Political Uncertainty and Risk Premia

Ľuboš Pástor
University of Chicago,
CEPR, and *NBER*

Pietro Veronesi
University of Chicago,
CEPR, and *NBER*

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Abstract

We study the pricing of political uncertainty in a general equilibrium model of government policy choice. We find that political uncertainty commands a risk premium whose magnitude is larger in poorer economic conditions. Political uncertainty reduces the value of the implicit put protection that the government provides to the market. It also makes stocks more volatile and more correlated when the economy is weak. In addition, we find that government policies cannot be judged by the stock market response to their announcement. Announcements of deeper reforms tend to elicit less favorable stock market reactions.

Both authors are at the Booth School of Business, University of Chicago, 5807 South Woodlawn Avenue, Chicago, IL 60637, USA. Email: lubos.pastor@ChicagoBooth.edu and pietro.veronesi@ChicagoBooth.edu.

1. Introduction

Political uncertainty has come to the forefront of the public debate in recent years. In the United States, the ratings firm Standard & Poor's cited political uncertainty among the chief reasons behind its unprecedented downgrade of the U.S. Treasury debt in August 2011.[1] Even prior to the political brinkmanship over the statutory debt ceiling in the summer of 2011, much uncertainty surrounded the U.S. government policy changes during and after the financial crisis of 2007-2008, such as various bailout schemes, the Wall Street reform, and the health care reform. In Europe, the ongoing sovereign debt crisis has been accompanied by a large amount of uncertainty over the actions of the European governments.

How does uncertainty about future government actions affect asset prices? On the one hand, this uncertainty could have a positive effect if the government responds properly to unanticipated shocks. For example, we generally do not insist on knowing in advance how exactly a doctor will perform a complex surgery; should unforeseeable circumstances arise, it is useful for a qualified surgeon to have the freedom to depart from the initial plan. In the same spirit, governments often intervene in times of trouble, which might lead investors to believe that governments provide put protection on asset prices (e.g., the "Greenspan put"). On the other hand, political uncertainty could have a negative effect because it is not fully diversifiable. Non-diversifiable risk generally depresses asset prices by raising discount rates.[2] Both of these effects arise endogenously in our theoretical model.

We analyze the effect of political uncertainty on stock prices in the context of a general equilibrium model. In our model, firm profitability follows a stochastic process whose mean is affected by the prevailing government policy. The policy's impact on the mean is uncertain. Both the government and the investors (firm owners) learn about this impact in a Bayesian fashion by observing realized profitability. At a given point in time, the government makes a policy decision—it decides whether to change its policy and if so, which of potential new policies to adopt. The potential new policies are viewed as heterogeneous a priori—the agents expect different policies to have different impacts, with different degrees of prior uncertainty. If a policy change occurs, the agents' beliefs are reset: the posterior beliefs about the old policy's impact are replaced by the prior beliefs about the new policy's impact.

[1] The "debate this year has highlighted a degree of uncertainty over the political policymaking process which we think is incompatible with the AAA rating," said David Beers, managing director of sovereign credit ratings at Standard & Poor's, on a conference call with reporters on August 6, 2011.

[2] For example, some commentators argue that the risk premia in the eurozone have been inflated due to political uncertainty. According to Harald Uhlig, "The risk premium in the markets amounts to a premium on the uncertainty of what Merkel and Sarkozy will do." (Bloomberg Businessweek, July 28, 2011).

When making its policy decision, the government is motivated by both economic and non-economic objectives: it maximizes the investors' welfare, as a social planner would, but it also takes into account the political costs (or benefits) associated with adopting any given policy. These costs are unknown to the investors, who therefore cannot fully anticipate which policy the government is going to choose. We refer to the investors' uncertainty about the political costs as "political uncertainty." Investors learn about the political costs by observing political signals that we interpret as outcomes of various political events.

Solving for the optimal government policy choice, we find that a policy is more likely to be adopted if its political cost is lower, as well as if its impact on profitability is perceived to be higher or less uncertain. Policies whose impact is higher or more certain are welfare-improving. We also find that a policy change is more likely in weaker economic conditions, in which the current policy is typically perceived as harmful. By replacing poorly-performing policies in bad times, the government effectively provides put protection to the market.

We explore the asset pricing implications of our model. We show that stock prices are driven by three types of shocks, which we call capital shocks, impact shocks, and political shocks. The first two types of shocks are driven by the shocks to aggregate capital. These fundamental economic shocks affect stock prices both directly, by affecting the amount of capital, and indirectly, by leading investors to revise their beliefs about the impact of the prevailing government policy. We refer to the direct effect as capital shocks and to the indirect effect as impact shocks. We also refer to both capital and impact shocks jointly as economic shocks. The third type of shocks, political shocks, are orthogonal to economic shocks. Political shocks arise due to learning about the political costs associated with the potential new policies. These shocks, which reflect the flow of political news, lead investors to revise their beliefs about the likelihood of the various government policy choices.

Our main focus is on the model's implications for the equity risk premium. We decompose this premium into three components, which correspond to the three types of shocks introduced above. We find that all three components contribute substantially to the risk premium. Interestingly, political shocks command a risk premium despite being unrelated to the economic fundamentals. Investors demand compensation for uncertainty about the outcomes of purely political events, such as debates and negotiations. Those events matter to investors because they affect the investors' beliefs about which policy the government might adopt in the future. We refer to the political-shock component of the equity premium as the *political risk premium*. Another component, that induced by impact shocks, compensates investors for a different aspect of uncertainty about government policy—uncertainty about the impact of the current policy on firm profitability. Only the risk premium induced by capital shocks is unrelated to government-induced uncertainty.

We find that the composition of the equity risk premium is highly state-dependent. Importantly, the political risk premium is larger in weaker economic conditions. In fact, when the conditions are very weak, the political risk premium is the largest component of the equity premium in our baseline calibration. In a weaker economy, the government is more likely to adopt a new policy. Therefore, news about which new policy is likely to be adopted—political shocks—have a larger impact on stock prices in a weaker economy.

In strong economic conditions, the political risk premium is small, but the impact-shock component of the equity premium is large. When times are good, the current policy is likely to be retained, so news about the current policy's impact—impact shocks—have a large effect on stock prices. Impact shocks matter less when times are bad because the current policy is then likely to be replaced, so its impact is temporary. Interestingly, impact shocks often matter the most when times are neither good nor bad, but rather slightly below average. In such intermediate states, investors are the most uncertain about whether the current policy will be retained. Impact shocks then affect stock prices by revising not only the investors' perception of expected profitability, but also their perception of the probability of a policy change. As a result, investors demand extra compensation for holding stocks, and the equity premium exhibits a hump-shaped dependence on the economic conditions.

The equity premium in weak economic conditions is affected by two opposing forces. On the one hand, the premium is pulled down by the government's implicit put option—the fact that the government is likely to change its policy in a weak economy. This put option reduces the equity premium by making the effect of the impact shocks temporary and thereby depressing the premium's impact-shock component. On the other hand, the premium is pushed up by political uncertainty, as explained earlier. In our baseline calibration, the two effects roughly cancel out. More generally, political uncertainty reduces the value of the implicit put option that the government provides to the markets.

Strong state dependence characterizes not only the equity premium but also the volatilities and correlations of stock returns. Stocks are generally more volatile and more highly correlated when the economic conditions are poor, mostly due to political uncertainty. In addition, volatilities and correlations are higher when the potential new policies are perceived as more heterogeneous a priori. More policy heterogeneity also generally implies higher risk premia and lower stock prices, but only when the economy is weak.

When the government announces its policy decision, stock prices jump. The expected value of the jump represents the risk premium that compensates investors for holding stocks during this announcement. This jump risk premium can be fully attributed to political uncertainty. We find that this premium is generally higher when the economic conditions are weaker as well as when there is more policy heterogeneity. These results support our prior conclusions about the pricing of political uncertainty.

We obtain several additional interesting results related to the stock market's reaction to the announcement of the government's policy decision. We show analytically that a welfare-improving policy choice need not lead to higher stock prices, nor does a positive stock market reaction imply that the newly adopted policy is welfare-improving. Among policies delivering the same welfare, the policies whose impact on profitability is more uncertain, such as deeper reforms, elicit less favorable stock market reactions. The broader lesson is that one cannot judge government policies by their announcement returns.

We also show that the announcement returns depend on the economic conditions. For example, if the old policy is retained in good economic conditions, the stock market reaction is weak because this policy choice is largely anticipated by the investors. In contrast, a policy change in good economic conditions prompts a stronger market reaction because it contains a larger element of surprise. This latter reaction is likely to be negative because a policy change in good conditions is likely to be politically motivated. Finally, averaging across economic conditions, we find that stock prices tend to fall at the announcement of a policy change. The average return at the announcement of a policy change is more negative when there is more heterogeneity across the potential new policies.

There is a small but growing amount of theoretical work on the effects of government-induced uncertainty on asset prices. Sialm (2006) analyzes the effect of stochastic taxes on asset prices, and finds that investors require a premium to compensate for the risk introduced by tax changes.[3] Tax uncertainty also features in Croce, Kung, Nguyen, and Schmid (2011), who explore its asset pricing implications in a production economy with recursive preferences. Finally, Ulrich (2011) analyzes the premium required by bond investors for Knightian uncertainty about both Ricardian equivalence and the size of the government multiplier. All of these studies are quite different from ours. They analyze fiscal policy, whereas we consider a broader set of government actions. They use very different modeling techniques, and they do not model the government's policy decision explicitly as we do. None of these studies

[3]Other studies, such as McGrattan and Prescott (2005), Sialm (2009), and Gomes, Michaelides, and Polkovnichenko (2009), relate stock prices to tax rates, without emphasizing tax-related uncertainty.

feature Bayesian learning, which plays an important role here.

Our model is also different from the learning models that were recently proposed in the political economy literature, such as Callander (2008) and Strulovici (2010). In Callander's model, voters learn about the effects of government policies through repeated elections. In Strulovici's model, voters learn about their preferences through policy experimentation. Neither study analyzes the asset pricing implications of learning.

Pástor and Veronesi (2011) develop a closely related model of government policy choice that differs from ours in two key respects. First, in their model, all government policies are perceived as identical a priori, whereas we consider heterogeneous policies, elevating the importance of policy choice. Second, in our model, investors learn about the political costs of the potential new policies. This learning introduces additional shocks to the economy, political shocks, which give rise to the political risk premium. Moreover, our study has a different focus. Pástor and Veronesi analyze the stock market reaction to the government's policy decision. We provide some complementary results on the announcement returns, but our main object of interest is the risk premium induced by political uncertainty.

There is a modest amount of empirical work relating political uncertainty to the equity risk premium. Erb, Harvey, and Viskanta (1996) find a weak relation between political risk, measured by the International Country Risk Guide, and future stock returns. Pantzalis, Stangeland, and Turtle (2000) and Li and Born (2006) find abnormally high stock market returns in the weeks preceding major elections, especially for elections characterized by high degrees of uncertainty. This evidence is consistent with a positive relation between the equity premium and political uncertainty. Other related asset pricing studies include Belo, Gala, and Li (2011), who link the cross-section of stock returns to the firms' exposures to the government sector, and Boutchkova, Doshi, Durnev, and Molchanov (2010), who relate political uncertainty to stock volatility. The literature has also related political uncertainty to private sector investment.[4] Finally, the literature has analyzed the effects of uncertainty about government policy on inflation, capital flows, and welfare.[5]

[4]For example, Julio and Yook (2011) find that firms reduce their investment prior to major elections. Durnev (2011) finds that corporate investment is less sensitive to stock prices during election years. In other related work, Rodrik (1991) shows that even moderate amount of uncertainty about the duration of a policy reform can impose a hefty tax on investment. Hassett and Metcalf (1999) find that the impact of tax policy uncertainty on investment depends on the process followed by the tax policy.

[5]For example, Drazen and Helpman (1990) study how uncertainty about a future fiscal adjustment affects the dynamics of inflation. Hermes and Lensink (2001) show that uncertainty about budget deficits, tax payments, government consumption, and inflation is positively related to capital outflows at the country level. Gomes, Kotlikoff, and Viceira (2008) calibrate a life-cycle model to measure the welfare losses resulting from uncertainty about government policies regarding taxes and Social Security. They find that policy uncertainty

The paper is organized as follows. Section 2. presents the model. Section 3. analyzes the government's policy decision, while Section 4. examines how the stock market responds to this decision. Sections 5. and 6. present our key results on the pricing of political uncertainty. Section 7. analyzes the probability distributions of the stock market reactions to government policy changes. Section 8. concludes. The Appendix contains some technical details as well as a reference to the Technical Appendix, which contains all the proofs.

2. The Model

Similar to Pástor and Veronesi (2011), we consider an economy with a finite horizon $[0, T]$ and a continuum of firms $i \in [0, 1]$. Let B_t^i denote firm i's capital at time t. Firms are financed entirely by equity, so B_t^i can also be viewed as book value of equity. At time 0, all firms employ an equal amount of capital, which we normalize to $B_0^i = 1$. Firm i's capital is invested in a linear technology whose rate of return is stochastic and denoted by $d\Pi_t^i$. All profits are reinvested, so that firm i's capital evolves according to $dB_t^i = B_t^i d\Pi_t^i$. Since $d\Pi_t^i$ equals profits over book value, we refer to it as the profitability of firm i. For all $t \in [0, T]$, profitability follows the process

$$d\Pi_t^i = (\mu + g_t)\, dt + \sigma dZ_t + \sigma_1 dZ_t^i \ , \tag{1}$$

where (μ, σ, σ_1) are observable constants, Z_t is a Brownian motion, and Z_t^i is an independent Brownian motion that is specific to firm i. The variable g_t denotes the impact of the prevailing government policy on the mean of the profitability process of each firm. If $g_t = 0$, the government policy is "neutral" in that it has no impact on profitability.

The government policy's impact, g_t, is constant while the same policy is in effect. The value of g_t can change only at a given time τ, $0 < \tau < T$, when the government makes an irreversible policy decision. At that time τ, the government decides whether to replace the current policy and, if so, which of N potential new policies to adopt. That is, the government chooses one of $N + 1$ policies, where policies $n = \{1, \ldots, N\}$ are the potential new policies and policy 0 is the "old" policy prevailing since time 0. Let g^0 denote the impact of the old policy and g^n denote the impact of the n-th new policy, for $n = \{1, \ldots, N\}$. The value of g_t is then a simple step function of time:

$$g_t = \begin{cases} g^0 & \text{for} \quad t \leq \tau \\ g^0 & \text{for} \quad t > \tau \ \text{ if the old policy is retained (i.e., no policy change)} \\ g^n & \text{for} \quad t > \tau \ \text{ if the new policy } n \text{ is chosen, } n \in \{1, \ldots, N\} \ . \end{cases} \tag{2}$$

materially affects the agents' consumption, saving, labor supply, and portfolio decisions.

A policy change replaces g^0 by g^n, thereby inducing a permanent shift in average profitability. A policy decision becomes effective immediately after its announcement at time τ.

The value of g_t is unknown for all $t \in [0, T]$. This key assumption captures the idea that government policies have an uncertain impact on firm profitability. As of time 0, the prior distributions of all policy impacts are normal:

$$g^0 \sim N\left(0, \sigma_g^2\right) \tag{3}$$

$$g^n \sim N\left(\mu_g^n, \sigma_{g,n}^2\right) \qquad \text{for } n = \{1, \ldots, N\} \ . \tag{4}$$

The old policy is expected to be neutral a priori, without loss of generality. The new policies are characterized by heterogeneous prior beliefs about g^n. The values of $\left\{g^0, g^1, \ldots, g^N\right\}$ are unknown to all agents—the government as well as the investors who own the firms.

The firms are owned by a continuum of identical investors who maximize expected utility derived from terminal wealth. For all $j \in [0, 1]$, investor j's utility function is given by

$$u\left(W_T^j\right) = \frac{\left(W_T^j\right)^{1-\gamma}}{1-\gamma} \ , \tag{5}$$

where W_T^j is investor j's wealth at time T and $\gamma > 1$ is the coefficient of relative risk aversion. At time 0, all investors are equally endowed with shares of firm stock. Stocks pay liquidating dividends at time T.[6] Investors always know which government policy is in place.

When making its policy decision at time τ, the government maximizes the same objective function as the investors, except that it also faces a nonpecuniary cost (or benefit) associated with any policy change. The government chooses the policy that maximizes

$$\max_{n \in \{0, \ldots, N\}} \left\{ \mathrm{E}_\tau \left[\frac{C^n W_T^{1-\gamma}}{1-\gamma} \mid \text{policy } n \right] \right\}, \tag{6}$$

where $W_T = B_T = \int_0^1 B_T^i di$ is the final value of aggregate capital and C^n is the "political cost" incurred by the government if policy n is adopted. Values of $C^n > 1$ represent a cost (e.g., the government must exert effort or burn political capital to implement policy n), whereas $C^n < 1$ represents a benefit (e.g., policy n allows the government to make a transfer to a favored constituency).[7] For each new policy n, $n \in \{1, \ldots, N\}$, the value of C^n is revealed to the agents at time τ. As of time 0, the prior distribution of each C^n is

[6] No dividends are paid before time T because the investors' preferences (equation (5)) do not involve intermediate consumption. Firms in our model reinvest all of their earnings, as mentioned earlier.

[7] We refer to C^n as a cost because higher values of C^n translate into lower utility (as $W_T^{1-\gamma} / (1-\gamma) < 0$).

lognormal and centered at $C^n = 1$:

$$c^n \equiv \log(C^n) \sim N\left(-\frac{1}{2}\sigma_c^2, \sigma_c^2\right) \qquad \text{for } n = \{1, \ldots, N\} \ , \tag{7}$$

where the c^n values are uncorrelated across policies as well as independent of the Brownian motions in equation (1). We normalize $C^0 = 1$, so that retaining the old policy is known with certainty to present no political costs or benefits to the government. Immediately after the C^n values are revealed at time τ, the government uses this information to make the policy decision. Uncertainty about $\{C^n\}_{n=1}^N$, which is given by σ_c as of time 0, is the source of *political uncertainty* in our model. Political uncertainty introduces an element of surprise into policy decisions, resulting in stock price reactions at time τ.

