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# From Nixon to Trump: Energy Policy in the Global Era

by

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**Abstract**

From 1970 to 2011 the United States underwent a 20% increase in trade as a percentage of GDP. International trade growth has complicated the accurate estimation of cumulative environmental effects while necessitating increased political entanglement. The current US-China trade war illustrates this complexity. Current trade talks include, but are not limited to 'decoupling' the two nations and the 'reshoring' of US manufacturing. If decoupling were to occur the United States would also be reshoring the energy demands and the ecological impacts of greater goods production. This paper evaluates this possible shift in terms of its impact on environmental and energy policy. It considers the causes for economic and political entanglement during this period, and the need for policy adjustments. To this end, this paper ultimately argues that the United States government ought to fund global multi-regional input-output (MRIO) studies in order to better inform environmental and energy policy.

**Acknowledgements**

I would like to thank Professor David Chan for his time and guidance throughout the preparation of this project. His patience has only been exceeded by that of Kira Farrell, who has unfailingly supported me during this time. I would also like to thank Professors Irene Herremans and David Ince, who have helped keep this project on track and relevant. Professor Herremans in particular was helpful in its conception as well as its very many permutations. Last, but not least, I'd like to thank George Marshal who has not shied from answering the most obscure economic questions and suppositions throughout the wiring of this paper.

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## Chapter 1 – Introduction to Project

### 1.1 Introduction – Project Summary

The ongoing trade war with China runs deeper than mere trade. Surface are concerns about currency manipulation, intellectual property theft, and other trade violations. However, in July of 2018, CIA agent Michael Collins reported that China is conducting a covert 'cold war' against the United States (Smith, 2018). Shortly after, vice president Mike Pence elaborated on this claim, saying that China has been using a whole of government effort to undermine the US through a host of economic and military maneuvers (Finnegan, 2018).

Trade never has been simple. From the smuggling of the silk worm to the opium wars to the 1973 oil embargo, trade is rarely a mere transaction between two willing partners—and politics is never far behind. The current trade war is no different and talk of cold war politics is fitting. Trade relations with China began with president Richard Nixon, and largely for political rather than economic reasons. China was to be brought in from the cold. Relations were established primarily to encourage peace. Trade was merely a means to an end—to halt Soviet territorial expansion and to keep China from erecting an iron curtain like that of the isolated USS.R. (The Richard Nixon Foundation, 2009). Though the current trade dispute will likely end in a mutually favorable agreement, it may end with political tension and a complete removal of

trade relations. Considering that the United States has been a fundamental asset during the rise of China, there would be a morbid irony if relations were to end with a new cold war.

The parallels between the opening of Chinese trade and its possible closing do not end with mere war rhetoric. Nixon opened relations while facing an energy crisis—he entered office knowing that the United States would likely not continue to be the world's largest oil producer. Facing the possibility of an energy dependent United States, he crafted a host of new environmental and energy policies which would encourage energy conservation domestically while securing foreign supply. These policies were meant to be temporary. Yet, they would come to define US trade and energy policy; and would ultimately lead to increased trade reliance with China. With the newfound energy independence of the United States a host of new policy options have reopened. Yet, their birth is threatened by the baggage of past failures.

The aim of this paper is at once grand and simple. It is grand in that it attempts to explain fifty years of energy policy and relate it to the present regime. It is simple in that it seeks to merely advocate that the present regime is lacking in its environmental aspirations, and to its own detriment. More specifically, that the present regime ought to pay more heed to consumption-based impacts of its economy on the environment. To this end, this paper evaluates the environmental, energy and security related impacts of increased import consumption by the United States. This is done in an effort to improve US energy policy. Specifically, the paper

scrutinizes the validity of reporting national energy consumption and carbon dioxide emission on the basis of production rather than consumption; and that increased trade has, and will likely continue to, acerbate the need for consumption-based accounting (CBA). The paper draws upon a multi-regional input/output (MIRO) analysis in order to illustrate the discrepancy between production versus consumption-based accounts of carbon emission and energy use. These considerations are made in order to argue that the United States should task itself with conducting its own MIRO studies[1].

In order to illustrate the need for consumption-based accounting, the body of the paper begins in Chapter 2 with a primer on US energy policy [section 2.1]. This is done to provide context for the reader concerning current issues in energy policy, to make the connection between domestic and international issues in energy policy and clearly define 'energy security'. The next sections are a historical review on the past fifty years of policy [sections 2.2 to 2.4]. These sections illustrate the question of 'why now'. Why is a review of energy policy now more relevant than ever? The short answer to this question is that the current administration approaches energy issues in a radically different way; a way enabled by a newfound increase in energy production.

The following chapter, Chapter 3, delves deeper into the consequences of these policies—their successes and failures—and how the current administration is adapting. Fundamentally, every

[1] Also referred to as footprint analysis for the purposes of this paper.

administration from Nixon until Trump has treated the US as unable to meet its own energy needs. With this assumption policy has revolved around conservation, securing foreign petroleum sources, and developing alternative (non-petroleum) energy sources. Thus, this leads to a discussion of the value of energy conservation, the fruits and failures of fifty years of conservation focused energy policy; and, finally the social and environmental spillover effects of such policy.

Next Chapter 4 begins with the paper's conclusion [section 4.1]. It illustrates the political and environmental benefits which could be gained from measuring environmental impacts on a consumption rather than production basis; and argues that this is particularly important if the 'reshoring' of manufacturing were to become prevalent. Lastly, this chapter ends with a section on the implications and limitations of this paper's assumptions and findings [section 4.2].

## 1.2 Methodology:

### 1.2.1 Interdisciplinary Approach:

This paper attempts to provide the reader with a historical context for which to understanding the present environmental and energy related policy decisions of United States government; and to provide policy recommendations appropriate for the current political environment. In order to meet these goals this paper requires an interdisciplinary approach. Fundamentally it is a policy paper. Specifically, it covers energy policy as well as its environmental impacts of such policy. As its scope covers the better part of fifty years its major component is historical. As it

attributes the motivations of policy adoption to energy fundamentals it also draws upon economic knowledge. Thus, this paper ought to be of interest to students of sustainability, political science, history, public policy and economics.

### 1.2.2 Literature Review:

This paper is primarily a large literature review. Its major influence is the book *Energy Efficiency: Building a Clean, Secure Economy* by James L. Sweeney, a fellow at the Hoover Institute. The book catalogues the drop in the energy-intensity of the United States economy and posits a scenario where the US could be consuming 80% more energy today (Sweeney, 2016). Sweeney marks 1973 as the pivotal year when energy conservation takes on a new role in the American mind. Prior to this point energy was simply one economic input among many. Spurred by the 1973 energy crisis it became the United States' fundamental economic bottleneck. Hence, due to economic (and political) pressures, the US was forced to economize on energy consumption.

Sweeney's book is interesting in that it flies in the face the dominant narrative of the US being the world's primary consumer culture. Indeed, though energy consumption shrank on a per dollar basis, it grew in gross terms. Further, Sweeney's timeline (from 1973 to 2016) is the period of 'Globalization'; a period where the US greatly increased its importation of goods. As the importation of goods is effectively the exportation of their factors of production and by-

products (e.g., CO2 emissions and energy consumption) the neglect of this consideration marks a fundamental problem in his estimates.

Luckily filling this gap isn't as difficult as it may seem. Various organizations track the environmental consequences of trade; colloquially referred to as the 'environmental footprints' of national economies. Such environmental footprints are derived using Global Multi-Regional Input-Output studies (MRIOs). The primary aim of these studies is to separate territorial[2] carbon dioxide emissions from consumption-based emissions. Though various databases record consumption-based emissions only the Eora database extends further back than 1995 (Kanemoto et al., 2014) (Kanemoto & Moran, Mapping the Carbon Footprint of Nations, 2016) Hence it was chosen and used to adjust Sweeney's estimates and give a better picture of how much total energy demand has dropped since 1973.

Though incomplete, Sweeney gives an excellent picture of the reduction of energy demand in the United States since 1973. The other half of energy policy concerns energy supply. Geopolitical analyst, Peter Zeihan's book *The Absent Superpower: The Shale Revolution and a World Without America* illustrates the political power afforded to the United States due to its increased energy supply (Zeihan, 2016). This book is the second major inspiration for this paper.

[2] 'Territorial' emissions are used synonymously with 'national' and 'production-based' for the purposes of this paper.

The United States has been on a quest for energy independence since the 1973 crisis. 'Energy independence' is a phrase with some ambiguity. However, in terms of net crude imports, current estimates place US dependence on foreign energy as roughly the same as they were in 1962—well before the crisis. Taken together, these two books illustrate how energy independence has only been possible though efforts to reduce energy demand while increasing domestic supply. They also provide excellent touchstones for evaluating the history of US energy policy.

### 1.2.3 Data Sources:

For verification purposes various databases have been utilized. For the sake of consistency and reliability, information from the various US agencies were used as much as possible. Agencies such as the US Environmental Protection Agency (US EPA), the US Energy Information Administration (EIA), the US Census Bureau (US CB) and the Bureau of Economic Analysis (US BEA). The only non-governmental databases used were the Eora Global MRIO database, stationed in Australia and the World Bank (WB). The Eora database is one of a few which track the environmental impacts of global consumption patterns. It disambiguates which economies are responsible for which environmental impacts. In simple terms it measures the footprints of each economy by calculating their impacts on a consumption as well as production basis.

### 1.2.4 Charts and Figures

Charts and figures were constructed from the sources above. One problem occurred when gathering data. This only concerns Figure 9. Figure 9 displays an estimate of the energy intensity of GDP both on a production and consumption basis. The consumption-based energy intensity portion of this chart had to be constructed from Eora carbon dioxide data. Though Eora conducts its own CBA concerning energy, their specific energy data had problems. To remedy this, it was necessary to construct an energy estimate based on CO2 data. This estimate was constructed by calculating the CO2 intensity per Btu (from EIA data) then multiplying that by Eora's CBA CO2 emissions estimate.

## Chapter 2 – From Nixon To Trump: A Brief History of US Energy Policy

### 2.1 Introduction to Chapter 2: Energy Policy Primer

Energy policy concerns the management of energy systems, but what exactly is an 'energy system'? When one imagines energy systems it is natural to start with the tangible. One tends to think in terms of domestic, civilian use. Thus, one may consider the fuel efficiency of our cars or the energy efficiency of our homes and offices. This is a good start as transportation, residential and commercial energy consumption constitute 40%[3] of US total primary energy consumption (US EIA, 2019).[4] If we expand our thinking slightly further, we may think of the next largest contributors to energy consumption—electricity production and the industrial sector[5]. Here, environmental considerations may come to the fore. We may think of the carbon intensity of our electrical production; of the make-up of our energy portfolios (i.e., what proportion of coal, nuclear natural gas or renewables, are used to make electricity). As this is already a great deal to consider, here is typically as far as most people go.

Indeed, most talk of energy policy revolves around increasing or reducing corporate average fuel efficiency (CAFE) standards, or how building codes may better ensure safer or better insulated homes. Within the home, policy makers may speak of informing consumers, via the

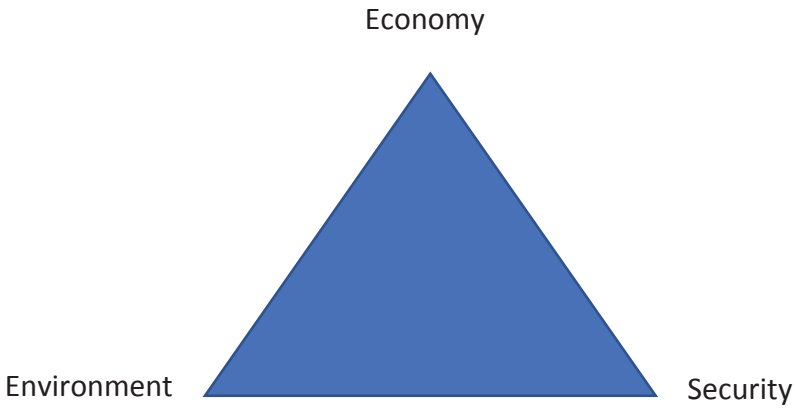
[3] Transportation—28.8%; Residential—6.2%; Commercial—4.5%
[4] 'Primary energy' accounts only for that energy which has not been transformed into another source before consumption. Thus, if coal was burned to crate electric energy, only the coal burned would be counted as 'primary', as the electrical product is a secondary form of energy.
[5] Electric power—38.1%; Industrial—22.4%

*Energy Star* program, of more energy efficient appliances. Outside the home, policy makers may consider the virtues or vices of living 'off the grid'; or if 'on', which regulations (or lack thereof) best serve the community. Finally, at the state or national level, policy makers may extol the virtues of decarbonization and advocate the need for a more diverse and clean energy portfolio.

Yet, energy systems extend beyond both state and national borders. Properly speaking there are no individual 'energy systems'. There are no discreet breaks between local, state, federal and international energy systems. Rather, there simply is 'the energy system'. It is a system not only affected by consumer choice and voting powers, but also by the politics of oil producing cartels, global demand, and the economics of global logistics. Expanded to its largest extent energy policy butts up against and overlaps with foreign policy. Further, the commodity nature of energy products coupled with easy transportation ensure global market forces reign supreme—and make political entanglement unavoidable.

