with standard deviation of around 0.5.

The prior distribution of $\sigma_{i,1|0}$ follows inverse Gamma distribution. From the estimated growth process, the average standard deviation for growth shocks across countries is around 3.5. Consider the case in which we have 25 observations for $z_{i,t} = 0.5 \cdot \beta + \xi_{i,t}$, the standard deviation of estimate for β is $(3.5/0.5)/\sqrt{25} \approx 1.4$. Thus, we set both the prior mean and standard deviation of $\sigma_{i,1|0}$ as 1.5 to be consistent with the estimate while remaining diffuse. This gives the shape and scale

hyperparameters as 3 and 3, respectively.

The prior distribution of λ_i also follows inverse Gamma distribution. From the construction method of financial liberalization index, the gap between two nearby levels is $1/18 \approx 0.055$. Based on this value, we set the prior mean and standard deviation for the implied standard deviation of implementation shocks both to 0.025, which gives the shape and scale hyperparameters for λ_i as 1.2945 and 0.004, respectively.

Lastly, we use flat priors for γ, δ_i, ϕ, κ, and χ, as we do not have much prior information.

A.4.2. The likelihood function

From equation (3), the likelihood function can be derived from the joint probability density of liberalization implementation shocks as

$$\mathcal{L}(R \mid \Theta, D) = \frac{1}{(2\pi)^{nT/2}} \prod_{i=1}^{n} \left[\lambda_i^{-\frac{T}{2}} \prod_{t=1}^{T} \exp\left(-\frac{\eta_{i,t}^2}{2\lambda_i} \right) \right],$$

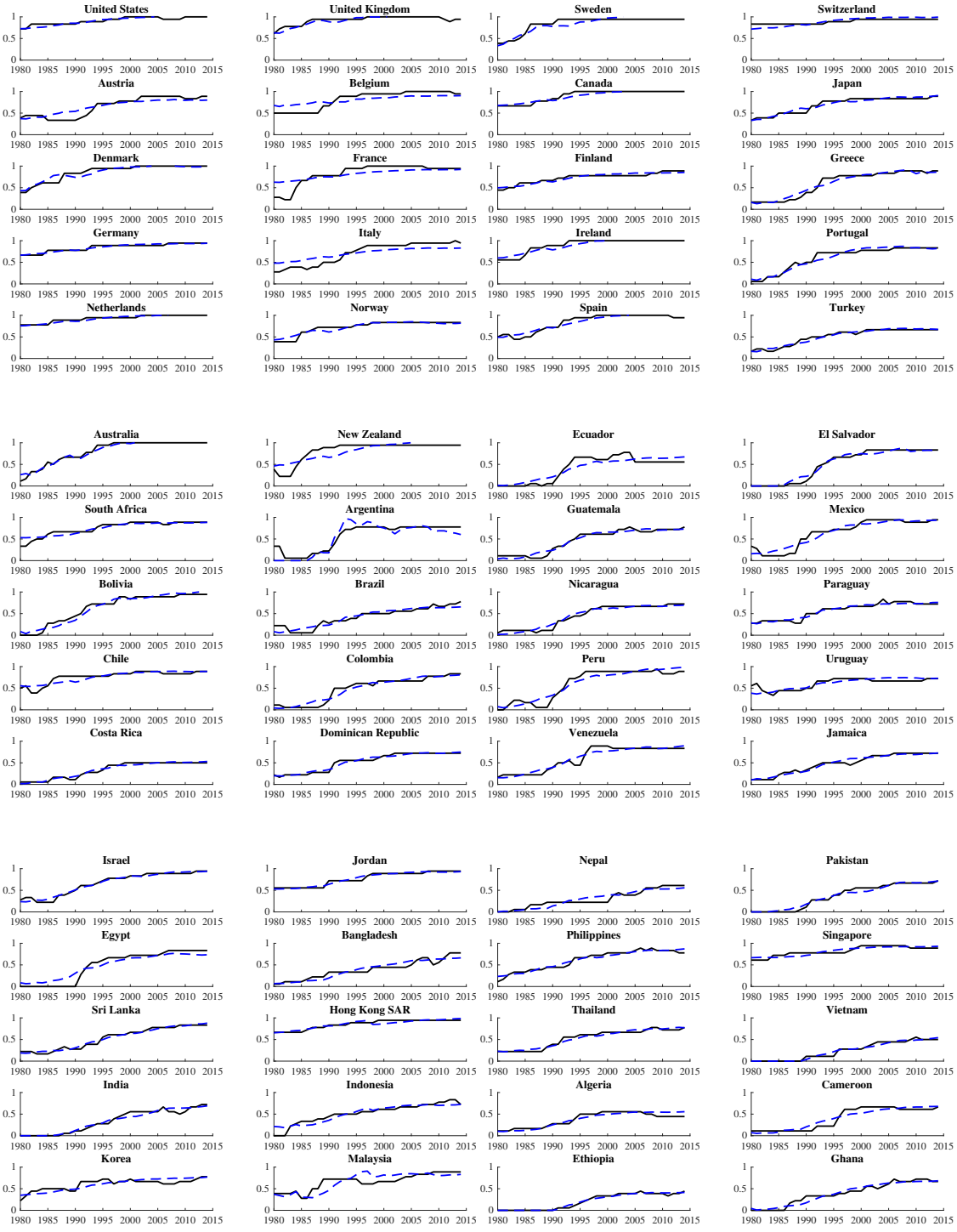
where $\eta_{i,t}$ is a function of unknown parameters

