Political Cycles and Stock Returns

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Abstract

We develop a model of political cycles driven by time-varying risk aversion. Agents choose to work in the public or private sector and to vote Democrat or Republican. In equilibrium, when risk aversion is high, agents elect Democrats—the party promising more redistribution. The model predicts higher average stock market returns under Democratic presidencies, explaining the well-known "presidential puzzle." The model can also explain why economic growth has been faster under Democratic presidencies. In the data, Democratic voters are more risk-averse and risk aversion declines during Democratic presidencies. Public workers vote Democrat while entrepreneurs vote Republican, as the model predicts.

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1. Introduction

Stock returns in the United States exhibit a striking pattern: they are much higher under Democratic presidents than under Republican ones. From 1927 to 2015, the average excess market return under Democratic presidents is 10.7% per year, whereas under Republican presidents, it is only −0.2% per year. The difference, almost 11% per year, is highly significant both economically and statistically. This fact is well known, having been carefully documented by Santa-Clara and Valkanov (2003).[1] However, the source of this return gap is unclear. After ruling out various potential explanations, most notably differences in risk, Santa-Clara and Valkanov dub this phenomenon the "presidential puzzle."

Many financial market anomalies are coincidences that can be attributed to data mining. Such anomalies tend to vanish out of sample. The presidential puzzle, however, survives an out-of-sample assessment. In the 1927–1998 period analyzed by Santa-Clara and Valkanov, the Democrat-Republican return gap is 9.4% per year. In 1999 through 2015, the gap is even larger at 17.4% per year. There seems to be a genuine fact to explain.

It might be tempting to offer explanations based on different economic policies of the two parties. Perhaps Democratic policies are good for the stock market, or Republican policies are bad. However, such explanations would require a large amount of market irrationality. Investors would have to repeatedly misprice stocks by failing to anticipate such policy effects. We propose a simpler explanation that does not involve irrational behavior.

Our explanation emphasizes the endogeneity of election outcomes. We argue that the return gap is not explained by what presidents do, but rather by when they get elected. Democrats tend to get elected when expected future returns are high; Republicans win when expected returns are low. To generate rational time variation in expected returns, we rely on time variation in risk aversion. The idea of time-varying risk aversion is widely accepted in financial economics as a way of understanding the observed time variation in risk premia (e.g., Campbell and Cochrane, 1999). When risk aversion is high, investors demand high compensation for risk, which they earn in the form of high average future returns.

We develop an equilibrium model of political cycles in which the presidential puzzle emerges endogenously. When risk aversion is high, such as during economic crises, voters are more likely to elect a Democratic president because they demand more social insurance. When risk aversion is low, such as during booms, voters are more likely to elect a Republican

[1] Prior to Santa-Clara and Valkanov (2003), this fact was reported by several studies in practitioner journals, such as Huang (1985) and Hensel and Ziemba (1995). To simplify the exposition, we attribute the finding to Santa-Clara and Valkanov whose analysis is more formal and comprehensive.

because they want to take more business risk. Therefore, risk aversion is higher under Democrats, resulting in a higher equity risk premium, and thus a higher average stock return. In our model, Democrats do not cause high stock returns; instead, both the high returns and the Democratic presidency are caused by high risk aversion. Similarly, Republicans do not cause low stock returns; they are associated with low returns simply because they tend to be elected when the risk premium is low. Power shifts between Democrats and Republicans arise naturally in the model, due to mean reversion in risk aversion.

Are Democrats more likely to get elected when risk aversion is high? Risk aversion tends to rise in times of economic turmoil (e.g., Guiso et al., 2016), and during such periods, left-wing parties tend to get elected. Broz (2013) examines bank crises in developed countries and finds that left-wing governments are more likely to be elected after financial crashes. Wright (2012) shows that U.S. voters tend to elect Democrats when unemployment is high. The two biggest financial crises over the past century also fit the bill. In November 1932, during the Great Depression, the incumbent Republican president Herbert Hoover lost the election to Democrat Franklin Roosevelt. In November 2008, at the peak of the financial crisis, Republican George W. Bush was replaced by Democrat Barack Obama. Roosevelt and Obama are not the only Democratic presidents elected during or shortly after recessions. For example, Kennedy was elected during the 1960-61 recession, Carter shortly after the 1973-75 recession, and Clinton shortly after the 1990-91 recession. We argue this is not a coincidence. When the economy is weak, risk aversion rises, contributing to a Democrat victory.

We also provide direct evidence connecting risk aversion to voter preferences. In the time series, four different proxies for risk aversion tend to decline over the course of a Democratic presidency, consistent with our model. In the cross section, more risk-averse Americans tend to vote Democrat while less risk-averse ones vote Republican, consistent with the idea that more risk-averse individuals avoid business risk but demand social insurance. We also find that government workers tend to vote Democrat while entrepreneurs vote Republican, as the model predicts. We find similar results for the UK, with the Labour (Conservative) Party playing the role of the U.S. Democratic (Republican) Party.

Not only stock returns but also economic growth has been faster under Democrats. From 1930 to 2015, U.S. real GDP growth is 4.9% per year under Democratic presidents but only 1.7% under Republican ones. A partisan growth gap has also been noted by Hibbs (1987), Alesina and Sachs (1988), and Blinder and Watson (2016). Our model can explain this gap if the public sector's contribution to aggregate productivity is sufficiently large.

This paper expands the intersection of finance and political economy. To finance, we contribute the first model of political cycles. To political economy, we add a new mechanism that generates such cycles, along with novel implications for asset prices. To both literatures, we add a rational explanation for the presidential puzzle in stock returns.

In the earliest economic models of political cycles, beginning with Nordhaus (1975), the sole objective of political parties is to win elections. In these "opportunistic" models, all parties adopt the same policy in an effort to capture the median voter (Downs, 1957). These models cannot explain differences between Democratic and Republican administrations. "Partisan" models, originating with Hibbs (1977), assume that parties have different policy preferences, which translate into different policy platforms. We develop a new partisan model with strong asset pricing implications. To our knowledge, this is the first model making predictions for stock market behavior under different administrations.

In the traditional partisan view (e.g., Hibbs, 1977, 1987, and Alesina, 1987), Democrats prioritize growth over inflation while Republicans do the opposite. In contrast, we emphasize the parties' different preferences over fiscal redistribution. We think of Democrats as the "high-tax" party and Republicans as the "low-tax" party. While these labels are simplistic, they have some empirical support. Across U.S. states, state tax burdens are higher when the state legislature is controlled by Democrats (Reed, 2006). Across developed countries, left-wing governments are associated with an expansion of government revenue (Cameron, 1978, Tavares, 2004, Potrafke, 2017a).[2] We show that the U.S. federal tax/GDP ratio tends to rise under Democratic presidents and fall under Republican presidents.

A large literature is devoted to tests of political cycle models (see surveys by Drazen, 2000a, and Dubois, 2016). Given their assumption that Democrats prioritize growth over inflation, partisan models can explain faster economic growth under Democrats, but their prediction of higher inflation under Democrats is less successful empirically (e.g., Drazen, 2000b, Potrafke, 2017b). Moreover, they cannot explain the presidential puzzle in stock returns. Our model can, and it can also explain faster growth under Democrats.

In finance, our paper is related not only to the literature on the presidential puzzle, cited earlier, but also to studies analyzing the market response to electoral outcomes. It is well known that the stock market tends to respond more favorably to the election of a Republican president.[3] This evidence is in line with our model: the election of a low-tax party is good news for shareholders because lower taxes imply higher after-tax cash flows. This effect is nontrivial, 2–3% per election (Snowberg et al., 2007), but the presidential puzzle is much

[2]Cameron (1978) argues that the U.S. "Democratic party is not considered to be leftist" by international standards, but adds that "it is, of course, true that the party is to the left of the Republican party."

[3]See, for example, Niederhoffer et al. (1970), Riley and Luksetich (1980), and Snowberg et al. (2007).

larger: almost 11% per year, or over 40% per four-year presidential term. This paper is also related to Belo et al. (2013), who relate political cycles to the cross-section of stock returns, Belo and Yu (2013), who link government investment to risk premia, Koijen, Philipson, and Uhlig (2016), who find government risk embedded in health care stock prices, Knight (2006), who analyzes the extent to which policy platforms are capitalized into stock prices, and the literature on political uncertainty.[4] Our model is significantly richer than Pástor and Veronesi (2016) as we add two key features: electoral choice and time-varying risk aversion. Moreover, while their focus is on income inequality, ours is on political cycles.

2. Model Overview

In this section, we briefly review our model and its main implications, so as to motivate our empirical work in Section 3. The model's formal presentation is in Section 4.

The model's key assumptions can be summarized in a single paragraph. Agents have heterogeneous skill and time-varying risk aversion. They choose one of two occupations: an entrepreneur or a government worker. Entrepreneurs are risk-takers whose income is increasing in skill and subject to taxation. Government workers support entrepreneurial activity and live off taxes paid by entrepreneurs. At the same time, agents vote for one of two political parties: Democrat or Republican. Democrats, if elected, impose a higher flat tax rate on entrepreneurs' income; Republicans impose a lower rate. Under either party, the government balances its budget. The election is decided by the median voter.

We find that, in equilibrium, entrepreneurs vote Republican while government workers vote Democrat. Republicans thus win the election if more than half of all agents are entrepreneurs. Agents become entrepreneurs if their skill is sufficiently high. The equilibrium mass of entrepreneurs is larger under Republicans than under Democrats.

Time-varying risk aversion shapes electoral outcomes by affecting agents' occupational choice, which affects their electoral choice. Higher risk aversion makes entrepreneurship less attractive because agents dislike the risk associated with entrepreneurship. More of them prefer the safe income from the government to the risky income from business ownership. By shrinking the ranks of entrepreneurs, higher risk aversion helps Democrats get elected. Loosely speaking, when agents are more risk-averse, they demand a stronger safety net, which Democrats do a better job providing through larger fiscal redistribution.

[4]See, for example, Pástor and Veronesi (2012, 2013), Boutchkova et al. (2012), Julio and Yook (2012), Baker et al. (2016), Fernández-Villaverde et al. (2015), and Kelly et al. (2016).

When risk aversion is high enough, the economy has a unique equilibrium in which less than half of all agents become entrepreneurs and Democrats win the election. When risk aversion is low enough, there is a unique equilibrium in which Republicans win. When risk aversion is in between, either party can win, and which of the two "sunspot" equilibria we end up in is impossible to predict within the model. Risk aversion connects the party in office to stock returns. Since high risk aversion gets the Democratic party elected, risk aversion is higher while Democrats are in power. The higher risk aversion translates into a higher risk premium under Democrats, generating the presidential puzzle inside the model.