Yet, for all its complexity, energy policy, since Nixon, has been reduced to a simple triangle (Sweeney, 2016). Each corner of the triangle corresponds to a major aspect of energy policy; while the general figure highlights their inextricable nature [Fig.1].

Figure 1: The Energy Policy Triangle




Source: (Sweeney, 2016)

The environmental leg of the triangle is likely most obvious to us. Energy use has and continues to be the primary driver of environmental degradation. Today environmental concerns tend to revolve around greenhouse gas emissions (GHGs); and, according to the EPA fossil fuel consumption accounts for 93.2% of US CO2 emissions (US EPA, 2019). Yet, even before our petroleum-based economy, whales were hunted to endangered status in pursuit of lamp oil. The turn of the 20th century saw the substitution of wale oil for 'rock oil' (what we call petroleum). Rock oil provided a vast improvement in availability, cost, and wildlife protection. Still, petroleum has led to its own problems such as acid rain smog and now, climate concerns. With this said, carbon emissions constitute the bulk of this paper's environmental considerations [section 3.2].

As for energy's economic role, cheap energy is synonymous with economic progress. Since the industrial revolution energy consumption has risen in tandem with living standards. Since the 1970s the US has moved from an industrial to a service-based economy. This period, sometimes referred to as 'globalization', has seen a gradual decoupling of economic growth and

energy consumption. Still, this does not imply some vanishing point where economic output will no longer be independent of energy inputs. Rather this just implies that the value added by US products has been greater while energy requirements per dollar of GDP have lessened. Less energy used invariably means less emissions produced. Impressively, territorial carbon emissions in the US have been slowly dropping even as population and energy use grow (US EPA, 2019). This has largely been due to progressively more energy-efficient technology coupled with more reliance on less carbon-intense fuel sources in electricity production. This paper focuses on the effectiveness of energy conservation policies in reducing energy demand [section 3.3].

The third leg of the policy triangle is security. Inasmuch as our world is driven by energy, securing the supply of energy is paramount both environmentally and economically. The link between energy security and the environment may be less obvious; but it is of fundamental importance. On the mundane level, an electricity outage may lead to spoiled produce. On the macro level, nuclear energy mismanagement or sabotage are cause for major environmental concern. As for the link between energy and security, anyone who has suffered a power-outage knows the accompanying feeling of vulnerability. To say our 'economy' depends on energy is just an abstract way of saying that our lifestyles, and even lives, depend on energy systems. In less dramatic terms, more minor energy disruptions have contributed heavily to recessions due to corresponding energy price increases. This paper focuses on the securement of foreign energy supply, periods of supply disruption, and the recent development of domestic supply [section 3.4].

## 2.2 1973-1991 - Energy Security in the Latter Cold War Era

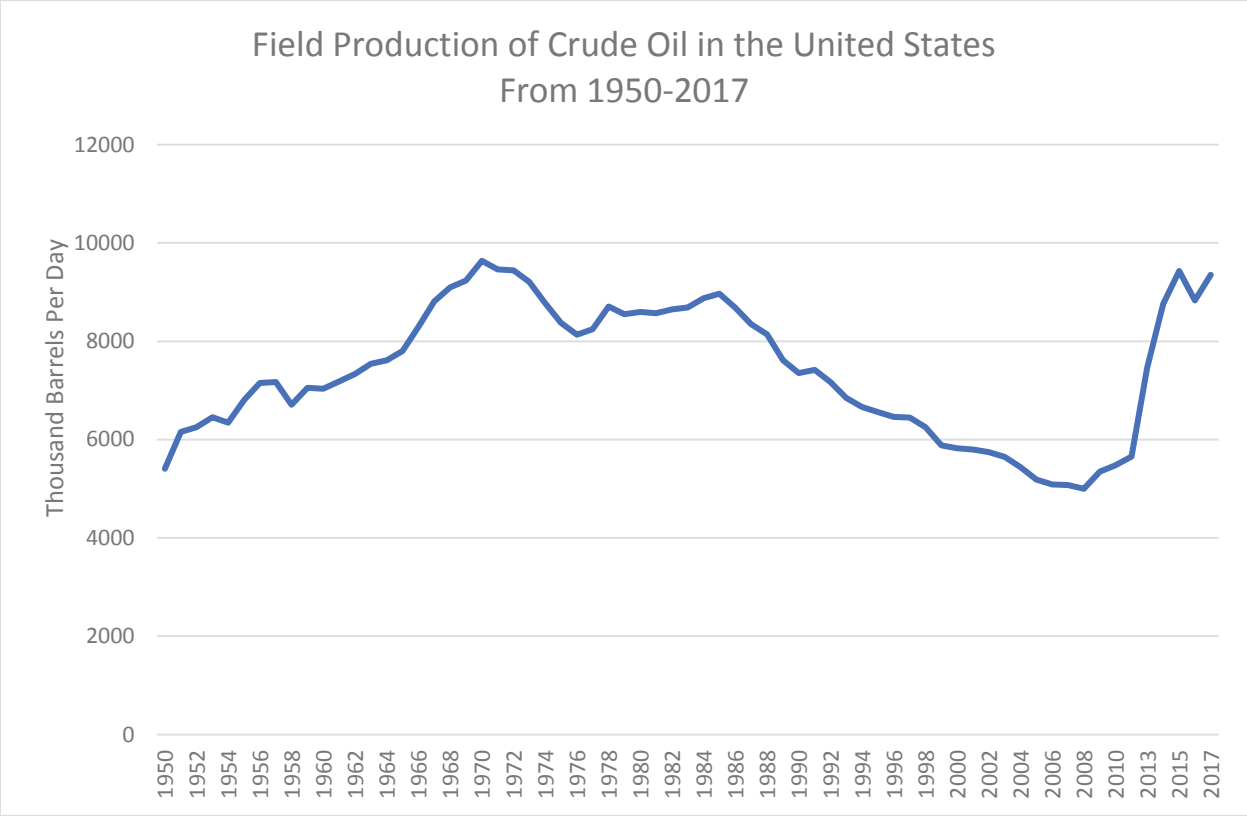
Energy is the engine of production and the animus of economies. It is the crux of modern power and the bane of ecological woes. Coupled with modern technology, energy is the true philosophers stone—virtually able to transform matter at will. Old wars of attrition revolved around fouling water and restricting lands. Today we can filter viruses from water and grow food in shipping containers. Attrition in modern warfare revolves around restricting energy. During the second world war, energy disruption was the dominant strategy on both sides. German U-boats sank Allied tankers while Allies prioritized bombing oil-bearing railways and crude refineries (Yergin, 1990). Though late to the war effort, the United States was responsible for a full two-thirds of global oil production (Yergin, 1990). In terms of energy, the entry of the United States spelled doom for the Axis. By war's end the US had contributed 6 of the 7 billion barrels of oil consumed by the Allied powers (Miller, 2019).

After the war the United States crude production grew to a peak in 1970. A peak not since surpassed though almost met in 2015 [

Figure 2]. Though still the world's largest producer in 1970 the amount of crude produced had fallen from two-thirds to only 13.5% of world production (Painter, 2014). Further, the USSR was quickly gaining on the US. The cold war was 'cold' in that it never broke out into open hostilities between the two major powers. Instead proxy, or vassal, states such as Vietnam and Korea hosted wars on their territories on behalf of the powers. Oil was, and still largely is, the life blood of war-engines. Thus, oil supply was of utmost importance during the cold war's

arms race. Just as in World War II whoever was able to secure the most oil was able to secure a tactical attrition-advantage.

Figure 2: Field Production of Crude Oil in the United States From 1950-2017




Source: Data from (The US Energy Information Administration, 2019b)

The cold war was 'cold' in that it never broke out into open hostilities between the two major powers. Instead proxy, or vassal, states such as Vietnam and Korea hosted wars on their territories on behalf of the powers. Oil was, and still largely is, the life blood of war-engines. Thus, oil supply was of utmost importance during the cold war's arms race. Just as in World War II, whoever was able to secure the most oil was able to secure a tactical attrition-

advantage. Naturally, this led to the procurement of oil a major policy priority for the United States.

Aside from the United States the NATO powers were oil-poor. This necessitated the sourcing of foreign oil from The Organization of the Petroleum Exporting Countries (OPEC). President Nixon, reading the writing on the wall, lifted the Mandatory Oil Import Quota Program (Cicchetti & Gillen, 1973). This was a protectionist program enacted in 1959 by president Eisenhower. Its aim was to ensure that the United States never became dependent on foreign oil. It did so by limiting the amount of oil imports to no more than 12.5% of domestic production. Nixon had good reason to remove this restriction. Energy was the heart of his cold war strategy. Not only to ensure battlefield supply, but to quell internal dissidents through the prosperity that cheap energy affords. Yet, this piece of legislation seemed to have been meeting its goals. After its removal, foreign oil quickly flowed to US markets.

In itself, the inflow of foreign oil was not a major issue. However, in 1973 the United States took the side of Israel during the Yom Kippur war. This enraged OPEC, sparking an oil embargo (Painter, 2014). The embargo quadrupled the cost of crude within a year. Though minor in terms of world history, this embargo marked the first chink in the armor in the post-war American superpower—a worrying prospect, amplified by the then looming threat of an oil-rich USSR.

In an effort to break up the communist bloc, Nixon sought to create a wedge between China and the Soviet Union. The ground work for this wedge was established well before he took office. A rift already existed between the Soviets and Mao since the death of Stalin in 1952. Mao had hoped to become the prime mover in the communist world and was frustrated by what he saw as a lack of respect from the new Soviet regime. In an effort to widen this rift and weaken the USS.R. Nixon sought to open trade relations with China (Painter, 2014). This was a bold new direction for US foreign policy. Though Nixon was staunchly anti-communist he still favored engagement over isolation; thus, his warming to China was considered something of a 'sleeping with the enemy' maneuver.

As for domestic policy, the embargo just so happened to coincide both with an unpopular, protracted war in Viet Nam as well as a growing environmental movement. The political landscape was ripe for military withdrawal as well as the introduction of environmental measures (Flippen, 2000). The president had already helped found the Environmental Protection Agency (EPA) in 1970, along with passing a plethora of other environmental protections. With the energy shock of 1973 he redoubled his conservation efforts, helping found the Energy Information Administration (EIA). He also introduced 'Project Independence'. This project put forth a host of policies with the goal of regaining US energy independence by 1980 (Yergin, 1990). Though Project Independence would not reach its goals this was not for lack of trying. Nixon advocated phase out of natural gas and oil in favor of coal, nuclear and solar energy and requested that Governors reduce speed limits and that gas stations close on Sunday in order to discourage superfluous travel.

With the exception of Regan (and now Trump), all subsequent presidents have trodden Nixon's path of energy conservation and stricter environmental controls. President Ford reintroduced protectionist policies on crude, banning the sale of domestic supplies internationally and over say the passing of the first CAFE standards in 1975. He also established the strategic energy reserve. A reservoir of crude which can be drawn upon in times of crisis—the reserve was designed as a hedge against sudden supply shortages. Though first filled in 1977, the reserve was not utilized to ease the energy crisis caused largely by the Iran-Iraq war. Instead it would be used during those recessions coinciding with Operation Desert Storm (1991) and Operation Iraqi Freedom (2005) (Lantero, 2015).

Regan marked a temporary reversal in domestic energy policy. Upon arrival at the White House his first executive order was to eliminate price controls on oil and natural gas (Steelman, 1986). This order may have been motivated purely by Regan's free-market ideology. However, it could not have been better timed, as by Regan's tenure the USS.R. had become a petrostate with an economy which was very valuable to oil price shocks (The Oil Drum, 2011). If sinking the price of oil was merely done out of a distaste for regulation, it was very coincidentally an intelligent geo-political move. According to some, the repercussions of Regan's energy deregulations had global consequences. Deregulation spurred production, which helped reduce global oil prices.

Though Regan's domestic energy policy no doubt played a role, upon further inspection, their

effects are overshadowed by events within the USS.R. and OPEC. The USS.R. was struggling to keep up its vast military spending. This while facing an energy crisis of its own. Though the USS.R. had become the world's largest oil producer, innovation in extraction technology did not keep pace with production. By the late 1980s the USS.R. was reaching the limits of economic oil production (The Oil Drum, 2011). Meanwhile the OPEC cartel was effectively broken up due to non-compliance from Saudi Arabia (Gately, Adelman, & Griffin, 1986). Though collapse cannot rightly be placed on one cause, cheap energy prices were clearly providing a therapeutic function for the Soviet system. Easily procured petroleum reserves helped the USS.R. rise to prominence by smoothing out the inefficiencies of its system (The Oil Drum, 2011).

The absence of OPEC to keep oil prices high, combined with increased production from the United States created an oil glut. A glut that played a pivotal role in the collapse of the Soviet Union and thus, the Communist bloc—effectively ending the cold war. Without the USS.R. international communism was both relegated to East Asia and devoid of nuclear weapons. Further, though China and Vietnam remained under communist governments they were rapidly liberalizing their markets (Autor, Dorn, & Hanson, 2016).

