ABSTRACT
China’s economic reforms over the last three decades have been monumentally successful, so much so that China now directly challenges the unipolar structure of the current international system. China’s ascent into “superpowerdom,” while remarkable has generated severe environmental consequences that pose some of the most serious security threats to China, the Asia-Pacific region, and the globe. China now faces three major environmental crises that threaten its domestic stability and international security – foreign energy dependence, water scarcity, and air pollution and climate change. China’s policy response to these issues could potentially inflame historical geopolitical rivalries and disrupt global economic stability. Given the security implications of how China will continue its “peaceful rise,” this thesis explores China’s foreign policy options and attempts to predict how China will behave in response to each environmental challenge. This thesis, using a hybrid of qualitative and quantitative methodologies, tests existing hypotheses found in environmental security literature to determine whether China will pursue peaceful, disruptive, or violent outcomes to resolve each environmental crisis.

The first chapter of this thesis looks at China’s dependence on foreign energy sources, a significant vulnerability that undermines China’s international leverage and foreign policy objectives and presents opportunities for violent conflict between China and its energy competitors. This chapter finds that rather than achieving energy security by militarily engaging energy competitors or supply manipulators, China is more likely to pursue bilateral defense alliances with countries that serve as its primary energy source. The second chapter of this thesis examines China’s water scarcity crisis, which is projected to become one of the most destabilizing events of the 21st century for human
and food security. This chapter optimistically finds that China will not engage in a violent inter-state “water war,” but will pursue cooperation and diplomatic resolutions to resolve existing water tensions. Finally, the third chapter of this thesis explores China’s air pollution and climate change crisis, which threatens China’s economic growth and by extension, global economic stability. This chapter finds that China can successfully fight its “war on pollution” and maintain high levels of economic growth by employing strategic economic incentives and “positive restrictions” rather than establishing barriers to foreign direct investment.

The conclusions of this thesis are important contributions to the literature on environmental security and provide strategic opportunities for United States policymakers to engage and influence China’s foreign policy decision-making process on the environment and international security.

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To my husband Tyler,

Thank you for reading all my papers and helping me master Excel. I could not have done this without you and your unending support and patience.

To my parents Jill and Michael,

Thank you for making me dinner before every class. They were delicious and showed me just how much you truly care. Love you both.
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INTRODUCTION

China’s economic reforms over the last three decades have transformed China from a sleeping giant into a global economic powerhouse that could challenge the unipolar structure of the international system. China’s economy has grown at an astounding average annual rate of nearly 10% since 1989.\(^1\) This dramatic rate of economic growth has earned China the International Monetary Fund’s symbolic title of largest economy in the world based on gross domestic product (GDP) and purchasing power parity, a position once occupied by the United Kingdom (UK) and later claimed by the United States (US) in 1872.\(^2\) Unfortunately, like the Industrial Revolutions experienced in the UK and US, China’s economic transformation has not been without consequence. What experts ominously describe as “the dark side of growth,” China’s “peaceful rise” has created one of the largest environmental nightmares of the 21st century. China now faces immense environmental challenges that have grave security implications at the domestic, regional, and international levels.

China’s over-exploitation and over-extraction of its national resource base now threaten China’s domestic economic, political, and social stability. Movements of internal social unrest are rapidly growing as the Chinese regime fails to reverse trends in environmental degradation and resource scarcity. Beyond China’s borders, China’s regional neighbors now have to combat transboundary air pollution, acid rain, fisheries depletion, and the degradation and depletion of shared river basins caused by decades of


unchecked Chinese economic growth and development.\textsuperscript{3} There is also increasing concern of growing political tensions over resources exploited by or shared with China that could ultimately culminate in violent armed conflicts and/or aggressive military unilateralism by China or its competitors. Of greatest concern to academics, policymakers, and China watchers are: the potential military conflicts in the South China Sea over disputed territories rich in oil and gas deposits,\textsuperscript{4} possible “water wars” in water-stressed South and Southeast Asia because of China’s unilateral damming and diversion schemes,\textsuperscript{5} and global economic decline and instability due to the costs of China’s environmental crises.

This intersection of economic growth and development, environment, and security has generated much interest and demand for debate on environmental security. While there is no singular and perfect definition of environmental security, the Institute for Environmental Security presents a comprehensive explanation of the complex relationship between the environment and security and the importance of studying such linkages, detailed below:

Environmental security is central to national security, comprising the dynamics and interconnections among the natural resource base, the social fabric of the state, and the economic engine for local and regional stability. While the precise roles of the environment in peace, conflict, destabilization, and human insecurity may differ from situation to situation and as such are still being debated in relation to other security and conflict variables, there are growing indications that it is increasingly an underlying cause of instability, conflict, and unrest. To the extent humankind neglects to maintain the globe’s life-supporting eco-systems generating water, food, medicine, and clean air, current and future generations will be confronted with increasingly severe instances of environmentally induced changes. Such events will test our traditional concepts, boundaries, and understandings of national security and alliance politics and, if taken for granted,\textsuperscript{6}


may lead to conflict, including violent conflict, from the global to the regional, national, local, or human level.6

To further the debate on environmental security, this thesis looks specifically at the environmental challenges China faces that are predicted to create the most turbulence on the international scale due to the unsustainable rates of exploitation and high global demand. These environmental challenges, which have been described as chokepoints in China’s development and stability, include foreign energy dependence, water scarcity, and air pollution and climate change. How China will behave in light of these environmental challenges is highly speculated on and widely divergent in expectations.

The goal of this thesis is to predict China’s foreign policy approach in response to each aforementioned environmental challenge and assess which variables will increase the likelihood of a peaceful, disruptive, or violent outcome. This thesis uses international relations and international political economy theory to frame China’s foreign policy perspective, but applies a hybrid of qualitative and quantitative methodologies to review how states behaved in historical case studies pertaining to each environmental constraint. This thesis presents an overall hypothesis that China will behave peacefully as it confronts its environmental security challenges and pursues continued economic growth and development. While this thesis is not intended to provide policy recommendations, the conclusions of all three chapters have significant policy implications and can serve as a guide for how US policymakers should approach environmental security issues, particularly as it relates to China and the Asia-Pacific region.

The first chapter of this thesis reviews how China will behave in its growing dependence on foreign energy sources. Energy dependence, as it pertains to

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environmental security, is recognized by most theorists as a strategic vulnerability that could potentially be used to undermine a state’s foreign policy options and degree of influence in the international system. Any changes to energy infrastructure, prices, routes, or supplies could critically destabilize a nation-state’s economy and by extension, global food security. Given that the economy is an essential component of national power and national security, states are expected to seek energy security policies that minimize disruptions to and/or restore their energy supply. The fear is that interference or perceived interference of the energy supply chain could result in dangerous over-reactions or miscalculations by affected nation-states, particularly by those states that are heavily dependent on energy imports.\textsuperscript{7} This is the case for China.

China has already reached the status of the world’s largest net importer of petroleum and other liquid fuels.\textsuperscript{8} As China’s dependence on coal, natural gas, petroleum, and oil imports grows, as does its growing population base and industrial and manufacturing sectors, there is increasing concern that China could consider military aggression as a means of achieving energy security, whether that be for opportunistic or defensive purposes. Others predict a more optimistic response as they expect increased levels of investment in renewable energy alternatives, diplomatic engagement, and alliance behavior to achieve energy security.

This chapter hypothesizes that alliance formation can and will be used as a procurement strategy and protection policy for great powers, like China, to increase state autonomy and maintain state security. Using ten case studies, this chapter applies a two-
sample t-test to examine whether resource dependence was correlated with alliance formation for great powers. This chapter finds that there is fairly strong correlation between resource dependence and alliance formation. Great powers have a higher likelihood of forming or keeping asymmetric alliances with resource-rich weak states as well as symmetric alliances with resource-rich great powers that it is dependent on for energy resources.

The conclusions of this chapter are significant as it adds energy dependence as another predictive variable of alliance formation and counters traditional balance of power and balance of threat theory that great powers have little incentive to form alliances with weak states. These findings should have a significant impact on US foreign policymakers as it could provide a predictive model of Sino-centric bilateral and/or regional security blocs that may challenge the current US-centric unipolar structure of the international system and US influence in the Asia-Pacific and Middle East regions.

The second chapter of this thesis explores how China will behave in its looming crisis of water scarcity. Water scarcity, as it pertains to environmental security, is predicted to be one of the primary sources of global instability within this century and the next. Most have come to agree that water scarcity often contributes to intrastate civil conflict and uprisings, can lead to destabilizing food insecurity, and health pandemics. However, not many can agree on whether water scarcity is a source of inter-state armed conflict or war. Water-stressed China is now finding itself in the center of this debate as it battles its severe water scarcity challenge. China’s current approach of aggressive unilateral “water grabs” to correct the crisis has generated considerable regional backlash.
Many environmental security theorists are now predicting “water wars” between China and its neighbors, which Elizabeth Economy explains below,

Water, in contrast [to oil and gas] comes far closer to creating inescapable and zero-sum competition…This potential for real damage is often compounded by poor or nonexistent information sharing between China and others with which it shares rivers. Real problems are exacerbated when a lack of information makes them less manageable, and phantom problems can become a source of conflict when there is insufficient information available to sort out myth from reality.9

Others expect a peaceful resolution through technological advancement and diplomatic negotiations. This chapter hypothesizes that downstream river-states will pursue inter-state armed conflict if the following conditions are present: if the upstream country restricts river flow, the downstream country is militarily stronger, there is a history of antagonism, and if technological solutions are absent. Using controlled case comparison and process tracing methodologies, this chapter tests whether water scarcity was correlated with inter-state armed conflict and tests whether the aforementioned variables were present during any inter-state armed conflict post-1945 where water was identified as the primary reason for war.

This chapter finds that there is weak correlation between water scarcity and inter-state armed conflict. Cooperation is more likely to be the preferred mechanism and first channel of recourse to address water scarcity. However, states are more likely to pursue military recourse if and when the seven following conditions are met: existing water scarcity or chronic water stress, an absence of technological solutions, competition for shared resources, attempted negotiations fail or cease to meet the state’s interests, perceived threat of aggression or perceived opportunity of gain, history of antagonism or conflict, and military superiority. As such, this chapter offers the term “pessimistic

equity-oriented pragmatism” as a new perspective on “water wars” and by extension, resource wars. Historical support for pessimistic equity-oriented pragmatism is significant as it demonstrates the importance of prioritizing effective international cooperation and diplomatic engagement over militarizing policy responses to such environmental crises. By brokering these discussions, international organizations and contributing state members have an opportunity to positively influence outcomes in the Asia-Pacific region and other geographical areas facing similar environmental crises.

The third and final chapter of this thesis discusses how China will behave as it confronts its air pollution crisis and pursues climate security. As China’s air pollution crisis is now one of the leading causes of internal unrest, regional disputes, and even hindering China’s own economic growth, the Chinese government is becoming serious on its war on pollution, having recently announced a series of anti-pollution laws that promise severe penalties for guilty polluters. Experts are now beginning to speculate on the short-term and long-term effects these new laws will have on China’s economic growth, while others are questioning what China new laws means for open trade, foreign direct investment (FDI), and China’s continued integration into the international economy. This chapter looks specifically at the relationship between pollution and FDI policies, with FDI serving as a proxy for openness to trade and economic liberalization.

This chapter hypothesizes that states are less likely to impose barriers to FDI as a tool to curb pollution, but will instead implement FDI policies that favor low-polluting sectors. Using a hybrid of quantitative and qualitative methodologies against eleven developed economies as case studies, this chapter tests whether air pollution was correlated with restrictive FDI policies. This chapter finds that there is weak correlation
between air pollution and FDI policies in general. All case studies maintained high FDI openness while experiencing reductions in carbon dioxide (CO₂) emissions. Few states used FDI policies to address pollution, relying primarily on environmental regulations. When FDI policies were used to curb pollution, states used a variance of strategic FDI incentives and “positive restrictions” to achieve reductions in pollution and CO₂ emissions. The conclusions of this chapter are significant as it demonstrates that nation-states can maintain high levels of trade and FDI openness while also confronting CO₂ emissions, and by extension environmental pollution. This chapter finds that states can employ a hybrid of economic incentives or “positive restrictions” to effectively curb pollution without compromising a state’s economic growth or development. This presents an opportunity for developing and developed economies to openly participate in the global economy and remain committed to fighting pollution and environmental degradation.

In conclusion, the findings of this thesis are generally optimistic as it looks to China’s future and its “peaceful rise.” This thesis contends that China’s behavior will likely remain peaceful despite its growing population demands and lessening resource base. China is more likely to maintain its trends of resource securitization using bilateral alliances, cooperative diplomacy, and openness to foreign direct investment. While unilateral military aggression and disruptive economic behavior are certainly possible, these policy actions are found to be less likely given the environmental consequences of such action and advantages gained from pursuing peaceful resolutions. Thomas Rawski captures this sentiment best when he writes:

Beijing’s intense focus on building a prosperous Chinese future, along with China’s large and growing reliance on global markets to promote its economic
objectives, tilts China’s international behavior toward cooperation rather than conflict. Despite the inevitable friction that accompanies the China’s expanding economic, political, military, and technological strength, this orientation, which is evident in Beijing’s approach to issues surrounding trade, environment, property rights, and the Korean peninsula, creates an opportunity for the international community to adjust to China’s expanding power and influence through mutual agreement rather than armed struggle.10

CHAPTER 1

WILL CHINA TURN TO ALLIANCES TO RESOLVE ITS ENERGY DEPENDENCE CRISIS?
Introduction

In 2010, China became the largest energy consumer and producer in the world.\textsuperscript{11} In 2012, China accounted for 49\% of global coal consumption and was the third-largest liquefied natural gas importer in the world.\textsuperscript{12,13} In 2013, China took the title of largest net importer of petroleum and other liquid fuels and accounted for one-third of the world’s oil consumption alone.\textsuperscript{14,15} While China has certainly prioritized diversification in its energy sources and has invested heavily in solar and wind power, non-renewables will likely remain a significant source of China’s energy supply for the next several decades. As China pursues its transition to non-renewables, the world is now preparing for the next-phase of energy security and is anxiously awaiting how China will realize its uniquely Chinese vision for achieving energy security.

Recent projections of China’s future energy demands and consumption rates have generated considerable speculation on the future of global energy security and even food security. Phillip Andrews-Speed summarizes these fears and the potential implications China’s energy demands could have on global security,

Some of the most prominent fears and concerns of the Western strategic community [are] that China’s import needs could lead to global scarcity; that China will use force, particularly in the South China Sea, to ensure security of supply; that it could lead central Asia and Russia acquiescing to Chinese

\textsuperscript{11} China overview. in United States Energy Information Administration [database online]. 2014Available from \url{http://www.eia.gov/countries/cab.cfm?fips=ch}.
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\textsuperscript{14} China is now the world's largest net importer of petroleum and other liquid fuels. in United States Energy Information Administration [database online]. 2014Available from \url{http://www.eia.gov/todayinenergy/detail.cfm?id=15531}.
\textsuperscript{15} China overview. in United States Energy Information Administration [database online]. 2014Available from \url{http://www.eia.gov/countries/cab.cfm?fips=ch}. 
hegemony in exchange for guaranteed energy exports; or that China will be tempted to sell missile, nuclear, and other destabilizing technology in the Middle East in exchange for security of supply.\textsuperscript{16}

This paper looks specifically at whether China will pursue geopolitical alliances to achieve its energy security, with alliances defined in this paper as "a formal or informal arrangement for security cooperation between two or more sovereign states."\textsuperscript{17} This paper proposes that resource dependence serves as an incentive for states to form alliances, whether they are symmetric or asymmetric, and addresses the realist assumptions that great powers possess a surplus of security that makes them immune to the effects of resource depletion. By conducting a comparative study of energy trade patterns and great power-alliance behaviors, this paper attempts to demonstrate how alliance formation can and will be used as a procurement strategy to help states secure resources to increase state autonomy and maintain state security. Conclusions of this study will be used to then predict which nation-states China will pursue alliances with in the 21\textsuperscript{st} century.

**Literature Review**

Existing scholarship on the relationship between nation-state alliances and resources predominantly characterize capability building as a motivator of alliance formation. Four major theoretical camps lead the literature on alliance formation. However, they reach differing conclusions on the causal relationship between resources and alliance formation. In all the theoretical models presented, alliance formations are


grounded in a balance of power or balance of threat paradigm and are bound to the accepted assumption that states will either balance against an expansionary power or an aggressive threat. This paper accepts this Realist assumption, but recognizes that Liberalists, Constructivists, and Marxists would predict and interpret alliance behavior differently.

*Balance of power alliances*

In classic balance of power tradition, nation-states form alliances in response to shifts in systemic power or the distribution of capabilities. The capability-aggregation model, which takes the lead in balance of power-alliance formation literature, theorizes that through alliance formation, states will aggregate individual state capabilities or sources of national power to deter or defeat a common enemy. Kenneth Waltz defines these capabilities as “size of population and territory, resource endowment, economic capability, military strength, political stability and competence.” Randall Schweller goes beyond this definition by making the argument that capabilities are not strictly limited to the material elements of geography, demography, economic power, or military strength. To Schweller, they are also defined by the state’s administrative ability to extract and mobilize these elements. Schweller faults capability-aggregation theorists for relying on the implicit assumptions that states are equal in material and administrative capacities, and will respond with comparable efficiencies. Glenn Snyder offers a solution

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to Schweller’s critique by proposing the term “power resources.” This new term maintains Waltz’s definition of capabilities or resources, used interchangeably here, but accounts for the use or application of these capabilities against opposing states. James Morrow also addresses the failure of the capability-aggregation model to allow for asymmetric alliances in its balance of power paradigm – which Morrow defines by the variation in capabilities and benefits allied states have to contribute to or gain from an alliance. He offers the security-autonomy tradeoff model as an alternative to capability-aggregation as it addresses the balance of power assumption that all potential allies, of which only great powers are considered, hold comparable or equal capabilities. A simplistic explanation of the security-autonomy tradeoff model is that great powers will form alliances with weak states to increase their autonomy, while weak states will form alliances with great powers to increase their security. In this scenario, both states must consider their internal and external situation to determine the cost-benefit ratio of engaging in alliance formation.

