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# Cultural Penetration and Punctuated Policy Change: Explaining the Evolution of U.S. Energy Policy

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**Abstract**

Punctuated equilibrium theory (PET) suggests that the policy process is characterized by long periods of incremental change and short periods of punctuated change. The impetus for the latter is usually a focusing event that breaks open policy monopolies, allowing for major changes in legislative decision-making. While a burgeoning body of literature, a shortcoming in the PET literature is that it has yet to explain why focusing events and subsequent breakdowns in policy monopolies sometimes fail to result in punctuated policy. We integrate theories on cultural change with punctuated equilibrium to explain why focusing events do not always result in the dramatic policy changes that we might expect. Specifically, we use the context of national energy policy and the lexical database, Google Ngram Viewer, to trace punctuating energy-related events and the occurrence or lack thereof subsequent policy change from 1952 to 2000.

**Keywords: e**nergy policy, punctuated equilibrium theory, Ngram

## Introduction

Punctuated equilibrium theory (PET) suggests that the policy process is characterized by long periods of incremental change and short periods of punctuated change. The impetus for the latter is usually a focusing event that breaks open policy monopolies, allowing for major changes in policymaking. While a burgeoning body of literature, a shortcoming in the PET literature is that it has yet to explain why focusing events and subsequent breakdowns in policy monopolies sometimes fail to result in punctuated policy. We integrate theories on cultural change with punctuated equilibrium to explain why focusing events and breaks in policy monopolies do not result in the dramatic policy changes that we might expect. We find that focusing events –events that shock a given policy system by pushing issues from the smaller policy subsystem venue to the macro-political environment- result in punctuated policy changes when they achieve culture penetration. Specifically, we use the context of national comprehensive energy policy and the lexical database, Ngram Viewer, to trace the relationship between punctuating energy-related events and the occurrence or lack thereof subsequent energy policy change.

## Literature Review

### Punctuated Equilibrium Theory

PET theorizes that policymaking is characterized by two distinct periods – stasis (incrementalism) and dramatic change (punctuated change) (Baumgartner and Jones, 1993) – and has two distinct venues – the policy subsystem and the macro-political environment (Redford, 1969). During periods of stasis, policymaking is monopolized by a narrow group of political actors who maintain control over – and benefit from – decisions in a given policy subsystem. As such, policymaking is incremental so as not to depart from the way that it has benefitted those that have monopolized the subsystem.

In contrast, periods of dramatic change are theorized to be the result of power breakdowns in these policy subsystems, which shift policymaking from the subsystem to the macro-political environment. PET suggests that this shift may be the result of a focusing event in the policy area of a given subsystem. Attention and scrutiny of those external to the subsystem causes policymaking to shift from the subsystem to the macro-political environment. Once in the macro-political environment, new interests are mobilized to challenge the status quo policymaking of the subsystem. This mobilization breaks down existing subsystem monopolies, enabling more dramatic changes in policymaking. (Baumgartner and Jones, 1993; Cashore and Howlett, 2007).

For example, we might point to the focusing event of 9/11 and the manner in which it shifted terrorism from the policy subsystem to the macro-political environment. The result was the creation of the Department of Homeland Security (Jochim and May, 2010) and other significant legislation. Similarly, Baumgartner and Jones (2014) highlight the manner in which major urban disorders caused crime policy to shift from the subsystem to macro-political system. The result was punctuated policymaking in the form of the Omnibus Crime Control and Safe Street Act (1968) and a doubling in federal spending over the next four years (Baumgartner and Jones, 2014).

Although PET has been applied to a number of policy areas, a key gap in the PET literature is explaining why successful challenges to policy monopolies do not lead to punctuated policy changes. For example, Givel (2006) shows that, even with the glut of information on the dangers of smoking, the massive mobilization of health advocates and the rise of tobacco control legislation during the 1990s, the tobacco industry successfully resisted numerous regulatory threats and kept state tobacco taxes low. Similarly, Perl and Dunn (2007) trace the evolution of Corporate Average Fuel Economy (CAFÉ) standards around the world. They show that, after major increases in CAFÉ standards, which were the result of power shifts in the interest groups controlling the policy subsystem, policymaking halted dramatically in 1985. In both cases, successful challenges to the policy subsystem ushered in by focusing events caused changes in policy monopolies. Yet, these changes to policy monopolies failed to lead to punctuated policymaking. In other words, the literature has failed to distinguish between punctuating and non-punctuating events.

Some scholars suggest that this gap in the literature can be filled by theoretically and empirically testing the role that culture and social movements play in explaining which events result in punctuating policymaking. For example, Kenny (2003) contends that, to understand the changing of norms and agendas that shape policymaking, we must integrate social movements into our theories. Similarly, John (2003) suggests that we should pay more attention to the focusing events that shape policy in order to determine when the punctuation actually begins (489). We take inspiration from the aforementioned criticisms by using the construct of cultural penetration to explain why some focusing events lead to punctuated policymaking and some do not. The next section begins with an explanation of the constructs of culture and cultural penetration and presents a framework for understanding the role that they play in PET.

## Theoretical Framework

### Cultural Penetration

While culture can be defined in a number of different ways (Kroeber and Kluckholm, 1952; Jahoda, 1984), a key component in defining the construct of culture is that it is separate from the community in which is it embedded. “A community is not merely a social entity whose members are bound by a web of crisscrossing affective bonds, but also one in which members share a set of core values,” in which “values are handed down from generation to generation, via socialization, and in this sense are traditional” (Etzioni, 2000, p191). The interactions to which Etzioni (2000) is

referring reinforce a give community's culture by demonstrating its prevalent belief systems, norms and values. So long as these belief systems, norms and values are demonstrated through the behaviors of society members, the society's culture is relatively stable.[i]

However, when focusing events occur and societal norms and values change, the culture experiences disruptions. This is to say that culture is a construct that captures the predominant patterns of values and norms within a given space and time (March and Olsen, 1989; Hall, 1993). It is not static because norms and values, which are shaped by societal events such as urban riots in the 1960s (Baumgartner and Jones, 2014) and 9/11 (May, Workman and Jones, 2008), may begin to change. In other words, patterns of norms and values compete for predominance in a given culture. Norms and values that successfully infiltrate (and alter) a community's culture have achieved cultural penetration.

Cultural Penetration as a Mechanism for Punctuated Policymaking

Cultural penetration can be one mechanism for policy change. Events in the political or economic environment that achieve cultural penetration lead to punctuated policymaking; events that do not have a cultural impact should not lead to punctuation.

Stasis, in this context, is a period of incremental policymaking. During stasis, there is a stable cultural norm controlled by the dominant political coalition in a given policy subsystem. This coalition can be made up of multiple groups that subscribe to the same policy core beliefs (Jenkins-Smith, et al. 2014) that help form policy images. Policy images, as expressions of empirical information and emotive appeals, are manifestations of the cultural norms (Baumgartner and Jones, 1993). By subscribing to these policy images, advocacy coalitions reinforce these norms. Furthermore, policy images are signals from the political environment to policymakers. When there is no conflict between cultural norms related to a policy issue, there is a singular policy image. Successful policy monopolies remain in control by maintaining this singular policy image. As the cultural norms remain in place so do the singular policy image and the policy monopolies.

