

LEARNING THE WEALTH OF NATIONS

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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.

KEYWORDS: Learning, dynamic of policies, economic growth, market-oriented policies, neighborhood effects.

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 do 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, Fischer (1995, p. 102) suggested 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.

In a similar vein, Krueger (1997) argued 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.” The testimony of a central figure in this dismantlement (Margaret Thatcher in Cran (2002)) also hints at the importance of

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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.

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 gross domestic product (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% of the observations correspond to a policy switch in our data set. 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, among other things. 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 toward 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 5–10% 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 redistributive 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), and 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, 2005), Sokoloff and Engerman (2000), and Engerman and Sokoloff (2002) documented 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, 2009), who argued that a country's development does not affect the choice of political regimes if we control for long-run factors (which, in our model are estimated on a shorter sample, are captured by country-specific effects). Our approach is also consistent with Giavazzi and Tabellini (2005), who found strong evidence about the effect of political regimes on economic policies and much weaker evidence of 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 policies or institutions.

Models of policymakers as learning agents have been successfully applied to explain the rise and fall of U.S. 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 (2010)).

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-Schündeln (2007), Alesina and Glaeser (2004), 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 to overcome the problem of the lack of a consistent measure of beliefs for

the many countries and periods that we consider. However, we find that our implied beliefs correlate mostly in the correct direction with the available data from the two leading cross-country surveys (the World Value Survey and the Latinobarometro). Moreover, Aghion et al. (2008), Alesina and Glaeser (2004), and Di Tella and MacCulloch (2007) found 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) found 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 (e.g., 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, that is, 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 5–8, and Section 9 concludes. Data and programs are available in the Supplemental Material (Buera, Monge-Naranjo, and Primiceri (2010)).

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 1 if country i is characterized by a market-oriented economy in period t and equals 0 otherwise. Let $Y_{i,t}$ denote per capita GDP in country i at time t and let $y_{i,t} \equiv \log Y_{i,t} - \log Y_{i,t-1}$ denote its growth rate. Policymakers are in power for one period and choose $\theta_{i,t}$ to solve

$$(2.1) \quad \max_{\theta_{i,t}} E_{i,t-1}[\log Y_{i,t} - \theta_{i,t} K_{i,t}],$$

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,

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

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.² 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 $\varepsilon_t \equiv [\varepsilon_{1,t}, \dots, \varepsilon_{n,t}]'$ is distributed according to

$$(2.3) \quad \varepsilon_t \stackrel{\text{i.i.d.}}{\sim} N(0, \Sigma),$$

where N denotes the Normal distribution.

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 the 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):

$$K_{i,t} = f_i + \xi \Pi_{i,t} + k_{i,t},$$

$$k_{i,t} \stackrel{\text{i.i.d.}}{\sim} N(0, \varrho_i^2).$$

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.

²In Buera, Monge-Naranjo, and Primiceri (2008), we experimented 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 7, we discuss the relationship between the *perceived* law of motion (2.2) and the *actual* law of motion.

2.2. Optimal Policy

Optimal policy at time t is given by

$$(2.4) \quad \theta_{i,t} = 1\{E_{i,t-1}(\beta_i^M) - E_{i,t-1}(\beta_i^S) > K_{i,t}\},$$

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 a country pursues a policy regime that is perceived to be, on average, detrimental to growth, with the sole purpose of learning about it. 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.³

2.3. Learning

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

$$(2.5) \quad \beta \sim N(\hat{\beta}_0; P_0^{-1}),$$

where $\hat{\beta}_0$ and P_0 represent the prior mean and precision matrix, respectively. For the prior covariance matrix, we choose the following parameterization

$$(2.6) \quad P_0^{-1} = I_2 \otimes (V \cdot R \cdot V),$$

³Much simplified versions of this problem have been solved by [Bolton and Harris \(1999\)](#) and [Keller, Rady, and Cripps \(2005\)](#).

where $V = \text{diag}([\nu_1 \sigma_1, \dots, \nu_n \sigma_n])$ and R denotes the a priori correlation matrix. The Kronecker structure implies 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 ($\{\sigma_i\}_{i=1}^n$), that is, the diagonal elements of Σ .

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 :

$$P_t = P_{t-1} + X_t' \Sigma^{-1} X_t,$$

$$\hat{\beta}_t = \hat{\beta}_{t-1} + \underbrace{P_t^{-1} X_t' \Sigma^{-1}}_{g_t} (y_t - X_t \hat{\beta}_{t-1}),$$

where $y_t \equiv [y_{1,t}, \dots, y_{n,t}]'$, $X_t \equiv [\text{diag}(1 - \theta_t), \text{diag}(\theta_t)]$, $\theta_t \equiv [\theta_{1,t}, \dots, \theta_{n,t}]'$ 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 is the initial uncertainty (ν_i) the higher is the relative precision of new observations and the larger is 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_j . 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 effects of policy regimes are the same 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 $z_{i,j}$,

$$(2.7) \quad R_{i,j} = \exp[-z_{i,j}' \gamma],$$

where we constraint $z'_{i,j}\gamma$ to be nonnegative.⁴ 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 country 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 are⁵

| | |
|-----------------------------------|--|
| $\{\hat{\beta}_{j,0}^S\}_{j=0}^n$ | expectation of initial beliefs about the effect of state intervention, |
| $\{\hat{\beta}_{j,0}^M\}_{j=0}^n$ | expectation of initial beliefs about the effect of market orientation, |
| $\{\nu_j\}_{j=0}^n$ | standard deviation of initial beliefs about the effect of state intervention and market orientation, |
| $\{\varrho_j\}_{j=1}^n$ | 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 , and denote by $D^T \equiv \{y_t, \theta_t, \Pi_t\}_{t=1}^T$ the entire set of available data on policies, growth, and countries' political and economic characteristics, then standard application of Bayes rule delivers

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

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

⁴The fact that bivariate correlations are between 0 and 1 does not generally guarantee that a correlation matrix is positive definite if the dimension of the matrix exceeds 2. However, (2.7) belongs to the Matérn family of covariance functions (Matérn (1960)), which guarantees the positive definiteness of R .

⁵For simplicity, we set Σ to its estimated value obtained using the entire set of data (see Section 7).

fit the data well, but only due to implausible estimates of policymakers' initial beliefs. 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 (2010)). 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 prior densities

$$\begin{aligned}\hat{\beta}_{i,0}^S &\sim N(\bar{\beta}_0^S, \omega_\beta^2), & i = 1, \dots, n, \\ \hat{\beta}_{i,0}^M &\sim N(\bar{\beta}_0^M, \omega_\beta^2), & i = 1, \dots, n, \\ \nu_i &\sim \text{IG}(s_\nu, d_\nu), & i = 1, \dots, n, \\ \varrho_i &\sim \text{IG}(s_\varrho, d_\varrho), & i = 1, \dots, n, \\ f_i &\sim N(\bar{f}, \omega_f^2), & i = 1, \dots, n, \\ \xi &\sim \text{Uniform}, \\ \gamma &\sim \text{Uniform}.\end{aligned}$$

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 (2006) data. First of all, the average annual growth rate of per capita GDP of countries in the Maddison data set in 1901–1950 (excluding the years corresponding to the two wars) is approximately 2%. Then we split the countries of the Maddison data set into two groups according to the value in 1950 of an indicator that measures the degree of market orientation; this indicator was constructed by Sachs and Warner (1995) as we describe below. 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 $\sigma_f^2 \cdot \nu_i^2$ should be approximately equal to $\text{var}(\bar{y}_i)$, the variance of the average growth rate of GDP. We obtain an estimate of $\text{var}(\bar{y}_i) = 0.0175^2$ as the variance of the average growth rates of the countries present in the Maddison data set between 1901 and 1950

(excluding the wars).⁶ To obtain an estimate of σ_i^2 based on presample observations, we again use 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 $[(0.0175)^2/0.0044]^{1/2} = 0.264$.

- We select s_θ and d_θ so that θ_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.

- We use a flat prior for the coefficients ξ and γ , which are common to all countries.

3.2. The Likelihood Function

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), that is, 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.