Given its objective function in equation (6), the government is "quasi-benevolent": it is expected to maximize the investors' welfare (because $\mathrm{E}_0[C^n] = 1$ for all n), but also to deviate from this objective in a random fashion. The assumption that governments do not behave as fully benevolent social planners is widely accepted in the political economy literature.[8] This literature presents various reasons why governments might not maximize aggregate welfare. For example, governments often redistribute wealth.[9] Governments tend to be influenced by special interest groups.[10] They might also be susceptible to corruption.[11] Instead of modeling these political forces explicitly, we adopt a simple reduced-form approach to capturing departures from benevolence. In our model, all aspects of politics—redistribution, corruption, special interests, etc.—are bundled together in the political costs $\{C^n\}_{n=1}^N$. The randomness of these costs reflects the difficulty investors face in predicting the outcome of the political process, which can be complex and non-transparent. For example, it can be hard to predict the outcome of a battle between special interest groups. By modeling politics in such a reduced-form fashion, we are able to focus on the asset pricing implications of the uncertainty about government policy choice.

Government policies also merit more discussion. We interpret policy changes broadly as government actions that change the economic environment. Examples include major reforms, such as the recent Wall Street reform or the health care reform. Deeper reforms, or more radical policy changes, typically introduce a less familiar regulatory framework whose impact on the private sector is more uncertain. Such policies might thus warrant relatively

[8]Drazen (2000) provides a useful overview of this literature.

[9]Redistribution is a major theme in political economy. Prominent studies of redistribution include Alesina and Rodrik (1994) and Persson and Tabellini (1994), among others. Our model is not well suited for analyzing redistribution effects because all of our investors are identical ex ante, for simplicity.

[10]See, for example, Grossman and Helpman (1994) and Coate and Morris (1995).

[11]See, for example, Shleifer and Vishny (1993) and Rose-Ackerman (1999).

high values of $\sigma_{g,n}$ in equation (4). In contrast, a potential new policy that has already been tried in the past might merit a lower $\sigma_{g,n}$ if the agents believe they have more prior information about that policy's impact. We abstract from the fact that government policies may affect some firms more than others, focusing on the aggregate effects.

2.1. Learning About Policy Impacts

As noted earlier, the values of the policy impacts $\{g^n\}_{n=0}^N$ are unknown to all agents, investors and the government alike. At time 0, all agents share the prior beliefs summarized in equations (3) and (4). Between times 0 and τ, all agents learn about g^0, the impact of the prevailing (old) policy, by observing the realized profitabilities of all firms. The Bayesian learning process is described in Proposition 1 of Pástor and Veronesi (2011). Specifically, the posterior distribution of g^0 at any time $t \leq \tau$ is given by

$$g_t \sim N\left(\widehat{g}_t, \widehat{\sigma}_t^2\right) \ , \tag{8}$$

where the posterior mean and variance evolve as

$$d\widehat{g}_t = \widehat{\sigma}_t^2 \sigma^{-1} d\widehat{Z}_t \tag{9}$$

$$\widehat{\sigma}_t^2 = \frac{1}{\frac{1}{\sigma_g^2} + \frac{1}{\sigma^2} t} \ . \tag{10}$$

Above, $d\widehat{Z}_t$ denotes the expectation errors, which reflect the differences between the average profitability across firms and its expectation.[12] When the average profitability is higher than expected, the agents revise their beliefs about g^0 upward, and vice versa (see equation (9)). Uncertainty about g^0 declines deterministically over time due to learning (see equation (10)). Before time τ, there is no learning about the new policies, so the agents' beliefs about $\{g^n\}_{n=1}^N$ at any time $t \leq \tau$ are given by the prior distributions in equation (4).

If there is no policy change at time τ, then the agents continue to learn about g^0 after time τ, and the processes (9) and (10) continue to hold also for $t > \tau$. If there is a policy change at time τ, the agents stop learning about g^0 and begin learning about g^n, the impact of the new policy n adopted by the government. As a result, a policy change resets the agents' beliefs about g_t from the posterior $N\left(\widehat{g}_\tau, \widehat{\sigma}_\tau^2\right)$ to the prior $N\left(\mu_g^n, \sigma_{g,n}^2\right)$. The agents continue to learn about g^n in a Bayesian fashion until time T.

[12] The $d\widehat{Z}_t$ shocks are related to the dZ_t shocks from equation (1) as follows: $d\widehat{Z}_t = dZ_t + \left[(g^0 - \widehat{g}_t)/\sigma\right] dt$.

2.2. Learning About Political Costs

The political costs $\{C^n\}_{n=1}^N$ are unknown to all agents until time τ. At time $t_0 < \tau$, investors begin learning about each c^n by observing unbiased signals. We model these signals as "signal = true value plus noise," which takes the following form in continuous time:

$$ds_t^n = c^n dt + h dZ_{c,t}^n \ , \qquad n = 1, \ldots, N, \tag{11}$$

where $1/h$ denotes signal precision. The signals ds_t^n are uncorrelated across n and independent of any other shocks in the economy. We refer to these signals as "political signals," and interpret them as capturing the steady flow of political news relevant to policy n. Real-world investors observe numerous political speeches, debates, and negotiations on a daily basis. The outcomes of these events help investors revise their beliefs about the political costs and benefits associated with the policies being debated.

Combining the signals in equation (11) with the prior distribution in equation (7), we obtain the posterior distribution of c^n, for $n = 1, \ldots, N$, at any time $t \leq \tau$:

$$c^n \sim N\left(\widehat{c}_t^n, \widehat{\sigma}_{c,t}^2\right) \ , \tag{12}$$

where the posterior mean and variance evolve as

$$d\widehat{c}_t^n = \widehat{\sigma}_{c,t}^2 h^{-1} d\widehat{Z}_{c,t}^n \tag{13}$$

$$\widehat{\sigma}_{c,t}^2 = \frac{1}{\frac{1}{\sigma_c^2} + \frac{1}{h^2}(t - t_0)} \ . \tag{14}$$

Equation (13) shows that the investors' beliefs about c^n are driven by the Brownian shocks $d\widehat{Z}_{c,t}^n$, which reflect the differences between the political signals ds_t^n and their expectations ($d\widehat{Z}_{c,t}^n = h^{-1}\left(ds_t^n - \mathrm{E}_t\left[ds_t^n\right]\right)$). Since the political signals are independent of all "fundamental" shocks in the economy (i.e., dZ_t and dZ_t^i), the innovations $d\widehat{Z}_{c,t}^n$ represent pure *political shocks*. These shocks shape the investors' beliefs about which government policy is likely to be adopted in the future, above and beyond the effect of the fundamental economic shocks. Interestingly, even though the political shocks are orthogonal to the economic shocks, they command a risk premium in equilibrium, as we show in Section 5.3.

Our model exhibits two major differences from the model of Pástor and Veronesi (2011). First, we allow the government to choose from multiple new policies that are perceived as heterogeneous a priori. Pástor and Veronesi consider only one potential new policy whose prior is the same as that of the old policy. Their framework is equivalent to a framework in which there are multiple new policies that are identical a priori, namely, $\mu_g^n = 0$ and

$\sigma_{g,n}^2 = \sigma_g^2$ for all n. In contrast, we allow μ_g^n and $\sigma_{g,n}$ to vary across policies, as a result of which the government's decision which new policy to adopt becomes important. We also allow the political costs C^n to differ across policies. Second, we allow the agents to learn about C^n before time τ. There is no such learning in Pástor and Veronesi's model; their political cost is drawn at time τ from the prior distribution in equation (7). Learning about C^n introduces additional "political" shocks to the economy, which play a key role in our paper. Finally, our focus differs from that of Pástor and Veronesi. They emphasize the announcement returns associated with policy changes. We provide some related analysis as well, but our main focus is on the risk premium induced by political uncertainty.

3. Optimal Government Policy Choice

In this section, we analyze how the government chooses its policy at time τ. After a period of learning about g^0 and $\{C^n\}_{n=1}^N$, the government chooses one of $N+1$ policies, $\{0, 1, \ldots, N\}$, at time τ. Recall that if the government replaces policy 0 by policy n, the value of g_t changes from g^0 to g^n and the perceived distribution of g_t changes from the posterior in equation (8) to the prior in equation (4).

It is useful to introduce the following notation:

$$\widetilde{\mu}^n = \mu_g^n - \frac{\sigma_{g,n}^2}{2}(T-\tau)(\gamma-1) \qquad n = 1, \ldots, N \tag{15}$$

$$x_\tau = \widehat{g}_\tau - \frac{\widehat{\sigma}_\tau^2}{2}(T-\tau)(\gamma-1) \ . \tag{16}$$

To align the notation for the old policy with the notation for the new policies, we also define

$$\widetilde{\mu}^0 = x_\tau \tag{17}$$

$$\mu_g^0 = \widehat{g}_\tau \tag{18}$$

$$\sigma_{g,0} = \widehat{\sigma}_\tau \ , \tag{19}$$

keeping in mind that the first two quantities are stochastic, unlike their counterparts for the new policies (for which there is no learning before time τ). Under this notation, at time τ, the agents' beliefs about each policy n are given by $N\left(\mu_g^n, \sigma_{g,n}^2\right)$, where this distribution is a prior for $n = 1, \ldots, N$ but a posterior for $n = 0$.

We refer to $\widetilde{\mu}^n$ in equations (15) and (17) as the "utility score" of policy n, for $n = 0, 1, \ldots, N$. This label can be easily understood in the context of the following lemma.

Lemma 1: *Given any two policies m and n in the set $\{0, 1, \ldots, N\}$, we have*

$$\mathrm{E}_\tau \left[\frac{W_T^{1-\gamma}}{1-\gamma} \mid \text{policy } n \right] > \mathrm{E}_\tau \left[\frac{W_T^{1-\gamma}}{1-\gamma} \mid \text{policy } m \right] \tag{20}$$

if and only if

$$\widetilde{\mu}^n > \widetilde{\mu}^m \ . \tag{21}$$

Lemma 1 shows that the policy with the highest utility score delivers the highest utility to the agents at time τ. It follows immediately from equations (15) through (17) that agents prefer policies whose impacts are perceived to have high means and/or low variances, analogous to the popular mean-variance preferences in portfolio theory.

The government's preferences differ from the agents' preferences due to political costs, as shown in equation (6). The government chooses policy n at time τ if and only if the following condition is satisfied for all policies $m \neq n, m \in \{0, \ldots, N\}$:

$$\mathrm{E}_\tau \left[\frac{C^n W_T^{1-\gamma}}{1-\gamma} \mid \text{policy } n \right] \quad > \quad \mathrm{E}_\tau \left[\frac{C^m W_T^{1-\gamma}}{1-\gamma} \mid \text{policy } m \right] \qquad \forall m \neq n \ .$$

The above condition yields our first proposition.

Proposition 1: *The government chooses policy n at time τ if and only if the following condition holds for all policies $m \neq n,\ m \in \{0, 1, \ldots, N\}$:*

$$\widetilde{\mu}^n - \widetilde{c}^n > \widetilde{\mu}^m - \widetilde{c}^m \ , \tag{22}$$

where we define

$$\widetilde{c}^n = \frac{c^n}{(\gamma - 1)(T - \tau)} \qquad\qquad n = 0, 1, \ldots, N \ . \tag{23}$$

Proposition 1 shows that the government chooses the policy with the highest value of $\widetilde{\mu}^n - \widetilde{c}^n$ across all $n \in \{0, \ldots, N\}$, or the highest "cost-adjusted utility score." Note that $\widetilde{c}^0 = 0$, so that policy 0's cost-adjusted utility score is simply x_τ, which is a simple increasing function of $\widehat{g}_\tau$ (see equation (16)). Therefore, the government finds it optimal to replace the old policy if the policy's impact is perceived as sufficiently unfavorable, i.e., if $\widehat{g}_\tau$ is sufficiently low. This result is the basis for our interpretation later on in Section 5. that the government effectively provides a put option to the market.

Before time τ, the agents face uncertainty about the government's action at time τ because they do not know the political costs. From Proposition 1, we derive the probabilities of all potential government actions, as perceived by the agents at any time $t \leq \tau$.

Corollary 1: *The probability that the government chooses policy n at time τ, evaluated at any time $t \leq \tau$ for any policy $n \in \{1, \ldots, N\}$, is given by*

$$p_t^n = \int_{-\infty}^{\infty} \Pi_{m \neq n, m \in \{1,\ldots,N\}} \left[1 - \Phi_{\widetilde{c}^m}\left(\widetilde{c}^n + \widetilde{\mu}^m - \widetilde{\mu}^n\right)\right] \Phi_x\left(\widetilde{\mu}^n - \widetilde{c}^n | \widehat{g}_t\right) \phi_{\widetilde{c}^n}\left(\widetilde{c}^n\right) d\widetilde{c}^n \ . \tag{24}$$

Above, $\phi_{\widetilde{c}^n}(.)$ and $\Phi_{\widetilde{c}^n}(.)$ are the normal pdf and cdf of $\widetilde{c}^n$, respectively, and Φ_x is the normal cdf of x_τ.[13] *The probability that the old policy will be retained is $p_t^0 = 1 - \sum_{n=1}^{N} p_t^n$.*

4. Stock Price Reactions to Policy Decisions

Firm i's stock represents a claim on the firm's liquidating dividend at time T, which is equal to B_T^i. The investors' total wealth at time T is equal to $B_T = \int_0^1 B_T^i di$. Stock prices adjust to make the investors hold all of the firms' stock. In addition to stocks, there is a zero-coupon bond in zero net supply, which makes a unit payoff at time T with certainty. We use this risk-free bond as the numeraire.[14] To ensure market completeness, we also assume the existence of securities in zero net supply whose payoffs span the risks associated with the random political costs. Standard arguments then imply that the state price density is uniquely given by

$$\pi_t = \frac{1}{\lambda} E_t\left[B_T^{-\gamma}\right], \tag{25}$$

where λ is the Lagrange multiplier from the utility maximization problem of the representative investor. The market value of stock i is given by the standard pricing formula

$$M_t^i = E_t\left[\frac{\pi_T}{\pi_t} B_T^i\right]. \tag{26}$$

4.1. The Announcement Returns

When the government announces its policy decision at time τ, stock prices jump. To evaluate this jump, we solve for stock prices immediately before and immediately after the policy announcement. Let M_τ^i denote the market value of firm i immediately before the announcement, and $M_{\tau+}^{i,n}$ denote the firm's value immediately after the announcement of policy n. Closed-form expressions for M_τ^i and $M_{\tau+}^{i,n}$ are given in the Appendix in Lemmas A1 and A2,

[13] As of time t, $\widetilde{c}^n \sim \mathcal{N}\left(\frac{\widehat{c}_t^n}{(\gamma-1)(T-\tau)}, \frac{\widehat{\sigma}_{c,t}^2}{(\gamma-1)^2(T-\tau)^2}\right)$ and $x_\tau \sim \mathcal{N}\left(\widehat{g}_t - \frac{\widehat{\sigma}_\tau^2}{2}(T-\tau)(\gamma-1), \widehat{\sigma}_t^2 - \widehat{\sigma}_\tau^2\right)$.

[14] This assumption is equivalent to assuming a risk-free rate of zero. Such an assumption is innocuous because without intermediate consumption, there is no intertemporal consumption choice that would pin down the interest rate. This modeling choice ensures that interest rate fluctuations do not drive our results.

respectively. We then define each firm's "announcement return" as the instantaneous stock return at time τ conditional on the announcement of policy n:

$$R^n(x_\tau) = \frac{M^{i,n}_{\tau+}}{M^i_\tau} - 1 \; . \tag{27}$$

The announcement return depends on x_τ but not on i: all firms experience the same announcement return as they are equally exposed to changes in government policy. Therefore, R^n also represents the aggregate stock market reaction to the announcement of policy n.

Proposition 2: *If the government retains the old policy, the announcement return is*

$$R^0(x_\tau) = \frac{\sum_{n=0}^{N} p^n_\tau e^{-\gamma(T-\tau)(\widetilde{\mu}^n - x_\tau) + \frac{\gamma}{2}(T-\tau)^2\left(\sigma^2_{g,n} - \widehat{\sigma}^2_\tau\right)}}{\sum_{n=0}^{N} p^n_\tau e^{(1-\gamma)(T-\tau)(\widetilde{\mu}^n - x_\tau)}} - 1 \; . \tag{28}$$

If the government replaces the old policy by the new policy n, for any $n \in \{1, \ldots, N\}$, the announcement return is equal to

$$R^n(x_\tau) = \left[1 + R^0(x_\tau)\right] e^{(\widetilde{\mu}^n - x_\tau)(T-\tau) - \frac{\gamma}{2}(T-\tau)^2\left(\sigma^2_{g,n} - \widehat{\sigma}^2_\tau\right)} - 1 \; . \tag{29}$$

Proposition 2 provides a closed-form expression for the announcement return associated with any government policy choice. The proposition implies the following corollary.

Corollary 2: *The ratio of the gross announcement returns for any pair of policies m and n in the set $\{0, 1, \ldots, N\}$ is given by*

$$\frac{1 + R^m(x_\tau)}{1 + R^n(x_\tau)} = e^{(\widetilde{\mu}^m - \widetilde{\mu}^n)(T-\tau) - \frac{\gamma}{2}(T-\tau)^2\left(\sigma^2_{g,m} - \sigma^2_{g,n}\right)} \; . \tag{30}$$

Interestingly, the above ratio does not depend on x_τ as long as both policies m and n are new (i.e., $m > 1$ and $n > 1$). If one of the policies is old, the ratio does depend on x_τ, as $\widetilde{\mu}^0 = x_\tau$ (see equation (17)). More interesting, the corollary shows that a given policy choice can increase investor welfare while decreasing stock prices, and vice versa. Consider two policies m and n, for which the following condition holds:

$$0 < \widetilde{\mu}^m - \widetilde{\mu}^n < \frac{\gamma}{2}(T-\tau)\left(\sigma^2_{g,m} - \sigma^2_{g,n}\right) \; . \tag{31}$$

Even though policy m yields higher utility (because $\widetilde{\mu}^m > \widetilde{\mu}^n$), policy n yields a higher announcement return ($R^m < R^n$). This result highlights the difference between maximizing utility and maximizing stock market value—the former is maximized by the policy with the highest utility score $\widetilde{\mu}^n$, whereas the latter is maximized by the policy with the highest value of $\widetilde{\mu}^n - \frac{\gamma}{2}(T-\tau)\,\sigma_{g,n}^2$. To understand this difference, recall from equation (4) that $\sigma_{g,n}$ measures the uncertainty about the impact of policy n on firm profitability. This uncertainty cannot be diversified away because it affects all firms. As a result, this uncertainty increases discount rates and pushes down asset prices. Adopting a policy with a high value of $\sigma_{g,n}$ can therefore depress asset prices even if this policy is welfare-improving.