*Balance of threat alliances*

Stephen Walt offers a variation of classic balance of power theory by making the compelling argument that the greater a nation-state’s aggregate power (defined as a state’s total resources to include population, total military and industrial capability, and technological prowess), the greater the threat posed. In Walt’s interpretation of balance of power theory, where threat outweighs power, nation-states will balance against or bandwagon alongside superior threats that hold greater “aggregate power, proximity,
offensive capability, and offensive intentions.”

Walt explains that balancing through alliance formation prevents domination by a single superpower, while bandwagoning through alliance formation guarantees state survival and offers opportunity to share in the spoils of victory gained by the superpower state. This opportunistic motive, which Schweller coins as bandwagoning for profit, brings to attention an inconsistency in Walt’s balance of threat theory that alliance formation is always in response to threats rather than power imbalances. It also contradicts Walt’s assessment that bandwagoning is inherently coerced, involuntary, or an act of appeasement. Schweller offers the interpretation that bandwagoning is not always defensive, but can also be offensive.

Revisionist states may in fact be motivated by their desire for expansion and gain in position and resources, an expected benefit of siding with a great power. To Schweller, alliance formation is just as much in response to threats as they are to gain resources.

**Power-transition theory**

While balance of power and balance of threat theories emphasize the importance of nation-states maintaining the status quo through internal growth or external alliance, power-transition theory maintains that internal growth of capabilities may lead a rising power to challenge the status quo through conflict. A.F.K. Organski, Jacek Kugler, and Douglas Lemke rationalize that the aggregation of capabilities creates an imbalance in the hierarchical status quo structure, rather than correcting it. Power-transition theory, however, ignores the relevance of alliances as a means of augmenting national power. To power-transition theorists, alliances are irrelevant to the balance of power, as

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24 Ibid.
demonstrated by comments by Organski, Kugler, and Lemke that “major changes in the international distribution of power occurred outside the normal pattern of alliances” and that “alliances affect only the size of the intervals between the strata, but could not alter the fundamental ranking of the great powers dominating the international system.”²⁷ In Woosang Kim’s interpretation of power-transition theory, both internally derived capabilities and external augments of power through alliance formation are considered and relevant.²⁸ Kim reaches the conclusion that alliances are just as much an indicator or measure of national power and should be considered in the calculations for when a nation reaches the peak of power transition.

Third world alignment

Jack Levy and Michael Barnett offer a different approach as to why nation-states form alliances, with resource securitization as the singular purpose of alliance formation.²⁹ Levy and Barnett argue that for resource-constrained nation-states, in particular third world countries, leaders are more inclined to choose external alliances over internal mobilization as it allows them to “secure urgently needed economic and military resources to promote domestic goals, respond to external and internal security threats, and consolidate their domestic political position.”³⁰ They make the argument that balance of power and balance of threat theorists fail to consider domestic political and economic constraints as variables in alliance formation as they are acting under the assumption that only external security threats are of concern. According to Levy and

Barnett, systemic realist approaches fail to consider that most threats third world leaders face are domestic in nature. Diverting or expending already inadequate resources on external security threats places regime stability, domestic security, social welfare, and the economic health of the country at risk – a cost too great for third world countries. Levy and Barnett explain that these elements are just as important as external threats for third world leaders and should be carefully weighed in the cost-benefit analysis rationalizing for or against alliance formation.

Summary

To summarize the four theoretical models presented above, a breakout of how they perceive and explain the relationship between resources and alliances is provided below. It is important to note that while the four theoretical models presented above reach varying conclusions about how resources or capabilities maintain or revise the status quo, resources remain the motivation behind alliance formation.

Table 1: Resources, Capabilities and Alliance Formation

<table>
<thead>
<tr>
<th>Theoretical model</th>
<th>Security challenge</th>
<th>Motivation</th>
<th>Action</th>
<th>Predicted end result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance of power</td>
<td>Power imbalance</td>
<td>Capability aggregation</td>
<td>Alliance formation</td>
<td>Maintained international status quo</td>
</tr>
<tr>
<td>Balance of threat</td>
<td>Threat to state survival</td>
<td>Capability aggregation</td>
<td>Alliance formation</td>
<td>Maintained international status quo</td>
</tr>
<tr>
<td>Security-Autonomy Tradeoff</td>
<td>Threat to state survival</td>
<td>Increase in security OR Increase in autonomy</td>
<td>Alliance formation</td>
<td>Maintained preferred international status quo</td>
</tr>
</tbody>
</table>
In all the aforementioned theoretical models, except the security-autonomy tradeoff model and the third world alignment theory, weaker states are not worth forming alliances with and as a result, asymmetrical alliances are not considered. Walter Lippmann explains this rationale when making the assertion, …

“A weak ally is not an asset. It is a liability. It requires the diversion of power, money, and prestige to support it and to maintain it. These weak states are vulnerable. Yet the effort to defend them brings us no nearer to a decision or to a settlement of the main conflict. Worst of all, the effort to develop such an unnatural alliance of backward states must alienate the natural allies of the US.31

Failure to tolerate these “unnatural” or asymmetrical alliances is to ignore the realities of historical alliance structures and existing ones today. The third world alignment theory does allow for these “unnatural” or asymmetrical alliances. However, the rationale for such alliance behavior is strictly limited to this first world-third world paradigm with the third world being the primary benefactor of alliances. To Levy and Barnett, domestic security needs are the primary motivator for alliance formation, but are limited to the weaker states being the sole beneficiaries. An explanation for why great powers would consider forming alliances with weak states is not offered.

The security-autonomy tradeoff model also allows for asymmetric alliances, but does not consider domestic security or resource securitization as a motivator for alliance

<table>
<thead>
<tr>
<th>Power-transition</th>
<th>Power imbalance</th>
<th>Capability aggregation</th>
<th>War</th>
<th>Altered international status quo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Third world alignment</td>
<td>Domestic insecurity</td>
<td>Resource securitization</td>
<td>Alliance Formation</td>
<td>Maintained domestic status quo</td>
</tr>
</tbody>
</table>

formation. Morrow explains that great powers are more likely to form alliances with weaker states to increase their autonomy. Concessions offered by weak states, like military bases or coordination of foreign and domestic policies, will incentivize great powers to form alliances, resulting in the great power increasing its autonomy and the weak increasing its security. However, according to Morrow, great powers possess a surplus of security and thus are not concerned with increasing capabilities, a measurement of power and guarantor of security. Morrow argues that “increases in their [exceptionally powerful nations] capabilities should be irrelevant to their interest in forming asymmetric alliances….increases in capabilities are not necessary to ensure their ability to protect their clients.”

This paper agrees with the security-autonomy tradeoff model that exceptionally powerful nations are incentivized to form asymmetric alliances in order to increase their autonomy. However, this paper counters Morrow’s conclusion that an increase in capabilities is irrelevant to asymmetrical alliance formation. Exceptionally powerful nations are not immune to resource depletion and cannot presume its surplus of security can be maintained indefinitely. Additionally, exceptionally powerful nations may lack critical resources that are not native and need to be imported from abroad. With industrialization depleting resources and globalization accelerating demand, exceptionally powerful nations must consider external alliances and alignments for resource securitization and capability aggregation purposes. As such, this paper hypothesizes that resource dependence incentivizes great powers to form both

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33 Ibid.
asymmetric alliances with resource-rich weak states and symmetric alliances with resource-rich great powers.

**Methodology**

To test this hypothesis, this study conducts three analytical tests: (1) an analysis of resource trade patterns in the commodities sectors of coal, natural gas, petroleum, and electricity from 1991 to 2011; (2) an analysis of US, French, German, Japanese, UK, and the BRICS’ alliance behaviors toward commodity import partners post-Cold War; and (3) a comparative study of the two data sets to validate resource dependency as a predictive determinant of alliance formation or alignment behavior. This study accepts that alternate variables like similar ideologies, historical records of partnership, and a shared geopolitical threat, may influence the likelihood of alliance formation and are difficult to control for. This study does not intend to contest the role of these variables on alliance formation nor are the conclusions of this study negated because of the existence of other variables. Through statistical analysis and measurements of probability, this study simply wishes to add resource dependency as an additional variable in alliance formation.

Resource dependency is measured by the amount of commodities domestically produced, domestically consumed, externally imported, and externally exported. This study uses Maaike Bouwmeester’s three measurements of resource dependency: (1) the ratio between national consumption and national production, (2) the percentage of national consumption sourced abroad, and (3) the number of trade partners per resource. For the first, resource dependency is measured by the ratio between net imports (imports minus exports) and consumption, or the percentage of consumption sourced by net

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imports. A nation-state is considered to be import-dependent as long as net imports source greater than 0.1% of national consumption. This occurs when imports resolve the gap between national production and national consumption. The higher the percentage or ratio between net imports and consumption, the greater the dependency. Resource dependency on a particular import country is measured by the ratio between imports from country X and net imports, or the percentage of net imports sourced by country X. Dependency on an import country is decreased if there are a greater number of trade partners.

The commodities coal, natural gas, refined petroleum, and electricity are selected as the independent variables for this study given that they source a large portion of the world’s energy consumption. While China may not be a large importer of natural gas or refined petroleum, these two commodities are selected as they are commonly imported among the case studies selected. Electricity was also selected as a data point because it encompassed the renewable energy sources used to supply a notable portion of global energy consumption, to include nuclear, hydroelectric renewables, non-hydroelectric renewables (geothermal, wind, solar, tide, wave, biomass, and waste), fossil fuels, and hydroelectric pumped storage. This paper recognizes the potential overlap caused by double-counting the energy sources used for electricity production. However, because import data for renewable energy sources is not available, electricity was selected as an independent variable. The data used to determine resource trade patterns and resource

dependency is derived from the US Energy Information Administration and the Massachusetts Institute of Technology’s Observatory of Economic Complexity.\textsuperscript{36, 37}

Alliance behaviors are more openly measured for this study and inclusive of all military alliance structures regardless of formality. This study uses Walt’s definition for alliances, "a formal or informal arrangement for security cooperation between two or more sovereign states."\textsuperscript{38} In applying Walt’s definition, the meaning of alliance and alignment are blurred to include any type of military agreement that establishes an expectation of behavior and consequence. Defense pacts, neutrality pacts, nonaggression pacts, consultation pacts, offense pacts, and ententes are all considered as possible alliance responses. International agreements, coalitions, programs, treaties, and/or organizations are not considered in this study as they are centered on policy objectives that achieve the collective good rather than offer bilateral security and autonomy guarantees. Data to determine alliance formation and alignment behavior is derived from the Alliance Treaty Obligations and Provisions Project (ATOP) and the Correlates of War Project (COW).\textsuperscript{39, 40} Alliances formed 1991 onwards or still in good standing as of 2012 were selected from the ATOP and COW data sets. Alliances that remained in good standing were considered for this study based on the reasoning that alliance duration or alliance cohesion is just as much a response to resource dependence as alliance formation. Additionally, given that most bilateral defense alliances were formed directly

\textsuperscript{36} Simoes, AGJ and CA Hidalgo. 2011. \textit{The Economic Complexity Observatory: An Analytical Tool for Understanding the Dynamics of Economic Development}. Workshops at the Twenty-Fifth AAAI Conference on Artificial Intelligence.
\textsuperscript{40} Gibler, Douglas M. 2009. \textit{International military alliances, 1648-2008}. CQ Press.
after World War II, already existing alliances had to be considered. How this affects the conclusions of this paper will be explained in the Discussions section of this study. The US, Brazil, France, Germany, UK, Russia, South Africa, China, India, and Japan were used as case studies given their classification as great powers.

Next, a two-sample t-test is used to test the hypothesis that resource dependence results in an increased probability of alliance formation. Two test groups are created: resource dependent importers and non-resource dependent importers. Resource dependent importers are defined as those countries where consumption exceeds production and imports from another country source more than 10% of national consumption. Non-resource dependent importers are defined as those countries where consumption exceeds production, but imports from another country source less than 10% of national consumption. For the purpose of this study, a country will be labeled as a resource dependent importer or a non-resource dependent importer for each commodity. Determination of grouping is strictly dependent on the percentage of imports from another country for that specific commodity. Countries where production levels exceed consumption are not considered for the two-sample t-test given that they did not qualify as a commodity importer.

A two-sample t-test is then applied to determine the probability of a defense alliance forming in cases of both test groups. A resource dependent importer is assigned a binary value of 1, while a non-resource dependent importer is assigned a value of 0. An existing bilateral defense alliance between the importer and exporter is assigned a binary value of 1, while a non-existing bilateral defense alliance is assigned a value of 0. The
two data sets are then paired in a comparative two-sample t-test to determine the p-value. The following shows how the t-test is formulated:

- **Array 1 (first data set):** Aggregate values of resource dependent and non-resource dependent importers for selected commodity
- **Array 2 (second data set):** Aggregate values of existing defense alliances or non-existing defense alliances for selected country
- **Tails (number of distribution tails to return):** Value of 1 for one-tailed distribution
- **Type (type of t-test):** Value of 2 for two-sampled equal variance (homoscedastic)
- **Null Hypothesis:** There is no difference between resource dependent and non-resource dependent countries in the proportions of defense alliances
- **Alternative Hypothesis:** Resource dependent countries have a greater proportion of defense alliances.

A p-value of less than 0.1 disproves the null hypothesis and proves the alternative hypothesis. If a p-value of less than 0.1 is achieved, the null hypothesis is rejected and the alternate hypothesis is accepted. The aggregate p-value of imported commodities by each country is used to assess whether there is a higher probability of the null hypothesis or alternate hypothesis occurring. A lower p-value indicates a low probability of the null hypothesis occurring and a greater probability that the alternate hypothesis will occur. Once the p-values are ascertained, probability matrixes are then created to determine the exact probability of the null hypothesis or alternate hypothesis occurring. A probability matrix is created for each case study country and commodity. It is then aggregated to determine the average probability of a resource dependent country forming or not
forming a defense alliance as well as a not resource dependent country forming or not forming a defense alliance.

**Data**

**Table 2: Two-sample T-Test P-values**

<table>
<thead>
<tr>
<th>Nation-State</th>
<th>Coal</th>
<th>Natural Gas</th>
<th>Refined Petroleum</th>
<th>Electricity</th>
<th>Aggregate P-value</th>
<th>Accepted Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>---</td>
<td>0.00000000000000000000 271147</td>
<td>0.00000000000000000000 0090 9</td>
<td>0.00000000000000000000 9969</td>
<td>7.08152E-72</td>
<td>Alternate</td>
</tr>
<tr>
<td>Brazil</td>
<td>0.18621 0864</td>
<td>0.000842219</td>
<td>0.0000000242</td>
<td>0.000842</td>
<td>0.000000002 8731546</td>
<td>Alternate</td>
</tr>
<tr>
<td>France</td>
<td>0.00000 000122</td>
<td>0.0000000080 08</td>
<td>0.0000000000000000 0276</td>
<td>---</td>
<td>0.00000000000000000000 373</td>
<td>Alternate</td>
</tr>
<tr>
<td>Germany</td>
<td>0.00000 0000731 752</td>
<td>0.0000000000000000 822812</td>
<td>0.0000000000000000 0498784</td>
<td>---</td>
<td>0.00000000000000000000 3683</td>
<td>Alternate</td>
</tr>
<tr>
<td>UK</td>
<td>0.00002 37604</td>
<td>0.0000000000000017 7096</td>
<td>---</td>
<td>0.0000000827 623</td>
<td>0.00000000000000000000 4102</td>
<td>Alternate</td>
</tr>
<tr>
<td>Russia</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>South Africa</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>China</td>
<td>---</td>
<td>0.201858201</td>
<td>0.011435184</td>
<td>---</td>
<td>0.064913462</td>
<td>Alternate</td>
</tr>
<tr>
<td>India</td>
<td>0.00589 5101</td>
<td>0.007254065</td>
<td>---</td>
<td>0.007254065</td>
<td>0.0000008857 8818</td>
<td>Alternate</td>
</tr>
<tr>
<td>Japan</td>
<td>0.01646 8153</td>
<td>0.065583486</td>
<td>0.022386805</td>
<td>---</td>
<td>0.000825</td>
<td>Alternate</td>
</tr>
</tbody>
</table>
Sources: US Energy Information Administration, International Energy Statistics; Alliance Treaty Obligations and Provisions Project (ATOP); the Correlates of War Project (COW); and the Massachusetts Institute of Technology’s Observatory of Economic Complexity.

Table 3: Overall Average Probability Matrix

<table>
<thead>
<tr>
<th></th>
<th>Defense Alliance with Import Partner</th>
<th>No Defense Alliance with Import Partner</th>
<th>Total Import Partners</th>
<th>Probability of having a defense alliance with import partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource Dependent</td>
<td>34</td>
<td>23</td>
<td>57</td>
<td>59.65%</td>
</tr>
<tr>
<td>Not Resource Dependent</td>
<td>548</td>
<td>1085</td>
<td>1633</td>
<td>33.56%</td>
</tr>
</tbody>
</table>

Discussion

Conclusions of the two-sample t-test reveal that the p-value is consistently less than 0.1 for the country case studies of US, Brazil, France, Germany, UK, China, India, and Japan. Russia and South Africa could not be used as case studies in the two-sample t-test given that their production levels far exceeded consumption and thus they did not qualify as importers for the commodities tested. A consistent p-value of less than 0.1 indicates that the statistical probability of the null hypothesis occurring is unlikely. Therefore, a p-value of less than 0.1 confirms the alternate hypothesis that resource dependent countries have a higher likelihood of forming or keeping an alliance with trade partners that they depend on for resources.

