



**A SYSTEM DYNAMICS MODEL INVESTIGATING THE EFFICACY OF NON-
KINETIC POLICY STRATEGIES ON THE DIFFUSION OF DEMOCRATIC
IDEOLOGIES IN CHINA**

THESIS

Maria S. Phillips, 1st Lieutenant, USAF

AFIT-ENS-MS-17-M-153

**DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY**

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

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Maria S. Phillips, BS

1st Lieutenant, USAF

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Maria S. Phillips, BSOR

1st Lieutenant, USAF

Committee Membership:

Dr. Richard F. Deckro
Chair

Lt Col Matthew J. Robbins, Ph.D.
Member

Abstract

Shaping the next century of global politics and power, United States-China relations comprise one of the most significant bilateral relationships in the world. A new era of unrestricted warfare is one example of how aggression from China could be very costly for the United States. The growth of democratic ideals within China decreases the risk of detrimental impacts according to democratic peace theory. This thesis explores a multifaceted system of relationships that regulate the diffusion of democratic ideology within China, as defined by a proxy-measure characterized as human rights by Freedom House. Relative deprivation theory coupled with an adapted Bass diffusion model are leveraged as constructs leading to the emergence of a social movement influencing China's system of government. Non-kinetic policy strategies directed towards reforming government are assessed utilizing system dynamics. Subsets within system dynamics theory, goal dynamics incorporating soft variables, are investigated and implemented within the model as a means to evaluate interactions between actors while accounting for competing objectives. The resulting model provides a pilot operational assessment of driving factors, marrying both policy and strategic influence objectives with mathematically structured analysis as applied to this realm of research. Results suggest areas of study for future development that potentially further United States objectives within China. Thus, this research illustrates the value of applying a system dynamics approach to connect quantitative and qualitative factors in a way that provides a more thorough understanding of complex geopolitical interactions.

*“It doesn’t hurt to dream a little- many great men and women have done so and made
great things happen.” -Grandpa*

*This is dedicated to the memory of my grandfather who has been a source of inspiration
and encouragement in my life. Thank you for inspiring me to dream.*

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Maria S. Phillips

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A SYSTEM DYNAMICS MODEL INVESTIGATING THE EFFICACY OF NON-KINETIC POLICY STRATEGIES ON THE DIFFUSION OF DEMOCRATIC IDEOLOGIES IN CHINA

I Introduction

“The relationship between the United States and China is the most important bilateral relationship of the 21st century”

—Former United States President Barack Obama [1]

1.1 Chapter Overview

This chapter introduces research objectives, motivation, background, and methodology used in this study. United States interests in the world are facilitated when democratic ideals are adopted by the populace of countries with government types that are more totalitarian in nature. This research centers on gaining an understanding as to which strategic influences appear to lead to greater adoption of democratic ideals within China. Democratic ideals are defined by a proxy measure of human rights. Human rights include both political rights and social freedoms and the measure of these is used to indicate the status of democracy within a nation. System dynamics, an operational research technique, is applied in order to better understand the complexity of this system and its influencing relationships.

1.2 Objective

The overall objective of this thesis is to provide insight into influences that spread democratic ideals in China. This is addressed by defining sub-objectives that together aid progress towards the desired goal. These objectives culminate in answering four research questions addressed through these efforts:

1. What are the key variables involved in spreading democracy in China?

2. What are the interacting relationships between the key variables?
3. What United States policy strategies represent the best options of influence?
4. How do these strategies create influence?

The following list details the process employed to answer these questions:

- Achieve a basis of understanding of the system to be modeled
- Identify key elements impacting the system
- Clearly define key elements and identify elements representing real-world concepts
- Understand the relationships between elements
- Generate a system map of real-world elements and their interactions
- Model the system based on the generated system map
- Identify elements with measureable data and incorporate data into the system
- Identify future measures for elements lacking data and utilize a consistent metric scheme for variables without measures.
- Postulate interaction behaviors for elements without data based on an understanding from literature
- Simulate the system created and validate results
- Generate policy strategies from a United States perspective
- Test policy strategy effects on the system and report results
- Summarize insight based on results and provide recommendations for further actions
- Characterize areas that for future focus which would be of greatest value in United States efforts to achieve stated goals

The first process to gain insight for the objective questions requires modeling the relevant system to reproduce a level of reality simulating the issues of concern. At the time of this writing, China has not shown substantial democratic tendencies. Therefore, a simulation of a nation tending towards authoritarian rule is used as a base model. This base model is then used in auxiliary simulations exploring the effects of proposed policy strategies. Numerous factors influence the results of this system. However, a boundary limiting the features to key internal actors and overarching high-level influences is used in constructing the model. The resulting pilot model serves as a foundation for policy

research conducted within this study. Additionally, the proposed structure is intended to serve future exploration of this topic.

