LEARNING THE WEALTH OF NATIONS

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Abstract. We study the evolution of market-oriented policies over time and across countries. We consider a model in which own and neighbors' past experiences influence policy choices through their effect on policymakers' beliefs. We estimate the model using a large panel of countries and find that it fits a large fraction of the policy choices observed in the postwar data, including the slow adoption of liberal policies. Our model also predicts that there would be reversals to state intervention if nowadays the world was hit by a shock of the size of the Great Depression.

1. Introduction

This paper explores the ability of a learning model to explain the adoption of market-oriented policies over time and across countries. Whether market allocations outperform state intervention has always been the subject of a heated debate. Not only people around the world hold conflicting views about this issue, but these views change over time as countries learn from their own past experience, as well as the experience of other countries. We show that the evolution of beliefs about the relative desirability of free markets can be a major driving force behind countries' transitions between regimes of *state intervention* and *market orientation*.

The notion that past experience shapes beliefs and policy decisions is well rooted in policy circles. For instance, Stanley Fischer suggests the rise of socialist ideas in the 20th century as a clear case of interaction of outcomes, ideas and policies:

> "It is not hard to see why views on the role of the state changed between 1914 and 1945 [...] A clear-headed look at the evidence of the last few decades at that point should have led most people to view the market model with suspicion, and a large role for the state with approbation- and it did." [Fischer (1995), p. 102]

Date: First version: September 2007. This version: November 2009. We would like to thank Daron Acemoglu, Graziella Bertocchi, V.V. Chari, Chad Jones, Ramon Marimon, Joel Mokyr, Juan Pablo Nicolini, Monika Piazzesi, Andrés Rodríguez-Clare, Martin Schneider, Ruben Segura, Neil Wallace, Tao Zha and participants in many seminars and conferences. We are also grateful to James Fearon for providing us with an updated series of the Fearon and Laitin's data on civil wars.

In a similar vein, Anne Krueger argues that the eventual dismantlement of these ideas was the consequence of the change in views that "resulted from a combination and interaction of research and experience with development and development policy." (Krueger (1997)) The testimony of a central figure in this dismantlement also hints at the importance of cross-country information spillovers:

> "I remember the foreign minister and the finance minister from another country saying to me: 'You're the first prime minister who has ever tried to roll back the frontiers of socialism. We want to know what's going to happen. Because if you succeed others will follow.'" [Margaret Thatcher in Cran (2002)]

We formalize this connection between ideas, policies and economic development in the context of a model where the performance of alternative policy regimes is uncertain. Policymakers start with some priors about the growth prospects of market-oriented and state-interventionist regimes, and use Bayes law to update these priors with the arrival of new information from all countries in the world. They may find it optimal to discount information from other countries because the effect of policy regimes on economic growth may be heterogeneous and spatially correlated. A country decides to pursue market-oriented policies if the perceived net impact of these policies on its GDP growth exceeds their political cost. We assume that this cost has a country-specific component and we let it also be a function of the economic and political characteristics of the country and of its neighbors, including the exposure to military conflicts.

We estimate the model (initial prior beliefs and parameters of the political cost) with data on the market orientation, GDP and a number of geographical, political and civil war indicators for a panel of 133 countries, over the years $1950-2001$. We discipline our estimation procedure by imposing that countries' initial beliefs in 1950 must be consistent with the data available for the $1900-1950$ period.

Our first question is whether such a learning mechanism can explain the data on the adoption of market-oriented policies. We indeed find that the baseline model correctly predicts almost 97% of the policy choices observed in the data. A more interesting challenge, however, is whether the model is able to predict policy switches, given the persistence of policy regimes, as reflected by the fact that only about 2 percent of the observations correspond to a policy switch in our dataset. The baseline model is also strong in this dimension. It accounts for 25.8%, 53.8%, 74.2% and 77.4% of the actual policy switches within windows of ± 0, 1, 2 and 3 years, respectively.

The empirical success of the model is mainly driven by the evolution of beliefs and not by the countries disparate and changing economic and political conditions. Indeed, if we shut-down the learning mechanism –and estimate fixed beliefs but otherwise allow the economic, political and military controls to vary as in the data– then our model loses more than two-thirds of its predictive power. This holds despite the fact that our estimates suggest that countries are more likely to pursue market-oriented policies when they are more democratic, have higher per-capita income and are not hosting a civil war. Therefore, the inclusion of these variables is supported by the data, but does not undermine the importance of evolving beliefs as determinants of policy changes.

The main challenge of our model is to account for the observed slow and late trend towards market orientation for most developing countries. The model explains it as follows. First, the information in the pre-1950 data led us to a calibration of priors consistent with most countries believing that governments outperform markets. Second, data from the 1950s and early 1960s –the beginning of our estimation sample– apparently consolidated these views since state-interventionist economies grew on average faster than expected and, particularly, faster than market-oriented economies. In agreement with our quotation from Fischer, our learning model would then predict policymakers to favor state intervention, at least until new information would lead them to revert their beliefs. In fact, in agreement with our quotation from Krueger, the growth collapse of the late 1970s and the 1980s triggered a switch in policymakers' beliefs. Through the lens of our model, the more dismal performance of state-interventionist countries during this period led some policymakers to downgrade their optimism for state intervention and move to market orientation. The superior performance of market-oriented countries during the 1990s consolidated these views and led even more countries to switch.

The empirical strength of our model allows us to tackle a number of other important questions about the relationship between beliefs formation and policy decisions. First, we ask what features of the model are crucial for the slow adoption of market-oriented policies. We find that the resistance to markets is a very robust property of our learning model, as long as policymakers entertain the *possibility* that the impact of various economic policies is heterogeneous across countries. Faster diffusion of market regimes would have required policymakers to be fully convinced that the effects of policies are the same in every country. Ruling out a priori the possibility of heterogeneity seems at odds with the observed behavior of policymakers (see, for example, Di Tella and MacCulloch (2007)).

Second, we investigate whether the world has now reached a point in which the vast majority of policymakers are convinced that market-oriented regimes are beneficial for growth. According to our results, we have not reached that point. Our estimated end-of-sample beliefs indicate that a considerable number of policymakers hold negative views about the merits of market economies. Moreover, many of those with favorable views are either quite uncertain or believe that the gains are quantitatively small.

This result motivates a third question: would a global recession induce some policy reversals to interventionism? Our answer is yes. More specifically, we estimate that approximately 5 to 10 percent of market oriented countries would become state interventionist if the world economy experienced a negative growth shock similar to the Great Depression of the 1930s.

In this paper, we focus on the formation and evolution of beliefs as a key force driving the choice of economic policies, as advocated by Kremer, Onatski, and Stock (2001). To this end, we abstract from many other interesting determinants of policy decisions, such as redistributional issues, interest-group politics and the role of multilateral institutions, which are the subject of an extensive political economy literature (see Grossman and Helpman (1995), Krusell and Rios-Rull (1996), Acemoglu, Johnson, and Robinson (2005), Persson and Tabellini (2002), among many others.) Within this literature, our paper is perhaps most closely related to Alesina and Angeletos (2005), Piketty (1995), Mukand and Rodrik (2005) and Strulovici (2008), because policy choices are the outcome of decisions of rational agents learning from past experience. Relative to these papers, we abstract from voting and redistributive considerations to attain instead an empirically tractable multi-country learning model.

Our study is also connected to some recent work that emphasizes the role of historical factors on policy choices. For instance, Acemoglu, Johnson, and Robinson (2001 and 2005), Sokoloff and Engerman (2000) and Engerman and Sokoloff (2002) document a very strong correlation of countries' initial endowments and colonial histories with their current institutions and level of development. While these papers concentrate on the determinants of political regimes, our interest in explaining economic policies leads us to take political regimes as given. This modeling choice is in line with the results of Acemoglu, Johnson, Robinson, and Yared (2008 and 2009), who argue that a country's development does not affect the choice of political regimes if we control for long-run factors (which, in our model estimated on a shorter sample, are captured by country-specific effects). Our approach is also consistent with Giavazzi and Tabellini (2005), who find strong evidence about the effect of political regimes on economic policies, and much weaker evidence on the converse. However, with the exception of the recent contribution of Persson and Tabellini (2009), none of these papers considers the impact of a country's neighbors' experience on institutions.

Models of policymakers as learning agents have been successfully applied to explain the rise and fall of US inflation (see, for instance, Sargent (1999), Cogley and Sargent (2005), Primiceri (2006) and Sargent, Williams, and Zha (2006)). Differently from this literature, policymakers in our model do not face a complex trade-off between alternative policy objectives. Our interest is instead in the role of learning spillovers among countries. From this point of view, our paper is also related to the literature on social learning and information spillovers in technology adoption and diffusion (see, for instance, Besley and Case (1994), Foster and Rosenzweig (1995) and Conley and Udry (2005)).

This paper is also linked to a fast growing body of work on the empirical behavior of beliefs (see, for example, Aghion, Algan, Cahuc, and Shleifer (2008), Alesina and Giuliano (2009), Alesina and Fuchs-Schundeln (2007) , Alesina and Glaeser (forthcoming), Di Tella and MacCulloch (2007) , Mayda and Rodrik (2005), and Landier, Thesmar, and Thoenig (2008)). These studies have the appealing feature of using direct measures of beliefs in the data. In this paper instead, we infer policymakers' beliefs from a structural learning model, which allows us to overcome the problem of the lack of a consistent measure of beliefs for the many countries and periods that we consider. While the two approaches are complementary, it is interesting to observe that Aghion, Algan, Cahuc, and Shleifer (2008), Alesina and Glaeser (forthcoming) and Di Tella and MacCulloch (2007) find support for the correlation between beliefs and actual policies adopted across countries, which is the central theme of our paper. Furthermore, Landier, Thesmar, and Thoenig (2008) find that beliefs are slowly moving, home biased and path dependent, which is qualitatively consistent with our results.

Finally, our work draws on the empirical literature on policy decisions and growth (for instance Jones (1997)) and the impact of trade policies and market orientation (e.g. Dollar (1992), Sachs and Warner (1995), Edwards (1998) or Rodriguez and Rodrik (2000)). Notice, however, that our focus is exactly on the converse, i.e. understanding the adoption of market-oriented policies. This is somewhat similar to Blattman, Clemens, and Williamson (2002), Clemens and Williamson (2004) and, to a lesser extent, Sachs and Warner (1995), although none of these papers stresses the importance of past growth performances for current policy choices.

The rest of the paper is organized as follows. Section 2 presents our theoretical model. Section 3 describes the estimation methodology. Section 4 examines the dynamics and geography of market orientation and economic growth during the postwar period. The estimation results and counterfactual exercises are discussed in sections 5, 6 and 7, while section 8 concludes.

2. Model

In this section we present a simple model in which the sequential arrival of information reshapes policymakers' beliefs and affects policy choices in each of the n countries of the world economy.

2.1. **The perceived data-generating process and the policy problem.** We simplify the choice of policies to the dichotomic case of countries that are either market oriented or heavily rely on state intervention. Policies are chosen period by period and we let $\theta_{i,t}$ be an indicator variable that equals one if country i is characterized by a market-oriented economy in period t and zero otherwise. Let $Y_{i,t}$ denote per-capita GDP in country i at time t and $y_{i,t} \equiv \log Y_{i,t} - \log Y_{i,t-1}$ its growth rate. Policymakers are in power for one period and choose $\theta_{i,t}$ to solve

$$\max_{\theta_{i,t}} E_{i,t-1} \left[\log Y_{i,t} - \theta_{i,t} K_{i,t} \right] \tag{2.1}$$

where the term $K_{i,t}$ corresponds to the political and social costs of market-oriented policies at time t. By imposing a policy objective as in (2.1), we are implicitly abstracting from voluntary experimentation, an assumption that we discuss further in section 2.2. The maximization is subject to policymakers' *perceived* relationship between policy choices and GDP growth,

$$y_{i,t} = \beta_i^S \left(1 - \theta_{i,t}\right) + \beta_i^M \theta_{i,t} + \varepsilon_{i,t}, \tag{2.2}$$

where β_i^S and β_i^M represent the average growth rates of country-i GDP under policies of state intervention and market orientation respectively.[1] The term $\varepsilon_{i.t}$ is an exogenous shock to the growth rate of GDP in country i that is uncorrelated over time, but potentially correlated across countries. More precisely, the vector $\varepsilon_t \equiv [\varepsilon_{1,t}, ..., \varepsilon_{n,t}]$ is distributed according to

$$\varepsilon_t \overset{i.i.d.}{\sim} N\left(0, \Sigma\right), \tag{2.3}$$

where N denotes the Normal distribution.

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[1] In Buera, Monge-Naranjo, and Primiceri (2008) we experiment with alternative specifications of (2.2), particularly with one that allows the growth rate of GDP to also depend on the gap between a country's GDP and the technological frontier, as in the convergence regressions of Barro and Sala-I-Martin (1995). Moreover, in sections 3 and 6 we discuss the relationship between the *perceived* law of motion (2.2) and and the *actual* law of motion.

We assume the following information structure: policymakers do not know the value of β_i^S and β_i^M, but have perfect knowledge of all the remaining model parameters, including the covariance matrix of the growth shocks Σ.