The model also implies that the private sector is more productive under Democrats because when risk aversion is high, only high-skilled agents become entrepreneurs. The public sector contributes to growth by leveraging the private sector's productivity. If this contribution is sufficiently strong, the model implies faster GDP growth under Democrats.

Political cycles arise naturally in our model. In a weak economy, risk aversion is high, helping Democrats win the election. Under Democrats, growth is higher, leading to lower risk aversion, which helps Republicans win the next election. Under Republicans, growth is lower, leading to higher risk aversion, which helps Democrats win, etc. See Figure 1.

3. Empirical Analysis: Democrats vs Republicans

In this section, we test the model's predictions empirically.

3.1. Stock Market Performance

Our model predicts a higher equity premium, and thus also a higher average stock market return, under Democrats than under Republicans. Santa-Clara and Valkanov (2003) compare average U.S. market returns under Democratic and Republican presidents between years 1927 and 1998. We extend their analysis through 2015. We construct a series of monthly excess stock market returns by subtracting the log return on a three-month Treasury bill from the log return on the value-weighted market return.[5] We obtain both series from the Center for Research in Security Prices, where they are available back to January 1927.

We construct a monthly time series of a Democrat dummy, D, defined as $D = 1$ if a Democratic president is in office and $D = 0$ otherwise. We assume that a president is in office

[5] Santa-Clara and Valkanov (2003) also use log returns. Simple returns lead to very similar results. Also note that by using excess returns, we effectively eliminate the effects of inflation.

until the end of the month in which his term ends. For example, if a new president assumes office on January 20, we assign the month of January to the old president and February to the new president. (Assigning January to the new president leads to very similar results.) We find $D = 1$ in 52.5% of all months between 1927 and 2015, indicating that time in the White House is split roughly equally between the two parties. Figure 2 plots average excess stock market returns for the 23 administrations between 1927 and 2015.

Table 1 compares market returns under Democratic and Republican presidents. In the full sample period, the average excess stock market return is 10.69% per year under Democrats but only -0.21% under Republicans. This is a striking result—all of the equity premium from 1927 through 2015 has been earned under a Democratic president! The Democrat-Republican gap, 10.90% per year, is significant both economically and statistically ($t = 2.73$). To assess statistical significance, we regress returns on D and compute the t-statistic for the slope based on standard errors robust to both heteroscedasticity and autocorrelation.

When we split the sample into two equally long subperiods, we find very similar results in both of them: almost 11% per year under Democrats and -0.2% under Republicans. Even in three equally long subperiods, the Democrat-Republican return gap is always positive, ranging from 4.57% to 14.46% per year. Santa-Clara and Valkanov's evidence is clearly robust to the addition of 17 years of data. In fact, the evidence is even stronger out of sample: in 1999–2015, the return gap is 17.39% per year ($t = 2.14$), compared to 9.38% ($t = 2.05$) in the 1927–1998 period analyzed by Santa-Clara and Valkanov.

Table 2 shows that the Democrat-Republican return gap is larger when computed over the early years of a presidency. The gap is huge, 36.88% per year, when averaged over the first year of the presidency alone. Over the first two years, the gap is 15.55%; over the first three years, it is 12.43%. All of these values exceed the full-term average of 10.90%. This evidence is consistent with our mechanism in the presence of mean reversion in risk aversion (e.g., Campbell and Cochrane, 1999). A Democrat has the highest likelihood of being elected when risk aversion is at its highest, such as during a crisis. Afterwards, risk aversion mean-reverts, resulting in a falling equity premium, especially in the early years of the Democratic presidency. The falling equity premium fuels stock returns while the Democrat is in office.[6] Similarly, Republicans are most likely to get elected when risk aversion is at its lowest, such as at the peak of the business cycle. It is therefore not surprising to observe a downturn shortly after a Republican takes office. In short, our mechanism predicts a larger return gap in the early years of presidential terms, which we see in the data.

[6]We provide additional evidence in support of this mechanism in Section 3.5.1.

The presidential puzzle cannot be explained by higher risk under Democrats. In fact, the volatility of stock returns under Democrats is lower, as shown by Santa-Clara and Valkanov (2003). In 1927–2015, the volatility is 17.33% per year under Democrats and 20.00% per year under Republicans. The annual Sharpe ratio is 0.62 under Democrats and -0.01 under Republicans. Similarly, the puzzle cannot be explained by higher policy uncertainty, or its faster resolution, under Democrats, as we show in the Online Appendix.

3.2. International Evidence

For an international perspective on the presidential puzzle, we analyze stock returns in five large developed countries outside the U.S.: Australia, Canada, France, Germany, and the UK. For each country, we compute its excess market returns by subtracting the country's 90-day interbank rate, obtained from FRED, from the country's MSCI stock index returns, which are available for 1970 through 2015. We compare each country's average excess market return when the U.S. president is a Democrat versus when he is a Republican.

Our approach reflects the view that international stock markets are mostly integrated in that stocks are globally owned. We argue that the outcome of the U.S. presidential election—the largest election in the developed world—is a signal about the level of global risk aversion. One could also relate each country's returns to the elections in that country, but doing so would implicitly assume that international stock markets are segmented in that there are no cross-border equity holdings. While markets do exhibit some home bias, they are far from segmented. Another complication in analyzing country-by-country elections is that it is difficult to determine the vote shares of high-tax and low-tax parties. No large country outside the U.S. has a simple two-party system. Even countries that come closest, such as the UK, have smaller parties that enter into coalitions with the leading parties. Junior coalition partners often have significant bargaining power over government policy.

Table 3 shows that in each of the five countries, average return is higher when a Democrat is in the White House. The Democrat-Republican difference is statistically significant in four of the five countries, ranging from 7.3% to 13.8% per year. These magnitudes are close to those observed for the U.S. This evidence suggests that the outcome of the U.S. election is related to equity risk premia across the globe. See the Online Appendix for more detail.

3.3. Economic Growth

Table 4 shows that GDP growth is faster under Democratic presidents, as the model predicts. We use real GDP growth data from BEA. In 1930 through 2015, the average growth is 4.86% per year under Democrats but only 1.70% under Republicans. The Democrat-Republican growth gap, 3.16% per year, is significant both economically and statistically ($t = 2.40$).[7] When we split the sample into two or three equally long subperiods, we find a positive gap in all of them. The gap is not always statistically significant, but it is at least 0.47% per year in all six time periods considered. Post World War II, the gap is 0.74% per year.

Prior studies report that the partisan growth gap is larger in the first half of the presidential term (e.g., Alesina and Sachs, 1988, Blinder and Watson, 2016). We confirm this finding in our longer sample. The growth gap over the first two years of presidency is 3.34% per year ($t = 3.73$), which exceeds the full-term average. A gradual reduction of the growth gap during presidential terms is consistent with our mechanism, in which Republicans (Democrats) are most likely to get elected at the peak (bottom) of the business cycle.

3.4. Electoral Transitions

Our model predicts that transitions from Republicans to Democrats are more likely to happen when the economy is weak, and vice versa (Figure 1). To examine this prediction, we run logistic regressions in which the dependent variable is equal to one in months when one party wins the presidential election over an incumbent president from the other party, and zero otherwise. Our sample contains five transitions from a Republican president to a Democratic president (1932, 1960, 1976, 1992, 2008) and four reverse transitions (1952, 1968, 1980, 2000). Given the small numbers of observations, we include only one independent variable at a time. We consider three such variables: log stock market excess return, real GDP growth, and realized market variance estimated from daily data within the month. We average each of these variables over the previous m months, where $m \in \{3, 6, 12, 36\}$.

Table 5 shows that transitions from Republicans to Democrats tend to be preceded by poor economic performance. At all horizons, such transitions are preceded by low market returns, low GDP growth, and high volatility. This evidence supports the model. However, no relation is significant for Democrat-to-Republican transitions, whereas our model predicts a positive relation. The reason is that our model does not include elements of the popular

[7] We follow the same approach to assessing statistical significance as in Sections 3.1 and 3.2: we regress GDP growth on the Democrat dummy D and compute the t-statistic for the slope coefficient, based on standard errors robust to both heteroscedasticity and autocorrelation.

retrospective voting theory, which predicts that incumbents tend to be voted out in bad times (e.g., Fair, 1978). That stylized fact pulls opposite to our risk-aversion theory for Democrat-to-Republican transitions, contributing to the no-result we observe for such transitions.

The two theories—retrospective voting and time-varying risk aversion—are mutually consistent, and both are supported by Table 5. When the economy is weak and the incumbent a Republican, voters tend to elect a Democrat, as predicted by both theories. When the economy is weak and the incumbent a Democrat, retrospective voting predicts that voters elect a Republican, whereas our theory favors a Democrat. Table 5's finding of no significant effect of economic conditions on Democrat-to-Republican transitions is consistent with both mechanisms being at work and their opposing effects roughly offsetting each other. In Section 4.6, we discuss a model extension in which retrospective voting is present. That extension predicts both patterns in Table 5: the strong state dependence of Republican-to-Democrat transitions and the weak state dependence of Democrat-to-Republican transitions.

Our model also predicts that Democrats (Republicans) are elected when the median voter is a government worker (entrepreneur). Electoral changes should thus be accompanied by occupational ones—we should see increases in the number of government workers, and decreases in the number of entrepreneurs, around transitions from Republican to Democratic presidents. Reverse transitions should be accompanied by opposite patterns. We construct crude measures of government work and entrepreneurship for which the time series are reasonably long. For government work, we add government employees and the unemployed. For entrepreneurship, we use the number of new firms entering the economy. We run logistic regressions similar to those in Table 5, focusing on changes around the transitions. We find that Republican-to-Democrat transitions tend to be accompanied by increases in government work and decreases in entrepreneurship, as the model predicts. For reverse transitions, the evidence is insignificant, but it points in the model-predicted direction. The evidence need not be strong because the underlying effect may be weak—in the model, a job change by a single agent, the median voter, causes the election outcome to flip. We conclude that our evidence is consistent with the model. For details, see the Online Appendix.

3.5. Risk Aversion

Risk aversion drives election outcomes in our model. In this section, we explore the role of risk aversion empirically, both in the time series and in the cross section.

3.5.1. Time Series

We use four proxies for risk aversion. The proxy with the strongest theoretical justification is the surplus consumption ratio, which is perfectly negatively correlated with risk aversion in the habit model of Campbell and Cochrane (1999). In addition, we use the measures of Pflueger et al. (2018), Miranda-Agrippino and Rey (2018), and the unemployment rate. We also use four proxies for the equity risk premium that may be related to risk aversion: *cay* (Lettau and Ludvigson, 2001), the dividend-price ratio, the equity premium bound of Martin (2017), and IPO volume, which is related to the equity premium in the model of Pástor and Veronesi (2005). The details of all measures are in the Online Appendix.