1.3 Motivation

United States policy towards foreign nations is ever adapting as technologies continue to connect nations in ways that were unheard of only a few decades ago. Within the last century there have been significant shifts in foreign policy reflecting changes in United States goals towards other nations. In particular, the previous era of isolationism early in the twentieth century was replaced by a policy of aiding the spread of democratic ideals by the start of, and in large part due to, the United States involvement in World War II. Former United States President Franklin Roosevelt articulated the transformation from a United States foreign policy of neutrality to one of global action by asserting four freedoms entitled to every person: the freedom of speech and expression, the freedom to worship God in his own way, the freedom from want, and the freedom from fear [2]. Mrs. Eleanor Roosevelt later referred to these freedoms in her efforts to advocate for human rights to include helping draft the Universal Declaration of Human Rights which was adopted by the United Nations in 1948 [3]. This deduction is revered as a multi-lateral acceptance of a standard of rights inherent to every person regardless of background or culture.

The policy of spreading democracy is widely debated not only by those in power under other types of political regimes, but also by those in the academic spheres within democracies. The questions addressed within this research are aimed at how to more effectively influence the adoption of democratic ideals within China, leaving scholars and

political science intellectuals, and, most importantly, elected officials to determine whether or not said policies should be the adopted United States foreign policy.

The current United States policy towards spreading democracy at the time of this writing is in support of an expansionist viewpoint. The expansionist viewpoint adopted as a foreign policy in the United States has continued since the Clinton and Bush Administrations and perhaps has strengthened under the Obama administration depending on how it is defined [4], [5]. Former United States President George W. Bush stated that "it is the policy of the United States to seek and support the growth of democratic movements and institutions in every nation and culture, with the ultimate goal of ending tyranny in our world." [6] Furthermore, under former United States President Barack Obama, the spread of democracy was a vital goal and a focus [7]. Clearly recent leaders of the United States have been and continue to be concerned with this topic.

The ideals often held as pillars of democracy are the freedoms for the people, the promotion and spread of human rights, the transparency of government, and the spread of economic growth, as well as the spread of ideas. These represent the basis for the spread of democratic ideals that are captured within the pilot model presented in this research. Further in-depth application is discussed in the methodology section in Chapters 4 and 5.

1.4 Background

The United States government has several documents outlining the attitude and strategies towards Eastern Asian nations, more specifically China.

U.S. policy objectives [are] to encourage China to uphold international rules and norms and to contribute positively to resolving regional and global problems ...U.S. Policy towards China DoD will also continue to monitor and adapt to China's evolving military strategy, doctrine, and force development, and

encourage China to be more transparent about its military modernization program. The United States will adapt its forces, posture, investments, and operational concepts to ensure it retains the ability to defend the homeland, deter aggression, protect our allies, and preserve a principled regional order founded in international law and norms that benefit all countries equally.

-Office of the Secretary of Defense 2016 [8]

China, over the years, has maintained its communist regime roots despite an increase in economic freedoms, and recently the hold of the unilateral dictatorship has increased in control and power. Human rights are not held to world standards in China. In addition, several relevant governing practices impact ties to the United States.

Popular thought was that capitalism would make China more democratic; however in recent history it appears to have had the opposite effect [9]. This speaks to the need for a better method to understand the inner-workings of the Chinese governmental system as well as a need for identifying the drivers to spreading democracy. The development of a system dynamics model may help remedy the difficulty of comprehending how the complex interactions between various influences impact strategic objectives. System dynamics is well suited for policy analysis given its inherent nature [10].

1.5 Methodology

Multifaceted behaviors within a system can be analyzed utilizing system dynamics. Such models allow for capturing the behavior of multiple interacting relationships by simulating the effects over time [11]. The purpose of system dynamics does not categorically lead to mathematical accuracy, but rather it leads to insights and conclusions of overall relationship interactions. A better understanding of the overall

system, given its size, is the purpose of this research and the reason why system dynamics is utilized as the investigative tool.