This likelihood is irrespective of power status of the primary commodities exporter. Alliances between great powers and weak states and great powers and near equal power states share the same probability of alliance formation or alliance duration. This conclusion significantly varies from mainstream balance of power and balance of
threat theorists who argue great powers have little to no incentive to form an asymmetric alliance with a weak state, and that great powers have no desire or incentive to increase in capabilities. Resource securitization is proven to be enough of an incentive for a great power to form or keep an alliance with another great power or weak state.

A probability matrix averaging the probabilities of a resource dependent country having an alliance with a trade partner supported the conclusions of the two-sample t-test. The probability of a great power having a defense alliance with an import trade partner it is resource dependent on is valued at 59.65%, while the probability of a great power having a defense alliance with an import trade partner it is not resource dependent on is valued at only 33.56%. Correlation, however, does not imply causality. The two-sample t-test fails to address whether the alliance was formed in response to natural resource needs or if resource dependency was a consequence of an already existing alliance or robust diplomatic relations. Second, causality is difficult to ascertain in this study because some alliances were formed pre-1991 but remained cohesive as of 2012. Limiting the dataset to only alliances formed post-1991 was not chosen for this study as it would significantly constrain the two-sample t-test as most bilateral alliances were formed directly post-World War II and progressively fewer following that time in history. Including alliances formed pre-resource dependence levels, as is done in this study, removes the ability to assess causality. To accommodate this, the alternate hypothesis is amended to the following: great powers have a higher likelihood of forming or keeping asymmetric alliances with resource-rich weak states and symmetric alliances with resource-rich great powers that it is resource dependent on.
For China specifically, only two of the four commodities tested were imported from foreign partners - natural gas and refined petroleum. China was resource dependent on four countries for natural gas, which are listed in ranking order of percentage imported: Indonesia (27.37%), Saudi Arabia (13.62%), United Arab Emirates (12.18%), and Australia (12.15%). As of 2012, China did not have a formal or informal defense alliance with any of these countries. China did, however, have strong economic ties to these countries, which is detailed below. China’s p-value for natural gas was valued at 0.201858201, indicating the null hypothesis of no correlation between resource dependency and alliance behavior was correct. In the case of refined petroleum, China was resource dependent on four countries, which are also listed in ranking order of percentage imported: South Korea (31.35%), Singapore (19.13%), Japan (10.92%), and Russia (10.40%). As of 2012, China only had defense alliances with Japan and Russia. The p-value for refined petroleum was valued at 0.0114, indicating the alternate hypothesis that there is a correlation between resource dependency and alliance behavior was correct. An overall statistical average of both p-values was 0.064913462, which confirms the alternate hypothesis that there is a correlation between resource dependency and alliances. Based on this conclusion, a soft prediction can be made that China has a higher likelihood of forming a defense alliance with Indonesia, Saudi Arabia, the United Arab Emirates, Australia, South Korea, and Singapore if China maintains continued dependence on natural gas imports from those countries. Additionally, China has a higher likelihood of maintaining its alliance with Japan and Russia if it remains dependent on refined petroleum imports from those countries.
Is probability statistics enough to predict alliance behaviors? In looking at China’s relations with its top natural gas import trade agreements, the likelihood of alliances forming appear in part subjective to ideological whims, historical suspicions, and regional threats. China and Indonesia have made significant progress in security and defense cooperation since diplomatic relations resumed in 1990, much of which was a consequence of booming trade relations between the two states, particularly in the energy sector. Defense technology cooperation agreements, arms sales, and visits by senior officials by both countries indicate a steady progression toward a bilateral defense treaty being signed. However, frictions in economic relations; remaining historical suspicions of ethnic prejudices and ideological differences; and diverging Chinese and Indonesian views of regional leadership in the Association of Southeast Asian Nations (ASEAN), could be a barrier to a bilateral defense agreement being formed. In fact, Indonesia’s preference to use multilateral organizations like ASEAN and the Group of Twenty (G20) to manage relations with China may negate the need for a bilateral defense alliance entirely. For now, China and Indonesia appear content to remain significant trade partners, not strategic-defense partners.41

China and Saudi Arabia have also made significant progress since official diplomatic relations were established in 1990. With China now exceeding the US as the top importer of Saudi oil, both nations have aggressively pursued robust diplomatic and trade relations. A nuclear cooperation agreement signed in January 2012 marked a new era of cooperation between the two countries with China becoming the fourth signatory to agree to assist Saudi Arabia in the development of civilian nuclear energy.

However, energy security and energy trade security appears to be the extent of the Sino-Saudi relationship. Naser al-Tamimi explains that the Saudis will not forgo existing US security defense guarantees for Chinese guarantees, nor do the Chinese intend or have the capability to extend their security umbrella and influence to Saudi Arabia or the region. However, that could change as US loyalty to Saudi Arabia is brought into question and China emerges as a world power. The US negotiations with Iran and the Obama administration’s decision to opt against a military strike on Syria is certainly testing the strength of that relationship. As al-Tamimi summarizes, “economic interests still largely define the China-Saudi relations but they have developed rapidly, coupled with frequent high-level exchanges with growing mutual political trust. But should the US put some distance between itself and the region, Riyadh is likely, in the longer term to seriously consider parallel political and security arrangements which would inevitably include China.”

China’s relationship with the United Arab Emirates is like that with Indonesia and Saudi Arabia with an explosion in trade between the two countries since official diplomatic relations were established in 1984. Robust economic relations, which are not exclusively dominated by the energy sector compared to other Gulf States, culminated in the January 2012 agreement to advance bilateral relations to a strategic partnership. While most of the objectives of the strategic partnership are trade-oriented, the two countries did agree to “reinforce military exchanges of visits, conduct exchanges between

44 Ibid.
military colleges, and to strengthen cooperation in such aspects as personnel training, technical equipment, military industry and military trade. "46 Both countries recognize the importance of maintaining strong bilateral relations and will likely continue to progress the relationship, if not toward a bilateral alliance. As Chen Jingxian, vice president of the China Economic Co-operation Centre, states, “I do not see any reason why the relationship between the two countries will not develop further.”47

China and Australia have also maintained strong bilateral relations since the establishment of diplomatic relations in 1972. While trade and economic relations have served as the crux of the bilateral relationship, defense cooperation has significantly increased in the last few years – a result of the growing trade boom between both countries. The Australian Department of Foreign Affairs reported that defense cooperation has increased through “senior-level dialogue, educational exchanges, reciprocal naval ship visits, and humanitarian assistance and disaster relief exercises.”48 However, the development in defense exchanges between China and Australia has resulted in a heated debate on whether Australia should reconsider its historical defense alliance with the US to accommodate China’s rise as a great power. Hugh White explains that China’s economic growth has resulted in a significant rise in its power, leverage, and influence in the region, bringing China into direct competition with the US as a regional force. White proposes five options for Australia if China’s rise continues: (1) remain allies with the US and accept the costs and risks posed by American forces in Australia.

and the region, (2) ally with a new regional power - China, (3) pursue armed neutrality, (4) ally with Southeast Asian maritime countries particularly Indonesia, and (5) pursue unarmed neutrality. Current trends seem to indicate a hybrid of options one and two with Australia accommodating and aligning with both countries.

China’s bilateral relationship with South Korea appears to be much more unstable than China’s relationship with Saudi, the United Arab Emirates, or Australia, and far more finicky than trade and economic relations would suggest. Despite China being South Korea’s number one trade partner, political entanglements and trade conflicts between the two countries weaken the possibility of a China-South Korea alliance. Concerns of China’s existing alliance with North Korea, China’s recent unilateral extension of its air defense zone in the East China Sea, and long-standing suspicions of China’s intentions toward the Korean peninsula are only a few of the concerns South Koreans have about forgoing an alliance with the US in favor of China. South Korea’s dependence on trade with China, however, keeps China at the forefront of its foreign policy strategy. At this time, the current political climate in South Korea appears to favor a careful balancing act of having a strategic partnership with both the US and China, as can best be managed.

Finally, China and Singapore have a long history of bilateral relations, but only until diplomatic relations were established in 1990 did trade and economic relations truly accelerate. This acceleration of trade, however, has not yet culminated in the

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51 Suk-hee, Han. 2012. *South Korea seeks to balance relations with china and the united states*. Council on Foreign Relations.
establishment of a defense alliance or even defense cooperation. Robyn Vidra explains that Singapore refrained from engaging China in the defense industry, entrusting the US militarily to hedge against regional powers like China.52 This preference towards the US could change in favor of China if the US loses its capability to provide Singapore with the same security guarantees as before. As Vidra states, “given weakening American military and economic might, and projections that China’s military spending may surpass the US by 2035, the power of the US security hedging role may be diminishing.”53

In looking at China’s relationship with Indonesia, Saudi Arabia, United Arab Emirates, Australia, South Korea, and Singapore there appears to be greater incentive and propensity toward defense cooperation and alliance formation when trade relations are critical to maintaining economic strength. The six case studies show that improved bilateral relations are a natural and necessary progression of robust trade relations; while defense cooperation and alliance formation require more persuasion and the right circumstances. As such, the revised hypothesis that there is a higher likelihood of alliance formation if the great power is resource dependent on the commodity exporter still stands. However, it is important to note that resource dependence cannot be used alone to predict that alliance formation will occur. Instead, resource dependence should be used as one of many indicators of alliance formation.

Conclusion

Resources are central to alliance formation theory in the balance of power and balance of threat paradigm, but are deemed irrelevant when considering asymmetrical alliances between great powers and weak states. Great powers are presumed to have a

53 Ibid.
surplus of security – as measured by resources and capabilities – and are thus immune to the effects of resource depletion and resource dependency. Geopolitical trends, however, indicate a movement away from this assumption, with great powers focused on establishing or improving bilateral relations with those countries it shares significant trade and remains dependent on for commodity imports. Using a two-sample t-test and probability matrix, this paper reaches the conclusion that there is a fairly strong correlation between resource dependency and alliance formation, though causality is indeterminate. Great powers do have a higher likelihood of pursuing or keeping an alliance with countries it depends on for natural resource commodities. However, resource dependence cannot be used as a stand-alone variable to predict alliance behavior. This behavior, as it relates to energy security and environmental security, can be best described as a “political measure to reduce probability of disruption.”

As Andrews-Speeds explains,

Political links with energy exporters would be of great importance, and these would be supported by a range of economic measures such as aid, inward investment and sales of key goods. Governments pursuing this approach might not be overly concerned about the cost of implementation compared to the probability and impact of the disruptive event. The strategy of the Japanese government from the 1970s typifies this attitude as does China’s current approach.

According to this conclusion, China should have a higher likelihood of pursuing or keeping a defense alliance with Indonesia, Saudi Arabia, the United Arab Emirates, Australia, South Korea, Singapore, Japan, and Russia based on Chinese imports of natural gas and refined petroleum. China’s dependency on those commodities should

55 Ibid.
incentivize China to form a defense alliance with those countries given that they source a significant percentage of China’s consumption.

The likelihood of China forming alliances with its geo-economic trade partners should be considered significant for international relations theorists and policymakers alike. If resource dependence is an indicator of alliance formation, as this paper attempts to show, this could provide a predictive model of Sino-centric security blocs that may challenge the current US-centric unipolar structure of the international system and reduce US influence in the Asia-Pacific and Middle East regions. It certainly presents a new alternative balance of power paradigm with China at the center.
CHAPTER 2

WILL CHINA GO TO WAR OVER WATER?
Introduction

China is severely water-stressed and the implications it holds for China, the region, and the globe are serious. Despite China’s geographical advantage of most major transboundary rivers originating within China’s borders, China is facing a severe internal water crisis. Contributing factors to China’s water crisis include over-extraction of groundwater and surface water, uneven geographical distribution of water between the dry North and water-rich South, and deterioration of clean drinking water due to poor industrial and manufacturing practices. According to a report by the UN, all three major water basins in Northern China – the Huai, Hai, and Huang/Yellow river basins - have less than 1,000 cubic meters per capita of renewable water.\textsuperscript{56} This is incredibly problematic given that “below 1,000 cubic meters, water scarcity begins to hamper economic development and human health and well-being,”\textsuperscript{57} It is also concerning given that the Huai, Hai, and Huang/Yellow river basins serve China’s “largest urban and industrial concentrations and most intensive irrigated agriculture”\textsuperscript{58}

China’s water scarcity crisis could have serious implications for global food security, energy security, and economic growth. China is projected to become food self-insufficient and expected to drive up unsustainabe demand for imported grains, which by extension, will drive up world grain prices.\textsuperscript{59} With 97% of China’s energy industry being

\begin{footnotesize}
\begin{itemize}
  \item \textsuperscript{57} Fry, Al. 2006. Water facts and trends. World Business Council for Sustainable Development.
  \item \textsuperscript{59} Brown, Lester, and Brian Halweil. 1998. China’s water shortage could shake world food security. World Watch Institute (July/August 1998).
\end{itemize}
\end{footnotesize}
water-reliant, China’s ability to maintain its economic growth is in question. In fact, China’s water scarcity and air pollution crisis has already cost China 2.3% of its GDP.

This chapter focuses on the security threat posed by China’s freshwater pollution and scarcity dilemma given that water arguably poses the greatest existential threat of all non-renewable natural resources. Assuming desalination technology and environmental protection laws fail to drastically change the current path of water degradation in China and the region; environmentalists warn that inter-state armed conflict or war could be inevitable. This chapter aims to identify the intervening variables that increase the probability of states pursuing armed conflict to correct their resource scarcity challenges, particularly of that related to water. Conclusions of this study will be used to then predict if China will initiate or face armed conflict in the 21st century over water and with whom.

**Literature Review**

Existing academic scholarship on resource scarcity greatly diverges in expected state responses to environmental challenges like water shortage. Four dominant theoretical camps lead the literature on the subject, with neo-Malthusian realists predicting a pessimistic outcome of state-induced war, liberal pragmatists predicting a more optimistic outcome of international cooperation, distributionists predicting conflict internal to the state, and cornucopian neo-liberalism predicting technological solutions.

**Malthusian Realism**

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The Malthusian and neo-Malthusian argument is guided by the pessimistic principles of Thomas Hobbes’s realism. Realists, whether subscribed to the classical, structural, neoclassical, or rational choice camps of realism, believe in the fundamental principles of the three S’s of realism: statism, survival, and self-help. Statism, as defined by Tim Dunne and Brian Schmidt, is the ideology in which the state is the principle actor and sovereignty its distinguishing trait, survival the pre-eminent goal of the state, and self-help the means of the state to achieving its goals of survival and sovereignty. For classical realists like Thucydides, Machiavelli, and Hans Morgenthau, power politics is driven by human behavior and the need to accumulate power in an anarchic, zero-sum international system. In this system, the exertion of unilateral force is a necessary tool and a prerogative of the state to secure and expand their vital interests. The state, in its fight for survival, will favor war over cooperation with competing states; otherwise it will risk its own interests being subordinated to another state’s and the chance that their competitor will achieve relative gains in power and security.

Thomas Malthus’s theory on population growth and resource exhaustion complements realism’s zero-sum assumption and offers a scientific and environmental explanation for why states would respond to environmental challenges with violent force. Malthus argued that the equilibrium between population levels and resource levels could not continue at a sustainable rate over time. Population growth, an automatic consequence of man’s need to reproduce and societal progression, would by nature

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overtax the supporting ecosystems and agricultural base, thus creating a crisis of food, water, and resource insecurity. Preventive checks, which Malthus defined as man’s economic determination of the cost-value ratio of having more children, could help temper population growth. However, population growth could only be fully and systemically controlled by the unavoidable onset of diseases, droughts, famines, war, etc., what Malthus termed positive checks. Malthus argued that until the positive checks of natural phenomena re-introduced the favored equilibrium between population and resources, war was both justified and necessary to meet the resource demand of an exponentially growing population.  

Paul Ehrlich, the leading modern-day Malthusian realist and ultimate pessimist, predicted in *The Population Bomb* that population growth would surpass food production at an unsustainable and catastrophic rate. Ehrlich offered two solutions to the population-food crisis – a birth rate solution and the death rate solution. The birth-rate solution, similar to Malthus’s preventive checks, is whatever means to control the birth rate for population control. The death-rate solution, similar to Malthus’s positive checks, is any phenomena that increase the death rate. Ehrlich identified war, famine, and pestilence as such possible phenomena.  

