Policy Uncertainty and the Economy: A Review of the Literature

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I. Introduction

There has been an explosion of work exploring the economic impact of uncertainty. Bloom (2009) and Baker, Bloom and Davis (2013) have provided recent evidence that policy uncertainty may have first order effects on the overall economy. The study of the interaction between uncertainty and economic behavior, of course, dates back to some of the earliest contributions to modern economics, including the seminal work of Keynes (1936). But modern technologies have allowed economists to construct measures of uncertainty that were previously unavailable, and to explore empirical linkages that previously had only been the subject of speculation.

In more modern work, policy uncertainty has been a key focus of the macroeconomic, public finance and environmental economics literatures. The former has identified key linkages between economic activity and measures of policy uncertainty as well as variables that impact policy uncertainty, such as elections and debt levels. For their part, the public finance and environmental economic literatures have developed micro-foundations for these macroeconomic results.

These latter literatures have focused on three areas of inquiry. First, theoretical models that allow exogenously uncertain policies to influence the optimal decisions of agents have been developed, and a range of results has been derived from them. Second, uncertainty concerning fundamentals has been incorporated into models, and the impact of uncertainty on optimal policy design has been evaluated on the basis of these models. Third and finally, the impact of non-policy uncertainty on the optimal decisions of individual agents and firms has been investigated, and the policy implications of these investigations have been evaluated.
The purpose of this paper is to connect the latest work on the impact of uncertainty on the overall economy with the earlier literature in a more thorough and rigorous manner than would be possible in a typical academic paper focused on its own original results. We begin with a brief section that uses a simple example to highlight the circumstances in which uncertainty can be expected to have particularly important results for the conclusions drawn from economic models. The same section highlights a distinction that remains important throughout the paper. We then review the latest macroeconomic literature on the impact of uncertainty on the overall economy. We then proceed to review the public finance and environmental economic literatures germane to understanding the role of uncertainty in economic activity. Though uncertainty can have important effects on behavior of governments, consumers and firms, in this review we focus on the impact on the behavior of governments and firms.

II. Intuitive Examples

According to the traditional view, it is rational to invest in any project with expected cash flows that generate a positive net present value. It may also be intuitive to think that policy uncertainty can discourage economic activity in general and investment in particular. Contrary to this intuition, however, uncertainty has been found to in general increase investment (e.g., in Hartman 1972 and Abel 1983).

The intuition for this result serves as an important anchor for an understanding of the modern literature on uncertainty. Imagine a producer who starts out selling goods at price $P_0$. If the introduction of a random new tax then causes the price of his output to fluctuate between lower price $P_1$ and higher price $P_2$, with an upward-sloping supply curve, the gain generated in
the producer’s “good” state with price $P_2$ exceeds the loss in the producer’s “bad” state with price $P_1$. This can be seen in Figure I, wherein the area of good state area A exceeds the area of bad state area B.

![Figure I](image)

To the extent that producers can increase the quantity of goods produced as price increases, therefore, uncertainty can increase profits and investment as well.

A key feature of this simple example is the ability of the producer to costlessly adjust his output up and down. Beginning with Arrow (1968), Bernanke (1983) and Pindyck (1988), however, economists have generated more-general models that assume adjustment to be costly. When adjustment is costly and returns are uncertain, then a firm may potentially experience
regret for the choices it made. This regret, as we shall see, is a crucial element in modern models that find negative effects of uncertainty.

To illustrate, suppose, as in Auerbach and Hassett (2002), that a firm accustomed to powering its operations with a coal furnace is considering the purchase of a new, more energy-efficient gas-powered furnace. This new furnace costs $100 today, but it has an uncertain return tomorrow because the future price of the gas required to operate the gas-powered furnace is uncertain. If the price of gas stays the same, the operation of the furnace stands to generate $400 in profit. However, if there is bad news tomorrow and the price of gas increases, then the furnace will generate no new revenue and therefore a $100 loss due to the $100 outlay required to purchase it.

If the probability of either outcome for the price of gas is .5, ignoring discounting, then the expected net present value of purchasing the machine is:

\[(.5 \times $400) + (.5 \times $0) - $100 = $100\]

Due to the positive expected value of the furnace’s future cash flows, it may be tempting to conclude that it is rational to make the investment today. But it is in fact still optimal to delay and postpone that decision until tomorrow: the decision to delay allows one to avert the $100 expenditure on the cost of the furnace in the event the price of gas rises and the operation of the furnace is no longer economically rational. As the table below shows, if the probability of the gas price rising is .5, then this delay until tomorrow increases the expected profit generated by the purchase from $100 to $150, an increase of $50. The $50 increase in expected value comes from avoiding the $100 loss if the 50% probability scenario of a gas price increase comes to fruition.
Table I: Investing today versus waiting until tomorrow

<table>
<thead>
<tr>
<th>Today</th>
<th>Tomorrow If goods news (Probability = .5)</th>
<th>Tomorrow If bad news (Probability = .5)</th>
<th>Expected return</th>
</tr>
</thead>
<tbody>
<tr>
<td>If goods news</td>
<td></td>
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<tr>
<td>If bad news</td>
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</tr>
<tr>
<td>Expected return</td>
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</tr>
<tr>
<td>Scenario 1: The expected profit if you buy a new gas-powered furnace that costs $100 today, even though it has an uncertain return tomorrow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pay $100</td>
<td>Earn $400</td>
<td>Earn nothing/eat loss</td>
<td>$100</td>
</tr>
<tr>
<td>Scenario 2: Expected profit if you wait and decide whether to purchase the furnace tomorrow, when you already know whether the price of gas has increased.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pay nothing</td>
<td>Earn $400-$100 = $300</td>
<td>Earn nothing/no loss</td>
<td>$150</td>
</tr>
</tbody>
</table>

Thus, because the firm can avoid the possibility of the loss of $100 if a bad state materializes and the price of gas increases, it is better for the firm to delay the investment.