The roots of system dynamics are found in continuous differential equations [12]. Feedback loops derived from relationships define the systems responses to inputs in relation to time. The behavior of the relations is derived from expert knowledge and documented research that form the structure for behavior interaction. Analyzing the key relationships that are interconnected in the overall system of influences using system dynamics modelling appears to be a previously unexplored approach to evaluate the effectiveness of United States strategic initiatives on the spread of spread democratic ideals within China.

1.6 Assumptions and Limitations

An iterative process of analyzing pertinent literature was utilized to condense various forms of influences to categories summarizing the highest levels of influence. Assumptions and limitations applied within the model constructs are listed as follows:

- The basis for impacted feedback loops explored in this research is founded on research as well as discussion with China experts. The components of the included model represent those factors thought to have the greatest relevancy to the modeled process. These structures do not represent all influences to the process but rather only those understood to be most pertinent to this research.
- This initial model does not account for the effect Chinese government actions have on United States policies. United States actions are treated as an

unconstrained input to the model. This exogenous variable remains constant throughout the simulation.

- For variables without data or measurements, soft variable methodology is applied. Relationships between these variables are based on findings documented in the literature. Each relationship is shaped by general system dynamics behaviors and overall provide either positive or negative contributions to the flows between variables and stocks. Although additional data and differential equations dictating variable values within the system would more accurately predict the impact of the influences, the complexity of analyzing each existing relationship falls outside of the scope of this research. Suggestions for future measurements are included within the discussion of each component, and a higher fidelity study in this area is recommended for follow-on research.
- The horizon of the model is simulated for 30 years. This provides sufficient time to analyze the condition of the system while not extending to a point where the simulation is extrapolating too far outside of the scope of practical assumptions. This additionally extends the five and ten year timelines suggested for policy assessment [13].
- The model is incremented in time steps of 1 year. This is consistent with available data incorporated in the model.
- Actions endogenous to the system are consistent for 1 year periods. Actions exogenous to the system, to include policy strategies, remain consistent for the duration of the simulation.

- Exogenous variables to the model are estimated when relationships are not clearly identified within literature.

Additional assumptions and limitations specific to the simulated model are discussed in Chapters 4 and 5.

1.7 Summary

Chapter 1 stated the objective of this thesis, established the motivation, and briefly discussed the background and methodology applied within this research. Chapter 2 discusses the context of motivation for this research and establishes the circumstances surrounding the investigation of this issue. Chapter 3 provides a literature review of social theories and methodology approach utilized. It describes system dynamics modeling and expounds on key applications of this approach relevant to the methodology used in this research. Chapter 4 provides an overview of the methodology and approach applied in model formulation as well as the policy design. Chapter 5 provides a more detailed formulation of the model components and the relationships between model components. A detailed description of each component is provided including a brief background of the component as well as an overview of its incorporation in the overall model. Chapter 6 presents the tests used to validate the model and variables as well as results of applied policy strategy. Chapter 7 summarizes the results and conclusions and discusses recommendations for future research.

II Research Context

America's support for democracy and human rights goes beyond idealism — it's a matter of national security. Democracies are our closest friends, and are far less likely to go to war.... Respect for human rights is an antidote to instability...

-Former United States President Barack Obama [14]

2.1 Chapter Overview

This chapter outlines the underlying motivation for this study. The United States and China relationship is vital in global politics. As such, factors that can positively impact this relationship warrant careful evaluation using additional techniques such as systems dynamics modeling. A brief background of this topic is provided, including an overview of United States – China relations, a discussion of democracy, and an overview of democratic and human rights policy within both the United States and China.

2.2 United States-China Relations

China has steadily increased its global presence over the years economically and militarily. With a long-term outlook, a sizeable population, and a driven party, China stands as a force to contend with on the world stage. There is little doubt to the growing power of China and its role as a major contributor to molding history in the coming decades. China is headed by the Chinese Communist Party (CCP), in which membership is required in order for individuals to reach a status of sanctioned influence within the country. Communist ideals have significantly shaped its international interactions and “in the last decade, the Chinese regime has shown itself to be anti-democratic, no friend of free markets, a first-class cyber bully and more interested in rewriting or ignoring international norms than in respecting them” [15]. As China expands its power and reach in the global arena, communist ideals will continue to spread and could raise tensions

with or even overpower democracy on a global scale. This is evidenced in several border conflicts China currently engages with in the regions of Kashmir, the Baekdu mountains, and parts of the Himalayan Mountains, among others.