*Liberal Pragmatism*

Liberal pragmatism predicts a more optimistic state response to environmental insecurities. Grounded in the foundational principles of Hugo Grotius’s rationalism, the predictions of liberal pragmatists are best described by Grotius when he writes “states are not engaged in a simple struggle, like gladiators in an arena, but are limited in their

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66 Ibid.
conflicts by common rules and institutions."\textsuperscript{68} Drastically different from realism, liberalists argue that the anarchic international system is not a zero-sum system, but a system where mutual interests can be shared. Liberalists recognize that international organizations are included participants in the balance of power construct, though the state remains the dominant rational actor of the international system. International organizations, centered on shared normative values and international law, serve as effective platforms for states to achieve absolute gains and deliberate on contentious issues of mutual interest. Violent state behavior is thus tempered in favor of cooperation and dialogue.\textsuperscript{69}

Environmental pragmatists, also known as equity-oriented pragmatists, would argue that states will pursue international forums and multilateral cooperation to resolve environmental challenges. Pragmatists, like neo-Malthusian realists, recognize the finite limits of natural resources, but diverge in two respects: the acceptance of absolute gain and the perceived value of international organizations.\textsuperscript{70} Pragmatists argue that the finite limit of natural resources require the commitment of all states to effectively extract, conservatively employ, and wisely preserve such non-renewable resources. The absence of a state’s commitment will not only cost that state’s ability to leverage that resource in the long-term for economic, military, and societal gain, but will cost all neighboring states by damaging the sustainability of shared lands and waters. To pragmatists, absolute environmental gain by all participating states is considerably more favorable than relative

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\end{footnotesize}
environmental gains by one state. To achieve this, states will work through international organizations like the UN to secure its natural resource requirements and thus avoid war.\textsuperscript{71}

\textit{Distributionism}

Distributionists, whom are most closely linked to pragmatists, adopt Marxist ideology to explain how unequal distribution of wealth and power is a cause, not consequence, of resource degradation and scarcity. However, like cornucopian neo-liberals, distributionists contend that environmental insecurities are the product of weak institutions and poor governance. In fact, distributionists like James Boyce make the compelling argument that internal social, political, and economic variables are just as important, if not more so, as population growth when debating contributing factors to resource scarcity.\textsuperscript{72}

Michael Renner, who is most closely aligned with the distributionist camp, acknowledges that both resource wealth and resource scarcity can contribute to violent conflicts, but focuses exclusively on conflicts within resource-rich countries.\textsuperscript{73} Renner focuses his attention on resource cursed states, which are most commonly singular commodity-export states where corruption, patronage, and enclave characteristics thrive. Renner offers the compelling argument that within the Global South, the resource curse perpetuates a vicious cycle where resource securitization and extraction serves as the source of conflict, and by which conflicts are prolonged through resource-based funds. States suffering from already poor governance, weak civil society, and nearly absent

\textsuperscript{71} Ibid.
economic diversification and investments cannot break free from their overdependence on resources and commodities as their source of national wealth. These resource-based riches preserve the lifelines of these repressive, autocratic regimes until they themselves eventually fall prey to internal rebellions.\textsuperscript{74}

Ian Bannon and Paul Collier of the World Bank acknowledge the link between natural resources and conflict, pointing out that resource-induced conflict has always been internal to the state, not between states. Bannon and Collier support Renner’s findings that low-income, resource-rich countries that depend on exporting primary commodities are most at risk of experiencing conflict (Collier-Hoeffler model). This is because low-income countries are usually plagued by poor governance and corrupt leadership, who are perceived as and often guilty of having stolen and mismanaged resource endowments. These grievances serve as powerful drivers for secessionist movements and civil war.\textsuperscript{75}

\textit{Cornucopian Neo-Liberalism}

Cornucopian neo-liberalism diverges from realist Malthusianism and liberal pragmatism in its idealistic optimism that environmental insecurities will resolve itself through rule of law and market-driven technological innovation. Cornucopian neo-liberalism is grounded in Immanuel Kant’s philosophy on perpetual peace and Cornucopian faith in human ingenuity. Kant advocated and argued for the necessity of creating a league of peace in which states willingly entered into societal contracts for the purpose of ending all wars. These institutions of law would ensure the collective security of all states and create an environment of enduring peace, which Kant contended should

\textsuperscript{74} Ibid.
be the unmitigated duty of states to pursue and achieve. With Kant’s utopian peace established and governmental institutions theoretically perfected, markets are free for ideas and technology to be realized.⁷⁶

Cornucopian neo-liberalsists, known in the environmental world as economic optimists, argue that human ingenuity will self-correct trends exacerbating the resource scarcity dilemma, which is best explained by J.R. Hicks’s induced innovation theory.⁷⁷ According to Hicks and Cornucopian advocates, the forces of competitive markets will drive individuals to invent technologies that improve labor productivity, create new efficiencies during production, and develop alternatives or substitutes that reverse problematic environmental trends. Counter to Malthus’s argument that population growth is irreversible, economic optimists argue that population growth will not exhaust the existing resource base. In fact, economic optimists argue that population growth is to society’s benefit given that an increase in population growth will likely lead to an increase in ideas. To Cornucopians, the minute possibility of conflict is not because of the degradation or scarcity of resources, but the weakness of institutions and governmental policies to adapt to the resource crisis.⁷⁸

Julian Simon, the prominent cornucopian and economic optimist of the 21st century, was adamant that natural resources are in fact not finite. Simon, who explicitly considered the word finite to be inappropriate and misleading, argued that technology is advancing at such a rapid rate that newly discovered alternatives or substitutes for natural commodities are already being applied in a wide range of industries. To Simon, the

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evidence clearly shows that technological solutions are making resource scarcity an obsolete issue. Simon also applied this same argument when debating the relationship between population growth and resource scarcity. Simon, in his own words, explained that “more people and more wealth have correlated with more (rather than less) resources and a cleaner environment - just the opposite of what Malthusian theory leads one to believe.”

Simon recognized that with more people came more ideas, better technology, increases in the labor force, wealth, and production, and improvements in the standard of living. Simon warned that vilifying population growth would distract developing nations from the real problems plaguing the state’s economic and political systems.

Hybrid Approach

Thomas Homer-Dixon, a leading scholar on environmental security, advances the debate by offering a hybrid approach that merges strengths of the four theoretical approaches together. However, as highlighted by Susanne Peters in Philippe Le Billon’s *Geopolitics of Resource Wars*, there are very evident limitations within the main theoretical camps, all of which independently fail to fully consider internal and external variables contributing to the probability or improbability of inter-state resource conflicts occurring. Peters explains that while both Malthusian realism and neo-realism are the expected and assumed theories that can explain resource wars, their primary weakness is their inability to accommodate changes in the status quo, particularly of that achieved through conflict prevention.

Pushing Peters’s assessment further, Malthusian realism

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and neo-realism both fail in their ability to explain why historical precedence shows a favored outcome of cooperation rather than violent inter-state conflict to resolve contentious resource-based issues.

Equity-oriented pragmatists, on the other hand, place their utmost confidence in international cooperation, organizations, and regimes, making the UN the premier organization best suited to resolve any environmental tensions between states. This chapter argues that there are three main weaknesses to this generally optimistic assumption. The first is that equity-oriented pragmatists expect states to willingly surrender what can be deemed elements of national sovereignty and self-determination for the greater good. It can be argued that the potential environmental gains achieved through cooperation may not be enough to justify the potential loss of economic and military wealth, especially not for developing nations. Second, equity-oriented pragmatists assume that states have the ability to comply with international environmental law established in these international forums. It may be more economical to continue unsustainable environmental practices than to change the practices of private industry and state-run institutions. In fact, the know-how, technology, money, and infrastructure to implement these changes may not exist or may be insufficient to fully enforce the agreements. Third, equity-oriented pragmatists put their faith in international organizations to resolve environmental challenges, though international regimes are absent effective enforcement mechanisms. Enforcement of agreed-upon international laws requires buy-in from participating states, which can be difficult to achieve if a state or states do not find it in their interest to take action.
Distributionists, who follow the theoretical principles of Marxism and neo-Marxism, fail to look beyond internal social conflicts and the first world-third world paradigm. Peters argues that because distributionism focuses almost exclusively on grievances and insecurities within the developing South, the theory loses relevance when applied to the developed states and great powers of the Global North. To continue Peters’s point, distributionists are unable to explain why stable and economically wealthy states are characterizing resource scarcity as a grave security threat and are militarizing their responses. Robust political and diplomatic institutions, strong governance mechanisms, and healthy economies should, in theory, eliminate any reason to pursue conflict. Why developed states are increasing their military signaling and aggression over contentious lands and areas with great resource potential are left unexplained by distributionism.\(^{82}\)

Finally, Cornucopianism’s greatest flaws are in its optimism and implicit assumption that natural resources are infinite, growth is endless, and technological ingenuity is certain. Peter Harris warns against the dangers of basing environmental and economic policies on cornucopianism given that it “lacks any scientific basis and it blatantly contravenes the laws of thermodynamics.”\(^{83}\) In fact, one of cornucopianism’s leading scholars Bjorn Lomborg, author of The Skeptical Environmentalist, moderated his own optimism when admitting that the effects of man-made climate change and deforestation were problematic.\(^{84}\) This paper also faults cornucopianism for failing to explain why environmental tensions and violent resource conflicts have occurred between

\(^{82}\) Ibid.


generally stable nation-states and why whole civilizations have disappeared because of resource and water scarcity. Multiple examples in history have shown resources are finite, civilizations can and will cease to grow, and technological ingenuity will not save civilizations in time. \(^{85}\) Cornucopianism fails to explain why those instances have occurred.

As such, this paper adopts Homer-Dixon’s hybrid approach as it is arguably the most comprehensive theoretical worldview that can best enlighten the debate on resource wars and to offer a prediction of the probability of China experiencing inter-state conflict over water scarcity. Homer-Dixon adopts elements of all four theories, reaching the conclusion that environmental scarcity rarely acts as a singular variable leading to conflict and is almost always coupled with aggravated political, economic, and social conditions. Homer-Dixon asserts the possibility of three types of conflicts that could arise from environmental scarcity: group-identity conflict, coup d’état, and simple-scarcity conflict. This paper focuses on simple-scarcity conflict, which Homer-Dixon defines as “interstate resource wars we intuitively expect when states rationally calculate their interests in a situation where there is a fixed or shrinking pie of natural resources.” \(^{86}\) In Homer-Dixon’s core model of causal links, he fails to address which variables would contribute to this type of conflict. He does, however, offer a short explanation of why it could happen. Homer-Dixon argues that in the unlikely event that resource wars were to occur, they would most likely be fought over agriculturally-productive land, forests, fresh water, and fish. These wars would be more likely to occur between upstream and


downstream countries and only if certain conditions existed. These mandatory conditions include upstream country restrictions on river flow, history of antagonism, and a militarily stronger downstream country. Ashok Swain reaches the same conclusion as Homer-Dixon.

Swain argues that there is a cause-effect relationship between resource scarcity and large-scale conflict, though it is not necessarily directly correlated. Swain argues that water scarcity alone is unlikely to be the root cause of violent conflict. It is more likely that water scarcity results in war because of how it exacerbates underlying environmentally-induced crises like food scarcity, population displacement, or ethnic alignment. Like Homer-Dixon, Swain recognizes that riparian states, or states situated on the banks of a river, are at greatest risk of violent conflict, but suggests more research be done to determine how water scarcity specifically contributes to inter-state war. This paper attempts to fill that gap by identifying which variables must be present for simple-scarcity conflict to occur.

**Hypothesis, Definitions, and Methodology**

This paper accepts Homer Dixon’s core model and hypothesizes that downstream hydraulic-river states will pursue inter-state war if the upstream country restricts river flow, the downstream country is militarily stronger, there is a history of antagonism, and if technological solutions are non-existent. However, before introducing the methodology used to test the aforementioned hypothesis, definitions of key terms and principles are offered first.

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87 Ibid.
Environmental scarcity, as defined by Homer-Dixon, is “scarcity of renewable resources such as croplands, forests, rivers water, and fish stocks.” This paper accepts Homer-Dixon’s determination that scarcity can be supply-induced (depletion or degradation), demand-induced (overconsumption), and structurally-induced (inequitable distribution). This paper also accepts Homer-Dixon’s argument that degradation of renewable resources should be considered a form of scarcity.

Resource wars, as defined by Le Billon, are “an armed conflict in which the control and revenue of natural resources are significantly involved in the economy of the conflict and/or the motivations of the belligerents.”

Armed conflict, as defined by Uppsala Universitet’s Department of Peace and Conflict Research, is “a contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths in one calendar year.”

Interstate Conflict, as defined by Uppsala Universitet’s Department of Peace and Conflict Research, is “a conflict between two or more governments.”

This paper applies the research methods of controlled case comparison and process tracing to determine which variables must be present for scarcity-induced interstate armed conflict. This approach should effectively isolate all independent variables.

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92 Ibid.
linking environmental scarcity with conflict and thus achieve the end goal described by Homer-Dixon - “to determine if the independent and dependent variables are actually causally linked, and, if they are, to induce from a close study of many such cases the common patterns of causality and the key intermediate variables that characterize these links.” This methodology was selected because it ensures that one independent variable, environmental scarcity, is controlled for and that the dependent variable or expected outcome of conflict is held constant in all selected cases.

This paper will look at all historical cases from 1945 onwards where water scarcity was identified as a contributing factor to inter-state conflict. First, case studies could not pre-date the UN, the pinnacle of international organizations. The decision to only include cases when the UN was in operation is critical to the integrity of this paper given that prior to 1945; states did not have the alternative of pursuing cooperation through international organizations. Second, no technological solutions have been invented since 1945 that can fully substitute or replace river-based water resources. Desalination technology is the closest to achieving this end goal, but has not yet reached the capacity to fully sustain a country’s population and economic demands. This fact, therefore, eliminates the need to test the technological variable listed in the hypothesis. Additionally, research indicates that accurate quantitative data for water consumption is not available for the countries that engaged in violent armed conflict in the selected time frame. This means this paper cannot quantitatively test the hypothesis to determine whether states went to war because population demand for water could not be met. Instead, this paper must depend on historical accounts that describe water scarcity as the

cause or reason for inter-state conflict. Finally, this paper only looks at conflicts that involve or are sponsored by state actors. Many inter-state resource conflicts occurred between non-state actors at the individual level, where ethnic tribes and civilians from different countries engaged in small-scale skirmishes over water. This paper, to narrow its focus, only evaluates the phenomena of resource wars at the state level where states ordered forces to engage militarily. Conflicts between state actors of one country and civilians of a different country are not considered.

These case studies are pulled from databases produced and maintained by Oregon State University’s College of Earth, Ocean, and Atmospheric Sciences and the Pacific Institute. These two organizations are leading efforts to catalog all water-related events in the recorded history of mankind and categorizing these events according to region and conflict type. Data from Oregon State University’s International Water Event Database covers water events from 1948 to 2008. These water events are ranked according to the Basins at Risk (BAR) Water Event Intensity Scale, which range from -7 to 7. This paper only considers water events that are ranked between -7 and -5 on the BAR scale, with -7 corresponding to a formal declaration of war and -5 corresponding to small scale military acts. Detailed descriptions of water events ranked between -7 and -5 are provided below. Additional scrutiny is applied to case studies that meet the aforementioned criteria. Based on the event summaries provided in the International Water Event Database, case studies are de-selected if there are indications that water was a tool, target, or consequence of war, rather than a trigger or cause of war. While this paper recognizes that there is opportunity for error through this manual process, this method ensures with some degree

of confidence that the independent variables and dependent variables tested for are accurately represented.

Table 4: Basins at Risk (BAR) (Water Event Intensity Scale)

<table>
<thead>
<tr>
<th>BAR Scale (Water Event Intensity Scale)</th>
<th>EVENT DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>-7</td>
<td>Formal Declaration of War</td>
</tr>
<tr>
<td>-6</td>
<td>Extensive War Acts causing deaths, dislocation or high strategic cost: Use of nuclear weapons; full scale air, naval, or land battles; invasion of territory; occupation of territory; massive bombing of civilian areas; capturing of soldiers in battle; large scale bombing of military installations; chemical or biological warfare.</td>
</tr>
<tr>
<td>-5</td>
<td>Small scale military acts: Limited air, sea, or border skirmishes; border police acts; annexing territory already occupied; seizing material of target country; imposing blockades; assassinating leaders of target country; material support of subversive activities against target country.</td>
</tr>
</tbody>
</table>

Source: Oregon State University Basins at Risk Project

This paper also selects case studies from the Pacific Institute’s Water Conflict Chronology list, which cataloged water events occurring between biblical times and present day. The Pacific Institute categorized water events according to conflict type, which are as follows:

- **Military Tool (state actors):** where water resources, or water systems themselves, are used by a nation or state as a weapon during a military action.⁹⁵

- **Political Tool (state and non-state actors):** where water resources, or water systems themselves, are used by a nation, state, or non-state actor for a political goal.

- **Terrorism (non-state actors):** where water resources, or water systems, are either targets or tools of violence or coercion by non-state actors.\(^{96}\)

- **Military Target (state actors):** where water resource systems are targets of military actions by nations or states.\(^{97}\)

- **Development Disputes (state and non-state actors):** where water resources or water systems are a major source of contention and dispute in the context of economic and social development.\(^{98}\)

This paper limits case study selections from the Pacific Institute to conflicts that are categorized as development disputes as it eliminates conflicts where scarce water resources are a tool, target, or consequence of war, rather than a trigger or cause of war. This paper recognizes the overarching concern in using data by the Pacific Institute, which is that these conflicts are not ranked according to degree of hostilities. This makes it very difficult to assess whether these conflicts meet the criteria of armed conflict. As such, this paper will attempt to assign numerical values that correspond to Oregon State University’s BAR Water Event Intensity Scale. Again, only water conflicts ranked from -7 to -5 are considered for case studies. Upon selection of the case studies, this paper will qualitatively test for the presence of intervening variables identified by Homer-Dixon as causal factors of resource wars: upstream country restrictions on river flow, history of antagonism, and a militarily stronger downstream country.

**Data**

\(^{96}\) Ibid.  
\(^{97}\) Ibid.  
\(^{98}\) Ibid.
As documented in Oregon State University’s International Water Event database and the Pacific Institute Water Conflict Chronology, the following water events met the aforementioned criteria and were selected for case studies. A background on each selected case study is provided.