The timing of events is as follows: at the end of time $t-1$, policymakers in country i observe data on policy choices and GDP growth of all n countries, and update their beliefs about β_i^S and β_i^M. At the beginning of time t, they observe the realization of $K_{i,t}$ and then decide what policy $\theta_{i,t}$ to adopt.

Finally, while the political cost is directly observable by policymakers, it is unobservable to the researcher. For estimation purposes, we assume that $K_{i,t}$ is a function of a country-specific term f_i and a vector $\Pi_{i,t}$ of observable political and economic variables of country i (mainly, a political and a civil war indicator, and lagged per-capita GDP, as discussed below):

$$\begin{aligned} K_{i,t} &= f_i + \xi \Pi_{i,t} + k_{i,t} \\ & \quad k_{i,t} \overset{i.i.d.}{\sim} N\left(0, \varrho_i^2\right). \end{aligned}$$

Under this formulation, the political costs $K_{i,t}$ can inherit the autocorrelation and cross-country correlation properties from the variables in $\Pi_{i,t}$, even if the shock $k_{i,t}$ is uncorrelated over time and across countries. Notice also that the volatility of the political costs ϱ_i^2 is allowed to vary across countries.

2.2. **Optimal policy.** Optimal policy at time t is given by

$$\theta_{i,t} = 1\left\{E_{i,t-1}\left(\beta_i^M\right) - E_{i,t-1}\left(\beta_i^S\right) > K_{i,t}\right\},$$

where $1\{\cdot\}$ is the indicator function. The optimal policy decision depends on the expected average growth rates: policymakers choose to pursue market-oriented policies if the expected gain in growth rates exceeds the political cost.

By imposing a policy objective as in (2.1), we have implicitly followed Sargent (1999) and assumed that policymakers do not intentionally experiment. Abstracting from voluntary experimentation rules out the possibility that, with the sole purpose of learning about it, a country pursues a policy regime that is perceived to be on average detrimental to growth. We rule out experimentation for a number of reasons. First, while from a normative perspective experimenting might be beneficial, from a positive perspective it remains an open question the extent to which governments conduct social experimentation on the grand scale. Economists like Lucas (1981) or Blinder (1998) have argued against such behavior in policymaking.

Moreover, standard voting schemes seem to reduce the occurrence of collective experimentation (see Strulovici (2008)). Second, the gains from experimentation are reduced in our setting because of two forces: (i) our model resembles a two-armed bandit problem (Berry and Fristedt (1985)), but the presence of random variation in the political cost $K_{i,t}$ circumvents the incomplete learning results typical of the literature on multiarmed bandit problems (see El-Gamal and Sundaram (1993)); (ii) in our multicountry learning setting, policymakers benefit from the variation in the political costs of other countries, which should lower the incentives to experiment. Third and most important, the joint decision problem of n countries is extremely hard to solve, because it involves strategic experimentation motives.[2]

2.3. **Learning.** We assume that, in period $t = 0$, policymakers start off with a Gaussian prior density on the vector of unknown coefficients $\beta \equiv [\beta_1^S, ..., \beta_n^S, \beta_1^M, ..., \beta_n^M]'$:

$$\beta \sim N\left(\hat{\beta}_0 \quad ; \quad P_0^{-1}\right), \tag{2.4}$$

where $\hat{\beta}_0$ and P_0 represent the prior mean and precision matrix respectively. We choose the following parameterization for the prior covariance matrix:

$$P_0^{-1} = I_2 \otimes (V \cdot R \cdot V), \tag{2.5}$$

where V =diag($[\nu_1\sigma_1, ..., \nu_n\sigma_n]$) and R denotes the a-priori correlation matrix. Notice that we are simplifying our problem by assuming that policymakers start with a prior that assigns zero correlation and the same degree of uncertainty to the impact of market-oriented and state-interventionist policies on economic growth. The coefficients $\{\nu_i\}_{i=1}^n$ parameterize this uncertainty, which is also normalized by the standard deviation of the growth shocks in each country ($\{\sigma_i\}_{i=1}^n$). Finally, the elements of the matrix R, denote the a-priori correlations among the growth effects of economic policies across countries.

Priors are recursively updated with every new vintage of data. Our timing assumptions and the application of Bayes law deliver simple formulas for the optimal updating of the mean and precision matrix of the distribution of β:

$$\begin{aligned} P_t &= P_{t-1} + X_t'\Sigma^{-1}X_t \\ \hat{\beta}_t &= \hat{\beta}_{t-1} + \underbrace{P_t^{-1}X_t'\Sigma^{-1}}_{g_t}\left(y_t - X_t\hat{\beta}_{t-1}\right), \end{aligned}$$

[2] Much simplified versions of this problem have been solved by Bolton and Harris (1999) and Keller, Rady, and Cripps (2005).

where $y_t \equiv [y_{1,t}, ..., y_{n,t}]'$, $X_t \equiv [\text{diag}(1-\theta_t), \text{diag}(\theta_t)]$, $\theta_t \equiv [\theta_{1,t}, ..., \theta_{n,t}]'$ and the recursion is initialized at the prior mean and precision matrix.

The gain, $g_t \equiv P_t^{-1} X_t' \Sigma^{-1}$, determines the impact of new observations on the posterior mean of β. There are three important sets of coefficients that affect the structure of the gain of this learning problem. First, everything else equal, the higher the initial uncertainty (ν_i) the higher the relative precision of new observations and the larger the gain. Second, a higher international correlation among growth shocks (off-diagonal elements of Σ) reduces the total informational content of the vector of growth rates in each period and slows down the updating of beliefs. Third, and crucially, the a-priori correlation matrix (R) determines how much weight is given to data from other countries in updating the beliefs about β_i. In one extreme, if the effects of policy regimes are perceived to be entirely country specific, then beliefs about each country will be updated using data from that country only. In the opposite extreme, if policymakers believe that the growth effect of policy regimes is perfectly correlated across countries, then beliefs for each country are updated using data from all other countries.

More plausibly, policymakers might have a prior that the growth effect of market orientation in a country is more correlated with that of nearby countries and less so with more distant countries. To capture this idea in a flexible and tractable way, we assume that the prior correlation between the growth effects of government controls (or market friendliness) in countries i and j, $R_{i,j}$, is a parametric function of a vector of covariates $z_{i,j}$:

$$R_{i,j} = \exp\left[-z_{i,j}'\gamma\right],$$

where we re-normalize $R_{i,j}$ to be between 0 and 1. This formulation is similar to that adopted in the literature on geographically weighted regressions (Fotheringnam, Brunsdon, and Charlton (2002)). The vector $z_{i,j}$ may include various measures of geographic, cultural or economic distance between country i and j.

3. Inference

Like the agents of our model, we (the econometricians) are also Bayesian and wish to construct the posterior distribution for the unknown parameters of the model. These unknown coefficients are:

$\left\{\hat{\beta}^{S}_{j,0}\right\}_{j=0}^{n}$: expectation of initial beliefs about the effect of state intervention

$\left\{\hat{\beta}^{M}_{j,0}\right\}_{j=0}^{n}$: expectation of initial beliefs about the effect of market orientation

$\{\nu_j\}_{j=0}^{n}$: standard deviation of initial beliefs about the effect of SI and MO

$\{\varrho_j\}_{j=1}^{n}$: standard deviation of the exogenous component of the political cost

$\{f_j\}_{j=1}^{n}$: fixed effect of the political cost

ξ : coefficients of the political cost

γ : coefficients parameterizing the correlation of initial beliefs

If we collect the set of unknown coefficients in the vector α, denote by D the entire set of available data on policies and growth and by Π the data on countries' political and economic characteristics, standard application of Bayes rule delivers:

$$p(\alpha|D,\Pi) \propto \mathcal{L}(D|\alpha,\Pi)\cdot\pi(\alpha),$$

where $p(\cdot)$, $\mathcal{L}(\cdot)$ and $\pi(\cdot)$ represent the posterior, sampling and prior densities respectively, and $\propto$ denotes the proportionality relation. We now turn to the description of the priors and the construction of the likelihood function.

3.1. **Priors.** Since our model has many parameters, we use informative priors to prevent overfitting problems. For instance, we would like to avoid cases in which we fit the data well, but only due to estimates of policymakers' initial beliefs which are clearly implausible. As an example, consider the literature on macroeconomic forecasting: highly parameterized models do well in-sample, but perform poorly out-of-sample. The use of priors considerably improves the forecasting performance of these models (see, for instance, Doan, Litterman, and Sims (1984), Litterman (1986) or, more recently, Banbura, Giannone, and Reichlin (2007)). The role of priors is similar in our context since we also aim to use the model to conduct a set of counterfactual experiments.

We assume the following prior densities:

$$
\begin{aligned}
\hat{\beta}_{i,0}^{S} &\sim N\left(\bar{\beta}_{0}^{S},\omega_{\beta}^{2}\right), \qquad i=1,...,n \\
\hat{\beta}_{i,0}^{M} &\sim N\left(\bar{\beta}_{0}^{M},\omega_{\beta}^{2}\right), \qquad i=1,...,n \\
\nu_i &\sim \mathrm{IG}\left(s_\nu,d_\nu\right), \qquad i=1,...,n \\
\varrho_i &\sim \mathrm{IG}\left(s_\varrho,d_\varrho\right), \qquad i=1,...,n \\
f_i &\sim N\left(\bar{f},\omega_f^2\right), \qquad i=1,...,n \\
\xi &\sim \text{Uniform} \\
\gamma &\sim \text{Uniform}.
\end{aligned}
$$

These prior densities are parameterized as follows:

- We set $\bar{\beta}_0^S = 0.0275$ and $\bar{\beta}_0^M = 0.0125$. We have chosen these numbers using the Maddison data (Maddison (2006)). First of all, the average annual growth rate of per-capita GDP of countries in the Maddison dataset in 1901-1950 (excluding the years corresponding to the two wars) is approximately 2%. Then, we split the countries in the Maddison dataset in two groups, according to the value of the SW indicator in 1950. We find that, between 1946 and 1950, the state-interventionist countries grew on average 1.5% faster than the market-oriented. The values of $\bar{\beta}_0^S$ and $\bar{\beta}_0^M$ are then chosen so that $\bar{\beta}_0^S + \bar{\beta}_0^M = 2\%$ and $\bar{\beta}_0^S - \bar{\beta}_0^M = 1.5\%$. Notice that starting with a prior that most countries believed that state intervention fostered growth is consistent with the fact that only about 30% of the countries were market oriented in 1950. These priors are also consistent with the evidence in Clemens and Williamson (2004). The value of ω_β is set to 0.02, which implies a quite agnostic view about the mean of initial beliefs.
- We select s_ν and d_ν so that ν_i has an a-priori mean and a standard deviation equal to 0.264. The prior on ν_i is potentially important because it affects the speed of learning, especially for those countries for which fewer data are available. In calibrating this prior, we first observe that $\sigma_i^2 \cdot \nu_i^2$ should be approximately equal to $var(\bar{y}_i)$, the variance of the average growth rate of GDP. We obtain an estimate of $var(\bar{y}_i) = 0.0175^2$ as the variance of the average growth rates of the countries present in the Maddison dataset between 1901 and 1950 (excluding the wars).[3] To obtain an estimate of σ_i^2 based on

[3] There is a huge outlier in the distribution of the average growth rates across countries. Therefore, this variance is estimated with a robust method (squared average distance from the median of the 16 and 84th percentiles).

pre-sample observations, we use again the Maddison data and run a regression of GDP growth on time and fixed effects. We then compute the variance of the residuals for each country and calculate the mean of these variances (which equals 0.0044). Therefore, we set the mean of the prior for ν_i to $\left[\frac{(0.0175)^2}{0.0044}\right]^{1/2} = 0.264$.

- We select s_ϱ and d_ϱ so that ϱ_i has an a-priori mean and standard deviation equal to 0.01. The idea here is to discourage the model from fitting the data using very large variances of the exogenous component of the political cost $k_{i,t}$. This prior distribution implies that, if policymakers believe that growth under market orientation is 1% higher than under state intervention, they will adopt market-oriented policies with probability 87% on average (standard deviation 10%).
- We set $\bar{f} = 0$ so that market orientation does not entail a-priori higher average political costs than state intervention. The standard deviation of the fixed effect is set to $\omega_f = 0.02$ so that the model can capture particularly low or high average political costs if they are needed to fit the data.
- As the coefficients ξ and γ are common to all countries, we use a flat prior.

3.2. **The likelihood function.** In order to derive the posterior distribution of the unknown coefficients, we update these priors with the likelihood information. In section 2 we have fully specified the policy objective and the *perceived* data-generating process (DGP), i.e. policymakers' *perceived* relation between their policy choice and growth outcomes. Notice, however, that we have refrained from postulating what might be the *true* relation between policy choices and GDP growth (i.e. the *true* DGP).