Periods of punctuated policymaking, often begin with a focusing event or series of events that draw attention to problems with the dominant policy image and norms in a policy subsystem (Zahariadis, 2007). When conflicting norms emerge, there are competing policy images (Kingdon, 1995). This often occurs when the secondary beliefs of the dominant political coalition begin to diverge. This divergence results in conflicting norms, which then lead to the competing policy images. As new cultural norms are taking hold, more actors are able to become involved in the policy issue and the dominant coalition loses control.The inclusion of these new actors results in policies getting pushed to the macro political stage (Mortensen, 2009). Once on the macro political stage, policymakers respond during an open policy window to the new cultural norms that have become pervasive (Kingdon, 1995).

Thus, to expand the work of Baumgartner and Jones (1993), the mobilization of interests and changing policy image are not necessarily the mark of punctuations, the subsequent cultural change is the mark with the mobilization of interest groups and changing policy image serving as a manifestation of cultural change. As problems, politics, and policies are not completely independent of each other, there is an interaction in which focusing events alter political coalitions, which then spur cultural changes leading to new policy images (Zahariadis, 2007). Following periods of punctuations, new cultural norms are established and a new period of stasis is entered. The new cultural norms emerge from the conflict between the asymmetries in cultural change. As cultural conflict begins to dissipate, cultural norms begin to align and form a new policy image.

The mobilization of political actors is one essential signal of cultural change in the dynamics of punctuations, but there are two instances that do not entirely conform. First, interest group mobilizations may occur without cultural changes. As previous studies have shown, interests can attempt to punctuate equilibrium without success (Cashore and Howlett, 2007; Givel, 2008; Givel, 2010; Perl and Dunn, 2007). Interest mobilizations are the result of innovative individuals attempting to represent the unorganized or change their behavior to adapt to a changing political environment (Truman, 1951; Berry, 1977; Richardson, 2000). It is possible for these innovative individuals to misunderstand the environmental signals and begin to mobilize. As a result of bounded rationality, individuals can only consider limited amounts of information (Simon, 1957, 1997). If the limited information afforded a particular interest is not widespread, it will behave inconsistently with the cultural norms. Since there is no widespread cultural change occurring, the resultant policy change does not correspond to the interest mobilization.[ii]

Second, policy change may result without the mobilization of new actors. Dominant policy coalitions, which act as policy monopolies, can adapt to their environment by altering their belief structures through policy learning (Sabatier and Weible, 2007). In other words, policy monopolies can make policy changes in response to environmental changes without the introduction of new actors to the policy subsystem. This may occur with technical areas that are 'policies without publics' (May, 1991). As cultural changes occur policy monopolies can adapt and formulate new policies in order to stave off new actor mobilizations and maintain power. In both cases, cultural changes are at the root of policy changes. If cultural changes occur, punctuations happen. Interest mobilizations are signals which may or may not occur during the process, though. In sum, the cultural impact of events marks the difference between punctuating and non-punctuating events. In the following section, we illustrate our methodological approach to identifying cultural penetration.

## Methodological Approach

The case study focuses on three variable categories as related to U.S. energy policymaking from 1952 to 2000: (1) the historical events of the energy markets, (2) policy and institutional changes affecting energy policy, and (3) cultural penetration of energy constructs. The time period was chosen as it includes the full service of nine presidents over 48 years, which provides robust data for analysis. Specifically, 1953 was chosen as the beginning of the first new post-World War II administration, and 2000 was for the purposes relative to the Google Ngram Viewer databases. Additionally, the time period from 1953 to 2000 marks a natural modern period in history (Mayhew, 2005).

A three-part methodology was employed to appropriately position the case study. First, a historical narrative was used to synthesize the major events of the energy markets, affecting U.S. energy security. Scholarly sources on the major events were used to obtain the relative information. The historical analysis focused on political turbulence in major oil producing regions and the transformation of petroleum prices as potential punctuating events.

Second, policy and institutional changes affecting energy policy were identified to create a timeline of energy policymaking. The policy and institutional changes were limited to those policy or institutional changes which govern a comprehensive energy policy for the nation directed at long-term energy planning as identified in the 'Energy Timeline' available online from the Department of Energy (Department of Energy, 2011). The 'Energy Timeline' outlines the major events in the history of Energy from 1939 to 2009. Each item in the timeline between the inauguration of President Dwight D. Eisenhower and the end of the Clinton administration was reviewed and those items that created a reform in the comprehensive energy policy of the United States were identified. Between January 20, 1953 and December 31, 1999, 11 items were identified as affecting the governance of the comprehensive, long-term energy policy and planning.

We define energy policy as comprehensive national energy planning. As such, any policy should have broad impacts on U.S. energy and connect to an over-arching national energy strategy. Policies that may affect energy policy but are for a tangential purposes or of a limited focus do not fit within this definition. For example, the Obama Administration's use of regulatory actions under the Clean Air Act have impacted energy policy, but those are not part of a wider energy policy strategy or serve as a part of the wider national energy strategy. Alternatively, a policy to regulate nuclear safety would be too limited in scope to fit this definition as well. Of course, national energy planning can be steered from either presidential initiative (e.g., Nixon's Project Independence) or Congressional lawmaking (e.g., National Energy Acts of 1978). As policy can be made in both venues, they have equal propensity to be affected by punctuating events, and in many cases, policymaking is a result of both presidential initiatives and Congressional lawmaking.

Third, the ongoing Google Books Project has currently amassed more than 15 million books that are estimated to represent approximately 12 percent of all books published since the introduction of the printing press (Bohannon, 2010; Michel et al., 2011). This effort has resulted in a series of data sources that allow analysis of the written culture of the world in a manner previously thought impractical or impossible. This study utilizes a derivative of the Google Books Project, termed the Ngram Viewer. It is considered the largest cultural database in existence with over five million books and over five hundred billion words. The database originators, Jean-Baptiste Michel and Erez Lieberman Aiden, have coined the term 'culturomics' to describe this major advance in our ability to quantify written culture (*Culturomics*, n.d.).

The Ngram Databases in this research enables a dynamic analysis of key energy concepts as they appear in written culture over several decades and then relate these two periods of energy policy formation. Ngrams are words or series of words that appear in literature (a 1-gram is a single word; a bigram, a 2-word sequence; a trigram, a 3-word sequence; etc…). For our analysis, Ngrams associated with written energy culture were analyzed. After testing a wide variety of potential bigrams related to energy concepts and ideas with the potential to have a broad cultural impact, the 26 most popular, consistently used terms were selected. After further exploratory data analysis and consideration, it was determined these 26 terms represented three distinct domains, and were separated accordingly for analysis.[iii] Alternative forms of the 26 terms, as grams, bigrams, and trigrams (e.g., gasoline, domestic energy policy), were tested to confirm reliability of the selected terms and the three domains. Those tests indicate a consistent pattern suggesting the terms and domains utilized in the analysis are reflective of the larger energy related concepts being measured.