Table 5: Water Conflict Case Studies

<table>
<thead>
<tr>
<th>DATE</th>
<th>LOCATION</th>
<th>COUNTRY_LIST</th>
<th>BAR_Scale</th>
<th>EVENT_SUMMARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 1967</td>
<td>Jordan River</td>
<td>Israel, Egypt, Jordan, Syria</td>
<td>-6</td>
<td>Multiple skirmishes occurred between Israel and neighboring Arab states Egypt, Jordan, Syria, and Lebanon between 1948 and 1970 over water. The most violent and notable conflict over the Jordan River was the Six-day War in 1967.</td>
</tr>
<tr>
<td>September 1980</td>
<td>Shatt al-Arab Waterway</td>
<td>Iraq—Iran</td>
<td>-6</td>
<td>Iran-Iraq War; Saddam Hussein initiated Iran-Iraq War to retake Shatt al-Arab Waterway and punish Iran for Kurdish and Shia opposition in Iraq. Following months of fighting, Iranian soldiers attacked Iraqi forces on May 7 in Abadan, according to a joint Iranian military communiqué. At least 50 Iraqis killed. Fighting was over Shatt al-Arab.</td>
</tr>
<tr>
<td>January 1986</td>
<td>Lesotho Highlands Water</td>
<td>Lesotho, South Africa</td>
<td>-5</td>
<td>South Africa supported a bloody coup by Lesotho’s defense forces, which resulted in the two countries agreeing to share water from the Highlands of Lesotho. It remains unconfirmed whether South Africa was motivated by gaining access to the Highlands water, but is likely.</td>
</tr>
<tr>
<td>September 1998</td>
<td>Katse &amp; Mohale Dams; Lesotho Highlands Water</td>
<td>Lesotho, South Africa</td>
<td>-6</td>
<td>South Africa commits forces in first post-apartheid military intervention which resulted in a few fatalities and multiple injuries. It remains unconfirmed whether the Lesotho project was a...</td>
</tr>
</tbody>
</table>
motive behind South Africa's intervention, but is likely given that South Africa had a strategic imperative to secure the Katse & Mohale dam sites.

Source: Oregon State University Basins at Risk Project and Pacific Institute Water Conflict Chronology

Israel and Arab States (1967)

Israel and its neighboring states of Egypt, Jordan, Lebanon, and Syria had experienced an intense history of violent conflict and military skirmishes since Israel’s establishment as a state in 1948. Because the 1949 Armistice Agreement only demarcated land boundaries and not water rights, relations worsened and armed conflicts increased when both Israel and the Arab League attempted diversion schemes of the Jordan River and the Sea of Galilee.\(^9^9\) The Joint Armistice Commission, which convened in January 1967, resulted in both downstream Israel and upstream Syria agreeing to refrain from further military aggression. However, Syria’s continued war rhetoric, unilateral aggression, attempts to carry out its diversion of the Jordan River, and its alliance with Egypt fanned the flames of war.\(^1^0^0\) The threat of structurally-induced water scarcity and inability to meet the growing demand for water was enough to elevate the conflict. According to Jeffrey Sosland, “water scarcity, was however, an important intermediate cause of the 1967 War. During the 1949 to 1967 period, Israel’s water needs were more complex because the sources of Israel’s water supplies were near or just across its border.


\(^1^0^0\) Mann, Joseph. 2013. Syria, precipitator of the six day war. Middle Eastern Studies 49 (4) (07/01; 2014/11): 547-62.
in Syria and Lebanon.”\textsuperscript{101} The final catalyst to Israel’s pre-emptive attack in June 1967 was Egypt’s blockade of the critical Strait of Tiran in May earlier that year.\textsuperscript{102}

\textit{Iraq and Iran (1981)}

The eight-year Iran-Iraq war, which was largely fought over control and access to the Shatt al-Arab Waterway, unexpectedly escalated after the two downstream states equitably divided the contentious body of water in the Algiers Accord of 1975. Both water-stressed countries agreed to the Algiers Accord and subsequent 1975 Treaty on International Boundaries and Good Neighborly Relations which was signed a few months later. The treaties successfully established the centerline (or thalweg) of the Shatt al-Arab waterway as the demarcating border between the two downstream states.\textsuperscript{103} However, despite the Algiers Accord being explicitly clear in the division of territory and water, and language in the 1975 Treaty outlining exactly what state behaviors and avenues of mediation are expected and available in times of conflict, Iraq launched attacks on Iran over the Shatt al-Arab waterway six years later.\textsuperscript{104} While traditionally water-stressed Iraq was not enduring a drought or severe crisis of water scarcity at the time, the Iraqi regime felt a military response was justified to secure its access to the Waterway for navigational use and fresh water. In September 1980, Iraq declared the original agreement null and void, citing the reason “the accord was imposed on Iraq under duress”\textsuperscript{105} and thus began the Iran-Iraq war.\textsuperscript{106}

\textsuperscript{103} Martsching, Brad. TED conflict studies: Iran-Iraq war and waterway claims. in American University Inventory of Conflict and Environment [database online]. 1998Available from \url{http://www1.american.edu/ted/ice/iraniraq.htm}.
\textsuperscript{105} Mojtahed-Zadeh, Pirouz. 2007. \textit{Boundary politics and international boundaries of Iran A study of the origin, evolution, and implications of the boundaries of modern Iran with its 15 neighbors in}
Lesotho and South Africa also had a long history of tensions, particularly during the reign of Lesotho’s Prime Minister Chief Leabua Jonathan, who came into power in 1966. Jonathan deeply distrusted the South African white apartheid regime and offered his support to South Africa’s anti-apartheid movement African National Congress (ANC), which was responsible for numerous guerilla attacks within South Africa. Violence between the two nations worsened in the 1980s, particularly in December 1986 when several South Africans died by allegedly ANC-planted landmines and bombs. South Africa implemented economic sanctions on Lesotho and essentially banned border crossings between the countries. Crippling Lesotho’s economic health and damaging his political legitimacy, Jonathan was ready to acquiesce to South Africa’s demands on the ANC issue, but remained unwilling to surrender Lesotho’s water rights. South Africa, which has been chronically water-stressed, subsequently threw their support behind the violent military coup that overthrew Jonathan in January 1986. The consequence of the coup was immediate – South Africa quickly recognized the new regime, withdrew economic sanctions, and reached a long-desired bilateral agreement with Lesotho on water. The Lesotho Highlands Water Project ultimately gave South Africa a significant portion of the Highlands water in exchange for industrialization and
development assistance.\textsuperscript{110} Frederick Gordon explains South Africa’s pre-emptive actions to secure access to the Lesotho Highlands when he writes,

\begin{quote}
Water scarcity is the central variable in explaining the 1986 treaty formation. Lesotho in classical terms is a struggling economic state with limited economic production. However, it possessed significant water resources, something that its neighbor, a regional economic giant, South Africa, did not. In fact, South Africa’s economic and water conditions were almost a polar opposite to Lesotho. Home to approximately 33\% of the southern continent’s population, South Africa consumed 80\% of the region’s water resources despite containing only 10\% of the region’s natural water resources within its borders.\textsuperscript{111}
\end{quote}

\textit{Lesotho and South Africa (1998)}

In September 1998, conflict re-emerged between Lesotho and South Africa. Lesotho’s governmental regime was facing a military mutiny by its own Lesotho Defense Forces. South Africa made the decision to intervene, moving 600 troops into Lesotho as its first military engagement in the post-apartheid era. South Africa’s supposed humanitarian mission was "...to intervene militarily in Lesotho to prevent any further anarchy and to create a stable environment for the restoration of law and order."\textsuperscript{112} South Africa’s justification was “that the intervention was based on agreements reached in the South African Development Community (SADC); that all attempts at peacefully resolving the dispute had failed; and that South Africa had intervened to protect certain South African interests such as the Katse Dam water scheme.”\textsuperscript{113} However, most scholars recognize that South Africa’s intervention was not for humanitarian purposes. Most admit that South Africa’s intervention was motivated by the perceived threat that its access to the Lesotho Highlands water would be compromised. It was seen as a preemptive move

\textsuperscript{111} Ibid.
\textsuperscript{113} Ibid.
to protect against supply-induced water scarcity and as a critical maneuver to ensure South Africa recovered from the 1992-1993 drought.\textsuperscript{114} 

**Discussion**

The narrow selection of these case studies generally supports the prediction that inter-state resource wars are more likely to occur between downstream and upstream nation-states if three conditions exist: the upstream state restricts river flow, a history of antagonism, and a militarily stronger downstream country. However, the case studies show that these variables are not always necessary conditions for inter-state resource conflicts. It is also important to note that all case studies showed that negotiations and agreements had been attempted or even established before military conflict occurred.

**Table 6: Testing Variables Contributing to Water Wars**

<table>
<thead>
<tr>
<th>Year of Conflict</th>
<th>Body of Water</th>
<th>Perpetrating State</th>
<th>Opposing State</th>
<th>History of antagonism</th>
<th>Militarily Superior State (SIPRI data measured by military expenditures $millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>Jordan river</td>
<td>Israel (Downstream)</td>
<td>Syria (Upstream), Jordan (Upstream), Egypt (Not a riparian state of the Jordan river)</td>
<td>Yes</td>
<td>Israel: 672.12 (1967) Egypt: 422.00 (1967) Jordan: 99.26 (1967) Syria: 94.74 (1967) ISRAEL (If measured state against state) ARAB STATES (If measured cumulatively)</td>
</tr>
<tr>
<td>1981</td>
<td>Shatt al-Arab Waterway</td>
<td>Iraq (Downstream)</td>
<td>Iran (Downstream)</td>
<td>Yes</td>
<td>Iraq: 11864E Iran: 7145Eb IRAQ</td>
</tr>
</tbody>
</table>

\textsuperscript{114} Wolf, Aaron T., and Newton, Joshua T. Case study of transboundary dispute resolution: The Tigris-Euphrates basin. in Oregon State University [database online]. 2013 Available from \url{http://www.transboundarywaters.orst.edu/research/case_studies/Tigris-Euphrates_New.htm}.

\textsuperscript{115} SIPRI military expenditure database. in Stockholm International Peace Research Institute [database online]. 2015 Available from \url{http://www.sipri.org/research/armaments/milex/milex_database}.


In all four selected case studies, a downstream riparian state initiated the conflict. Downstream Israel initiated the Six-Day War in response to upstream Syria’s unilateral aggression to secure its access to the Jordan River. Michael Oren reports in *Six Days of War* that “the downhill course to war, from the Israeli perspective, was marked by Arab acts on the ground. The northern border erupted in 1964 with Syria’s unilateral efforts to divert the Jordan headwaters and then to prevent Israeli cultivation of the demilitarized zones.”\(^{118}\) Egypt’s involvement in the Six-Day War does not qualify as a counter-argument to Homer-Dixon’s assessment or this paper’s hypothesis that resource conflicts are initiated by downstream states. This is because Egypt signed a mutual defense agreement with Syria in November 1966 and was brought into war out of obligation and as a result of false Soviet reporting that Israel had placed troops on the Syrian border.\(^{119}\)

\(^{120}\)

In the cases of South Africa and Lesotho, the military aggression by downstream South Africa in 1986 and 1998 against upstream Lesotho was in response to South Africa’s need to secure its access to the Lesotho Highlands Water, which was under threat by the Jonathan regime in 1986 and by mutineers in 1998. Fako Johnson Likoti reaches the conclusion that “realist interests, centering on water, were the major

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imperative, rather than humanitarian impulses.” Likoti explains that none of the UN-specified conditions mandating or justifying humanitarian intervention warranted South Africa’s response in 1998 specifically. Even South African Ministry of Foreign Affairs officials admitted that South Africa sent troops to Lesotho amongst others to defend the Katse Dam.

The case study of Iraq and Iran shows, however, that conflict does not necessarily have to occur between downstream and upstream states nor does it have to be in response to threats to water access. Downstream Iraq’s decision to go to war with downstream Iran over the Shatt al-Arab Waterway indicates that military engagement could be opportunistic rather than defensively motivated. Iraq’s access to the Shatt al-Arab Waterway was not under threat by the Iranians. Iraq’s choice to go to war was very much an effort to enhance its resource base, not secure what was already guaranteed under the Algiers Accord.

In all four selected case studies, there were strong histories of antagonism and military conflicts between the participating states. Israel and the Arab States had fought in multiple large-scale wars and small-scale skirmishes before 1967, most notably the 1948 Arab-Israeli War and the 1956 Suez Crisis. In the year preceding the Six-Day War, armed conflicts between Israel and Syria significantly escalated in intensity.

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122 Ibid.
123 Mojtaheh-Zadeh, Pirouz. 2007. Boundary politics and international boundaries of Iran A study of the origin, evolution, and implications of the boundaries of modern Iran with its 15 neighbors in the middle east, the Persian gulf, the Caucasus, the Caspian sea, Central Asia, and West Asia. 2007: Universal-Publishers.
Michael Oren reports in *Six Days of War* that “the security situation went from worse to insufferable. Over the course of 1966, Israel recorded ninety-three border incidents – mines, shooting, sabotage, while the Syrians boasted seventy-five guerilla attacks in the single month of February-March.”\(^\text{125}\) For Iraq and Iran, tensions between the two states escalated with Ayatollah Ruholla Khomeini seizing power in 1979. The new Iranian regime publicly supported overthrowing Saddam Hussein’s regime, going so far as aiding rebel Iraqi Kurds, underground Iraqi Shi’ite movements, and conducting terrorist attacks again Iraqi officials.\(^\text{126}\) Tensions culminated with an attempted assassination attempt on Iraqi Deputy Premier Tariq Aziz and Iraqi Minister of Information Latif Nusseif al-Jasim in April 1980. Iran’s hostile views toward Iraq are best represented by Hujjat al-Islam Sadeq Khalkhali who claimed “We have taken the path of true Islam and our aim in defeating Saddam Hussein lies in the fact that we consider him the main obstacle to the advance of Islam in the region.”\(^\text{127}\) Finally, Lesotho and South Africa, which were generally economically mutually dependent, experienced deterioration in relations in 1972 and tensions returning in 1995. Lesotho became increasingly anti-South African beginning in 1972, providing refuge to ANC.\(^\text{128}\) Violence and cross-border guerilla attacks significantly increased until the coup in 1986 with Jonathan declaring in April 1983 that Lesotho was effectively in a state of war with South Africa. Despite Lesotho and South Africa establishing diplomatic relations in 1992, tensions continued because of contested territorial claims by Lesotho.\(^\text{129}\)

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\(^\text{125}\) Ibid.
\(^\text{129}\) Ibid.
Finally, in all four selected case studies, the conflict-initiating state had an arguably superior military force than its opponent. While military expenditures are certainly not sufficient alone to determine superiority, it does represent how much the state invested in its military forces at the time. A contextual background of each state’s defense posture the year of the conflict shows that the initiating state had clear military advantages over its opponent. For the case study of Israel and the Arab States, most military strategists argue that Israel was superior in military training, command, and motivation, though it is matter of fact that Israel had significantly less soldiers and military equipment than its Arab opponents. In fact, Israel’s military superiority was in part thanks to Egypt, Syria, and Jordan’s socioeconomic and geopolitical circumstances at the time. For Egypt, its declining economy and exhausted military base made Egypt vulnerable and a full-scale Egyptian military response to Israeli aggression difficult. Oren explains that “in fact, not just the air force but the entire Egyptian army was in deplorable shape, drained by Yemen and by serious cutbacks in defense spending.”130 Syria also severely miscalculated and overestimated Soviet and Egyptian military capabilities and willingness to assist on the Syrian front.131 Syria, which had only recently fallen under the control of Salah Jadid’s regime after a coup d’état in 1966 and Syria’s military regime now under the leadership of Hafez al-Assad were ill-prepared and ill-equipped for a war with Israel. At the time of conflict, the new Syrian regime was more focused on establishing its domestic legitimacy and political rule.132 The Syrian military, though better equipped than the Israelis, remained dependent on Soviet and Egyptian military

132 Ibid.
aid. Jordan, like Syria, was overly dependent on Iraq to provide air cover and a second line of defense, which Jordan was severely lacking.133

For the Iraq-Iran conflict, Iraq had dedicated a significant percentage of its national GDP to military training and defense procurement in the years preceding the Iran-Iraq war. According to Hossein Askari, Iraq dedicated nearly 60% of its oil revenues to military spending between 1975 and 1979 - “by the time Iraq invaded Iran in 1980, it was acquiring almost five times the amount of Iranian arms purchases, spending more than 20% of its GDP on its military, and had 45,000 more men-under-arms than Iran.”134 Iraq certainly had an upper hand compared to its military foe. For South Africa and Lesotho, the latter could never compete militarily. Lesotho was always economically, militarily, and demographically smaller and weaker than its big brother South Africa. In fact, Lesotho’s economic and political viability was entirely dependent on its relations with South Africa.135

Based on the case studies above, it can be concluded that Homer-Dixon and this paper’s hypothesis was generally correct that the presence of three conditions - upstream restrictions on river flow, a history of antagonism, and a militarily stronger downstream country – increase the probability of inter-state conflict occurring. However, the case study of Iraq and Iran demonstrates that the conflict does not have to occur between downstream and upstream states and that the conflict can be opportunistic rather than defensive. Therefore, a revised hypothesis incorporating the findings of this study is

presented below. Inter-state resource conflict is more likely to occur if the following conditions are present:

- water scarcity (supply, demand, or structurally-induced) or chronic water stress, an absence of technological solutions,
- competing needs and interests for hydrological resources, with a downstream riparian state most likely to initiate the conflict,
- negotiations are attempted but fail or cease to meet the interests of the involved riparian states,
- aggressive unilateral behavior, perceived threat of unilateral aggression by a competing upstream riparian state, or perceived opportunities to secure resources by a competing downstream state,
- an existing history of antagonism or conflict between the riparian states, and
- a militarily superior downstream country.