We will specify a true DGP in section 6, to make sure that our results are not due to the fact that policymakers' perceived model is very far off from a plausible true DGP and to perform some out-of-sample simulations. Here we only impose one condition about the true DGP, i.e. that in reality GDP growth depends on actual policies and is not directly affected by the policymakers' beliefs that led to those policies. As we prove in appendix A, this natural assumption is very convenient because it makes the inference about our parameters of interest (α) independent of the details of the true DGP. In other words, our inference about the coefficients of the policy objective and policymakers' perceived model, as well as the results that we present in the next section, are not affected by the details of the way policy affects growth outcomes in reality.

If we denote by D^s the available data on policy orientation and growth up to a generic time s, the likelihood function can then be written as a product of conditional densities:

$$\mathcal{L}(D^T|\alpha, \Pi^T) \propto \prod_{i=2}^{n} \left[\mathcal{L}(\theta_{i,1}|\alpha, \Pi_{i,1}) \cdot \prod_{t=2}^{T} \mathcal{L}(\theta_{i,t}|D^{t-1}, \alpha, \Pi_{i,t}) \right].$$

In turn, the conditional density $\mathcal{L}(\theta_{i,t}|D^{t-1}, \alpha, \Pi_{i,t})$ can be written as

$$\begin{aligned} \mathcal{L}(\theta_{i,t}|D^{t-1}, \alpha, \Pi_{i,t}) &= \Phi \left(\frac{\hat{\beta}^M_{i,t-1} - \hat{\beta}^S_{i,t-1} - f_i - \xi \Pi_{i,t}}{\varrho_i} \right)^{1(\theta_{i,t}=1)} \cdot \\ & \cdot \left(1 - \Phi \left(\frac{\hat{\beta}^M_{i,t-1} - \hat{\beta}^S_{i,t-1} - f_i - \xi \Pi_{i,t}}{\varrho_i} \right) \right)^{1-1(\theta_{i,t}=1)}, \end{aligned}$$

where $\Phi(\cdot)$ denotes the cdf of a standard Gaussian density. These results are derived in appendix A.

4. Postwar Dynamics and Geography of Market Orientation

In the rest of the paper, we explore the ability of our learning model to explain the observed adoption of economic policies across countries and over time. To this end, we use data from a large panel of liberalizations (133 countries, 1950 – 2001) originally constructed by Sachs and Warner (1995) and revised and extended by Wacziarg and Welch (2008). In this section, we describe these data and present evidence on the connection between policy choices and countries' past growth performances. The findings of this section motivate the structural estimation exercise undertaken in section 5.

4.1. **Measuring market orientation.** In order to investigate the dynamics of market orientation, we require data on the policy orientation of a large panel of countries and years. This entails two measurement challenges: policies are intrinsically multidimensional, and comparable measures across countries and time are scarce. With these restrictions in mind, as a proxy for market orientation, we use the Sachs and Warner's (1995, hereafter SW) indicator of liberalizations.

This indicator was originally constructed as a measure of openness to international trade. In particular, SW argue that a government disposes of a variety of mechanisms to intervene in the economy and restrict international trade. The most direct mechanism, of course, is to impose tariffs and other barriers on imports. Other mechanisms include taxing, restricting or monopolizing exports and limiting or blocking the convertibility of the country's currency. Finally, a socialist government is likely to have significant distortions on international trade.

Following this logic, SW require the following five criteria to classify a country as "open": (i) The average tariff rate on imports is below 40%; (ii) Non-tariff barriers cover less than 40% of imports; (iii) The country is not a socialist economy (according to the definition of Kornai (2002)); (iv) The state does not hold a monopoly of the major exports; (v) The black market premium is below 20%. The resulting indicator is a dichotomic variable. If in a given year a country satisfies *all* of these five criteria, SW call it open and set the indicator to 1. Otherwise, the indicator takes the value of 0.[4]

Since most of these criteria (especially (iii)-(v)) capture forms of government intervention that go clearly much beyond restrictions on international trade, the SW indicator is better interpreted as a broader, albeit stark, measure of market orientation. In this respect, we follow Rodriguez and Rodrik (2000) by viewing the "SW indicator [as one that] serves as a proxy for a wide range of policy and institutional differences," where "trade liberalization is usually just one part of a government's overall reform plan for integrating an economy with the world system. Other aspects of such a program almost always include price liberalization, budget restructuring, privatization, deregulation, and the installation of a social safety net." (Sachs and Warner (1995)). As a consequence, we dub a country as "market-oriented" if the SW indicator is equal to 1, and "state interventionist" if it is equal to 0. Moreover, notice that the broadness of the indicator is an advantage for us, not a concern. In fact, we are not interested in exploring the impact of trade policies on economic growth, but rather explaining countries' policy decisions as a function of past growth performances. Therefore, the broader the policy measure we use the better.

In our study, we use the revision of the SW indicator carried out by Wacziarg and Welch (2008) who expanded the sample of countries and years and revised the information used to classify the countries.[5] The data are an unbalanced panel, partly because separations and unifications have led to start or stop reporting some countries as independent entities.

It is important to recognize that the dichotomic nature of the SW indicator is an important limitation. Countries with very different degrees of state intervention end up being classified equally. Moreover, the indicator fails to capture reforms if they do not simultaneously move countries in all five criteria, e.g. China in later years. Unfortunately, richer indicators, such

[4] Since a complete panel dataset with all these criteria is not available for the entire postwar period, SW and Wacziarg and Welch (2008) perform a complementary country by country analysis of large reform episodes, in order to find out whether large changes in policies led a country not to meet (or start meeting) some of these criteria. This extended dataset is referred to as the "panel of liberalization dates."

[5] For example, SW apply criterion (iv) only for African countries while Wacziarg and Welch extended it to other regions. In general, for the same years as SW, the revision of Wacziarg and Welch lead more countries to be classified as market oriented relative to the original SW measure.

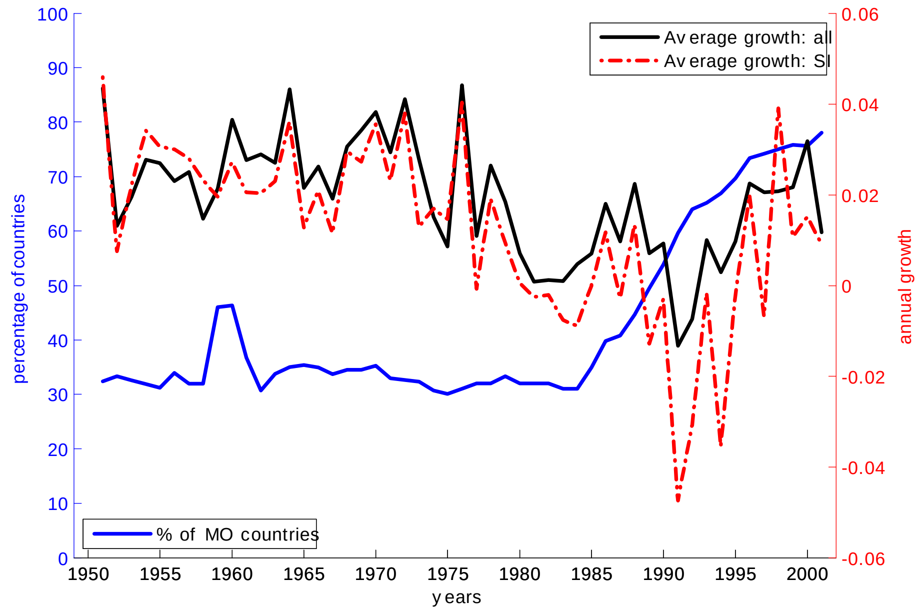

FIGURE 1. World average of market orientation and growth (SI: state-interventionist countries; MO: market-oriented countries; All: all countries.)

as those produced by the World Bank or the Heritage Foundation, are only available for a reduced sample of countries and a handful of recent years. The large coverage of countries and years in the SW indicator is essential to study changes in the orientation to markets, which, as we now show, happen only so often.

4.2. **The dynamics of market orientation.** Figure 1 plots the evolution of the world fraction of market-oriented countries according to the SW indicator (thick solid line, with scale on the left-hand side axis). In 1950, only about 30% of the countries qualify as market oriented. The spike in the late 1950s reflects the creation of the European Economic Community, followed by the inclusion in the sample of a number of state-interventionist developing countries. In the years from 1963 to 1984, the share of market-oriented economies increases only very marginally. However, in 1985 we observe the beginning of a global movement towards market orientation that continues until the end of the sample. By 2001, the fraction of market economies has increased to almost 80%.

The world-wide average hides interesting regional differences. Figure 2 displays the fraction of market economies (solid line, with scale on the left-hand-side axis) within eight regions of the world. Some of these regions started the sample as state interventionists and began a

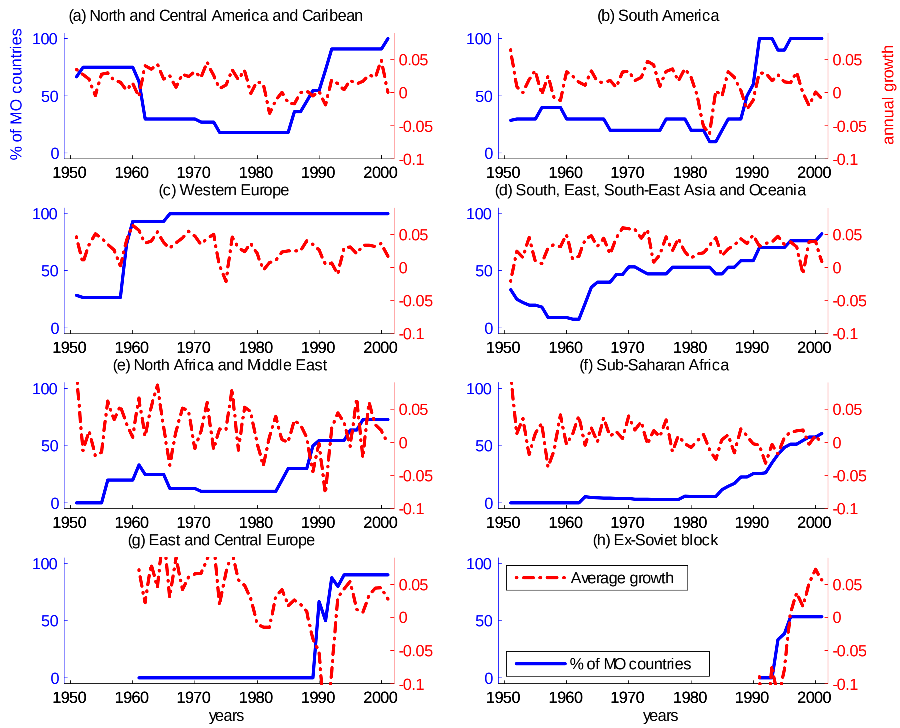

FIGURE 2. Regional patterns of market orientation and growth (MO: market-oriented countries.)

transition to market economies only later on. Earlier transitions towards market orientation include Western Europe, with the creation of the European Economic Community, and the Asian/Pacific region. On the contrary, North and Central America started relatively market oriented. However, after the establishment of the Central American Common Market and the diffusion of economic policies based on import substitutions, essentially only the U.S. and Canada remained market friendly between 1960 and 1985. After the crisis in early 1980s, the region began its transition to market orientation with Costa Rica and Mexico.

4.3. **Market orientation, growth, wars and the political environment.** In order to relate policy choices and past growth performances, figure 1 also plots the (unweighted) average growth rate of per-capita GDP (thin, solid line, with scale on the right-hand-side axis).[6] Interestingly, many countries opted for market orientation only after the growth collapse of the late 1970s and early 1980s, which was even more severe for state-interventionist economies (dashed line). A similar pattern can be observed at the regional level (figure 2): most regions

[6] GDP data are obtained from Penn World Table 6.2.

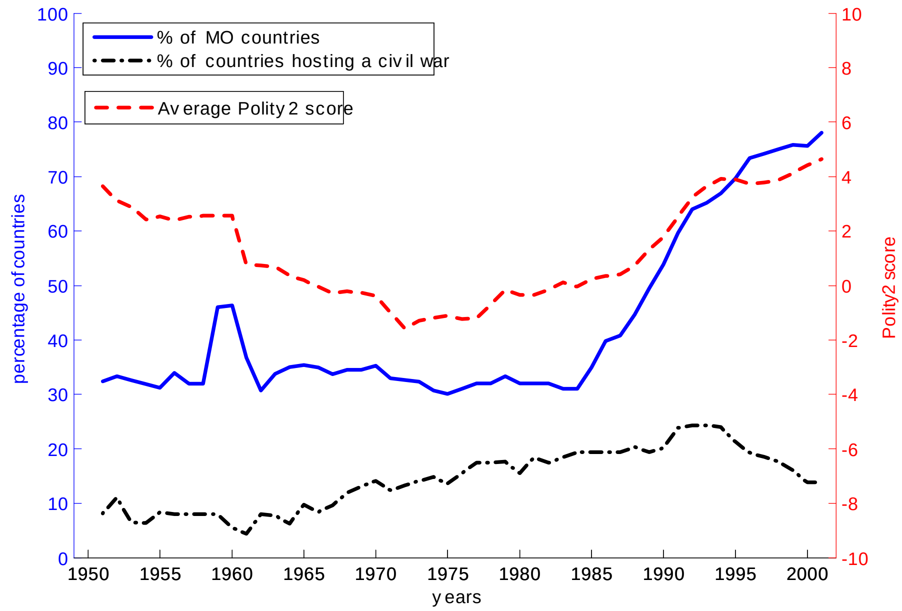

FIGURE 3. World average of market orientation and political variables.

began a transition to market orientation after the deterioration of their growth performances. Our model of belief formation interprets these low growth episodes as the driving forces of the policy changes.