Communism is one of the greatest threats to the spread of democratic ideology. It has been cited as a believed hindrance to the China-United States relations in global conflicts, trade, and economic dealings with China [16], [17]. In spite of China's "lie in wait" mentality, it has recently started exerting its powers worldwide. This is seen in several of the recent territorial disputes such as the Spratly Islands and those in the South China Sea [18]. The number of those willing to oppose China's global aspirations and violation of international norms are dwindling. The United States remains one of the few countries with the resources, strategic positioning, and most importantly motivation to create a change within the regime. Although China has significantly less conventional military firepower than the United States, it has far more manpower and arguably a superior economic position of global influence [19].

A non-democratic China is a significant threat despite the comparison of military firepower. China is engaging in unrestricted warfare to promote its values [20]. A book published in 1999 by two People's Liberation Army Colonel's titled *Unrestricted Warfare* outlines a strategy of unconventional methods of attack designed to defeat a superpower while circumventing the need for direct military action [20]. These methods are not traditional methods of war, but rather target the crippling of the United States influence and power through unconventional attacks in the areas of economic warfare, cyber warfare, cultural warfare, and other unconventional assaults. For example, a study commissioned by the United States Department of Defense and conducted by Kevin

Freeman, author of *Secret Weapon*, related the role of economic warfare in precipitating the 2008 financial collapse [21]. Many experts, like Freeman, believe multiple non-democratic nation states have specific economic warfare units tasked with crippling the United States economy in 2008 style financial attacks [21].

A traditional military response from the United States is ineffective as an option to viably protect against such attacks. Even if it were possible to force a government regime change within China using kinetic means, it is evidenced that such an approach is ineffective and at best may lead to a temporary and highly unstable regime [22]. However, if there were a way to assist in transitioning power or ideals in China to become a more peaceful or democratic nation, this could be an essential step in improving relations and decreasing risk and tensions between the United States and China. Greater transparency in the ruling party of China as well as improving human rights, would have a significant impact towards building trust between the two nations while disarming some of the barriers that currently exist. Democratic peace theory postulates that a key factor to predicting peace between nations is the government system of democracy. Democracy is further discussed in the light as a potential tool for peace and the improvement in relations between the United States and China.

2.3 Democracy

2.3.1 Democratic Peace Theory

Democratic Peace theory posits that democracies are less likely to go to war with one another due to the pacifying influence of democracy. Presumably this includes the objectives of all types of warfare, both conventional as well as unconventional. This

liberalist theory is criticized by realists who claim that the logic is flawed and therefore peace seen between democracies may not be due to the democratic nature of these states [23]. Statistical evidence shows that wars between democracies are very infrequent if they occur at all depending on data assumptions within various research efforts. An example of such research is provided in Table 1 where dyads represent a pair of state and each year of existence provides an additional observation point recorded in the table.

Table 1 Dispute Behavior of Politically Relevant Interstate Dyads, 1946-1986 [24]

Highest Level of Dispute	Both States Democratic	One or Both Nondemocratic	Total Dyads
No dispute	3864	24503	28367
Threat of force	2	39	41
Display of force	4	116	120
Use of force	8	513	521
War	0	32	32
Total	3878	25203	29081

In Table 2, the percent of escalation of disputes when both states are democratic is less for each category when compared to disputes where one or both states are nondemocratic, Table 2 .

Table 2 Percent of Interactions within Dyads

Highest Level of Dispute	Both States Democratic	One or Both Nondemocratic	Total Dyads
No Dispute	99.64%	97.22%	97.54%
To threat of force	0.05%	0.15%	0.14%
To display of force	0.10%	0.46%	0.41%
To use of force	0.21%	2.04%	1.79%
To war	0.00%	0.13%	0.11%
Total	100.00%	100.00%	100.00%

Regardless of whether democracies go to war with each other, there is supporting evidence for the lessened probability of war between democracies due to a commonality in values and ideals [25].

Although the motives of a nation expending efforts to support democracies internationally is debated, it is evidenced in literature that there may be some truth and benefit resulting from increasing the number of democracies in the world. A discussion paper published by the Belfar Center for Science and International Affairs [26] summarizes the theoretical benefits of democracies for the United States and serves as a starting point for the purpose of spreading democratic ideals. The arguments presented by the Center are listed in the following outline:

1. It's good for the citizens of new democracies;
 - Democracy leads to liberty and liberty is good
 - Liberal democracies are less likely to use violence against their own people
 - Democracy enhances long-run economic performance
 - Democracies never have famines

2. Democracy is good for the international system

- The evidence for the democratic peace
- Why there is a democratic peace: the causal logic
 - Normative explanations
 - Institutional/structural explanations
 - Combining normative and structural explanations

3. The spread of democracy is good for the United States

- Democracies will not go to war with the United States
- Democracies don't support terrorism against the United States
- Democracies produce fewer refugees
- Democracies will ally with the United States
- American ideals flourish when others adopt them

These arguments, even if only a partial correct indication of the beneficial nature of the reality that could exist between the United States and China, indicate that it is certainly worth considering and exploring the ways in which the United States can further efforts to promote democracy in China due to the potential future global impact of China.