In Table 1, the 26 energy terms are organized into three domains: Domestic Energy Policy, International Energy Policy, and Energy Technology. These terms tend to be inclusive of energy markets in terms of distribution, demand, and production. For comparative purposes, we limited the use of terms to bigrams. The American English Ngram Database was then utilized to calculate the annual cultural presence or frequency of each term. Frequencies were summed for the items in each domain to calculate an annual composite measure of the domains presence in American written culture. These calculations were carried out each year for the period from 1900 through 2000; the entire 20th century was included to provide an overview to base magnitude of change. While other methodologies for cultural measurement are available, the resulting data allow us to quantify and graphically depict significant patterns of energy culture change in the United States over several decades.

[TABLE 1 ABOUT HERE]

The raw Ngram data is interesting, but relies on visual analysis and simple description to draw conclusions. Joinpoint regression was, therefore, employed to provide a more substantive analysis of trends. Joinpoint regression works similar to ordinary least squares (OLS) regression; however, rather than fit a single line to the data, multiple lines are fitted to indicate statistically significant changes in trends over time. Joinpoint assumes linearity in data, but only for segments of the data. Based on this approach, linear segments are fitted to the data and connected at joinpoints. The joinpoints then indicate notable points of change in trends. This method is most commonly used in the epidemiology, but is applicable here for its ability to identify changes in trends (La Torre, 2010). In this case, the joinpoint results indicate the year a change in trends occurs, and the slope of each trend. From these results, it is easy to identify the eras and directional strength of cultural penetration.

The next step in our analysis was to overlay information about the development and formation of energy policy with the patterns of Domestic Energy Policy, International Energy Policy, and Energy Technology in written culture. It is our contention that PET provides the theoretical framework and conceptual tools that enable us to understand the relationship between punctuating events, energy culture, and policy formation that underlie our data patterns.

## Results

### Historical Events of Energy Markets

The post-World War II period was a tumultuous time in energy. During this period there were crises of supply in the form of both dearth and glut, dramatic spikes in the price of oil, and socio-political conflicts in the Middle East (the most important petroleum producing region in the world). Both market fluctuations and the socio-political conflicts that lead to them represent a traumatic event in the energy markets, with drastic implications for the usage of energy worldwide. With this typology of market fluctuations in mind, the energy timeline from 1952 to 2000 can be characterized by six events: 1) the Suez Canal Crises; 2) the 1967 Arab Oil Embargo; 3) the 1973 Energy Crisis; 4) the 1979 Energy Crisis; 5) the oil glut of the 1980's; and 6) the Gulf War. Figure 1 shows the timeline of energy crises from 1952 to 2000 (for more detail on these events see Yergin, 1992; for an alternative perspective see Klare, 2001, 2004). Figure 2 shows the average annual domestic oil price from 1952 to 2000. These events involved a similar set of circumstances across time, and all carry the same innate potential to be a punctuating event.

[FIGURE 1 ABOUT HERE]

The Suez Canal had been of strategic importance for the transportation of goods from Middle Eastern and Asian ports since its completion in 1869; the alternative route involved circumnavigating the African continent. In 1956, Gamal Abdel Nasser chose to exercise his legal authority to nationalize the Suez Canal, following a period of growing tensions with Britain and France. In response, Britain and France allied themselves with Israel to invade Egypt and retake the canal, leading Nasser to order ships sunk to close off the canal, halting its use for shipping (Kunz, 1991; Yergin, 1992; Klare, 2004). The crisis was severe enough for the Eisenhower administration to encourage U.S. oil companies to coordinate efforts to guarantee oil supply to both the U.S. and its European allies under an anti-trust waiver (Nash, 1968). However, prices were not overwhelmingly impact by the events (British Petroleum, 2011). The Suez Canal Crisis was a major crisis for the West with scarcity of supply threatening the United States, and its major allies.

[FIGURE 2 ABOUT HERE]

On June 5, 1967, Israel launched a surprise attack on Egyptian forces, following a period of high tensions, wining decisive victories against Egyptian, Syrian, and Jordanian forces (Yergin, 1992; Oren, 2002). Following the surprise Israeli attack, oil ministers from the Arab oil producing countries voted unanimously to embargo oil shipments to any nations participating in or supporting military action against any Arab nation. However, the pragmatism of many oil ministers led to lax enforcement. The world oil market did not see a dearth of supply, but rather Western nations had to make logistical modifications to overcome the oil embargo, which included routing oil tankers through third countries or tampering with shipping manifests (Yergin, 1992). As a result of world oil supply stability, there were no price shocks (British Petroleum, 2011). However, the 1967 oil embargo was a major challenge to the paradigm of oil relations between the Western and Arab worlds, for this was the first time in history that Arab nations were refusing to supply petroleum to the U.S (Yergin, 1992).

The events of the 1973 Oil Crisis were similar to those of the 1967 Oil Crisis. In October 1973, a combined Egyptian-Syrian force launched an attack on Israeli territory making major gains in the first four days. In response, oil ministers of the Organization of Arab Petroleum Exporting Countries agreed to an embargo of oil to nations who provided Israel with military assistance as well as incremental cuts in oil production over time until their economic and political goals were met (Yergin, 1992; Klare, 2001, 2004; Rabinovich, 2004). The embargo and production cuts continued until March 1974 (Yergin, 1992; Klare, 2004). Due to a nearly 25% cut in Arab oil production, prices nearly quadrupled from October 1973 to March 1974, marking the largest price spike in history as well as setting a new record oil price for the 20$^{th}$ century. By the end of 1974, oil prices had reached a plateau at their new height, remaining fairly stable until 1979 (British Petroleum, 2011).

Before the world was fully recovered from the aftermath of the 1973 Oil Crisis, further instability in the Middle East would lead to a second crisis in less than a decade. The 1979 Oil Crisis began with the Iranian revolution, and the suspension of Iranian oil production for a short time, followed by a period of inconsistency (Yergin, 1992; Klare, 2004). The result was a nearly 50% jump in the price of oil, setting a new record for oil in the 20$^{th}$ century (British Petroleum, 2011). The beginning of the Iran-Iraq war led to continued declines in Arab oil production (Yergin, 1992). The record set in 1980 for price of oil would stand until July 2009 (British Petroleum, 2011). The 1973 and 1979 oil crises combined made the 1970's into a very tumultuous decade. However, both events can be characterized by political instability in the Middle East leading to a crisis of supply, and price shocks leading to new records.