However, it is important to recognize that also the world's political and social landscape changed considerably during our sample period. According to our model, this might contribute to explain the evolution of observed policy choices. To investigate this possibility, figure 3 displays the behavior of two important determinants of the political cost of market orientation in our structural model: the world average of Polity2 scores and the fraction of countries engaged in a civil war.

Data on the political environment and on military conflicts were taken from the "Polity IV" dataset and from Fearon and Laitin (2003), respectively. The Polity IV dataset is the most widely used dataset in empirical work on political science and international relations. The Polity2 score aggregates democratic and autocratic qualities of institutions and classifies countries in a spectrum on a 21-point scale, ranging from -10 (least democratic) to $+10$ (most democratic, see Marshall and Jaggers (2005) for further details). From Fearon and Laitin (2003) we use their dummy variable on civil wars. Fearon and Laitin classify a country to be in a civil war (indicated by a value of 1 for the variable) if it is engaged in a military conflict that satisfy some minimum criteria.[7]

Figure 3 shows a remarkable trend towards democracy during the second part of the sample, which is likely to be an important force behind the run-up towards market orientation. As for the civil war indicator, it also exhibits an improvement in the most recent years, although it appears to be less pronounced. Below we show the importance of our learning mechanism in explaining the switches in policy regimes, even after controlling for the observed changes in the political environment.

4.4. **Reduced-form regressions.** Before turning to structural estimation, we run reduced-form regressions to examine further the relationship between policy choices and observed growth rates.

Specifically, we consider the following linear probability model:[8]

$$E\left(\theta_{i,t}|...\right) = \phi_i + \phi_t + \phi_1\theta_{i,t-1} + \phi_2\hat{E}_{i,t-1}\left(y|\theta=1\right) + \phi_3\hat{E}_{i,t-1}\left(y|\theta=0\right) + \phi_4\bar{\theta}_{i,t-1}. \quad (4.1)$$

Here, the policy decision of country i in period t $(\theta_{i,t})$ is a function of its own past policy $(\theta_{i,t-1})$, a distance-weighted measure of other countries' policies $(\bar{\theta}_{i,t-1})$ and the distance-weighted average growth rate over the previous 3 years of other countries under the two policy regimes ($\hat{E}_{i,t-1}\left(y|\theta=1\right)$ and $\hat{E}_{i,t-1}\left(y|\theta=0\right)$).[9]

Our theory predicts policies to be persistent ($\phi_1 > 0$), due to the persistence of beliefs implied by Bayesian updating. It also predicts that countries are more likely to pursue market-oriented policies in periods in which market-oriented neighbors grow faster ($\phi_2 > 0$), as a consequence of information spillovers. Similarly, in periods of faster growth of state-interventionist neighbors, the probability of being market oriented should decline ($\phi_3 < 0$). Finally, the precision of the information about the success of market economies depends on the number of countries following those policies. Therefore, our theory predicts a positive correlation among policies ($\phi_4 > 0$), provided that on average countries update their beliefs about the benefits of market

[7] The primary criteria are: (i) the conflict involves fighting between agents of (or claimants to) a state and organized, nonstate groups who sought either to take control of a government, to take power in a region, or to use violence to change government policies; (ii) the conflict killed at least 1,000 over its course, with a yearly average of at least 100; (iii) at least 100 were killed on both sides (including civilians attacked by rebels). For further details, including secondary criteria and comparison with other indicators on wars, see Fearon and Laitin (2003).

[8] We have opted for a linear probability model because it provides a parsimonious local approximation to more general probability models. In addition, alternative non-linear fixed effects models would be inconsistent (Chamberlain (1980)).

[9] Formally, we define: $\hat{E}_{i,t-1}\left(y|\theta\right) = \sum_{s=1}^{3}\sum_{j:\theta_{j,t-s}=\theta} e^{-d_{ij}/\delta_1} y_{j,t-s} / \sum_{s=1}^{3}\sum_{j:\theta_{j,t-s}=\theta} e^{-d_{ij}/\delta_1}$ $\theta = 0,1$, and $\bar{\theta}_{i,t-1} = \sum_{j\neq i} e^{-d_{ij}/\delta_2}\theta_{j,t-1} / \sum_{j\neq i} e^{-d_{ij}/\delta_2}$.

orientation upwards (which will be the case according to the estimation results of our structural model). It is important to recognize, however, that finding $\phi_4 > 0$ can also be symptomatic of a force of "fads and fashion" in policy choices, which may also be at play in the data (see Banerjee (1992) or Bikhchandani, Hirshleifer, and Welch (1992)).

Table 1 presents the estimation results of equation 4.1 in our data. In the first column, we estimate a simplified version that excludes $\bar{\theta}_{i,t-1}$ from the regressors and sets $\delta_1 = 2,500$, which fixes the effective neighborhood of the median country, defined as $\sum_{j \neq i} e^{-d_{ij}/\delta_1}$, to be 20 countries. In columns 2-5 we progressively add various features to the model, by including country fixed and time effects (columns 2-4); adding $\bar{\theta}_{i,t-1}$ –the effect of the average policy choices of neighbors– and estimating the effective country neighborhoods when measuring past growth performance and policy choices, i.e. optimizing over δ_1, (columns 3-4); and, finally, controlling for the political and economic environment, as measured by the Polity2 score, log-relative GDP, and the Fearon and Laitin's indicator for civil wars (column 4).

Table 1 reveals three robust features of the data, which are consistent with the predictions of our structural model. First, policies are very persistent (second row). The probability that a country who was market oriented in period $t-1$ keeps the same policy in period t is 85 to 96 percent larger than that of countries that were interventionist in period $t-1$. Second, policy choices are highly correlated to past performance of policy regimes (third and fourth rows). For each additional point of per-capita GDP growth of market-oriented (state interventionist) countries in the neighborhood of country i, the long-run probability that country i is market oriented increases (decreases) by approximately 5 (6) percent in our specification with fixed and time effects. Finally, countries are more likely to be market oriented when their neighbors followed the same policies (fifth row) or when they have a high polity2 score (sixth row).

	(1)	(2)	(3)	(4)
constant	0.037^{***}			
	(0.005)			
$\theta_{i,t-1}$	0.958^{**}	0.88^{***}	0.87^{***}	0.86^{***}
	(0.004)	(0.01)	(0.01)	(0.01)
$\hat{E}_{i,t-1}[y\|\theta=1]$	0.04	0.39^{*}	0.60^{*}	0.54^{*}
	(0.16)	(0.22)	(0.35)	(0.34)
$\hat{E}_{i,t-1}[y\|\theta=0]$	-0.58^{***}	-0.69^{***}	-0.77^{***}	-0.59^{**}
	(0.11)	(0.19)	(0.29)	(0.28)
$\bar{\theta}_{i,t-1}$			0.13^{***}	0.13^{***}
			(0.03)	(0.03)
polity IV				0.0019^{***}
				(0.0005)
log-relative GDP				-0.0014
				0.0086
Civil wars				-0.0107
				0.0076
δ_1	2500	2500	3849.8^{***}	3280.4^{***}
			(1112.0)	(987.6)
Country-specific effect	No	Yes	Yes	Yes
Time effect	No	Yes	Yes	Yes

TABLE 1: *Estimation results of the reduced-form linear probability model. * (**) [***] significant at the 10% (5%) [1%] level.*

We conclude this section by noting that these results must be interpreted with caution, in light of the "reflection" problem emphasized by Manski (1993). Specifically, the identification of endogenous interactions effects (ϕ_4) and contextual effects (ϕ_2 and ϕ_3) is problematic due to the collinearity of the two effects. In our model, however, this problem is much less severe because neighborhoods are individual specific. In other words, all countries discount the information from all other countries differently, depending on their geographic location. This feature breaks the the symmetry that causes the collinearity problem. On the other hand, the fact that we estimate the structure of groups adds a non-trivial element of complexity relative to more standard linear-in-mean models. Finally, the structural learning model that we study in the rest of the paper belongs to a class of binary choice models whose non-linearity makes identification less problematic (Brock and Durlauf, 2001a and b).

We now turn to the estimation of this model.

5. Results

This section presents the estimation results and assesses the goodness of fit of our learning model. In our baseline specification, the cross-country correlation of initial beliefs about the effect of market orientation and state intervention depends on the geographic distance (in thousands of Km) between countries' capitals ($d_{i,j}$), which is highly correlated with both economic and cultural distance. The political cost of being market oriented ($K_{i,t}$) is a function of four explanatory variables: (i) a country-specific effect (f_i), (ii) the logarithm of an average (over the past five years) of a country's GDP relative to the US ($rY_{i,[t-5,t-1]}$), (iii) the Polity2 score ($\pi_{i,t}$), (iv) the civil war dummy of Fearon and Laitin (2003) ($cw_{i.t}$). To each of these variables we subtract their pooled means (except, of course, to the country-specific effects), in order to normalize the expected political cost of market orientation to be equal to zero for the average country/year. In this section we also present some alternative specification of the political cost.

5.1. **Parameter estimates.** Table 2 reports the posterior estimates of the coefficients parameterizing the structure of the prior correlation (γ) and the political cost (ξ). The first column of the table refers to the baseline model. According to our estimates, the coefficient γ is positive, so that the cross-country correlation of initial beliefs decreases with geographic distance. This correlation is approximately equal to 0.85 for countries that are $1,000$ Km apart, while it becomes only about 0.5 for countries distant $5,000$ Km from each other. The a-priori cross-country correlation of beliefs plays an important role in our analysis because it affects the weight policymakers put on the experience of other countries and, therefore, the speed of learning. In the next sections we will analyze its contribution to the evolution of policymakers' beliefs about the effect of state intervention and market orientation on growth.

	baseline ($\mathbf{M}_1$)	$\mathbf{M}_2$	$\mathbf{M}_3$	$\mathbf{M}_4$	$\mathbf{M}_5$
Prior correlation (γ)					
$d_{i,j}$	0.152	0.163	0.150	0.155	0.201
Geographic distance	(0.021)	(0.022)	(0.018)	(0.022)	(0.038)
Political cost (ξ)					
$rY_{i,[t-5,t-1]}$	-0.0035	-0.0031	-0.0042	-0.0157	-0.0122
Log-relative GDP	(0.0015)	(0.0015)	(0.0018)	(0.0021)	(0.0021)
$\pi_{i,t}$	-0.0007	-0.0006	-0.0005	-0.0001	-0.0001
Polity2	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
$cw_{i,t}$	0.0048	0.0045	0.0048	0.0094	-0.0077
Civil wars	(0.0011)	(0.0013)	(0.0012)	(0.0015)	(0.0017)
$\pi n_{i,t}$		-0.0012			-0.0007
Polity2 (neighbors)		(0.0002)			(0.0001)
$wn_{i,t}$		-0.0025			-0.0002
Civil Wars (neighbors)		(0.0008)			(0.0010)
$sc_{i,t}$			0.169		0.0725
Soviet Controlled			(0.096)		(0.9641)
Country-specific effect	Yes	Yes	Yes	Yes	Yes
Time effect	No	No	No	Yes	Yes

TABLE 2: *Coefficient estimates in the baseline model and various alternative models with different specifications of the structure of the political cost.*

Our results suggests that the political costs of being market oriented are reduced with a higher relative per capita income, with more democracy and with the lack of a civil war.

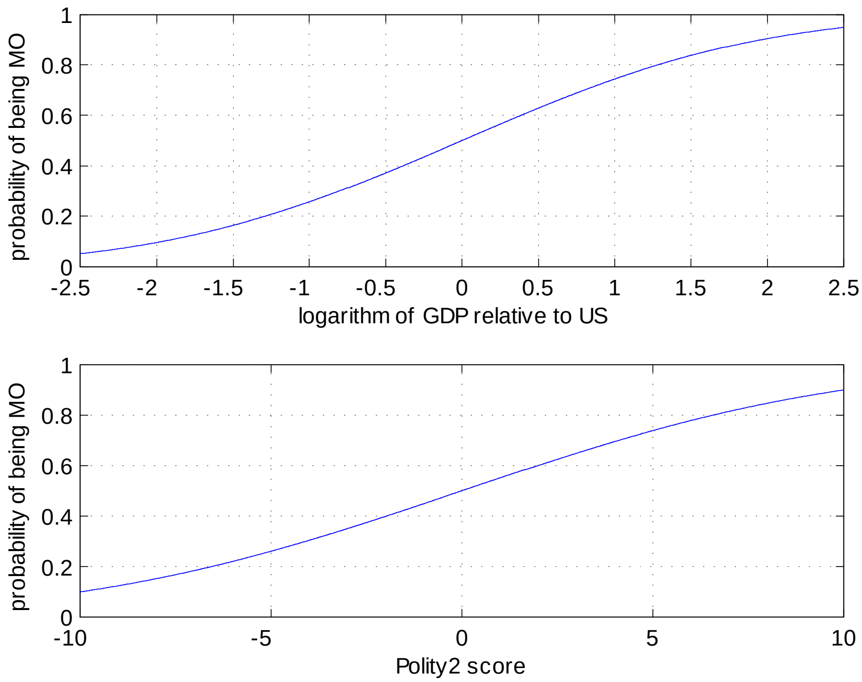

FIGURE 4. Probability of being market oriented as a function of (a) the logarithm of GDP relative to the US and (b) the Polity2 score for the average country.