The interesting lesson here is that one cannot judge government policies by their announcements returns. A positive stock market reaction does not guarantee that the newly adopted policy is welfare-improving, and vice versa. It might not be surprising to obtain such a result in a model with heterogeneous agents some of whom do not own stocks because in such a model, a positive stock market reaction need not benefit all agents. In our model, however, all agents are identical, so they all benefit equally when the stock market goes up. Related results can also be obtained in models with consumption smoothing. However, there is no intermediate consumption in our model. Our result is not driven by intertemporal substitution, but rather by the risk effects discussed in the previous paragraph.

Corollary 3: *Holding the utility score $\widetilde{\mu}^n$ constant, policies with higher uncertainty $\sigma_{g,n}$ elicit lower announcement returns.*

Corollary 3 follows immediately from Corollary 2. Among policies delivering the same utility, the policies with higher values of $\sigma_{g,n}$ elicit less favorable stock market reactions.

What government policies exhibit high values of $\sigma_{g,n}$? As noted earlier, good candidates are policies whose adoption represents a sharp structural break in the economic environment, such as deep regulatory reforms. The long-term impact of such reforms is often difficult to assess in advance. Deep reforms may well be welfare-improving, but they also tend to inject non-diversifiable risk in the economy, which may result in lower asset prices.

4.2. A Two-Policy Example

In the rest of this section, we illustrate some of our key results on the announcement returns. To simplify the exposition, we consider a special case of $N = 2$, allowing the government to choose from two new policies, L and H, in addition to the old one. We assume that both new policies are expected to provide the same level of utility a priori, $\widetilde{\mu}^L = \widetilde{\mu}^H$. This iso-utility assumption can be motivated by appealing to the government's presumed good intentions—it would be reasonable for the government to eliminate from consideration any policies that are perceived by all agents as inferior in terms of utility. Such an outcome is not guaranteed to obtain in practice, but it represents a natural starting point for our analysis. We also assume, without loss of generality, that policy H is perceived to have a more uncertain impact on firm profitability, so that $\sigma_{g,L} < \sigma_{g,H}$. As argued earlier, policy H can then be viewed as the deeper reform. To ensure that both new policies yield the same utility, policy H must also have a more favorable expected impact, so that $\mu_g^L < \mu_g^H$. It follows immediately from equation (15) that to ensure $\widetilde{\mu}^L = \widetilde{\mu}^H$, we must have

$$\mu_g^H - \mu_g^L = \frac{1}{2}\left(\sigma_{g,H}^2 - \sigma_{g,L}^2\right)(T-\tau)(\gamma-1) \ . \tag{32}$$

That is, the higher uncertainty of policy H must be compensated by a higher expectation.

Table 1 reports the parameter values used to calibrate the model. For the first eight parameters (σ_g, σ_c, μ, σ, σ_1, T, τ, and γ), we choose the same annual values (2%, 10%, 10%, 5%, 10%, 20, 10, 5) as do Pástor and Veronesi (2011). The remaining three parameters (h, $\sigma_{g,L}$, and $\sigma_{g,H}$) do not appear in Pástor and Veronesi's model. We choose $h = 5\%$, equal to the value of σ, so that the speed of learning about each C^n is the same as the speed of learning about g^n. We choose $\sigma_{g,L} = 1\%$ and $\sigma_{g,H} = 3\%$, so that the prior uncertainties about the new policies are symmetric around the old policy's $\sigma_g = 2\%$. In addition, we require that the new-policy means be symmetric around the old-policy mean of zero, that is, $\mu_{g,L} = -\mu_{g,H}$. It then follows from equation (32) that $\mu_{g,L} = -0.8\%$ and $\mu_{g,H} = 0.8\%$. Finally, we assume that learning about C^n begins at time $t_0 = \tau - 1$, which means that political debates about the new policies begin one year before the policy decision. All of these parameter choices strike us as reasonable, but we also perform some sensitivity analysis.

Panel A of Figure 1 plots the announcement returns of the three policies, R^0, R^L, and R^H, as a function of $\widehat{g}_\tau$. Recall from Proposition 2 that the announcement returns depend on x_τ, which is a simple function of $\widehat{g}_\tau$ (see equation (16)). The variable $\widehat{g}_\tau$, the posterior mean of g^0 at time τ, is the key state variable summarizing the *economic conditions*. High values of $\widehat{g}_\tau$ indicate that the prevailing government policy is helping make firms highly profitable, which is generally indicative of strong economic conditions. Similarly, low values of $\widehat{g}_\tau$ tend to indicate low profitability and thus weak economic conditions.[15] Panel B plots the probabilities of all three policy choices, as perceived by the investors immediately before time τ. We set the values of $\widehat{c}_\tau^L$ and $\widehat{c}_\tau^H$ equal to their initial values at time 0 ($\widehat{c}_\tau^L = \widehat{c}_\tau^H = -\sigma_c^2/2$) to make both new policies equally likely (as a result, the solid and dotted lines in Panel B

[15]The value of $\widehat{g}_\tau$ is determined by the cumulative effect of all aggregate profitability shocks before time τ (see equation (9)). A high value of $\widehat{g}_\tau$ implies high average realized profitability, and vice versa. Plotting a quantity against $\widehat{g}_\tau$ is equivalent to plotting it against the average realized profitability computed across many paths of shocks simulated from our model. To the extent that strong (weak) economic conditions are characterized by high (low) aggregate profitability, $\widehat{g}_\tau$ is a natural measure of economic conditions.

coincide). In both panels, policy H is labeled as the "new risky policy," whereas policy L is labeled as the "new safe policy" (since $\sigma_{g,L} < \sigma_{g,H}$).

The policy probabilities in Panel B of Figure 1 are easy to understand. When $\widehat{g}_\tau$ is very low, the probability that the old policy will be retained is close to zero. A low $\widehat{g}_\tau$ indicates that the old policy is "not working," so the government is likely to replace it (Proposition 1). Both new policies receive equal probabilities of almost 50% when $\widehat{g}_\tau$ is very low. In contrast, when $\widehat{g}_\tau$ is very high, the old policy is almost certain to be retained. A high $\widehat{g}_\tau$ boosts the old policy's utility score, thereby boosting the probability of no policy change. It is possible for the government to replace the old policy even when $\widehat{g}_\tau$ is high—this happens if the government derives an unexpectedly large political benefit from one or both of the new policies—but such an event becomes increasingly unlikely as $\widehat{g}_\tau$ increases. All three policies receive equal probabilities when $\widehat{g}_\tau = -0.7\%$. Interestingly, when $\widehat{g}_\tau = 0$, the old policy is almost certain to be retained. This result is driven by learning about g^0. By time τ, the agents learn a lot about the old policy's impact: $\widehat{\sigma}_t$ drops from $\sigma_g = 2\%$ at time 0 to 1.24% at time $\tau = 10$ (see equation (10)). This decrease in $\widehat{\sigma}_t$ improves the old policy's utility score relative to the new policies (about which there is no learning before τ). Therefore, the old policy is likely to be replaced only if its perceived impact $\widehat{g}_\tau$ is sufficiently negative.

The announcement returns in Panel A of Figure 1 are also intuitive. The solid line is always below the dotted line—the new risky policy produces a lower announcement return than the new safe policy (i.e., $R^H < R^L$) for any $\widehat{g}_\tau$, consistent with Corollary 3. The two lines depend on $\widehat{g}_\tau$ in very similar ways, as predicted by Corollary 2. The announcement of the new risky policy is always bad news for the stock market ($R^H < 0$), due to the discount rate effect discussed earlier. When $\widehat{g}_\tau$ exceeds -0.5% or so, any policy change is bad news (i.e., $R^H < 0$ and $R^L < 0$), and both R^H and R^L grow more negative as $\widehat{g}_\tau$ increases. The reason is that when $\widehat{g}_\tau$ is high, retaining the old policy is the best option from the investors' perspective, so any policy change comes as a disappointment. However, any policy change is also very unlikely for $\widehat{g}_\tau > -0.5\%$, as shown in Panel B. Therefore, the large negative values of R^H and R^L observed at high values of $\widehat{g}_\tau$ occur with very low probability.

The dependence of R^0 on $\widehat{g}_\tau$ (the dashed line) is the result of an interaction of two effects. First, higher values of $\widehat{g}_\tau$ push R^0 up because a policy with a more favorable impact on profitability is better for stock prices. Second, higher values of $\widehat{g}_\tau$ push R^0 closer to zero because they increase the probability that the old policy will be retained. The first effect dominates when $\widehat{g}_\tau$ is low, while the second effect prevails when $\widehat{g}_\tau$ is high. When $\widehat{g}_\tau$ is very low, below -1.6% or so, R^0 is negative because the retention of a policy that is perceived to harm the private sector reduces market values. As $\widehat{g}_\tau$ rises, R^0 turns positive because the old policy is perceived as a better outcome than a coin toss that could result in the adoption of the new risky policy, which would be far worse for stock prices. As $\widehat{g}_\tau$ rises above -0.8% or so, R^0 begins to decline toward zero because the second effect begins to dominate. The probability of the old policy climbs quickly, reaching values very close to one by the time $\widehat{g}_\tau$ rises to about -0.4%. For any $\widehat{g}_\tau > -0.4\%$, R^0 is essentially zero. Naturally, if the market expects the old policy to be retained, the announcement of such a retention contains only a small element of surprise, so the resulting stock market reaction is weak.

Armed with the understanding of how stocks respond to various policy choices at time τ, we are now ready to analyze stock prices and risk premia before time τ. Some additional interesting results related to the announcement returns, ones that are not central to our analysis of the risk premia, are presented later in Sections 6. and 7.

5. Stock Prices Before the Policy Decision

This section analyzes the asset pricing implications of political uncertainty before time τ. First, we examine the effect of this uncertainty on the stochastic discount factor. Next, we study the level of stock prices and its dependence on the economic and political shocks. Finally, we analyze the risk premium induced by political uncertainty.

5.1. The Stochastic Discount Factor

Before time τ, the agents learn about the impact of the old policy as well as the political costs of the new policies. This learning generates stochastic variation in the posterior means of g^0 and $\{c^n\}_{n=1}^N$, as shown in equations (9) and (13). The $N+1$ posterior means, $\left(\widehat{g}_t, \widehat{c}_t^1, \ldots, \widehat{c}_t^N\right)$, represent stochastic state variables that affect asset prices before time τ. The posterior variances of g^0 and $\{c^n\}_{n=1}^N$ vary deterministically as a function of time (see equations (10) and (14)). We denote the full set of $N+2$ state variables, including time t, by

$$S_t \equiv \left(\widehat{g}_t, \widehat{c}_t^1, \ldots, \widehat{c}_t^N, t\right) \ . \tag{33}$$

The following proposition presents an analytical expression for the stochastic discount factor, which is defined in equation (25).

Proposition 3: *The stochastic discount factor (SDF) at time $t \leq \tau$ is given by*

$$\pi_t = \lambda^{-1} B_t^{-\gamma} e^{\left(-\gamma\mu + \frac{1}{2}\gamma(\gamma+1)\sigma^2\right)(T-\tau)} \Omega\left(S_t\right) \ , \tag{34}$$

where the function $\Omega(S_t)$ is given in equation (A3) in the Appendix.

The dynamics of π_t, which are key for understanding the sources of risk in this economy, are given in the following proposition, which follows from Proposition 3 by Ito's lemma.

Proposition 4: *The SDF follows the diffusion process*

$$\frac{d\pi_t}{\pi_t} = \left(-\gamma\sigma + \sigma_{\pi,0}\right) d\widehat{Z}_t + \sum_{n=1}^{N} \sigma_{\pi,n} d\widehat{Z}_{c,t}^n \ , \tag{35}$$

where

$$\sigma_{\pi,0} = \frac{1}{\Omega} \frac{\partial \Omega}{\partial \widehat{g}_t} \widehat{\sigma}_t^2 \sigma^{-1} \tag{36}$$

$$\sigma_{\pi,n} = \frac{1}{\Omega} \frac{\partial \Omega}{\partial \widehat{c}_t^n} \widehat{\sigma}_{c,t}^2 h^{-1} \ . \tag{37}$$

Equation (35) shows that the SDF is driven by three types of shocks, which we refer to as capital shocks, impact shocks, and political shocks.

Capital shocks, measured by $-\gamma\sigma d\widehat{Z}_t$, are due to stochastic variation in total capital B_t. In the filtered probability space, B_t follows the process

$$\frac{dB_t}{B_t} = (\mu + \widehat{g}_t)dt + \sigma d\widehat{Z}_t \ , \tag{38}$$

which shows that the shocks to total capital are perfectly correlated with $d\widehat{Z}_t$. Capital shocks would affect the SDF in the same way even if all the parameters were known.

Impact shocks, measured by $\sigma_{\pi,0} d\widehat{Z}_t$, are also perfectly correlated with $d\widehat{Z}_t$, but they are induced by learning about the impact of the old policy (g^0). Recall from equation (9) that the revisions in the agents' beliefs about g^0, denoted by $d\widehat{g}_t$, are perfectly correlated with $d\widehat{Z}_t$. It follows from equation (36) that impact shocks affect the SDF more when the sensitivity of marginal utility to variation in $\widehat{g}_t$ is larger (i.e., when $\partial\Omega/\partial\widehat{g}_t$ is larger), when the uncertainty about g^0 is larger (i.e., when $\widehat{\sigma}_t$ is larger), as well as when the precision of the $\widehat{g}_t$ shocks is larger (i.e., when σ^{-1} is larger). Impact shocks capture the unexpected variation in marginal utility resulting from learning about the old policy's impact.

As noted above, both capital shocks and impact shocks are driven by the same underlying shocks $d\widehat{Z}_t$. Since the latter shocks represent perceived shocks to aggregate capital (see equation (38)), they affect the aggregate fundamentals of the economy. Therefore, we refer to both capital shocks and impact shocks jointly as *economic shocks*.

The third and final type of shocks, *political shocks*, are orthogonal to economic shocks. Political shocks, measured by $\sum_{n=1}^{N} \sigma_{\pi,n} d\widehat{Z}_{c,t}^{n}$, arise due to learning about the political costs $\{C^n\}_{n=1}^{N}$ (see equation (13)). The $d\widehat{Z}_{c,t}^{n}$ shocks are independent of the $d\widehat{Z}_t$ shocks; hence the orthogonality between the political and economic shocks. It follows from equation (37) that political shocks have a bigger effect on the SDF when the sensitivity of marginal utility to $\widehat{c}_t^n$ $(\partial\Omega/\partial\widehat{c}_t^n)$ is larger, when the uncertainty about political costs $(\widehat{\sigma}_{c,t})$ is larger, as well as when the precision of the political signals (h^{-1}) is larger.

Interestingly, the importance of political shocks for the SDF is state-dependent, as a result of the dependence of the sensitivity $\partial\Omega/\partial\widehat{c}_t^n$ on $\widehat{g}_t$. When $\widehat{g}_t$ is large, this sensitivity is close to zero, and so is $\sigma_{\pi,n}$. In fact, we can prove the following corollary.

Corollary 4: *As* $\widehat{g}_t \to \infty$, $\sigma_{\pi,n} \to 0$ *for all* $n = 1, \ldots, N$.

The logic behind this corollary is simple. As $\widehat{g}_t$ increases, the old policy becomes increasingly likely to be retained by the government at time τ, as discussed earlier. In the limit, as $\widehat{g}_t \to \infty$, the old policy is certain to be retained. Since the new policies are certain not to be adopted, news about their political costs does not matter. More generally, learning about the relative attractiveness of the new policies matters more if the old policy is more likely to be replaced, which happens when $\widehat{g}_t$ is lower. We return to this point later in this section.

5.2. The Level of Stock Prices

The level of stock prices is derived in closed form in the following proposition.

Proposition 5: *The market value of firm* i *at time* $t \leq \tau$ *is given by*

$$M_t^i = B_t^i e^{(\mu-\gamma\sigma^2)(T-\tau)} \frac{H(S_t)}{\Omega(S_t)} , \tag{39}$$

where $\Omega(S_t)$ *and* $H(S_t)$ *are given in equations (A3) and (A4) in the Appendix.*

To understand the dependence of stock prices on the state variables, we evaluate the market-to-book ratio (M_t^i/B_t^i, or M/B) for the same economy analyzed earlier, with $N = 2$ and the parameter values from Table 1. Figure 2 plots M/B as a function of $\widehat{g}_t$ for three different combinations of $\widehat{c}_t^L$ and $\widehat{c}_t^H$. In the baseline scenario (solid line), we set $\widehat{c}_t^L = \widehat{c}_t^H =$

$-\frac{1}{2}\sigma_c^2$, which is the prior mean from equation (7).[16] In this scenario, policies H and L are perceived as equally likely to be adopted at time τ. In the other two scenarios, we maintain $\widehat{c}_t^L = -\frac{1}{2}\sigma_c^2$ but vary $\widehat{c}_t^H$ so that one policy is more likely than the other. In the first scenario (dashed line), $\widehat{c}_t^H$ is two standard deviations below $\widehat{c}_t^L$, so that policy H is more likely. In the second scenario (dotted line), $\widehat{c}_t^H$ is two standard deviations above $\widehat{c}_t^L$, and policy L is more likely. All quantities are computed at time $\tau - 1$ when the political debates begin.

Figure 2 highlights the effects of both economic and political shocks on stock prices. First, consider the economic shocks, or shocks to aggregate capital. Recall that these shocks are perfectly correlated with shocks to $\widehat{g}_t$ (see equations (9) and (38)). Figure 2 shows that the relation between M/B and $\widehat{g}_t$ is monotonically increasing. Higher values of $\widehat{g}_t$ increase stock prices because they raise the agents' expectations of future profits.