The energy crises of the 1970s resulted in two phenomena for the 1980s: high oil prices led to a reduced demand on petroleum and Non-OPEC nations were able to become the highest producers, as OPEC nations cut production. The result of these two circumstances was the world oil market was flooded with crude oil creating a glut and collapse in price (Yergin, 1992; Barsky, 2004). Between 1980 and 1986, the price of oil decreased by nearly 70%. Though prices never returned to their pre-1973 level, the price in 1986 was the lowest in more than a decade and was only 25% higher than the 1973 level (British Petroleum, 2011). OPEC efforts to stabilize prices and speculation by traders led to a price spike in 1987 (Yergin, 1992; Barsky, 2004). This would be the largest price spike in almost a decade, though it was short lived (British Petroleum, 2011). The 1980's was in many ways the contrarian decade to the 1970's, as it can be characterized by price extremes, price spikes, and crises of supply. The 1980's carried as much potential for punctuations as the 1970's did with the events of the oil market.

Finally, on August 2, 1990, Iraq launched an aggressive attack against its neighbor, Kuwait. The goal of the attack was to gain control of the rich Kuwaiti oil fields, as well as the economic goods located in Kuwaiti city. The U.S. launched Operation Desert Shield deploying troops to the region in response, with a request to other nations to form a coalition against Iraqi aggression. In January 1991, Operation Desert Storm began with aerial bombing meant to repel Iraqi forces from Kuwait. The conflict officially ended on February 28, 1991 following the withdrawal of Iraqi troops from Kuwait (Klare, 2001, 2004; Finlan, 2003). As a result of halted production of Kuwaiti oil and trader speculation, oil prices experienced a spike of nearly 24% (Barsky, 2004; British Petroleum, 2011). Oil prices were at their highest since 1985 during and immediately after the conflict (British Petroleum, 2011).

Energy Policy and Institutional Changes

Between 1952 and 2000, there were several developments in comprehensive energy policy. Figure 3 shows the timeline of policy and institutional changes from 1952 to 2000. From 1952 to 1972, there is essentially no comprehensive energy legislation, policy, or institutional changes at the federal level of government. While there are developments in civilian nuclear energy policy and administration, this only represents an isolated part of the U.S. energy mixture and does not constitute comprehensive energy planning. Nuclear energy had the lowest production of any major source until 1975 when it overtook wood and 1977 when it overtook hydroelectric, but still remains a distant fourth behind petroleum, coal, and natural gas. Additionally, there were new environmental policy based reforms that affected energy usage, but these were primarily focused on environmental protection and not energy. Policy and institutional changes do not begin to occur until mid-1973. Through three administrations (Eisenhower, Kennedy, and Johnson) there was essentially no comprehensive energy policy or planning.

[FIGURE 3 ABOUT HERE]

The first major changes in U.S. energy policy occurred in a relatively rapid fashion. The first institutional change directed at developing a comprehensive policy does not occur until June 1973, with the founding of the Energy Policy Office by President Richard Nixon. Less than five months later, in November 1973, Nixon announced Project Independence, with the goal of coordinating U.S. resources to achieve self-sufficient energy production free of foreign oil. The next month, Nixon replaces the Energy Policy Office with the Federal Energy Office, taking on more responsibility and authority. The following May with the signing of the Federal Administration Act, the Federal Energy Office was replaced with the Federal Energy Administration moving the responsibility for comprehensive energy planning out of the White House and into the federal bureaucracy. As they are typically treated as nothing more than a footnote, the institutional changes and policy directions during the Nixon Administration have little qualitative importance in the history of energy policy, with the exception of establishing the first comprehensive plans and institutional oversight.

During his short administration, President Gerald R. Ford managed to sign to major pieces of energy legislation, furthering the Nixon era policies of energy security and independence. The first was the Energy Reorganization Act, signed in October 1974, split the functions of the Atomic Energy Commission into several entities, as well as formed the precursor to the Department of Energy, the Energy Research and Development Administration. The second was the Energy Policy and Conservation Act, signed in December 1975, which established the Strategic Petroleum Reserve and extended oil price controls in an effort to better secure U.S. energy reserves.

The Carter Administration was faced with a daunting task of continuing to mitigate the circumstances of the last energy crisis in 1973, and then managing the next energy crisis in 1979. President Jimmy Carter's first major change in policy direction was his National Energy Plan announced in a national speech in April 1977. Carter's speech became famous for referring to the energy crisis as the 'moral equivalent of war' and setting out 10 principles for U.S. energy policy. In August 1977, Carter took the first major step in his National Energy Plan by establishing the Department of Energy when he signed the Department of Energy Organization Act. The most significant energy legislation of the 1970's came in 1978 with the National Energy Acts. The National Energy Acts consisted of five acts that established new policies for public utilities regulation, energy taxes, conservation, power plant fuel use, and natural gas. The final instance of energy policy for the Carter Administration was the Energy Security Act of 1980, signed in June. The Energy Security Acts consisted of six acts focused on diversifying the U.S. energy mix by encouraging the development of renewable energy production in the U.S.

After the signing of the Energy Security Acts in 1980, the U.S. did not adopt a new energy policy program until 1992. However, it should be noted as part of the Reagan revolution many of the programs started by the Nixon, Ford, and Carter administrations were significantly scaled back or terminated (Perl, 2009). Nevertheless, the changes by the Reagan administration were part of a much larger strategy of policy and administrative changes, including deregulation and devolution (Durant, 1992; Van Horn, 1996; Troy, 2005). Therefore, these changes may be resultant of a separate set of phenomenon as the rest of energy policy changes in this timeline.

President George H.W. Bush signed the Energy Policy Act of 1992 in October. The Energy Policy Act of 1992 addressed energy efficiency, energy conservation, energy management, and renewable energy. The general tone of the Energy Policy Act was to facilitate a more diversified energy source mixture for the U.S. The Energy Policy Act of 1992 was the last energy policy alteration until the George W. Bush administration.

Evolution of Culture Penetration for Energy

While measuring and interpreting culture and cultural change is a difficult and intensive task, the Ngram data provides the ability to quantify a previously un-quantifiable concept and allows for a markedly sophisticated analysis of change over time. Additionally, the joinpoint regression results indicate the specific years and slopes of changing trends over time. There are five notable trends occurring in the data: 1) similar trajectories of change and stability across all three constructs; 2) almost non-existent cultural penetration in energy policy and technology prior to 1972; 3) a lack of change surrounding events in the energy timeline prior to 1972; 4) a distinctive, unequalled increase in cultural penetration from 1972 to 1981; and 5) a sudden decrease in cultural penetration after 1981. Figure 4 shows the trend for the domestic energy policy construct; Figure 5, the international energy policy construct; Figure 6, the energy technology construct.

[FIGURES 4, 5, and 6 ABOUT HERE]

First, all three constructs (domestic energy policy, international energy policy, and energy technology) maintain a markedly similar pattern of stasis and change over the 20th century. The policy constructs follow almost the exact same trajectory until 1972. The exception is for energy technology, which sees a slightly elevated slope in 1938; this is most likely a consequence of nuclear energy research. However, 1972 proves to be the choke point for change in all three constructs with a dramatic increase. Second, prior to 1972, cultural penetration in energy policy and technology is at a minimum. The period from 1900 to 1972 represents the lowest level of cultural penetration in energy over the entire 20th century. The cultural penetration for the policy constructs is essentially at a bare minimum. While penetration in energy technology is higher than that for the energy policy constructs, it is still markedly lower than in subsequent years.