This conclusion lends most credence to the theoretical camp of equity-oriented pragmatism, which prioritizes cooperation through international organizations. Moreover, this paper proposes a new term “pessimistic equity-oriented pragmatism” as a more accurate perspective on the debate. Pessimistic equity-oriented pragmatism argues that cooperation will likely be the preferred mechanism and first channel of recourse to address resource scarcity if technological solutions are unavailable. However, states will not restrict its behavior if state sovereignty and self-preservation are threatened by competing riparian states and if military conditions are determined to be in its favor. Separately, this paper notes that this revised hypothesis does not address under what conditions riparian states determine negotiations fail or cease to meet their interests. This
paper suggests further research be done to look at the geopolitical and socioeconomic motivations behind state determinations that cooperation can no longer address its resource requirements and recommends using the same case studies selected in this paper.

**Conclusion**

For China’s current environmental situation, the following transboundary river basins are reported by multiple sources as the most likely resource base to inspire interstate armed conflict with or by China: the Brahmaputra, Ganges, Indus, Mekong, and Salween.136 137 Given that China is an upstream riparian state with the aforementioned river basins flowing from China’s Tibet Autonomous Region (TAR), it is highly unlikely that China will initiate armed conflict. Instead, three behaviors are expected from China: unilateral aggression through river diversion schemes, international cooperation, and/or a combination of both. The debate rests on whether downstream riparian states within the aforementioned river basins are likely to initiate armed conflict against China and if the aforementioned conditions have been met.

Evaluated for conditions established in the revised hypothesis, China should not face any threats of large-scale armed conflict despite escalating tensions with shared riparian states over water resources. No riparian states met all the conditions for interstate armed conflict highlighted in the revised hypothesis. That said, the most likely riparian neighbors to initiate some type of conflict with China are India and Vietnam. Both countries met the conditions of environmental scarcity, absence of technological

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solutions, competing interests and needs for hydrological resources shared with China, downstream status, Chinese unilateral aggression in dam construction along the Brahmaputra and Mekong river basins, and histories of military aggression and political tension.\textsuperscript{138} 139 140 141 The only condition that failed to qualify India and Vietnam for inter-state armed conflict with China was their absence of military superiority.\textsuperscript{142}

Therefore, this paper expects China, India, and Vietnam, as well as other competing riparian states to participate in bilateral and multilateral negotiations and to pursue international diplomacy and cooperation to address their scarcity-induced tensions. While China may be reluctant now, this paper expects China to come to the negotiating table before pursuing full military action. There is an increased possibility of successful cooperation between China and Vietnam given that the two nation-states have agreed to a multilateral treaty committing treaty members to provide hydrological data for the Mekong river during flood season.\textsuperscript{143} Despite the fact that this treaty does not address water consumption rights, the fact that both states have successfully negotiated and cooperated over water resources is a positive indicator that cooperation between the two states is possible. However, optimism for success in these negotiations is admittedly tempered by China’s continued unwillingness to ratify the UN Convention on Non-


Navigable Use of International Watercourses or the Berlin Rules on Water Resources.144 Until an agreement is reached, this paper asserts that existing tensions will likely only amount to military signaling, rhetorical attacks, or diplomatic and political hostilities given that neither India nor Vietnam can compete with China militarily. Small-scale inter-state skirmishes certainly could occur, but it is far more likely that these types of conflicts will occur between civilians of the competing states than between military troops.

144 Ibid.
CHAPTER 3

WILL CHINA IMPOSE BARRIERS TO FDI TO CORRECT ITS POLLUTION CRISIS?
Introduction

Many of China’s major cities are now blanketed by a haze of toxic chemicals, tangible evidence of the costs of its rapid economic growth. Statistics on the impacts of China’s pollution crisis show that life expectancy for residents in highly-polluted northern China are 5.5 years shorter than in southern China, and that air degradation has contributed to over a million premature deaths in 2010 alone.\(^{145}\)\(^{146}\) In fact, the Xinhua News Agency reported in November 2013 that the number of lung cancer cases in Beijing alone increased by more than 50% in the last decade, likely because of China’s hazardous air pollution.\(^{147}\) China’s air pollution crisis has also had a negative toll on China’s growing economy. China’s Ministry of Environmental Protection reported in 2010 that environmental degradation, which includes air pollution and damage to the ecosystem, cost China 3.5% of the nation’s GDP, which is equivalent to $230 billion.\(^{148}\)

The tremendous economic and human costs of pollution have forced China to get serious about its environmental challenges. This was most evident when Chinese Premier Li Keqiang declared war on pollution at the annual meeting of parliament, stating that “we [China] will resolutely declare war against pollution as we declared war against poverty.”\(^{149}\) Questions are now being asked whether China can effectively wage a war on pollution while also sustaining its economic growth.

This paper aims to answer that question by reviewing the relationship between pollution, specifically CO2 emissions, and foreign direct investment (FDI) policies, with


FDI serving as a measure of openness to international trade. CO₂ emissions were selected as the pollutant of interest because it is one of the primary greenhouse gases contributing to global climate change and because China is the leading contributor of CO₂ emissions. This paper uses historical case studies of developed economies to determine whether FDI policies can be an effective tool of pollution control. The conclusions of this paper are used to then predict whether China will respond to its pollution crisis by maintaining or reducing its levels of FDI openness.

**Literature Review**

*Theories on Pollution and FDI*

The relationship between pollution and FDI has been extensively written on, though there is a noticeable absence of contributions from the International Political Economy (IPE) perspective and extensive disagreement on the causality and positivity of the relationship. Of what has been written on pollution and FDI, four theoretical camps dominate – the Pollution Haven Hypothesis, the Pollution Halos Hypothesis, the Porter Hypothesis, and the Environmental Kuznets Curve (hereafter referred to as the Kuznets Curve).

*Pollution Haven Hypothesis*

The Pollution Haven Hypothesis argues that developing nations will relax environmental standards or fail to enforce them in order to increase their competitiveness within the international economy. The Pollution Haven Hypothesis predicts that in order to secure FDI inflows, developing nations will participate in a “race-to-the-bottom” to become attractive pollution havens for transnational or multinational firms to invest

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their capital. In theory, foreign investors will flock to pollution haven countries in order to capitalize on lower production costs. This migratory movement of firms toward pollution haven countries is often described as the “industrial flight hypothesis” where companies will move offshore to conduct high-polluting activities. For the Pollution Haven Hypothesis, both the developing nation and the firm have a vested interested in pursuing weak environmental standards - attracting capital for the developing nation and maximizing profits for the firm. Under this framework, the environmental consequences for the host-nation are severe. Unfortunately, there is no incentive for the firm or developing nation to correct trends in environmental degradation and pollution and thus no incentive to restrict or place conditions on FDI inflows. Therefore, the state will maintain high FDI openness as it transitions from the pre-industrial to post-industrial phase of development.

Pollution Halo Hypothesis

The Pollution Halo Hypothesis argues otherwise. Pollution Halo theorists contend that the introduction of better management practices, environmental standards, and advanced technology by foreign firms should promote and instill greener industrial behavior within the developing host-nation. It is expected that as FDI flows in, environmentally-friendly industrial know-how and technology will also proliferate and become embedded into normal business practices within domestic and international

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industries. Rather than offshore high-polluting activities, companies become avid participants in the transfer of low-polluting activities. As Jean-Marie Grether and Jaime de Melo explain, “superior technology and management, coupled with demands by ‘green’ consumers in the OECD [Organization for Economic Cooperation and Development], lift industry standards overall.” This creates a “race-to-the-top” effect where developing nations become pollution halos or countries known for promoting green industry standards. This occurs through local firms adapting industry standards and governments enforcing regulations that adapt these high-industry standards. Under this framework, there is no incentive to restrict or place conditions on FDI inflows as a measure of curbing pollution; in fact, any FDI inflows should in theory directly contribute to reduced pollution. As such, states will maintain high FDI openness as it pursues its transition from the pre-industrial to post-industrial phase of development.

*Porter Hypothesis*

The Porter Hypothesis argues that strict environmental regulations create a win-win scenario for the firm and the developing nation. Economist Michael Porter, the founder of the Porter Hypothesis, contends that well-designed environmental regulations can in fact promote competitiveness and innovation within the firm. As pollution is a symptom of wasted resources, efforts to reduce pollution will likely result in increased productivity and improved efficiencies. As such, these well-designed environmental regulations work in favor of the firm because it “trigger[s] innovations that lower the total

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cost of a product or improve its value. Such innovations allow companies to use a range of inputs more productively – from raw materials to energy to labor – thus offsetting the costs of improving environmental impact and ending the stalemate. Ultimately, this enhanced resource productivity makes companies more competitive, not less."\(^{158}\) Based on these conclusions, economic growth will lead to improved environmental conditions because of already existing environmental regulations. This theory fails to predict how companies will actually behave, whether they will participate in offshoring highly-polluting activities as is expected in the Pollution Haven Theory or will contribute to reductions in polluting activities as is expected in the Pollution Halo theory. This theory also fails to address whether states will restrict or place conditions on FDI inflows to curb pollution as it only looks at the relationship between FDI and pollution from the perspective of the firm and not from the perspective of the state.

*Environmental Kuznets Curve*

The Kuznets Curve presents a more complex relationship between pollution and FDI and can be viewed as a hybrid of the Pollution Haven and Pollution Halo theories. The Kuznets Curve argues that economic growth via FDI inflows has an initially negative effect on the environment during the pre-industrial phase of development and a positive effect on the environment during the post-industrial phase of development.\(^{159}\) This explains the inverted U-shape curve of the Kuznets Curve. The Kuznets Curve expects that pollution will increase as per capita income increases. Once a certain level of income or “turning point” is reached, trends of environmental degradation and pollution will

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begin to reverse in a movement toward cleaner, greener behaviors.\textsuperscript{160} The significance of the Kuznets Curve is that environmental degradation and pollution are not permanent consequences of economic development.\textsuperscript{161} Environmental degradation and pollution are expected to occur in the short-term, while environmental responsibility and green behavior occur in the long-term. This expectation of future reductions in pollution promotes the “grow now, clean up later” mentality. Stern points out that “if the EKC [Environmental Kuznets Curve] hypothesis was true, then rather than being a threat to the environment, as claimed by the environmental movement and associated scientists in the past, economic growth would be the means to eventual environmental improvement.”\textsuperscript{162}

From the surface, the Kuznets Curve appears to require no outside intervention by the firm or developing host-nation to improve environmental standards. Economic growth is expected to improve environmental standards without the intervention of external variables. Income levels are considered to be sufficient explanations for the shift in the Kuznets Curve. However, subsequent amended versions of the Kuznets Curve recognize that income is not enough and that structural changes must be made at the turning point, which can include enforcement of environmental regulations, a shift from manufacturing to service sector-oriented FDI, diffusion of technology and best practices, or demands by more affluent and environmentally-conscious populations for improved environmental conditions.\textsuperscript{163} Under this amended framework, there is no incentive for the


developing nation to restrict or place conditions on FDI inflows during its initial phases of development or later phases of development. The state will maintain high FDI openness until it reaches a certain income level, before which it can expect high levels of pollution during the pre-industrial phase of development. In the post-industrial phase of development, states will maintain high FDI openness and can expect improvements in pollution during the post-industrial phase of development. The only expected change to FDI policies is that the state will impose policies favoring FDI inflows toward low-polluting sectors (service-oriented) rather than traditionally high-polluting sectors (manufacturing and industry-oriented).

**Critiquing the Four Theories on FDI and the Environment**

There appears to be no consensus among economists on the relationship between FDI and the environment and on which theory best explains a state’s developmental experiences. Early qualitative studies supporting the Pollution Haven Hypothesis like those authored by Hemamala Hettige, Robert Lucas, and David Wheeler, and Muthukumara Mani and Wheeler are questioned due to inadequate consideration of local factors of endowment and endogeneity of pollution abatement costs. In fact, most economists like Werner Antweiler, Brian Copeland, and M.S. Taylor and Gunnar

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Eskeland and Ann Harrison\textsuperscript{168} now conclude that there is insufficient econometric evidence to support the Pollution Haven Hypothesis despite its prevailing acceptance within the policy sphere and by ecological economists.\textsuperscript{169} There is also some evidence to support the Pollution Halo Hypothesis as shown by the likes of Lyuba Zarsky and Robert Baldwin and L. Alan Winters.\textsuperscript{170,171} However, the conclusions of Halo theorists vary based on which emission gases and industry sectors are chosen. Nadia Doytch and Merih Uctum, as an example, conclude that the Halo Hypothesis is supported by studies on FDI flows into service sectors whereas the Haven Hypothesis has more credence when studying FDI flows into manufacturing sectors.\textsuperscript{172} Critics of the Halo Hypothesis go even further and point to potential negative spillovers caused by firms from developed nations exporting dirty industry behavior, technology, and know-how. These critics point to faulty assumptions that firms from developing nations already possess the knowledge and capability to qualify as green industries.\textsuperscript{173}

For the Kuznets Curve, despite being widely popularized following studies by Gene Grossman and Alan Krueger or Thomas Selden and D. Song, critics argue that there are econometric flaws in the methodology used to support the Kuznets Curve effect.\textsuperscript{174}

According to economist David Stern, there are econometric issues of heteroskedasticity,

\textsuperscript{169} Gallagher, Kevin. 2001. The economics of trade and the environment: Redefining the research agenda. Global Development and Environment Institute.
\textsuperscript{172} Doytch, Nadia, and Merih Uctum. 2012. Globalization and the environmental spillovers of sectoral FDI.
simultaneity, omitted variables bias, and cointegration. Economists also point to flawed assumptions in the reversibility of environmental degradation, overall environmental improvement when statistics show simple shifts in pollutants or polluting country, and lack of consideration of income disparities within the developing nation. Other critics counter that the turning point necessary to correct pollution in developing nations and even in developed nations may never be reached due to the impossibly high “turning point” costs. Gallagher captures how inconclusive and complex the trade-environment literature is when he writes:

These debates can be grouped into three categories: the relationship between economic growth and the environment (Environmental Kuznets Curve); the relationship between trade and environmental quality (Pollution Haven Hypothesis); and the relationship between environmental regulation and competitiveness (Porter effect)...looked at through this lens, it is revealed that the three debates are each only looking at a particular slice of the trade and environmental relationship. They are less right or wrong as they are incomplete. The EKC literature empirically picks up all three effects, but it is difficult to determine which of the three effects is dominant.

Hypothesis, Methodology, and Definitions

This paper looks closer at the Kuznets Curve given its incorporation of elements of all four trade-environment theories. As there is conflicting evidence supporting and contradicting all four theories, this paper uses the Kuznets Curve as a theoretical template to explain trade-environment relationships and to introduce how economic policies influence that relationship.

This paper contends that amended versions of the Kuznets Curve, which recognize structural changes as the cause of the Kuznets Curve turning point, best

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explains the environmental improvements seen in developing economies. This paper accepts that alternate variables or structural changes like environmental regulations, diffusion of green technology, and environmental demands by affluent populations may also result in reductions in pollution and are difficult to control for. This study does not intend to contest the role of those variables on reduced pollution nor are the conclusions of this study negated because of the existence of other variables. This study simply wishes to test whether critics of the Kuznets Curve are correct that shifts in economic policies favoring low-polluting sectors rather than traditionally high-polluting sectors can explain a reduction in pollution. As such, this paper offers the following hypothesis:

States are more likely to maintain high FDI openness as they transition from the pre-industrial to post-industrial phase of development. States will not impose barriers to FDI as a tool to curb pollution, but will instead implement FDI policies that favor low-polluting sectors.

This paper chooses case studies from the Financial Times Stock exchange (FTSE) September 2014 Annual Country Classification Review, which classifies countries as developed, advanced emerging, secondary emerging, and frontier. Case studies were selected from the Review’s list of developed countries given their successful transition from the pre-industrial to post-industrial phase of development and having reached or surpassed the turning point for the pollutant selected for this study. According to the FTSE, developed countries have to meet all criteria listed under the following categories: market and regulatory environment, custody and settlement, dealing landscape, and a developed derivatives market. Countries classified as developed include: Australia, Austria, Belgium/Luxembourg, Canada, Denmark, Finland, France, Germany, Greece,

177 FTSE annual country classification review. 2014. FTSE.
Hong Kong, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, South Korea, Spain, Sweden, Switzerland, UK, and US.

Countries are selected if they have reached the post-industrial phase of development, which is determined by their GDP per capita level. This paper selects countries currently in the post-industrial phase of development in order to effectively test the hypothesis throughout the development phase. As explained in the literature review, the post-industrial phase of development is reached when the turning point on the Kuznets Curve is met, which varies for each pollutant studied. For CO₂ emissions, the pollutant selected for this study, the Kuznets Curve turning point is assessed to be between $22,500 and $34,700 (measured in 1985 US dollars) or $48,869.96 and $75,368.34 (measured in 2015 US dollars) in GDP per capita.\textsuperscript{178} Data for GDP per capita is derived from the World Bank’s GDP per capita dataset measured in current US dollars, which is defined by the World Bank as “gross domestic product divided by midyear population.”\textsuperscript{179} This paper selects the following developed economies as case studies given that they reached and/or surpassed the Kuznets Curve turning point for CO₂ emissions: Australia, Austria, Canada, Denmark, Finland, Ireland, Netherlands, Norway, Singapore, Sweden, Switzerland, and the US. Respective GDP per capita values and dates of when the case studies first reached or surpassed the Kuznets Curve turning point for CO₂ emissions are provided later in the Data section of this paper.

\textsuperscript{178} Yandle, Bruce, Maya Vijayaraghavan, and Madhusudan Bhattarai. 2002. \textit{The environmental Kuznets curve: A primer}. PERC, PERC Research Study 02-1.