We will specify a “true” DGP in Section 7 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, that is, that, in reality, GDP growth and the determinants of the political cost depend on actual policies and are not directly affected by the beliefs that led to those policies. 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.⁷ 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 and the determinants of the political cost in reality.

⁶There 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 16th and 84th percentiles).

⁷It 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.

With a slight abuse of notation in which \mathcal{L} is used generically to denote an arbitrary density function, the likelihood function can be written as a product of conditional densities:

$$\mathcal{L}(D^T|\alpha) = \mathcal{L}(D_1|\alpha) \prod_{t=2}^T \mathcal{L}(D_t|D^{t-1}, \alpha).$$

Using the assumption mentioned in the previous paragraph, each term of the product equals

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

so that

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

where c is a constant term independent of α . Since the policy decision is given by (2.4), it follows that the conditional density $\mathcal{L}(\theta_{i,t}|\Pi_{i,t}, D^{t-1}, \alpha)$ can be written as

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

where $\Phi(\cdot)$ denotes the cumulative distribution function (cdf) of a standard Gaussian density.

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

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 mea-

surement 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 (1995; hereafter SW) indicator of liberalizations.

This indicator was originally constructed as a measure of openness to international trade. In particular, SW argued 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 required the following five criteria to classify a country as "open":

- (i) The average tariff rate on imports is below 40%.
- (ii) Nontariff 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 0.⁸

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" (MO) if the SW indicator is equal to 1 and as "state interventionist" (SO) if it is equal to 0.

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 re-

⁸Since a complete panel data set with all these criteria is not available for the entire postwar period, SW and Wacziarg and Welch (2008) performed a complementary country by country analysis of large reform episodes to find out whether large changes in policies led a country not to meet (or start meeting) some of these criteria. This extended data set is referred to as the panel of liberalization dates.

vised the information used to classify the countries.⁹ The data are an unbalanced panel, partly because separations and unifications have led to starting or stopping 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 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 (thin, solid line with scale on the left-hand side axis). In 1950, only about 30% of the countries qualified as market ori-

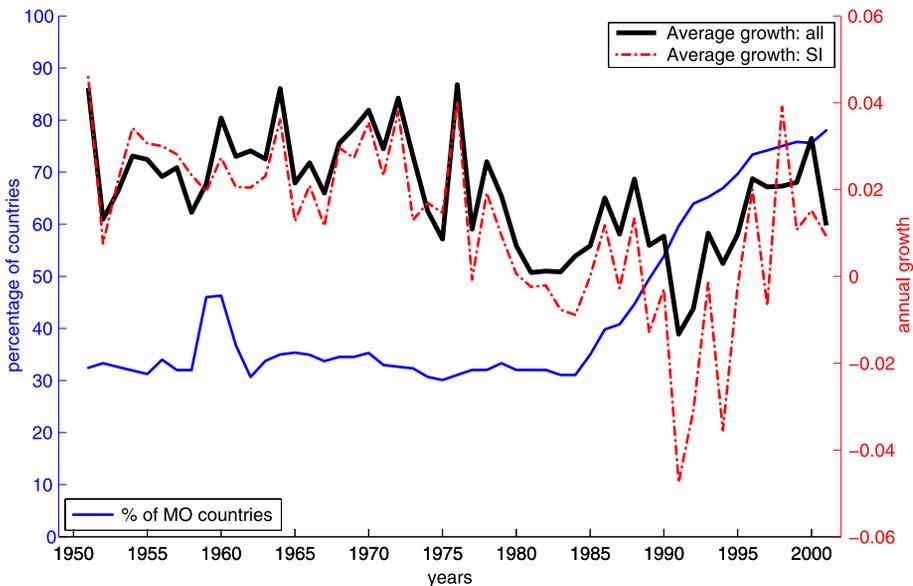


FIGURE 1.—World average of market orientation and growth.

⁹For example, SW applies 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 by Wacziarg and Welch led more countries to be classified as market oriented relative to the original SW measure.

ented. 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 did not exhibit a clear trend. However, in 1985 we observe the beginning of a global movement toward market orientation that continues until the end of the sample. By 2001, the fraction of market economies had increased to almost 80%.

The worldwide 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 transition to market economies only later on. Earlier transitions toward 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 rela-

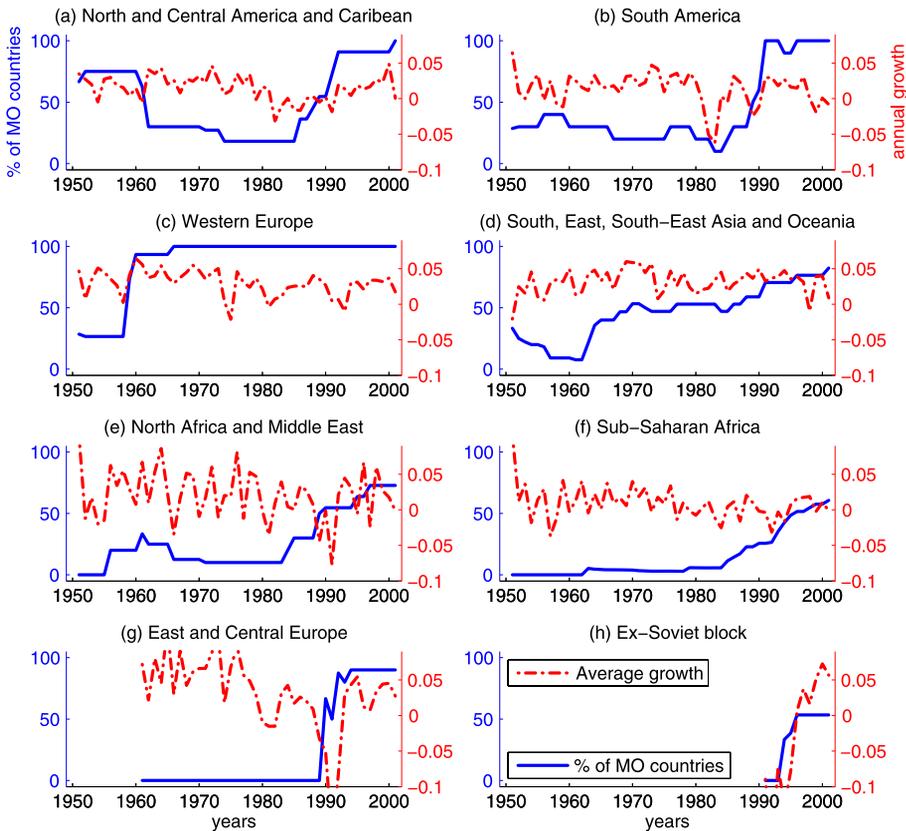


FIGURE 2.—Regional patterns of market orientation and growth.

tively 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 United States and Canada remained market friendly between 1960 and 1985. After the crisis in the 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*

To relate policy choices and past growth performances, Figure 1 also plots the (unweighted) average growth rate of per capita GDP (thick, solid line with scale on the right-hand-side axis).¹⁰ 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 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 data set and from Fearon and Laitin (2003), respectively. The Polity IV data set is the most widely used data set 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). We use the dummy variable on civil wars from Fearon and Laitin (2003). Fearon and Laitin classified a country to be in a civil war (indicated by a value of 1 for the variable) if it was engaged in a military conflict that satisfied some minimum criteria.¹¹

Figure 3 shows a remarkable trend toward democracy during the second part of the sample, which is likely to be an important force behind the run-up

¹⁰GDP data are obtained from Penn World Table 6.2.

¹¹The 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 1000 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).