More interesting, the relation between M/B and $\widehat{g}_t$ is highly nonlinear. This relation is nearly flat when $\widehat{g}_t$ is low, steeper when $\widehat{g}_t$ is high, and steeper yet when $\widehat{g}_t$ takes on intermediate below-average values. To understand this nonlinear pattern, recall that the probability of retaining the old policy, p_t^0, crucially depends on $\widehat{g}_t$. When $\widehat{g}_t$ is very low, the old policy is very likely to be replaced at time τ (i.e., $p_t^0 \approx 0$). Therefore, shocks to $\widehat{g}_t$ are temporary, lasting for one year only. As a result, shocks to $\widehat{g}_t$ have a small effect on M/B, and the relation between M/B and $\widehat{g}_t$ is relatively flat. This result is indicative of the put protection that the government implicitly provides to the stock market.

In contrast, when $\widehat{g}_t$ is high, the old policy is very likely to be retained (i.e., $p_t^0 \approx 1$). Therefore, shocks to $\widehat{g}_t$ are permanent and the relation between M/B and $\widehat{g}_t$ is steeper. The relation is even steeper for intermediate values of $\widehat{g}_t$ that are mostly below the unconditional mean of zero (for example, for the solid line, these are values between -1% and 0.3% or so). For those intermediate values, p_t^0 is highly sensitive to $\widehat{g}_t$—a positive shock to $\widehat{g}_t$ substantially increases p_t^0. Therefore, a positive shock to $\widehat{g}_t$ gives a "double kick" to stock prices—in addition to raising expected profitability, it also reduces the probability of a policy change. The latter effect lifts stock prices because a policy change is expected to be bad news for stocks for these intermediate values of $\widehat{g}_t$, as shown earlier in Section 4.

Political shocks also exert a strong and state-dependent effect on stock prices. Recall that political shocks are due to revisions in $\widehat{c}_t^L$ and $\widehat{c}_t^H$ (see equation (13)). Figure 2 shows that these revisions matter especially when $\widehat{g}_t$ is very low, i.e., in poor economic conditions. For example, when $\widehat{g}_t = -2\%$, increasing $\widehat{c}_t^H$ by two standard deviations pushes M/B up by

[16]Note that the prior mean represents the initial values of $\widehat{c}_t^L$ and $\widehat{c}_t^H$ at time 0, in that $\widehat{c}_0^L = \widehat{c}_0^H = -\frac{1}{2}\sigma_c^2$.

8% (dashed line vs. solid line), and then by another 9% (solid line vs. dotted line). M/B rises because a higher value of $\widehat{c}_t^H$ makes policy H less likely relative to policy L, and policy H has a more adverse effect on stock prices (e.g., see Figure 1). In contrast, political shocks do not matter in strong economic conditions—when $\widehat{g}_t$ is sufficiently high, above 1% or so, the three lines in Figure 2 coincide. This result is closely related to Corollary 4. When $\widehat{g}_t$ is very high, the old policy is almost certain to be retained (i.e., $p_t^0 \approx 1$), so that news about the political costs of the new policies is irrelevant.

To summarize, Figure 2 shows that economic and political shocks, which are orthogonal to each other, exert important independent effects on stock prices. Political shocks matter especially in poor economic conditions (i.e., when $\widehat{g}_t$ is low), whereas economic shocks matter in better conditions, especially in below-average-but-not-terrible conditions (i.e., when $\widehat{g}_t$ takes on intermediate below-average values).

5.3. The Risk Premium and Its Components

The dynamics of stock prices are presented in the following proposition.

Proposition 6: *Stock returns of firm i at time $t \leq \tau$ follow the process*

$$\frac{dM_t^i}{M_t^i} = \mu_M^i dt + (\sigma + \sigma_{M,0})\, d\widehat{Z}_t + \sum_{n=1}^{N} \sigma_{M,n} d\widehat{Z}_{c,t}^n + \sigma_1 dZ_t^i \ , \tag{40}$$

where

$$\begin{aligned} \sigma_{M,0} &= \left(\frac{1}{H}\frac{\partial H}{\partial \widehat{g}_t} - \frac{1}{\Omega}\frac{\partial \Omega}{\partial \widehat{g}_t}\right)\widehat{\sigma}_t^2 \sigma^{-1} \\ \sigma_{M,n} &= \left(\frac{1}{H}\frac{\partial H}{\partial \widehat{c}_t^n} - \frac{1}{\Omega}\frac{\partial \Omega}{\partial \widehat{c}_t^n}\right)\widehat{\sigma}_{c,t}^2 h^{-1} \end{aligned}$$

and

$$\mu_M^i = (\gamma\sigma - \sigma_{\pi,0})\,(\sigma + \sigma_{M,0}) - \sum_{n=1}^{N} \sigma_{\pi,n}\sigma_{M,n} \ . \tag{41}$$

Equation (40) shows that individual stock returns are driven by both economic shocks ($d\widehat{Z}_t$) and political shocks ($d\widehat{Z}_{c,t}^n$), as well as by the firm-specific dZ_t^i shocks. The latter shocks do not command a risk premium because they are diversifiable across firms. The risk premium μ_M^i, which also represents the expected value of dM_t^i/M_t^i, is given in equation (41). This risk premium does not depend on i, so it also represents the market-wide equity risk premium. The risk premium can be further decomposed as follows:

$$\mu_M^i = \underbrace{\underbrace{\gamma\sigma^2}_{\text{Capital shocks}} + \underbrace{(\gamma\sigma\sigma_{M,0} - \sigma\sigma_{\pi,0} - \sigma_{M,0}\sigma_{\pi,0})}_{\text{Impact shocks}}}_{\text{Economic shocks}} - \underbrace{\sum_{n=1}^{N} \sigma_{\pi,n}\sigma_{M,n}}_{\text{Political shocks}} . \tag{42}$$

Equation (42) shows that the risk premium has three components corresponding to the three types of shocks introduced earlier in the discussion of Proposition 4. Recall that impact shocks are induced by learning about g^0 (i.e., by time variation in $\widehat{g}_t$), whereas political shocks are induced by learning about C^n (i.e., by $d\widehat{Z}_{c,t}^n, n = 1, \ldots, N$). Also recall that both capital shocks and impact shocks are driven by the same economic shocks $d\widehat{Z}_t$. A positive shock $d\widehat{Z}_t$ increases not only current capital B_t (equation (38), a capital shock) but also expected future capital via $\widehat{g}_t$ (equation (9), an impact shock).

The last term in equation (42) represents the risk premium induced by the political shocks, which are orthogonal to the economic shocks. It is interesting that the political shocks command a risk premium despite being unrelated to the economic fundamentals. We refer to this premium as the *political risk premium*, to emphasize its difference from the more traditional economic risk premia that are driven by the fundamental shocks. The political risk premium is the premium that investors demand for holding stocks due to uncertainty about which new policy the government might adopt in the future.

The second term in (42), the risk premium induced by impact shocks, represents compensation for a different aspect of uncertainty about government policy—uncertainty about the impact of the prevailing policy on profitability (g^0). If g^0 were known with certainty, this component of the risk premium would be zero. Learning about g^0 affects the investors' expectations of future capital growth, as well as their assessment of the probability that the government will change its policy. Since the signals about g^0 are perfectly correlated with economic shocks ($d\widehat{Z}_t$), the second term in (42) represents an economic risk premium.

The risk premium induced by capital shocks, $\gamma\sigma^2$, is independent of any state variables. In contrast, the risk premia induced by both impact shocks and political shocks are state-dependent because $\sigma_{M,n}$ and $\sigma_{\pi,n}$ depend on S_t for all $n = 0, \ldots, N$. For example, we already know that the political risk premium goes to zero as $\widehat{g}_t \to \infty$ (Corollary 4). More generally, we show below that the political risk premium is larger in poorer economic conditions (i.e., when $\widehat{g}_t$ is low). We also show that the risk premium induced by impact shocks varies with the economic conditions in an interesting non-monotonic fashion.

5.3.1. The Risk Premium: A Quantitative Analysis

To assess the potential magnitudes of the equity risk premium and its components, we calculate these quantities for the parameter values from Table 1. Panel A of Figure 3 plots the risk premium and its three components as a function of $\widehat{g}_t$. The component due to capital shocks is plotted in blue at the bottom, the component due to impact shocks is plotted in green in the middle, and the component due to political shocks is plotted in red at the top. Panel B plots the probabilities of the three policy choices as of time t. The values of $\widehat{c}_t^L$ and $\widehat{c}_t^H$ are set equal to the same prior mean, so that both new policies, L and H, are equally likely. As before, all quantities are computed at time $t = \tau - 1$.

Panel A of Figure 3 shows a hump-shaped pattern in the risk premium. The premium is about 4% per year when $\widehat{g}_t$ is either high or low, but it is 5.5% for intermediate values of $\widehat{g}_t$. This hump-shape is not induced by the capital-shock component, which contributes a constant 1.25% regardless of $\widehat{g}_t$. Instead, this pattern results from the state dependence of the political-shock and impact-shock components, which are discussed next.

The political risk premium is the largest component of the total risk premium when $\widehat{g}_t$ is low. This component accounts for almost two thirds of the total premium when $\widehat{g}_t$ is below -1.5% or so, contributing about 2.5% per year. This contribution shrinks as $\widehat{g}_t$ increases, and for $\widehat{g}_t > 0.3\%$ or so, the political risk premium is essentially zero. This non-linear dependence of the political risk premium on $\widehat{g}_t$ is closely related to the non-linear probability patterns in Panel B. When $\widehat{g}_t$ is below -1.5% or so, the probability of a policy change one year later is essentially one, so uncertainty about which new policy will be adopted has a large impact on the risk premium. In contrast, when $\widehat{g}_t > 0.3\%$, the probability of a policy change is very close to zero. Since it is virtually certain that the potential new policies will not be adopted, news about their political costs does not merit a risk premium.

The impact-shock component is the largest component of the risk premium when $\widehat{g}_t$ is high. When $\widehat{g}_t$ is above 0.5% or so, this component contributes about 2.5% per year to the total premium. Its contribution is even higher, about 3.5%, when $\widehat{g}_t$ is close to zero, but it is much lower, only about 0.2%, when $\widehat{g}_t$ is very low. This interesting non-monotonicity is also related to policy probabilities, as discussed earlier in Figure 2. When $\widehat{g}_t$ is low, the probability of a policy change is high; as a result, shocks to $\widehat{g}_t$ are temporary and they have a small effect on the risk premium. This result reflects the quasi-benevolent nature of the government—by essentially guaranteeing a policy change if economic conditions turn bad, the government effectively provides a put option to the market.

This put option is worth little when $\widehat{g}_t$ is high because a policy change is then unlikely. Given the longer-lasting nature of the shocks to $\widehat{g}_t$, the risk premium induced by impact shocks is higher when $\widehat{g}_t$ is high. The premium is even higher for intermediate values of $\widehat{g}_t$ for which the probability of a policy change is highly sensitive to $\widehat{g}_t$. A negative shock to $\widehat{g}_t$ then depresses stock prices not only directly, by reducing expected profitability, but also indirectly, by increasing the probability of a policy change. The indirect effect is negative because a higher likelihood of a policy change is bad news for stocks for such values of $\widehat{g}_t$, as shown in Section 4. Given the double effect of the $\widehat{g}_t$ shocks, investors demand extra compensation for holding stocks in the intermediate economic conditions. For example, when $\widehat{g}_t = 0$, impact shocks account for about two thirds of the 5% total risk premium.

Overall, Figure 3 shows that the composition of the equity risk premium depends on the economic conditions. In strong conditions, the equity premium is driven by economic shocks, whereas in weak conditions, it is driven mostly by political shocks. In those weak conditions, the risk premium is affected by two opposing forces. On the one hand, the premium is reduced by the implicit put option provided by the government. On the other hand, the premium is boosted by the uncertainty about which new policy the government will adopt. The two forces roughly cancel out for the parameter values used here. An additional force, which operates in intermediate economic conditions, is the uncertainty about whether the old policy will be replaced. Due to that uncertainty, the largest values of the equity premium obtain in average and slightly-below-average economic conditions.

5.3.2. Robustness

Figures 4 and 5 examine the robustness of the results from Figure 3 to other parameter choices. In Panels A and B of Figure 4, we replace the baseline value $\sigma_g = 2\%$ by two different values, 1% and 3%, while keeping all remaining parameters at their baseline values from Table 1. We see that σ_g affects primarily the impact-shock component of the risk premium. This component is larger for higher values of σ_g. This is intuitive because when σ_g is higher, the old policy's impact is more uncertain, and the $\widehat{g}_t$ shocks are more volatile (see equations (9) and (10)). In Panels C and D, we replace the baseline value $\sigma_c = 10\%$ by 5% and 20%. We see that σ_c affects mostly the political-shock component of the risk premium. The political risk premium is higher when σ_c is higher. This makes sense because larger values of σ_c make political costs more uncertain, thereby increasing the volatility of the political shocks (see equations (13) and (14)). In Panels A and B of Figure 5, we replace the baseline value $h = 5\%$ by 2.5% and 10%. Similar to σ_c, h affects primarily the political risk premium. This premium is lower when h is higher because the signals about the political costs are then less precise. As a result, learning about these costs is slower and the political shocks are less volatile (see equations (13) and (14)). In Panels C and D, we replace the baseline value $\tau - t = 1$ year by 1.5 and 0.5 years. This change affects mostly the impact-shock component. When time τ is closer, two things happen. First, the posterior uncertainty about g^0 is smaller, which pushes the impact-shock component down. Second, the probability of a policy change is more sensitive to the $\widehat{g}_t$ shocks for intermediate values of $\widehat{g}_t$, which pushes the impact-shock component up for such values of $\widehat{g}_t$. Overall, Figures 4 and 5 lead to the same qualitative conclusions as Figure 3 about the relative importance of economic and political shocks in different economic conditions.

Figure 6 provides another robustness check by varying the properties of the new policies. This figure is analogous to Figure 3, except that the new policies no longer yield the same level of utility a priori. In Panels A and C, we replace the baseline values $(\sigma_{g,L}, \sigma_{g,H}) = (1\%, 3\%)$ by $(0.9\%, 3.1\%)$, thereby making policy H riskier and policy L safer. We keep all remaining parameters at their baseline values, including $\mu_g^L = -0.8\%$ and $\mu_g^H = 0.8\%$. Since policy H now yields less utility than policy L, its prior probability is smaller than that of policy L. Indeed, in Panel C, policy L is about twice as likely as policy H at any level of $\widehat{g}_t$. In Panels B and D of Figure 6, we replace the baseline values of $\sigma_{g,L}$ and $\sigma_{g,H}$ by $(1.1\%, 2.9\%)$, making policy H safer and policy L riskier. Policy H then yields more utility, and it is about twice as likely as policy L. We keep $\widehat{c}_t^L$ and $\widehat{c}_t^H$ equal to their initial values, as before.

The main difference between Panels A and B of Figure 6 on one side and Figure 3 on the other is in the magnitude of the political risk premium. In Panel A, this risk premium is substantially larger than in Figure 3, whereas in Panel B it is smaller. For example, at large negative values of $\widehat{g}_t$, the political risk premium is about 4% in Panel A and 1% in Panel B, compared to 2.5% in Figure 3. The reason behind the larger premium in Panel A is that the two new policies are more different from each other, making the choice between them more important. In contrast, the two policies are more similar in Panel B, reducing the importance of uncertainty about which of them will be chosen. Apart from this quantitative difference, Figure 6 reaches the same conclusions as Figure 3.

5.3.3. The effect of policy heterogeneity

In Figure 7, we examine how the risk premia depend on the degree to which the potential new policies differ from each other while providing the same level of welfare. Unlike in Figure

6, we keep both policies H and L on the iso-utility curve. We define policy *heterogeneity* as $\mathcal{H} = \sigma_{g,H} - \sigma_{g,L}$. To vary $\mathcal{H}$, we vary $\sigma_{g,L}$ and $\sigma_{g,H}$ while keeping all other parameters fixed at their values from Table 1. In the baseline case examined in Figure 3, we have $\sigma_{g,L} = 1\%$ and $\sigma_{g,H} = 3\%$, so that $\mathcal{H} = 2\%$. In Figure 7, we consider three levels of $\mathcal{H}$: 1%, 2%, and 3%, by choosing $(\sigma_{g,L}, \sigma_{g,H}) = (1.5\%, 2.5\%), (1\%, 3\%)$, and $(0.5\%, 3.5\%)$, respectively. For each of the three pairs of $(\sigma_{g,L}, \sigma_{g,H})$, we choose μ_g^H and $\mu_g^L = -\mu_g^H$ such that both new policies yield the same level of utility. Panel A plots the probability of retaining the old policy, as perceived at time $t = \tau - 1$. The new policies are equally likely as we set $\widehat{c}_\tau^L = \widehat{c}_\tau^H = -\sigma_c^2/2$, as before. Panel B plots the total equity premium, whereas Panels C and D plot its components due to economic and political shocks, respectively. Recall that economic shocks include both capital and impact shocks.

Figure 7 shows that the risk premium is generally higher when the new policies are more heterogeneous, except in strong economic conditions. This relation is driven mostly by the premium's political shock component in poor economic conditions. At large negative values of $\widehat{g}_t$, the political risk premium is 0.7% when $\mathcal{H} = 1\%$ and 5.7% when $\mathcal{H} = 3\%$, compared to 2.5% in the baseline case. Not surprisingly, when the new policies are more heterogeneous, uncertainty about which of them will be chosen is more important. In addition, more heterogeneity increases the importance of the decision whether to retain the old policy, resulting in a higher impact shock component. Adding up the two effects across Panels C and D, the total risk premium in Panel B strongly depends on the menu of policies considered by the government, except in good economic conditions when no policy change is expected.

Figure 8 describes the same scenario as Figure 7, but instead of the risk premium, it plots the stock price level (M/B), the volatility of individual stock returns, and the correlation between each pair of stocks. First, consider the baseline case of $\mathcal{H} = 2\%$ (solid line). The stock price level in Panel B exhibits the same hockey-stick-like pattern as it does in Figure 2, for the same reason—the government's implicit put option supports stock prices in poor economic conditions. Panels C and D show that stocks are more volatile and more highly correlated when the economic conditions are poor. Comparing very good conditions ($\widehat{g}_t = 2\%$) with very bad ones ($\widehat{g}_t = -2\%$), volatility is almost 50% higher in bad conditions (19.5% versus 13.4%), and the pairwise correlation is over 70% higher (74% versus 43%). The reason is that political uncertainty is higher in bad economic conditions, as discussed earlier. This uncertainty affects all firms, so it cannot be fully diversified away.