It is worth noting that the rationality of delay depends on the irreversibility of the investment. Were the firm able to sell the gas furnace for its full cost in the event the price of gas rises, then the scenario in which the firm lost $100 as the price of gas rose would never materialize because the firm would simply sell the machine for $100 and breakeven in spite of the increase in the gas price. However, it seems unlikely that many investments are reversible. There are two main reasons for this:

1) Many pieces of capital equipment are customized and therefore, once installed, have little or no value to any other firm.

2) If economic conditions render the operation of capital equipment economically unviable for one firm, it is unlikely that the operation of that same capital equipment would be economically viable for another firm.

Thus, in the real world, there is a gain to waiting in the presence of uncertainty if the investment expenditure in question entails sunk costs. Nevertheless, the temptation to conclude that
uncertainty from the randomness of policy necessarily decreases investment is still a temptation that leads one astray.

Before proceeding to the review of the literature, it seems worth clarifying the distinction between parametric uncertainty (effectively synonymous with “risk” in the colloquial sense of the word) and uncertainty of the Knightian variety. Parametric uncertainty refers to the uncertainty that arises from a lack of perfect foresight about which of a known set of events with a known set of probabilities will occur in the future. For instance, an individual attempting to guess the outcome of a coin-toss faces parametric uncertainty. An increase in parametric uncertainty would occur if the game of a single coin-toss were modified so that the participant had to guess correctly the sequence of heads-or-tails that would result from a series of three coin tosses, as this would increase the number of possible final outcomes from two to eight. Yet the number of possible outcomes remains finite, and the probability of any given possible outcome’s occurrence remains known.

This contrasts with the nature of Knightian uncertainty, which deals with a more-fundamental lack of knowledge about the future. This distinction between Knightian and parametric uncertainty often reaches undergraduates in economics courses in the form of the “Ellsberg paradox” first presented in Ellsberg (1961), and Hansen (2014) offers a lucid exposition of its relevance to the modern economics literature. Yet one powerful and illustrative analogy dates back to John Maynard Keynes’s 1921 Treatise on Probability, the text to which Keynes footnotes his discussion of the concept of uncertainty in his 1936 magnum opus, The General Theory. To borrow the analogy from Keynes (1921), suppose you know that two urns contain only black and white marbles. You know that the first contains equal proportions of both colors. You have no information about their proportions in the second. If asked to estimate the
fraction of white balls that will be drawn in a long series of draws, assuming each marble is replaced after it’s drawn, the rational modal forecast for both urns is ½. Yet the forecast for the second remains more uncertain (in the sense of Knightian uncertainty) than the same forecast for the first, even though they each have the same quantitative value. In contrast to a mere increase in the number of flips in a series of coin tosses that an individual must correctly guess in order to win a coin-toss guessing game, shifting from Keynes’s first urn to Keynes’s second urn entails shifting from a distribution with a known set of probabilities to a distribution that lacks any known set of assignable probabilities. And this kind of Knightian uncertainty posed by the second urn is distinct from the parametric ‘uncertainty’ that generates the risk of drawing a blackball even if you know the specific proportions of white and black marbles, as in Keynes’s first urn. Ellsberg (1961) noted that individuals tend to be averse to Knightian uncertainty, and tend to want to prefer to bet on the first urn.

The distinction between Knightian and parametric uncertainty remains important for developing a deep understanding of the literature on uncertainty, yet it is often not directly addressed in many of the studies reviewed in this paper. It is worth keeping the contrast between these two forms of uncertainty in mind when evaluating the different studies, a point we expand upon in the final section.

**III. Uncertainty and Investment: Earlier literature**

Perhaps the most natural starting point for a review of the literature on uncertainty and investment is the literature on aggregate investment fluctuations that began to blossom in the
1960’s, a logical predecessor of today’s literature.\(^1\) Hall and Jorgenson (1967), following Jorgenson (1963), deployed a user-cost formula in a neoclassical framework to explain aggregate investment fluctuations. They concluded that it described the data well. These models did not incorporate uncertainty, and early empirical analyses in this literature tended to suggest that tax policy generated no effect at all on investment. An important and notable innovation arrived when adjustment costs were added to these models.

For the purposes of this paper, however, perhaps the most salient development in this literature derived from an approach first suggested in Tobin (1969) but only made fully possible by Hayashi (1982): expressing investment in terms of current and future expected values of capital. That is, as in Auerbach (1989) and Abel (1990), investment can be expressed in terms of current and future values of the user cost of capital. At this point, the notion that policy is known with certainty was dropped. Models such as that featured in Auerbach and Hines (1988) offer in-depth treatments of the effects of dropping the assumption of certainty. They find, for example, that firms might accelerate investment into today if an investment tax credit were expiring—but also that an expected reduction in the corporate tax rate could act like an investment tax credit, because firms would accelerate purchases into today in order to receive the deduction at a higher tax rate.