This paper will track each selected case study’s level of FDI openness using OECD’s FDI Regulatory Restrictiveness Index.\textsuperscript{180} The Index, according to OECD, “measures statutory restrictions on foreign direct investment in 58 countries, including all OECD and G20 countries, and covers 22 sectors…The FDI Index gauges the restrictiveness of a country’s FDI rules by looking at the four main types of restrictions on FDI: foreign equity restrictions, screening and prior approval requirements, rules for key personnel, and other restrictions on the operation of foreign enterprises.”\textsuperscript{181} The Index scores countries on a scale of 0 to 1, with 0 representing zero regulatory impediments to FDI inflows and 1 representing full regulatory impediments to FDI inflows. This paper will provide statistics for total FDI index as a measure of FDI openness toward primary, secondary, and tertiary sectors, which are defined below.

According to the OECD, primary sectors cover agriculture and forestry, fishing, mining and quarrying. Secondary sectors include manufacturing, food and other, oil refineries and chemicals, metals, machinery and other minerals, electric, electronics and other instruments, transport equipment, electricity (generation and distribution), and construction. Tertiary sectors include distribution, wholesale, retail, transport, surface, maritime, air, hotels and restaurants, media, radio and TV broadcasting, other media, communications, fixed telecoms, mobile telecoms, financial services, banking, insurance, other finance, business services, legal, accounting and auditing, architectural, engineering, and real estate investment.\textsuperscript{182} Primary and secondary sectors are considered high-polluting sectors while the tertiary sector is considered a low-polluting sector.

\textsuperscript{182} Ibid.
Additionally, the Index only covers the years between 1997 and 2013 and only indexes FDI openness for the following years: 1997, 2003, 2006, 2010, 2011, 2012, and 2013. Singapore was deselected as a case study because data for Singapore was not available in the OECD FDI Regulatory Restrictiveness Index.

Finally, this paper will use CO₂ emissions statistics from the OECD’s Greenhouse Gas emissions database to track each country’s pollution levels between 1997 and 2012. CO₂ emissions were selected as the pollutant of interest because it is one of the primary greenhouse gases contributing to global climate change and because according to the US Environmental Protection Agency, CO₂ from fossil fuel use contributed to 57% of global greenhouse gas emissions. The CO₂ emissions within the OECD’s Greenhouse Gas Emissions Database is used to track pollution levels for each case study country and will be used to compare against FDI openness levels. Because the FDI openness index only covers the years 1997, 2003, 2006, 2010, 2011, 2012, and 2013, this paper will look at CO₂ emissions for those years specifically.

Upon compiling these data sets, this paper will chart how FDI openness levels compare to levels of CO₂ emissions overall. This will reveal visually whether CO₂ emissions have a relationship with FDI openness levels. Based on the hypothesis, this paper expects to see continuing high levels in overall FDI openness as CO₂ pollution levels rise in the pre-industrial phase of development and decrease in the post-industrial phase of development. A qualitative analysis will then be provided to explain the drop in

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CO₂ emissions, which is hypothesized to be caused by a shift in FDI policies favoring low-pollution sectors rather than an overall reduction in FDI openness.

Data

The following table shows respective GDP per capita values and dates of when the case studies first reached or surpassed the Kuznets Curve turning point for CO₂ emissions. The year is an important marker of when each case study transitioned from the pre-industrial phase of development to post-industrial phase of development according to the Kuznets Curve.

Table 7: Case Study Turning Points for CO₂ Emissions

<table>
<thead>
<tr>
<th>Country</th>
<th>GDP/capita values when states first reached or surpassed CO₂ Turning Point</th>
<th>Year when states first reached or surpassed CO₂ Turning Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>$49,650</td>
<td>2008</td>
</tr>
<tr>
<td>Austria</td>
<td>$51,293</td>
<td>2008</td>
</tr>
<tr>
<td>Canada</td>
<td>$51,790</td>
<td>2011</td>
</tr>
<tr>
<td>Denmark</td>
<td>$52,041</td>
<td>2006</td>
</tr>
<tr>
<td>Finland</td>
<td>$53,403</td>
<td>2008</td>
</tr>
<tr>
<td>Ireland</td>
<td>$50,567</td>
<td>2005</td>
</tr>
<tr>
<td>Netherlands</td>
<td>$50,858</td>
<td>2007</td>
</tr>
<tr>
<td>Norway</td>
<td>$49,263</td>
<td>2003</td>
</tr>
<tr>
<td>Sweden</td>
<td>$53,324</td>
<td>2007</td>
</tr>
<tr>
<td>Switzerland</td>
<td>$53,255</td>
<td>2004</td>
</tr>
<tr>
<td>US</td>
<td>$49,803</td>
<td>2011</td>
</tr>
</tbody>
</table>

Source: World Bank’s GDP per capita dataset

The following table provides FDI Regulatory Restrictiveness Index scores aggregated by the OECD to show levels of FDI openness during the years 1997, 2003, 2006, 2010, 2011, 2012, and 2013. As a reminder to the reader, the Index is scored on a scale of 0 to 1 with 0 representing no regulatory restrictions and 1 representing full regulatory restrictions.

Table 8: FDI Regulatory Restrictiveness Index

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Primary Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>1997</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>0.181</td>
</tr>
<tr>
<td></td>
<td>2006</td>
<td>0.181</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>0.078</td>
</tr>
<tr>
<td></td>
<td>2011</td>
<td>0.078</td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td>0.078</td>
</tr>
<tr>
<td></td>
<td>2013</td>
<td>0.078</td>
</tr>
<tr>
<td>---------------</td>
<td>--------</td>
<td>------</td>
</tr>
<tr>
<td>Primary Sector</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>Secondary Sector</td>
<td>0.143</td>
<td>0.143</td>
</tr>
<tr>
<td>Tertiary Sector</td>
<td>0.171</td>
<td>0.153</td>
</tr>
<tr>
<td>Total FDI Index</td>
<td>0.158</td>
<td>0.149</td>
</tr>
<tr>
<td>Primary Sector</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>Secondary Sector</td>
<td>0.11</td>
<td>0.11</td>
</tr>
<tr>
<td>Tertiary Sector</td>
<td>0.352</td>
<td>0.343</td>
</tr>
<tr>
<td>Total FDI Index</td>
<td>0.267</td>
<td>0.263</td>
</tr>
<tr>
<td>Primary Sector</td>
<td>0.163</td>
<td>0.163</td>
</tr>
<tr>
<td>Secondary Sector</td>
<td>0.174</td>
<td>0.174</td>
</tr>
<tr>
<td>Tertiary Sector</td>
<td>0.185</td>
<td>0.185</td>
</tr>
<tr>
<td>Total FDI Index</td>
<td>0.178</td>
<td>0.178</td>
</tr>
<tr>
<td>Primary Sector</td>
<td>0.056</td>
<td>0.056</td>
</tr>
<tr>
<td>Secondary Sector</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>Tertiary Sector</td>
<td>0.056</td>
<td>0.056</td>
</tr>
<tr>
<td>Total FDI Index</td>
<td>0.038</td>
<td>0.038</td>
</tr>
<tr>
<td>Primary Sector</td>
<td>0.056</td>
<td>0.056</td>
</tr>
<tr>
<td>Secondary Sector</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Tertiary Sector</td>
<td>0.056</td>
<td>0.056</td>
</tr>
<tr>
<td>Total FDI Index</td>
<td>0.038</td>
<td>0.038</td>
</tr>
<tr>
<td>Primary Sector</td>
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<td>0.185</td>
</tr>
<tr>
<td>Secondary Sector</td>
<td>0.178</td>
<td>0.178</td>
</tr>
<tr>
<td>Tertiary Sector</td>
<td>0.178</td>
<td>0.178</td>
</tr>
<tr>
<td>Total FDI Index</td>
<td>0.178</td>
<td>0.178</td>
</tr>
<tr>
<td>Primary Sector</td>
<td>0.062</td>
<td>0.062</td>
</tr>
<tr>
<td>Secondary Sector</td>
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<td>0</td>
</tr>
<tr>
<td>Tertiary Sector</td>
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<td>Total FDI Index</td>
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<tr>
<td>Primary Sector</td>
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<tr>
<td>Secondary Sector</td>
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<td>0</td>
</tr>
<tr>
<td>Tertiary Sector</td>
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<td>Primary Sector</td>
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<tr>
<td>Secondary Sector</td>
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<tr>
<td>Tertiary Sector</td>
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<td>Total FDI Index</td>
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<td>Primary Sector</td>
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<tr>
<td>Secondary Sector</td>
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85
The following table provides total CO₂ emissions for each case study during the years 1997, 2003, 2006, 2010, 2011, and 2012. Data for 2013 was not available within the OECD’s Greenhouse Gas Emissions Database.

Table 9: Total CO₂ Emissions for Case Studies

<table>
<thead>
<tr>
<th></th>
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<tr>
<td>United States</td>
<td>317772.25</td>
<td>364605.1</td>
<td>385969.34</td>
<td>399364.82</td>
<td>398161.39</td>
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<td>77800.99</td>
<td>76633.08</td>
<td>72366.12</td>
<td>70353.7</td>
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<td>Austria</td>
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<td>584115.81</td>
<td>571751.48</td>
<td>554408.24</td>
<td>557289.69</td>
<td>550546.59</td>
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<tr>
<td>Canada</td>
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<td>50419.97</td>
<td>45475.43</td>
<td>40798.82</td>
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<td>72365.65</td>
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<td>63488.3</td>
<td>56403.34</td>
<td>50733.33</td>
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<td>Finland</td>
<td>38255.68</td>
<td>45151.23</td>
<td>47227.19</td>
<td>41292.13</td>
<td>37716.34</td>
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<td>48479.12</td>
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<td>5375002.9</td>
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Source: OECD’s FDI Regulatory Restrictiveness Index

The below charts are provided to visually show how FDI openness levels compare to levels of CO₂ emissions overall.
Table 10: Australia FDI Openness and CO₂ Emissions

Source: OECD’s FDI Regulatory Restrictiveness Index and OECD’s Greenhouse Gas Emissions Database

Table 11: Austria FDI Openness and CO₂ Emissions

Source: OECD’s FDI Regulatory Restrictiveness Index and OECD’s Greenhouse Gas Emissions Database

Table 12: Canada FDI Openness and CO₂ Emissions

Source: OECD’s FDI Regulatory Restrictiveness Index and OECD’s Greenhouse Gas Emissions Database
Table 13: Denmark FDI Openness and CO₂ Emissions

Source: OECD’s FDI Regulatory Restrictiveness Index and OECD’s Greenhouse Gas Emissions Database

Table 14: Finland FDI Openness and CO₂ Emissions

Source: OECD’s FDI Regulatory Restrictiveness Index and OECD’s Greenhouse Gas Emissions Database

Table 15: Ireland FDI Openness and CO₂ Emissions

Source: OECD’s FDI Regulatory Restrictiveness Index and OECD’s Greenhouse Gas Emissions Database
Table 16: Netherlands FDI Openness and CO₂ Emissions

Source: OECD’s FDI Regulatory Restrictiveness Index and OECD’s Greenhouse Gas Emissions Database

Table 17: Norway FDI Openness and CO₂ Emissions

Source: OECD’s FDI Regulatory Restrictiveness Index and OECD’s Greenhouse Gas Emissions Database

Table 18: Sweden FDI Openness and CO₂ Emissions

Source: OECD’s FDI Regulatory Restrictiveness Index and OECD’s Greenhouse Gas Emissions Database
Discussion

As graphically shown, all the selected case studies exhibited the same general FDI policy behavior as they transitioned from the pre-industrial to post-industrial phase of development. They all maintained or increased their levels of FDI openness. The tertiary sector experienced the greatest shift in FDI openness with all states except the US increasing FDI openness. This generally supports the hypothesis that nation-states will maintain high FDI openness throughout the pre-industrial and post-industrial phase of development and that those nation-states will shift FDI policies to favor inflows directed toward low-pollution sectors rather than impose an overall reduction in FDI openness.
However, this does not necessarily support the hypothesis that nation-states will do so as a tool to curb pollution.

The increase in levels of FDI openness had varying effects on CO₂ emissions in the case studies. For five case studies, Denmark, Finland, Ireland, Sweden, and the US, there appeared to be a very weak relationship between FDI openness and CO₂ emissions. For Denmark, CO₂ emissions had already been on the decline since 1997. The only change in FDI openness occurred within the tertiary sector and occurred much later in 2010. For Finland, CO₂ emissions peaked and decreased in 2003 before any changes in FDI openness occurred. There were increases in FDI openness in the primary, secondary, and tertiary sectors, but these changes did not occur until 2006 and 2010. For Ireland, CO₂ emissions peaked and decreased in 2006 before any changes in FDI openness occurred. The only change in FDI openness occurred within the tertiary sector and occurred much later in 2010. For Sweden, CO₂ emissions had been on the decline since 1997. The only change in FDI openness occurred within the tertiary sector and occurred later in 2010. For the US, CO₂ emissions peaked and decreased in 2006 without any changes in FDI openness overall or within any of the primary, secondary, or tertiary sectors. Given that reductions in CO₂ emissions occurred before or without any changes in FDI openness for Denmark, Finland, Ireland, Sweden, and the US, these five cases demonstrate that FDI polices may not be necessary policy tools to influence CO₂ emissions. This study, however, does not dismiss the possibility that FDI policies could be correlated with reductions in CO₂ emissions.

For the other six case studies of Australia, Austria, Canada, Netherlands, Norway, and Switzerland, there appeared to be some correlation between FDI openness and CO₂ emissions.
emissions. For Australia, CO₂ emissions peaked and decreased in 2010, the same year there was an overall increase in FDI openness, seen within the primary, secondary, and tertiary sectors. There were earlier increases in FDI openness in 1997, 2003, and 2006, but CO₂ emissions continued to rise during that time. For Austria, CO₂ emissions peaked and decreased in 2003, the same year there was an overall increase in FDI openness. The only change in FDI openness occurred within the tertiary sector that year. There were subsequent increases in FDI openness in 2010, but CO₂ emissions were already on the decline. For Canada, CO₂ emissions peaked and decreased in 2003 the same year when there was an overall increase in FDI openness. The only change in FDI openness occurred within the tertiary sector that year. There were subsequent increases in FDI openness in 2010, but CO₂ emissions had already been on the decline. For the Netherlands, CO₂ emissions peaked and decreased the same year when there was an overall increase in FDI openness. The only change in FDI openness occurred within the tertiary sector and occurred in 2010. For Norway, CO₂ emissions peaked and decreased the same year when there was an overall increase in FDI openness. The only change in FDI openness occurred within the tertiary sector and occurred in 2010. For Switzerland, CO₂ emissions peaked and decreased in 2010, the same year when there was an overall increase in FDI openness. The only change in FDI openness occurred within the tertiary sector and occurred in 2010. Given that reductions in CO₂ emissions occurred the same year that changes in FDI openness occurred for Australia, Austria, Canada, Netherlands, Norway, and Switzerland, these six cases demonstrate that FDI policies may be correlated with reductions in CO₂ emissions.
As such, a qualitative review of these six case studies is provided to ascertain the correlation and relationship between FDI policies and CO₂ emissions and to determine whether China can and will be more likely to use FDI policies as a tool to counter CO₂ pollution. A closer review of Denmark, Finland, Ireland, Sweden, and the US is not provided given the likely presence of other exogenous variables already influencing the reduction in CO₂ emissions.

**Australia**

Australia maintains high FDI openness and is ranked the 7th largest FDI recipient in the world as of 2013. 185 Australia applies a combination of restrictions and incentives to discourage and promote FDI inflows to specific sectors. FDI inflows in the media, banking, air transporting, and mining sectors are liable to certain restrictions, while incentives are offered to investments in the food-processing, energy, large infrastructures, tourism infrastructures, and high-value added services sectors. 186 The use of restrictions and incentives do not appear to be intentionally used to address the environment given that sector bias appears to be indiscriminate of pollution intensity. In fact, the Australian government “pledged to reduce red tape and ‘green tape’ that slowed investment projects and delayed environmental approvals.”187 As such, sector bias appears to be directed toward enhancing national economic policy goals rather than achieving national environmental goals.

In the case of Australia, programs to reduce pollution appear to be primarily enforced by various environmental policies and regulations. The Clean Energy Future

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187 Ibid.
Legislation was introduced in 2011, which established the Carbon Pricing Mechanism known later as the Australian emissions trading system (ETS).\textsuperscript{188} This legislation committed the Australian government to reduce emission to below 5% below 2000 levels by 2020. The Australians also committed to the Kyoto Protocol under the UN Framework Convention on Climate Change (UNFCC) in 2007, which committed the country to reducing emissions during the first phase of the Kyoto Protocol (2008 to 2012).\textsuperscript{189} Therefore, this paper assesses that the peak and reduction in CO\textsubscript{2} emissions seen in 2010 was unlikely to have been caused by a structural change in the form of FDI policies but rather because of the enforcement of environmental regulations and policies like the Kyoto Protocol agreement and other external variables not tested for in this paper.

\textit{Austria}

Austria maintains high FDI openness with no restrictions or preferences for specific sectors or industries.\textsuperscript{190} The Austrian government offers investment incentives in the form of financial and tax subsidies, preferential loans, loan guarantees, and grants to firms that invest in economically underdeveloped areas or invest in automotive producers, manufacturing of high-tech products, and environmental technologies.\textsuperscript{191} The State Departments reports that “Austria welcomes foreign direct investment that avoids a negative impact on the environment, creates new jobs in high technology fields, promotes capital-intensive industries, and has links to R&D activities, for which special tax

\textsuperscript{189} Ibid.
\textsuperscript{191} 2014 investment climate statement: Austria executive summary. 2014. US State Department.
incentives are available.” Unlike Australia, the use of FDI incentives appear to be intentionally used to address the environment. Rather than applying sector bias through restrictions or incentives, Austria applies incentives to promote green investments regardless of industry.