Departing from the baseline case and looking across the three lines in Panel B of Figure 8, we see that higher heterogeneity generally implies lower stock prices, but only in weak economic conditions. This result is easy to understand. More policy heterogeneity means more political uncertainty, especially in weak conditions, as discussed earlier. The higher political uncertainty translates into higher risk premia (see Figure 7), which push stock prices down. Higher heterogeneity also generally implies higher volatilities and correlations, as shown in Panels C and D. For example, in poor economic conditions, the correlation is 86% when $\mathcal{H} = 3\%$ but only 48% when $\mathcal{H} = 1\%$. Again, more heterogeneity means more political uncertainty, and political shocks affect all firms.

6. The Jump Risk Premium

In this section, we study the risk premium at a different point in time. Instead of quantifying the premium before time τ as in Section 5., we measure it at time τ, immediately before the policy decision. Before time τ, the political risk premium is induced by a continuous stream of political shocks, which lead investors to revise their beliefs about the probabilities of the various policy choices. At time τ, the ultimate political shock occurs when the C^n's are revealed and the government announces its decision. Stock prices jump at the announcement, as shown in Section 4., so the risk premium at time τ is a jump risk premium.

This jump risk premium is due to political uncertainty. Before time τ, investors face uncertainty about two events: whether the current policy will be replaced, and if so, which new policy will be adopted. Whereas the probability of the second event depends on political shocks only, the first event's probability is driven by both political and economic shocks. Therefore, the political risk premium defined as compensation for political shocks captures only some of the uncertainty associated with government policy choice. In contrast, immediately before the policy decision at time τ, all remaining uncertainty is political. Investors observe $\widehat{g}_\tau$ and the only uncertainty they face pertains to the revelation of the political costs. As a result, the jump risk premium can be fully attributed to political uncertainty.

The jump risk premium is the expected announcement return at time τ, conditional on all the information available to investors immediately before the government's decision:

$$J\left(S_\tau\right) = \sum_{n=0}^{N} p_\tau^n R^n\left(x_\tau\right) \ , \tag{43}$$

where the probabilities p_τ^n come from Corollary 1 and the announcement returns R^n come from Proposition 2. In equilibrium, this premium is also equal to the conditional covariance between the announcement return and the jump in the stochastic discount factor:

$$J\left(S_\tau\right) = -\mathrm{Cov}_\tau\left(\frac{M^i_{\tau+}}{M^i_\tau} - 1, \frac{\pi_{\tau+}}{\pi_\tau} - 1\right) \ . \tag{44}$$

The jump risk premium compensates investors for holding stocks during the announcement of the government's policy decision. We derive a closed-form expression for $J\left(S_\tau\right)$.

Proposition 7: *The conditional jump risk premium is given by*

$$J\left(S_\tau\right) \ = \ \frac{\sum_{n=0}^{N} p^n_\tau e^{-\gamma(T-\tau)(\widetilde{\mu}^n - x_\tau) + \frac{\gamma}{2}(T-\tau)^2\left(\sigma^2_{g,n} - \widehat{\sigma}^2_\tau\right)} \sum_{n=0}^{N} p^n_\tau e^{(\widetilde{\mu}^n - x_\tau)(T-\tau) - \frac{\gamma}{2}(T-\tau)^2\left(\sigma^2_{g,n} - \widehat{\sigma}^2_\tau\right)}}{\sum_{n=0}^{N} p^n_\tau e^{(1-\gamma)(T-\tau)(\widetilde{\mu}^n - x_\tau)}} - 1.$$

To shed some light on the jump risk premium, Panel A of Figure 9 plots $J\left(S_\tau\right)$ as a function of $\hat{g}_\tau$, for three different levels of heterogeneity $\mathcal{H}$. We use the baseline parameter values from Table 1, while varying $\mathcal{H}$ in the same way as in Figures 7 and 8. Panel B plots the probability of retaining the old policy, as perceived immediately before the policy decision. We choose $\widehat{c}^L_\tau$ and $\widehat{c}^H_\tau$ that make both new policies equally likely, as before.

Figure 9 shows that the jump risk premium strongly depends on both $\hat{g}_\tau$ and $\mathcal{H}$. First, the premium is generally higher in weaker economic conditions. For example, for the baseline case of medium $\mathcal{H}$, the premium is 1% when $\hat{g}_\tau$ is sufficiently low, but it is negligible when $\hat{g}_\tau$ is sufficiently large. The reason is that when $\hat{g}_\tau$ is large, the current policy is virtually certain to be retained, so that investors face essentially no uncertainty related to the policy announcement. In contrast, when $\hat{g}_\tau$ is low, investors know that a policy change is coming, but they don't know which new policy will be adopted. As a result, they demand a larger compensation for the jump risk in weaker economic conditions.

Figure 9 also shows that the jump risk premium increases with heterogeneity, as long as the economic conditions are sufficiently weak. When $\mathcal{H}$ is low, the premium is only 27 basis points, but when $\mathcal{H}$ is high, the premium rises to almost 2.3%. A larger value of $\mathcal{H}$ means a larger difference between the two new policies; as a result, uncertainty about which of them will be adopted becomes more important. We also see that the magnitudes of the jump risk premia can be substantial. Overall, Figure 9 lends further support to our conclusions from Section 5. about the pricing of political uncertainty.

7. Distributions of the Announcement Returns

In this section, we provide additional interesting results on the stock market reactions to government policy announcements. We extend our analysis from Section 4.2. by incorporating the random nature of the economic conditions and political news. In Section 4.2., we analyze the announcement returns conditional on a range of values of $\widehat{g}_\tau$, some of which are more likely to occur than others. Between times 0 and τ, $\widehat{g}_t$ follows the martingale process in equation (9), starting at $\widehat{g}_0 = 0$. The probability distribution of $\widehat{g}_\tau$, evaluated as of time 0, is given by $\widehat{g}_\tau \sim N(0, \sigma_g^2 - \widehat{\sigma}_\tau^2)$. We take this uncertainty about $\widehat{g}_\tau$ into account in this section. Similarly, in Section 4.2., we set $\widehat{c}_\tau^L = \widehat{c}_\tau^H$, but in general, both variables follow the stochastic processes in equation (13). We now account for that uncertainty as well.

Figure 10 plots the probability distributions of the announcement returns R^0 (Panel A), R^H (Panel B), and R^L (Panel C) for the baseline parameter values from Table 1. Unlike Figure 1, which relies on the same parameters, Figure 10 incorporates the prior uncertainty about all unknown quantities as of time 0. To integrate this uncertainty out, we use our model to simulate 500,000 random draws of $\hat{g}_\tau$, $\widehat{c}_\tau^L$, $\widehat{c}_\tau^H$, C^L, and C^H from their respective probability distributions. For each set of draws, we compute the government's optimal policy decision, as well as the corresponding announcement return.[17] We then split the 500,000 announcement returns into three subsets corresponding to the three possible policy choices, obtaining the three probability distributions plotted in Figure 10.

Figure 10 shows that a large share of the probability mass of all three announcement returns is concentrated near zero. The reason is that most of the time, investors have a pretty good idea of what announcement the government is going to make. Specifically, the observable quantities $\widehat{g}_\tau$, $\widehat{c}_\tau^L$, and $\widehat{c}_\tau^H$ often assign a very high probability to one of the three policies. As a result, the effect of the policy choice is often reflected in stock prices before the announcement, and the stock market reaction to the announcement is often weak.

Nonetheless, the announcement returns can sometimes be quite different from zero. Even if investors expect the government to act in a particular way, an extreme draw of political costs at time τ can produce a surprising policy choice. Moreover, for many combinations of ($\widehat{g}_\tau$, $\widehat{c}_\tau^L$, and $\widehat{c}_\tau^H$), investors do face substantial uncertainty about the policy choice just before time τ. Figure 10 shows that a surprise announcement of the new risky policy is generally bad news ($R^H < 0$), whereas a surprise announcement of the new safe policy is generally

[17]The empirical frequencies of the various policy choices indicate that the unconditional probabilities of policies 0, L, and H are 63.4%, 18.3%, and 18.3%, respectively.

good news ($R^L > 0$). There is a fair amount of skewness in both Panels B and C.

7.1. The Expected Announcement Return

Finally, we analyze the means of the distributions plotted in Figure 10, which we refer to as *expected announcement returns* (EAR). We compute the EAR conditional on each policy choice by averaging the announcement returns across the subset of the 500,000 simulations in which the given policy is adopted. Since the simulations integrate out all uncertainty about $\hat{g}_\tau$, $\widehat{c}^L_\tau$, $\widehat{c}^H_\tau$, C^L, and C^H, each EAR represents an expectation evaluated at time 0.

Panel A of Figure 11 plots the EAR conditional on any policy change (i.e., policy H or policy L). Panels B and C condition on policies H and L, respectively, and Panel D conditions on the retention of the old policy. In each panel, EAR is plotted as a function of heterogeneity $\mathcal{H} = \sigma_{g,H} - \sigma_{g,L}$. As before, we vary $\mathcal{H}$ by varying $\sigma_{g,L}$ and $\sigma_{g,H}$ while keeping all other parameters at their values from Table 1. We vary $(\sigma_{g,L}, \sigma_{g,H})$ from $(2\%, 2\%)$, in which case $\mathcal{H} = 0$, to $(0, 4\%)$, in which case $\mathcal{H} = 0.04$. For each pair $(\sigma_{g,L}, \sigma_{g,H})$, we choose μ^H_g and $\mu^L_g = -\mu^H_g$ such that both new policies yield the same level of utility.

Panel A of Figure 11 shows that the EAR conditional on a policy change is negative at any level of $\mathcal{H}$. In other words, the stock market falls, on average, when the government announces a policy change. This result extends the main proposition of Pástor and Veronesi (2011), who consider a single-new-policy case ($\mathcal{H} = 0$) and prove analytically that EAR $<$ 0. For $\mathcal{H} = 0$, the EAR is -1.8%, which is similar to the values reported by Pástor and Veronesi.[18] As $\mathcal{H}$ increases, EAR becomes more negative, all the way to -7.5% for $\mathcal{H} = 0.04$. This result is driven mostly by the pattern plotted in Panel B of Figure 11.

Panel B shows that the EAR for the new risky policy H becomes increasingly negative as $\mathcal{H}$ increases, varying from -1.8% at $\mathcal{H} = 0$ to -16.7% at $\mathcal{H} = 0.04$. A higher level of $\mathcal{H}$ makes policy H riskier, thereby strengthening the discount rate effect that pushes stock prices down when policy H is adopted. In contrast, the EAR for the new safe policy L, plotted in Panel C, depends on $\mathcal{H}$ in a non-monotonic way: it initially rises from -1.8% at $\mathcal{H} = 0$ to 1.8% at $\mathcal{H} = 0.03$, but then it falls to 1.1% at $\mathcal{H} = 0.04$. This hump-shaped

[18] Pástor and Veronesi (2011) report EARs ranging from 0 to -2% in their Figure 4. For their benchmark parameter values (which match our Table 1), they report an EAR of -0.5%, which is smaller in magnitude than the -1.8% that we find here. The difference is due to the fact that even with $\mathcal{H} = 0$, our model differs from theirs. In our model, the two new policies have separate political costs, C^L and C^H, whereas there is only one cost in their model. Randomly drawing two independent costs instead of one increases the element of surprise in the government's policy choice, thereby increasing the magnitudes of the EAR's.

pattern is an outcome of two effects. First, the announcement of policy L is good news for stocks in that it averts the abysmal alternative of policy H. Since the EAR of policy H becomes increasingly negative as $\mathcal{H}$ rises, this first effect pushes the EAR of policy L up as $\mathcal{H}$ increases. Second, the announcement of policy L can be bad news for stocks if the market expects the old policy to be retained. It is easy to show that the utility scores of the new policies decline as $\mathcal{H}$ increases.[19] In contrast, the old policy's utility score is independent of $\mathcal{H}$. Therefore, as $\mathcal{H}$ increases, the appeal of the old policy rises, and so does the probability of its retention. As a result, the announcement of policy L can reduce stock prices when $\mathcal{H}$ is high because it precludes the retention of the more appealing old policy.

Panel D of Figure 11 shows that the EAR of the old policy is positive and decreasing in $\mathcal{H}$. The EAR is positive mostly because the retention of the old policy allows investors to breathe a sigh of relief that policy H will not be adopted. The EAR decreases in $\mathcal{H}$ because the probability of the old policy rises as $\mathcal{H}$ increases, as explained in the previous paragraph. When $\mathcal{H}$ is high, the market expects the old policy to be retained. Therefore, this policy choice is largely reflected in the stock prices before the announcement, and the stock market reaction to the announcement is weak. For example, the EAR is only 0.03% when $H = 0.04$.

8. Conclusions

We examine the effect of political uncertainty on stock prices through the lens of a general equilibrium model of government policy choice. In the model, the government tends to change its policy when the economy is weak, effectively providing put protection to the stock market. However, the value of this implicit put option is reduced by political uncertainty. This uncertainty commands a risk premium even though political shocks are orthogonal to the fundamental economic shocks. The risk premium induced by political uncertainty is large especially when the economic conditions are poor. Political uncertainty also makes stocks more volatile and more highly correlated in bad economic conditions. In such conditions, the equity premium is driven mostly by the interaction between the government's put option and political uncertainty, whereas in good conditions, it is driven by economic uncertainty. The premium is often largest in intermediate below-average conditions, in which investors face the most uncertainty about whether the government will change its policy.

We also show that government policies cannot be judged by the stock market reaction to their announcement. Among policies providing the same level of utility, the stock market

[19] The proof relies on the facts that H and L are on the iso-utility curve and $\mu_g^L = -\mu_g^H$.

responds less favorably to policies whose future impact is more uncertain, such as deeper reforms. In addition, we find that the average stock market response to the announcement of a policy change is negative, especially when there is a lot of heterogeneity among the potential new policies. More policy heterogeneity also generally increases the risk premia as well as the volatilities and correlations of stock returns.

Our analysis opens several paths for future research. For example, it would be interesting to extend our model to endogenize the political costs of government policies. We treat those costs as exogenous, for simplicity, but it would be useful to build the microfoundations for them based on the insights from the political economy literature. Such an extension could in principle link asset prices to various political economy variables. Another extension could make the government and the investors asymmetrically informed. Our symmetric-information setting has the virtue of simplicity, but it would seem plausible for the government to have more information about the political costs of the various government policies. Our focus is on stocks, but future work can also relate political uncertainty to the prices of other assets, such as bonds. Last but not least, future research can test the implications of our model empirically. Given a credible empirical proxy for political uncertainty, one could try to assess the magnitude of the risk premium induced by this uncertainty, as well as its dependence on the economic conditions. More work on the government's role in asset pricing is clearly warranted.

Appendix

The Appendix contains selected formulas that are mentioned in the text but omitted for the sake of brevity. The proofs of all results are available in the companion Technical Appendix, which will be downloadable from the authors' websites soon.

Lemma A1: *Immediately before the policy announcement at time τ, the market value of any firm i is given by*

$$\begin{aligned} M_\tau^i &= B_\tau^i e^{(\mu-\gamma\sigma^2)(T-\tau)+\widehat{g}_\tau(T-\tau)+\frac{(1-2\gamma)}{2}(T-\tau)^2\widehat{\sigma}_\tau^2} \times \\ &\times \frac{\left(1+\sum_{n=1}^N p_\tau^n\left(e^{(1-\gamma)\left(\mu_g^n-\widehat{g}_\tau\right)(T-\tau)+\frac{(1-\gamma)^2}{2}(T-\tau)^2\left(\sigma_{g,n}^2-\widehat{\sigma}_\tau^2\right)}-1\right)\right)}{\left(1+\sum_{n=1}^N p_\tau^n\left(e^{-\gamma\left(\mu_g^n-\widehat{g}_\tau\right)(T-\tau)+\frac{\gamma^2}{2}(T-\tau)^2\left(\sigma_{g,n}^2-\widehat{\sigma}_\tau^2\right)}-1\right)\right)} . \end{aligned} \tag{A1}$$

Lemma A2: *Immediately after the announcement of policy n at time τ, for any $n \in \{0, 1, \ldots, N\}$, the market value of any firm i is given by*

$$M_{\tau+}^{i,n} = B_{\tau+}^i e^{(\mu-\gamma\sigma^2+\mu_g^n)(T-\tau)+\frac{1-2\gamma}{2}(T-\tau)^2\sigma_{g,n}^2} . \tag{A2}$$

Definition of Omega.

$$\Omega(S_t) = \sum_{n=0}^N p_t^n F^n(S_t)\, e^{-\gamma\mu_g^n(T-\tau)+\frac{\gamma^2}{2}(T-\tau)^2\sigma_{g,n}^2} . \tag{A3}$$

In equation (A3), we have

$$\begin{aligned} F^n(S_t) &= \int e^{-\gamma\Delta b_\tau} f(\Delta b_\tau | S_t, n \text{ at } \tau)\, d\,\Delta b_\tau \qquad n = 1, \ldots, N \\ F^0(S_t) &= \int e^{-\gamma\left(E[\Delta b_\tau]+(\widehat{g}_\tau-\widehat{g}_t)\sqrt{\frac{V_{b_\tau}}{V_{\widehat{g}_\tau}}}\right)-\gamma(T-\tau)(\widehat{g}_\tau-\widehat{g}_t)} f(\widehat{g}_\tau | S_t, 0 \text{ at } \tau)\, d\widehat{g}_\tau , \end{aligned}$$

where $V_{b_\tau} \equiv \mathrm{Var}(b_\tau|S_t) = \widehat{\sigma}_t^2(\tau-t)^2 + \sigma^2(\tau-t)$, $V_{\widehat{g}_\tau} \equiv \mathrm{Var}(\widehat{g}_\tau|S_t) = \widehat{\sigma}_t^2 - \widehat{\sigma}_\tau^2$, and the conditional densities $f(\Delta b_\tau|S_t, n \text{ at } \tau)$ and $f(\widehat{g}_\tau|S_t, 0 \text{ at } \tau)$ are defined below. The density of $\Delta b_\tau = b_\tau - b_t = \log(B_\tau/B_t)$ conditional on S_t and policy n being chosen at time τ is

$$\begin{aligned} & f(\Delta b_\tau | S_t, n \text{ at } \tau) \\ = & \frac{\phi_{\Delta b_\tau}(\Delta b_\tau)}{p_t^n} \int_{-\infty}^{\widetilde{\mu}^n - E_t[x_\tau]-(\Delta b_\tau - E_t[\Delta b_\tau])\frac{\widehat{\sigma}_t^2}{(\tau-t)\widehat{\sigma}_t^2+\sigma^2}} \Pi_{j\neq n}\left(1-\Phi_{\widetilde{c}^j}\left(\widetilde{c}^n-\widetilde{\mu}^n+\widetilde{\mu}^j\right)\right)\phi_{\widetilde{c}^n}(\widetilde{c}^n)\, d\widetilde{c}^n , \end{aligned}$$

where $\phi_{\Delta b_\tau}(\Delta b_\tau)$ is the normal density with mean $E_t[\Delta b_\tau] = \left(\mu + \widehat{g}_t - \frac{1}{2}\sigma^2\right)(\tau - t)$ and variance V_{b_τ}. In addition, $E_t[x_\tau] = \widehat{g}_t - \frac{\widehat{\sigma}_\tau^2}{2}(T-\tau)(\gamma-1)$.