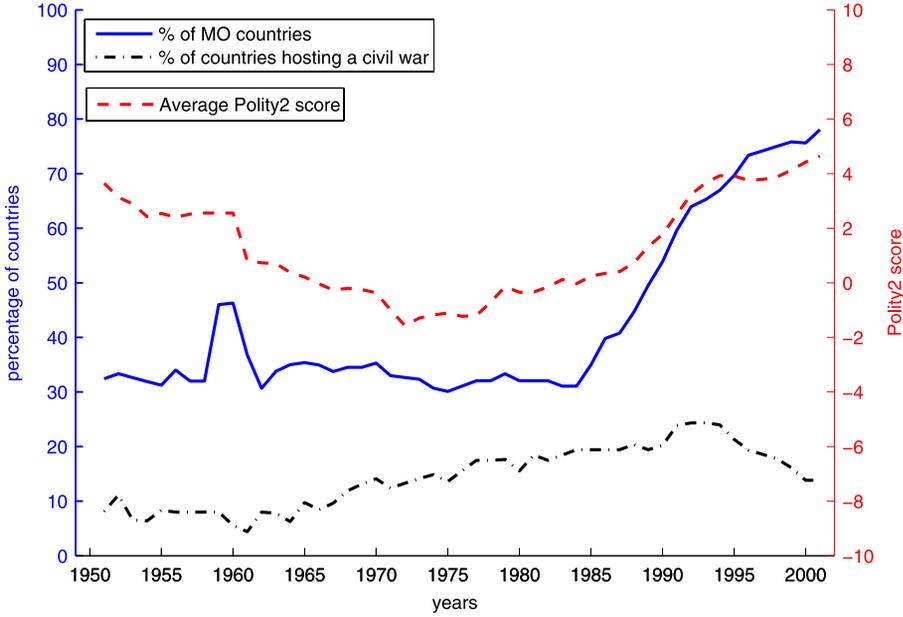


FIGURE 3.—World average of market orientation and political variables.

toward 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 further examine the relationship between policy decisions and observed growth rates, and highlight salient (partial) correlations in the data. In particular, we show that a country's choice of being market oriented or state interventionist is correlated with the fraction of neighboring countries following these policies and their past growth performances, even after controlling for other political and economic variables, as well as country and time fixed effects.

Specifically, we consider the linear probability model

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

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 ($\hat{E}_{i,t-1}(y|\theta = 1)$ and $\hat{E}_{i,t-1}(y|\theta = 0)$).¹²

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 orientation upward (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)).

Columns 1–4 of Table I present the estimation results of equation (4.1) on our data. These results can be interpreted either as maximum likelihood estimates or as posterior modes with uninformative priors. In column 1, we estimate a simplified version that excludes $\bar{\theta}_{i,t-1}$ from the regressors and sets $\delta = 2500$, which fixes the effective neighborhood of the median country, defined as $\sum_{j \neq i} e^{-d_{ij}/\delta}$, 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, that is, optimizing over δ (columns 3 and 4); and, finally, controlling for the political and economic environment, as measured by the Polity2 score, log-relative GDP, and the Fearon and Laitin indicator for civil wars (column 4).

Table I reveals three robust features of the data that which are consistent with the predictions of our structural model. First, policies are very persistent (second row). The probability that a country that was market oriented in period $t - 1$ keeps the same policy in period t is 85–96% 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

¹²Formally, we define $\hat{E}_{i,t-1}(y|\theta) = \frac{\sum_{s=1}^3 \sum_{j:\theta_{j,t-s}=\theta} e^{-d_{ij}/\delta} y_{j,t-s}}{\sum_{s=1}^3 \sum_{j:\theta_{j,t-s}=\theta} e^{-d_{ij}/\delta}}$, $\theta = 0, 1$, and $\bar{\theta}_{i,t-1} = \frac{\sum_{j \neq i} e^{-d_{ij}/\delta} \theta_{j,t-1}}{\sum_{j \neq i} e^{-d_{ij}/\delta}}$.

TABLE I
ESTIMATION RESULTS OF THE REDUCED-FORM LINEAR PROBABILITY MODEL
AND PROBIT MODEL (COLUMN 5)

| | (1) | (2) | (3) | (4) | (5) |
|---------------------------------|---------------------|--------------------|-----------------------|-----------------------|---------------------|
| Constant | 0.037*** (0.005) | | | | |
| $\theta_{i,t-1}$ | 0.958** (0.004) | 0.88*** (0.01) | 0.87*** (0.01) | 0.86*** (0.01) | 0.43*** (0.02) |
| $\hat{E}_{i,t-1}[y \theta = 1]$ | 0.04 (0.16) | 0.39* (0.22) | 0.60* (0.35) | 0.54* (0.34) | 0.99** (0.45) |
| $\hat{E}_{i,t-1}[y \theta = 0]$ | -0.58*** (0.11) | -0.69*** (0.19) | -0.77*** (0.29) | -0.59** (0.28) | -1.02* (0.55) |
| $\bar{\theta}_{i,t-1}$ | | | 0.13*** (0.03) | 0.13*** (0.03) | 0.08 (0.06) |
| Polity IV | | | | 0.0019*** (0.0005) | 0.001 (0.0008) |
| Log-relative GDP | | | | -0.0014 (0.0086) | -0.0092 (0.0205) |
| Civil wars | | | | -0.0107 (0.0076) | -0.0207 (0.0129) |
| δ | 2500 | 2500 | 3849.8*** (1112.0) | 3280.4*** (987.6) | 2449** (1093) |
| Country-specific effect | No | Yes | Yes | Yes | Yes |
| Time effect | No | Yes | Yes | Yes | Yes |

Note: *, **, and *** denote significant at the 10%, 5%, and 1% levels.

(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%) 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).

We have opted for a linear probability model as the simplest framework to highlight some key (partial) correlations in the data. To check robustness, we have also experimented with a Probit specification and obtained similar results, as illustrated by column 5 of Table I, although the estimation of nonlinear models with fixed effects suffers from the incidental parameters problem (see Neyman and Scott (1948) or Chamberlain (2010)). Available approaches to tackle the incidental parameters problem in dynamic discrete choice models tend not to apply or to be feasible in our framework with lagged dependent explanatory variables, not strictly exogenous regressors, unbalanced panels, and a relatively small cross-sectional dimension (see Lancaster (2000), Honore and Kyriazidou (2000), or Arellano and Hahn (2007)).

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-country specific. In other words, all countries discount the information from all other countries differently, depending on their geographic location. This feature breaks the symmetry that causes the collinearity problem. On the other hand, the fact that we estimate the structure of groups adds a nontrivial 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 nonlinearity makes identification less problematic, although, to the best of our knowledge, dependent on the specific nonlinear structure that we postulate (Brock and Durlauf (2001a, 2001b)).

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 kilometers (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 5 years) of a country's GDP relative to the United States ($rY_{i,[t-5,t-1]}$), (iii) the Polity2 score ($\pi_{i,t}$), and (iv) the civil war dummy of Fearon and Laitin (2003) ($cw_{i,t}$). From each of these variables, we subtract their pooled means (except, of course, to the country-specific effects) to normalize the expected political cost, of market orientation to be equal to zero for the average country/year. We also present some alternative specification of the political cost including additional time-varying explanatory variables.

5.1. Parameter Estimates

Table II reports the posterior estimates of the coefficients parameterizing the structure of the prior correlation (γ) and the political cost (ξ). The second 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 1000 km apart, while it becomes only about 0.5 for countries 5000 km distant 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

TABLE II
 COEFFICIENT ESTIMATES IN THE BASELINE MODEL AND VARIOUS ALTERNATIVE MODELS
 WITH DIFFERENT SPECIFICATIONS OF THE STRUCTURE OF THE POLITICAL COST

| | Baseline (M ₁) | M ₂ | M ₃ | M ₄ | M ₅ | M ₆ |
|--------------------------------|----------------------------|----------------|----------------|----------------|----------------|----------------|
| Prior Correlation (γ) | | | | | | |
| $d_{i,j}$ | 0.152 | 0.163 | 0.150 | 0.181 | 0.265 | 0.155 |
| Geographic distance | (0.021) | (0.022) | (0.018) | (0.055) | (0.032) | (0.022) |
| Political Cost (ξ) | | | | | | |
| $rY_{i,[t-5,t-1]}$ | -0.0035 | -0.0031 | -0.0042 | -0.0051 | 0.0097 | -0.0157 |
| Log-relative GDP | (0.0015) | (0.0015) | (0.0018) | (0.0017) | (0.0019) | (0.0021) |
| $\pi_{i,t}$ | -0.0007 | -0.0006 | -0.0005 | -0.0006 | -0.0005 | -0.0001 |
| Polity2 | (0.0001) | (0.0001) | (0.0001) | (0.0001) | (0.0001) | (0.0001) |
| $cw_{i,t}$ | 0.0048 | 0.0045 | 0.0048 | 0.0054 | 0.0047 | 0.0094 |
| Civil wars | (0.0011) | (0.0013) | (0.0012) | (0.0012) | (0.0006) | (0.0015) |
| $\pi n_{i,t}$ | | -0.0012 | | | | |
| Polity2 (neighbors) | | (0.0002) | | | | |
| $wn_{i,t}$ | | -0.0025 | | | | |
| Civil wars (neighbors) | | (0.0008) | | | | |
| $sc_{i,t}$ | | | 0.169 | | | |
| Soviet controlled | | | (0.096) | | | |
| $\text{inf}_{i,[t-5,t-1]}$ | | | | -0.0003 | | |
| Inflation | | | | (0.0001) | | |
| $\text{td}_{i,t-1}$ | | | | 0.0054 | | |
| Trade deficit | | | | (0.0047) | | |
| $\text{edu}_{i,t}$ | | | | | -0.0088 | |
| Education | | | | | (0.0006) | |
| Country-specific effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Time effect | No | No | No | No | No | Yes |
| Number of observations | 4641 | 4641 | 4641 | 3903 | 3951 | 4641 |

the evolution of policymakers' beliefs about the effect of state intervention and market orientation on growth.