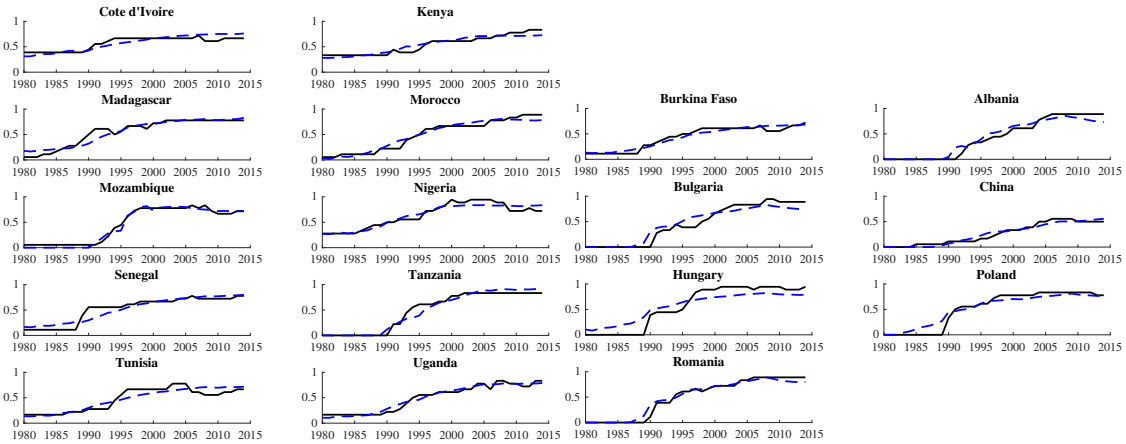
$$\eta_{i,t} = r_{i,t} - (\bar{r}_{i,t} + \kappa r_{i,t}^{p} + \psi^{-1}\beta_{i,t+1|t}).$$

A.4.3. The estimation procedure

We divide the whole sample into two parts, training sample ($1973 \sim 1979$) and estimation sample ($1980 \sim 2014$). While parameters are estimated only using the estimation sample, policymakers' beliefs are updated with observed growth components and financial liberalization data in the training sample period. The role of training sample is to help alleviate overfitting concerns and to discipline policymakers' initial beliefs at the beginning of the estimation. For instance, the model can fit data well, but policymakers' initial beliefs are implausible. With the proposed training sample, policymakers update their beliefs with true growth and financial policy data for seven years prior to the estimation period. In this way, the training sample imposes a fair amount of information on policymakers' beliefs, and the estimation does not start from arbitrary beliefs. Besides, we exclude 12 former Soviet Union countries due to lack of growth information before 1990 and Zimbabwe due to implausible growth observations, so we end up with 77 countries in our estimation.