Table 6 reports the results from time-series regressions of risk aversion on the Democrat dummy, D, time in office, which is the number of months for which the party in power has held the presidency, and the interaction of D and time in office. The slope on this interaction term is significantly negative for all four proxies, indicating that risk aversion tends to decline over the course of a Democratic presidency. This evidence is consistent with our model, in which a high level of risk aversion propels Democrats to power. The subsequent mean reversion in risk aversion, evident from Table 6, pushes up stock prices, as discussed earlier in the context of Table 2. The evidence based on the risk premium proxies is less conclusive. For three of the four proxies, the coefficient estimates also indicate a declining risk premium under Democrats, but none of the estimates are statistically significant. Overall, the evidence presented in Table 6 supports the model.

3.5.2. Cross Section

Strictly speaking, our model does not make cross-sectional predictions for risk aversion because it holds risk aversion constant across agents. However, the model's mechanism suggests that in the presence of cross-sectional heterogeneity, more risk-averse agents would vote Democrat while less risk-averse ones would vote Republican. That is indeed true in the data, as we show next. Our evidence also supports the model's predictions that entrepreneurs vote Republican while government workers vote Democrat. We test these predictions in both U.S. and UK voter survey data. For the U.S., we use data from the 2014 Cooperative Congressional Election Study. For the UK, we use the 2014-2018 British Election Study.

For both countries, we estimate logit regressions across voters. On the left-hand side is a dummy variable equal to one if the survey respondent supports the Democratic Party (for the U.S.) or the Labour Party (for the UK), and zero otherwise. The right-hand side variables include a proxy for the respondent's risk aversion, dummy variables identifying the respondent as an entrepreneur or a government worker, and controls for the respondent's income, education, age, and gender. We infer U.S. voters' risk aversion from their responses to questions about whether they would accept risky gambles. UK respondents report their willingness to take risk. We describe all variables in detail in the Online Appendix.

Table 7 shows that more risk-averse voters are more likely to support both the Democratic Party and the Labour Party. This evidence is consistent with the idea that risk-averse voters avoid business risk but demand social insurance. Both parties also have more support among government workers and less among entrepreneurs, as the model predicts. The results hold for both countries, with and without controls, providing strong support for the model.[8]

3.6. Additional Evidence

We interpret the high-tax party as Democrats and the low-tax party as Republicans. It is often argued that Democrats favor bigger government than do Republicans. For more evidence, we compare changes in the tax burden under Democrat versus Republican presidents in 1929 to 2015. We measure the tax burden by the ratio of total federal tax to GDP.

We find that the tax burden tends to rise under Democratic presidents and fall under Republican presidents. Under Democrats, the tax/GDP ratio rises by 0.44% per year, on average, whereas under Republicans, it falls by 0.30% per year. The Democrat-Republican difference of 0.74% per year is highly significant ($t = 3.15$). When we split the sample into two equally-long subperiods, we find a positive and significant Democrat-Republican difference in both of them. We tabulate the results in the Online Appendix, where we also describe the data in detail. Overall, it seems reasonable to interpret Democratic presidents as favoring more tax-based redistribution and Republican presidents as favoring less.

This interpretation is unaffected by the consideration of the federal government's budget deficit. While the deficit tends to be larger under Democratic presidents, the partisan difference is not statistically significant. See the Online Appendix for details. This evidence suggests that our modeling assumption of no budget deficit is not unreasonable.

Income is a key variable of interest in the literature on the determinants of voting behavior. Richer Americans are more likely to vote Republican, but the relation is far from

[8]For U.S. data, we can also measure whether the respondent has any investment in the stock market. We find that stock owners are less likely to vote Democrat. This evidence is consistent with our model, in which stock owners are entrepreneurs. See the Online Appendix for details.

perfect (e.g., Gelman et al., 2007). This evidence is consistent with our model, in which entrepreneurs vote Republican and also tend to be richer than government workers because of higher skill. The model thus implies a positive relation between income and voting Republican. The relation is imperfect because some entrepreneurs end up with low income due to negative realizations of business risk. In short, our model produces a positive but imperfect relation between income and the Republican vote, just like in the data.

The relation between income and voting Republican is positive unconditionally, and strongly positive within states, but it is negative across states: richer states are more likely to vote Democrat in presidential elections (Gelman et al., 2007). This evidence does not necessarily go against our model. In the model, it is not income but net position with respect to fiscal redistribution that determines voting behavior. Some of the richer states might be net tax recipients. For example, the state with the highest average income in 2015, Maryland, has many residents with well-paid government jobs.

4. Model

There is a sequence of electoral periods indexed by t. At the beginning of each period, a continuum of agents with unit mass is born. These agents immediately choose an occupation and elect a government. At the end of the period, agents consume and die.

Agents have identical preferences over end-of-period consumption:

$$U_t\left(C_{i,t+1}\right) = \frac{\left(C_{i,t+1}\right)^{1-\gamma_t}}{1-\gamma_t} \ , \tag{1}$$

where $C_{i,t+1}$ is agent i's consumption at the end of period t and $\gamma_t > 0$ is the coefficient of relative risk aversion. Note that risk aversion γ_t varies over time but not across agents.

Agents are heterogeneous in entrepreneurial skill. Agent i is endowed with a skill level μ_i, which is randomly drawn from a normal distribution:[9]

$$\mu_i \sim N\left(0, \sigma_\mu^2\right) \ . \tag{2}$$

Agents with higher skill produce more output if they become entrepreneurs.

Each agent is endowed with one unit of human capital. Agents choose whether to deploy this capital in the private or public sector. Specifically, each agent chooses one of two

[9]Without loss of generality, we set the mean of this distribution to zero, to simplify the algebraic presentation. None of our conclusions rely on the zero mean, though (see the Online Appendix).

occupations: entrepreneur or government worker. Entrepreneurs produce output and pay taxes; government workers support entrepreneurial activity and consume taxes.

If agent i chooses to become an entrepreneur, she invests her capital in a private agent-specific technology that produces output equal to

$$Y_{i,t+1} = e^{\mu_i + \varepsilon_{t+1} + \varepsilon_{i,t+1}} G_t \ , \tag{3}$$

where ε_{t+1} is an aggregate shock, $\varepsilon_{i,t+1}$ is an idiosyncratic shock, and G_t is the government's contribution. All shocks are i.i.d. normal: $\varepsilon_{t+1} \sim N(-\frac{1}{2}\sigma^2, \sigma^2)$ and $\varepsilon_{i,t+1} \sim N(-\frac{1}{2}\sigma_1^2, \sigma_1^2)$, so that $\mathrm{E}(e^{\varepsilon_{t+1}}) = \mathrm{E}(e^{\varepsilon_{i,t+1}}) = 1$. All $\varepsilon_{i,t+1}$ are i.i.d. across agents. The investment is made at the beginning of period t. The shocks are realized—and output $Y_{i,t+1}$ produced—at the end of period t, just before a new generation of agents is born. Each entrepreneur owns a firm producing a liquidating dividend of $Y_{i,t+1}(1 - \tau_t)$, where τ_t is the tax rate. The entrepreneur can sell a fraction of her firm to other entrepreneurs and use the proceeds from the sale to purchase two kinds of financial assets: shares in the firms of other entrepreneurs and risk-free bonds. The bonds mature at the end of period t and are in zero net supply. Each entrepreneur faces a constraint inspired by moral hazard considerations: she must retain ownership of at least a fraction θ of her own firm. Due to this friction, markets are incomplete.

If agent i becomes a government worker, she contributes to production indirectly, by supporting entrepreneurs. In practice, governments support business in many ways: by maintaining law and order, building roads, providing education, supporting research, etc. We summarize all this support in the term G_t.[10] This term enters equation (3) in a multiplicative fashion, indicating that government makes all entrepreneurs more productive. We do not make any assumptions about G_t, other than it is positive and finite, until Section 4.3. Each government worker consumes an equal share of the tax revenue paid by entrepreneurs. Government workers cannot sell claims to their future tax-financed income.

Since the model features only two types of agents, the types must be interpreted broadly. In a realistic system of fiscal redistribution, we think of entrepreneurs as net contributors, or net tax payers, and government workers as net beneficiaries, or net tax recipients. For example, we think of government workers as not only government employees but also retirees living off Social Security, people on disability or unemployment benefits, etc.

In the election, agents choose between two political parties, H (high-tax) and L (low-tax). The parties differ in a single dimension: the tax rate they levy on entrepreneurs' income.

[10] Barro (1990) seems to be the first to include government as an input in a private production function.

We denote the tax rates of parties H and L by τ^H and τ^L, respectively, where $\tau^H > \tau^L$. We take the two rates as given and assume that the parties implement them if elected.[11] Under either party, the tax proceeds are redistributed to government workers, so that the government runs a balanced budget. The election is decided by the median voter.

Some of our assumptions resemble those of traditional partisan models. For example, the assumption of single-dimensional party platforms appears throughout the book of Alesina and Rosenthal (1995). The assumption that parties implement their policy platforms is also common (e.g., Rogoff and Sibert, 1988). We innovate by letting agents make not only electoral but also occupational choices; as a result, the occupation of the median voter changes endogenously. Another innovation is to allow agents' risk aversion to vary over time, which induces time variation in policy preferences. These novel modeling features are crucial in generating our asset pricing predictions.

4.1. Equilibrium

At the beginning of each period, agents make two simultaneous choices: they select an occupation and vote for a party. We solve for a Nash equilibrium in which each agent maximizes the expected utility in equation (1) while taking all other agents' choices as given. We first show how agents vote while taking occupational choices as given (Section 4.1.1), then how agents choose their occupations while taking electoral choices as given (Section 4.1.2), and finally, we examine the equilibrium outcomes (Section 4.1.3).

Let $\mathcal{I}_t$ denote the set of agents who choose to become entrepreneurs at the beginning of period t. The equilibrium mass of entrepreneurs is $m_t = \int_{i \in \mathcal{I}_t} di$ and the mass of government workers is $1 - m_t$. In equilibrium, $\mathcal{I}_t$ includes all agents whose expected utility from being an entrepreneur exceeds that from being a government worker. Since each agent's utility depends on $\mathcal{I}_t$, obtaining the equilibrium involves solving a fixed-point problem. Below, we present only the results. All proofs are in the Online Appendix.

4.1.1. Electoral Choice

We assume that each agent votes for the party whose election would maximize the agent's utility. This sincere voting assumption seems reasonable because, due to their infinitesimal size, agents cannot affect the election outcome through strategic voting.

[11]In Section 4.6, we discuss a model extension in which the tax rates are endogenous.

Proposition 1. *All entrepreneurs vote for party L and all government workers vote for party H. Therefore, party L wins the election if and only if $m_t > 0.5$.*

Proposition 1 shows that agents' electoral and occupational choices are closely connected. Given $\mathcal{I}_t$, the economy's expected total output is fixed. This output is divided among government workers, whose share is equal to the tax rate, and entrepreneurs, whose share is one minus the tax rate. Therefore, government workers vote for high taxes while entrepreneurs vote for low taxes. More broadly, net beneficiaries of fiscal redistribution vote Democrat while net contributors vote Republican. Empirical support for Proposition 1 is in Table 7.