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. 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 argued 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 $(rY_{i,[t-5,t-1]} - \bar{rY})$, the deviation of log-relative GDP from the pooled mean, [Figure 4\(a\)](#) 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 they have a common standard deviation of the political cost, $\varrho_i = 0.53\%$, which corresponds to the mean estimate

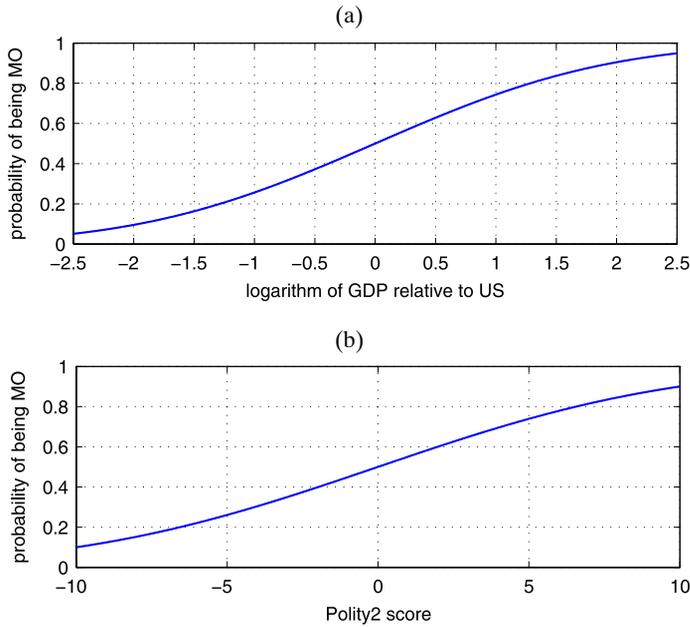


FIGURE 4.—Probability of being market oriented as a function of (a) the logarithm of GDP relative to the United States and (b) the Polity2 score for the average country.

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 United States has a 90% probability of being market oriented, while a country with only 10% of the U.S. per capita GDP (e.g., Zambia) has only a probability of 10% of being market oriented.

We also find that more democratic countries seem to have a lower political cost of being market oriented. Figure 4(b) 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, the average country is 30% less likely to be market oriented if it hosts a civil war.

The third through seventh columns of Table II refer 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 1 if a country was a member of the Warsaw Pact and, therefore, under Soviet Union military control ($sc_{i,t}$). Model \mathbf{M}_4 includes the aver-

age level of inflation over the past 5 years ($\text{inf}_{i,t-5,t-1}$) and the trade deficit ($\text{td}_{i,t-1}$) of a country as proxies for its macroeconomic stability. In model \mathbf{M}_5 , we control for the average years of schooling in the country's total population ($\text{edu}_{i,t}$), measured using the data set of Barro and Lee (2001).¹³ Finally, in model \mathbf{M}_6 , we augment our baseline specification of the political cost of market orientation with a time effect.

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. However, the statistical significance of this coefficient is weak, which is also the case for the coefficients on inflation in \mathbf{M}_4 . A higher level of education seems to be associated with a lower political cost of market orientation, consistent with the findings of Mayda and Rodrik (2005). 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. One exception is \mathbf{M}_5 , where the addition of the education variable perversely reverts the sign of the coefficient on relative GDP. Finally, the seventh column indicates that the inclusion of a time effect decreases the importance of the Polity2 score, increases the relevance of log-relative GDP and the civil war dummy, and does not change the estimate of the prior spatial correlation.

5.2. Model's Fit

In this subsection we use different criteria to assess how well our model fits the data. 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 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 toward market orientation starting in the mid 1980s.

¹³Due to the limited coverage of the data set of Barro and Lee (2001) relative to ours, we used an extrapolation procedure to obtain data for the years 1950–1959 and 2000–2001.

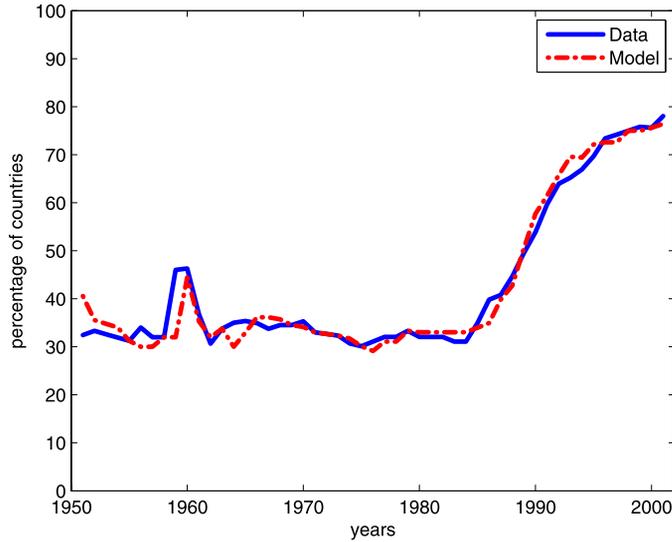


FIGURE 5.—Actual and model-predicted fraction of market-oriented countries.

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 III presents a quantitative assessment of the fit of the model. Focusing on the second 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 challenging test, because we only observe 101 policy switches in our data set (2% of the total policies). We are therefore quite satisfied with the performance of the model along this dimension.

Table III also reports the fit of the five alternative specifications of the political cost that we presented above. Notice that models M_2 , M_3 , and M_4 fit the data essentially as well as M_1 , validating our choice of the baseline. More substantive fit improvements can be seen for the model including education (M_5) and the one with a time effect (M_6). In particular, M_6 performs better especially in terms of explaining policy switches at short horizons, which 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