But even these models tended to produce somewhat implausibly small empirical estimates of the impact of expected tax policy on investment (see Auerbach and Hassett 1992 for a discussion of these estimates). The problem is clear in hindsight: as documented in Cummins, Hassett, and Hubbard (1994), Congress tends to enact investment tax credits during recessions. Business investment tends, due to market forces, to fall during recessions. This creates a natural

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\(^1\) This literature review draws from Hassett and Hubbard (2002).
downward bias in estimates of the effects of investment tax credits, as they will by the very nature of this process appear to co-vary with declines in investment. To resolve this econometric dilemma, the literature turned towards the experience of major tax reforms, which arguably offer periods in which there is exogenous cross-sectional variation in the user cost of capital or tax-adjusted value of “q”. Auerbach and Hassett (1991) and Cummins, Hassett and Hubbard (1994, 1995, 1996) demonstrate that major tax reforms are also associated with significant firm- and asset-level variation in key tax parameters (such as the effective rate of investment tax credit and the present value of depreciation allowances). Hence tax variables are likely to be a good instrument for the user cost or Q during tax reforms: variation across assets within a given year is large, as is within-asset variation over time. The treatment of different assets relative to one another also changes over time. Estimates using this source of exogenous variation produced very large estimates of the impact of tax policy on investment, contrary to the previous literature.

But these results still presented the literature with a significant challenge. Policymakers clearly were moving policy variables around frequently and with actions that were not perfectly predictably. The linearized versions of the models that were relied upon to incorporate expectations into estimates did not allow for an impact of uncertainty per se at all. In fact, if a constitutional amendment were passed to lock expected tax policy in place and remove it from the fickleness of the policy-setting process, models such as Auerbach and Hassett (1992) would imply that no effect would be predicted. That implication seems at odds with basic intuition about what would happen in such a scenario.

The next step, then, was to begin to incorporate policy uncertainty into these policy focused models. Early work such as Hartman (1972) and Abel (1983) found that uncertainty increases investment for much the same reason that our first intuitive example made the firm
better off when prices became more uncertain (i.e., firms shift investment to the “good” tax state and away from the “bad” tax state). Pindyck (1988), however, showed that uncertainty can have a depressing effect on investment if the investment is irreversible.

The Pindyck (1988) result might lead one to expect that tax policy uncertainty would have depressing effects on investment. Hassett and Metcalf (1999), however, highlighted a key problem with necessarily drawing that conclusion. Until then, models of irreversible investment relied on Geometric Brownian Motion processes to model price uncertainty. Such a process, which is a continuous time random walk, can wander off to infinity over time, and seems a poor approximation of a tax variable, which is bounded between 0 and 1. In order to identify the impact of moving to a more realistic process, they incorporated a stationary Poisson jump process into the standard model. In related work, they also modeled the impact of replacing the GBM assumption with an alternative mean reverting process (Hassett and Metcalf 1995).

The importance of the distinction becomes clear in the specific context of the investment tax credit (ITC) addressed by Hassett and Metcalf (1999). Suppose the investment tax credit oscillates only between ‘high’ and ‘low’ states that, on average, exist for intervals of equal expected duration. If the ITC is in effect at a given time, then it is expected to be reduced in the future, an expectation that might induce a firm to accelerate investment into today. But this effect is not an effect of uncertainty. Rather, it follows from the user cost analysis of Auerbach and Hines (1988) which linearized the model and abstracted from uncertainty.

Hassett and Metcalf (1999) lay out the conditions under which the effects of variation in uncertainty can be studied independently from such other effects. First, the effects of uncertainty should vary positively with the spread between the high and low credit states. For example, if
there is a 50 percent chance of the ITC oscillating between a state of 5 percent and a state of 15 percent in one world, and we compare that to a world where the ITC instead fluctuates between a state of 0 and a state of 20 percent, then differences between those two worlds could be attributed to variation in uncertainty (note that average expected tax rates stay the same in either world). The second manner in which uncertainty can be independently studied in such a model is to draw on the work of Theil (1967), and recognize that the situation is more uncertain—that is, that agents have less information about the future tax policy—when the probability of the ITC switching between states approaches .5.

The distinction between Geometric Brownian Motion and a stationary Poisson Process emphasized in Hassett and Metcalf (1999) has a large impact on their results. While increasing uncertainty raises hurdle rates and slows investment if modeled with a Geometric Brownian Motion, the increase in investment tends to accelerate investment into the current period if modeled by a Poisson Process. This is because firms are more likely to find themselves in a situation where the high ITC state, and the nervousness that it might switch off, combine to induce them to accelerate investment into the high ITC period. In other words, while irreversibility might solve the problem that uncertainty has counter intuitive beneficial effects in some models, in a model that is designed to model tax policy, the embarrassing result appears to return.

Subsequently, there has been a veritable explosion of work in this area. Alvarez, Kannianen and Sodersten (1998) explore a model where firms face uncertainty both about tax rates and about the tax base. In their model, the firm knows a reform is coming in the future but knows neither the reform’s scale nor its timing. They demonstrate that uncertainty about the tax base and uncertainty about the tax rate generate effects in opposing directions, and solve for the
conditions that would be sufficient for Hartmann (1972) style counterintuitive effects of uncertainty to exist. In other words, they show that the effect could in theory go either way, even while modeling in a more general way tax policy.

Bohm and Funke (2000) explore the sensitivity of the result that tax policy uncertainty may stimulate investment. They argue that, while theoretically interesting, the results tend to be very small relative to the normal fluctuations of economic variables. Thus, they argue, tax uncertainty is likely a very minor policy concern. Niemann (2004) similarly finds that the role of tax policy uncertainty is highly ambiguous and likely small.