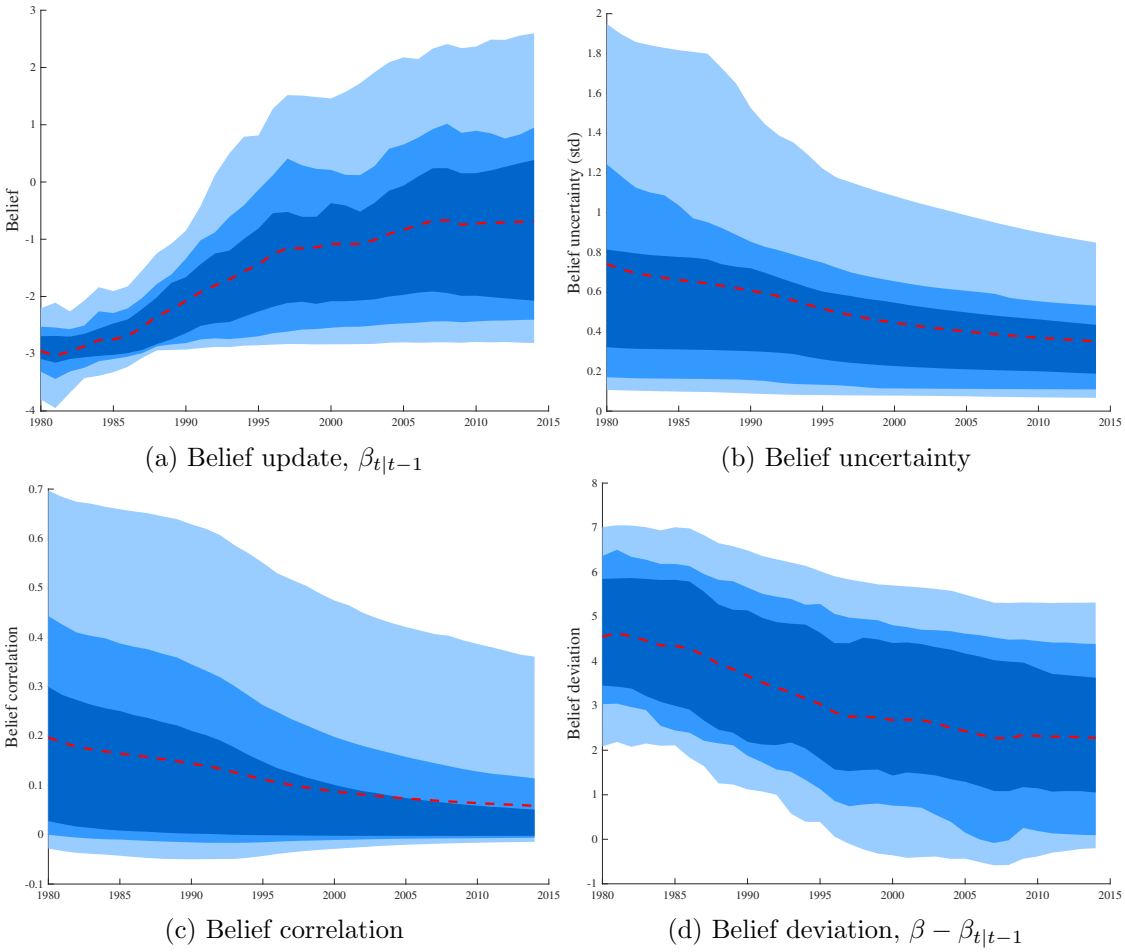
A.5. Model fit for each country





A.6. Belief evolution

The driving force behind learning is the evolution of policymakers' beliefs. The estimated evolution of heterogeneous beliefs over time and across countries is summarized in Figure A.5 in which the red dashed line represents the average value and the blue shades represent 50 (25th to 75th), 70 (15th to 85th), and 90 (5th to 95th) percentile intervals from dark to light colors. As one can see, a majority of policymakers' beliefs were below zero in 1980 and gradually increased over time (Figure A.5a). At the end of the sample, beliefs about the effects of financial liberalization on growth in some countries were positive, while stayed negative for other countries. The evolution of the average belief fluctuated in the 1980s, rose up in the 1990s, and then flattened out. As information about the effects of financial liberalization accumulated from countries' own and other countries' experiences, the belief uncertainty (the standard deviation) and the dispersion of belief uncertainty declined over time (Figure A.5b). The average belief uncertainty in 2014 was about half of that level in 1980, reflecting an increase in the belief precision. The correlation of beliefs across countries declined over time (Figure A.5c), as countries accumulated their own experiences. But the dispersion of belief correlations remained substantial. A belief deviation for country i, defined as $\beta_i - \beta_{i,t|t-1}$, measures the gap between the value of β_i estimated from the data generating process represented by equation (1) and the country's belief about the value of β_i at time t. In early periods, most countries significantly underestimated the effects of financial liberalization on growth. The average of belief deviations moved towards zero over time (Figure A.5d).



(a) Belief update, $\beta_{t|t-1}$ (b) Belief uncertainty

(c) Belief correlation (d) Belief deviation, $\beta - \beta_{t|t-1}$

Figure A.5: The evolution of heterogeneous beliefs across countries

Note: The red dashed line represents the average value across countries. The blue shades represent 50 (25th to 75th), 70 (15th to 85th), and 90 (5th to 95th) percentile intervals from dark to light colors.