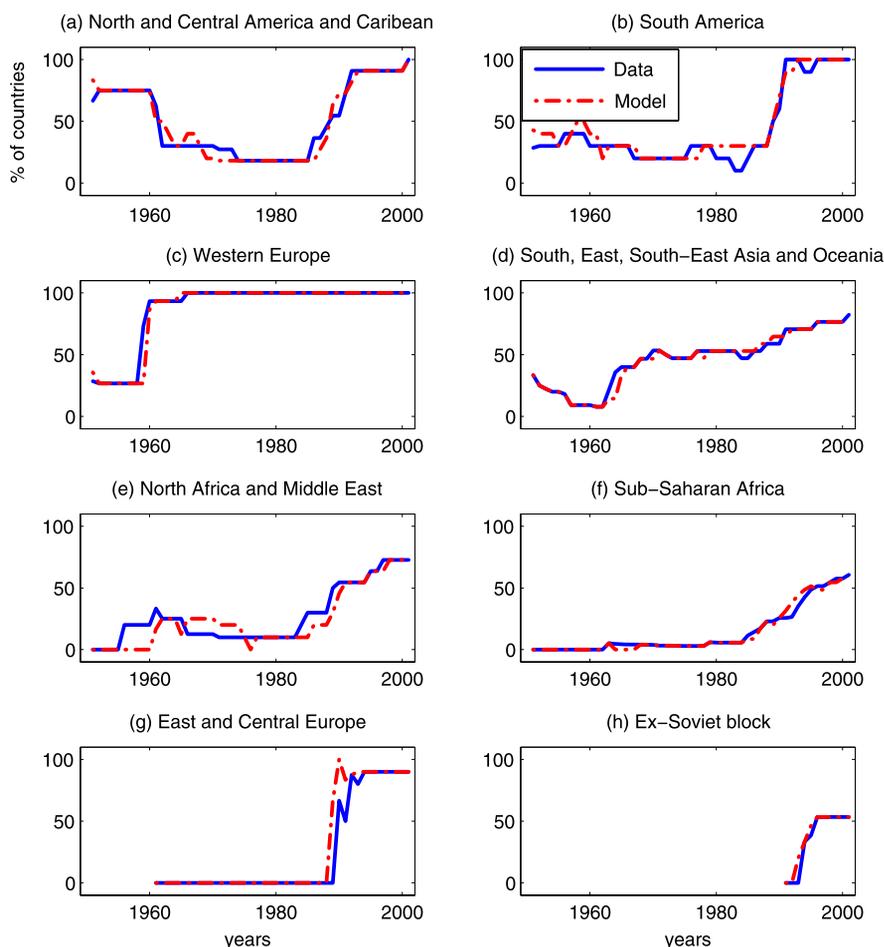


FIGURE 6.—Actual and model-predicted fraction of market-oriented countries across regions.

TABLE III

MEASURES OF FIT FOR THE BASELINE MODEL AND VARIOUS ALTERNATIVE MODELS WITH DIFFERENT SPECIFICATIONS OF THE STRUCTURE OF THE POLITICAL COST

| | Baseline (M_1) | M_2 | M_3 | M_4 | M_5 | M_6 |
|---------------------------------------|--------------------|---------|---------|---------|---------|---------|
| Log-likelihood | -419.49 | -384.61 | -413.33 | -381.11 | -310.71 | -275.21 |
| Share of correct predictions | 96.6% | 97.0% | 96.6% | 96.3% | 97.1% | 97.9% |
| Share of correctly predicted switches | | | | | | |
| ±0-year window | 25.8% | 28.0% | 26.9% | 26.7% | 29.1% | 58.1% |
| ±1-year window | 53.8% | 58.1% | 57.0% | 51.9% | 68.3% | 75.3% |
| ±2-year window | 74.2% | 77.4% | 74.2% | 74.7% | 81.0% | 80.6% |
| ±3-year window | 77.4% | 81.7% | 78.5% | 77.2% | 84.8% | 87.1% |

that take into account the increased number of parameters (i.e., the Bayesian information criterion).¹⁴

5.3. *The Role of Learning and the 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 is crucial to explain the observed dynamics of market-oriented policies.

To evaluate the contribution to fit of the learning component of the model, we simply reestimate 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 second column of Table IV 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 kept the same policy in place for the entire postwar period. As we argued earlier, a much more challenging task is predicting policy switches. As is clear from Table IV, 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 (second

TABLE IV
MEASURES OF FIT WHEN THE LEARNING MECHANISM IS TURNED OFF

| | Baseline (M_1) | M_2 | M_3 | M_4 | M_5 | M_6 |
|---------------------------------------|--------------------|---------|---------|---------|---------|--------|
| Log-likelihood | -1282.5 | -1114.8 | -1280.4 | -1066.4 | -701.11 | -484.7 |
| Share of correct predictions | 85.5% | 88.7% | 85.5% | 88.9% | 92.0% | 95.8% |
| Share of correctly predicted switches | | | | | | |
| ± 0 -year window | 5.4% | 10.7% | 6.4% | 7.6% | 26.6% | 50.5% |
| ± 1 -year window | 14.0% | 20.4% | 15.0% | 21.5% | 41.8% | 65.6% |
| ± 2 -year window | 22.6% | 26.9% | 22.6% | 24.1% | 46.8% | 66.7% |
| ± 3 -year window | 24.7% | 31.2% | 24.7% | 25.3% | 49.4% | 69.9% |

¹⁴Of 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.

column of Table III) is mainly due to the presence of the learning mechanism that we emphasize in this paper.

The third through seventh columns of Table IV 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 or the indicators of macroeconomic stability (M_2 , M_3 , and M_4) alter the result that learning is essential. The addition of average years of schooling (M_5) slightly improves the performance of the model without learning, although the model with learning still fits the data substantially better. Moreover, it is important to recall that this model is estimated on a smaller data set relative to the baseline.

Finally, as one would expect, the use of time effects enhances the performance of the models without learning (M_6), whose fit becomes comparable to our baseline. We want to stress that, by construction, the time effect in M_6 captures the average evolution of market-oriented policies over time. This is not our preferred specification because it is fundamentally against the spirit of our learning model, which can be interpreted as providing a structural explanation and interpretation for the time effect. 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.¹⁵

The intuition for the good empirical performance of the learning model is due to two main features of the data. First, learning is capable of explaining 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

¹⁵For the model with a time effect, we have assumed that the value of the time effect remains unchanged relative to its estimate in 1990.

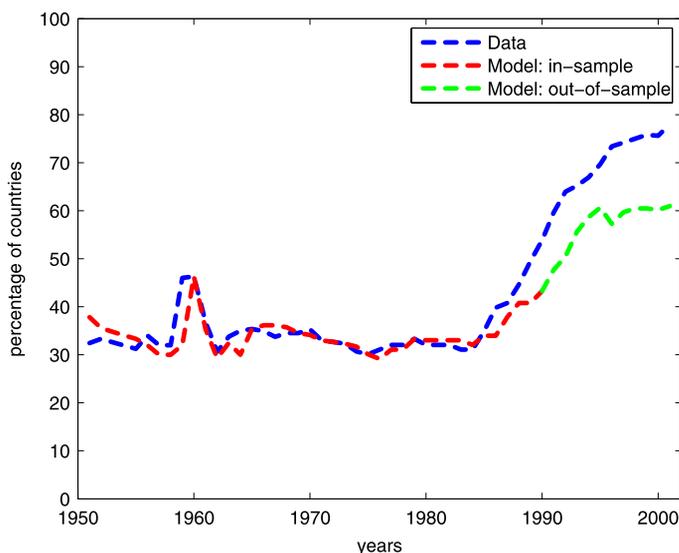


FIGURE 7.—Actual and model-predicted fraction of market-oriented countries.

the lens of the model, past growth experiences are important determinants of beliefs and policy dynamics.

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 8 plots the time evolution of the empirical distribution of $\{\hat{\beta}_{i,t}^{M*} - \hat{\beta}_{i,t}^{S*}\}_{i=1}^n$, that is, 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 10–90th percentiles of the distribution, while the darkest shade denotes the 40–60th 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 toward favoring market-oriented regimes. By 2001, the histogram of implied $\{\hat{\beta}_{i,T}^{M*} - \hat{\beta}_{i,T}^{S*}\}_{i=1}^n$ has moved upward, 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 differ-

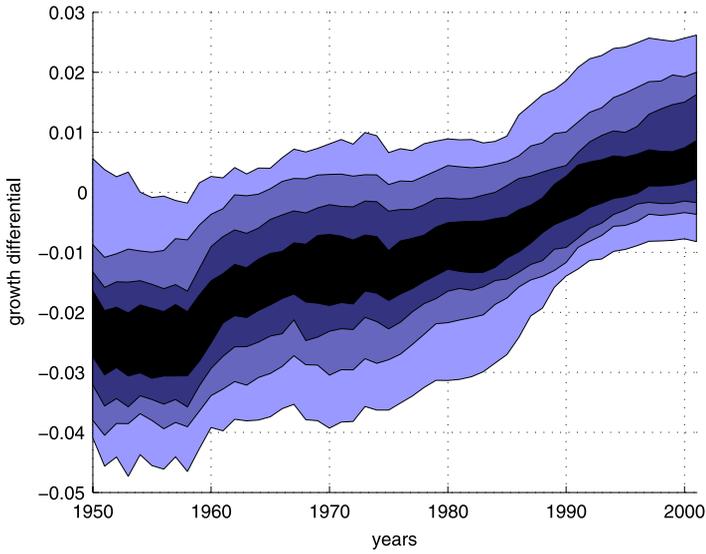


FIGURE 8.—Evolution over time of the empirical distribution of $(\hat{\beta}_{i,t}^{M*} - \hat{\beta}_{i,t}^{S*})_{i=1}^n$, that is, the difference between the posterior mode of the mean of policymakers' beliefs about the effect of market-oriented and state-interventionist policies on growth.