Government workers consume tax revenue, which depends on total output Y_{t+1},

$$Y_{t+1} = \int_{j \in \mathcal{I}_t} Y_{j,t+1} \, dj \ . \tag{4}$$

For a given tax rate τ_t, total tax revenue is $\tau_t Y_{t+1}$. Since this revenue is distributed equally among $1 - m_t$ government workers, the consumption of any given worker i is

$$C_{i,t+1} = \frac{\tau_t Y_{t+1}}{1 - m_t} = \tau_t \, \frac{m_t}{1 - m_t} \, G_t \, e^{\varepsilon_{t+1}} \, \mathrm{E}\left[e^{\mu_j} | j \in \mathcal{I}_t\right] \qquad \text{for all } i \notin \mathcal{I}_t \ , \tag{5}$$

where the second equality follows from equation (3). Given $\mathcal{I}_t$, each government worker's consumption is proportional to τ_t. Each worker is thus better off choosing τ^H over τ^L.[12]

Entrepreneurs consume the proceeds of their investments. Entrepreneur i's firm pays a dividend $Y_{i,t+1}(1 - \tau_t)$. The firm's equilibrium market value at the beginning of period t is

$$M_{i,t} = \mathrm{E}_t\left[\pi_{t,t+1} \, Y_{i,t+1} \, (1 - \tau_t)\right] \ , \tag{6}$$

where $\pi_{t,t+1}$ is the endogenous stochastic discount factor. To diversify, the entrepreneur sells the fraction $1 - \theta$ of her firm and uses the proceeds, $(1 - \theta) \, M_{i,t}$, to buy shares in other firms and risk-free bonds. Each entrepreneur chooses her portfolio by maximizing expected utility. In equilibrium, each entrepreneur holds fraction θ of her portfolio in her own firm and $1 - \theta$ in the value-weighted aggregate stock market portfolio. There is no borrowing or lending because risk aversion is equal across entrepreneurs. Entrepreneur i's consumption is

$$C_{i,t+1} = (1 - \tau_t) \ G_t \, e^{\mu_i + \varepsilon_{t+1}} \left[\theta e^{\varepsilon_{i,t+1}} + (1 - \theta)\right] \qquad \text{for all } i \in \mathcal{I}_t \ . \tag{7}$$

This consumption increases in μ_i, indicating that more skilled entrepreneurs, whose firms have higher market values, tend to consume more. Given $\mathcal{I}_t$, each entrepreneur's consumption is proportional to $1 - \tau_t$. Entrepreneurs are thus better off choosing τ^L over τ^H.

[12]Since government workers do not invest, they do not bear idiosyncratic risk. Yet their consumption is not risk-free: it depends on the aggregate shock ε_{t+1}. Given our balanced budget assumption, there is no room for intertemporal smoothing by the government. When the economy suffers a negative shock, tax revenue declines, and so does government workers' consumption. Empirically, the wages of public employees are indeed procyclical, though not as much as private sector wages (Quadrini and Trigari, 2007).

4.1.2. Occupational Choice

In this subsection, we analyze how agents choose to become entrepreneurs or government workers, taking the electoral choice (i.e., the tax rate) as given.

Proposition 2. *Assume that party $k \in \{H, L\}$ is in power, so that the tax rate τ^k is given. Agent i becomes an entrepreneur if and only if*

$$\mu_i > \underline{\mu}_t^k \ , \tag{8}$$

where $\underline{\mu}_t^k$ is the unique solution to

$$\underline{\mu}_t^k \ = \ \log\left[\frac{\tau^k}{1-\tau^k}\right] + \log\left[\frac{1-\Phi\left(\underline{\mu}_t^k; \sigma_\mu^2, \sigma_\mu^2\right)}{\Phi\left(\underline{\mu}_t^k; 0, \sigma_\mu^2\right)}\right] + \frac{\sigma_\mu^2}{2} - \frac{\log\left(\mathrm{E}\left\{\left[\theta e^{\varepsilon_{i,t+1}} + 1 - \theta\right]^{1-\gamma_t}\right\}\right)}{1-\gamma_t} \ , \tag{9}$$

and $\Phi(.; a, b)$ is the cdf of the normal distribution with mean a and variance b. The equilibrium mass of entrepreneurs, $m_t^k = 1 - \Phi\left(\underline{\mu}_t^k; 0, \sigma_\mu^2\right)$, always satisfies $0 < m_t^k < 1$.

Equation (8) shows that only sufficiently skilled agents become entrepreneurs. Agents with lower skill become government workers. We emphasize that μ_i denotes *entrepreneurial* skill, not general ability. An agent can be an extremely capable public official, police officer, or public school teacher while other agents are better suited for entrepreneurship.

Corollary 1. *The equilibrium mass of entrepreneurs m_t^k is decreasing in the tax rate τ^k, risk aversion γ_t, idiosyncratic volatility σ_1, and the degree of market incompleteness θ.*

Corollary 1 identifies four variables whose high values discourage entrepreneurship: a high tax rate reduces entrepreneurs' after-tax income; a high risk aversion means low willingness to bear the idiosyncratic risk associated with entrepreneurship;[13] a high idiosyncratic volatility implies that entrepreneurial risk is large; and a high degree of market incompleteness means that this risk cannot be diversified away. When the four variables take high values, only the most skilled agents find it worthwhile to become entrepreneurs.

4.1.3. Equilibrium Outcomes

The equilibrium outcomes crucially depend on risk aversion.

[13]In two special cases, risk aversion has no impact on entrepreneurship. When $\sigma_1 = 0$, entrepreneurship involves no idiosyncratic risk. When $\theta = 0$, all idiosyncratic risk can be diversified away. But for $\sigma_1 > 0$ and $\theta > 0$, a higher value of risk aversion implies a lower amount of entrepreneurship.

Proposition 3. *There exist two thresholds $\underline{\gamma} < \overline{\gamma}$ such that:*

1. *For $\gamma_t > \overline{\gamma}$, there is a unique equilibrium: $m_t < \frac{1}{2}$ and party H wins the election*
2. *For $\gamma_t < \underline{\gamma}$, there is a unique equilibrium: $m_t > \frac{1}{2}$ and party L wins the election*
3. *For $\underline{\gamma} < \gamma_t < \overline{\gamma}$, there are two pure-strategy Nash equilibria that can both be supported:*
   (a) *If agents believe party H will win, then $m_t < \frac{1}{2}$ and H wins*
   (b) *If agents believe party L will win, then $m_t > \frac{1}{2}$ and L wins*

The formulas for the two thresholds, $\underline{\gamma}$ and $\overline{\gamma}$, are presented in the Online Appendix.

This proposition shows that when risk aversion is high enough, the economy is in the "H equilibrium" where taxes are high and the majority of agents work for the government. When risk aversion is low enough, we are in the "L equilibrium" where taxes are low and most agents are entrepreneurs. In between, either equilibrium is possible.

To understand Proposition 3, recall from Corollary 1 that the threshold $\underline{\mu}_t^k$ from Proposition 2 is increasing in the tax rate τ^k. Since $\tau^L < \tau^H$, we have $\underline{\mu}_t^L < \underline{\mu}_t^H$. There are three types of agents. Agents with $\mu_i > \underline{\mu}_t^H$ are "always-entrepreneurs": they choose entrepreneurship in both H and L equilibria. Agents with $\mu_i < \underline{\mu}_t^L$ are "never-entrepreneurs": they choose government work in both equilibria. The third type are agents with

$$\underline{\mu}_t^L < \mu_i < \underline{\mu}_t^H \ . \tag{10}$$

These "intermediate-skill" agents choose a different occupation depending on whether we are in the H or L equilibrium. The three types of agents are illustrated in Figure 3.

Since both thresholds $\underline{\mu}_t^L$ and $\underline{\mu}_t^H$ are increasing in γ_t, a higher value of γ_t implies a smaller mass of always-entrepreneurs and a larger mass of never-entrepreneurs. When $\gamma_t > \overline{\gamma}$, the mass of never-entrepreneurs exceeds $\frac{1}{2}$ so that, given Proposition 1, we end up in the H equilibrium. When $\gamma_t < \underline{\gamma}$, the mass of always-entrepreneurs exceeds $\frac{1}{2}$ and we end up in the L equilibrium. When $\underline{\gamma} < \gamma_t < \overline{\gamma}$, the masses of both never-entrepreneurs and always-entrepreneurs are smaller than $\frac{1}{2}$, so it is the intermediate-skill agents who decide which of the two equilibria will be supported. Which equilibrium they pick cannot be determined within the model. If they believe, for whatever reason, that the high-tax party is going to win, then that party indeed wins. But if they believe the low-tax party is going to win, then the low-tax party wins. See Figure 4 for an illustration of this sunspot equilibrium.

Given the indeterminacy of the equilibrium when $\underline{\gamma} < \gamma_t < \overline{\gamma}$, we need a rule for choosing between H and L in such scenarios. For simplicity, we assume that this choice is randomly determined by the flip of a fair coin.