The density of $\widehat{g}_\tau$ conditional on S_t and the old policy being retained at time τ is

$$f\left(\widehat{g}_\tau | S_t, 0 \text{ at } \tau\right) = \phi_{\widehat{g}}\left(\widehat{g}_\tau\right) \frac{\Pi_{n=1}^{N}\left(1 - \Phi_{\widetilde{c}^n}\left(\widetilde{\mu}^n - \widehat{g}_\tau + \frac{\widehat{\sigma}_\tau^2}{2}\left(T-\tau\right)\left(\gamma-1\right)\right)\right)}{1 - \sum_{n=1}^{N} p_t^n}$$

where $\phi_{\widehat{g}}\left(\widehat{g}_\tau\right)$ is the conditional normal density of $\widehat{g}_\tau$, with mean $\widehat{g}_t$ and variance $\widehat{\sigma}_t^2 - \widehat{\sigma}_\tau^2$.

Definition of H.

$$H\left(S_t\right) = \sum_{n=0}^{N} p_t^n G^n\left(S_t\right) e^{(1-\gamma)\mu_g^n (T-\tau) + \frac{(1-\gamma)^2}{2}(T-\tau)^2 \sigma_{g,n}^2}\ , \tag{A4}$$

where

$$\begin{aligned} G^n\left(S_t\right) &= \int e^{(1-\gamma)\Delta b_\tau} f\left(\Delta b_\tau | \widehat{g}_t, n \text{ at } \tau\right) d\ \Delta b_\tau \qquad n = 1, \ldots, N \\ G^0\left(S_t\right) &= \int e^{(1-\gamma)\left(E[\Delta b_\tau] + (\widehat{g}_\tau - \widehat{g}_t)\sqrt{\frac{V(b_\tau)}{V(\widehat{g}_\tau)}}\right) + (1-\gamma)(T-\tau)(\widehat{g}_\tau - \widehat{g}_t)} f\left(\widehat{g}_\tau | \widehat{g}_t, 0 \text{ at } \tau\right) d\widehat{g}_\tau \end{aligned}$$

Table 1
Parameter Choices

This table reports the baseline parameter values used to produce the subsequent figures. All variables are reported on an annual basis (except for γ, which denotes risk aversion). The parameter choices for the first 8 parameters are identical to those in Pástor and Veronesi (2011). The value of $h = 5\%$ is chosen equal to the value of σ, to equate the speeds of learning about the policy impacts and political costs. The prior uncertainties about the new policies, $\sigma_{g,L} = 1\%$ and $\sigma_{g,H} = 3\%$, are chosen to be symmetric around the old policy's $\sigma_g = 2\%$.

σ_g	σ_c	μ	σ	σ_1	T	τ	γ	h	$\sigma_{g,L}$	$\sigma_{g,H}$
2%	10%	10%	5%	10%	20	10	5	5%	1%	3%

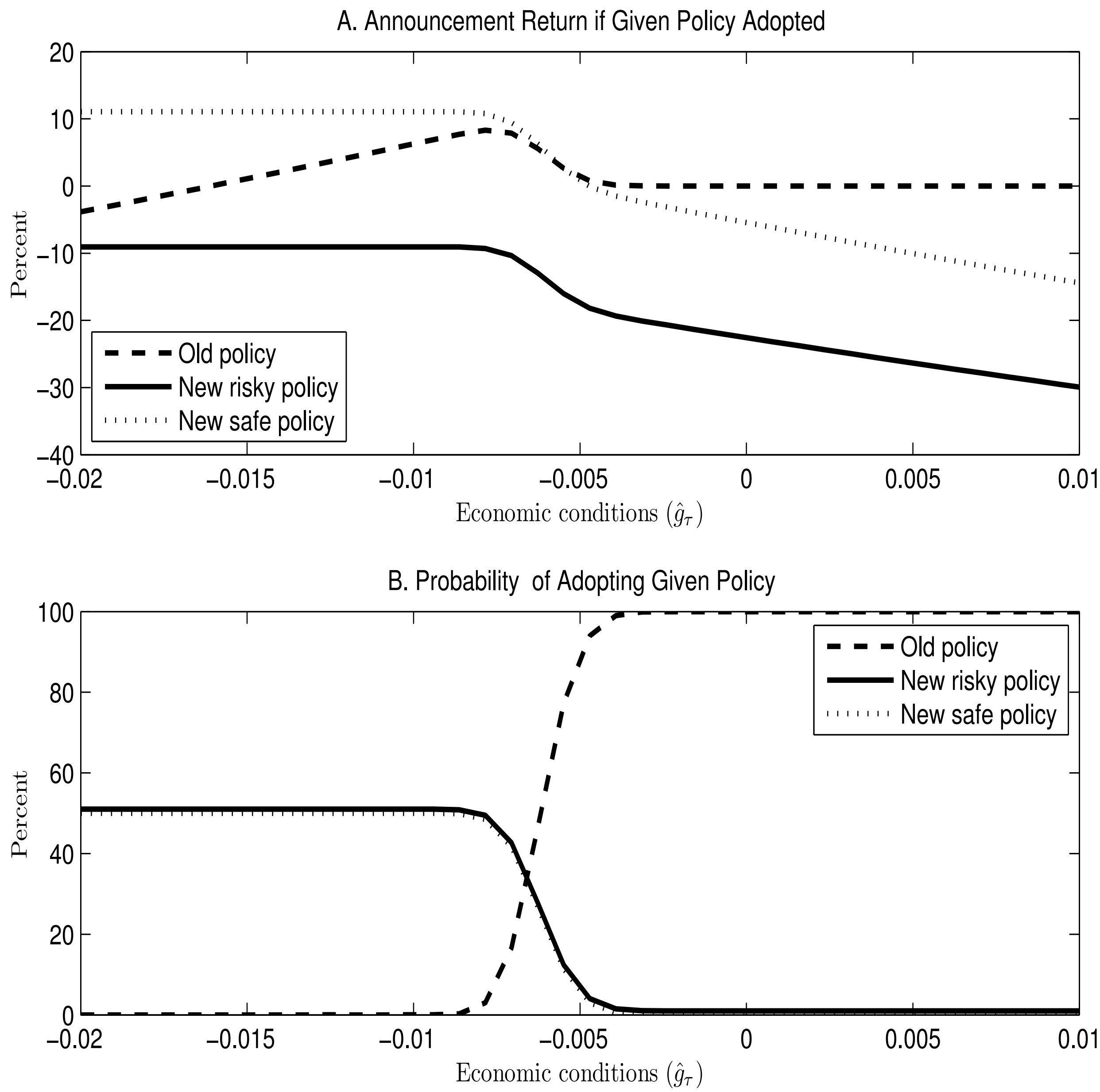

Figure 1. The stock market's response to the government's policy decision. Panel A plots the stock market return immediately after the announcement of the government's policy decision at time τ. The announcement returns are plotted for all three possible policy choices—the old policy, the new risky policy, and the new safe policy—as a function of $\hat{g}_\tau$, which is the posterior mean of the old policy's impact g^0 as of time τ. Panel B plots the probabilities of all three policy choices, as perceived by the investors immediately before time τ. The values of $\widehat{c}_\tau^L$ and $\widehat{c}_\tau^H$ are set equal to their initial values at time 0 ($\widehat{c}_\tau^L = \widehat{c}_\tau^H = -\sigma_c^2/2$), so that both new policies are equally likely; as a result, the solid and dotted lines in Panel B coincide. The parameters are from Table 1.

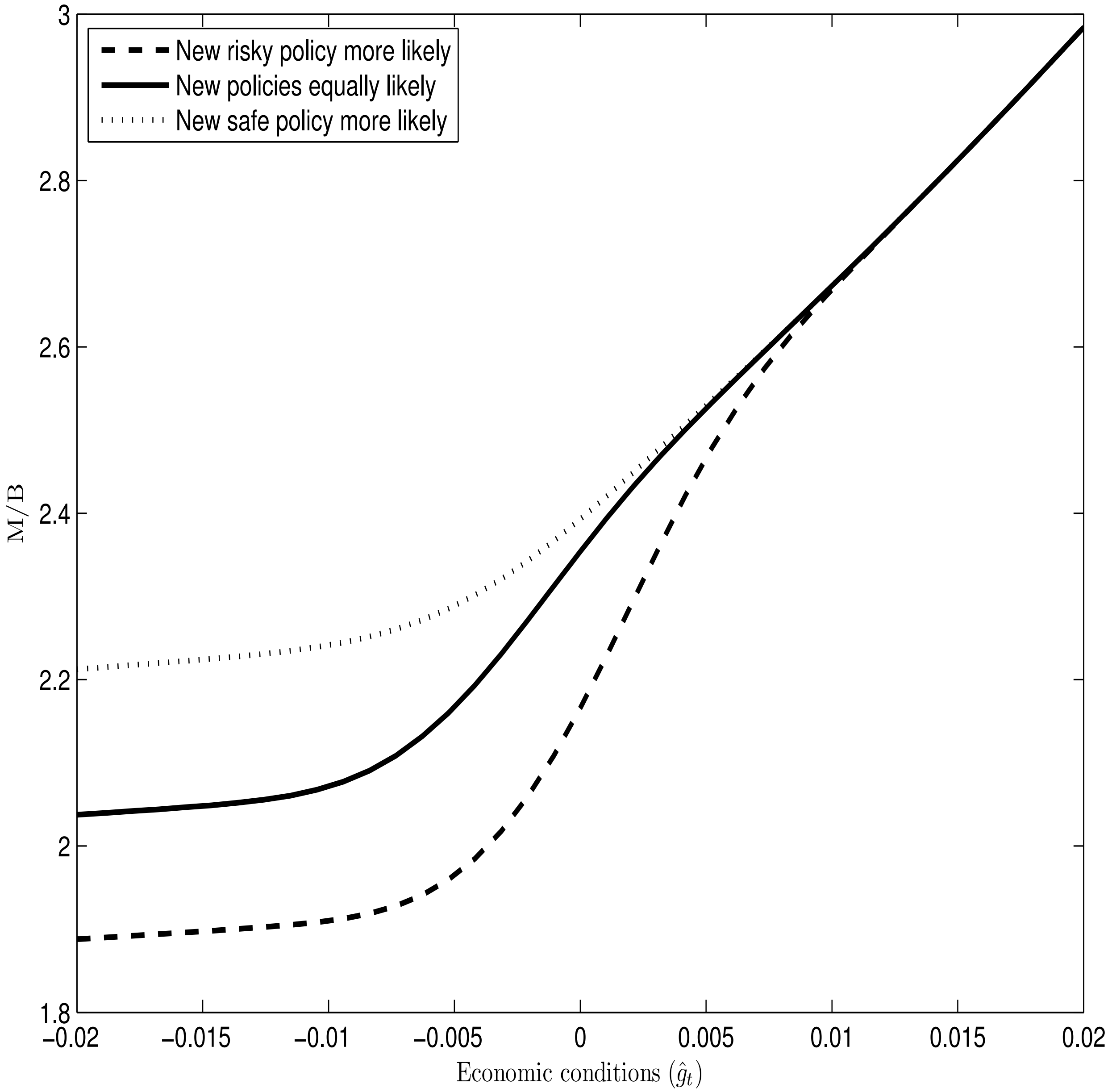

Figure 2. The level of stock prices: The effects of economic and political shocks. This figure plots the aggregate stock price level, measured by the market-to-book ratio M/B, as a function of $\hat{g}_t$, which is the posterior mean of the old policy's impact g^0 as of time t. The solid line corresponds to the scenario in which $\widehat{c}_t^L = \widehat{c}_t^H$ are both equal to their initial value, so that both new policies are equally likely to be adopted at time τ. The dashed (dotted) line corresponds to the scenario in which $\widehat{c}_t^L$ is equal to its initial value but $\widehat{c}_t^H$ is two standard deviations below (above) the same initial value, so that the new risky (safe) policy is more likely. Shocks to $\hat{g}_t$ represent economic shocks, whereas shocks to $\widehat{c}_t^L$ and $\widehat{c}_t^H$ are pure political shocks. All quantities are computed at time $t = \tau - 1$ when the political debates begin. The parameter values are in Table 1.

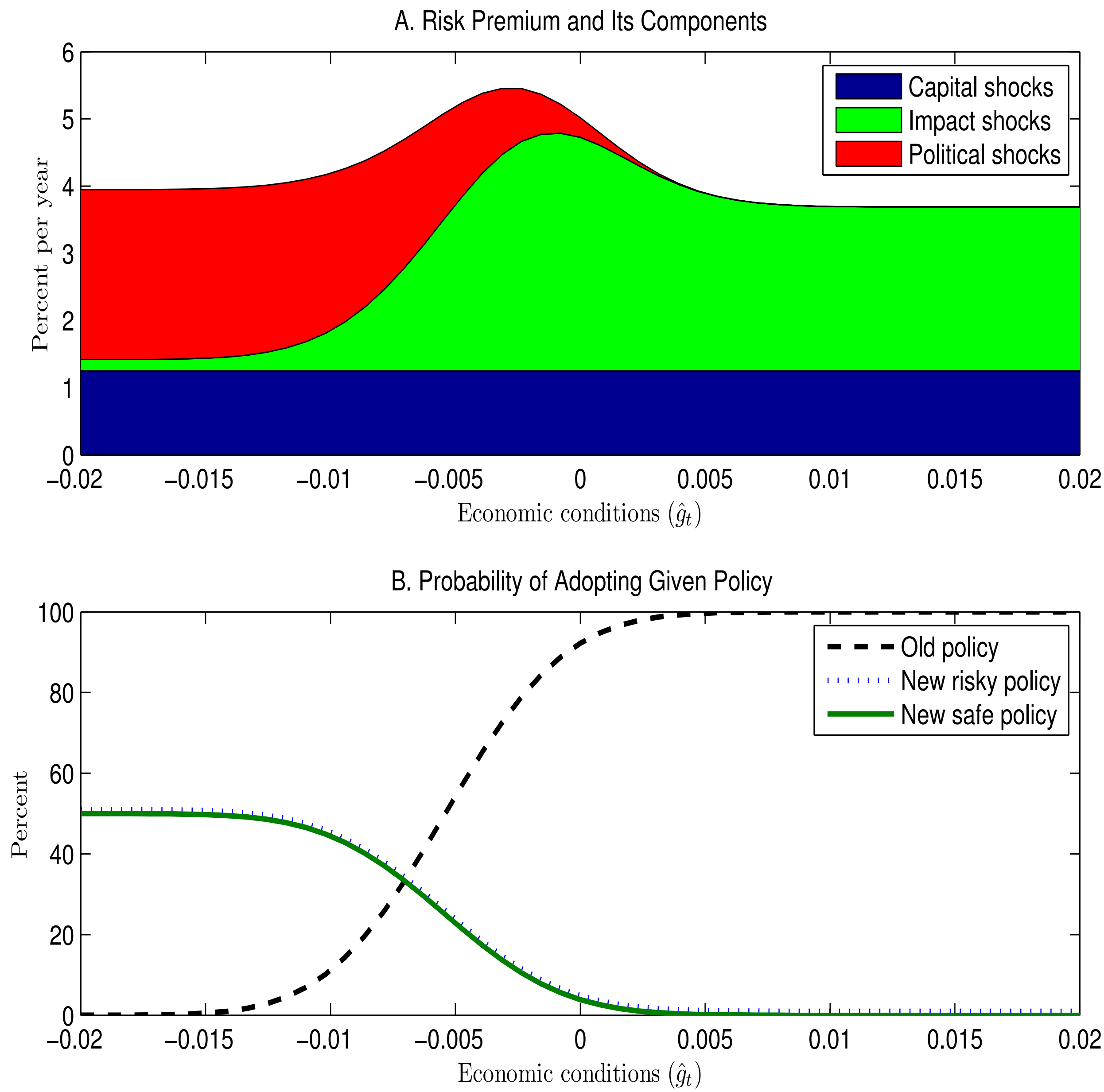

Figure 3. The equity risk premium and its components. Panel A plots the equity risk premium and its components as a function of $\hat{g}_t$, which is the posterior mean of the old policy's impact g^0 as of time t. The flat blue area at the bottom represents the component of the risk premium that is due to "capital" shocks, i.e. shocks to capital B_t in the absence of any updating of beliefs about g^0. The capital shocks are unrelated to the government. The middle green area represents the component of the risk premium that is due to "impact shocks", which reflect learning about the old policy's impact g^0. The top red area represents the component of the risk premium that is due to "political shocks", which reflect learning about C^L and C^H. The three areas add up to the total equity risk premium. Panel B plots the probabilities of the three government policy choices as of time t. The values of $\widehat{c}_t^L$ and $\widehat{c}_t^H$ are set equal to their initial value at time 0, so that both new policies are equally likely; as a result, the solid and dotted lines in Panel B coincide. All quantities are computed at time $t = \tau - 1$ when the political debates begin. The parameter values are in Table 1.