Finding lower political costs for being market friendly for relatively more developed countries is consistent with the theoretical results of Acemoglu, Aghion, and Zilibotti (2006), who argue that countries are likely to switch from state intervention to market orientation as they develop. To evaluate the economic significance of the estimated coefficient of -0.0035 on $\left(rY_{i,[t-5,t-1]} - \overline{rY}\right)$, the deviation of log-relative GDP from the pooled mean, figure 4a plots the model-implied probability of being market oriented for countries with different levels of income. The figure is constructed for the case in which a country holds similar beliefs about the effects of market orientation and state intervention, and assumes that $\varrho_i = 0.53\%$, which corresponds to the mean estimate of ϱ_i. Clearly, poor countries are substantially less likely to be market oriented than more developed economies. For instance, everything else equal, a country with a level of GDP similar to the US has a 90% probability of being market oriented, while a country with only 10% of the US per-capita GDP (e.g. Zambia) has only a probability of 10% to be market oriented.

We also find that more democratic countries seem to have a lower political cost of being market oriented. Figure 4b plots the implied probability of being market oriented as a function of the deviation of the Polity2 score from the pooled mean. Everything else equal, a country with low Polity2 score is substantially less likely to be market oriented relative to more democratic countries. Finally, the presence of a civil war increases the political cost of market orientation. In particular, for the average country, a civil war reduces the probability of being market oriented by more than 30%.

Columns $2-5$ of table 2 refers to models that differ from the baseline for the structure of the political cost. For instance, in model $\mathbf{M}_2$ we control for the presence of a civil war in at least one of the neighboring countries ($wn_{i,t}$) and for the average Polity2 score of the neighboring countries ($\pi n_{i,t}$). Model $\mathbf{M}_3$ allows the political cost to depend on a dummy variable equal to one if a country was a member of the Warsaw Pact and, therefore, under the Soviet Union military control ($sc_{i,t}$). First, notice that the average Polity2 score of neighboring countries has an even larger negative effect on the political cost than the domestic Polity2 score. Perhaps a bit surprisingly, the presence of a civil war in a neighboring country decreases the political cost of market orientation at home, while the Soviet control dummy has a very large positive impact on this cost, although the statistical significance of the coefficient is weak. Second, notice that the inclusion of these extra variables hardly changes the values of the coefficient estimates of the common determinants of the political cost.

In model $\mathbf{M}_4$ we augment our baseline specification of the political cost of market orientation with a time effect, while model $\mathbf{M}_5$ combines all the explanatory variables of the previous models. We want to stress that the presence of time effect in $\mathbf{M}_4$ and $\mathbf{M}_5$ captures the average evolution of market-oriented policies over time by construction. These are not our preferred specifications because they are fundamentally against the spirit of our learning model, which can be interpreted as providing a structural explanation for the time effect. Nevertheless, checking the fit of models with time effect is important to assess the robustness of our results. Columns $4-5$ indicate that the inclusion of a time effect decreases the importance of the Polity2 score, increases the relevance of log-relative GDP, and perversely reverts the sign of the coefficient on the civil war dummy.

5.2. **Model's fit.** In this subsection we assess how well our model fits the data. Using different criteria, we find that the model explains quite well the observed dynamics of market-oriented policies over time and across countries.

Figure 5 reports the actual (solid line) and predicted (dashed-dotted line) fractions of market-oriented economies present in our sample. The model-predicted series corresponds to the sequence of one-step-ahead predictions of the baseline model, absent any shock to the political

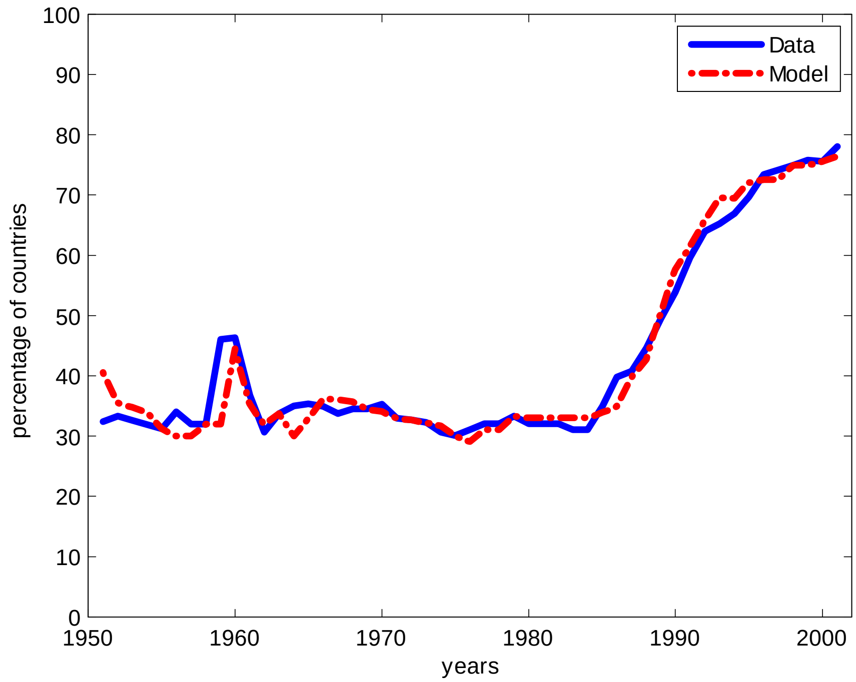

FIGURE 5. Actual and model-predicted fraction of market-oriented countries.

cost. For example, the value for 1990 represents what the estimated model predicts for the world share of market-oriented countries, given the information on GDP growth and policies up to 1989, the information about the political environment and civil wars in 1990, and assuming that in 1990 the shock to political costs is zero for each country. The figure makes clear that the model captures fairly well the high fraction of state-interventionist economies in the first part of the sample, and the run-up towards market orientation starting in the mid 1980s.

Figure 6 provides a more disaggregated picture of the fit of the model, by comparing the actual and predicted series for eight regions of the world economy. Notice that the model captures well episodes of policy reversals (e.g. Central and South America) and the heterogeneous timing of liberalizations (e.g. the earlier liberalizations in Asia and the more protracted reforms in Africa).

Finally, table 3 presents a quantitative assessment of the fit of the model. Focusing on the first column, the baseline model correctly predicts almost 97% of the policy choices observed in the data. Moreover, it accounts for 25.8%, 53.8%, 74.2% and 77.4% of the switches in policies, within ± 0, 1, 2 and $3-$year windows, respectively. Explaining changes in policies is a very

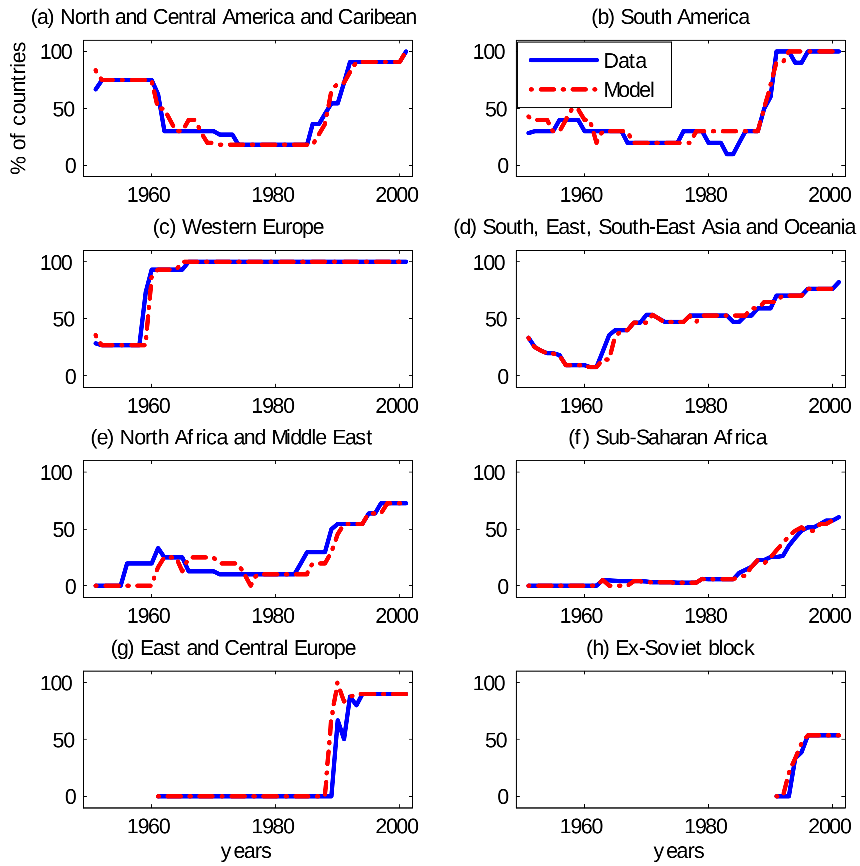

FIGURE 6. Actual and model-predicted fraction of market-oriented countries across regions

challenging test, because we only observe 101 policy switches in our dataset (2% of the total policies). We are therefore quite satisfied with the performance of the model.

	baseline ($\mathbf{M}_1$)	$\mathbf{M}_2$	$\mathbf{M}_3$	$\mathbf{M}_4$	$\mathbf{M}_5$
log-likelihood	-419.49	-384.61	-413.33	-275.21	-264.48
share of correct predictions	96.6%	97.0%	96.6%	97.9%	97.9%
policy switches (±0-y window)	25.8%	28.0%	26.9%	58.1%	58.1%
policy switches (±1-y window)	53.8%	58.1%	57.0%	75.3%	76.3%
policy switches (±2-y window)	74.2%	77.4%	74.2%	80.6%	80.6%
policy switches (±3-y window)	77.4%	81.7%	78.5%	87.1%	83.9%

TABLE 3: *Measures of fit for the baseline model and various alternative models with different specifications of the structure of the political cost.*

Table 3 also reports the fit of the four alternative specifications of the political cost that we presented above. Notice that model $\mathbf{M}_2$ and $\mathbf{M}_3$ fit the data essentially as well as $\mathbf{M}_1$, validating our choice of the baseline. More substantive fit improvements can be seen for models that include a time effect, especially in terms of explaining policy switches at short horizons. This should not be surprising since the time effect is bound to exactly capture the average evolution of policies over time. It is important to notice, however, that our baseline model is preferred to models with a time effect by selection criteria that take into account the increased number of parameters (i.e. the Bayesian Information Criterion).[10]

5.3. **Role of learning and evolution of beliefs.** The good empirical performance of our model is due to two ingredients: (i) the estimated evolution of policymakers' beliefs and (ii) the estimated structure of the political cost. The objective of this subsection is disentangling the relative importance of these two factors for the fit of the model and demonstrating that learning

[10] Of course, a formal model comparison exercise in a Bayesian framework would be based on the marginal data densities. However, the computation of the marginal data density is extremely challenging in this setting due to the very high number of parameters.

is crucial to explain the observed dynamics of market-oriented policies. We also explain why this is the case.

In order to evaluate the contribution to fit of the learning component of the model, we simply re-estimate the five versions of the model presented above, without learning. In particular, we estimate policymakers' initial beliefs, but force them to remain at the level of 1950 and not to be updated throughout the sample. We note that this restricted version of our model can be interpreted as a reduced-form representation of policies, corresponding to a standard panel probit model.