4.2. Stock Returns

To calculate firm market values in equation (6), we need the equilibrium stochastic discount factor $\pi_{t,t+1}$. We obtain it from entrepreneurs' first-order conditions: $\pi_{t,t+1} \propto e^{-\gamma_t \varepsilon_{t+1}}$. Interestingly, despite market incompleteness, $\pi_{t,t+1}$ does not depend on idiosyncratic shocks, $\varepsilon_{i,t+1}$, even though such shocks cannot be fully diversified away (for $\theta > 0$). The reason is that all agents have the same risk aversion and all firms the same risk exposure. As a result of this symmetry, all entrepreneurs' portfolios are symmetric—each entrepreneur holds fraction θ of her wealth in her own firm and $1-\theta$ in the market portfolio—and only aggregate risk, ε_{t+1}, is priced. This fact allows us to derive asset pricing results in closed form.[14]

The equilibrium market value of firm i at the beginning of period t is given by

$$M_{i,t} = (1-\tau_t)\, e^{\mu_i - \gamma_t \sigma^2} G_t \ . \tag{11}$$

Firm value is increasing in both μ_i and G_t because both raise expected pre-tax dividends. Firm value is decreasing in τ_t because stockholders receive after-tax dividends. The value is also decreasing in σ^2 and γ_t because agents dislike risk. Adding up $M_{i,t}$ across entrepreneurs, we obtain a closed-form solution for the value of the aggregate stock market portfolio:

$$M_{P,t} \;=\; (1-\tau_t)\, e^{-\gamma_t \sigma^2} \mathrm{E}\left[e^{\mu_j} | j \in \mathcal{I}_t\right] G_t\, m_t \ , \tag{12}$$

where the value of $\mathrm{E}\left[e^{\mu_j} | j \in \mathcal{I}_t\right]$ is in the Online Appendix. The market portfolio is worth $M_{P,t}$ at the beginning of period t and $(1-\tau_t)\, Y_{t+1}$ at the end of period t. Computing the ratio of these two values, we obtain the aggregate stock market return $R_{t+1} = e^{\gamma_t \sigma^2 + \varepsilon_{t+1}} - 1$. Recalling that $\mathrm{E}(e^{\varepsilon_{t+1}}) = 1$, the expected stock market return is

$$\mathrm{E}_t\left(R_{t+1}\right) = e^{\gamma_t \sigma^2} - 1 \;\approx\; \gamma_t \sigma^2 \ . \tag{13}$$

Proposition 4. *Assume that γ_t fluctuates sufficiently so that at least one of the events $\gamma_t < \underline{\gamma}$ and $\gamma_t > \overline{\gamma}$ occurs with nonzero probability, where $\underline{\gamma}$ and $\overline{\gamma}$ are from Proposition 3. Expected stock market return is then higher under party H than under party L:*

$$\mathrm{E}\left(R_{t+1} | \tau_t = \tau^H\right) \;>\; \mathrm{E}\left(R_{t+1} | \tau_t = \tau^L\right) \ . \tag{14}$$

Recall the three scenarios from Proposition 3: H, which occurs when $\gamma_t > \overline{\gamma}$ and in which party H always wins the election; L, which occurs when $\gamma_t < \underline{\gamma}$ and in which party L always

[14] Many quantities in this section, such as τ_t^k, γ_t^k, m_t^k, and G_t^k, depend on the equilibrium $k \in \{H, L\}$ that the economy is in. We suppress the superscript k throughout to reduce notational clutter.

wins; and H/L, which occurs when $\underline{\gamma} < \gamma_t < \overline{\gamma}$ and in which either party can win. Denote the expected returns in the three scenarios by ER^H, ER^L, and $\mathrm{ER}^{H/L}$. From equation (13),

$$\mathrm{ER}^L \;<\; \underline{\gamma}\sigma^2 \;<\; \mathrm{ER}^{H/L} \;<\; \overline{\gamma}\sigma^2 \;<\; \mathrm{ER}^H \;. \tag{15}$$

While ER^H is always earned under party H and ER^L under party L, $\mathrm{ER}^{H/L}$ can be earned under either party with equal probability. Therefore, in the H/L scenario, expected returns are the same under both parties. Averaging across all three scenarios, it follows that expected return under party H is higher than under party L.

Proposition 4 summarizes our explanation of the presidential puzzle (Table 1). As long as risk aversion is sufficiently volatile, expected market return under Democrats (party H) is higher than under Republicans (party L), on average. What has been viewed as a puzzle is a theorem in our model.

Expected stock returns in our model can be interpreted as risk premia—returns in excess of the risk-free rate—because that rate is effectively zero. Since agents consume only once, at the end of the period, there is no intertemporal consumption-saving decision that would pin down the risk-free rate. We thus use the bond price as the numeraire.

The equity risk premium reflects the unpredictability of aggregate shocks (see equation (13)). There is no premium for electoral uncertainty because stocks are claims on dividends paid just before the next election. In our simple model, agents and their firms live for one period. In a more complicated model in which firms' lives span elections, electoral uncertainty would command a risk premium (e.g., Kelly et al., 2016). Our conclusions would likely get stronger because the impact of electoral uncertainty on stock prices would be larger under party H when risk aversion is higher. In Section 4.5, we analyze the asset pricing implications of electoral uncertainty differently—by considering a mixed Nash equilibrium.

4.3. Economic Growth

To calculate economic growth in period t, we divide total output at the end of the period, Y_{t+1}, by total capital invested at the beginning of the period. That capital is equal to one because each agent is endowed with one unit of capital and the mass of agents is also one. Therefore, economic growth in period t is simply equal to Y_{t+1}. From equations (3) and (4),

$$Y_{t+1} = \mathrm{E}\left(e^{\mu_i} | i \in \mathcal{I}_t\right)\, m_t\, G_t\, e^{\varepsilon_{t+1}} \;. \tag{16}$$

The first term on the right-hand side, $\mathrm{E}\left(e^{\mu_i} | i \in \mathcal{I}_t\right)$, is the average value of e^{μ_i} across all entrepreneurs. This term measures the average productivity of entrepreneurs, excluding the government's contribution. We refer to this term as private sector productivity.

Proposition 5. *Private sector productivity is higher under party H than under party L:*

$$\mathrm{E}\left(e^{\mu_i} | i \in \mathcal{I}_t, \tau = \tau^H\right) \; > \; \mathrm{E}\left(e^{\mu_i} | i \in \mathcal{I}_t, \tau = \tau^L\right) \; . \tag{17}$$

To understand this proposition, recall that in equilibrium $k \in \{H, L\}$, agent i is an entrepreneur if $\mu_i > \underline{\mu}_t^k$ (Proposition 2). The skill threshold is higher under party H: $\underline{\mu}_t^H > \underline{\mu}_t^L$ (Corollary 1). The average skill of entrepreneurs is thus higher under party H, and so is the average value of e^{μ_i}. The private sector is more productive under party H due to the selection of more skilled agents into entrepreneurship.[15]

Proposition 5 shows that a key component of growth, private sector productivity, is higher under party H than under party L. However, growth in equation (16) depends also on the product of private investment m_t and the government's contribution G_t. Under party H, m_t is lower (Corollary 1) but G_t could be higher; therefore, $m_t G_t$ could be higher or lower. How $m_t G_t$ compares between the H and L equilibria depends on the functional form for G_t.

The only assumptions we have made about G_t so far is that it is positive and bounded. We now add the assumption that G_t is an increasing function of $1 - m_t$, the mass of government workers. With more workers, the government can make a larger contribution to aggregate output. The simplest increasing functional form is linear:

$$G_t = (1 - m_t)\, e^g \; . \tag{18}$$

The value of g can be interpreted as the average productivity of the public sector.

Given equation (18), $m_t G_t$ is proportional to $m_t(1 - m_t)$. If the latter product takes similar values under both H and L equilibria, then given Proposition 5, growth is faster under party H. The product $m_t(1 - m_t)$ is equal under both equilibria if the masses of entrepreneurs under those equilibria, m^H and m^L, are symmetric around $\frac{1}{2}$:

$$m^H + m^L = 1 \; . \tag{19}$$

The symmetry of m_t around $\frac{1}{2}$ seems natural—it means that the margin of victory is the same regardless of which party wins. For example, if $m^H = 0.48$ and $m^L = 0.52$, then the margin is always 4%, whether the election is won by party H or L. In general, m^H and m^L

[15] A closely related selection effect is emphasized by Pástor and Veronesi (2016). They also find that OECD countries with higher tax/GDP ratios tend to be more productive, as measured by GDP per hour worked. Blinder and Watson (2016) find that U.S. labor productivity and total factor productivity are both higher under Democratic than Republican administrations, but the difference is not statistically significant. Note that private productivity in Proposition 5 excludes the government's contribution G_t, unlike in the data.

depend on γ_t. For condition (19) to hold, the values of $m^H(\gamma_t)$ and $m^L(\gamma_t)$ must be spread out symmetrically around $\frac{1}{2}$. For example, suppose γ_t can take only two values, γ^H and γ^L, which lead to unique equilibria H and L. Then there is only one value of $m^H(\gamma^H)$ and one value of $m^L(\gamma^L)$. If these two values add up to one, condition (19) is satisfied.

Proposition 6. *Under the linearity of G_t and symmetry of m_t (conditions (18) and (19)), the expected economic growth under party H is higher than under party L:*

$$\mathrm{E}\left(Y_{t+1}|\tau_t = \tau^H\right) \;>\; \mathrm{E}\left(Y_{t+1}|\tau_t = \tau^L\right) \;. \tag{20}$$

This proposition is supported by the evidence in Table 4. The two assumptions in this proposition are sufficient but not necessary. Any other assumptions that keep $m_t G_t$ similar under both parties would also deliver (20), thanks to Proposition 5. For example, it is enough for the symmetry condition (19) to hold approximately.

The intuition behind Proposition 6 is that under party H, entrepreneurs are more skilled, and even though there are fewer of them, their high productivity is leveraged by stronger government support. For example, suppose voters kick out party L and elect party H. The mass of entrepreneurs shrinks from $m^L > \frac{1}{2}$ to $m^H < \frac{1}{2}$, which is harmful to growth. However, the entrepreneurs who quit are less skilled than those who stay. Moreover, the smaller private sector is supported by a larger public sector (because $1 - m^H > 1 - m^L$). Under conditions (18) and (19), the net effect is faster growth under party H.

A key ingredient of Proposition 6 is that G_t enters the production function (3) in a multiplicative fashion. The idea is that government contributes to output by leveraging the productivity of the private sector. For example, one police officer contributes to the productive capacity of many businesses. If an agent abandons a business of selling sandwiches and starts building roads, the economy suffers the loss of sandwiches, but it also gains because many businesses benefit from the common roads. Proposition 6 shows that intermediate-skill agents contribute more to aggregate growth by supporting top-skill agents than by investing on their own. The proposition holds under conditions (18) and (19), which ensure sufficient complementarity between the public and private sectors.

Proposition 6 holds also under weaker conditions. For example, we could allow for "decreasing returns to scale" in the public sector, so that each additional government worker contributes less to G_t. Specifically, we could replace condition (18) by $G_t = (1 - m_t)^{\alpha} e^g$, so that G_t is concave in the mass of government workers when $\alpha < 1$. The complementarity between the public and private sectors is present for any $\alpha > 0$. Condition (18) assumes

$\alpha = 1$, but Proposition 6 holds more generally, when α is sufficiently high.[16]

A social planner would choose m_t that maximizes expected total output and redistribute to maximize welfare. Under condition (18), the welfare-maximizing value of m_t is $m_t^* = 1 - \Phi(\frac{\sigma_\mu^2}{2}; 0, \sigma_\mu^2) < 0.5$. The social planner would thus assign fewer than half of agents, those with the highest skill, to entrepreneurship, and the remaining majority to government work. There are two opposing effects. On the one hand, G_t reduces output by "crowding out" private investment (higher $1 - m_t$ implies lower m_t). On the other hand, G_t raises output by leveraging the private sector's productivity. The latter effect is stronger when $m_t > m_t^*$; otherwise the former effect prevails. The two effects offset each other when $m_t = m_t^*$.