### 2.3 1991-2015 - Energy Security in the Post-Cold War Era

A funny thing happened in the wake of the Soviet collapse. That funny thing is that not much happened—at least in terms of energy policy. The cold war was over, yet, the drive for energy conservation hardly skipped a beat. Less than six months after the dissolution of the USS.R.

global conservation efforts were renewed during the Rio de Janeiro Earth Summit[6]. There, representatives of the first Bush regime pledged their support for an international effort to manage anthropogenic global warming (Wines, 1992); and a few months later the Energy Star program was born.

As for domestic energy production, the recent 'Shale Revolution' has finally made US oil production competitive on the world market but these gains are no more than a few years old (Zeihan, 2016). Nixon had wished to increase the number of nuclear reactors to one thousand by the year 2000. Not only would this be an expensive undertaking, but with the Three Mile Island incident in 1979 and the Chernobyl meltdown in 1988, nuclear power had two black eyes. Furthermore, the end of the cold war turned nuclear power plants from assets in a nuclear arms race to liabilities in terms of potential targets of terrorism[7]. Nixon and Carter had both voiced hope for the potential of solar energy but it still was not feasible. Meanwhile, with the collapse of the USS.R., the US was unopposed militarily. As the US was already securing trade routes increased trade was tantamount to an increased return on its investments.

During the decade following the Soviet collapse, the United States remained the world's second largest oil producer. Top place went to Saudi Arabia (BP, 2019). Though Saudi Arabia is a member of OPEC it has also been a key US ally and has reliably helped keep oil supply at stable

[6] The precursor event to the Kyoto Protocol

[7] Assets both in that they reduced reliance on other countries and that spent fuel could be reused in weapons production (Union for Concerned Scientists, 2011) .

levels (Killian, 2009). Thus, in terms of energy security, the US was sitting pretty. Project Independence may not have come to fruition, but if energy supply were stable enough, perhaps this program was rendered an artifact of a bygone era. Further, political entanglement via trade had proved to be viable strategy—China had remained out of the cold war, relations with Saudi Arabia had been repaired and alternate domestic energy sources were still not economically viable. Perhaps for all these reasons Bush Sr. saw little reason for a major change of course.

As for trade, Herbert Walker's administration may have been the primary architect of NAFTA, but it was under Clinton that it was executed. Likewise, though Nixon may have been the prime mover when it came to trade with China, but Clinton was the true father. If Nixon worked to get China's foot into US markets, Clinton swung the door wide open. NAFTA was passed in 1994, at the same time as Deng's Southern Tour—an effort by then Chinese Chairman Deng Xiaoping to popularize and extend Chinese manufacturing for global export (Autor, Dorn, & Hanson, 2016). At this time China's special economic zones (SEZs) were blossoming and the United States was the largest benefactor of China's remarkable economic growth. Only one thing kept the Chinese-United States trade relationship from its full potential. That one thing was a normalization of trade relations. Clinton met this requirement with the United States-China Relations Act of 2000, paving the way for China to enter the World Trade Organization (WTO) a year later (Autor, Dorn, & Hanson, 2016).

A recurring theme in the Trump presidency is that of denigrating his predecessors—particularly from Clinton to Obama, and particularly in terms of trade deals and energy policy. Though blame could easily be extended back to further regimes, there is merit in Trump's criticisms. Especially when considering the effects of the 'China Shock' (Autor, Dorn, & Hanson, 2016). This period refers to the years between 2000-2007 when the US economy failed to smoothly incorporate the large influx of imported Chinese goods. Though the importation of goods had been steadily increasing since the 1970s, it was greatly accelerated by the enactment of NAFTA (1994) and entry of China into the WTO (2001) [Fig. 8]. The obvious effects of these trade deals were a reduction in the costs of manufactured goods, along with a mixed bag of job losses and political entanglement [section 3.3].

Nevertheless, the Clinton presidency merits a milestone of its own—and not only in terms of greatly advancing trade relationships. Of the 24 years between Nixon's election and Clinton's only 4 of those years were held by a Democrat. Though Nixon resigned in disgrace, it must be said that he left a large legacy; and the lion's share of that legacy was environmental. Though George H.W. Bush attempted to spearhead the new era of global environmentalism—thereby cementing the Republican legacy of green governorship—he was overshadowed by Bill Clinton. Clinton managed to dedicate over 4.6 million acres of land to preserves and increase the clean energy research budget by 50%. Yet, what truly distinguishes the Clinton presidency is not what he accomplished, rather what he failed to accomplish. The 1990s marks a departure point in civic cohesion and political gridlock. Social scientists such as Robert D. Putnam have extensively documented the decline in social capital since the 1950s (Putnam, 2001). However,

political polarization was only beginning when Putnam was writing his book. According to the Pew Research Centre, political partisanship had doubled between the years of 1994 and 2014 (Pew Research Center, 2014). Political gridlock has been a hallmark of US politics since Clinton, especially in terms of environmental policy.

### 2.4 2015 - Present: From Energy Dependence to Energy Dominance

President Obama came into office casting himself as an ecological savior. With promises to heal the planet, he summarized his approach to energy policy was one of 'all of the above' (Leber, 2015). Any student of energy policy ought to notice the irony of this political shibboleth. The phrase intones a concerted effort and a practical approach without implying anything in particular. The irony being that this phrase could be attributed to any past presidents' policies. Obama, like every past president, proposed and/or enacted a mixed bag of interventionist and non-interventionist policies. For the most part he was an interventionist. He allocated billions to smart grid initiates and home weatherizing for low income homes, he extended tax credits for wind and solar, he increased CAFE standards, and he even quietly crippled the coal industry while approving hundreds of fracking operations—hurrying the US towards energy independence while also reducing CO2 emissions (Spear, 2013). Obama's energy legacy certainly was 'all of the above', though principally in terms of intervention.

Trump, with his penchant for tongue-in-cheek taunts took up the same rhetoric of 'all of the

above'. However, unlike Obama, his version of the phrase is built upon the idea of creating a level playing field—of deregulation and economic non-intervention (McLaughlin, Mar). This is not to say that Obama's tenure was without any deregulation in the energy sector. Though primarily an interventionist president, in 2014 Obama removed the export ban on domestic oil placed there by President Ford. This marked the beginning of an explosion of US oil production which shocked many analysts (Agee, 2018). As much as Trump may dislike his predecessor this one policy decision has helped make possible Trumps aspiration to make the United States into an energy superpower.

Given that the US may be entering a period of increased dominance and prosperity this ought to be cause for celebration. Yet, geopolitical analyst Peter Zeihan is sounding the alarm bells. Zeihan warns that an independent America could be bad news for the rest of the world. For Zeihan, US energy independence reduces the incentives of maintaining trade routes. If the US withdrawals from the defense of trade routes, the world runs the risk of regional powers filling the vacuum—eventually leading to a proliferation of regional conflicts (Zeihan, 2016).

This account is well founded. It implies an understanding of *power transition theory* (Gates & Kim, 2015). Essentially this theory states that any historical period lacking a hegemonic power enforcing order will be plagued with conflict until hegemonic power is enforced. Will a lack of energy demand have such drastic consequences? Zeihan believes it may—that the US will become, as it was prior to the world wars, isolationist; and, in turn the globe will be engulfed in

chaos until the US deigns to step in—restoring itself as the world's hegemonic superpower. Interestingly, the Trump administration seems well aware of the scenario put forth by Zeihan. The administration has bypassed referring to its global energy position as 'independent' and gone straight to calling it 'dominant'. This rhetorical flourish suggests that the Trump administration has little interest in becoming isolationist.

Former secretary of defense for the Trump administration H.R. McMaster writes extensively the role of energy in a Security white paper prepared for the White House (McMaster, 2017). In it he uses the same language of *power transition theory*—recognizing the growing regional threats from Russia and China. Further, his recommendations give no quarter to strategic withdrawal. In fact, he considers post-cold war politics as one of strategic withdrawal which needs to be remedied. Rather than stepping away, McMaster champions full engagement.

Zeihan is right concerning the diminishing returns on defending conventional trade routes. However, he overlooks how fundamentally trade is changing. The dominant mode of trade has evolved first from land, then to incorporate sea, then air. Trade of non-physical goods have increased dramatically over the past three decades and advancements in space travel are opening the further trade possibilities. Far from withdrawal, McMaster advocates the securement of space and cyber-space—a full-fledged gambit for future hegemony.

## Chapter 3 – The Successes and Failures of US Energy Policy

### 3.1 Introduction to Chapter 3: Apollo's Spirit

Success or failure of the past fifty years depends on which criteria is used for judgement. A strong case for failure can be made from a free-market as well as non-interventionist perspectives [section 4.2]. Free market advocates such as Robert L. Bradley and Philip Verleger argue that intervention in energy markets have been expensive, needless, failures (Bradley, 2018) (Verleger, 2011). To the contrary professor Michael Klare argues that not enough has been invested in green energy and that the human costs of protracted wars in the middle east far outstrips the capital costs of alternative energy systems (Klare, 2004). These analysts are mentioned here not to serve as bipolar examples. Professor Bradley, for example, does not praise the use of military engagement in order to secure energy related supply lines. Rather they are only mentioned to illustrate the many points of entry into the discussion—particularly entry points which give strong reasons to declare the past 50 years a catalog of failure.

As for success, one would be hard pressed to find an analysis who has no gripe with the last 50 years of policy and its consequences. If such a narrative were to exist it might tell a grand tale of the United States, in terms of energy production, tactically retreating; of it biding its time and using its trade deals to exert influence while developing the technology necessary to reemerge in a position of energy dominance. One may muse that though Project Independence overshot its deadline by 39 years, independence was eventually achieved.

Perhaps then, there is some irony in liking project independence to the Apollo project. Apollo, the Greek god of medicine was also a god whose power of foresight rivaled Prometheus. It certainly would be within the spirit of Apollo to stall for time in order to heal. This tactic would nicely fit a Nixonian strategy. But such a narrative is not the purpose of this paper. A definitive answer is beyond its scope. If any historical narrative is to be taken from this paper it is that the history of policy is one of path dependency and least-costing—of nation stumbling towards a goal. Nonetheless, this chapter puts forth an honest effort to evaluate this era in terms of its general economic, environmental and security achievements.

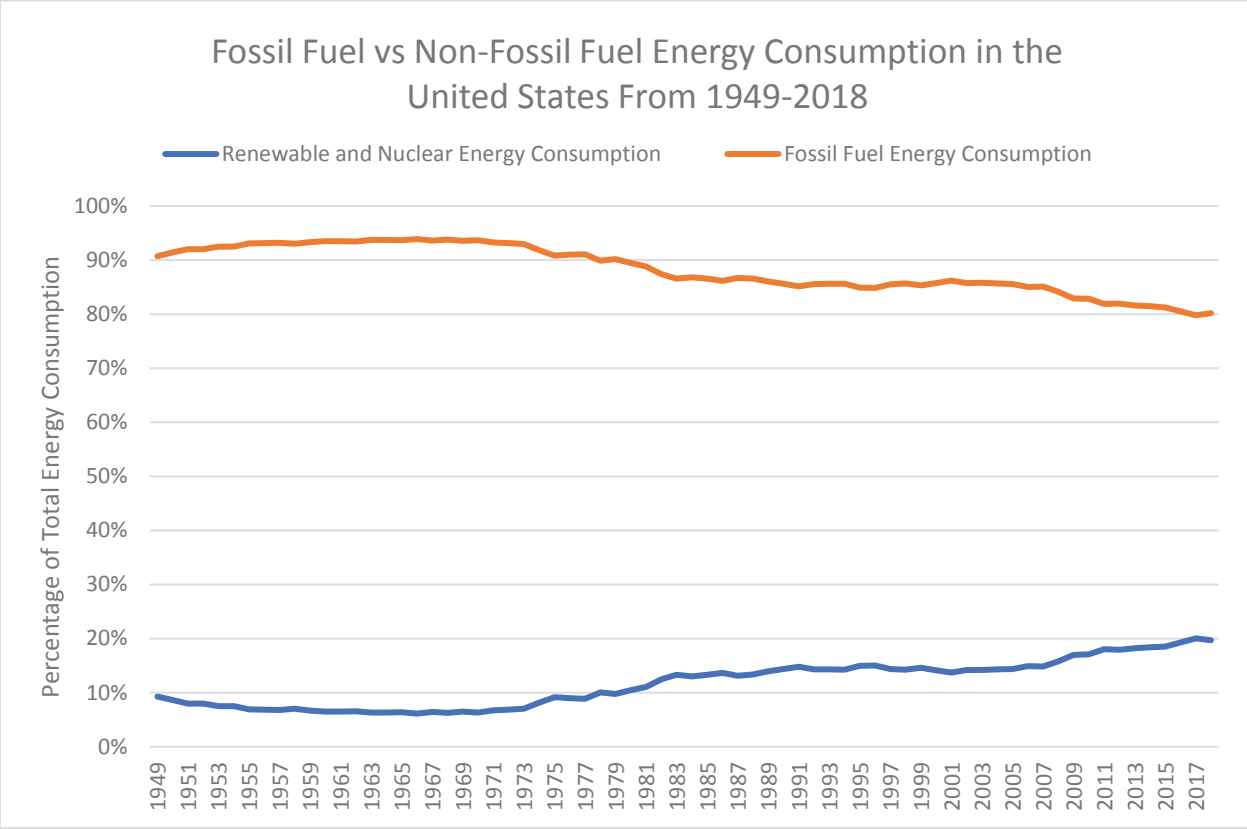
**3.2 Environmental impacts - From Energy Security to Clean Energy**

Though Nixon advocated the construction of 1000 nuclear power plants by the year 2000, this had nothing to do with climate goals and everything to do with national security. Though environmental protection was a top priority for Nixon, carbon emissions were not part of his plans. To his credit, since the founding of the EPA, every air pollutant other than carbon dioxide has either seen a marked reduction[8] [citation]. The recognition of carbon dioxide as a possible pollutant was not a political consideration until president George Bush Sr. Nevertheless, renewables were also part of Nixon's bid for independence. The following graph [Figure3] illustrates fossil fuel vs. renewable and nuclear energy consumption in the United

[8] These pollutants are: carbon monoxide, ammonia, sulfur dioxide, volatile organic compounds, particulate matter 15 and 25 and NOX.