Third, prior to 1972, events in the energy timeline had no substantive effect on cultural. The exception, again, is for the energy technology construct, but this was affected by technological innovation, not politics. For the policy constructs, events in 1956 and 1967 have no registered effects based on the joinpoint results. Fourth, after 1972, there is an unequivocal increase in cultural penetration in all three constructs. After 1972, there is a distinctive increase until 1981 (1980 for domestic policy), when a stable decline begins. However, in the international policy construct there is an additional change in slope in 1975, but the slope remains positive until 1981. Fifth, after 1981, there is a stable decrease in cultural penetration. All three cultural constructs show a drop after 1981 (1980 for domestic policy). This marks the end of the punctuating period.

Finally, sometime in the mid-1980s, a residual trend appears with the decline in cultural penetration flattening out. This is apparent in the domestic energy policy and energy technology constructs, but not in the international energy policy construct. For domestic energy policy, this occurs in 1986; for energy technology, in 1989. This is likely a result of the impact of the price collapse and political difficulty in the Middle East. However, it is clear the trends after the punctuating period are much different than before.

## Discussion

What is the distinction between punctuating and non-punctuating events? From 1952 to 2000, there were six major events with punctuating potential based on the crises of supply and price, each presenting new challenges to government, business, and the public. Of the events two (the Suez Canal Crisis and the 1967 Arab Oil Embargo)

occurred before 1972 and one (the 1980's oil glut and the Gulf War) occurred after 1981. Prior to 1972, there are no significant new policies adopted for comprehensive energy planning or governance. After 1981, only the Energy Policy Act of 1992 is adopted. However, the period of 1972 to 1981, experienced two oil crises and saw the adoption of nine different policy and/or institutional changes for energy governance in the United States. The three periods (1952 to 1971, 1972 to 1980, and 1981 to 2000) can be differentiated by the clear cultural penetration in energy at the time. From 1952 to 1971, there is only minimal cultural penetration for energy policy, international or domestic, or energy technology; the Suez Canal Crisis and the 1967 Arab Oil Crisis only had marginal impacts. From 1972 to 1980, there is a substantial increase in cultural penetration of energy policy and technology. Finally, from 1981 to 2000, there is a steady decline in cultural penetration, except for a notable change the late 1980's. Based on these findings, it is clear that energy policy adoption occurs in connection to increased cultural penetration, not events; not to say events do not influence cultural, though.

As cultural penetration of energy increases, the likelihood for policy adoption increases as well. In 1956 and 1967, the Suez Canal Crisis and Arab Oil Embargo had substantial impacts on energy markets but only had minimal cultural impacts; thus, policy was not adopted. The same is true of the 1980's oil glut. However, in 1973 and 1979, the oil crises had major cultural impacts; thus, new policy was adopted. The connection between culture and new policy is apparently no better than in June 1973. In June 1973, Nixon founded the Energy Policy Office in his White House nearly three months prior to the beginning of the oil embargo. Punctuating events can be distinguished from non-punctuating events based on their cultural impact; events with high cultural impact will cause punctuations, while events with low cultural impacts will not.

Finally, in the post-1981 period cultural penetration follows a different trend than in the pre-1972 period. Additionally, there is a divergence between the constructs in trends after 1981, suggesting energy policy has become more sophisticated in creating differing policy subsystems. After 1981, less important events resulted in a change in trends in the different constructs, because the underlining conflict in policy images was already present. For the Energy Policy Act of 1992, the already heightened conflict for energy policy images resulted in an event with less impact triggering action from the policy subsystem. The conflict of the 1970's resulted in heterogeneity of policy images, allowing for a divergence of policy subsystems and substantive potential of events. Similar action would likely not have developed from a similar event prior to 1972 due to the homogenous policy images present at that time. On the other hand, by 1992, the heterogeneity of policy images allowed for a relatively minor event to result in policy change. Thus, a higher level of sustained cultural penetration allows a less significant punctuating event to lead to policy change. The inverse is, of course, the lower level of sustained cultural penetration requires a more impactful punctuating event to lead to policy change. This is an interesting finding, but requires much more discussion than can be devoted to it here.

We want to point out that cultural penetration is one means through which policy frames can occur. Policy images may be imposed by powerful actors on less organized and/or less powerful populations (Prewitt and Stone, 1973). Alternatively, there may be two coalitions with competing policy images that remain over time. In these cases, we can see significant policy change where and continued unrest and competition in the policy venue. For example, there are competing policy images of climate change in American society (Whitmarsh, 2011). Yet, the Obama Administration engaged in significant policymaking to mitigate climate change. In both of the aforementioned cases, there is no cultural penetration but rather another stimulus prompts change. Another causal scenario might be that when policymaking occurs during a punctuation period it might be reinforcing the cultural penetration that was caused by the focusing event. In other words, the cultural penetration caused by the focusing event is furthered and it becomes difficult to strictly separate the source of the cultural penetration.

## Conclusions

The findings have notable implications for PET, U.S. energy policymaking, and methodology in public policy research. First, the introduction of culture and cultural impact as explanatory variables for policy changes addresses one of the most common criticisms of PET. Future research should attempt to apply PET to other units of analysis such as local governments and to policy areas to which it has previously not been applied to fully test the limits of its foundations and this attempt at expansion. The implications and mechanisms by which culture is translated into policy should be further explored within this framework as well. Additionally, previous findings using PET should be reassessed with the introduction of culture in an attempt to reconsider the explanatory power of PET and to test the validity of the findings here.

Second, U.S. energy policymaking appears to be defined by the instability in cultural penetration of energy and in energy markets. Energy policy is consistently made during times of crisis, and only appears to be aimed at mitigating the current crisis, rather than anticipating or preempting the next. A continuation of this approach is likely to result in energy policy being defined by the current conditions of the energy markets. Favorable market conditions will likely result in a lack of interest, while unfavorable market conditions will likely result in a significant increase. While the analysis only looks at 36 years of data, any casual observer of current trends or amateur historian can confirm that this pattern has been pervasive since the beginning of the commercial oil industry. Future research should continue to look at the reactive nature of energy policymaking with an eye towards mitigating the current circumstance. Furthermore, research should try to better understand the relationship between culture and energy. Energy policymaking may not be a simply technical pursuit, and should be considered in other lights. Additionally, we have defined energy policy at the federal level as executive or congressional policy action aimed specifically at the United States' over-arching national energy strategy. As such, it may be useful to broaden the definition and level of government at which this theory is tested.