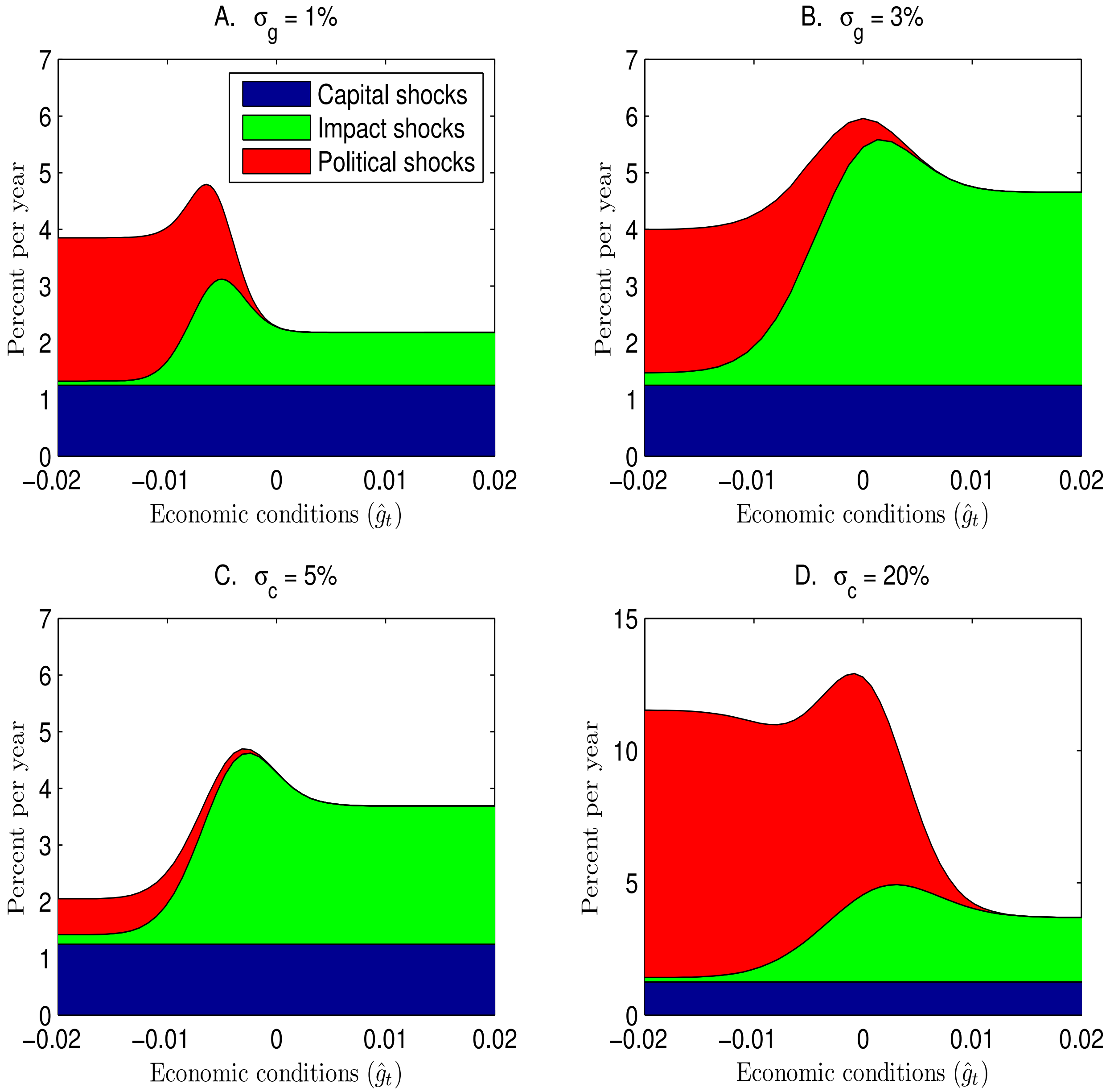

Figure 4. The equity risk premium and its components: The effects of σ_g and σ_c. Each of the four panels is analogous to Panel A of Figure 3—the flat blue area at the bottom represents the risk premium due to capital shocks, the middle green area represents the risk premium due to impact shocks, and the top red area represents the risk premium due to political shocks. The three areas add up to the total equity risk premium. The parameter values are in Table 1, except for σ_g and σ_c, which vary across the four panels.

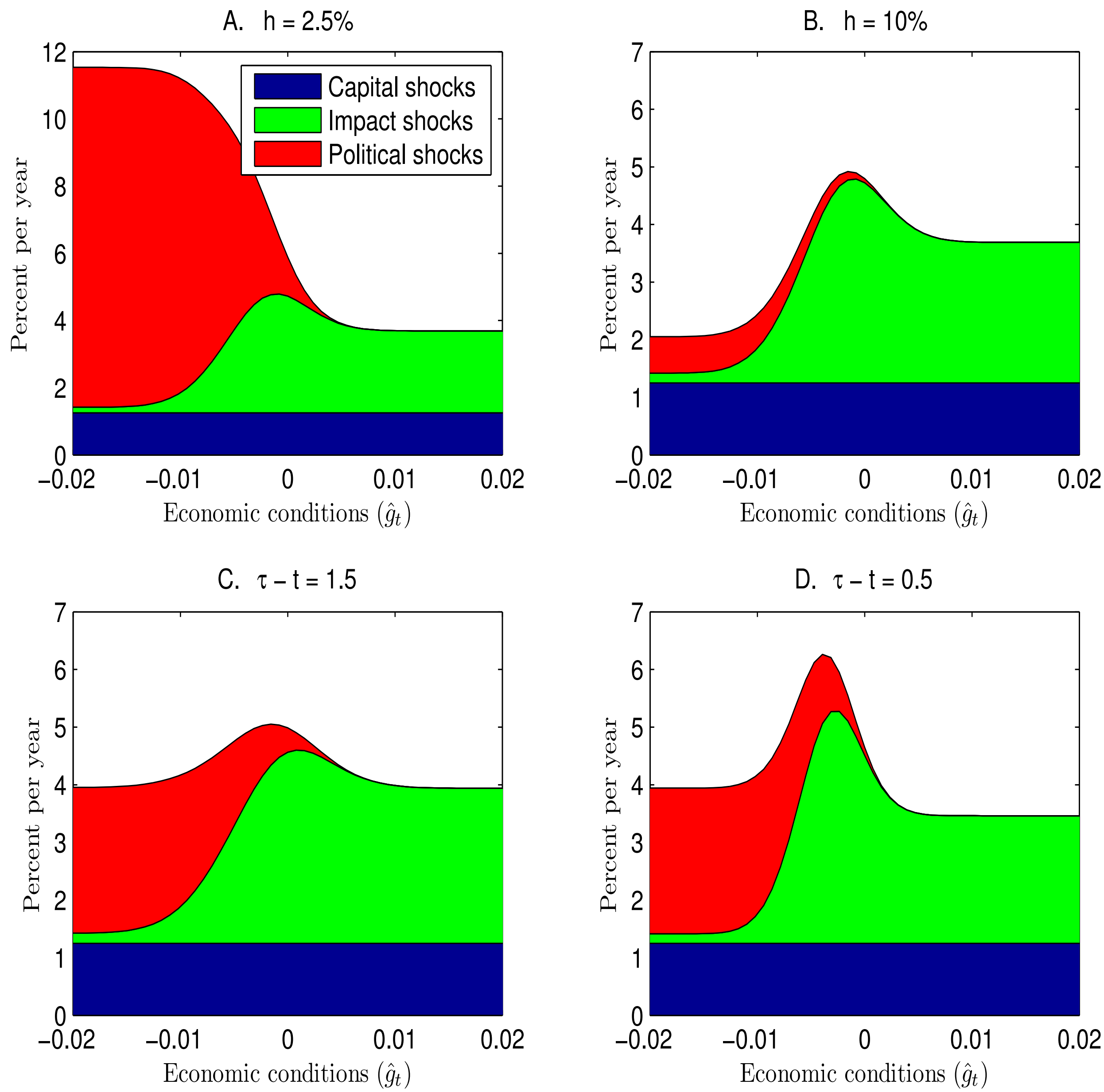

Figure 5. The equity risk premium and its components: The effects of h and t. Each of the four panels is analogous to Panel A of Figure 3—the flat blue area at the bottom represents the risk premium due to capital shocks, the middle green area represents the risk premium due to impact shocks, and the top red area represents the risk premium due to political shocks. The three areas add up to the total equity risk premium. The parameter values are in Table 1, except for h and $\tau - t$, which vary across the four panels.

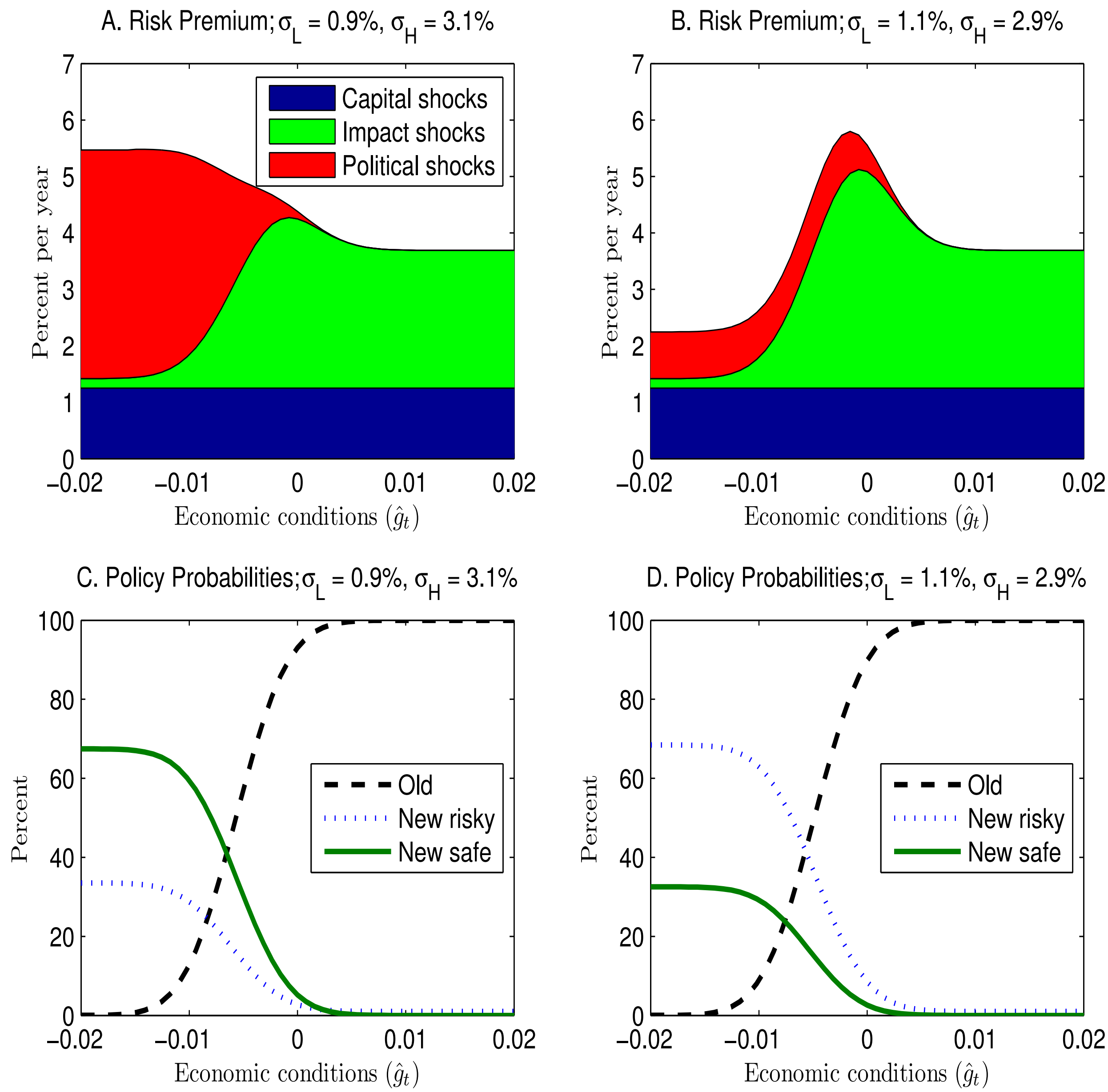

Figure 6. The equity risk premium and its components when new policies are at different utility levels. This figure is analogous to Figure 3, except that the new policies no longer yield the same level of utility a priori. In Panels A and C, the new risky policy yields less utility than the new safe policy, whereas it yields more utility in Panels B and D. In Panels A and C, the new risky policy is riskier and the new safe policy is safer compared to the benchmark case (because $\sigma_{g,L} = 0.9\% < 1\%$ and $\sigma_{g,H} = 3.1\% > 3\%$), whereas it is the other way round in Panels B and D. With the exception of $\sigma_{g,L}$ and $\sigma_{g,H}$, all other parameters, including μ_g^L and μ_g^H, are the same as in Table 1.

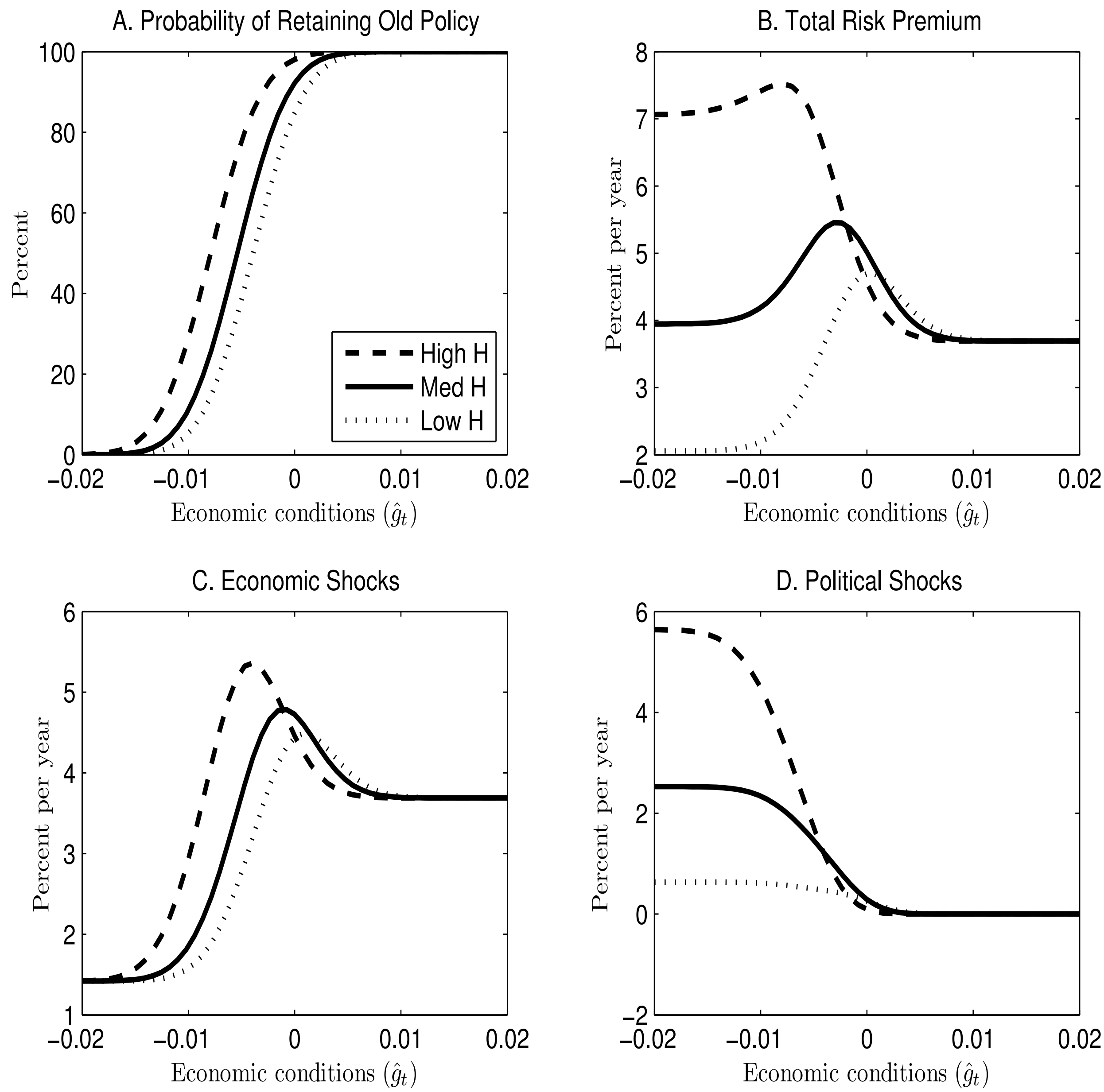

Figure 7. The equity risk premium and its components: The effect of policy heterogeneity. Panel A plots the probability of retaining the old policy, as perceived at time $t = \tau - 1$, for different values of $\hat{g}_t$ and three different levels of heterogeneity among the new policies. Heterogeneity $\mathcal{H}$ is defined as $\mathcal{H} = \sigma_{g,H} - \sigma_{g,L}$. The solid line corresponds to $\mathcal{H} = 0.02$, which is the benchmark case from Table 1. The dashed line corresponds to $\mathcal{H} = 0.03$, whereas the dotted line corresponds to $\mathcal{H} = 0.01$. For each of the three pairs of $(\sigma_{g,L}, \sigma_{g,H})$, we choose μ_g^H and $\mu_g^L = -\mu_g^H$ such that both new policies yield the same level of utility. All other parameter values are in Table 1. The values of $\widehat{c}_t^L$ and $\widehat{c}_t^H$ are set equal to their initial value at time 0, so that both new policies are equally likely to be adopted at time τ. Panel B plots the total equity risk premium as a function of $\hat{g}_t$ for the same three values of $\mathcal{H}$. Panel C plots the component of the total risk premium that is due to economic shocks, which include both capital shocks (i.e., shocks to B_t in the absence of learning about g^0) and impact shocks (i.e., learning about g^0). Panel D plots the component of the risk premium that is due to political shocks (i.e., learning about C^L and C^H).