4.4. Endogenous Risk Aversion

All the results presented so far are very general, as they hold for risk aversion γ_t following any exogenous process. We obtain further insights by specifying the evolution of γ_t. Evidence suggests that risk aversion rises after negative economic shocks (e.g., Guiso et al., 2016). We therefore endogenize γ_t by linking it to the state of the economy: $\gamma_t = \gamma(Y_t)$, which is decreasing in Y_t. That is, γ_t is high when the economy is weak (i.e., after low realizations of output Y_t at the end of the previous period), and vice versa.

Political cycles then emerge from the model. When the economy is strong, risk aversion is low, so party L is more likely to win the next election (Proposition 3). Under party L, growth is likely to be lower (Proposition 6), leading to higher risk aversion. As a result, the following election is more likely to be won by party H. Under H, growth is higher, leading to lower risk aversion and thus better electoral odds of party L, etc. (recall Figure 1).

To formalize this result, we consider a special case of $\gamma(Y_t)$ in which the function takes only two values, high or low, depending on the state of the economy:

$$\gamma(Y_t) = \begin{cases} \gamma^H \ , \ \text{where} \ \ \gamma^H > \overline{\gamma} \ , & \text{for } y_t < \overline{y} \\ \gamma^L \ , \ \text{where} \ \ \gamma^L < \underline{\gamma} \ , & \text{for } y_t > \overline{y} \end{cases} , \tag{21}$$

where $y_t = \log(Y_t)$ and $\overline{y} = \mathrm{E}[y_t] - \frac{1}{2}\sigma^2$. We let $\lambda^{H,L}$ denote the probability of an electoral shift from party H to party L, and $\lambda^{L,H}$ denote the probability of a reverse shift. In other

[16] Empirical studies generally find complementarity between public and private capital (e.g., Anschauer (1989) and Lynde and Richmond (1992)), but there is no consensus regarding the magnitude of the effect. In their meta-analysis of 68 studies, Bom and Ligthart (2014) find that over 80% of the reported estimates of the output elasticity of public capital are positive, but they range from -1.73 to 2.04. This range comfortably includes many values of α for which Proposition 6 holds. We must be cautious in comparing these estimates to α, though. Most empirical studies define public capital as the tangible capital stock owned by the public sector whereas in our paper, public capital is $1 - m_t$, the human capital of government workers.

words, λ^{k_1,k_2} is the probability of party k_2 winning the election when party k_1 is in power.

Proposition 7. *Under the assumptions in equation (21) and Proposition 6,*

$$\lambda^{H,L} \;=\; \lambda^{L,H} \;=\; \Phi\left(\frac{\mathrm{E}\left[y_{t+1}|H\right]-\mathrm{E}\left[y_{t+1}|L\right]}{2}\,;\,0,\sigma^2\right) \;>\; \frac{1}{2}\,. \tag{22}$$

This proposition formalizes the formation of endogenous political cycles. When party H is in power in period t, growth in period t tends to be faster, raising the likelihood of $y_{t+1} > \overline{y}$, in which case risk aversion jumps from γ^H to γ^L, which then results in a higher probability of party L winning the election at the beginning of period $t+1$. Under party L, it is more likely that $y_{t+2} < \overline{y}$, in which case risk aversion jumps from γ^L to γ^H, boosting the electoral prospects of party H at the beginning of period $t+2$, etc.

Interestingly, our model generates political cycles even in the absence of aggregate shocks. When we eliminate the aggregate shock ε_t from equation (3) by letting its volatility $\sigma^2 \to 0$, both $\lambda^{H,L}$ and $\lambda^{L,H}$ in equation (22) converge to one. In this limiting case, political cycles are fully deterministic as the two parties alternate in office at each election.

The assumption that γ_t is fully driven by Y_t establishes a tight link between political cycles and business cycles. In reality, however, the link between γ_t and Y_t is unlikely to be perfect. Any variation in γ_t that is independent of Y_t drives a wedge between business cycles and political cycles. By adding such independent variation, our model can easily generate return predictability above and beyond the business cycle.

To illustrate the formation of political cycles, we construct two numerical examples, which we present in the Online Appendix. In the first example, risk aversion $\gamma(Y_t)$ can take two values, as in equation (21). In the second example, risk aversion can take three values, covering all three scenarios considered in Proposition 3. Both examples show that the model generates realistic political cycles, and that it has no trouble matching not only the sign but also the magnitude of the observed Democrat-Republican return gap.

4.5. Announcement Effects

Stock prices respond to the announcements of election outcomes, especially if those outcomes are unexpected. To analyze such responses, we step away from the pure-strategy Nash equilibria described in part 3 of Proposition 3. In those equilibria, each agent takes the choices of other agents as given, which precludes surprises about electoral outcomes. We introduce such surprises by considering a mixed equilibrium for γ_t such that $\underline{\gamma} < \gamma_t < \overline{\gamma}$. To keep things simple, we analyze a simple case in which γ_t can take three values:

$$\gamma(Y_t) = \begin{cases} \gamma^H & \text{for } y_t < \underline{y} \\ \gamma^M & \text{for } \underline{y} \leq y_t \leq \overline{y} \\ \gamma^L & \text{for } y_t > \overline{y} \end{cases} , \tag{23}$$

where $\underline{y} < \overline{y}$ and the thresholds from Proposition 3 satisfy $\gamma^L < \underline{\gamma} < \gamma^M < \overline{\gamma} < \gamma^H$.

Proposition 8. *There exists $\gamma^M \in [\underline{\gamma}, \overline{\gamma}]$ for which the economy is in a mixed equilibrium with both parties H and L having the same probability of winning the election. In this equilibrium, $m_t = \frac{1}{2}$, and the median voter chooses the winning party randomly. In addition,*

(a) The market reaction to the election is positive if party L wins but negative if H wins

(b) The risk premium for electoral uncertainty is positive.

Stock prices rise when party L is elected because a lower tax rate implies higher after-tax dividends. Prices fall when H is elected because a higher tax rate means lower after-tax dividends. These predictions are supported by the evidence cited in footnote 3, which shows that the market responds more favorably to the election of a Republican president.

Agents require a risk premium for holding stocks during the electoral announcement. This premium, which is equal to the expected value of the announcement return, compensates stockholders for the uncertainty about which tax rate will prevail at the end of period t. This prediction is supported by the evidence of Kelly et al. (2016).

In the Online Appendix, we provide simple closed-form formulae for the party-specific announcement returns, the electoral risk premium, and the value of γ^M that satisfies Proposition 8. We also provide a numerical example showing that the model can deliver plausible magnitudes of the announcement returns and the risk premium.

4.6. Extensions

We extend our model in three ways. All three extensions make additional predictions at the expense of more complexity. In each extension, the model retains its ability to explain the presidential puzzle through time-varying risk aversion. We summarize the extensions here and supply the details in the Online Appendix.

First, we extend the model by allowing the government to run a budget deficit. By running deficits when risk aversion is high, and paying down debt when risk aversion is low, governments can mitigate the effect of risk aversion shocks. Yet, that setting produces the same key predictions as our baseline model. In addition, it predicts higher average deficits under Democrats, for which there is insignificant support in the data, as noted earlier.

Second, we endogenize the tax rates as equilibrium outcomes of the parties' policy decisions. We allow both parties to optimally choose their tax policy rates while internalizing their effects on agents' occupational and voting decisions. The resulting complexity forces us to solve the model numerically. For plausible parameter values, we find that Democrats choose higher tax rates than Republicans, and also that expected stock returns are higher under Democrats. Taking the tax rates as given in our baseline model allows us to make sharper statements, providing our main results as formal theorems.

Finally, we add persistent variation in government quality, which induces retrospective voting. The presence of both retrospective voting and time-varying risk aversion allows the extended model to predict both patterns in Table 5: significant coefficients for Republican-to-Democrat transitions and insignificant ones for Democrat-to-Republican transitions. The extended model also predicts higher average stock market returns under Democrats, for the same parameter values. We leave retrospective voting out of the baseline model because our objective is to highlight a new mechanism driving political cycles, one capable of explaining the presidential puzzle. Retrospective voting does not predict higher stock market returns under Democratic presidents, whereas time-varying risk aversion does.

5. Conclusions

We develop an equilibrium model of political cycles driven by voters' time-varying risk aversion. This novel mechanism generates the presidential puzzle of Santa-Clara and Valkanov (2003). The model implies that both stock returns and economic growth should be higher under Democratic administrations, as we observe in the data. We also provide empirical evidence, time-series and cross-sectional, linking risk aversion to voting preferences.

In our model, voting decisions are driven solely by economic considerations. This is in line with the survey evidence of Ansolabehere et al. (2006) that economic issues matter more than moral issues to U.S. voters. Yet, in reality, voters' views on moral issues also matter, as do the personal characteristics of the presidential candidates. Such non-economic considerations can enter our model via the sunspot equilibrium. When risk aversion is neither high nor low, the equilibrium is chosen by sunspots. Interpreting sunspots as random realizations of non-economic factors creates a role for these factors in determining electoral outcomes.

Our model assumes a single policymaker, abstracting from the interaction between the executive and the legislature. This assumption is often made for simplicity (e.g., Alesina, Roubini, and Cohen, 1997), and it seems appropriate given our focus on the presidential puzzle. While Santa-Clara and Valkanov (2003) find stock returns to be related to the presidential cycle, they find no relation to Congressional variables. Similarly, Blinder and Watson (2016) find that the partisan advantage in GDP growth is correlated with Democratic control of the White House but not of Congress. Neither study provides an explanation for this asymmetry. The lack of Congressional relevance is broadly consistent with our argument that what matters is not what presidents do but when they get elected. If the stronger performance under Democratic presidents were caused by their superior policymaking, we would expect Congressional variables to matter because presidents need Congressional support to implement reforms. That Congressional variables do not matter undermines the superior-policymaking explanation. Our explanation is only partial, though, for two reasons. First, we assume that the president is able to enact his party's tax rate, which requires Congressional support. This is Congress' only role in our explanation. Even that role can be relaxed by modifying our model so that the election of a Republican president results in, say, a 50% probability of a tax cut (if Congress is supportive) and a 50% probability of no tax change (if Congress is not supportive). As long as voters *expect* taxes to fall (rise) when they elect a Republican (Democratic) president, our model's implications are unchanged. Second, we do not have a full explanation for why risk aversion plays a larger role in presidential elections than in Congressional ones. We speculate that Congressional elections are more about local state-level issues whereas presidential elections are more reflective of the performance of the national economy. The role of Congress can be further examined in future research.