2.3.2 Democracy Definition

A clear definition of what constitutes democracy remains inconsistent throughout the literature. Technically, a pure democracy does not exist, even in the United States. Rather, a modified form biased towards various ideals of democracy shapes the definitions associated with the term. Although debatable, the often-associated elements of the concept of democracy are separation of powers, freedom of opinion, religious liberty, the right to vote in fair elections, governance based on public interest, and the assurance of basic human rights. A succinct definition classifies democracy as a "form of government, where a constitution guarantees basic personal and political rights, fair and free elections, and independent courts of law" [27]. These classification of ideal objectives are summarized into two categories: political rights and social freedoms which

collectively are referred to as human rights. Human rights, therefore, are the focus of this research as they accurately reflect the objectives of the democratic ideals sought through various United States political policy.

Unilaterally, it is difficult to achieve credibility when defining concepts that apply globally; the United Nations, however, clearly defines human rights in the Universal Declaration of Human Rights developed as a result of World War II [28]. The United States, as well as other members of the United Nations, are expected to uphold the declared rights “as a common standard of achievement for all peoples and all nations” [28]. It has been debated and some have criticized that the Universal Declaration of Human Rights is “a Western-biased document which fails to account for the cultural norms and values which exist in the rest of the world” [29]. There exists a debate as to whether or not human rights are universal and whether or not the UN document is valid for all peoples. However, both China and the United States are members of the UN which has adopted the document and agreed to this standard. While this bilateral standard is clear, measuring whether a state is upholding it is not a straightforward matter.

2.3.3 Democracy Quantification

While many experts have attempted to define and establish a standard for evaluating democracy among nations, two of the most well-cited and credible measures are Freedom House and Polity IV [30]. Freedom House is cited as the best known measure of democracy while the Polity project provides a wider range of data for a fewer amount of countries based on its minimalist definition of democracy [31]. These two measures value different aspects of democracy: the Freedom House measurement stresses a high level of individual rights and personal freedoms while Polity IV measurements

stress the constraints on elites and checks and balances within a government. The two measures dominate the political science literature as barometers of democracy with neither clearly dominating. Norris, in the text *Driving Democracy*, has shown these measures to be correlated [31]. Polity's 20 point score and the Freedom House 7 point rating have a correlation coefficient of 0.904 [31]. Regardless of the chosen measurement, the differences in application of the two measurements are assumed to be small enough to be used interchangeably with regards to the topic of this research. For this reason, a single measurement, Freedom House, is used as a measurement of the desired outcomes for the model created in this research.

2.3.4 Freedom House Measure

Established in 1941, Freedom House is a United States government funded non-governmental organization that believes the spread of democracy is the best weapon against totalitarian ideologies [32]. Freedom House provides information to help frame the policy debate in the United States and allows for assessment in progress on human rights globally [32]. It aims to act as a catalyst in the human rights debate worldwide using analysis and advocacy to achieve action and help progress the state of political rights and civil liberties globally [32].

Experts on each country are consulted to determine the final ratings and status using their democracy scale of nations. The process involves using a three-tiered rating system scoring countries based on a set of criteria which is included in Appendix A. These scores are combined to classify each country based on a political rights and civil liberties rating on a scale from 7 to 1. The average of these two ratings is used to classify a country's status.

China is rated as a 7 in political rights and a 6 in civil liberties according to the 2016 Freedom House Report. That equates to a status of "not free." A rating of 7 on political rights means that there are few or no political rights due to severe government oppression. A rating of 6 in civil liberties is categorized as countries that strongly limit the rights of expression and association allowing few civil liberties such as religious and social freedoms, highly restricted private business and open or free private discussion [33].