Pawlina and Kort (2005) extend the Hassett and Metcalf (1999) model to allow the government to set its policy in response to a trigger of real economic activity. Such a setting is reminiscent of the observed behavior of ITC policy in the U.S., wherein the government attempts to stimulate investment in a recession, a slowdown in real economic activity. They find that the impact of the trigger value on the optimal investment rule is not monotonic: the threshold decreases with uncertainty at low levels of the trigger value, but increases at high levels. This work importantly suggests that the government may be able to solve for the optimal level of policy uncertainty, which would minimize any negative consequences. The fact that trial and error may drive a government to such a policy of minimizing the effects of uncertainty, presumably, adds another argument in favor of the view that pure tax policy uncertainty effects may be small. This notion that uncertainty itself may have periods of fluctuation has also been found to be impactful. Bloom, Bond and Reenen (2007) find that high uncertainty reduces the responsiveness of firm investment to demand shocks.
Sialm (2006) explores the impact of policy uncertainty on asset prices, and finds another channel through which policy uncertainty could potentially be quite harmful. Policy changes can lead to large changes in asset prices. The presence of policy uncertainty, then, can significantly increase equity risk premia and the cost of capital.

Atug, Demers and Demers (2010) extend the Hassett and Metcalf (1999) model to a three state Poisson process, arguing that such a process is more consistent with the U.S. experience. Interestingly, they find that the additional state adds significant nuance to the findings. Since the Hassett and Metcalf (1999) model assumes that the direction of the stochastic move in the ITC is certain (one can only transit from a high to a low state or vice versa), then the acceleration effects are magnified. When the direction and the timing of the move are uncertain, however, Altug, Demers, and Demers (2010) show that uncertainty can have large negative effects on investment and that a stochastic ITC can even reduce long-run welfare because of these uncertainty effects.

Kang, Lee and Ratti (2014) explore the impact of both firm-level and aggregate uncertainty on investment. They find that the interaction between the two explains the very high effects of aggregate uncertainty. That is, they find that firms that face the highest level of idiosyncratic uncertainty are those that are more responsive to aggregate uncertainty. Intriguingly, they find that the largest firms do not respond at all to uncertainty.

Relying on the constraint that investment be irreversible, Nishide and Nomi (2009) model a large policy change as a regime change that probabilistically happens around, for example, a national election. Echoing the results of Bernanke (1983), they find that near a stochastic regime change, it is optimal for firms to act as if the worst possible outcome will occur. For example, if
one party is hostile to business while another is friendly, then as the election approaches optimal
investors will choose to delay investments, setting their investment levels to that which would be
appropriate if the unfriendly political party wins. Hansen (2014) yields a similar result using a
variation on this framework: distinguishing a lack of knowledge about which possibility from a
known distribution of possible future outcomes will be realized from genuine uncertainty about
which probability distribution correctly describes reality in the first place, Hansen (2014) finds
that in the face of such uncertainty, ambiguity-averse agents behave as if the worst possible
distribution were the true distribution.²

It is worth noting that this result is in some sense obvious if the hypothetical election is
tomorrow, as delay brings with it the benefit of avoiding the potential for regret in the bad state
and the opportunity cost is zero if there is no revenue from operations between then and now to
lose. If the election is a month away, then a firm contemplating a new investment would trade-
off the value of the possible increase in profits between now and the election against the potential
for regret the day of the election. As elections become temporally farther in the future, and as
interest rates increase, the more important the sales between now and the election become.³ This
casts an introspective perspective on the contemporary United States: in a low interest rate
environment, and with a political system that features consequential elections every two years, it
is not difficult to imagine how the investment-depressing effects of uncertainty could be
profound.

²The framework of Hansen (2014) will be explored in greater depth later in this paper.
³ Though perhaps not obvious at a glance, the relationship between interest rates and the tradeoff between making an
investment today versus making it tomorrow arises from the role of interest rates in mediating the relationship
between the present and future values of money. As interest rates increase, the future value of revenue’s accruing
today increases: any given quantity of money will earn more interest between now and any given future point in
time as interest rates increase. For a firm contemplating an investment decision, the future value of the revenues
accrued before the election is the opportunity cost that it would effectively pay if it chose not to invest and therefore
forego those revenues. Thus, the opportunity cost of delaying a revenue-generating investment is higher when
interest rates are higher.
To summarize, this literature has significantly expanded our understanding of the possible theoretical effects of policy uncertainty. Early work provided key insights into the theoretical difficulty of constructing models that produce the intuitively plausible result that higher uncertainty harms investment. However, the possible positive role of tax policy uncertainty is muted—if not reversed—in situations where significant large regime changes centered around elections are in play, or when both the direction and the timing of possible tax changes are uncertain. In addition, the relevance of irreversibility in mediating the effects of uncertainty on investment cannot be overemphasized.

It is interesting to note that all three of these theoretical situations seem quite empirically relevant. First, Altug, Demers, and Demers (2010) make a solid case that the three state Poisson model better characterizes recent policy uncertainty than the original Hassett-Metcalf (1999) two-state model. Second, at least at a glance, the relevance of elections in explaining fluctuations in policy uncertainty seems quite high. Figure II shows that increases in uncertainty as measured by the Baker, Bloom, and Davis (2013) index seem to correspond to the key inflection points of the American presidential election cycle. There are two clear peaks in the data: one near the presidential election month (which corresponds to month 0) and one immediately following the mid-term election (which corresponds to month -24). Though the reasons for the spike near the former seems intuitive given the importance of the incumbent president in shaping policy, the large size of the latter likely reflects uncertainty about how the newly-elected Congress will or will not cooperate to pass new legislation.
Third, a large literature has documented that irreversibility is a relevant concern for a significant share of aggregate investment (e.g., Caballero 1999).

As both conclusion to this section and introduction to the next, it is worth explicitly identifying three of the prominent empirical implications of the by and large theoretically-oriented literature thus far reviewed. 1) The effects of uncertainty will be greatest as one approaches a threshold event, like an election. 2) The effects of uncertainty will be greater in contexts in which the irreversibility of investment is higher. 3) Whether policy uncertainty facilitates or impedes economic activity depends on the context (i.e., the effects of policy uncertainty can be good in certain contexts and bad in others).