States.

Figure 3: Fossil Fuel vs Non-Fossil Fuel Energy Consumption in the United States From 1949-2018



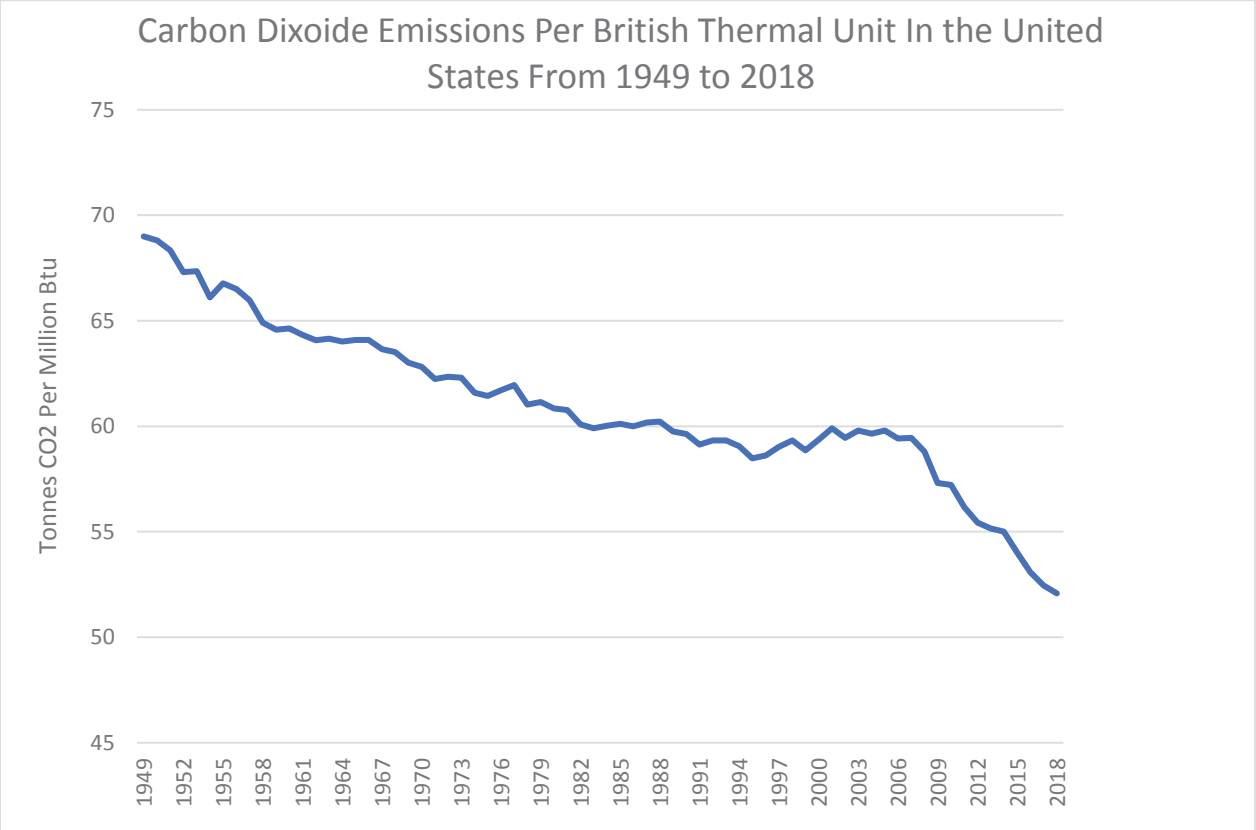

Source: Data from the (Energy Information Administration, 2019c)

As a percentage of total energy consumption, combined renewable and nuclear energy has had a very slow rise. As we can see, enthusiasm for alternate energy sources flatlined after the cold war in 1992. Alternative fuels have only begun to rise again in 2007, with the Bush Jr. and Obama administrations—with non-nuclear sources accounting for all growth. Renewable energy use as a percentage of total primary energy consumption has only increased 5% since 1970. Nuclear has not done much better, becoming 8% of total energy consumption by 2018

(EIA, 2019). This slow transition is not for lack of trying. From Solarex to Enron to Solyndra, commercial viability of solar power has never reached the cost-effective levels which president Carter promised where already available in 1979 (Bradley, 2018).

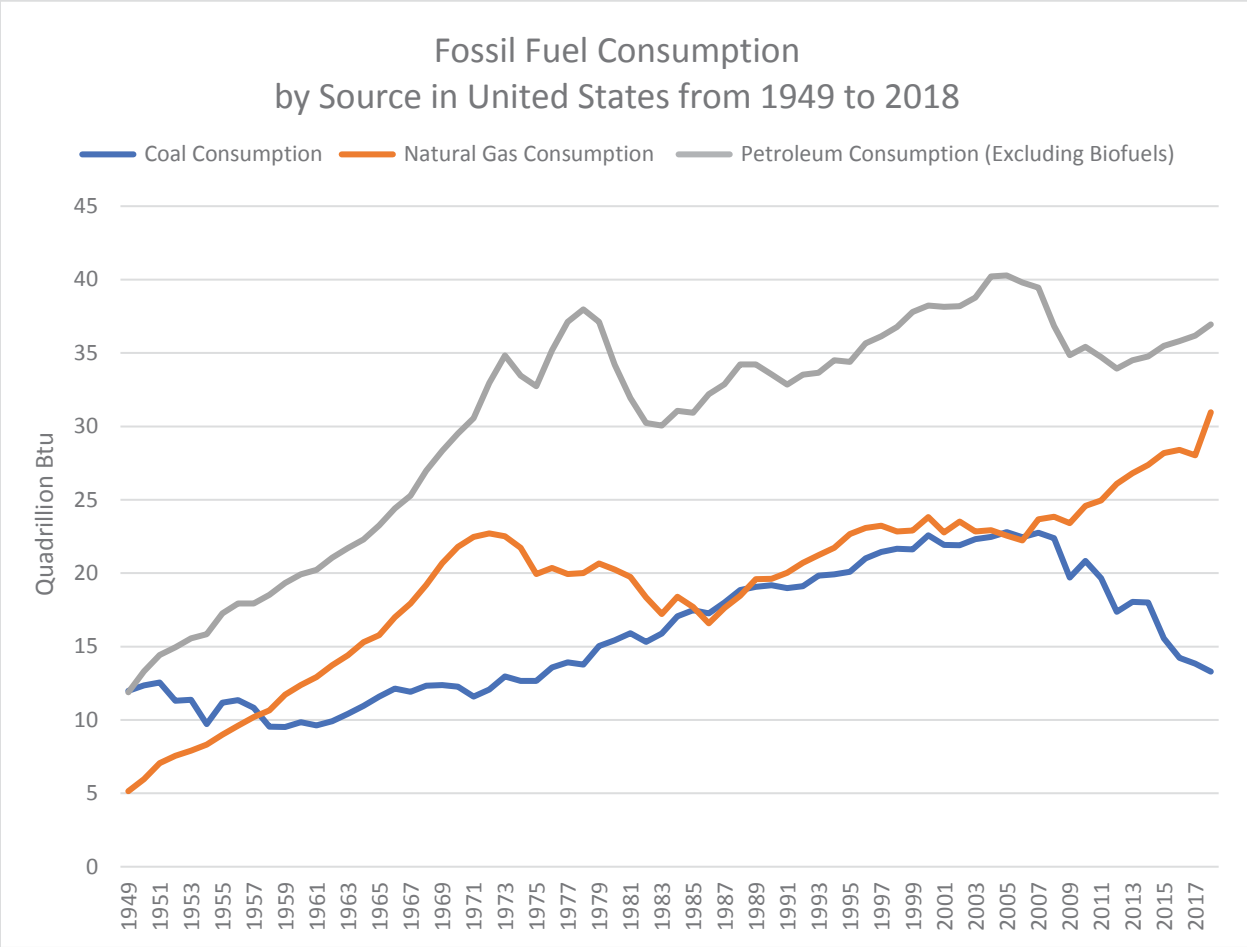
Naturally, not all fossil fuels are the same. Nor, are the ways which they are used. The following graphs illustrate the decarbonization of the United States Energy Supply [Figure. 4] and the changing composition of kinds of fossil fuels [Figure 5].

Figure 4: United States Carbon Dioxide Emissions Per British Thermal Unit From 1949 to 2018




Source: Data from the (Energy Information Administration, 2019a) (Environmental Protection Agency, 2019)

Figure 5: Fossil Fuel Consumption by Source in United States from 1949 to 2018




Source: Data from the (Energy Information Administration, 2019a)

Together these two graphs tell an interesting tale. First, as for energy security, energy consumption via oil essentially flatlines after 1973. The same goes for natural gas—use of which was also discouraged. Coal, the use of which was encouraged, shows constant growth. That is, until 2007 when coal's reduction is matched with a corresponding increase in natural gas usage. Oil consumption may have grown in gross terms, however it reduced from a peak in 1977 of 48% of total energy consumption; to a low in 2013 of 35% of consumption. Natural gas

hit a peak use in terms of total energy consumed of 32%. After a low of only 22% in 1987 it has not climbed back up to 31% of total energy consumption.

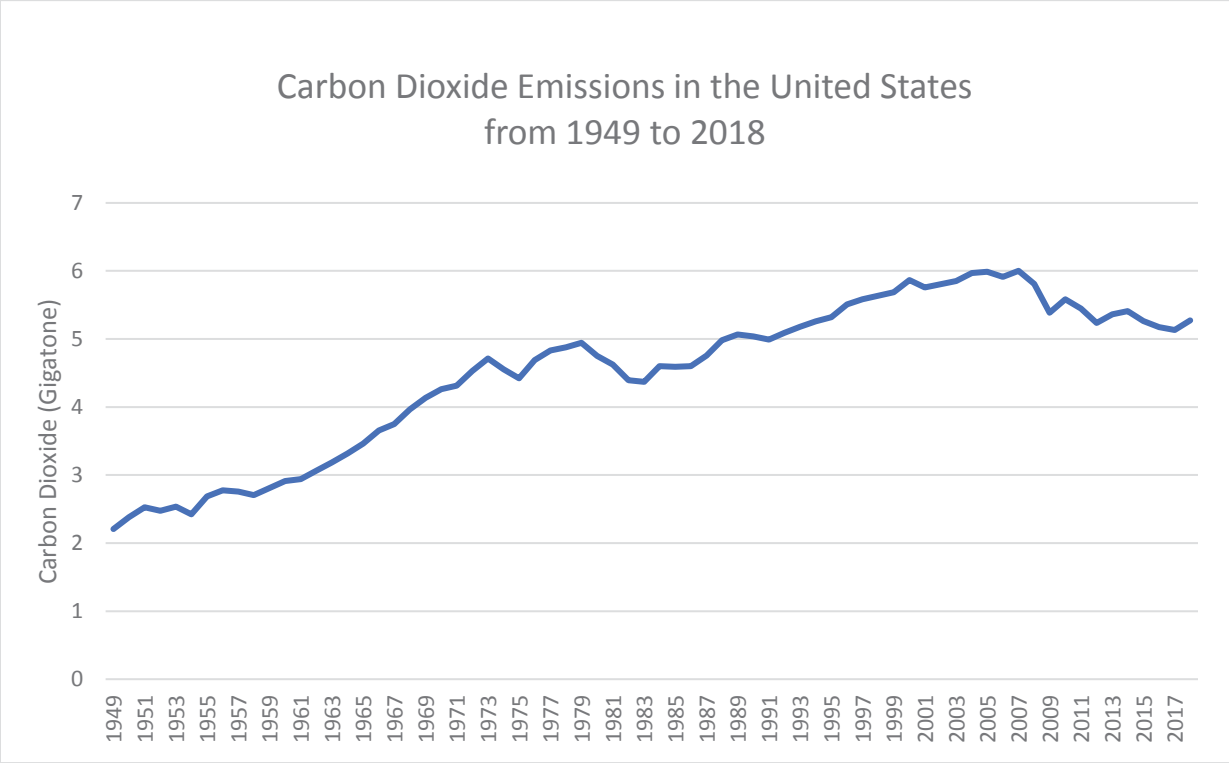
What makes these fluctuations in energy source interesting, are the effects on the carbon intensity of energy [Fig.4]. Surprisingly the carbon produced per Btu showed constant shrinkage even through those years when coal was replacing other fossil fuel alternatives. Considering that there was no pressure to reduce CO2 emissions it must be assumed that these reductions represent marginal technological developments. The concerns about carbon emissions only emerged around 1992 with the Rio Earth Summit. Curiously, the proceeding period shows a flatlining of the carbon intensity of energy [Fig. 4]. This increase appears to be due to the forward march of coal consumption [Fig. 5]. It is not until 2007 that carbon intensity takes a steep downward turn. The primary driver of this being the phase out of coal power plants and the phase in of combined cycle natural gas power plants[9]. This suggests two things. First that the period of carbon consciousness has not been successful in decreasing the carbon intensity of the energy supply—which ought to be of highest concern. Secondly, this also suggests that the reintroduction of natural gas in electricity production has done more to reduce carbon intensity than any other clean energy program.[10]

[9] In terms of percentages changes in total energy consumption the past ten years had a 10% reduction in coal use. A 6% increase in natural gas use and a 4% increase in renewables.
[10] This is a strong claim. However, the decade proceeding 2005 saw carbon emissions from electricity generation reduced by 9% due to switching to natural gas. Comparatively emissions reductions from wind and solar managed to only reduce emissions by 7% (Zeihan, 2016).