The first column of table 4 summarizes the results of this experiment for our baseline specification. The model without the learning mechanism is still capable of explaining a fair amount of the policy choices that we observe in the data. This is not surprising, however, considering that many countries in our sample keep the same policy in place for the entire postwar period. As we argued earlier, a much more challenging task is predicting policy switches. As it is clear from table 4, the model without learning fails dramatically along this dimension, accounting for only 5.4%, 14%, 22.6% and 24.7% of the switches in the data, within ± 0, 1, 2 and $3-$year windows, respectively. We conclude that the success of our baseline model at predicting policy switches (first column of table 3) is mainly due to the presence of the learning mechanism that we emphasize in this paper.

	baseline ($\mathbf{M}_1$)	$\mathbf{M}_2$	$\mathbf{M}_3$	$\mathbf{M}_4$	$\mathbf{M}_5$
log-likelihood	-1,282.5	-1,114.8	-1,280.4	-484.7	-477.7
share of correct predictions	85.5%	88.7%	85.5%	95.8%	95.8%
policy switches ($\pm$0-y window)	5.4%	10.7%	6.4%	50.5%	49.4%
policy switches ($\pm$1-y window)	14.0%	20.4%	15.0%	65.6%	64.5%
policy switches ($\pm$2-y window)	22.6%	26.9%	22.6%	66.7%	68.8%
policy switches ($\pm$3-y window)	24.7%	31.2%	24.7%	69.9%	72.0%

TABLE 4: *Measures of fit when the learning mechanism is turned off.*

Columns 2−5 of table 4 conduct a similar exercise for the various alternative specifications of the political cost. The inclusion of neither the neighbors' characteristics nor the Soviet control dummy ($\mathbf{M}_2$ and $\mathbf{M}_3$) alter the result that learning is essential. As one would expect, however, the use of time effects substantially improves the performance of the models without learning ($\mathbf{M}_4$ and $\mathbf{M}_5$), whose fit becomes comparable to our baseline. This result suggests that our learning mechanism approximates well the time effects and, therefore, provides a structural explanation and interpretation of their dynamics. In order to demonstrate the importance of this feature of our model, we perform an out-of-sample forecasting exercise –the Achilles' heel of most highly parameterized models. Specifically, we estimate our baseline model using data until 1990 and then use the estimated model parameters to generate policy forecasts between 1991 and 2001. Figure 7 reports the world share of market-oriented policies in the data and predicted by our model. Until 1990, the model's predicted series represents one-step-ahead in-sample predictions, while after 1990 they are out-of-sample forecasts. Between 1990 and 2001, the model predicts an increase in the share of market-oriented economies of 17.7%, about *three fourths* of the increase observed in the data (24.2%). On the contrary, the model with time effects, but without learning, fails in this out-of-sample forecast exercise, as it predicts only a 5.6% increase in the world share of market-oriented countries.[11]

Why is the learning mechanism of our model able to explain such a large share of the evolution of economic policies across time and space? The intuition for its good empirical performance is due to two main features of the data. First, learning is capable to explain the initial low share of market-oriented economies due to the information in the pre-1950 data, which led to a calibration of priors consistent with most countries believing that the state outperforms the market. In addition, the first decade of our estimation sample is consistent with this idea, because state-interventionist economies exhibited higher average growth rates than market-oriented ones. This reinforced preferences for government intervention and, consistent with the data, prevented a faster diffusion of market orientation. Second, the learning mechanism is able to explain the wave of liberalizations that started in the mid-1980s because of the low GDP growth observed in the 1970s and early 1980s, especially for state-interventionist countries. Through the lens of the model, past growth experiences are important determinants of beliefs and policy dynamics.

In order to make this intuition more precise, figure 8 presents a summary of the estimated evolution of beliefs over time and across countries for our baseline model. In particular, figure

[11] It is unclear how to generate out-of-sample predictions in a model with time effects. We have assumed that the time effects remain unchanged relative to their estimate in 1990.

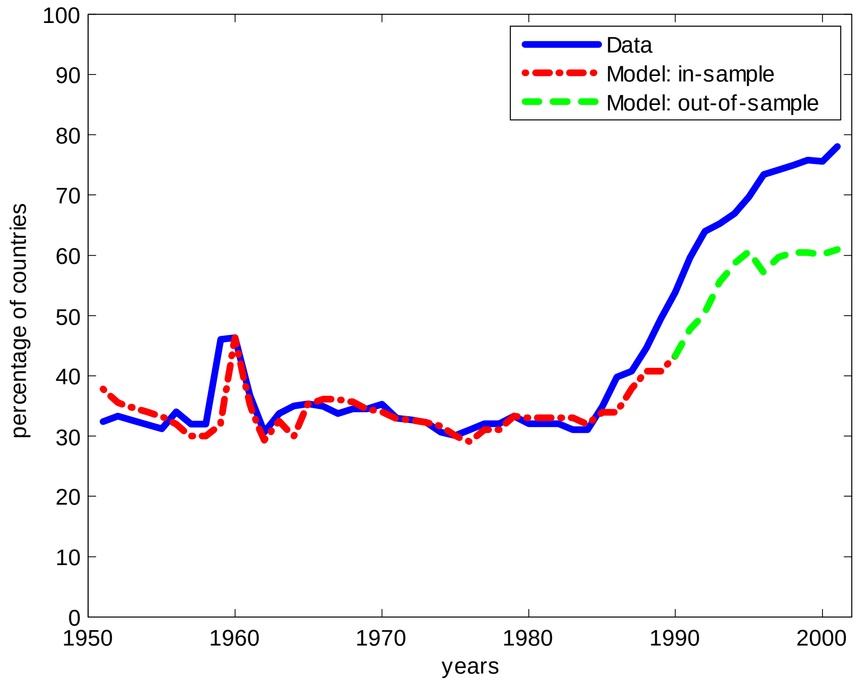

FIGURE 7. Actual and model-predicted fraction of market-oriented countries.

8 plots the time evolution of the empirical distribution of $\left\{\hat{\beta}_{i,t}^{M*}-\hat{\beta}_{i,t}^{S*}\right\}_{i=1}^{n}$, i.e. the difference between the posterior mode of the mean of policymakers' beliefs about the effect of market-oriented and state-interventionist policies on growth. The lightest shaded areas correspond to the $10-90$th percentiles of the distribution, while the darkest shade denotes the $40-60$th percentiles. As mentioned earlier, initial beliefs about the success of market economies were quite negative and characterized by considerable dispersion across countries. According to our estimates, in 1950 the vast majority of countries believed that market-oriented policies were inferior to state intervention in terms of economic growth. These beliefs evolved, slowly shifting towards favoring market-oriented regimes. By 2001, the histogram of implied $\left\{\hat{\beta}_{i,T}^{M*}-\hat{\beta}_{i,T}^{S*}\right\}_{i=1}^{n}$ has moved upwards, with a perceptible majority of countries believing that market-oriented policies are growth enhancing. However, quite interestingly, the dispersion of beliefs across countries has declined, but certainly not disappeared.

Figure 9 summarizes the precision of these beliefs across countries and over time, by plotting the evolution of the empirical distribution of the uncertainty about the difference between average growth under market orientation and state intervention. For most countries, the initial uncertainty about the differential effect of these policies is substantial. By 2001, countries have

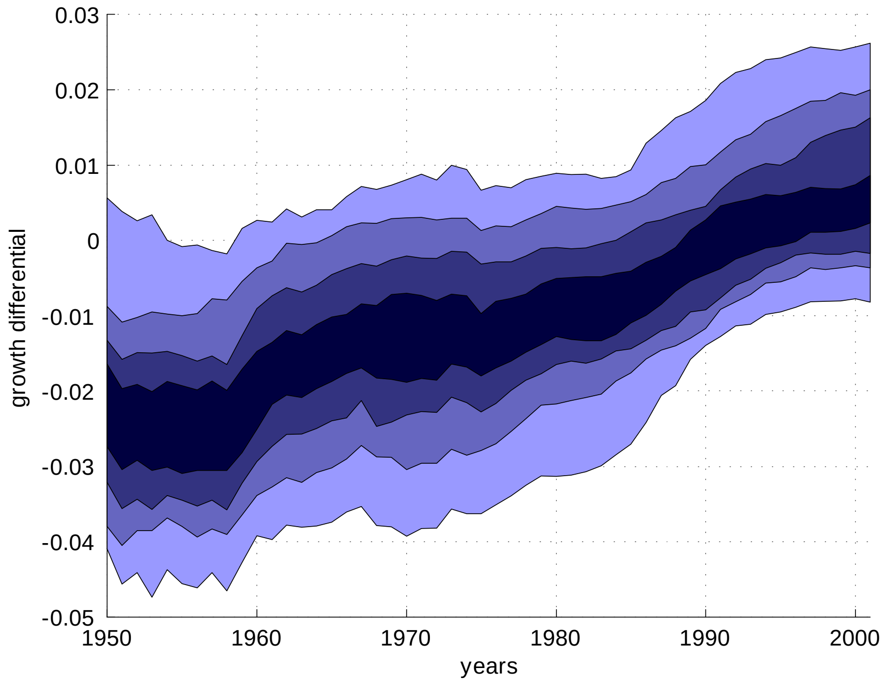

FIGURE 8. Evolution over time of the empirical distribution of $\left\{\hat{\beta}^{M*}_{i,t} - \hat{\beta}^{S*}_{i,t}\right\}_{i=1}^{n}$, i.e. the difference between the posterior mode of the mean of policymakers' beliefs about the effect of market-oriented and state-interventionist policies on growth.

sharpened their views considerably, although significant doubts remain. In fact, the median country believes that on average, market orientation leads to an approximately 0.5% faster GDP growth than government intervention (figure 8), but it also attaches to this estimate a standard deviation of about 0.65%.

Given our results, an obvious question to ask is *whether the world has reached a point in which the vast majority of policymakers are convinced that a market-oriented regime is beneficial for economic growth?* Figure 8 and 9 tell us that this is certainly not the case. There still exists a considerable amount of negative views about the merits of market economies. Moreover, many of those countries with a favorable view either remain quite uncertain or believe that the gains are quantitatively minimal. As a matter of fact, in 2001 only 47 countries in our dataset would estimate average growth under market orientation to be statistically significantly (at the 95% confidence level) higher than average growth under state intervention. As one would expect, the US, Western Europe and countries like Hong Kong or Singapore belong to this small group, while many developing countries belong to the rest.

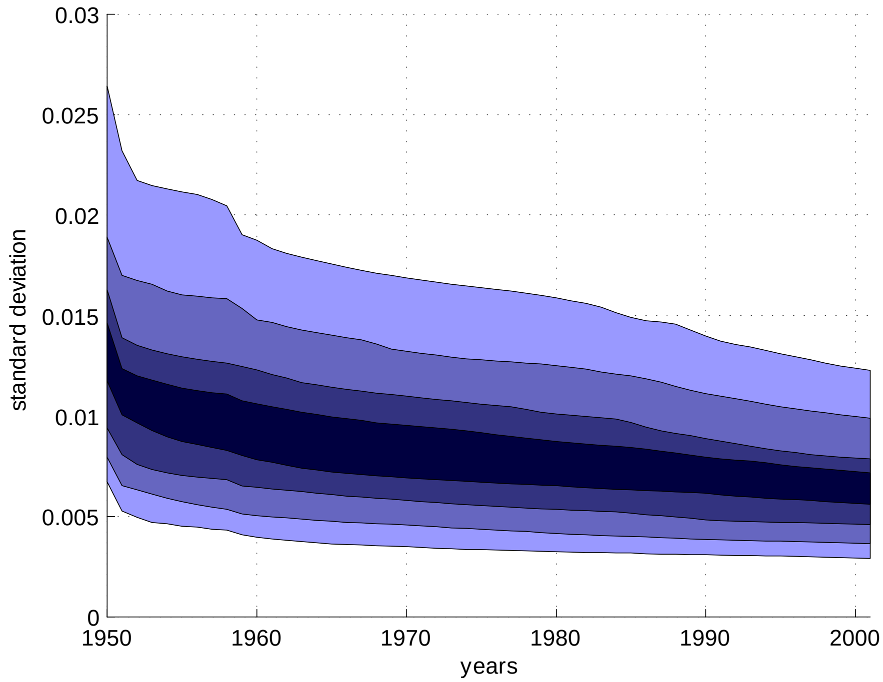

FIGURE 9. Evolution over time of the empirical distribution of the uncertainty about the difference between average growth under market orientation and state intervention.

6. A "True" Data-Generating Process and the Movement Towards Market Orientation

In this section we relate our learning model to a flexible statistical representation of the data on growth and market orientation, which we call the "true" DGP. We estimate it using the entire set of available data from 1950 to 2001 and compare these estimates to the real-time evolution of policymakers' beliefs implied by our learning model. We have two goals. First, we want to evaluate the extent to which our model of beliefs formation is consistent with the statistical information available in our sample. Since our policymakers are perfectly rational Bayesian agents, this task boils down to making sure that their initial priors are not unreasonable. Such a comparison between a plausible true DGP and policymakers' initial priors serves also our second purpose, i.e. examining what factors –if any– are responsible for the slow adoption of market orientation around the world, which our model fits well.