The empirical papers that serve as the focus of the next section provide broad support for these implications.
IV. Uncertainty and the Economy: New approaches

The literature in the previous section reviewed models that attempted to establish *a priori* constraints on the likely impact of policy uncertainty on investment and economic activity. In this section, we focus on the recent literature that has looked specifically for empirical effects of uncertainty.

Perhaps the most prominent recent strain of this literature addresses the potential role of policy uncertainty in explaining the economic fluctuations observed during and after the Great Recession. In one influential paper, Baker, Bloom, and Davis (2013) construct a novel index of economic policy based on a diverse array of metrics, performing tests of the index’s validity through a human audit of 3,500 newspaper sources and other common-sense measures. They find that the increase in policy uncertainty that followed the onset of the Great Recession had significant negative effects on aggregate investment and on employment as well as on consumption expenditures. The overall contribution of Baker, Bloom, and Davis (2013) to the literature on economic policy uncertainty, however, extends beyond the findings of the original 2013 paper and into the literature as a whole.

A number of studies have deployed the Baker, Bloom, Davis (2013) index as an independent variable, attempting to glean insight into the impact of policy uncertainty on other economic variables. Matching firm-level data with the data series of this index, Gulen and Ion (2013) find that economic policy uncertainty can explain up to 32% of the drop in corporate investment over the 2007-2009 time period. They find, moreover, that the investment-suppressing effects of economic policy uncertainty are greater for firms with more-irreversible potential investments. Another notable contribution comes from Pastor and Veronesi (2012, 2013), who develop a model in which the governments endogenously choose a new policy with
effects that agents learn the true impact of only through time, in a Bayesian learning process. Matching this model to stylized fact, Pastor and Veronesi (2013) associate increases in the Baker, Bloom, and Davis (2013) index with increases in the volatility of US equities as well as their correlation to one another. Brogaard and Detzel (2015) find that increases in the index lower equity prices by raising the discount rate on future cash flows and generating a risk premium idiosyncratic to economic policy uncertainty rather by than by directly altering cash flows or dividends. Constructing a cross-sectional economic uncertainty index of their own rather than using the index of Baker, Bloom, and Davis (2013), Shoag and Veuger (2013) find that cross-sectional variation in uncertainty can explain a significant portion of cross-sectional variation in the unemployment fluctuations associated with the Great Recession.

However innovative this literature may be, omitted variable bias seems likely to belie any attempt to draw causal conclusions from studies that use indices of economic policy uncertainty as an independent variable. If the distribution of possible future states of the economy becomes more uncertain “bad and uncertain” states of nature, and if economic policy responds to economic conditions, then economic policy will become more uncertain in “bad and uncertain” states of nature. But the underlying cause of this transition to a world of both deteriorating economic conditions and of heightened policy uncertainty is the underlying transition to a “bad and uncertain” state of nature that causes both the deterioration in economic conditions and an increase in policy uncertainty, a mechanism distinct from any causal effect running from policy uncertainty to economic conditions. As argued in Hansen (2014), economic agents may be more concerned with uncertainty about the nature of the future distribution of possible economic conditions in bad states than in good states: if the distribution of possible ‘true’ probability distributions of future states of economic conditions widens as uncertainty increases, the worst-
case scenario that an ambiguity-averse economic agent in Hansen (2014) treats as if it were the current scenario will be worse. Thus, Hansen (2014) suggests a plausible mechanism that would explain why uncertain states of nature tend to also be bad states of nature. And this mechanism does not entail any recourse to a policy-based transmission mechanism.

The view of developments in the post-crisis United States as constituting a transition to a “bad and uncertain” state of nature comports with stylized facts at least at a high-level. The policymakers who responded to the financial crisis and the Great Recession certainly seem to believe that the future path of economic conditions they faced was more uncertain than what that which typically faces policymakers. After all, in 2004, only a few years before the crisis erupted, Ben Bernake said that expected the ‘Great Moderation’ of macroeconomic volatility observed during the late 1990’s and early 2000’s to continue indefinitely (Bernake 2004). And Tim Geithner’s memoir of his time as Treasury Secretary leaves readers with little doubt that policymakers felt blindsided by the end of the ‘Great Moderation’ and undertook a series of “constant zigzags” not by choice, but due to the rapid and seemingly unpredictable evolution of the financial and economic conditions to which policymakers felt they should respond (Geithner 2014). From this perspective, the variation in policy uncertainty observed in the context of the Great Recession seems likely to be due at least in part to variation in uncertainty about the future path of the economic conditions to which optimal policy responds. The notion that the omitted variable of a transition to a “bad and uncertain” state of nature during the financial crisis and its aftermath undercuts the literature that frames policy uncertainty as a cause of the economic deterioration associated with the Great Recession, therefore, seems at least very plausible.

Though others writing in this literature concede that the resolution of key questions of causality between uncertainty and economic growth will remain unresolved at least until future
research progresses (e.g., Bloom 2014), Gulen and Ion (2013) attempt to address the omitted variable bias concern directly. They concede that concerns about omitted variable bias are “legitimate,” but claim that the use of lagged values of uncertainty alleviates these concerns does not seem sufficient. As an ostensible further check of robustness, they use a measure of political polarization as an instrument for policy uncertainty. Citing the unpublished manuscript of McCarty (2012), they claim that greater political polarization fosters political gridlock that increases policy uncertainty. But this runs counter to the basic intuition that political gridlock narrows rather than widens the range of possible bargaining outcomes and therefore decreases policy uncertainty, as well as counter to the results of Füss and Bechtel (2008). From this perspective, the validity of their instrumental variable seems dubious at best. This in turn suggests that their result in the instrumental variable regressions may have more to do with the fact that political polarization has for decades trended upwards in the United States, resulting in a peak in the late 2000’s—the same time as the Baker, Bloom, and Davis (2013) index happens to peak in the wake of the Great Recession. As a result, though Gulen and Ion (2013) offer a thoughtful reply to the omitted variable bias objection, the argument they offer does not seem to suffice in overcoming that objection.