More damningly, not only did carbon intensity flatline from 1992 to 2007, but this was also the time of the China Shock—the time of explosive trade growth with China. Currently China's carbon intensity of energy is 42% greater than the United States (The World Bank (WB), 2019a)[11]. Why does this matter? Because the above graph [fig. 4] only considers territorial emissions. It does not incorporate those emissions embodied in trading with china. The graph below uses data from the EIA to illustrate gross carbon dioxide emissions in the United States [**Error! Reference source not found.**]. This graph displays territorial emissions. Notice that the period from 1996 to 2007 shows very little emissions growth. An average of .8% per year to be exact. Further, from 2001-2007 emissions flatten.

[11] This figure is as of 2014. China's carbon intensity would have fluctuated over this period, which is not being considered here. However, China's economy remains primarily coal driven. This, in spite of large-scale renewable development. Its economy was more coal dominant in the past. Thus this 1.5 estimate is likely conservative.

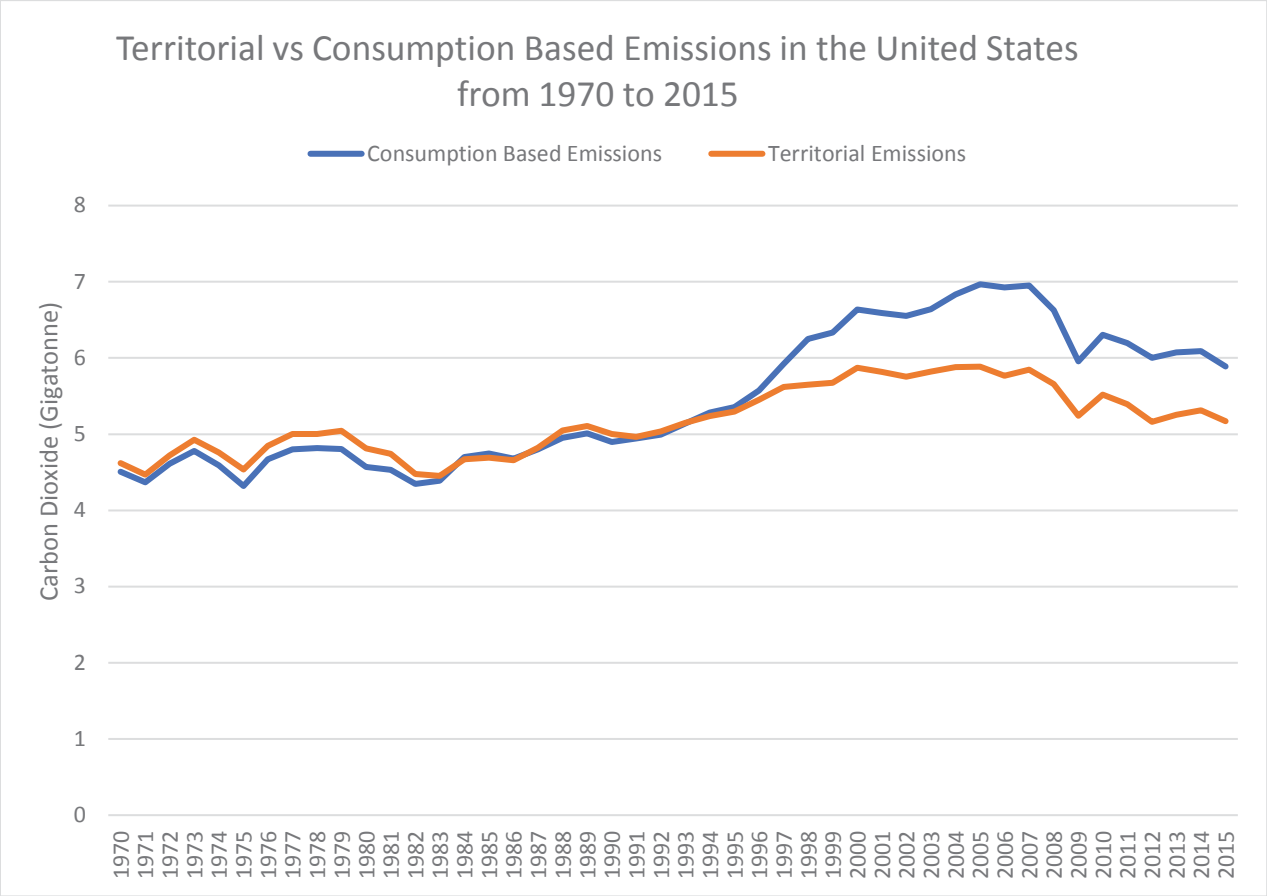
Figure 6: Carbon Dioxide Emissions in the United States From 1949 to 2018




Source: Data from the (Environmental Protection Agency, 2019)

When emissions embodied in trade are accounted for a significantly different picture emerges [Figure 7]. Instead of a .8% average annual increase we have a 2.2% increase. Instead of emissions flatlining from 2001 to 2007 we have average annual emissions growth of .7%. This presents an environmental and political dilemma. This CBA estimate further casts shade on the environmental achievements of this period. Not only in terms of gross emissions but also emissions per capita as well as measurements on the carbon and energy intensities of the US economy. Most damningly this increase in hidden emissions has happened during the period of increased concern for global warming.

Figure 7: Territorial vs Consumption Based Emissions in the United States from 1970 to 2015




Source: Data from (Kanemoto & Moran, 2016)

What turns this situation from a problem to a quagmire is that any president who might choose to acknowledge that, on a consumption basis, the United States is responsible for a larger portion of global emissions, will tacitly be charged with fixing the problem. On the other hand, if the problem of emissions embodied in trade is ignored, policies which could reduce global emissions at the cost of increasing territorial emissions will bear the political costs of an increase in territorial emissions without reaping the credit of global decrease.

As for the success of past environmental policy: given the consumption-based estimates of the present situation one must admit that the environmental impacts of past policy have failed. Keep in mind that this statement is in regards to carbon dioxide emissions. The original goals of the EPA aimed to reduced many other air pollutants and were successful in so doing. However, this is cold comfort in a political environment where carbon is the primary concern

Considering the CBA estimate, one must conclude that economic and security concerns have been prioritized over environmental worries. Emissions grew in tandem with trade. Trade with partners such as China, who's economy is far more carbon intense on a per Btu basis. Ironically, the use of natural gas has been largely responsible for the recent reduction in carbon intensity in the US This grants the current administration some license to either push for environmental reforms abroad, or to encourage trade restrictions. Unfortunately, this may be disputed if CBA estimates are contested [

4.2 Further **Study**].

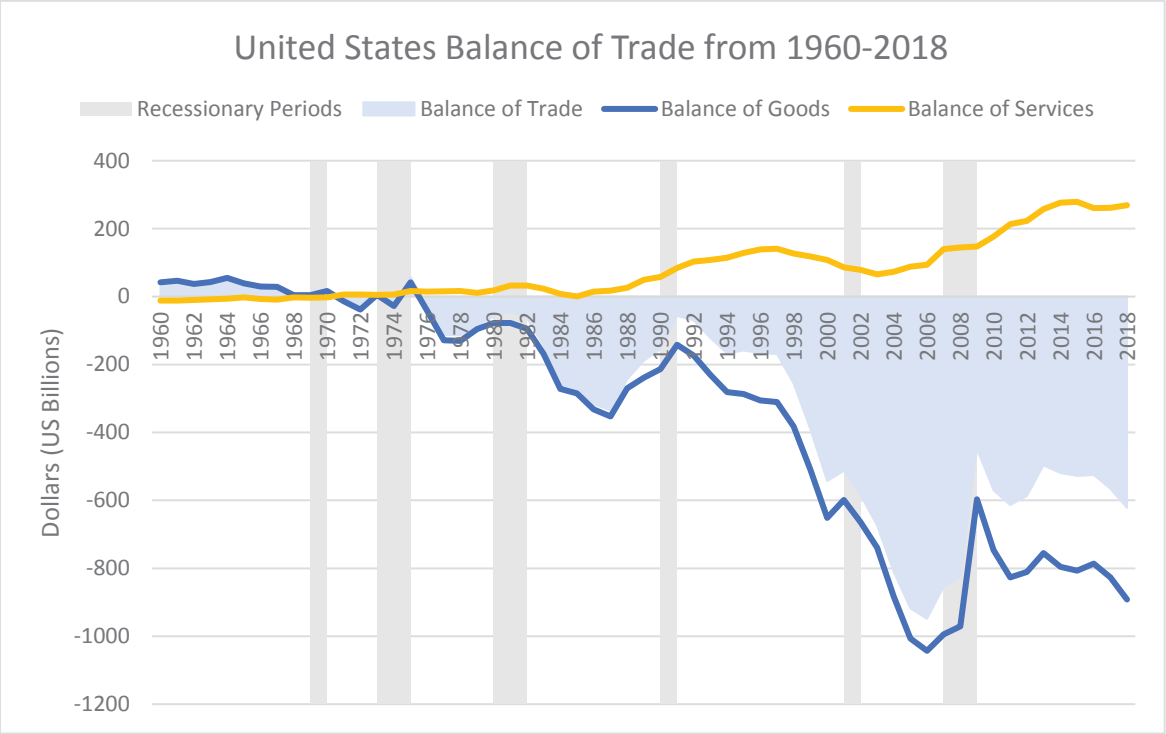
### 3.3 Economics - Trade, Demand Reduction and Supply Increase

From a free-trade perspective, trade balances don't matter. If markets are efficient then capital flows to where its most needed, creating value in the process. Thus, if one country is a net importer while another is a net exporter this sheds no light on the economic advantages or disadvantages of either trading partner. Further, from a libertarian perspective, trade entanglement, encourages peace. As the saying goes, 'When goods do not pass borders, soldiers will.' As mentioned in Chapter 2, there is some historical evidence to support these claims. However, the political reality of trade infinitely complicates the economic concerns—complicating the reality of economic trivialities like the balance of trade.

[Figure 8] illustrates the massive effects of trade policy on the national balance of trade. 1976 marks the last year the United States held a positive trade balance. Since the 1970s the US has been transitioning from a manufacturing to a service-based economy. [Figure 8] provides some anecdotal evidence that this has been the case as the amount of services exported has grown at the same time as growth in manufactured imports. What is more interesting about this data is the timing of import growth. Though recessionary periods clearly influence the purchase of imported goods its growth has been relatively unabated. This forward march of international

trade is punctuated with numerous political agreements. The largest of which would be NAFTA in 1994 and the US-China Relations Act of 2000.

Figure 8: United States Balance of Trade from 1960 to 2018




Source: Data from the (US Census Bureau, 2019a) Dollars = Nominal 2018; CPI from the (US Census Bureau, 2019b) 1982-4=100

Though the economic consequences of trade growth have been positive on the whole, there have been issues. The flood of cheap consumer goods has hallowed out America's manufacturing sector, suppressed wages and has contributed to an increase in income inequality (Gould, 2018) (Autor, Dorn, & Hanson, 2016). Aside from wage suppression and some increased income inequality the United States has surely benefited from cheap consumer goods. However, the political benefits have utterly failed to materialize. The loss of

manufacturing employment has caused political division within the United States—an unintended consequence which has surely added to the patter of civic strife already emerging in the 1990s (Pew Research Center, 2014). This may be forgivable if trade entanglement had reached its intended consequence; if it had provided enough pressure on China to guide it towards a more liberal government. Instead, China is less free now than before its entry into the WTO (Biao, 2019).

Nixon had successfully used US consumer demand to build a relationship with China. A relationship which helped keep China out of the cold war. In the same ethic, the Bush and Clinton and Obama regimes hoped that greater trade relations would lead to greater governmental liberalization—while building wealth for both countries. Today the hope that trade may eventually lead to a freer China is reaching a vanishing point. In hindsight Clinton may have been wrong in establishing trade normality with China. Perhaps, in the wake of the Tiananmen Square Massacre, China had earned a stick rather than a carrot. However, both countries have benefited materially during this time. Further, the bigger the carrot, the bigger the stick. Sudden decoupling with China grants the US leverage in further pressuring the Chinese government to liberalize. Thus, in the end the Bush/Clinton wide-open stance to global trade may prove to be an overall success. This remains to be seen.