6.1. **The true DGP.** We assume that the true DGP is a hierarchical linear model, i.e. the following flexible statistical representation of the postwar growth data:

$$y_{i,t} = b_i^S (1 - \theta_{i,t}) + b_i^M \theta_{i,t} + e_{i,t}, \quad i = 1, ..., n \tag{6.1}$$

$$e_t \sim N(0, S \cdot Q \cdot S) \tag{6.2}$$

where $b \equiv \left[b_1^S, ..., b_n^S, b_1^M, ..., b_n^M\right]$, S is an $n \times n$ diagonal matrix with standard deviations on the main diagonal and Q is an $n \times n$ correlation matrix. This formulation allows market-oriented and state-interventionist policies to have a country-specific effect on economic growth. These effects correspond to the realization of a draw from a population with distribution

$$b \sim N\left(\bar{b}, \zeta^2 \cdot I_2 \otimes (S \cdot W \cdot S)\right), \tag{6.3}$$

where $\bar{b} \equiv \left[\bar{b}^S, \bar{b}^M\right]$, and $\bar{b}^S$, $\bar{b}^M$ and ζ are scalar parameters. The elements of the $n \times n$ correlation matrix W are modeled as

$$W_{i,j} = \exp\left[-d_{i,j} \cdot \lambda\right],$$

which allows for the possibility of spatial correlation.[12]

Specifying the true DGP as a hierarchical linear model is appealing for several reasons. First, equation (6.1) is identical to (2.2), implying that the true and perceived DGP are absolutely continuous with respect to each other. Indeed, if growth rates are generated by equations (6.1)-(6.3), policymakers endowed with model (2.2) and priors (2.4) would eventually learn the truth. Second, had policymakers at some previous time $t_0 < 1950$ known the population distribution of b, then they would have adopted it as their prior at that initial time. Consequently, beliefs in 1950 can be interpreted as the outcome of the evolution of these beliefs in the pre-1950 period, in response to various shocks, including for instance the Great Depression. In practice, of course, it is unreasonable to assume that policymakers knew beforehand the population distribution of b, which, as econometricians, we can estimate only because we have access to the entire set of postwar data. Nevertheless, a comparison between the estimates of (2.4) and (6.3) is useful to understand to what extent policymakers' initial beliefs in 1950 were sensible, in light of the postwar data, and what are the main discrepancies between these beliefs and the truth.

Consistent with our learning model, policies are predetermined with respect to e_t. Therefore, the coefficients of the model can be estimated by maximum likelihood following the procedure

[12] For symmetry, we also allow the growth shocks to be spatially correlated by assuming that $Q_{i,j} = c \cdot \exp\left[-d_{i,j} \cdot \varkappa\right]$.

described in Gelman, Carlin, Stern, and Rubin (2004), which involves integrating out b. Our estimates are presented in table 5.

$\bar{b}^S$	$\bar{b}^M$	ζ	λ	c	$\varkappa$
0.021	0.021	0.317	0.388	0.247	0.317
(0.003)	(0.004)	(0.064)	(0.179)	(0.037)	(0.067)

TABLE 5: *Estimates of the hierarchical linear model.*

Observe that we find no difference between the population means of the growth effect of market-oriented and state-interventionist policies ($\bar{b}^S$ and $\bar{b}^M$). On the other hand, our estimate of λ indicates that the distribution of b exhibits substantial spatial correlation. When this correlation is high, the population mean of b needs not be equal to the average estimate of the elements of the b vector. Indeed, our estimate of the vector b suggests that the growth impact of market orientation is greater than the growth impact of state intervention in most countries. This point is illustrated in figure 10, which plots the empirical distribution of $\left\{b_i^{M*} - b_i^{S*}\right\}_{i=1}^n$, i.e. the difference between the maximum likelihood estimate of average growth under market orientation and government intervention across countries. Most of the distribution is located on the right with respect to zero, with the 10^{th} and 90^{th} percentiles equal to 0% and 2.8% respectively.

For comparison, figure 10 also plots the empirical distribution of $\left\{\hat{\beta}_{i,T}^{M*} - \hat{\beta}_{i,T}^{S*}\right\}_{i=1}^n$, i.e. the difference between the mean of policymakers' beliefs about the effect of market orientation and state intervention on growth at the end of the sample. While the estimates based on the true DGP suggest that policymakers are more uncertain and more pessimistic about the net impact of market-oriented policies, it is interesting to note that the two distributions are remarkably close to each other. Indeed, a test of the hypothesis that $b_i^M - b_i^S = \hat{\beta}_{i,T}^{M*} - \hat{\beta}_{i,T}^{S*}$ fails to reject the null for 119 countries out of 133.[13] This suggests that the evolution of policymakers' beliefs and implied policy decisions are not driven by extreme initial priors, but rather by the observed joint dynamics of growth and policies observed in the data.

[13] These tests would fail to reject even more often if we took into account the uncertainty about the remaining coefficients of the true DGP, which we ignore for computational reasons.

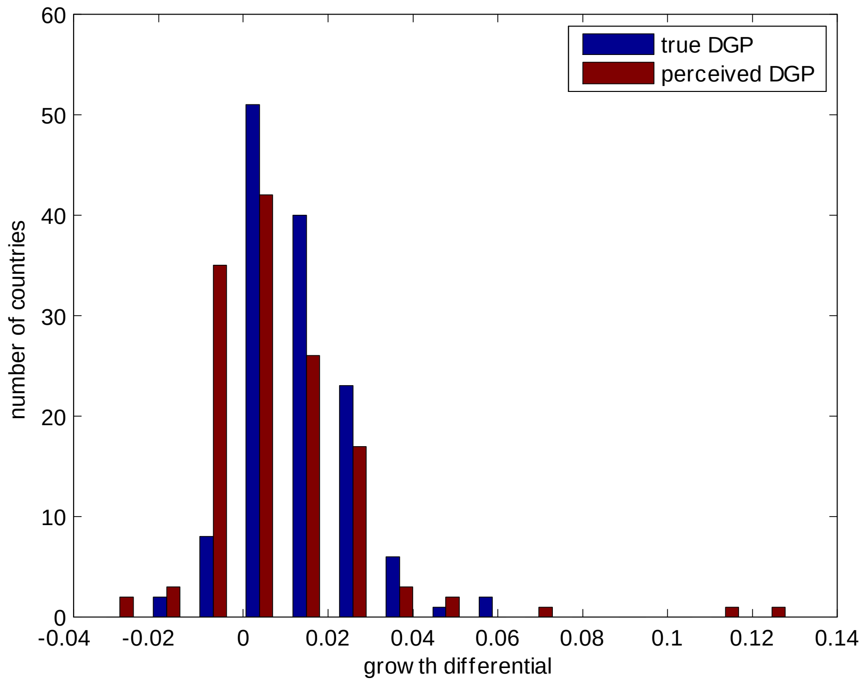

FIGURE 10. Empirical distribution of $\left\{b_i^{M*} - b_i^{S*}\right\}_{i=1}^{n}$, i.e. the difference between the true DGP ML estimate of average growth under market orientation and government intervention, and $\left\{\hat{\beta}_{i,T}^{M*} - \hat{\beta}_{i,T}^{S*}\right\}_{i=1}^{n}$, i.e. the difference between the posterior mode of the mean of policymakers' beliefs about average growth under market orientation and state intervention.

6.2. **The late movement towards market orientation.** In this subsection we perform a number of counterfactual experiments to understand the sensitivity of our results to alternative specifications and estimates of our model of beliefs' formation. Specifically, we investigate whether reasonable changes in policymakers' priors in 1950 or their perceived model would have speeded up the adoption of market-oriented policies. First, we consider the role of initial uncertainty. Second, we analyze the evolution of beliefs for alternative assumptions about the prior spatial correlation. Finally, deviating more substantially from the baseline and our true DGP, we examine a model where policymakers believe that the effect of policies is *common* across countries, but they have heterogeneous priors about these common effects.

We begin by asking whether the slow diffusion of market friendliness can be attributed to the fact that policymakers' priors in 1950 were too dogmatic in favor of state intervention. To answer this question, we modify the 1950 initial beliefs of policymakers by increasing their initial uncertainty, $\{\nu_i\}_{i=1}^{n}$, by about 50 percent. With this increase, the mean of $\{\nu_i\}_{i=1}^{n}$

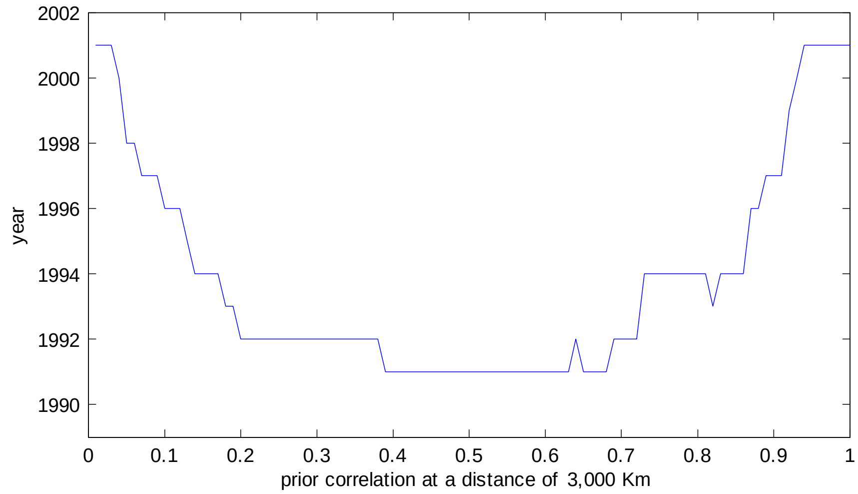

FIGURE 11. Year in which the median country becomes market oriented, as a function of the prior spatial correlation at a distance of 3,000 Km.

equals the estimate of ζ, i.e. the standard deviation of the population distribution of b in the true DGP. We then simulate the evolution of policymakers' beliefs under this new prior, given the observed data. Under this counterfactual scenario, we find that the median country would have preferred market orientation starting in 1989, which is very similar to 1991, our result with our baseline model. Our general conclusion is that reasonable changes in policymakers' initial uncertainty would have not substantially speeded up the adoption of market-oriented policies.

In our second experiment we set the mean and standard deviation of policymakers' initial beliefs equal to their estimated values, but we consider alternative values of the parameter γ governing the perceived spatial correlation of the effect of policies. Figure 11 reports the time in which the median country starts preferring market orientation, as a function of the prior correlation coefficients at a distance of 3,000 Km (our baseline estimated value is 0.634 and the correlation implied by the true DGP is 0.312).

Notice that the median country never chooses to become market oriented before 1991, no matter what the prior correlation is. When this correlation is low, state intervention persists even longer. This is because, in updating beliefs about the growth effect of policies in one country, the experience of the rest of the world is perceived not to be very relevant and, as a consequence, information accumulates slower. However, this effect is not monotone because high spatial correlations also imply very slow adoption of market-oriented policies as we explain below. Our general conclusion is that the slow diffusion of market orientation is a robust result to very different values of policymakers' perceived spatial correlation of the effect of policies on growth.

To understand why the prior spatial correlation has a non-monotone effect on the timing of adoption of market-oriented policies, it is instructive to consider a special case of our model of beliefs formation. In particular, assume that: (i) growth shocks have the same variance and are uncorrelated across countries (i.e. $\Sigma = \sigma^2 I_n$); (ii) policymakers' priors are characterized by the same degree of uncertainty (i.e. $V = \sigma^2 \nu^2 I_n$); and (iii) the prior mean on the effect of policies on growth is still heterogeneous, but the prior spatial correlation across all countries is equal to *one*. Under these assumptions, the evolution of beliefs about average growth under market orientation is given by the formula

$$\hat{\beta}^M_{i,t} = \hat{\beta}^M_{i,t-1} + \frac{\nu^2 \cdot n}{1 + \nu^2 \cdot \sum_{j=1}^{n} \sum_{s=1}^{t} \theta_{j,s}} \left[cov\left(\theta_t, y_t - \hat{\beta}^M_{t-1}\right) + \bar{\theta}_t \left(\bar{y}_t - \bar{\beta}^M_{t-1}\right)\right], \qquad i = 1, ..., n,$$

where the upper bar stands for the cross-sectional means and *cov* denotes the cross-sectional covariance. Notice that, if $\bar{y}_t = \bar{\beta}^M_{t-1}$, beliefs about market orientation are updated upwards at time t only if $cov\left(\theta_t, y_t - \hat{\beta}^M_{t-1}\right)$ is positive, i.e. if market-oriented countries perform *better* than expected in $t-1$. In other words, beliefs are not driven by the naive correlation between policies and growth, but by the correlation between growth and the deviations from the expected heterogeneous effects of policies. According to our model, this is what has prevented an earlier diffusion of market orientation around the world. Apparently, at least until the late 1980s, the only countries growing fast under market orientation were the ones that were expected to do so.

The fact that policy effects are perceived to be heterogeneous plays a key role for this result. In fact, if policymakers thought that the effect of policies were common across all countries (i.e. $\hat{\beta}^M_{i,t-1} = \hat{\beta}^M_{j,t-1}$, for all i and j), they would only have to learn about this common effect, about which the data of all other countries would become fully informative. In such a case $cov\left(\theta_t, y_t - \hat{\beta}^M_{t-1}\right)$ would boil down to $cov\left(\theta_t, y_t\right)$, so that beliefs about the benefits of market orientation would improve for the good performance of any market-oriented country, not just those not expected to perform well. As a consequence, learning is greatly accelerated and the diffusion of market orientation much faster.

We illustrate this point in a third counterfactual experiment, in which we consider a model where policymakers believe that the effect of policies is common across countries, but they have heterogeneous priors about these common effects.[14] In particular, for each country i, we set

[14] The important feature of this experiment is the perceived common effect, not the heterogeneous priors, which we adopt only for convenience.