Granted, as Gulen and Ion (2013) note, the uncertainty index approach does grant the analytical advantage of serving as a continuous time-series measure of uncertainty. This contrasts with the literature that analyzes economic activity near the timing of political elections, harnessing the exogeneity of election timing in certain contexts to isolate the effects of policy uncertainty. But given our own analysis in the previous section, that suggested that uncertainty in the U.S. clearly peaks around elections, the linkages between these two literatures are worth

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4 See footnote 7 on page 16 of Gulen and Ion (2013).
exploring. The election-based approach may indeed fail to analyze variation in policy uncertainty during the expansive lengths of time that separate elections in many countries. But economists have for decades recognized the pervasiveness of endogeneity issues when it comes to the study of uncertainty (e.g., Rodrik 1990). The recent tact in the literature towards constructing indices of policy uncertainty, though novel and laudable, does not seem to overcome this long-standing methodological constraint. Elections may hold a good deal of promise, as, in the U.S. at least, their dates are exogenous.

The literature that analyzes the impacts of policy uncertainty through the proxy of political elections, for its part, remains an active area of scholarship. Kelly, Lubos, and Pastor (2014) find that the prices of equity options that straddle the dates of either national elections or global economic summits tend to be more expensive, consistent with the notion that insurance against price drops and variance increases becomes more valuable as political uncertainty increases. Though the study of policy risk from equity options pricing dates back to the study of the 1987 British election in Gemmill (1992), the bulk of the literature between then and now focuses on realized fluctuations in the price of the underlying equities rather than the volatility implied by the pricing of options on those equities.

The picture that emerges from the literature on national equity markets is one in which elections unambiguously increase both the volatility and the level of returns. Pantzalis, Stangeland, and Turtle (2000) analyze a sample of thirty-three countries and find that the two-week period before an election engenders abnormal equity market returns. Bialkowski, Gottschalk, and Wisniewski (2008) find that national elections induce greater market volatility in their sample of 27 OECD countries. Li and Qi analyze US presidential elections from 1960 to 2000 and find, as do Pantzalis, Stangeland, and Turtle (2000) and Bialkowski, Gottschalk, and
Wisniewski (2008), that close elections generate more market volatility. These results are consistent with the notion in Pastor and Veronesi (2013) and Brogaard and Detzel (2015) that investors demand a risk premium for the political risk posed by election outcomes. But even if one tables the argument that there is a distinct risk premium that arises from risks idiosyncratic to policy uncertainty rather than through policy uncertainty’s second-order effects on economic variables, a simple CAPM model suggests that expected returns should be higher before elections given Pastor and Veronesi’s (2013) finding that elections tend to elevate correlations between securities (e.g., “market beta” in a CAPM framework). Nevertheless, for all this discussion of investors reaping higher returns as compensation for holding a nation’s public equity assets near the time of a national election, Bialkowski, Gottschalk, and Wisniewski (2008) find that a strategy of investing all of one’s capital in a nation’s stock market shortly before it has a national election generates an excess return of only 33 basis points.\footnote{That said, the simulated results of any event-based international equity trading strategy are likely very sensitive to the simulation’s specifications (e.g., timing, leverage, extent of reinvestment of returns, foreign currency hedges or fluctuations, etc.). There does not seem to be any reason for the results reported in Bialkowski, Gottschalk, and Wisniewski (2008) to be an exception to this rule.}

Another rich corner of the literature analyzes variation across American states rather than nation-states. Gao and Qi (2012) find that municipal bonds issued by state governments immediately before a gubernatorial election pay a premium of 6 to 8 basis points due to this electoral proximity. Jens (2013) estimates the investment-suppressing effect of a gubernatorial election on the state-level investment during the quarter of the election at between 5% and 15% depending on the subsample, with the closeness of an election exacerbating the decline. Kim, Pantazalis, and Park (2012) find that alignment between the partisan affiliation of a state’s leading politicians and the partisan affiliation of the incumbent U.S. President generates excess returns on both a raw and risk-adjusted basis for firms domiciled in that state. However, their
own finding that the level of legislative activity of an elected representative (e.g., a local Congressman introducing a lot of bills) has the effect of significantly increasing the returns to political alignment seems to belie their own interpretation of this result as the result of a reduction in “policy risk” rather than an increase in the capture of political spoils. Nevertheless, under the assumption of basic risk-aversion, these findings of Kim, Pantazalis, and Park (2012) seem to rationalize the results of Gao and Qi (2012) and Jens (2013): regardless of the mechanism, if state elections outcomes have economic consequences for firms, public securities markets and firm expenditures both should reflect the risk of an adverse election outcome.