As for the oil trade, the US economy has been dependent on foreign oil supply until very

recently[12]. This reality only began to emerge during the latter part of the Obama administration, and has only been fully realized around the time of the 2016 election. Understandably, then, the past fifty years of energy policy has been focused on demand management. The only direct power the US has had in supply management has been in providing security to trade routes as well as maintaining stability in the middle east. Yet, being a buyer in a world of sellers is not necessarily a weak economic position, even if the majority of sellers are colluding to control prices via the OPEC cartel. The Yom Kippur war may have damaged US relations with Arab nations, but that does not mean that all was lost. Following the 1973 crisis, Nixon immediately sought to repair relations with Saudi Arabia and Saudi Arabia has, subsequently, worked to keep oil supply stable (Wong, 2016).

As will be discussed in section 3.4, a stable energy supply tends to coincide with economic stability. Still, a secure supply of energy as only been half the equation. At the same time demand reduction through energy conservation has never relented. CAFE standards have guided fuel efficiency standards while the Energy Star program has aided citizens in budgeting energy maintenance costs. Recessions tend to encourage conscious consumption; not only in terms of having less capital for the initial purchase, but also in that operating costs become dearer. In that the CAFE and Energy Star programs encourage the purchase of energy-efficient products it stands to reason that recessionary periods would see greater purchase of more

[12] A case could be made that this era was largely *due* to energy policies rather than a response to external conditions [

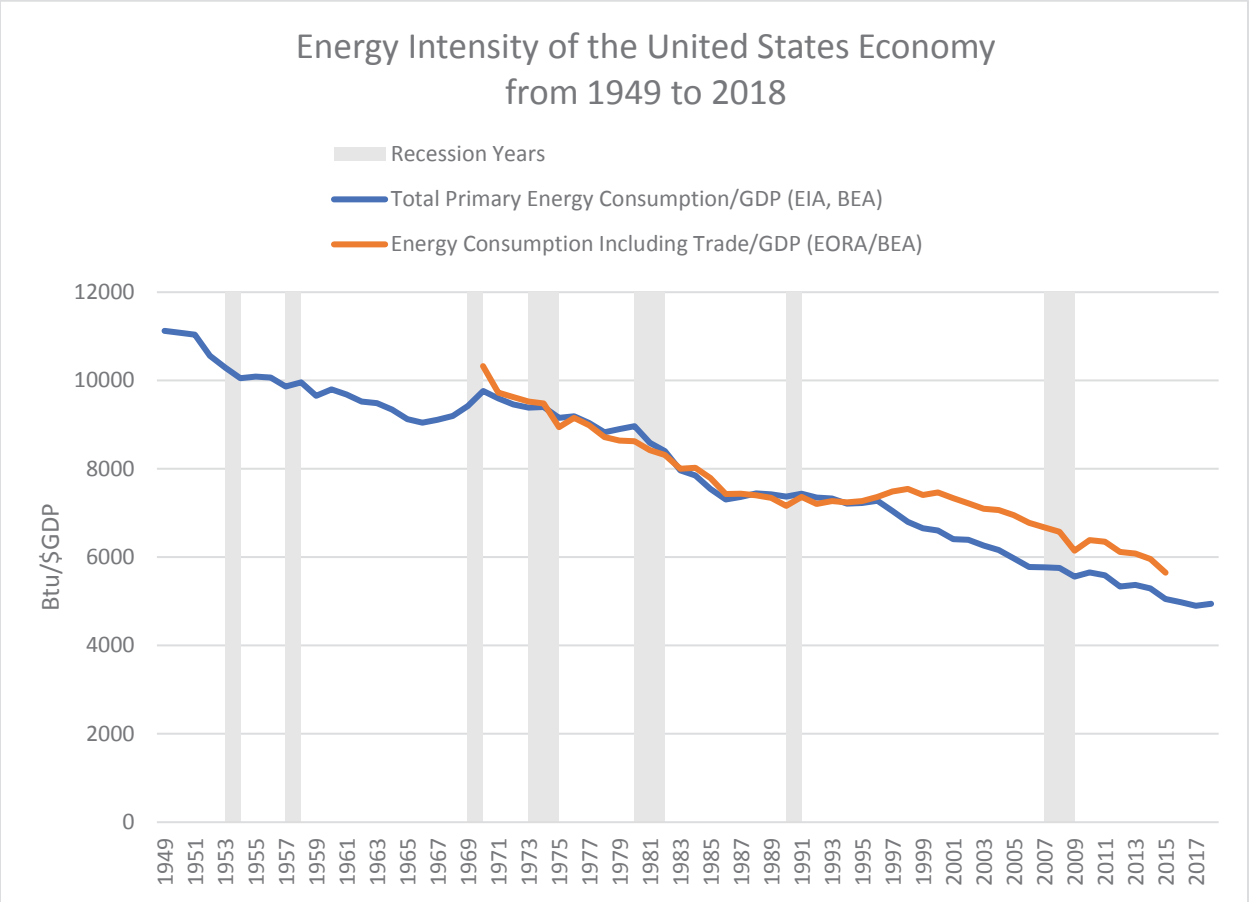
4.2 Further **Study**].

efficient products[13]. The overall effect has been economic growth while energy supply is uninterrupted, along with a ratcheting of reduced consumer demand during recessionary periods. In plain speak: people tend not to mind energy costs during good times. During bad times, they do—yet, when good times return, no one rebuys old, inefficient products.

As Energy consumption is the primary driver of carbon emissions, consumption trends are essentially the same. From Nixon to Trump gross energy consumption, along with gross emission, have risen. This is not to say that energy demand has not fallen by other measures. Energy consumption per capita has fallen, as have the energy requirements needed to produce a dollar of GDP [Figure 9]. The Graph below illustrates demand reduction on a per dollar of GDP basis. This graph was constructed using three separate data sources [see 1.2.4]. First, the total primary estimate was taken from the EIA. It represents standard, territorial energy consumption estimate. This data was combined with GDP data from the BEA in order to yield an estimate on the energy intensity of the US economy. Lastly, Eora data was used to create a consumption-based estimate; it is represented with the orange line.

[13] Providing, or course, that initial costs are not prohibitive. Policy makers concerned with CAFE standards take the trade-off between capital and operating costs into account when considering standards. If, for example, increases in fuel efficiency are uneconomical consumers will simply opt not to buy new cars. In such a case an increase in efficiency standards would have no effect, or even a negative effect, in reducing gross emissions.

Figure 9: Energy Intensity of the United States Economy From 1949 to 2018




Source: Data from the (Energy Information Administration, 2019a) (Kanemoto & Moran, 2016) (United States Census Bureau, 2019b)

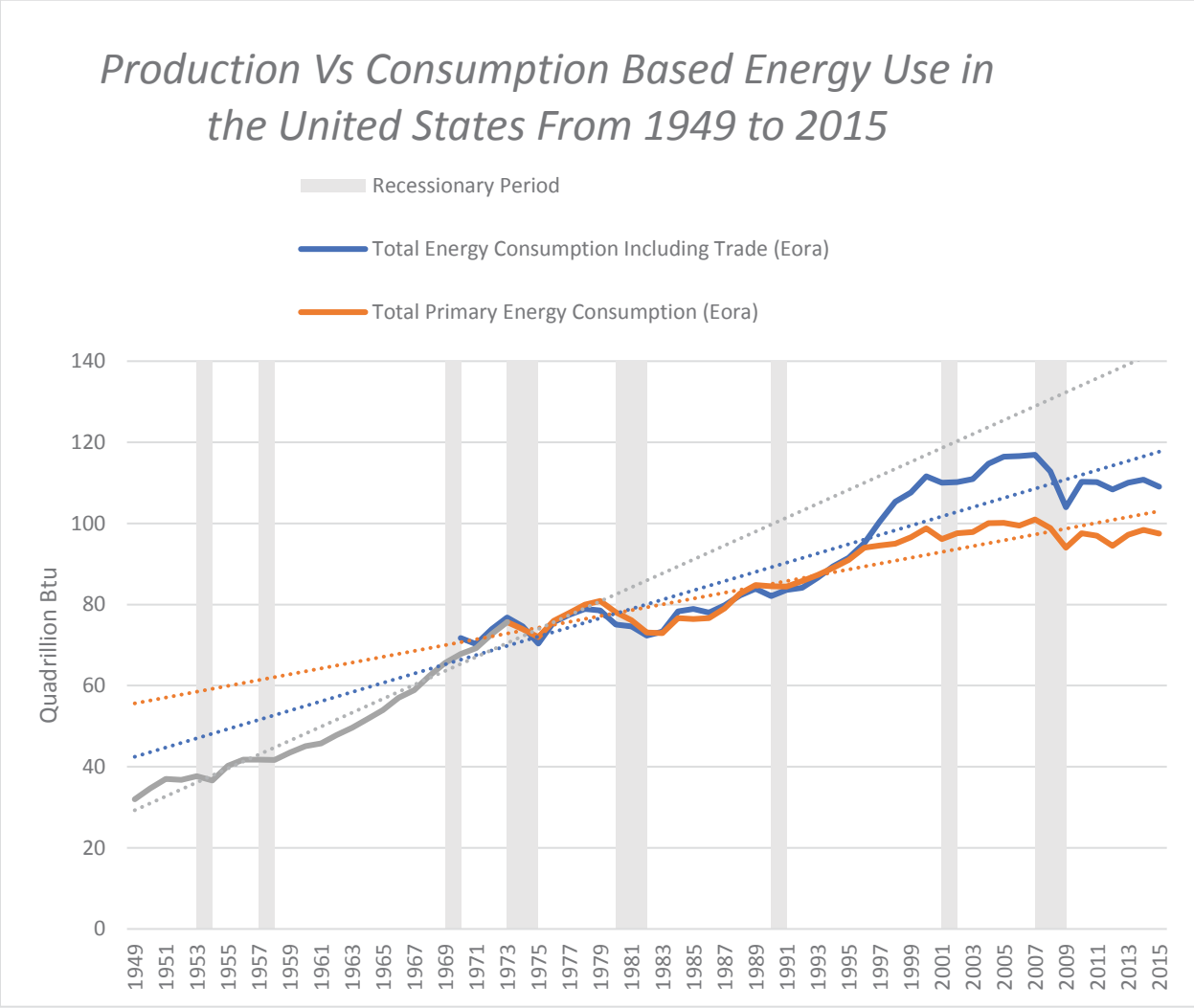
As one would assume, the consumption-based account is less impressive. The period of the seventies and early eighties saw a steep decrease in energy intensity. This is to be expected as producers and consumers economize on energy during its steep price increase [Fig. 10]. Interestingly, both in terms of territorial and consumption-based accounts, energy intensity trends drastically change in 1985 [Fig. 9]. This year marked a crash in the price of crude, the prelude to the fall of the Soviet Union. With the exception of a mild spike in 1990, crude prices would remain relatively cheap and stable until 1999. 1999, also being the year when energy

intensity measures begin to decrease by both measures; suggesting that price influenced intensities.

Considering the price of oil during this time it is, perhaps, an achievement that the United States continued to economize on energy at all. Though recessions are not desirable they do encourage conservation. Their effects reverberate as their memory continues to motivate saving even after they run their course—the lingering memories of the bad old days effecting conservation efforts. As mentioned, there is also the ratcheting effect of technology. That people are motivated to purchase efficient products when energy prices spike, yet have no incentive to return to inefficient products when prices are cheap. CAFE standards (implemented in 1979) and Energy Star program (implemented in 1992) no doubt helping to encourage conscious consumption.

Though energy conservation is a good in itself, its geopolitical implications are also significant. The shale revolution is often given full credit for the current energy independence enjoyed by the United States. The replacement of foreign oil with domestic is only half the story. The other half the story is demand reduction. For a fuller account of this one needs only to turn to Professor James L. Sweeney's book entitled *Energy Efficiency.* There he illustrates in detail how advances in automotive gas mileage, lighting, refrigeration and many other technologies have created an economy which foregoes as much as 80 quadrillion Btu in energy (Sweeney, 2016).

Figure 10: Production Vs Consumption Based Energy Use in the United States From 1949 to 2015




Source: Data from the (Energy Information Administration, 2019a) (Kanemoto & Moran, 2016)

The above graph illustrates the major theme of Professor Sweeney's book while also incorporating consumption-based energy estimates from Eora [Fig. 10]. The grey and orange lines are built upon total primary energy consumption data from the EIA and represents territorial energy consumption. The blue line represents total energy when energy embodied by trade is included. Notice that the grey line (i.e., pre-1973 trend) terminates in 1973 and

continues on as an orange line (i.e., total primary energy consumption). This is done to separate these two periods into liner trends.