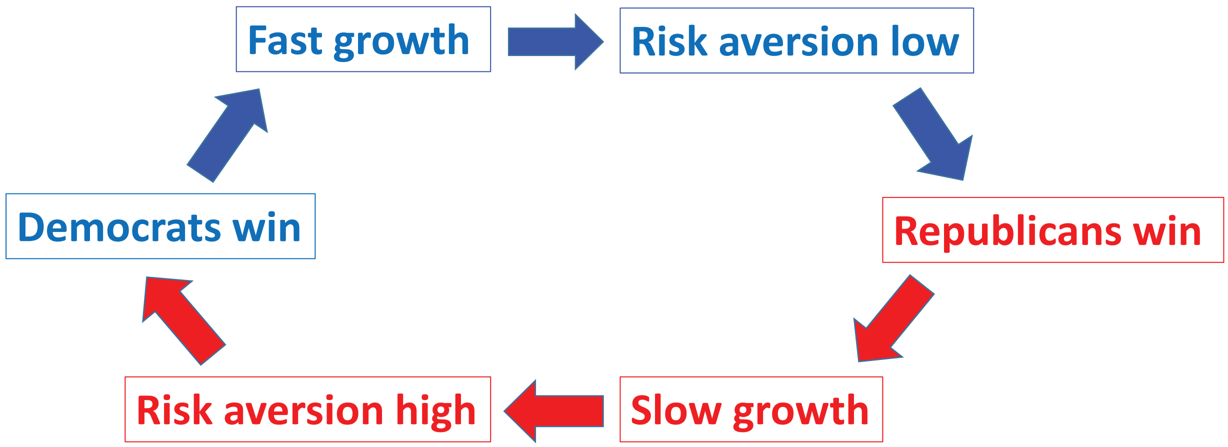

Figure 1. Political cycles. This figure describes the formation of political cycles in the model.

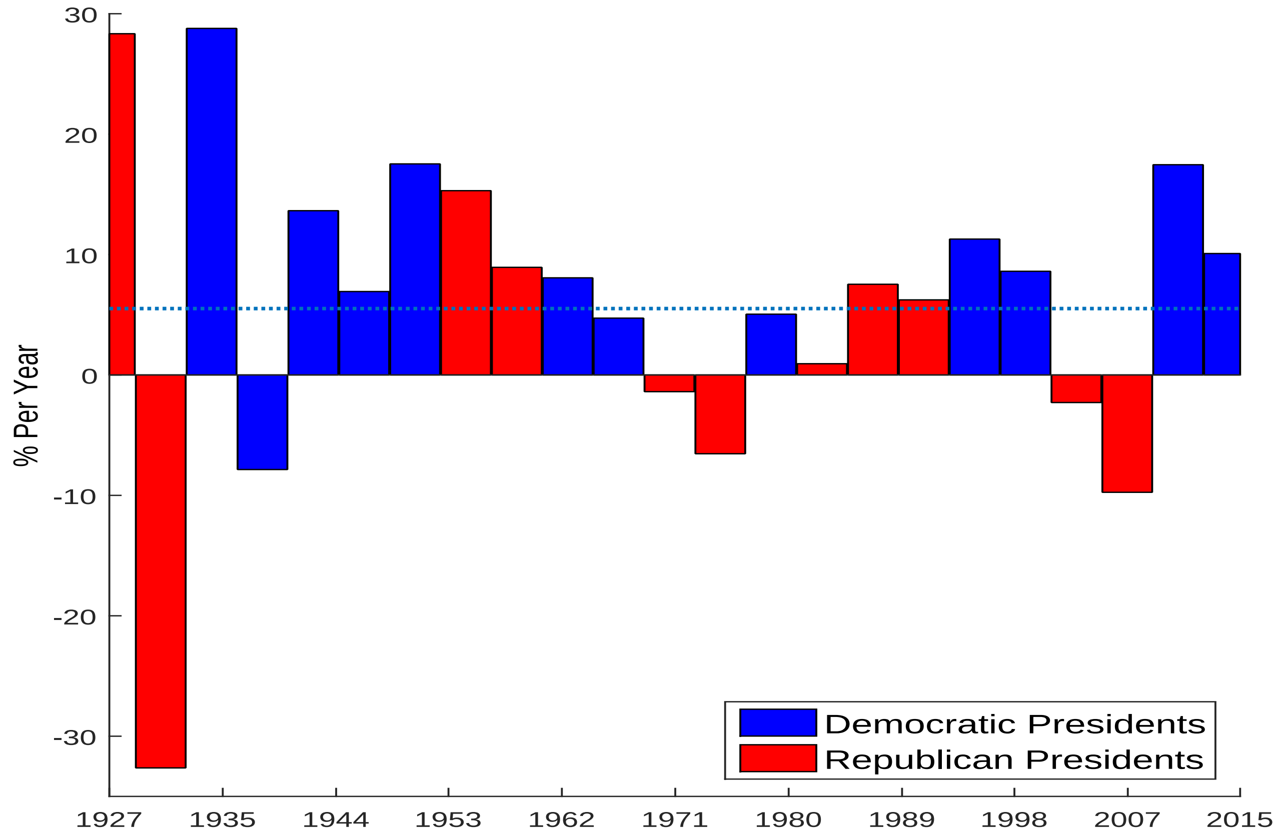

Figure 2. Average market returns under Democrat vs Republican presidents. This figure plots average U.S. excess stock market returns under each of the 23 administrations between 1927 and 2015, from President Coolidge through President Obama. We plot log returns on the value-weighted market index in excess of log returns on the three-month Treasury bill. Presidents are assumed to be in office until the end of the month during which they leave office. The horizontal dotted line plots the unconditional mean return.

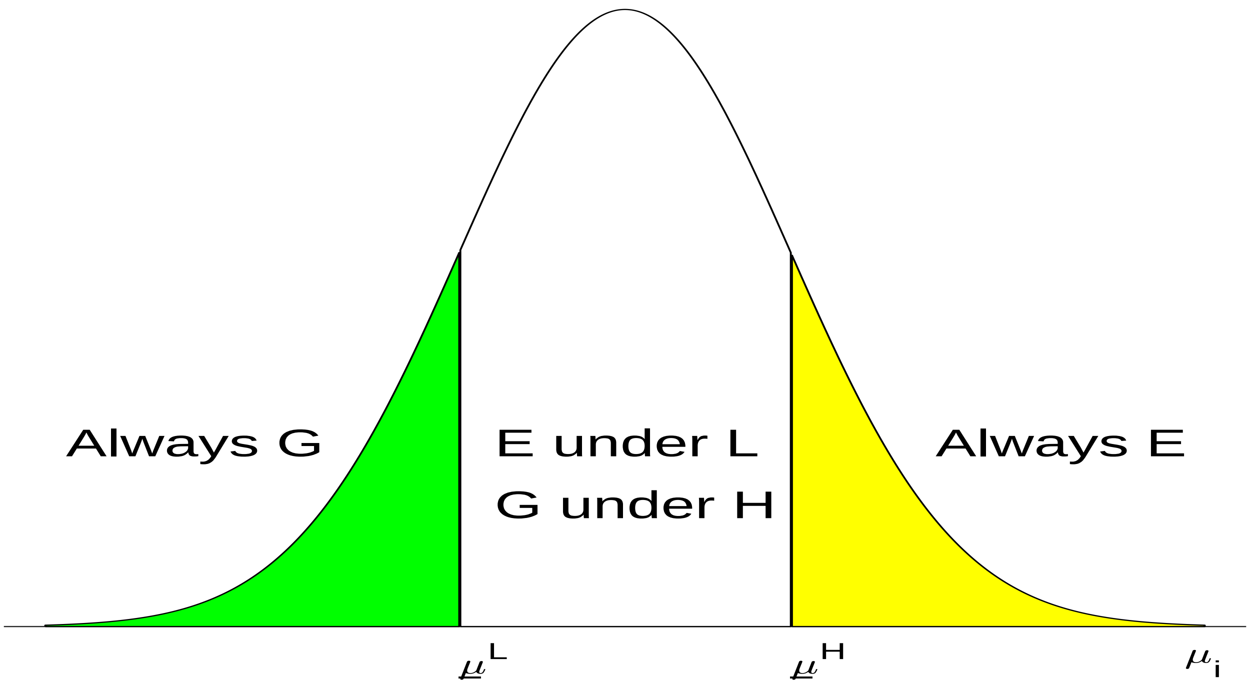

Figure 3. Occupational choice. Agents whose entrepreneurial skill $\mu_i > \underline{\mu}^H$ always choose to be entrepreneurs, regardless of which party is in power. Agents whose $\mu_i < \underline{\mu}^L$ always choose to be government workers. Intermediate-skill agents, for whom $\underline{\mu}^L < \mu_i < \underline{\mu}^H$, choose to be entrepreneurs when party L is in power but government workers when party H is in power.

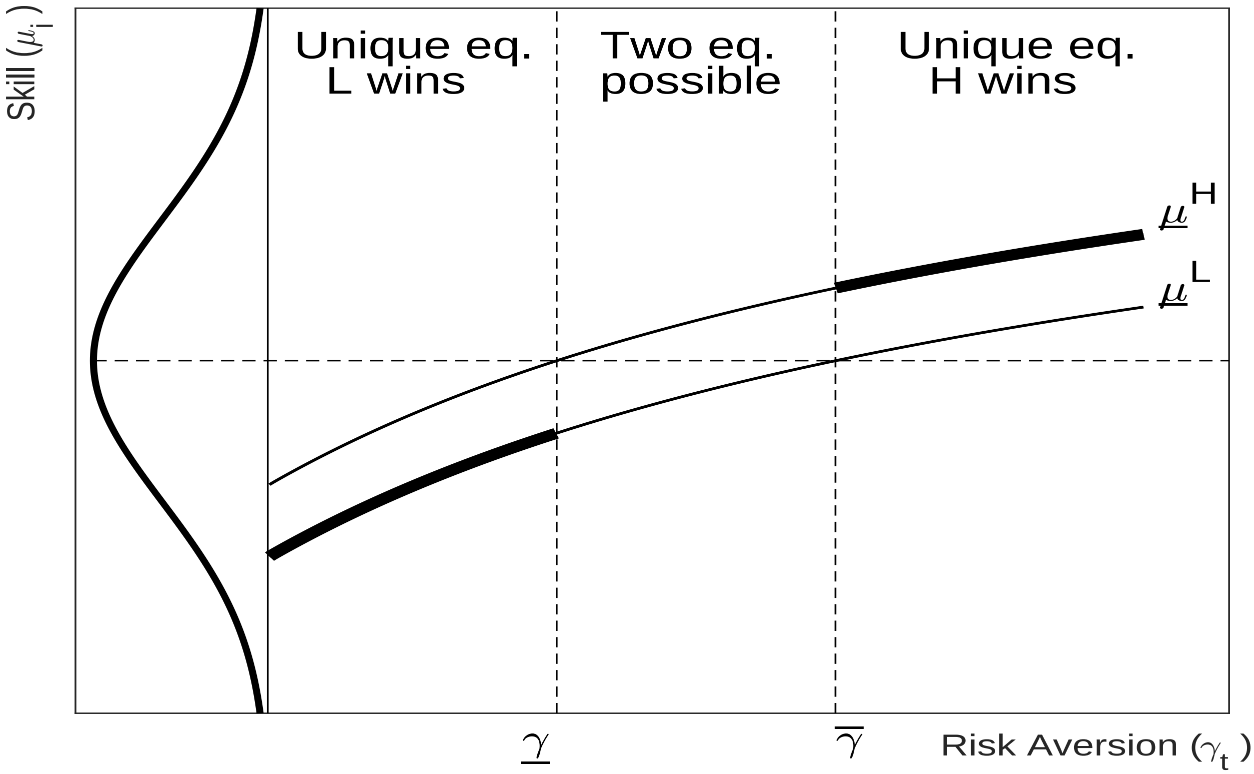

Figure 4. Equilibrium outcomes. For $\gamma_t > \overline{\gamma}$, both $\underline{\mu}^H$ and $\underline{\mu}^L$ are positive; as a result, there is a unique equilibrium in which the median voter is a government worker and party H wins the election. For $\gamma_t < \underline{\gamma}$, both $\underline{\mu}^H$ and $\underline{\mu}^L$ are negative; as a result, there is a unique equilibrium in which the median voter is an entrepreneur and party L wins the election. For $\underline{\gamma} < \gamma_t < \overline{\gamma}$, two equilibria, H and L, are possible.