Third, there are conceptual and analytic challenges with the construct of cultural penetration. Namely, important, punctuating events have a fuzzy conceptual definition. Rather, we rely on our analysis to show us which events are important based on whether they lead to cultural penetration. This is conceptually problematic because events are determined to be important after the fact. Thus, it will become important to more closely examine the idea of cultural penetration and develop a more solid conceptual definition, which is determined by our analysis. Finally, Ngram is a powerful tool for social science research. Like all new research tools and technology, it should be given its fair share of scrutiny, but should not be discounted or overlooked. Ngram is limited in its ability to comprehensively capture the construct of energy policy nor can it qualitatively tell the difference between important and less important energy events. Nonetheless, the ability to quantify culture opens up new avenues for analysis and inquiry. Without Ngram, the chart used to show the cultural changes for energy would have required page after page of qualitative research from a plethora of sources to obtain the same results. This new tool should be taken seriously as a means to create new knowledge and reconsider old ideas. Future research should utilize Ngram as a new and powerful tool for analysis, as well as expand its methodological rigor.

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**Table 1. Energy Terms**

| Domestic Energy Policy | International Energy Policy | Energy Technology |
|---|---|---|
| o Energy Policy | o Energy Crisis | o Solar Energy |
| o Energy Politics | o Energy Independence | o Wind Energy |
| o Energy Legislation | o Energy Security | o Nuclear Energy |
| o Energy Planning | o Energy Imports | o Alternative Fuel |
| o Energy Regulation | o Oil Imports | o Alternative Energy |
| o Energy Conservation | o Oil Prices | o Renewable Energy |
| o Gasoline Prices | o Arab Oil | o Energy Research |
| o Domestic Energy | o Energy Trade | o Energy Technology |
| | | o Energy Efficiency |
| | | o Fuel Economy |

**Figure 1. Timeline of Energy Crises, 1952 – 1989**

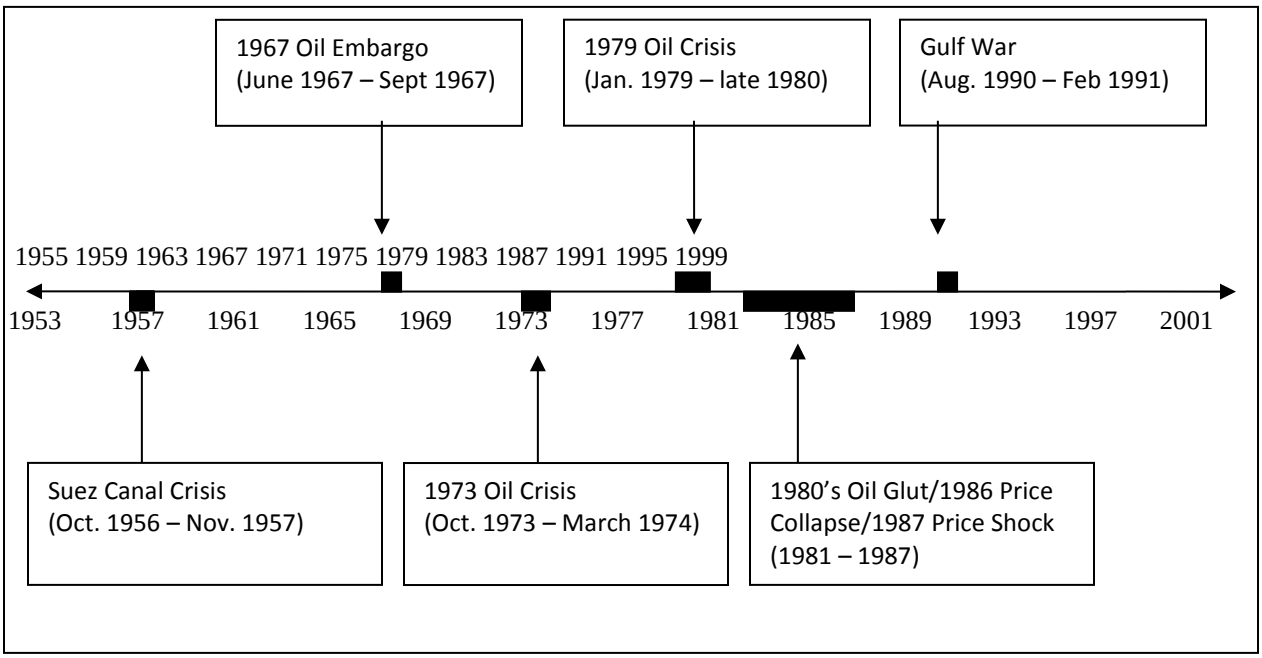
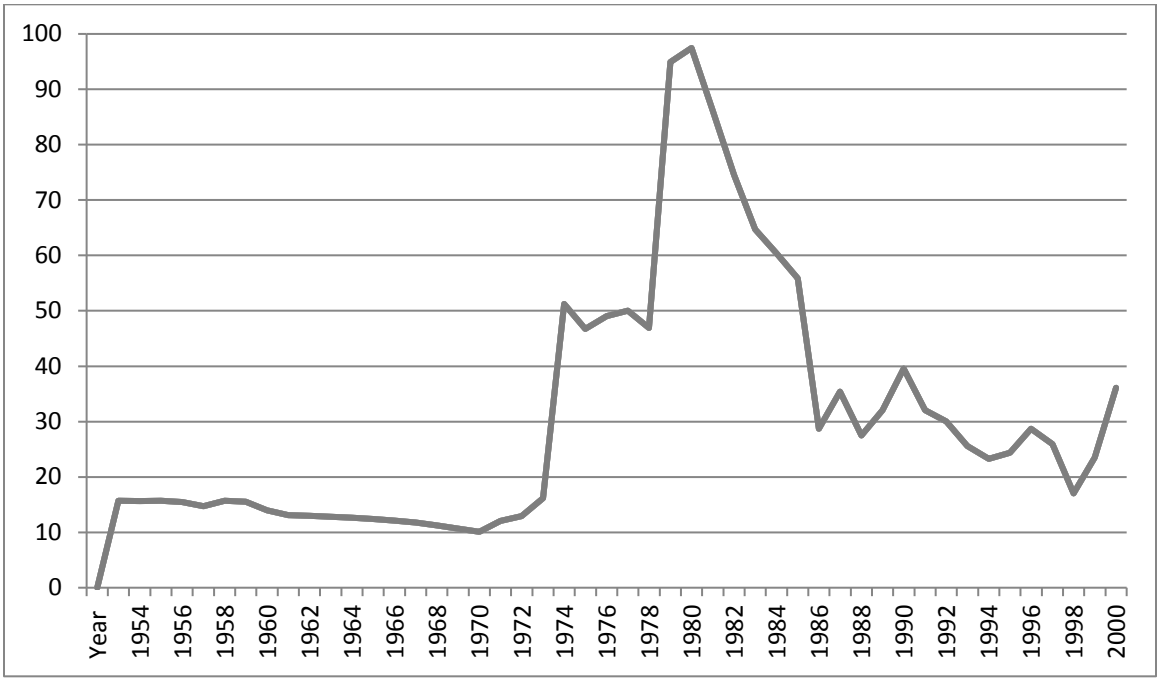


**Figure 2. Average Annual Domestic Oil Prices, 1952 – 2000**




Source: British Petroleum, "Statistical Review of World Energy," June 2011, available at www.bp.com/statisticalreview.