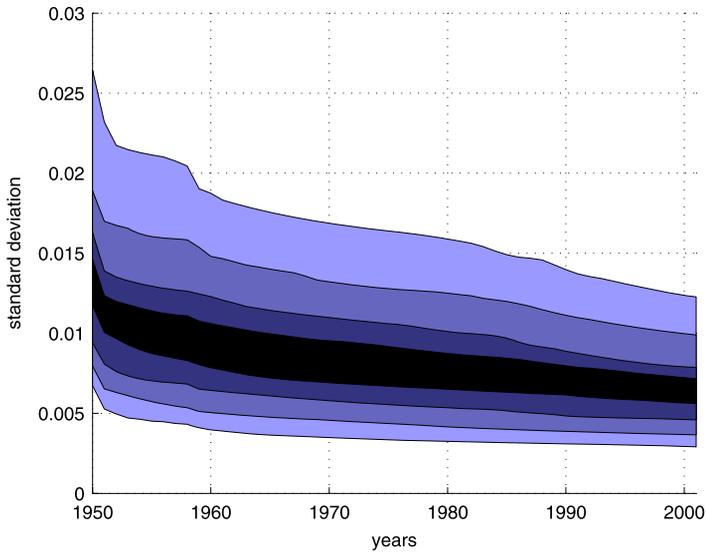


FIGURE 9.—Evolution over time of the empirical distribution of the uncertainty about the difference between average growth under market orientation and state intervention.

ential effect of these policies is substantial. By 2001, countries have 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 at which the vast majority of policymakers are convinced that a market-oriented regime is beneficial for economic growth?* Figures 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 data set 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 United States, Western Europe, and countries like Hong Kong or Singapore belong to this small group, while many developing countries belong to the rest.

5.4. The Model's Implied Beliefs and Survey Data

In the previous sections, we have argued that our estimated learning model fits the policy data well. As an additional validation exercise, in this subsection we show that the beliefs implied by our model are positively correlated with available cross-country survey data on beliefs.

The World Value Survey (WVS) and the Latinobarometro interview a large number of individuals in different countries on their views and expectations on many social, cultural, and economic issues. The WVS has conducted five “waves” of interviews in all the regions of the world. Of these waves, only the first four overlap with our sample, that is, those conducted in 1981–1984, 1989–1993, 1994–1999, and 1999–2004. The Latinobarometro has collected opinions in 16 Latin American countries since 1995 and from this survey we can use responses for the years 1995, 1998, 2000, and 2001.

The comparison between our model's implied beliefs and these survey data faces two challenges. First there are no questions in the survey that exactly match the model's notion of beliefs about the growth implications of policies, that is, $\hat{\beta}_{i,t}^{M*} - \hat{\beta}_{i,t}^{S*}$. From the many questions asked, we selected those that, ex ante, in our opinion, were conceptually closest. Table V lists them in descending order according to this criterion. The second challenge is data availability, since the most relevant questions are usually available only for a small subset of countries and years, as also indicated in Table V.

For each question, we compute country/year averages of the individual answers. Table V reports the correlation of the resulting indicator with our model's implied beliefs, that is, $\hat{\beta}_{i,t}^{M*} - \hat{\beta}_{i,t}^{S*}$. The last column of the table also

TABLE V
CORRELATIONS OF THE MODEL'S IMPLIED BELIEFS WITH AVAILABLE SURVEY DATA

| Survey | | Variable | | | | | | |
|---------------------------|------------------------------------|--------------|-------|----|-----|--|----------|------|
| | | Availability | | | | Correlation With $\hat{\beta}_{i,t}^{M*} - \hat{\beta}_{i,t}^{S*}$ | | |
| World Values Survey (WVS) | | # Obs. | Waves | | | | Estimate | Fit? |
| Code | Description | | I | II | III | IV | | |
| E127 | Market economy right for country | 10 | | | x | | -0.76 | Yes |
| E062 | Allow or restrict imports | 49 | | | x | | -0.13 | Yes |
| E036 | Private or state owned business | 98 | x | x | x | | -0.06 | Yes |
| E037 | Government must provide | 100 | x | x | x | | 0.20 | Yes |
| E039 | Competition: good or harmful | 90 | x | x | x | | 0.06 | Yes |
| E042 | State should control or free firms | 30 | | | x | | 0.03 | Yes |
| E040 | Success: hard work or connections | 66 | x | x | | | -0.13 | No |
| Latinobarometro | | # Obs. | Years | | | | Estimate | Fit? |
| Code | Description | | 95 | 98 | 00 | 01 | | |
| C602 | Market economy is best for country | 32 | | x | x | | -0.26 | Yes |
| C604 | Private enterprise is beneficial | 16 | | x | | | -0.25 | Yes |
| C601 | Prices determined by competition | 48 | | x | x | x | -0.29 | Yes |
| C506 | Government must solve problems | 16 | | | | x | -0.26 | No |
| C504 | Pay better more efficient workers | 8 | x | | | | 0.14 | No |
| C603 | Encourage foreign investment | 32 | | x | | x | -0.37 | Yes |

specifies whether these correlations have the expected sign, depending on the numerical scale and the structure of each question.

The most closely related questions in both surveys ask whether markets are perceived to be beneficial for the country. In both cases, we find that the responses are aligned with the predictions of our model. Indeed, even for a small number of observations, the correlation is surprisingly strong in the WVS. The other indicators capture views about the desirability of government intervention, the operation of firms, and whether private enterprise, competition, or international trade (imports) are perceived as desirable. We also include C603 (encouragement of foreign investment) from the Latinobarometro, since incentives to foreign investment have been strongly associated to pro-openness policy agendas in Latin America during the 1990s. It is important to keep in mind that these indicators, and many others in the two surveys, are less relevant for our purposes since they capture views on specific dimensions of government intervention or redistributive beliefs, which can be perfectly compatible with a country having a SW indicator of 1, for example, the welfare state in Western Europe. Moreover, other questions such as E042 (whether firms should be free or state controlled) in the WVS, refer to current policies as opposed to absolute views on regulation of firms. Nevertheless, with a few exceptions, the results for these other indicators are also in line with the predictions of our

model. However, we view these positive results as merely suggestive, due to the data limitations highlighted above.

6. A COMPETING HYPOTHESIS

An alternative explanation for the adoption of market-oriented policies is that instead of learning, policymakers perfectly know the model's parameters and their drift over time. Fitting the data would then require that market-oriented policies were inferior during the 1950s, 1960s, and 1970s, and since the mid 1980s these policies have become the most convenient option.

A natural rationalization of such a story could be based on trade complementarities, because some of the benefits of market-oriented policies come from trade with other countries. Since trade expands when other countries are also market oriented, free markets might have been suboptimal until the 1980s—because potential trade partners were interventionists—while they might have become optimal in the 1990s, once worldwide trade openness enhanced trade opportunities for all countries. To evaluate the empirical merit of this alternative hypothesis, in this subsection we assume that policymakers base their policy choices on a modified version of model (2.2):

$$(6.1) \quad y_{i,t} = \beta_i^S(1 - \theta_{i,t}) + (\beta_i^M + \beta^{MM} \bar{\theta}_{-i,t-1})\theta_{i,t} + \varepsilon_{i,t},$$

where $\bar{\theta}_{-i}$ represents an average of other countries' policies and the benefits of market orientation vary endogenously over time with the policy decisions of other countries. Presumably, $\beta^{MM} > 0$ and policy decisions are strategic complements.¹⁶ We estimate equation (6.1) on our data, using four different proxies for $\bar{\theta}_{-i}$: (i) the average policy of the other countries in country- i 's region; (ii) the distance-weighted average policy of other countries, setting the effective neighborhood to 20 countries (similar to the formulation used in Section 4.4); (iii) the average volume of trade, (imports + exports)/GDP, of the other countries in country- i 's region; and (iv) the distance-weighted average volume of trade of other countries. In all four cases, we experiment with pooled, fixed effect, and fixed and time effect panel regressions. Not one of our estimates of β^{MM} is statistically significantly greater than zero. Even worse, using proxies (iii) and (iv), we obtain negative point estimates for β^{MM} . Therefore, these results do not provide support for the conjecture that market orientation was useless in the first part of the sample, due to the scarcity of trade partners. Moreover, even if we pick the highest point estimate, $\beta^{MM} = 0.0096$ (achieved with proxy (ii) in the regression with fixed and time effects), and give our policymakers the knowledge of this coefficient, the model without learning can only explain 26.9% of the policy switches within a ± 3 -year window.