Table 1
Average Stock Market Returns under Democratic and Republican Presidents

This table reports average excess stock market returns under Democratic presidents, Republican presidents, and the Democrat-Republican difference. Excess stock returns are computed monthly as the log return on the value-weighted total stock market in excess of the log return on a 3-month T-bill. Returns are reported in percent per year, for the full sample period as well as for subperiods. Presidents are assumed to be in office until the end of the month during which they leave office. t-statistics, reported in parentheses, are computed based on standard errors robust to heteroscedasticity and autocorrelation.

	Democrat	Republican	Difference
1927:01–2015:12	10.69	-0.21	10.90
	(4.17)	(-0.07)	(2.73)
1927:01–1971:06	10.80	-0.20	11.00
	(2.83)	(-0.03)	(1.58)
1971:07–2015:12	10.52	-0.22	10.74
	(3.46)	(-0.06)	(2.24)
1927:01–1956:08	12.58	-1.89	14.46
	(2.51)	(-0.20)	(1.37)
1956:09–1986:04	5.94	1.38	4.57
	(1.62)	(0.37)	(0.85)
1986:05–2015:12	11.99	-0.99	12.98
	(3.49)	(-0.21)	(2.17)
1927:01–1998:12	10.52	1.15	9.38
	(3.54)	(0.32)	(2.05)
1999:01–2015:12	11.37	-6.02	17.39
	(2.48)	(-0.91)	(2.14)

Table 2
Average Stock Market Returns in the Presidents' Early Years in Office

This table reports average excess stock market returns under Democratic presidents, Republican presidents, and the Democrat-Republican difference over the full sample period of January 1927 to December 2015. The results are computed over subsets of presidents' terms corresponding to their first one, two, or three years in office. Full-term results are identical to those reported in the first row of Table 1.

	Democrat	Republican	Difference
Year 1 in office	21.75	-15.13	36.88
	(2.03)	(-1.94)	(2.70)
Years 1 and 2 in office	11.47	-4.08	15.55
	(1.73)	(-0.66)	(1.56)
Years 1, 2, and 3 in office	15.00	2.57	12.43
	(3.11)	(0.56)	(1.67)
Full term	10.69	-0.21	10.90
	(4.17)	(-0.07)	(2.73)

Table 3
International Evidence on the Presidential Puzzle

For each country, this table reports the difference between that country's average excess stock market returns in periods when the U.S. president is a Democrat versus a Republican. Stock return data are from Morgan Stanley Capital International, covering the period 1970–2015. Excess stock returns are computed monthly as the log return on the country's market index minus the log of the country-specific 90-day interbank rates from FRED. Returns are in percent per year. Presidents are assumed to be in office until the end of the month during which they leave office. t-statistics, reported in parentheses, are computed based on standard errors robust to heteroscedasticity and autocorrelation.

	Australia	Canada	France	Germany	UK
Dem-Rep	11.31	13.62	13.78	11.63	7.33
	(2.05)	(2.78)	(2.33)	(2.02)	(1.38)

Table 4
Average GDP Growth under Democratic and Republican Presidents

This table reports average GDP growth under Democratic presidents, Republican presidents, and the Democrat-Republican difference. GDP growth is reported in percent per year for the full sample period as well as for equally long subperiods. t-statistics, reported in parentheses, are computed based on standard errors robust to heteroscedasticity and autocorrelation.

	Democrat	Republican	Difference
1930:01–2015:12	4.86	1.70	3.16
	(4.87)	(1.96)	(2.40)
1930:01–1972:12	6.11	0.36	5.75
	(4.06)	(0.18)	(2.33)
1973:01–2015:12	3.02	2.54	0.47
	(7.12)	(4.98)	(0.76)
1930:01–1958:08	6.46	-1.86	8.31
	(3.07)	(-0.63)	(2.33)
1958:09–1987:04	4.64	3.16	1.47
	(7.09)	(4.40)	(1.50)
1987:05–2015:12	2.91	2.21	0.70
	(7.59)	(4.32)	(1.27)

Table 5
Predicting Electoral Transitions

This table reports the estimated slopes and their t-statistics from a logistic regression model. The left-hand side variables, given in column headings, are dummy variables that are equal to one if the given electoral transition occurs in the current month and zero otherwise. The left column reports results for elections resulting in transitions from a Republican president to a Democratic president. The right column corresponds to transitions from a Democratic president to a Republican president. Each regression has a single right-hand side variable. The right-hand side variables are log stock market return in excess of the risk-free rate, real GDP growth, and realized market variance estimated from daily data within the month. Each right-hand side variable is the average of the corresponding quantity computed over the previous m months, where $m \in \{3, 6, 12, 36\}$ varies across the four panels.

	Transition from Republicans to Democrats	Transition from Democrats to Republicans
	Panel A. Lag of 3 months	
Stock return	-13.66	-0.32
	(-1.33)	(-0.02)
GDP growth	-0.17**	-0.01
	(-2.38)	(-0.12)
Market variance	10.66***	-10.00
	(3.38)	(-0.43)
	Panel B. Lag of 6 months	
Stock return	-16.19	10.94
	(-1.03)	(0.48)
GDP growth	-0.17**	-0.04
	(-2.26)	(-0.38)
Market variance	12.35***	-11.39
	(2.57)	(-0.47)
	Panel C. Lag of 12 months	
Stock return	-36.44**	11.99
	(-2.09)	(0.39)
GDP growth	-0.14*	-0.02
	(-1.80)	(-0.22)
Market variance	13.58**	-6.67
	(2.02)	(-0.34)
	Panel D. Lag of 36 months	
Stock return	-66.33**	60.22
	(-2.46)	(0.93)
GDP growth	-0.17*	0.07
	(-1.95)	(0.66)
Market variance	12.59	-20.56
	(1.15)	(-0.65)

*: significant at 10% level; **: significant at 5% level; ***: significant at 1% level

Table 6
Time Series of Risk Aversion

This table reports the slope coefficients from time-series regressions in which the left-hand side variables are four proxies for risk aversion (columns 1 through 4) and four proxies for the equity risk premium (columns 5 through 8). The risk aversion proxies are "CC," the negative of the surplus consumption ratio (Campbell and Cochrane, 1999), "PVS," the negative of the price of volatile stocks (Pflueger et al., 2018), "MR," the aggregate risk aversion measure of Miranda-Agrippino and Rey (2018), and "UNE," the unemployment rate. The risk premium proxies are "CAY" (Lettau and Ludvigson, 2001), "DP," the aggregate dividend-price ratio, "IM," the one-year equity premium bound of Martin (2017), and the negative of IPO volume (Pástor and Veronesi, 2005). The right-hand-side variables are the Democrat dummy D, which is equal to one if a Democratic president is in office and zero otherwise, time in office, which is the number of months for which the party in power has held the presidency, and the interaction of D and time in office. The intercept is included in the regression. All slope coefficients are multiplied by 100. t-statistics, reported in parentheses, are computed based on standard errors robust to heteroscedasticity and autocorrelation.

	Proxies for Risk Aversion				Proxies for Equity Risk Premium			
	CC	PVS	MR	UNE	CAY	DP	IM	IPO
Democrat	1.09	45.19	138.19	118.60	0.40	-0.28	2.37	11.82
	(1.87)	(1.59)	(2.20)	(1.08)	(0.29)	(-0.32)	(1.16)	(0.96)
Time in office	0.01	0.37	0.60	0.74	0.01	0.01	0.01	0.11
	(1.33)	(1.57)	(0.92)	(0.73)	(0.71)	(0.92)	(0.34)	(1.07)
Interaction	-0.03	-0.85	-2.99	-2.25	-0.01	0.00	-0.02	-0.16
	(-2.66)	(-2.11)	(-3.20)	(-2.20)	(-0.56)	(0.28)	(-0.54)	(-0.85)
Observations	683	183	252	816	256	1068	193	672

Table 7
Who Are the Democratic Voters?

This table reports the slope coefficients from logit regressions estimated across voters. In columns 1 through 4, the left-hand side variable represents the support for the U.S. Democratic Party among the respondents to the 2014 Cooperative Congressional Election Survey. The variable is equal to one if the respondent voted for the Democratic candidate (Obama) in the 2012 presidential election and zero otherwise. In columns 5 through 8, the left-hand side variable represents the support for the UK Labour Party among the respondents to the 2014-2018 British Election Study. The variable is equal to one if the respondent expresses support for the Labour Party and zero otherwise. The right-hand-side variables are listed in the first column. The intercept is included in the regression. The *t*-statistics are in parentheses.

	U.S. Democratic Voters				UK Labour Voters			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Risk Aversion	0.13	0.12	0.12	0.12	0.14	0.14	0.16	0.14
	(7.28)	(6.04)	(5.89)	(5.40)	(8.23)	(5.23)	(4.77)	(3.72)
Entrepreneur		-0.28	-0.25	-0.15		-0.40	-0.41	-0.39
		(-5.68)	(-5.04)	(-2.65)		(-7.83)	(-6.38)	(-4.95)
Government Worker			0.19	0.12			0.22	0.26
			(3.39)	(1.95)			(4.07)	(3.99)
Income				-0.03				-0.10
				(-3.47)				(-12.86)
Education				0.26				0.44
				(13.30)				(7.94)
Age				-0.01				-0.01
				(-4.50)				(-4.83)
Gender (Male)				-0.62				-0.16
				(-11.62)				(-3.02)
Observations	8855	7809	7771	6784	30301	12626	7949	6279

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