The three colored, dotted lines correspond to the three datasets. They represent these datasets translated into trends. As trends we can see that the orange and grey lines diverge greatly. This is where professor Sweeney derives his figure of forgone energy use in the vicinity of 80 quadrillion Btu—a staggering 80% increase in energy demand. The supposition being that if there was no energy crisis, if energy prices had not become volatile, energy consumption would like have continued upon its pre-crisis trend. Sweeney does not use foot-print data. If he were, it would have to compare the blue to the grey trend lines, rather than the orange to the grey. As we can see, the blue trend line presents a less rosy trend than the orange. It is roughly 12 quadrillion Btu higher than the EIA estimate. This is a very large discrepancy; however, it is far from the grey line, the pre-crisis trend.

Naturally, the supposition that an alternate timeline could have yielded a world where the US, today, required 180 quadrillion BTU of energy annually is somewhat drastic. To suppose that, without the 1973 crisis consumption would be 80% higher, is not the point. Rather, the significance is twofold. First, we can say that if the United States were to become completely closed economy it would require roughly a 12% increase in energy production. This figure matters when considering the reshoring of manufacturing. Secondly, if the US were to require

80% more energy today, the recent surge in domestic supply would have little effect on such extremely high demand.

Thus, granting professor Sweeney's estimate, one must conclude that conservation efforts have been extremely successful. Indeed, the reduction of energy demand far outstrips the recent increase in energy production. Further, when CBA estimates of energy use are considered, conservation efforts are less impressive—though still significant. Whether policy or price had the greater effect on conservation will be left ambiguous—suffice it to say that conservation has been successful.

**3.4 Security - Supply Disruption and Recessions**

The securement of energy supply does not necessarily prioritize foreign sources. During the period in question it has, but this does not mean this tendency must continue. It stands to reason that increased domestic oil production lessens the urgency of a stable foreign supply. This same reasoning explains why middle eastern stability has been so important to the United States; and it suggests it may be less so in the near future. However, before such speculation upon the effects of energy dependence on policy, its fruitful to look into the post-Nixon period of energy dependence.

When the United States won its arms race with the Soviet Union, it was arms rich while still relatively energy poor. Thus, not only did the US have the capability to secure international trade routes, but sourcing energy from distant shores creates a de facto risk sharing agreement. More supply nodes would reduce the impact if any node were disrupted. Further, the involvement of more nations would align the interests of a greater part of the world, creating a hegemonic coalition.

The bigger the hegemon, the more resilient. Economically, a larger trading block is more resilient in that if one country, or supply node, happened to falter another could pick up the slack. Politically, the bigger the hegemonic block, the greater the opposition rogue actors may face. This logic applies as much to the oil trade as it does all trade. From a security perspective, the outsourcing of manufacturing to China aligns Chinese and western interests by allowing US consumer demand to create real economic growth in China. From an energy-security perspective, the energy embodied in Chinese goods is energy the US does not need to source for itself.

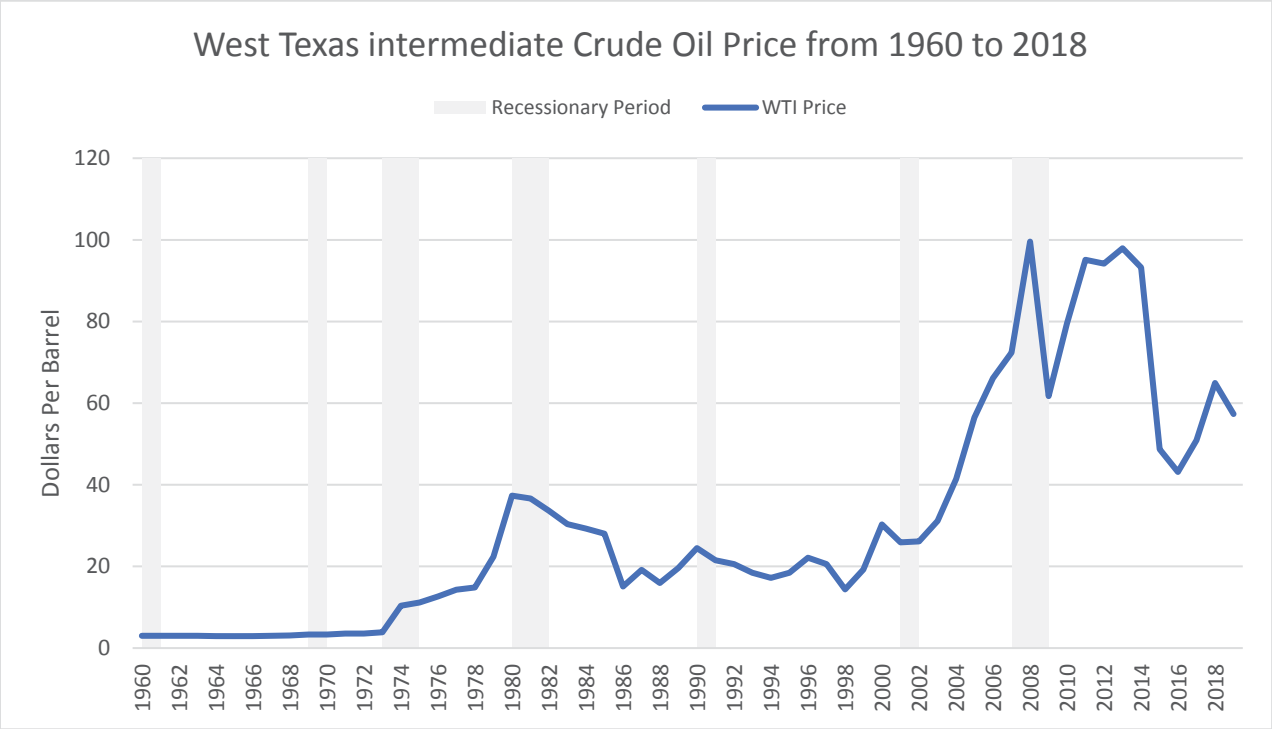
This line of reasoning leads to the question, how resilient has this system of political and economic entanglement been? To answer this question, it is helpful to turn to a paper by professor Lutz Killian entitled *Not all Oil Price Shocks are Alike*. In it, professor Killian demonstrates how every major recession since the Nixon regime has been related with an

energy price crisis. Further that every energy crisis has also been largely driven by turmoil in the middle east (Killian, 2009).

Interestingly, how price shocks relate to conflict is more complicated that mere supply disruption. Intuitively, conflict between or within oil producing states would increase price through the reduction in global supply. On the contrary, Killian argues that supply disruption plays little role. Rather, expectations play the larger role. Conflict raises the price of oil more so through precautionary demand than actual supply shortage. In plain speak, the fear of an oil shortage raises demand enough to simulate an actual shortage—or at least a price spike.

A cursory look at crude prices somewhat confirms Killian's findings. The graph Below [Figure 11] illustrates the historic price flections of West Texas Intermediate crude oil (WTI). The grey bars in this graph represent recessionary periods. We can see that there is a price spike in 1973; a larger spike in 1980; a minor spike in 1990; a spike preceding the recession of 2002 and a huge spike in 2008. These spikes correspond with the Yom Kippur war of 1973; the Iran-Iraq war of 1980; and Operation Desert Storm of 1990.

Figure 11: West Texas intermediate Crude Oil Price from 1960 to 2018




Source: Data from (Energy Information Administration, 2019b)

Indeed, middle eastern conflict appear to coincide rather nicely with most price spikes and most recessions. However, a few things should alarm the reader when considering this chart. First it must be said that this chart illustrates spot price data. Futures data would be a better fit; however, oil futures data starts only in 1983.[14] Next, the recession of 2001 does not fit the conflict pattern. Though 9/11 occurred in 2001 precautionary demand dropped thereafter (Killian, 2009). The recession of 2008 also does not nicely fit with mid-eastern conflict. Though

[14]Futures data does not significantly differ from spot prices. Killian's methodology is complex, incorporating things like freight data and its relation to real economic activity. Given these difficulties WTI spot prices serve as a very overly simplistic yet pedologically valuable tool.

the Iraq war endured from 2003-2011, Killian finds that real economic activity, particularly in Asia, was the larger contributor to oil price increases. From 2002-2007 global GDP grew annually an average of roughly 4.4% (The World Bank (WB), 2019b). That the great recession was caused moreso by real economic activity rather than precautionary demand fits with the continuation of high oil prices following the conclusion of the Iraq war. Oil prices remained high until 2014.

2014 happens to be the same year that president Obama lifted regulations on the export of domestic oil on the global market. This act was not taken on a whim. The end of the Iraq war failed to secure supply, prompting some to conclude that military intervention has increasingly become an obsolete strategy; and that Obama's removal of domestic regulation was predicated on this realization (Vahe, 2018). Still, to credit deregulation as the sole factor in the eventual drop in oil price would be misleading. US and Canadian production had already been growing and Chinese demand was leveling off since 2010-2011. Further, as prices began to fall, Saudi Arabia decided not to attempt to influence prices via cutting supply. Instead, they kept production stable rather than lose market share (Depersio, 2019).

This period tells an interesting tale about the resilience of the international system and the effects of US energy and foreign policy. The energy spikes of 1973 and 1980 were very pronounced. Foreign policy during the Nixon regime helped weaken the OPEC alliance, helping to create an oil glut in 1985; which, in turn, hastened the collapse of the Soviet Union. When

Saddam Husain attacked Kuwait in 1990 George H.W. Bush responded with a swift war. Though precautionary demand drove oil prices higher, Bush Sr. managed prices by making withdrawals from the US Strategic Petroleum Reserve. Learning from his father, Bush Jr. also withdrew oil reserves in 2005 (Lantero, 2015). However, judging by WTI spot prices, global oil demand was already too high for a strategic withdrawal to make a meaningful effect on price. Still, given that oil prices were relatively stable for the 15 years following 1985, is reason to say that the international system was quite resilient.

To remark that the system was resilient is not to justify it or imply that no better course of action was available. Rather it is just to provide some defense of prior policies while suggesting that they may be past their due-date in terms of effectiveness. That the 2008 price spike was largely driven by Asian energy consumption, for example, ought to give policy makers pause. Given that China has supplanted the United States both in energy consumption and goods production, one must conclude that the underlying conditions of previous policies have changed.

Former policies, at least those from Nixon to Carter, were drafted with the understanding that the United States would continue be the leader in energy consumption. Further, that it would continue to be a technology leader; and that the supply of cheap energy and cheap manufacturing would aid in maintaining an economic and technological advantage. These goals appear to have been temporarily met before eroding at an alarming pace. Forced technology

transfer and growing Chinese labor costs continue to undercut the motivations of previous trade agreements. Meanwhile the environmental consequences of this trade deal have been accumulating from the start [see section 3.2].

Perhaps these costs could be ignored if the United States were also meeting its hopes for a liberal East Asia. Rather than a freer China, China has grown strong—primarily by meeting US consumer demand. Further, they have used this strength only to bolster the defenses of its illiberal government. This presents both an environmental quagmire and a security crisis. A quagmire concerning the reshoring of environmental impacts and a crisis of a belligerent China. In terms of security Trump has had only two very difficult options: either further enable Chinese autocracy or endanger global peace through trade disentanglement.

### 3.5 Trump's Energy Policy Triangle

Though the recent oil boom is mostly credited with energy independence, demand reduction has been the more important, if silent, partner. This particular moment has been hard fought and marks dramatic changes in policy. Changes which will have international repercussions. As the US embraces being, on the whole, an energy maker rather than energy taker, they further gain the power to disrupt other economies. In the 1970s, supply disruption was enough to severely impact the US economy. Though price spikes may have been largely driven by precautionary demand, this did not make them any less real. Now the shoe is on the other

foot. Energy independence gives the United States a vastly greater bargaining position as demand disruption has the power to severely impact economies dependent on meeting western energy needs (Miller, 2010).

To not overstate the point, historical context is required. Though US proven reserves have grown substantially since the 1970s such reserves still lag far behind countries like Venezuela or Saudi Arabia (BP, 20190. 'Independence' is a relative term—and one that resists easy measurement. Still, at least in terms of net crude imports the US is currently at 1962 levels of dependence (EIA, 2019). But this means little outside of the global political context. We can speak crudely and say that the US global energy position has returned to something similar to pre-crisis times, and that the US is now again in a position to supply its NATO allies with their energy needs. But this would be to ignore five decades of change. The world is a much different place and references to the past can only grant limited insights.

As the saying goes 'history does not repeat, but it does rhyme'. Trump shares similarities with many past presidents. He is, for example, like Regan in that he favors regulation reduction and non-interventionist domestic policies. Yet, he is perhaps most like Nixon. He is like Nixon in his focus on international relations and tactical trade deals. Further, he is like Nixon in his willingness to drastically change the way the United States orientates itself with the rest of the world. Still, very unlike Nixon, Trump has inherited a very different geopolitical situation.

Some have described Nixon's suite of polices one of tactical withdrawal. The United States was and has not ceased to be the world's hegemonic power. This is not to say that its power never waned. Arguable 1970s represents the nadir of US power in the post-war era. Hence Nixon's policies were largely policies of strategic disengagement. He withdrew from the Vietnam war, and vowed never to engage again in protracted foreign wars. He brokerage trade deals, and worked to reduce domestic energy production. To stem dissidents at home he strove to maintain economic stability while he worked towards bi-partisanship—most notably by way of environmental protections. Though these are all good policies, they fall short of the kind of projection of military strength that would have been maintained if the US continued a more aggressive stance towards the USS.R.