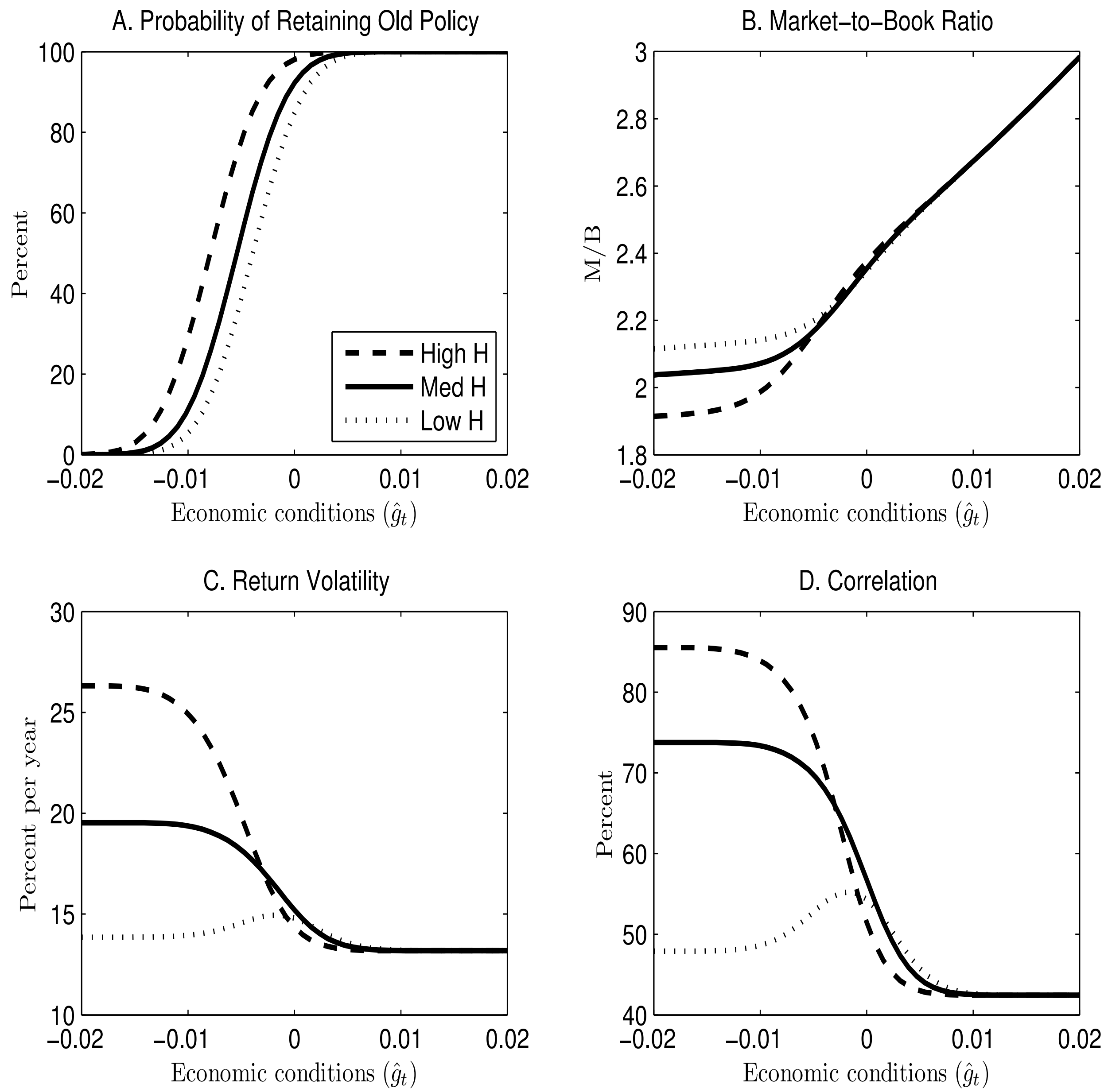

Figure 8. Stock price level, volatility, and correlations. This figure is constructed in the same way as Figure 7, except that it plots different quantities—the stock price level, measured by the market-to-book ratio, the volatility of each stock's return, and the correlation between each pair of stocks. All quantities are plotted at time $t = \tau - 1$ for different values of $\hat{g}_t$ and three different levels of heterogeneity among the new policies, defined as $\mathcal{H} = \sigma_{g,H} - \sigma_{g,L}$.

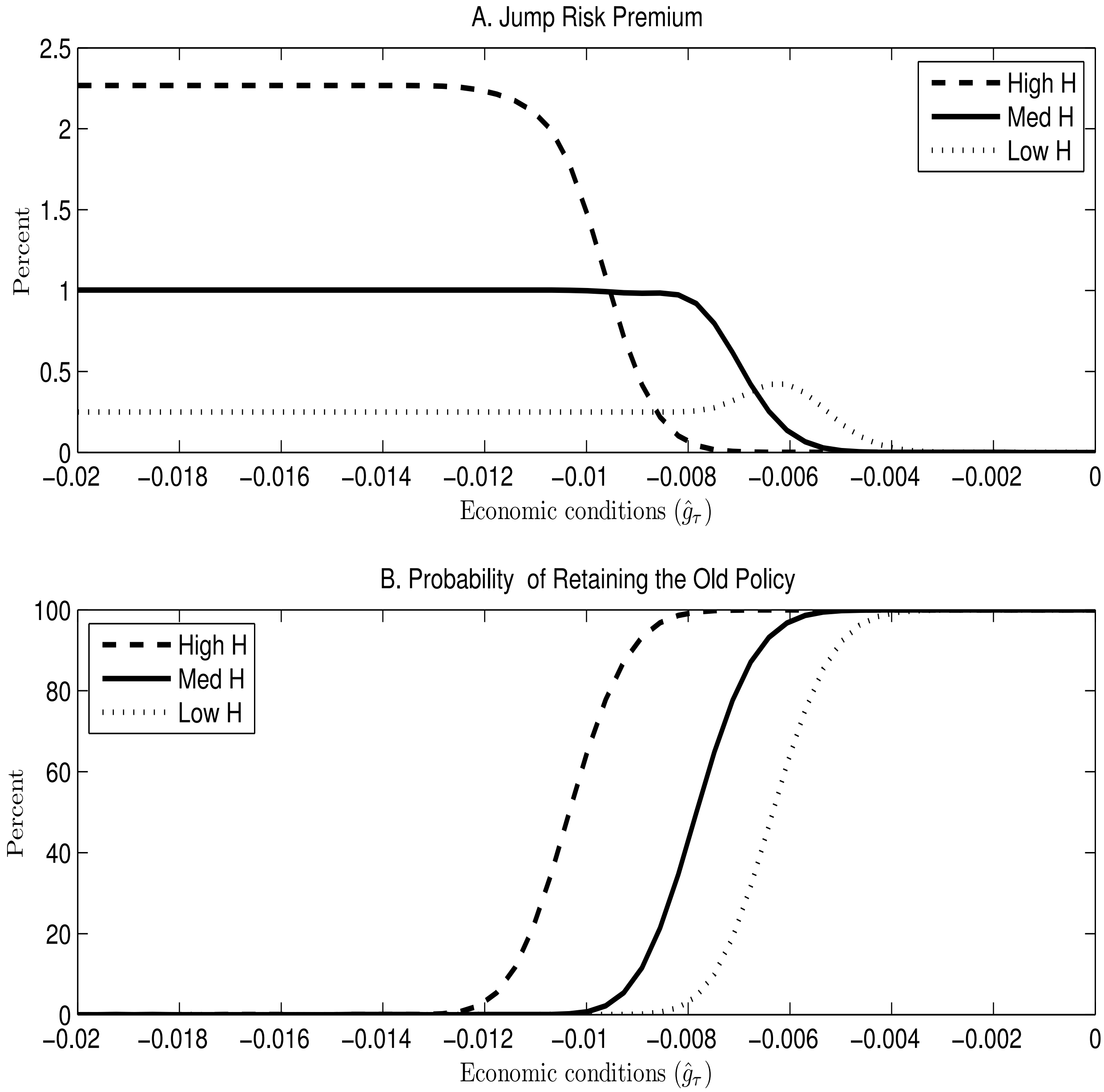

Figure 9. The Jump Risk Premium. Panel A plots the conditional expected stock return immediately before the government's policy decision at time τ. This jump risk premium compensates investors for the uncertainty associated with the government's policy decision. Panel B plots the probability of retaining the old policy, as perceived immediately before the government's policy decision. Both the jump risk premia and the policy probabilities are plotted for different values of $\hat{g}_\tau$ and three different levels of heterogeneity among the new policies, defined as $\mathcal{H} = \sigma_{g,H} - \sigma_{g,L}$. The values of $\widehat{c}_t^L$ and $\widehat{c}_t^H$ are set equal to their initial values at time 0, so that both new policies are equally likely to be adopted at time τ. All parameter values, except for those we need to vary in order to vary $\mathcal{H}$ (in the same way as in Figures 7 and 8), are in Table 1.

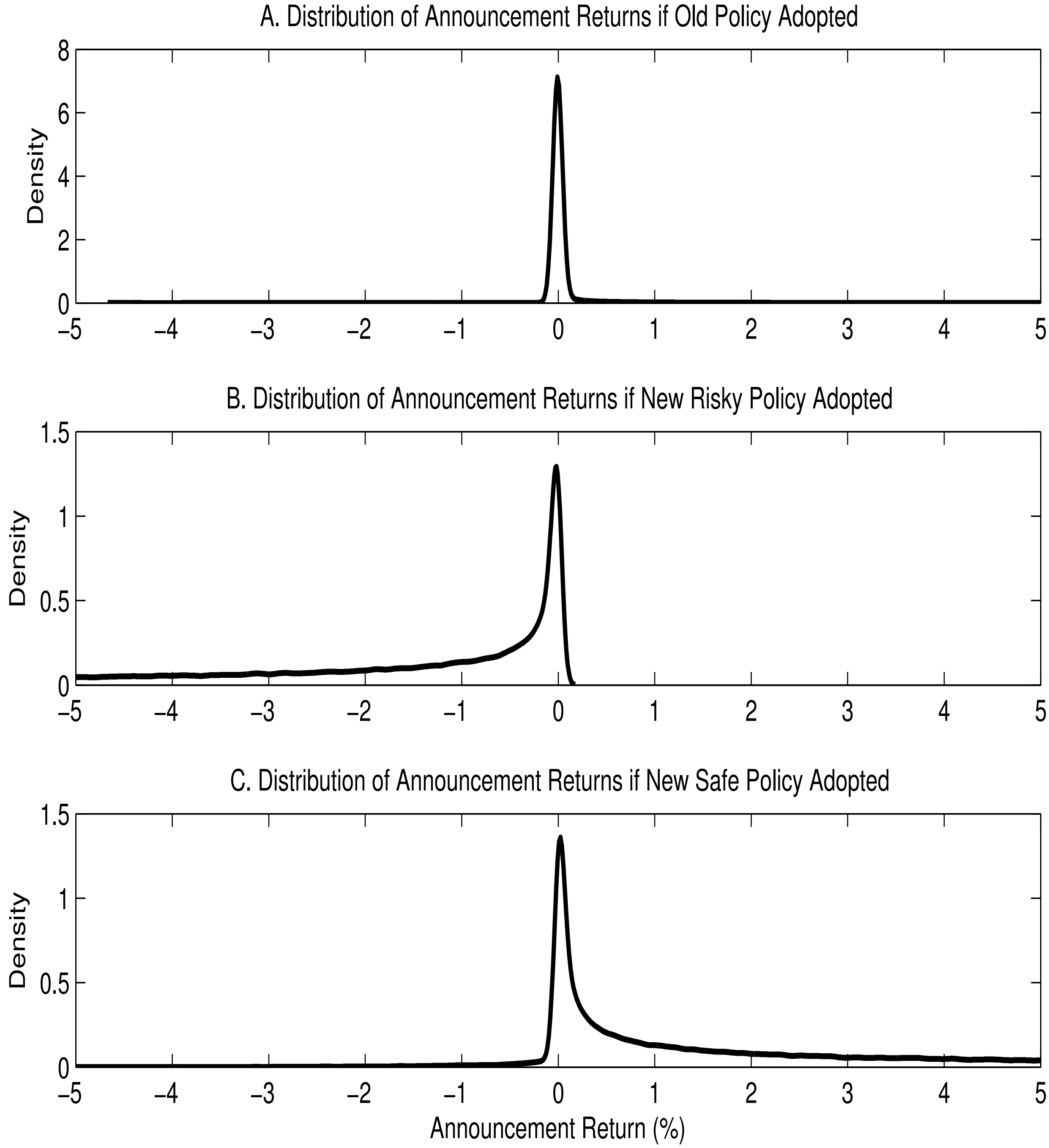

Figure 10. Probability distributions of the stock market's responses to various government policy choices. Each panel plots the probability density function of the stock market return immediately after the announcement of the government's policy decision at time τ. Panel A conditions on the government's decision to retain the old policy, Panel B conditions on the adoption of the new risky policy, and Panel C conditions on the adoption of the new safe policy. The probability distributions reflect uncertainty about all unknown parameters as of time 0. The distributions are obtained across 500,000 simulated values of $\hat{g}_\tau$, $\widehat{c}_\tau^L$, $\widehat{c}_\tau^H$, C^L, and C^H. The parameter values are in Table 1.

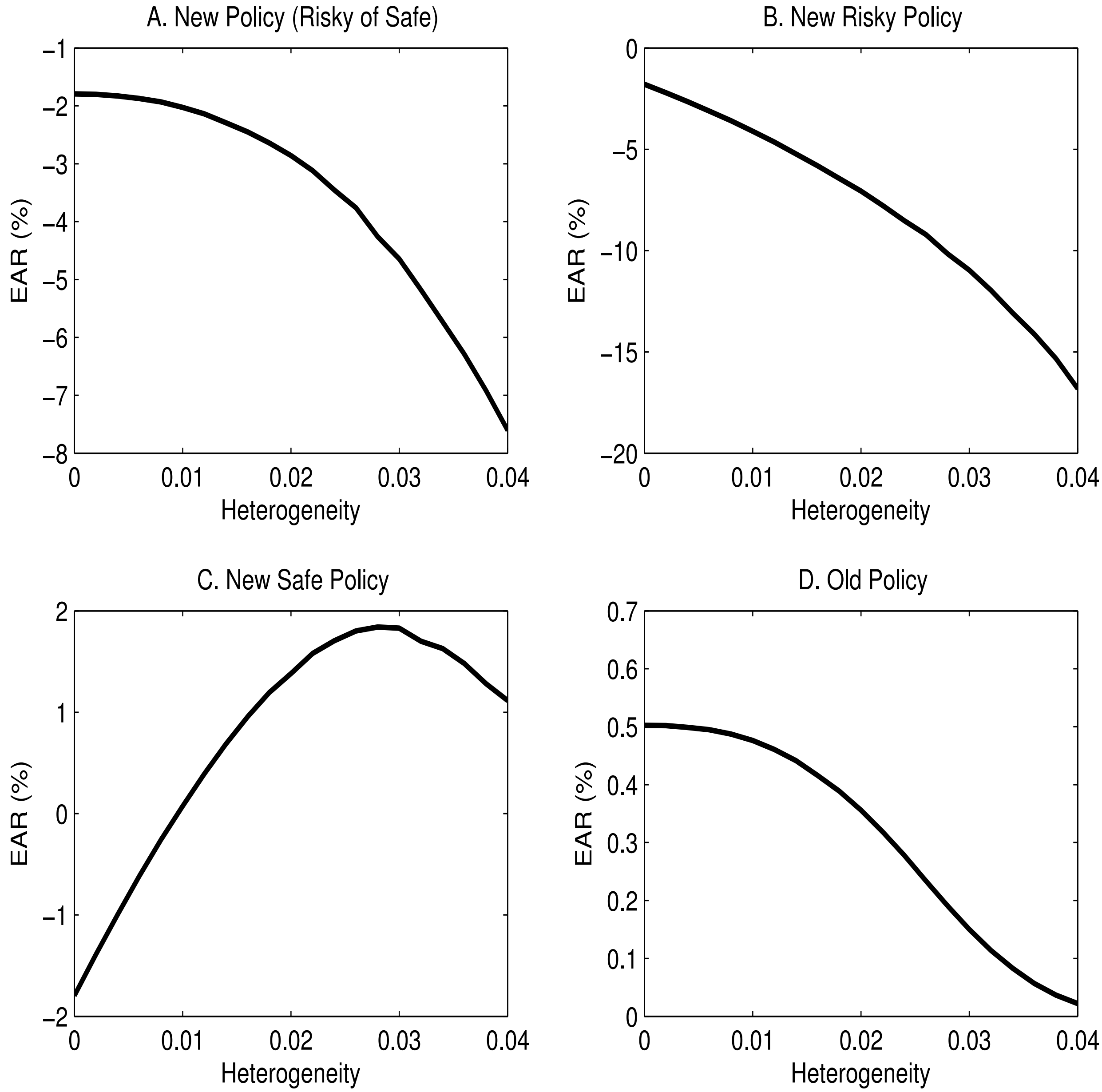

Figure 11. Expected announcement returns for various government policy choices. This figure plots the expected value of the stock market return immediately after the announcement of the government's policy decision at time τ. The expectation integrates out uncertainty about $\hat{g}_\tau$, $\widehat{c}_\tau^L$, $\widehat{c}_\tau^H$, C^L, and C^H as perceived at time 0. The expectation is obtained by averaging the announcement returns across the subset of 500,000 simulations in which the given policy is adopted at time τ. The expectation is plotted as a function of heterogeneity $\mathcal{H}$, defined as $\mathcal{H} = \sigma_{g,H} - \sigma_{g,L}$. The parameter values are in Table 1, except that we vary $(\sigma_{g,L}, \sigma_{g,H})$ from $(2\%, 2\%)$, the case for which $\mathcal{H} = 0$, to $(0, 4\%)$, the case for which $\mathcal{H} = 0.04$. For each pair $(\sigma_{g,L}, \sigma_{g,H})$, we choose μ_g^H and $\mu_g^L = -\mu_g^H$ such that both new policies yield the same level of utility. In the benchmark case from Table 1, $\mathcal{H} = 0.02$.

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