A.7. Model including IMF programs

As explained previously, in some countries, the IMF and the World Bank have played a major role in advising the authorities about the reform process. Here we explore whether participation in programs of the IMF promotes financial liberalization. Specifically, we include an IMF program dummy as one of the other factors determining financial liberalization in the equation (4), and re-estimate the model while keeping all other specifications the same as our baseline model. The dummy, IMF_{it} equals one when the country is in an IMF program at time t, and zero otherwise.

Table A.5: Estimation results for the model with IMF program

Coefficients	Baseline model
Prior correlation	
Geographic distance (γ)	0.0618
	(0.0313)
Political cost	
Deviation from norm (ψ)	7.8705
	(0.9373)
Geopolitical influence	
Influence coefficient (κ)	0.4170
	(0.1198)
Ideology distance (χ)	1.4898
	(1.0018)
Effects from other factors	
Relative GDP (ϕ_1)	-0.2729
	(0.1743)
Polity2 (ϕ_2)	0.0081
	(0.0215)
Currency crisis (ϕ_3)	0.0184
	(0.1540)
Debt crisis (ϕ_4)	-0.0003
	(0.4590)
Banking crisis (ϕ_5)	-0.0381
	(0.0957)
Global interest rate (ϕ_6)	-0.0314
	(0.0562)
IMF program dummy (ϕ_7)	0.0456
	(0.0364)
Country FEs	Yes
Mean absolute error (MAE)	0.055
BIC	-15300.0

Table A.5 shows the estimation results for augmented model. First, the coefficient for the IMF program dummy is positive but not significant at 10 percent level, suggesting possible movement towards financial liberalization during periods of IMF programs. Since participation in the IMF

programs is endogenous—other considerations that lead to a program can also propel financial reforms, it is difficult to strictly interpreting this result as the evidence of IMF programs playing a critical role in reforms. Second, the estimated coefficients for other parameters are mostly aligned with the estimates from the baseline model, and the fit of this model (MAE) is almost the same as the baseline model.

Next, we run experiments in which we remove IMF programs (by setting all IMF program dummies to zero) and simulate counterfactual paths of financial liberalization and output growth. In Figure A.6, we can see that IMF programs were almost negligible for the global financial reform contagion.