¹⁶We have modeled strategic interaction with a lag to abstract from the possibility of multiple equilibria and the related complications in evaluating the likelihood function (Tamer (2003)).

To explain at least about 50% of the policy switches, we need $\beta^{MM} = 0.03$, the highest point estimate plus 2 standard deviations. This suggests that an explanation of the data along these lines requires a theory not only of economic, but also (geo)political complementarities, which might be interesting to explore in future research. Moreover, integrating these complementarities into our learning framework seems a promising development. In such a model, learning the benefit of market-oriented policies could provide impetus to the flows of liberalizations, while strategic complementarities could constitute an important propagation mechanism.

7. A “TRUE” DATA-GENERATING PROCESS AND THE MOVEMENT TOWARD 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 also serves our second purpose, that is, examining what factors—if any—are responsible for the slow adoption of market orientation around the world, which our model fits well.

7.1. The True DGP

We assume that the true DGP is a hierarchical linear model, that is, the flexible statistical representation of the postwar growth data is

$$(7.1) \quad y_{i,t} = b_i^S(1 - \theta_{i,t}) + b_i^M \theta_{i,t} + e_{i,t}, \quad i = 1, \dots, n,$$

$$(7.2) \quad e_t \sim N(0, S \cdot Q \cdot S),$$

where $b \equiv [b_1^S, \dots, b_n^S, b_1^M, \dots, b_n^M]$, 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

$$(7.3) \quad b \sim N(\bar{b}, \zeta^2 \cdot I_2 \otimes (S \cdot W \cdot S)),$$

where $\bar{b} \equiv [1_n \cdot \bar{b}^S, 1_n \cdot \bar{b}^M]$ and 1_n is an $n \times 1$ vector of ones, while \bar{b}^S , \bar{b}^M , and ζ are scalar parameters. The elements of the $n \times n$ correlation matrix W are modeled as

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

which allows for the possibility of spatial correlation.¹⁷

Specifying the true DGP as a hierarchical linear model is appealing for several reasons. First, equation (7.1) 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 (7.1)–(7.3), policymakers endowed with model (2.2) and priors (2.5) 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 (2.5) and (7.3) is useful to understand the extent to which policymakers' initial beliefs in 1950 were sensible, in light of the postwar data.

Consistent with our learning model, policies are predetermined with respect to e_t . Therefore, the likelihood function can be evaluated using the procedure described in Gelman, Carlin, Stern, and Rubin (2004). The estimation results, reported in Table VI, can be interpreted either as maximum likelihood estimates or as posterior modes and standard deviations under uninformative priors.

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). However, our estimate of the realized vector b indicates that the growth impact of market orientation is greater than that of state intervention in most coun-

TABLE VI
ESTIMATES OF THE HIERARCHICAL LINEAR MODEL

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

¹⁷For symmetry, we also allow the growth shocks to be spatially correlated by assuming that $Q_{i,j} = a \cdot \exp[-d_{i,j} \cdot \varkappa]$.

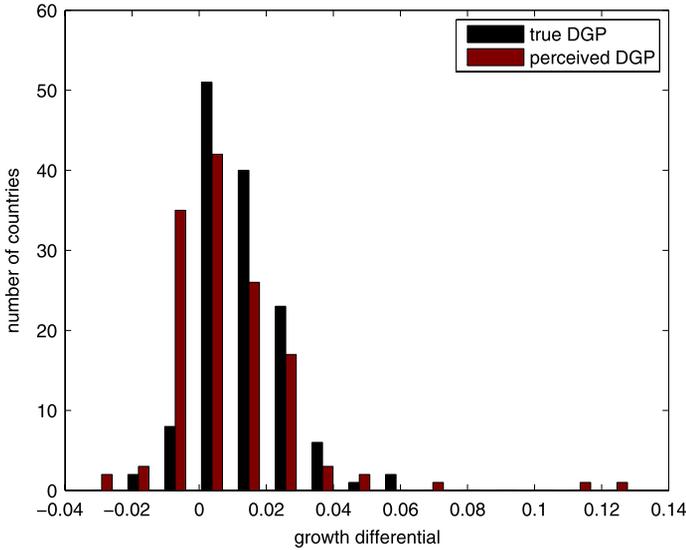


FIGURE 10.—Empirical distribution of $\{b_i^{M*} - b_i^{S*}\}_{i=1}^n$, that is, the difference between the true DGP maximum likelihood estimate of average growth under market orientation and government intervention, and $\{\hat{\beta}_{i,T}^{M*} - \hat{\beta}_{i,T}^{S*}\}_{i=1}^n$, that is, the difference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

tries. This suggests that countries underperforming under state intervention are scattered around the world, while countries performing well under market orientation tend to be clustered together. Therefore, when the model is allowed to account for this spatial correlation structure (captured by the estimate of λ), each of these individual observations tends to be overweighted (for the scattered countries) or underweighted (for the clustered countries). Figure 10 illustrates this point by plotting the empirical distribution of $\{b_i^{M*} - b_i^{S*}\}_{i=1}^n$, that is, the difference between the 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 10th and 90th percentiles equal to 0% and 2.8%, respectively.

To understand why the effectiveness of these policies exhibits geographical dispersion, we think that it may be useful to interpret our DGP as a reduced-form representation of a more general framework in which the interaction of market orientation and possibly other policies and institutions is important for growth. For instance, it could be the case that being market oriented is more beneficial in combination with other institutions that favor the persistent development of the private sector (e.g., rule of law, good enforcement of contracts, or efficient safety nets). If so, the “reduced-form” effectiveness of market orientation will inherit the possibly strong cross-country dispersion and spatial correlation of these other policies and institutions.

For comparison, Figure 10 also plots the empirical distribution of $\{\hat{\beta}_{i,T}^{M*} - \hat{\beta}_{i,T}^{S*}\}_{i=1}^n$, that is, 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 133.¹⁸ 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.

Finally, given the estimates of the heterogeneous effects of policies in the true DGP and those of the political cost of market orientation, we ask which countries should efficiently choose to be interventionists by the end of our sample. Our results suggest that only two countries would experience large gains under state-interventionist regimes: Iraq and Sri Lanka. This is due to their high country-specific political cost, their low level of development, the presence of a civil war (in Sri Lanka), and a dictatorship (in Iraq). We also find that five additional countries would have some more modest benefits under state intervention: Belarus, India, Moldova, Pakistan, and Syria. With the exception of Moldova, this is explained by the fact that market orientation in these countries entails high political costs, despite leading to faster growth. In all of these cases, however, the gains of state-interventionist policies are likely to disappear as these countries develop, their governments become more democratic, and their civil wars come to an end.

7.2. *The Late Movement Toward 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 the initial uncertainty and the mean of policymakers' priors. 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

¹⁸These 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.

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%. With this increase, the mean of $\{\nu_i\}_{i=1}^n$ equals the estimate of ζ , that is, 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 not have substantially speeded up the adoption of market-oriented policies.

In a second experiment, we shift the mean of policymakers' initial beliefs in 1950 so that the prior mean of the average country is equal to our estimate of \bar{b}^S and \bar{b}^M , obtained using the entire post-1950 sample. In other words, we ask what would have happened if policymakers' initial beliefs in 1950 had been on average as favorable toward market orientation as suggested by the full-sample estimation. Obviously, with these counterfactual initial priors, many more countries should have been market oriented in the early 1950s. However, the superior performances (and the prevalence) of interventionist regimes in the 1950s would have very quickly shifted policymakers' beliefs back toward favoring state intervention and the median country would have become market oriented in 1989. Indeed, from approximately the mid 1950s, the baseline and counterfactual models imply a similar evolution of policymakers' beliefs.