Though perspectives differ on how exactly it matters, the literature on the topic suggests that there is some form of a “presidential election cycle” in the US stock market. Belo, Gala, and Li (2013) devise a novel method of measuring an industry’s exposure to fluctuations in government spending through BEA data and find that firms with more (less) exposure to government programs significantly outperform under Democratic (Republican) presidencies. Booth and Booth (2003) find that equity market returns are higher in the last two years of a presidential term even when controlling for partisan control and economic conditions. They find, however, that the equities of small businesses outperform under Democratic regimes and that fixed income securities outperform under Republican regimes. Santa-Clara and Vlakov (2003), by contrast, find that the US stock markets outperform under Democratic regimes relative to Republican regimes—and that this outperformance increases when controlling for business cycle variables. They interpret this result as evidence that Democratic regimes generate higher equity market returns through the generation of “positive surprises” for the market rather than through
any influence on economic conditions more generally.\textsuperscript{6} Though related to one particular election rather than election cycles in general, Auerbach and Hassett (2006) analyze the effects of variation in the probability of a permanent extension of the 2003 dividend tax cut on firm capital structure by matching the political futures market pricing of a Republican versus Democratic win in the 2004 Presidential election with equity and options market data. And they find evidence that expectations of the election outcome had significant economic effects.

Evidence from cross-national and firm-level investment decisions should remove any doubt that the economic consequences of election cycles extend beyond the pricing of financial assets to “real” decisions. Julio and Yook (2013) find that cross-border flows of foreign direct investment, but not cross-border portfolio flows, remain sensitive to the timing of elections. Given the greater difficulty of reversing FDI relative to portfolio flows, this result seems consistent with the notion that irreversibility mediates the investment-suppressing effects of economic policy uncertainty. Julio and Yook (2012) examine domestic investment expenditures and again find lower levels of investment in election years, though the magnitude of the investment reduction remains greater than in the case of FDI than in the case of domestic investment. In a result that appears to comport with the notion that political uncertainty’s effects are not mediated through any second-order effects in conventional economic channels, Durnev (2010) finds investment by US firms during election years to be less sensitive to stock prices.

A recent strand of literature attempts to clarify the precise source of uncertainty through the development of formal models calibrated to match stylized facts. Ulrich (2013) finds that the

\textsuperscript{6} It may be worth noting that they Santa-Clara and Vlakov (2003) are referring to the excess return of the US stock market: its raw performance above the three-month U.S. Treasury bill rate (in their specification). They decompose the 9% excess return of Democrats relative to Republicans into the component attributable to real equity returns and the component attributable to the real U.S. Treasury bill rate. Under Democratic regimes, they find that real equity returns are 5% higher and U.S. Treasury bill rates are 4% lower, thus generating an excess return increase of 9%.
US Treasury yield curve contains information about the level of Knightian uncertainty surrounding the macroeconomic effects of policies chosen by elected governments. Given the well-known effects of expected government debt issuance on Treasury yields through supply-side channels (e.g., Laubach 2009), however, the exclusion of possible issuance-based effects on the yield curve in the model of Ulrich (2013) may be a cause for skepticism about the evidence from the U.S. Treasury yield curve that Ulrich (2013) offers as empirical support for the model. According to Croce, Nguyen, and Schmid’s (2012) model of endogenous growth with model uncertainty, short-term countercyclical policies can have a depressing effect on innovation and long-term growth when agents don’t know the “true” future distribution of possible fiscal scenario. Calibrated to match several properties of the U.S. macroeconomic experience in the 20th century, the model may inspire fruitful future research about the precise mechanisms through which countercyclical “stabilization” policies may in fact increase uncertainty about economic policy over longer-term horizons.

V. Looking Ahead

The attempts of the Ulrich (2013) and Croce, Nguyen, and Schmid (2012) models to specify the nature and source of the uncertainty is one that the literature on policy uncertainty would do well to follow. Dating back at least to John Maynard Keynes’s *General Theory* of 1936, criticisms of the economic literature on the grounds that it fails to appreciate the distinction between uncertainty and risk seem germane to the modern literature.7 In perhaps the most

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7 The most directly relevant passage in *The General Theory* (from Chapter XII, section II): “The state of long-term expectation, upon which our decisions are based, does not solely depend, therefore, on the most probable forecast we can make. It also depends on the confidence with which we make this forecast—on how highly we rate the likelihood of our best forecast turning out quite wrong. If we expect large changes but are very uncertain as to what
thorough modern treatment of the topic, Hansen (2014) formally demonstrates that many of the “puzzles” that the literature asset-pricing literature tends to rationalize through models of time-varying risk-aversion may in fact be explicable in terms of aversion to ambiguity about which model best describes the world, an ambiguity that arises from uncertainty, rather than in terms of risk-aversion. As intimated in Bloom (2014) vis-à-vis his invocation of Knight’s (1921) distinction between the mere risk of a coin flip from the uncertainty of, say, an attempt to guess how many coins mankind would ever produce, this distinction dates back to economic books of genesis.

From the perspective of this long-established distinction between uncertainty and risk, in general the literature on the “uncertainty” posed by elections appears problematic. Much of the literature reviewed suggests that election results influence the distribution of returns among the various individual securities that constitute the aggregate national stock market. And this seems to hold true even outside of the contexts that are the typical focus of studies reviewed here: even the election of Adolf Hitler generated abnormal returns for certain firms in interwar Germany (Ferguson and Voth 2008). If a significant fraction of investors are risk-averse, have constraints that prevent them from simply buying every stock in the national market (e.g., they have a client mandate to invest in individual securities), and face either home-bias or constraints against international diversification (e.g., they have a client mandate to invest in domestic securities), then they should require additional compensation in exchange for holding a security during a time period in which an imperfectly forecastable binary outcome alters the distribution of future returns from its status quo. Thus, the literature that posits the existence of some form of an