In addition to FDI green incentives, Austria has pioneered and championed environmental causes in Europe, having introduced its first federal environmental legislation in 1958. Austria is a signatory of the UNFCC, the Kyoto Protocol, and the European Union’s ETS. It also has multiple environmental legislative policies that govern Austria’s environmental responsibilities, to include the 1998 Environmental Control Act and the 2001 Environmental Management Act. This paper assesses that the peak and reduction in CO₂ emissions seen in 2003 could have been influenced by a combination of economic and environmental policies present at that time. Therefore, this paper reaches the conclusion that in the case of Austria, structural changes in the form of FDI green incentives, enforcement of environmental regulations and policies, and other external variables not tested for in this paper could explain Austria’s peak and reduction in CO₂ emissions.

Canada

Canada’s FDI experience is unique as it is governed by the Investment Canada Act (ICA), the World Trade Organization, and the 1994 North American Free Trade Agreement (NAFTA). Canada has generally high FDI openness though it imposes

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192 Ibid.
strict restrictions on investments in a variety of sectors to include the telecommunications, cultural, financial, commercial aviation, general aviation, and mining sectors.\(^{196}\) The services sector is generally the most free with the NAFTA ensuring that “restrictions on bilateral services trade will not be applied in the future.”\(^{197}\) The Canadians also have high FDI openness in the energy sector as a means to develop its oil and gas resources.\(^{198}\) As a result, most FDI inflows are directed to the finances and energy and mining sectors. Canada’s preference for FDI inflows into a high-polluting sector (energy and mining) and low-polluting sector (finance) shows that sector bias appears to be directed more toward enhancing national economic policy goals rather than achieving national environmental goals. The use of restrictions and incentives do not appear to be intentionally used to address the environment given that sector bias appears to be indiscriminate of pollution intensity.

In the case of Canada, programs to reduce pollution appear to be primarily enforced by Canadian environmental acts, regulations, and agreements, in particular the Canadian Environmental Protection Act of 1999, the UNFCC, the Kyoto Protocol (ratified in 2002 and withdrawn from in 2011), the Copenhagen Accord of 2009, and Cancun Agreements of 2010.\(^{199}\) This paper assesses that the peak and reduction in CO\(_2\) emissions seen in 2003 was unlikely to have been caused by a structural change in the form of FDI policies but rather because of the enforcement of environmental regulations.


\(^{198}\) Ibid.

and policies like the Kyoto Protocol agreement and other external variables not tested for in this paper.

**Netherlands**

The Netherlands is highly liberalized and has no regulatory restrictions on FDI. The Dutch government imposes strong incentives to secure FDI inflows into state-preferred investment sectors: creative industries, logistics, horticulture, agro and food sector, life sciences, energy, water, chemical industry, and high tech. The State Department explains that “industry-specific, targeted investment incentives have long been a tool of Dutch economic policy to facilitate economic restructuring and to promote energy conservation, regional development, environmental protection, research and development (R&D), and other national socioeconomic goals…Since 2011, successive Dutch governments have pursued a program designed to stimulate research and development investments in the nine top sectors.” This strategy allows the Dutch to secure high rates of FDI inflows while also promoting high environmental standards in the country.

The Netherlands has also imposed strong environmental regulations to curb greenhouse gas emissions. The 2004 Dutch Environmental Management Act governs almost all national legislation related to the environment and is predominantly based on EU environmental legislation. The Netherlands has been a member of the Kyoto Protocol Agreement since becoming a signatory in 2002, committing to reducing CO₂

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202 Ibid.
emissions by 6% relative to 1990 levels by 2010. Other policy instruments like the Climate Policy Implementation Plan have also been used in the last decade to continue reductions in CO₂ emissions. This paper, therefore, assesses that the peak and reduction in CO₂ emissions seen in 2010 could have been influenced by a combination of economic and environmental policies present at that time. This paper reaches the conclusion that in the case of the Netherlands, structural changes in the form of FDI green incentives based on sector bias, enforcement of environmental regulations and policies, and other external variables not tested for in this paper could explain its peak and reduction in CO₂ emissions.

**Norway**

Norway’s FDI policies have become increasingly liberalized so that it better conforms to European Union (EU) standards for foreign investments and moves away from sector bias. According to the US State Department, Norway has lifted FDI restrictions affecting the petroleum sector, manufacturing sector, financial and other services sectors, and the media sector, though Norway shows greater preference for investments in the petroleum sector, mainland industry, and in less developed geographical areas of Norway. Norway has also instated high barriers for investments in the agricultural sector and monopolized industries like the postal services, railways, and domestic production and retail sale of alcohol. However, it has worked to lift the restrictions on the aforementioned monopolized industries. In 2004, Norway banned investment in companies that “engaged in various forms of weapons production,

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204 Ibid.
environmental degradation, tobacco production, human rights violations, and what it terms ‘other particularly serious violations of fundamental ethical norms.’

It also follows the EU’s European Economic Area Agreement to govern its investment regulatory climate, which dictates in Part 4, Chapter 3, Article 73 that the contracting party (of which Norway is one) will have the following objectives:

- to preserve, protect and improve the quality of the environment;
- to contribute towards protecting human health;
- to ensure a prudent and rational utilization of natural resources.

This is coupled with Norway’s implementation of a CO₂ tax, the Pollution Control Act, the Petroleum Act, and the Greenhouse Gas Emissions Trading Act (GGGETA). The GGGETA’s ETS was designed to help Norway reach its Kyoto Protocol commitments. It was amended in 2007 and 2009 to facilitate Norway’s compliance with Directive 2003/87/EC. These policies enabled Norway to reach its Kyoto Protocol and EU ETS commitments during its Kyoto Protocol Phase II period from 2008 to 2012. As such, this paper assesses that the peak and reduction in CO₂ emissions seen in 2010 could have been influenced by a combination of economic and environmental policies present at that time. This paper reaches the conclusion that in the case of Norway, structural changes in the form of FDI green restrictions, enforcement of environmental regulations and policies, and other external variables not tested for in this

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208 Ibid.
211 Ibid.
paper could explain Austria’s peak and reduction in CO₂ emissions. It is important to note that positive environmental effects in Norway are not necessarily because of a shift in FDI policies favoring low-pollution sectors (sector bias), but because of a preference in FDI policies for firms practicing environmentally friendly standards within their respective industries.

_Switzerland_

According to the US State Department, Switzerland’s FDI policies are generally fair with little preference or bias for investments toward specific sectors or geographical areas.²¹² Investments are generally open to and equally regulated for Swiss nationals and foreign investors. The few restrictions that do exist apply to state monopolies like the rail transport services, postal services, insurance and commercial activities.²¹³ There are additional restrictions in the form of domicile requirements that apply to “air and maritime transport, hydroelectric and nuclear power, operation of oil and gas pipelines, and transportation of explosive materials.”²¹⁴ However, these restrictions do not appear to directly address the environment, place environmental conditions on FDI, or show preferences for FDI inflows toward low-polluting sectors. In fact, Swiss FDI policies prefer large scale investments in both manufacturing and service sectors, demonstrating that there is no sector bias and indiscriminate to pollution intensity. Like Australia, FDI policies appear to be directed toward enhancing national economic policy goals rather than achieving national environmental goals.

In the case of Switzerland, programs to reduce pollution appear to be primarily enforced by environmental policies and regulations. Environmental laws in Switzerland are governed by the 1985 Protection of the Environment revised in 1995 and 2003, the 1999 CO₂ Act revised in 2011, and the Swiss ETS introduced in 2008 and revised in 2011. These laws are likely to have the most effect on Switzerland’s CO₂ emissions and are likely the best explanation for why CO₂ emissions peaked and decreased in 2010. The CO₂ Levy and the Swiss ETS were implemented by the Swiss government to achieve the Swiss Kyoto Protocol commitment to curb CO₂ emissions by 10% relative to 1990 levels by 2010. While improvements in FDI openness toward low-polluting tertiary sectors could have certainly contributed to reductions in pollution, the correlation is difficult to ascertain given the presence of other policy variables like existing environmental regulations and firms’ already existing preference to invest in Switzerland’s low-polluting finance and service sectors. This paper, therefore, assesses that the reduction in CO₂ emissions seen in Switzerland in 2010 is much more likely to be correlated with and a product of environmental regulations and other external variables not tested for in this paper, rather than the imposition of specific FDI policies and restrictions.

**Conclusion**

As the eleven case studies demonstrate above, FDI policies diverge greatly among developed economies and have varied applications as it relates to CO₂ emissions and pollution in general. The hypothesis was correct in that states are more likely to maintain

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high FDI openness as they transition from the pre-industrial to post-industrial phase of development and that states are less likely to pursue an overall reduction in FDI openness as a tool to curb pollution. It is important to note, however, that the correlation between pollution and FDI policies appears to be weak as five of the eleven case studies - Denmark, Finland, Ireland, Sweden, and the US - saw reductions in pollution before or without any changes in FDI openness were made. Even among some case studies where there appeared to be some correlation between pollution and FDI policies, FDI policies were not intentionally used to correct trends in pollution. Only in three of the reviewed case studies – Austria, Netherlands, and Norway – have FDI policies been intentionally used to address pollution. Furthermore, in each of those three cases studies, FDI policies were used differently to address pollution. The three case studies used a combination of economic incentives and “positive restrictions” to achieve its environmental goals, with positive restrictions being defined in this paper as economic restrictions designed to discourage dirty investments that incur GDP losses caused by environmental damage and degradation. In Austria, the government incentivized green FDI inflows without showing any sector bias or imposing barriers to FDI. In the Netherlands, the government incentivized green FDI inflows showing sector bias toward non-pollution intensive sectors, but without imposing barriers to FDI. In Norway, the government used “positive restrictions” to discourage dirty FDI inflows without showing any sector bias or imposing overall barriers to FDI.

As such, the hypothesis should be amended to show that states are not likely to impose barriers to FDI as a tool to curb pollution, but will instead implement FDI policies that
Incentivize FDI inflows into low-polluting sectors, or

Incentivize green FDI inflows that promote green technology, business practices, and know-how regardless of industry, or

Restrict FDI inflows into high-polluting sectors, or

Restrict dirty FDI inflows that promote dirty technology, business practices, and know-how regardless of industry, or

A combination of any one of the above.

What does this mean for China? According to the Kuznets Curve, China is years away from reaching the turning point for CO₂ emissions and thus years away from correcting its environmental air pollution crisis. China’s current GDP per capita is $6,807.40 measured in current US dollars. The Kuznets Curve turning point is assessed to be $48,869.96 and $75,368.34 in current US dollars. According to the Kuznets Curve, until the turning point is reached, China should have no incentive to reverse its current trends in CO₂ emissions as it cannot afford to do so and is expected to continue to behave like a pollution haven. This paper contends that China can reverse its CO₂ emissions trends before it reaches the Kuznets Curve turning point for CO₂ emissions and can do so by manipulating FDI policies through selective implementation of strategic economic incentives or “positive restrictions.” While the correlation between FDI policies and pollution remains weak and there are likely more effective policy tools to counter pollution, FDI policies can still be applied as a tool for pollution control.

Additionally, the four case studies of Denmark, Finland, Sweden, and the US demonstrate that reductions in CO₂ emissions can be achieved during the pre-industrial

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phase of development. This means China has an opportunity to reduce its pollution and emissions trends before the effects of environmental degradation and ecological damage become irreversible. The high income levels set by the Kuznets curve may not be a necessary variable in curbing pollution, specifically that of CO₂ emissions. Second, all eleven case studies showed that it was possible to maintain high FDI openness while curbing pollution. This means China does not have to compromise or sacrifice its levels of FDI or trade openness as it confronts its pollution crisis. This counters some economic environmentalists, who argue that trade barriers are essential to environmental improvements. Third, China can choose effective economic strategies that secure the FDI inflows necessary for economic growth and promote environmentally-responsible industry and development. The three cases of Austria, Netherlands, and Norway demonstrate that states can selectively implement economic policies that promote green FDI and/or discourage dirty FDI that fits its national economic and environmental policy goals. China’s 12th Five-Year Plan for Utilization of Overseas Capital and Investment Abroad shows that China foresees a vision that embraces a combination of strategic economic incentives and “positive restrictions.” According to the US State Department,

The 12th FYP for Utilization of Overseas Capital and Investment Abroad, issued by the National Development and Reform Commission (NDRC), promises to guide more foreign direct investment (FDI) to an identified set of strategic and newly emerging industries (SEIs), namely energy efficiency and environmental technologies, next-generation information technology, biotechnology, advanced equipment manufacturing, new energy sector, new materials, and new energy vehicles, while “strictly” limiting FDI in energy and resource-intensive and environmentally damaging industries.²¹⁷

This lends hope to China behaving more like a pollution halo as it transitions to the post-industrial phase of development and that it will maintain generally high levels of openness to trade and FDI as it confronts its environmental crisis.
CONCLUSION

As this thesis attempts to show, environmental security is an increasingly relevant and important phenomenon that demands the attention of academics and policymakers alike. Unlike a few decades before where the environment was marginally important to national policy agendas and largely considered irrelevant to national security, nation-states are now recognizing that this intersection of environment and security poses a substantial threat to global peace, stability, and security. Two of the world’s largest economies, greenhouse gas emitters, and energy consumers – the US and China – are now acknowledging that combating climate change is within their national security interest. This recognition is reflected in the 2015 US National Security Strategy which listed climate change as one of eight top strategic risks to US interests and China’s 12th Five-Year Plan which placed environmental protection as one of its top priorities for 2011 to 2015. There is now a heated debate within the environmental security and international relations disciplines on how nation-states will respond to their environmental security challenges as resources become increasingly scarce and population demands surge.

Theorists that subscribe to international relations realism theory expect a zero-sum response to their environmental security challenges. With the survival of the state and theory of relative gains guiding nation-state policy responses, realists anticipate a future of conflict and violence. Those that subscribe to international relations liberalism theory expect a cooperative response to their environmental security challenges, given the assumption that absolute gains in security can be achieved through positive engagement and peaceful interaction. This thesis tests realism and liberalism’s relevance in explaining how nation-states have responded to their environmental security challenges and applies
the experiences of selected case studies to predict how China will behave as it confronts its crises of foreign energy dependence, water scarcity, and air pollution and climate change. All three chapters of this thesis find that China will be more likely to pursue peaceful resolutions to its environmental security challenges and is more likely to use bilateral defense alliances, international cooperation and diplomatic resolution, and strategic economic incentives and “positive restrictions” as tools to achieve energy security, water security, and climate security, respectively.

The first chapter of this thesis adds to realism’s security-autonomy tradeoff model by introducing resources as an indicator of alliance formation between states of symmetric and asymmetric power status. It concludes that alliance formation can and will be used as a proactive procurement strategy to help great powers, like China, secure resources that increase state autonomy and state security. This means China should have a higher likelihood of pursuing or keeping a defense alliance with Indonesia, Saudi Arabia, the United Arab Emirates, Australia, South Korea, Singapore, Japan, and Russia based on its dependence on natural gas and refined petroleum imports from these countries. The implications of defense alliances between China and the aforementioned countries are significant. These alliances could potentially shift US influence in the Asia-Pacific and the Middle East region toward China and secure what the Chinese term a new model of great power relations. The Chinese have already begun this path by pursuing geo-economic alliances that create a Sino-centric environment of mutual dependence and shared economic interests. To counter Chinese balancing, the US must reassess its alliances and reiterate its strategic value to those allies it deems of key national security interest.
The second chapter of this thesis offers a new term “pessimistic equity-oriented pragmatism” to the literature on environmental security and resource wars. This term marries the theories of Malthusian realism and Equity-oriented pragmatism, to explain how states will respond to its water security challenges. The marriage of both theories recognizes that states will pursue cooperation and diplomatic resolutions first to resolve its environmental stresses, but will not refrain from conflict or violence if deemed absolutely necessary for state survival and if specific conditions are met. For China, the greatest threat of conflict stems from India and Vietnam, though this paper finds that conflict with either state will likely occur after negotiations were attempted and should not amount to more than small-scale skirmishes, military signaling, rhetorical attacks, or diplomatic and political hostilities. The implications of these findings are in fact, positive. It presents US policymakers and the international community an opportunity to engage the region and help broker solutions that promote sustainable water conservation and consumption practices in the region. As the US pursues its “pivot to Asia,” the US can use water scarcity as a positive platform to engage China and encourage cooperation within the region.

Finally, the third chapter of this thesis finds that international trade policies, specifically as it relates to FDI, does not need to be restrictive, but can be strategically employed to counter air pollution and climate change. The use of FDI incentives and “positive restrictions,” defined in this paper as economic restrictions designed to discourage dirty investments that incur GDP losses caused by environmental damage and degradation, allow states to maintain open trade policy while pursuing its environmental objectives. This runs counter to some economic environmentalists, who argue that trade
barriers are essential to environmental improvements. For China, this means it can continue to pursue trade liberalization while maintaining its commitment to environmental protection. This presents an opportunity for bilateral trade partners and international organizations like the World Bank and the International Monetary Fund to work with China as it continues to integrate into the global economy and pursues sustainable development and economic growth.

In conclusion, the findings of this thesis are significant additions to the literature on environmental security. As nation-states face increasing resource constraints, rapid population growth, and severe environmental challenges, there is an opportunity for diplomatic engagement through bilateral negotiations, international institutions, and open trade. Regardless if motivations for such cooperation are realism’s state-centric capabilities aggregation theory or liberalism’s emphasis on achieving absolute gains through cooperation, environmental security can be achieved through peaceful means. Hopefully, the conclusions of this thesis will encourage US policymakers to smartly and strategically engage China on the environmental challenges it faces and promote the continuation of a peaceful Chinese rise.
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