In the 1970s the United Sates was no longer in the position to project power in the same, direct way. And perhaps this was a blessing in disguise as some credit the fall of the Soviet Union to an unlikely source. One which emerged over the 1960s and 70s. One which was a much softer kind of power. The cultural revolution had recast western culture as fancy free and fun-loving. The iron-curtain kept out most of this decadent behavior. But, bit by bit, it was smuggled into the Soviet Block—sparking a desire for blue jeans and Chuck Norris movies (Călugăreanu, 2015).

The decline and withdrawal of the United states as the world's superpower has been foretold by many analysts during the Obama years. Is the United States in another period of diminished power, much like the 1970s? —Unlikely, especially in terms of energy. In terms of energy,

Trumps situation more resembles those of post-war presidents like Truman or Eisenhower. However, post-war presidents inherited a world where the United States was preeminent in wealth, military prowess, manufacturing, energy production and technological progress. Today they are merely leaders in military strength, energy production, wealth and technological progress—and only by certain measures.

But what does this mean for energy policy? The Trump administration is clearly focused on the economic and security legs of the policy triangle. Contrary to some critics, Trump is no isolationist. Rather he uses the possibility of isolationism as a threat. The complete closing of the United States' economy is a figurative 'nuclear option' which is only slightly more likely as the literal nuclear option. Some reshoring of manufacturing is occurring, but its final extent is anyone's guess. More likely, the bulk of industry leaving China will end up in other Asian countries or even South American countries with relatively low labor costs (Reinicke, 2019) (Zeihan, 2016). Trump may threaten to sever all trade ties with China and others, but so-far this has been salesmen's bluster. Instead Trump's presidency has been focused on redrawing trade agreements. If the era of energy dependence can be characterized as one where consumer demand was used to softly project western influence abroad, this new moment of energy independence is one where the United States can assert itself in a more dominant way. One where the withdrawal of trade relations is being used to further the political goals of the United States.

In the end Trump may find he should have been a better student of his predecessors. He is currently treading on thin ice with his Chinese trade deal. He has mentioned both the desire to reshore manufacturing and to provide China with its energy needs in the form of natural gas (DiChristopher, 2017). Though a very tough sell, this would be an ideal situation for the United States. Reshoring manufacturing would reduce opportunities along the supply chain for intellectual property theft—helping to ensure the US' crucial technological edge. It would shift trade relations rather than severing them, keeping the door open for continued pressure to Illiberalize China via trade. Even if Trump negotiated everything he wanted. Even if he were to shift China's trade relation from one where the US imports goods to one where the US exports energy, this would still be fraught with problems. Without the US as a purchaser it is unclear how China would be able to find buyers to make up for such a sever lack of consumer demand. Without US consumer demand, China would likely not need as much a share of the United States' newfound energy production. More worrying, the US has, at the same time, placed sanctions on Iran—inadvertently encouraging China to forego US relations in favor of securing Iranian oil (Faucon & McFarlane, 2018). In other words, Trump may accidentally push US rivals into its own economic block, undoing the kind of 'divide and conquer via trade' strategy which Nixon used so successfully.

Properly steering the ship-of-state in transformational times is like threading a needle. If Trump is successful, he very well could shore up the economic and security legs of the energy triangle, while maintain the world's current, fragile peace. However, even if he gets the trade

deal he wants, the third leg of the triangle—the environmental leg—will still be lacking. This marks the final way in which Trump, to his detriment, is unlike Nixon. Though the US has been very successful in using natural gas to reduce carbon emissions, it is unclear if this would be enough to maintain territorial emissions while reshoring manufacturing. Further, if emissions grow Trump leaves himself open to climate change critics.

Environmentally, the Trump administration is focusing attention on reducing plastic in global waterways. This is a noble goal and given that most plastic pollution does not originate from American sources this move casts shade away from the United States. More importantly, plastic reduction is not a popular environmental concern. Considering the current level of rhetoric from certain Democratic rivals the reduction of plastic waste is akin to sweeping the deck of the Titanic. Like Nixon, Trump appears to understand the marriage of economic and political success. Unlike Nixon, Trump seems to be overlooking the value of serving the popular environmental movement of his time. This may prove to be a fatal risk if he hopes for his policies to last beyond his tenure. Any reshoring of manufacturing will, necessarily, bring with it an increase of territorial carbon dioxide emissions.

Still, in a way, Trump is one of the most environmentally ambitious presidents to date. That is, in that his administration aspires to reduce gross carbon emissions while growing GDP and returning manufacturing to American shores. This is a tall order. Meeting any one of these goals would be an accomplishment. Considering how each goal ought to work against the other

succeeding in all three measures would be an impressive feat. Economically, any reshoring will have the disadvantage of higher labor costs. Higher labor costs are liable to be passed onto the costs of products, negatively effecting consumption. If consumption were to decrease it would, in turn, negatively affect GDP. Environmentally, Trump aims to reshore some of the dirtiest industries such as steel and aluminum production; industries which will no doubt work against the reduction of gross emissions.

Perhaps the inertia of prior environmental trends will be enough for Trump to meet these goals. After all, energy use per dollar of GDP have trended downward since the 1950s while the carbon intensity of energy has steeply fallen over the past decade [section 3.3]. Perhaps then, the best way to measure carbon emissions is on a dollar of GDP basis. This would make more sense. Especially, if the US were to somehow regain the mantle of 'factory of the world'. Yet, even at this, emissions per dollar of GDP is threatened by the reshoring process. That is: if reshoring were to reduce consumption via an increase in the cost of consumer goods, this would work against GDP growth. Thus, reshoring would affect measuring CO2 on a GDP basis negatively on both ends—It would reduce GDP via reduced consumption while also increasing territorial emissions.

Of course, these factors do not necessarily imply Trump cannot have GDP growth, Carbon reduction and manufacturing growth at the same time. Rather, they only suggest the deck is very stacked against Trump's ambitions. They also suggest that Trump is placing a great deal of

faith in how much innovation the market can provide when unfettered. The China Shock period transferred a large portion of US energy use and carbon emissions. Any reshoring of manufacturing may work to shrink the gap between territorial and consumption-based estimates. Given that the carbon intensity of energy is vastly higher in China this would no doubt shrink global emissions at the cost of increasing territorial emissions.

If this were to happen it would represent a loss of political capital, a missed opportunity to show that his administration is tackling environmental issues in good faith. For these reasons, and more, the current administration should consider tracking the environmental footprints of its own economy.

## Chapter 4 – Conclusion and Further Study

### 4.1 Conclusion

Given Trumps stance on global warming it may be hard to imagine what value Trumpian politics would have in investing in footprint analysis. With a little imagination it becomes apparent. Though footprint studies have been developed for the goal of enforcing environmental protections internationally. The proposed means of enforcement are typically tax and spend policies. Afterall, if a carbon tax, or a credit trading regime were to be introduced in the United States, companies which outsource production would have an unfair advantage over companies which do not. This describes what the UN call 'carbon leakage'.

As much as Trump distinguishes himself as a nationalist, he is no isolationist. His flurry of sanctions and tariffs have not been employed to end global trade—rather, to change it. His motivations may be economic first and ecological a distant last; however, footprint studies ought to be given priority. Though carbon taxation or credit trade are currently far from being implicated in the United States, Democratic rhetoric on climate change is reaching a fever pitch. If a Democrat were to soon occupy the white house footprint accounts would become a necessary step in policing international corporations. Republicans would do well to get ahead of this. If US reshoring is to be as ecologically superior to offshoring, measuring the effects of such a move ought to be of utmost importance.

There is a kind of irony in the U.N.'s development of the 'carbon leakage' concept. The U.N. is an international body and concerned with developing global standards, yet the elimination of 'carbon leakage' fundamentally lends itself to nationalist policies. Footprint studies can be a tool in tax and spend frameworks as much as it can be used for the justification of tariffs and sanctions. Again, Trump's concerns lie more with security than the environment but the two are not mutually exclusive. The fusion of political, economic and ecological effects of the shale revolution are seen in the rebranding of natural gas as 'molecules of freedom'. As juvenile as this phrase may sound it perfectly describes the current hopes being placed on this energy source. This molecule is helping to reduce the US ecological impact while granting US citizens the wealth required to breathe easy. Still, there is one more, less obvious, implication in the 'freedom molecule' rhetoric. As the US changes from an energy importer to an exporter, so changes their geopolitical stance. The obvious change is stated in McMaster's white paper. Namely, that the United States will have greater influence internationally as they have the potential to provide energy to friendly nations who currently, by economic neissity must purchase from unfriendly nations.

Further, economic foot-printing could be used in coalition building. McMaster speaks of increasing the energy purchasing choices of friendly nations who are economically compelled to buy from autocratic countries. This market-based way of reducing autocratic power is an indirect method. Ecological concerns could be crafted to further limit the economic choices of

autocratic states. European nations tend to be economically similar to the United States while differing in being more concern with climate change issues. If the US, were able to prove how more environmentally friendly its manufacturing processes were, it could organize a new multilateralism which could provide greater pressure on states like China.

Though natural gas may be inferior to wind or solar in their carbon intensity per Btu, their ability to cheaply supplant coal as a fuel for electricity production makes it ideal for bridging the gap between now and a future of even less carbon intensity. This could mark another potential win for the US in terms of economics, ecology and security. Yet, in that emissions are only measured territorially it is politically neutered. Worse, the potential global emissions reductions are endangered by myopic reporting methods. Whereas, during the China Shock, the US was effectively hiding its own true emissions total, a future is possible where the opposite problem emerges. That is: a future where global emissions reduce due to US manufacturing and trade, yet where the US only bears responsibility for its point of source emissions. In other words: where the US effectively replaces foreign coal consumption, yet all that is accounted for in this transaction is the increased territorial emissions due to domestic oil and gas production.

### 4.2 Further Study

The one question which hangs over this paper like a specter is the reliability and feasibility of the multi-regional input-output (MRIO) models which serve as the backbones of CBA studies. I've purposefully kept away from the question of methodology in constructing MRIO models as it is beyond me. Funding is relatively small. Eora's initial costs were a mere $500,000 Australian Dollars. And their annual operating budget was only $250,000 (Wiedmann et. al., 2011). A contemporary of Eora, EXIOPOL, received 5 million Euros in funding. These budgets are nothing compared to the proposed cuts to the $2.5 billion USD proposed to be cut from the EPA (Dennis, 2018). However, the bigger question concerns how reliable a MRIO analysis could be even if fully funded. MRIO studies rely on accurate data provided by all countries. As MRIO studies try to balance both resource consumption (inputs) and value-added (outputs), errors in the initial information would multiply in the conclusions. Further, there's the question of assumptions. The various MRIOs provide conflicting results given their different approaches (i.e., trade tables, value-added, or environmental effects). Needless to say, a proper evaluation of MRIO studies would be necessary before implementing the further policy suggestions.

The United States was not alone in offshoring manufacturing. An excellent topic would be comparing the United States with other NATO nations in terms of carbon dioxide transfers. The globalization period saw a huge increase in import purchases in the United States. The US was not unique in this. The West as a whole has been de-industrializing. The US was chosen

because it is the largest and most important economy to study. This does not mean that it has undergone the largest changes. As a percentage of GDP international trade has increased to a peak of 20% greater than in 1970. As stark a change, this is still 10% below the global average (World Bank, 2019c). This fact yields fertile ground for comparison studies.

An in depth look at the economics and role of free trade policies would make for an excellent, though probably too large, project. The amount and complexity of grants, tax incentives, credits etc., in the energy sector is dizzying. Peter Zeihan implies that the flurry of innovation in shale exploitation would not have been possible without President Obama lifting the ban on international petroleum sales for domestic products. However, he also mentions that the technological requirements (particularly in information technology) have only made shale exploitation competitive in the past six years or so. This raises a very interesting question about lassie-faire policies. Could these innovations have been made earlier? Did trade protectionism forestall innovation, or did it provide the United States with enough prosperity to develop technology until the time that it could reinvest in crude production? Further, if domestic oil were never banned from international markets would cleaner energy technologies have been developed faster? Environmentally, would global emissions now be lower if the United States had not relied so heavily imports?

Lastly, there's the question of what to do with surplus methane? Currently the US is encouraging international sale. If methane was used globally as a 'transition fuel' how much

global emissions could be reduced? Alternatively, if methane were not to find sufficient buyers it could become so cheap as to be considered a waste product. Unfortunately, methane is a gas and transporting gasses present logistical difficulties. Recent advancements have been made in more cheaply transforming methane into methanol, a liquid (Yirka, 2017). Methanol could replace ethanol as a fuel additive or it could be used to power fuel cells. Unlike purely electric vehicles fuel cells can be instantly fueled (Osborn, 2019). Hydrogen has taken center stage as the fuel of choice for fuel cells. Hydrogen is highly flammable and is a gas. Hydrogen, like purely electric vehicles, would require large infrastructure investments in order to create fueling stations. Methanol, on the other hand, would require much less cost in retrofitting the existing infrastructure. A feasibility study on largescale methanol fuel cell vs. purely electric vehicles would make for another excellent paper.

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