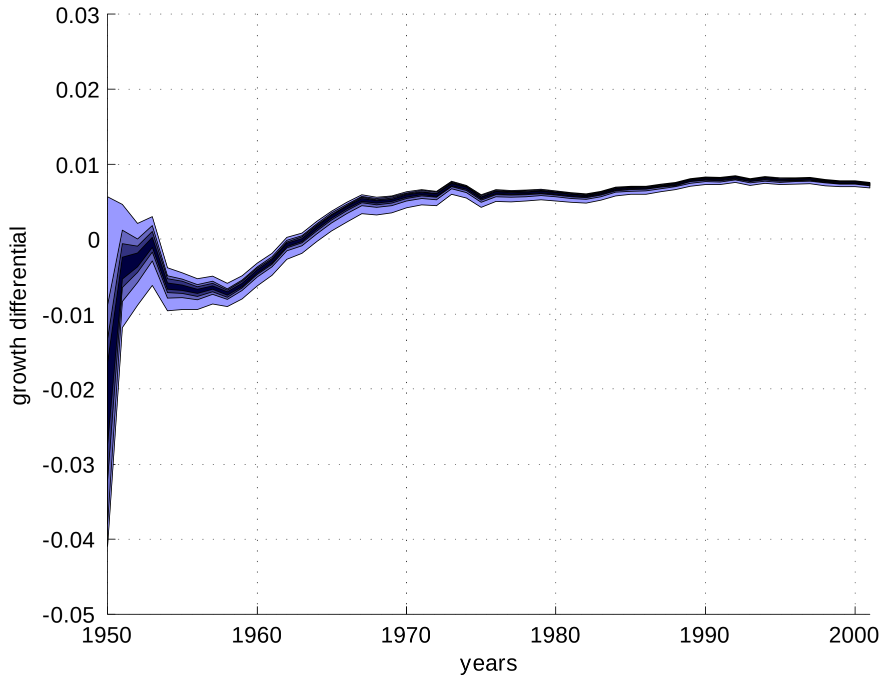

FIGURE 12. Evolution over time of the empirical distribution of $\left\{\hat{\beta}_{i,t}^{M*} - \hat{\beta}_{i,t}^{S*}\right\}_{i=1}^{N}$, i.e. the difference between the posterior mode of the mean of policymakers' beliefs about the effect of market-oriented and state-interventionist policies on growth.

the initial prior mean of the common effect of policies to the estimated value of $\hat{\beta}_{i,0}^{S}$ and $\hat{\beta}_{i,0}^{M}$, and the initial standard deviation to the estimated value of ν_i. However, we now assume that policymakers of country i believe that the effect of policies on growth in all other countries is the same as in their country.[15]

Figure 12 plots the time evolution of the empirical distribution of $\left\{\hat{\beta}_{i,t}^{M*} - \hat{\beta}_{i,t}^{S*}\right\}_{i=1}^{n}$, i.e. the difference between the posterior mode of the mean of policymakers' beliefs about the effect of market-oriented and state-interventionist policies on growth. Observe that, in this model with perceived common effects, the median country would have embraced market orientation in the 1960s, soon after market-oriented countries started growing faster than state-interventionist economies.

To conclude, the slow adoption of market-oriented policies that we observe in the data is a very robust feature of our model with potentially heterogeneous effects of economic policies on GDP growth. Substantially faster diffusion of market orientation would have taken place

[15] This is a special case of the model of Buera, Monge-Naranjo, and Primiceri (2008).

only if policymakers had ruled out a priori the possibility of heterogeneity and had been fully convinced that the effect of policies are common across countries. This is in contrast with the estimates of our true DGP and, more importantly, with the casual observation about policy debates in different countries (see, for instance, Di Tella and MacCulloch (2007)).

7. Policy Reversals: Another Great Depression

One natural application of our model is trying to answer the question: *Would we observe policy reversals towards state intervention if the world was hit by another Great Depression?* The answer of our estimated model is yes. We obtain this answer by conducting a final set of counterfactual simulations. Differently from the previous section, here we keep all model parameters at their estimated posterior mode, but generate artificial paths of GDP growth in order to induce a large global recession.

More specifically, these simulations are constructed as follows. Suppose that time τ is the starting point of the counterfactuals. Policymakers update their beliefs with time-τ information. We construct the political cost based on the value of the Polity2, civil war and relative GDP variables at time $\tau + 1$ and a draw of the exogenous shock from the estimated distribution.[16] The combination of beliefs and political cost determines policymakers' choice of the policy variable, which, in turn, contributes to the realization of GDP growth in period $\tau + 1$. A new vintage of data is now available and policymakers form time-$\tau + 1$ beliefs by updating their priors with the new information, and so on for H periods.

In order to generate GDP growth as a function of the policy decision, we use a slightly modified version of the true DGP estimated in section 6. The modification consists of the introduction in (6.1) of a forcing variable, $F_{i,s}$, which we calibrate to match the size of the Great Depression in the 1930s. Using the Maddison dataset we compute

$$\{F_{i,s}\}_{s=1}^{H} = [-0.0047, -0.0517, -0.0867, -0.0687, 0.0023, 0, ..., 0], \qquad i = 1, ..., n,$$

which corresponds to the average deviation across countries of the growth rate in 1929-1933 relative to the average growth between 1919 and 1928.

Figure 13 depicts the share of market-oriented countries switching to government intervention within five years, in response to the global recession that starts in 2002. This share is plotted as a function of the impact of the depression on market-oriented relative to state-interventionist economies, keeping the average impact equal to $\{F_{i,s}\}_{s=1}^{H}$. For instance, the

[16] Going forward, we assume that the Polity2 and civil war variables remain unchanged relative to their value at time τ.

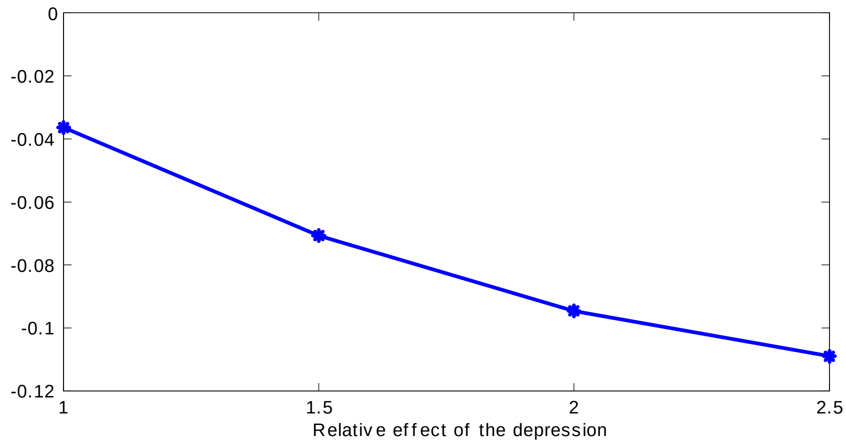

FIGURE 13. Fraction of countries becoming market oriented as a consequence of a counterfactual severe recession hitting at different possible points in time. Fraction of countries becoming market oriented as a consequence of a severe world-wide recession in 2002, as a function of the differential impact of the recession on market-oriented and state-interventionist countries.

fraction of market-oriented countries reverting to interventionism would be about 10% if the depression affected market-oriented economies twice as much as state-interventionist ones. We find that this effect would take almost forty years to wash out. Part of the intuition for this result is straightforward: if policymakers perceive that state intervention leads to faster growth, they will update their beliefs accordingly and, in some cases, switch policy. However, as evident from the intercept of figure 13, a depression that has the same impact on market-oriented and state-interventionist economies would also induce some policy reversals. This is because policymakers would update downwards both the beliefs about the benefits of markets and governments. However, since in 2002 most countries are market oriented, the signal about the deterioration in growth performance of market-oriented economies would be much more precise and these beliefs would evolve faster. This intuition suggests also that, had such an equal recession hit the world economy in the 1960s or 1970s, when beliefs were less precise and when most countries were state-interventionists, it would have spawn an even larger reversal in the opposite direction, i.e. from state intervention to market orientation.

8. Concluding Remarks

We have explored the ability of a learning model to explain the observed transition of countries between regimes of state intervention and market orientation. In our model, the crucial determinants of policy choices are policymakers' beliefs about the relative merits of the markets versus the state. These beliefs, in turn, are influenced by past experience.

The estimated model fits well the data of 133 countries for the postwar period. Our results indicate that countries around the world were slow to adopt market-oriented policies because policymakers take seriously the possibility that the impact of these policies is country-specific. Moreover, our findings suggest that by the end of the sample many countries remain agnostic about the growth prospects of market economies. Indeed, according to the model, a global GDP growth shock of the size of the Great Depression would induce between 5 and 10% of countries in the world to revert to state intervention.

In this paper, we have focused on the evolution of beliefs as the driving mechanism of policy changes and have abstracted from other forces that are undoubtedly important. For example, we have not considered the higher incentives that a country might have to be market oriented when other countries are also market oriented, as well as all other reasons that may lead countries to herd behind the policy choices of other countries. It would be interesting to allow for these policy complementarities and strategic interaction among policymakers of different countries. Similarly, it seems important to enrich our model with explicit political economy dimensions and examine how they interact with the mechanism of beliefs formation that we have presented in this paper. These are our priorities for future research.

Appendix A. The Likelihood Function

Let $\alpha \equiv \left[\left\{ \hat{\beta}^S_{j,0} \right\}_{j=0}^n, \left\{ \hat{\beta}^M_{j,0} \right\}_{j=0}^n, \{\nu_j\}_{j=0}^n, \{\varrho_j\}_{j=1}^n, \{f_j\}_{j=1}^n, \xi, \gamma \right]$ and let ψ denote the set of coefficients that parameterize the true data generating process for GDP growth, which we can leave unrestricted. The likelihood function can be written as a product of conditional densities:

$$\mathcal{L}(D^T|\alpha, \psi, \Pi^T) = \mathcal{L}(D_1|, \alpha, \psi, \Pi_1) \prod_{t=2}^{T} \mathcal{L}(D_t|D^{t-1}, \alpha, \psi, \Pi_t), \tag{A.1}$$

with a slight abuse of notation in which $\mathcal{L}$ is used generically to denote an arbitrary density function. Under the assumption that the distribution of the vector $y_t \equiv [y_{1,t}, ..., y_{n,t}]'$ depends on α only through the vector $\theta_t \equiv [\theta_{1,t}, ..., \theta_{n,t}]'$, it follows that

$$\mathcal{L}(D_t|D^{t-1}, \alpha, \psi, \Pi_t) = \mathcal{L}(y_t|\theta_t, D^{t-1}, \psi, \Pi_t)\mathcal{L}(\theta_t|D^{t-1}, \alpha, \Pi_t) \tag{A.2}$$

$$= \mathcal{L}(y_t|\theta_t, D^{t-1}, \psi, \Pi_t) \prod_{i=1}^{n} \mathcal{L}(\theta_{i,t}|D^{t-1}, \alpha, \Pi_{i,t}) \tag{A.3}$$

This assumption is natural in our framework. It implies that the realization of GDP growth is affected by past and current policy decisions, but does not directly depend on the beliefs that have led to those policy choices. This assumption allows us to evaluate the likelihood function of α without taking a stand on ψ and the true data generating process of GDP growth. It is important to note that, even in those cases in which this assumption is undesirable, our methodology can still be interpreted as a limited-information estimation strategy. Combining (A.1) and (A.3), we obtain the following result:

$$\mathcal{L}(D^T|\alpha, \Pi^T) \propto \prod_{i=2}^{n} \left[\mathcal{L}(\theta_{i,1}|\alpha, \Pi_{i,1}) \cdot \prod_{t=2}^{T} \mathcal{L}(\theta_{i,t}|D^{t-1}, \alpha, \Pi_{i,t}) \right].$$

Since the policy decision is given by

$$\theta_{i,t} = 1\left\{ E_i\left(\beta_i^M|D^{t-1}\right) - E_i\left(\beta_i^S|D^{t-1}\right) > K_{i,t} \right\}, \quad i = 1, ...n,$$

it follows that

$$\begin{aligned}\Pr\left(\theta_{i,t} = 1|D^{t-1}, \alpha, \Pi_{i,t}\right) &= \Pr\left(K_{i,t} < E_i\left(\beta_i^M|D^{t-1}\right) - E_i\left(\beta_i^S|D^{t-1}\right)\right) = \\ &= \Phi\left(\frac{\hat{\beta}_{i,t-1}^M - \hat{\beta}_{i,t-1}^S - f_i - \xi\Pi_{i,t}}{\varrho_i}\right).\end{aligned}$$

This implies

$$\begin{aligned}\mathcal{L}(\theta_{i,t}|D^{t-1}, \alpha, \Pi_{i,t}) &= \Phi\left(\frac{\hat{\beta}_{i,t-1}^M - \hat{\beta}_{i,t-1}^S - f_i - \xi\Pi_{i,t}}{\varrho_i}\right)^{1(\theta_{i,t}=1)} \cdot \\ &\quad \cdot \left(1 - \Phi\left(\frac{\hat{\beta}_{i,t-1}^M - \hat{\beta}_{i,t-1}^S - f_i - \xi\Pi_{i,t}}{\varrho_i}\right)\right)^{1-1(\theta_{i,t}=1)}.\end{aligned}$$

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