precise form these changes will take, then our confidence will be weak… The state of confidence, as they term it, is a matter to which practical men always pay the closest and most anxious attention. But economists have not analysed it carefully and have been content, as a rule, to discuss it in general terms.”
“uncertainty risk premium” may be rationalized by the literature that finds that election outcomes alter the distribution of returns within the stock market, whether that be due to government consumption effects (Belo, Gala, and Li 2013) or state-federal “political alignment” effects (Kim, Pantazalis, and Park 2012). If this is so, then the effect oft-attributed to “uncertainty” created by the presence of the election may at least in part be explicable as a market response simply to the existence of an additional draw from Keynes’s urn in the form of an election, rather than to variation in the uncertainty of the outcome of a draw from Keynes’s urn (such variation could, for example, entail moving from Keynes’s first urn of known proportions of black and white marbles to Keynes’s second urn, where he does not tell you the ratio of white to black marbles). In other words, economic agents treating elections as merely an additional coin flip, an activity that Bloom (2014) notes that Knight (1921) cited as an example of an activity that does not involve uncertainty, seems able to explain at least some fraction results attributed to “uncertainty” in the literature based on political elections.

Nevertheless, the evidence presented by this literature does lend credence to the notion that uncertainty, as distinct from risk, plays at least some role in generating some form of the “uncertainty risk premium” now in vogue. The key observation is that polling and election futures markets in some sense at least allow one to measure the probability of one side winning in a given election. Li and Born (2006), Bialkowski, Gottschalk, and Wisniewski (2008), Jens (2013), and Julio and Yook (2013) all find that closer elections exacerbate the magnitude of the suppressing-effect of an impending election on economic activity. Bialkowski, Gottschalk, and Wisniewski (2008) also associate a lack of compulsory voting laws with heightened pre-election stock market volatility. A closer election gives greater reason to doubt the modal election forecast, and the variation in voter turnout stymied by mandatory voting is known to render polls
less-reliable as forecasts of election outcomes. These results therefore suggest that variation in
the confidence with which one can forecast an election outcome—the uncertainty of the
outcome—can have an effect on economic activity that is distinct from any effect arising from
the mere existence of another coin flip that alters the distribution of securities returns in an
aggregate national stock market. To articulate a theoretical motivation for this search of stylized
facts, researchers could elaborate on the mathematical models of uncertainty introduced in
Hansen (2014), perhaps even synthesizing them with more-familiar models of risk-aversion in
order to develop a rigorous framework for the empirical differentiation of risk from uncertainty.
On the flipside, given the general difficulty of empirically differentiating the effects of risk-
aversion from those of uncertainty noted in Hansen (2014), the combination of the constancy of
the “coin flip component” of political elections and cross-election variation in their genuine
uncertainty suggests that political elections could offer fertile ground for empirical attempts to
differentiate the footprint of uncertainty from that of risk.

Though empirically disentangling the effects of risk from uncertainty remains a tall-
order, the literature to date suggests several avenues of research that could be promising. The
Kelly, Lubos, and Pastor (2014) study of options markets disentangles price risk, variance risk
(the risk of an increase in return variance), and tail risk (the risk of a very large price decrease).
Studies of options markets (e.g., Liu, Pan, and Wang 2005) relate “uncertainty-aversion” to the
pricing of the same component of the options surface that corresponds to tail risk. Kelly, Lubos,
and Pastor (2014) have cross-national but not panel data on election uncertainty, data based on

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8 For instance, this is known to be the case in Israel, where turnout is very volatile. Before Israel’s recent “upset”
election, many commentators noted that even the modal forecasts of election outcomes from polls are much more
uncertain than polls in many other countries in part because of this. Underscoring this, The Atlantic entitled its
the most recent poll before an election. A fruitful future study could combine panel data on poll spreads or political futures with panel data on how the pricing of stocks and stock options unfolds in the months before an election. For instance, by observing the covariance of the pricing of tail risk and realized equity market volatility as poll spreads evolve, one could begin to try to understand whether the “uncertainty risk premium” that seems to appear before elections is driven purely by the increase in realized volatility that even a basic CAPM model would suggest should yield higher expected returns, or whether its existence is attributable at least in part to variations in the pricing of the tail risk that can be used to proxy for uncertainty according to Liu, Pan, and Wang (2005).

Another fruitful direction for research suggests itself based on the models of Ulrich (2013) and Croce, Nguyen, and Schmid (2012). Both focus on the uncertainty about the macroeconomic effects of policy choices made by politicians already elected. Put in the context of the literature on election outcomes, this suggests that a two-stage model wherein the first stage captures the uncertainty about the election winner and the second stage captures uncertainty about the policies chosen by the election winner could synthesize these two sub-literatures. The many empirical approaches in the literature on election cycles offer an abundance of suggestions for how to approach the empirical aspect of the first stage of such a model. As for the empirics of the second-stage, a variation of the Ulrich (2013) methodology of extracting information on demand-side effects of US government policy from US Treasury yield curves, perhaps modified to also include the effects that government policies have on the yield curve due to their influence on the supply of Treasury securities, serves as possible reference point.

Lastly, the literature on “real” investment activity finds that investment falls near elections, but does not devote as much attention to whether or not later increases in investment
offset this investment decrease. Answering this question seems like a necessary precondition to answering the broader question of whether elections are welfare-enhancing or welfare-decreasing from an economic perspective. If investment decreases near elections and economic actors do not compensate by correspondingly increasing investment in future time periods, then this suggests that elections may be welfare-decreasing. Alternatively, if increases in investment in subsequent time periods equal or exceed the value of the decreases in investment associated with a national election, then elections may not necessarily reduce economic welfare over longer time horizons.

Clearly, the literature on the economics of uncertainty has evolved in many different directions since the 1990s. While many questions remain, the fact that the most pressing research questions are so precisely focused is perhaps the best metric of progress.
References