In a third 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 3000 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 to be not 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 of very different values of policymakers' perceived spatial correlation of the effect of policies on growth.

To understand why the prior spatial correlation has a nonmonotone 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

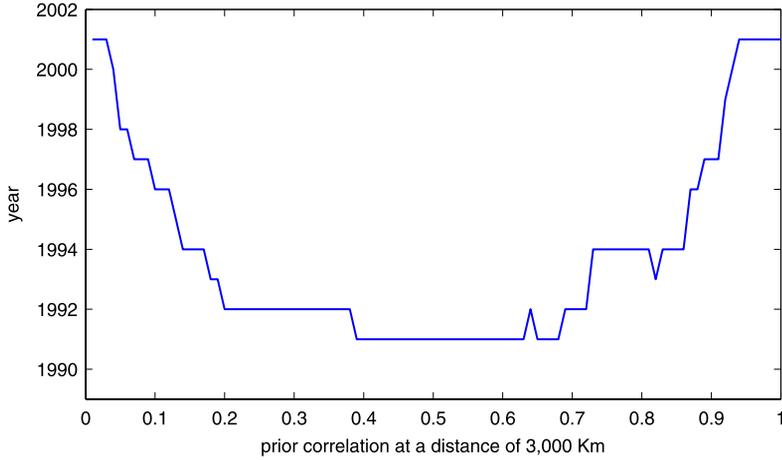


FIGURE 11.—Year in which the median country becomes market oriented, as a function of the prior spatial correlation at a distance of 3000 km.

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 1. Under these assumptions, the evolution of beliefs about average growth under market orientation is given by the formula

$$\hat{\beta}_{i,t}^M = \hat{\beta}_{i,t-1}^M + \frac{\nu^2 \cdot n}{1 + \nu^2 \cdot \sum_{j=1}^n \sum_{s=1}^t \theta_{j,s}} \times [\text{cov}(\theta_t, y_t - \hat{\beta}_{i,t-1}^M) + \bar{\theta}_t(\bar{y}_t - \bar{\beta}_{i,t-1}^M)], \quad i = 1, \dots, n,$$

where the upper bar stands for the cross-sectional means and cov denotes the cross-sectional covariance. Notice that if $\bar{y}_t = \bar{\beta}_{i,t-1}^M$, beliefs about market orientation are updated upward at time t only if $\text{cov}(\theta_t, y_t - \hat{\beta}_{i,t-1}^M)$ is positive, that is, 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 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 those 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., $\hat{\beta}_{i,t-1}^M = \hat{\beta}_{j,t-1}^M$ 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 $\text{cov}(\theta_t, y_t - \hat{\beta}_{i,t-1}^M)$

would boil down to $\text{cov}(\theta_t, y_t)$, 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 is much faster.

We illustrate this point in a fourth 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.¹⁹ In particular, for each country i , we set 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 set 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.²⁰

Figure 12 plots the time evolution of the empirical distribution of $\{\hat{\beta}_{i,t}^{M*} - \hat{\beta}_{i,t}^{S*}\}_{i=1}^n$, that is, 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

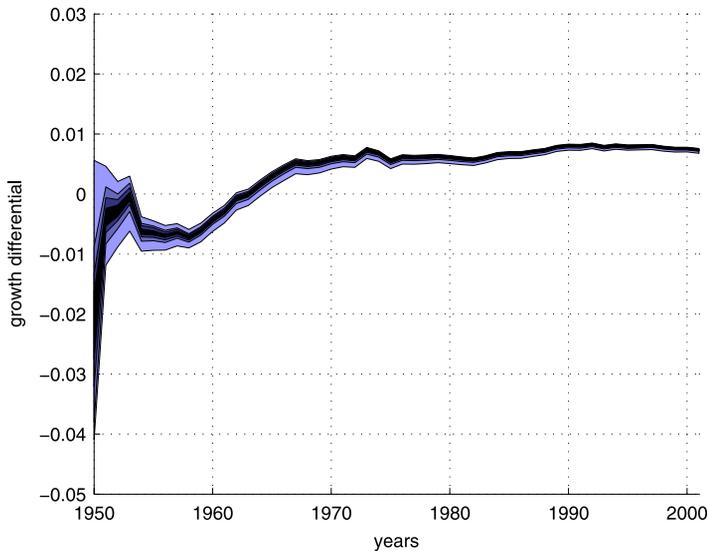


FIGURE 12.—Evolution over time of the empirical distribution of $\{\hat{\beta}_{i,t}^{M*} - \hat{\beta}_{i,t}^{S*}\}_{i=1}^N$, that is, the difference between the posterior mode of the mean of policymakers' beliefs about the effect of market-oriented and state-interventionist policies on growth.

¹⁹The important feature of this experiment is the perceived common effect, not the heterogeneous priors, which we adopt only for convenience.

²⁰This is a special case of the model of Buera, Monge-Naranjo, and Primiceri (2008).

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

8. POLICY REVERSALS: ANOTHER GREAT DEPRESSION

One natural application of our model is trying to answer the question, “Would we observe policy reversals toward 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 so as 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.²¹ 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.

To generate GDP growth as a function of the policy decision, we use a slightly modified version of the true DGP estimated in Section 7. The modification consists of the introduction in (7.1) of a forcing variable, $F_{i,s}$, which we calibrate to match the size of the Great Depression in the 1930s. Using the Maddison data set, we compute

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

$$i = 1, \dots, n,$$

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

²¹Going forward, we assume that the Polity2 and civil war variables remain unchanged relative to their value at time τ .

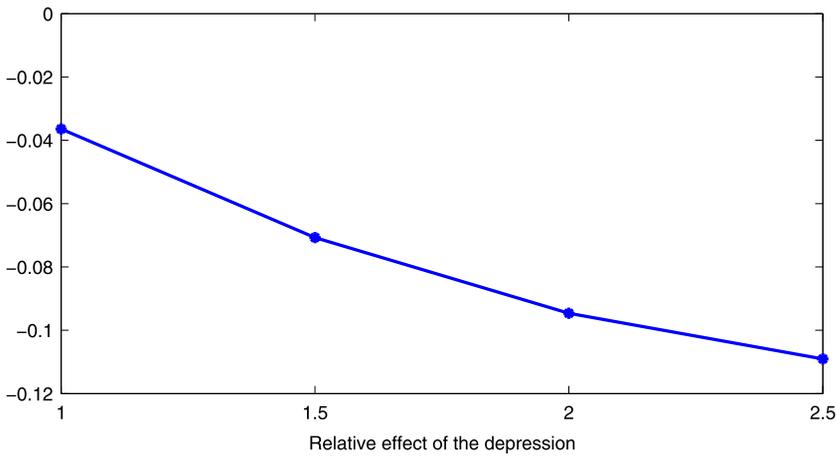


FIGURE 13.—Change in the share of market-oriented countries as a consequence of a severe worldwide recession in 2002, as a function of the differential impact of the recession on market-oriented and state-interventionist countries.

Figure 13 depicts the change in the share of market-oriented countries within 5 years in response to the global recession that starts in 2002. Negative numbers reflect that countries, on net, are switching from being market-oriented to being state-interventionist. The change in the share of market-oriented countries 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 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 40 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 downward the beliefs about both the benefits of markets and governments. However, since most countries in 2002 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 spawned an even larger reversal in the opposite direction, that is, from state intervention to market orientation.

9. 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 policy-makers' 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.

While slow in our context, we should stress that the speed of learning is typically influenced by the strength of the effectiveness of policies. Therefore, policies and institutions with more visible benefits on countries' growth (e.g., Acemoglu, Johnson, and Robinson (2005)) are more likely to be regarded as successful and adopted widely around the world provided that they can be easily implemented. Similarly, learning would presumably be faster if these policies also had an effect on other relevant economic variables. However, in this case policymakers might face a more complex trade-off between alternative policy objectives, which could complicate their learning process (Sargent (1999)).

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, in our learning model, we have not considered other reasons that may lead countries to herd behind the policy choices of other countries. Similarly, it would be interesting 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.

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