**Figure 3. Timeline of Energy Policy and Institutional Changes, 1952 – 1989**

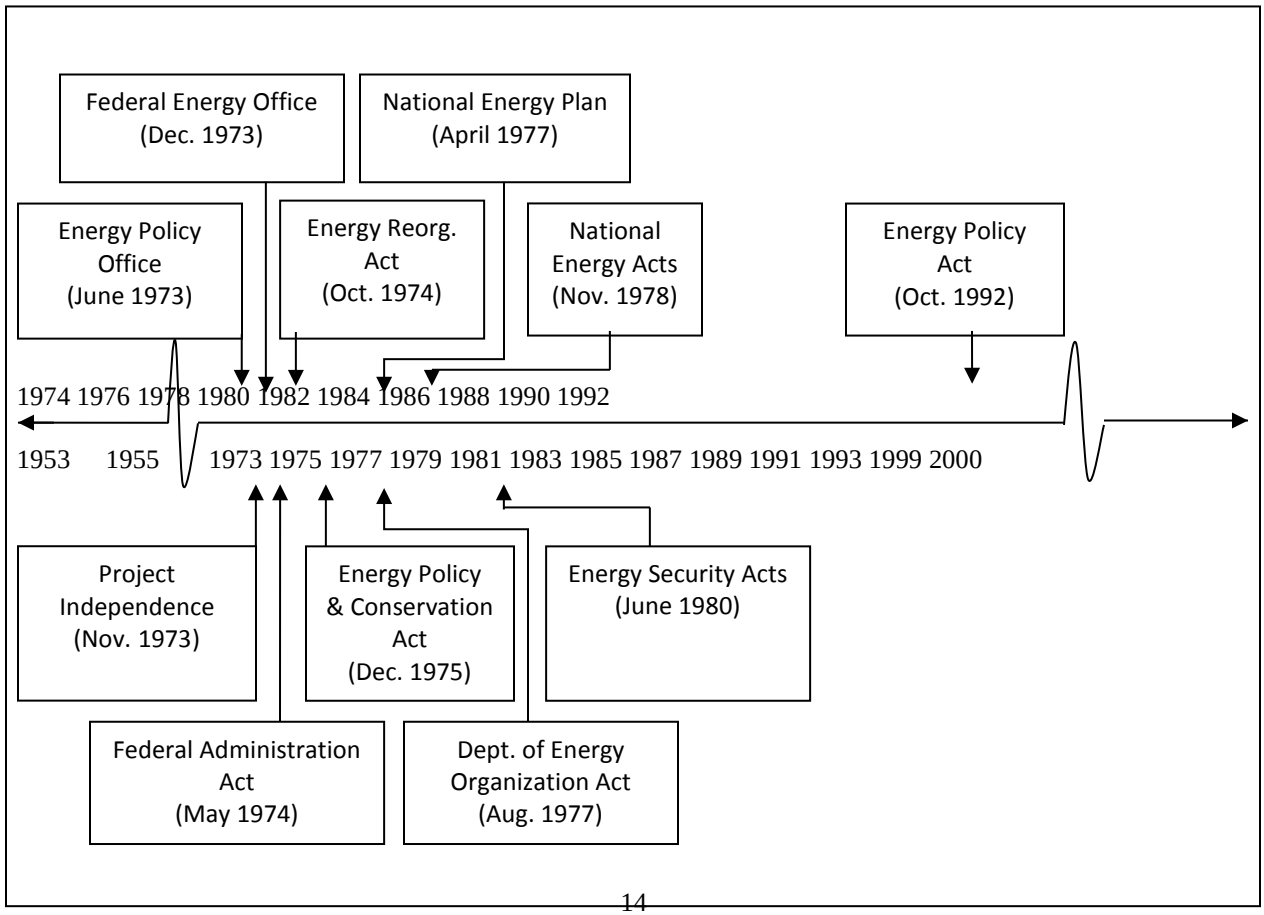


**Figure 4. Joinpoint Results for Ngram: Domestic Energy Policy Construct**

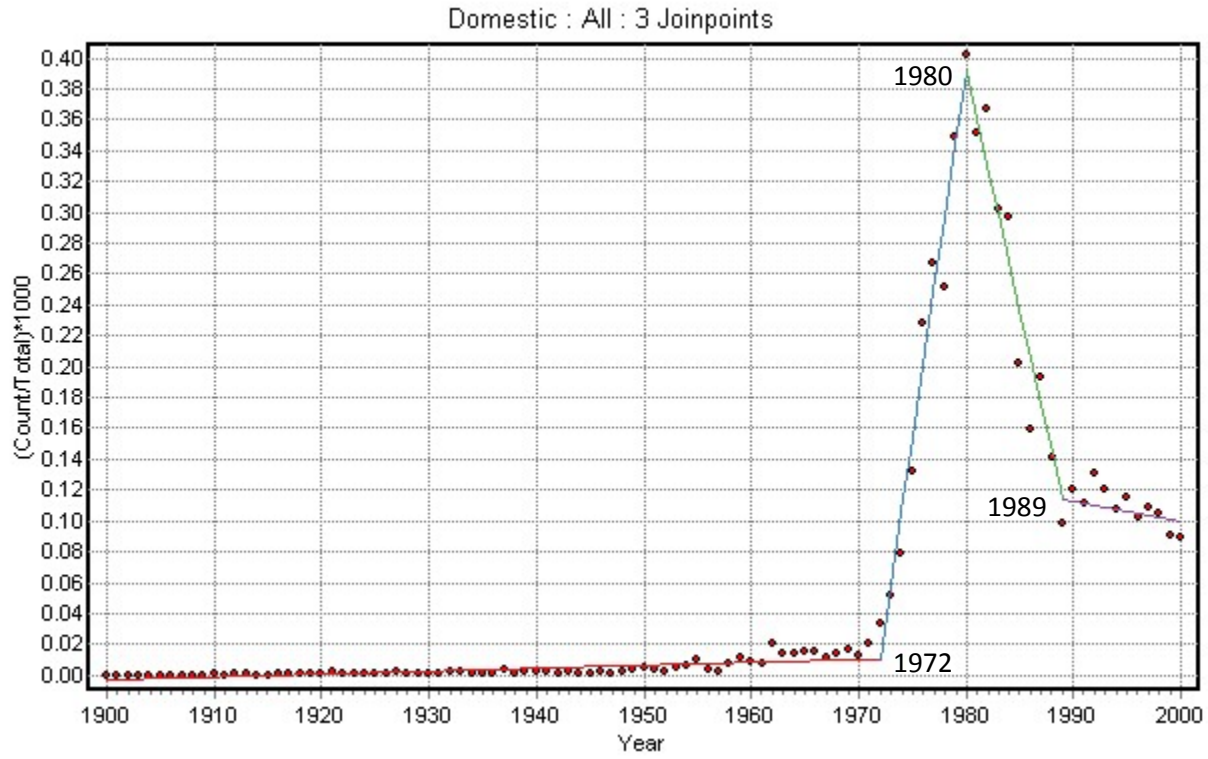



**Figure 5. Joinpoint Results for Ngram: International Energy Policy Construct**

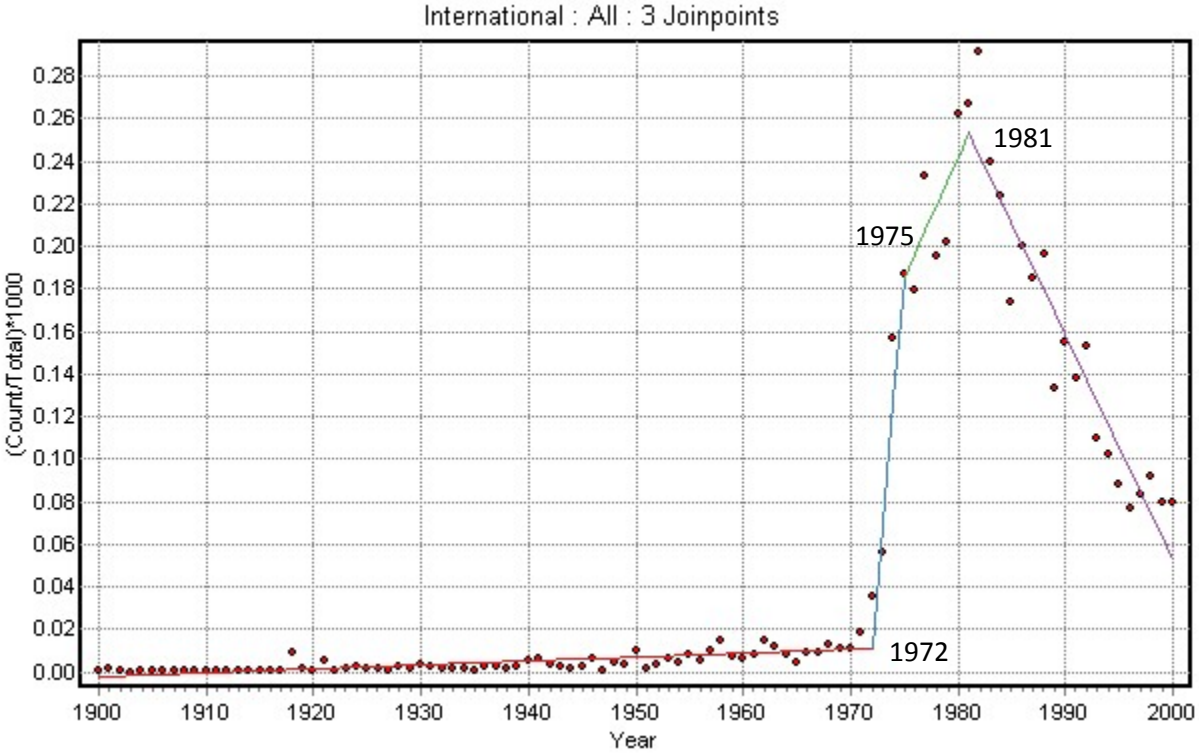
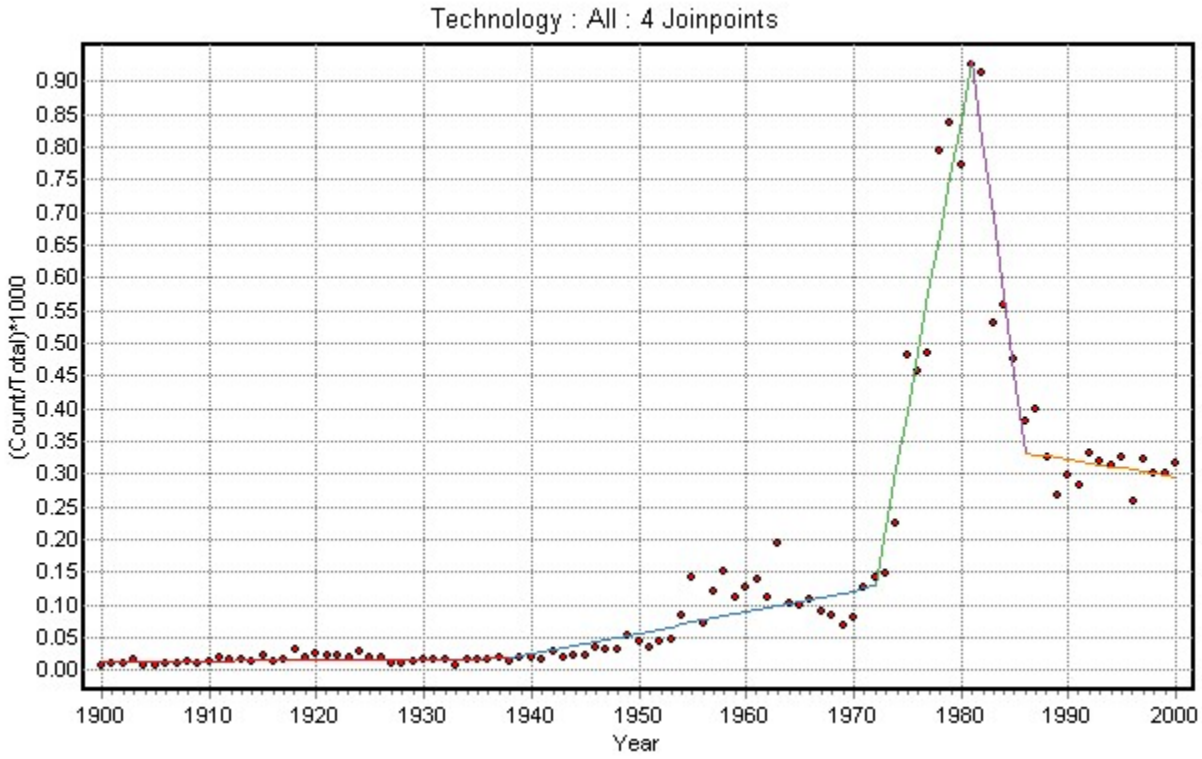


**Figure 6. Joinpoint Results for Ngram: Energy Technology Construct**




[i] We do want to highlight that culture does not form a coherent whole. Rather, culture can be viewed 'as normally being contradictory, loosely integrated, contested, mutable, and highly permeable' (Sewell, 1999, p. 53). In keeping with this rather abstract understanding of culture, the definition provided here is relatively abstract.

[ii] We intentionally chose te word widespread here as there is likely no information that is representative of an entire public's cultural norms.

[iii] The Ngram dataset essentially provides counts of the frequency of words across time and the level of frequency is an indication of the cultural prevalence of a given cultural component. While the frequency of a word or phrase does indicate prevalence it does not necessarily indicate endorsement or opposition to a particular issue or policy option.