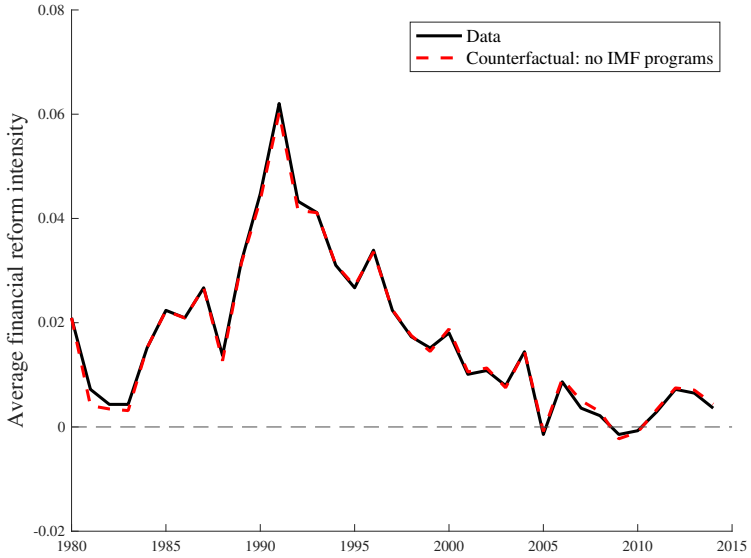


Figure A.6: The counterfactual financial reform intensity without IMF programs

Note: The figure displays the average financial reform intensity. The black solid line represents the actual data, and the red dashed line represents the counterfactual one that there had been no IMF programs.

A.8. Model with alternative priori correlation

In this section, we explore an alternative way to model the priori correlation matrix L in the prior precision matrix $\Sigma_{1|0}^{-1}$. In the benchmark model, we assume that the priori correlation is a function of geographic distance. Here we consider an alternative setup where the prior belief correlation is a function of initial ideological distance. Specifically, we assume the priori correlation $L_{ij} = \exp[-\tilde{d}_{ij}\gamma]$, where $\tilde{d}_{ij}$ is the ideological distance between countries i and j in 1972. We re-

estimate the model while keeping all other parts the same as the benchmark model. The posterior estimates are in Table A.6, and the model's prediction for the average of observed financial reforms is in Figure A.7. We can see that the overall fit of this model is inferior to the benchmark model based on the comparison of MAE and BIC.

Table A.6: Estimation results for the model with alternative priori correlation matrix

Coefficients	Baseline model
Prior correlation	
Ideological distance (γ)	8.7258
	(0.0000)
Political cost	
Deviation from norm (ψ)	12.5542
	(0.1456)
Geopolitical influence	
Influence coefficient (κ)	0.2999
	(0.0099)
Ideology distance (χ)	1.1546
	(0.1464)
Effects from other factors	
Relative GDP (ϕ_1)	-0.4713
	(0.0354)
Polity2 (ϕ_2)	0.0102
	(0.0024)
Currency crisis (ϕ_3)	-0.0146
	(0.0250)
Debt crisis (ϕ_4)	-0.0267
	(0.0381)
Banking crisis (ϕ_5)	-0.0353
	(0.0265)
Global interest rate (ϕ_6)	-0.0650
	(0.0042)
Country FEs	Yes
Mean absolute error (MAE)	0.060
BIC	-14871.8

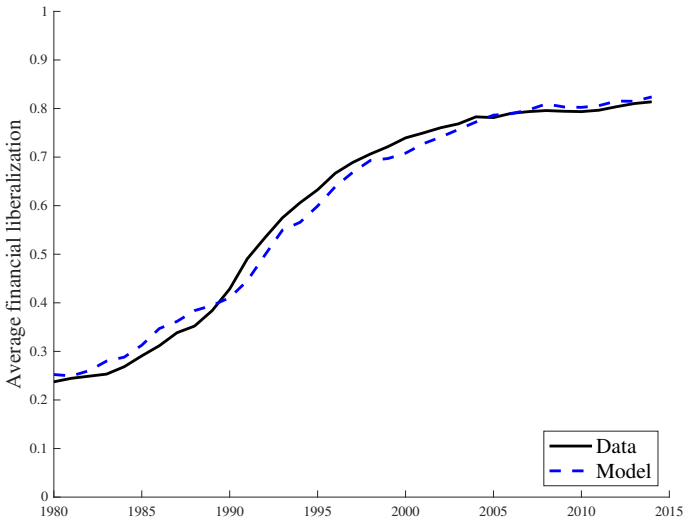


Figure A.7: Model-predicted average level of financial reforms with alternative priori correlation matrix