The chief advantages of this measure for application within this study center on its recognition and its consistency. The Freedom House scale of 1 to 7 provides a basis for consistent analysis across studies that is repeatable and clear. It's a quantifiable measure of the political development of countries allowing for global comparison from 1972 onward using time-series data utilizing a continuous measure. However, there is certain subjectivity required in the art of determining each country's scores. Critics have claimed the Freedom House scores may over-emphasize US and Western values [34]. In addition, the consistency of the evaluations across each location over time has been questioned as it does not include an economic dimension in the analysis, and the ultimate value of a single indicator or number may not be useful for evaluating policies [31]. Despite these criticisms, the Freedom House Measure has championed human rights globally and appears to be a widely-accepted measure of democracy in the political science community. The specific questions used to determine assigned ratings as well as the general methodology are included in Appendix A. A further in-depth explanation of the application of the measure within this model is discussed in Chapters 4 and 5.

2.4 United States Policy on Democracy

2.4.1 General Policy

There are tangible stakes linked to the number of democracies and non-democracies not just for the United States but globally. Since the end of World War II the United States has played a significant role in broadening democracies in Western Europe [35]. The United States engages in various activities designed to positively influence the ideals of democracy within the population of various regions. Officially the stance promoted by the United States government states that “supporting democracy not only promotes such fundamental American values as religious freedom and worker rights, but also helps create a more secure, stable, and prosperous global arena in which the United States can advance its national interests. In addition, democracy is the one national interest that helps to secure all the others ” [36]. With these guiding principles of encouraging democracy globally, the United States has been and continues to be an active advocate, spreading democracy through promotion and policy efforts. Each United States President since the end of World War II has articulated their support for human rights and greater freedom across the world [37].

2.4.2 United States Background on Democracy in China

Specific to China, the United States has a steady but what appears to be, a more passive approach in spreading democracy and its ideals. Nixon opened trade and established the underpinnings for United States-China political dealings in 1972 [38]. It was not until the violent Chinese government crackdown on student groups in Tiananmen Square 1989 that the United States took a specific focus on furthering human rights in China. Former United States President George H.W. Bush assisted dissidents, although

he did not respond against the "butchers of Beijing" after the Tiananmen Square incident. Former United States President Bill Clinton created a separation between economic ties to China and human rights issues, having faith that the capitalism in China would make efforts on its own. Clinton's Secretary of State, Warren Christopher, released a statement "Our policy will seek to facilitate a peaceful evolution of China from communism to democracy by encouraging the forces of economic and political liberalization in that great country" [39]. This policy remained consistent as the theme throughout the Clinton administration and continued into the following presidency.

Former United States President George W. Bush focused on religious freedoms in China while also anticipating that the economy of China would eventually lead to political changes as seen in South Korea and Taiwan [40]. South Korea and Taiwan, however, relied on the United States for defense and support in a way that allowed the United States to leverage greater influence on political changes within these nations. The faith that has been placed in a stronger economy leading to democratization of China has so far been misplaced. The economic robustness has not lead China closer to democracy as evidenced by reality [9], [41]. The rise in wealth has enabled a rich authoritarian regime; recently, President Xi has lessened certain freedoms since coming to power in 2012 [9].

Former United States President Barack Obama focused heavily on improving relations between the United States and China during his first term. However, during his second term in office, it has been speculated that a shift towards the Middle East and a change from Hillary Clinton to John Kerry as Secretary of State allowed relations between the United States and China to deteriorate and lose focus [42]. The recent

election, shifting the party in control of the White House and the balance in Congress, raises the question regarding what this administration will focus on regarding these issues.

At the time of this writing, President Donald Trump has yet to lay out a plan for how the United States will focus its policies on China and human rights abroad. When questioned on his opinion of Turkey's coup in July 2016, Trump stated that in regards to promoting civil liberties, the United States has enough problems and "it's very hard for us to get involved in other countries when we don't know what we are doing and we can't see straight in our own country" [43]. Additionally, he closed his Cleveland discussion talking about the movement of America First "Meaning we are going to take care of this country first before we worry about everybody else in the world" [43].

There has been speculation that President Trump may alter the classification of Taiwan and potentially change the United States policy on One China; however, overall it appears from statements made by President Trump thus far that he is unlikely to be willing to expend significant resources for improving conditions or spreading democracy in China [44].

Former Central Intelligence Agency director and previously senior adviser to President Donald Trump on national security, defense and intelligence during his transition to office, James Woolsey, released an opinion article stating his belief that challenging the Chinese social and political system is a risky endeavor [45]. It appears from his comments that despite United States commitment to spreading freedom, it is unlikely at this time that the Trump administration will see making great strides in this area with regards to China as a primary goal. The policy framing that appears to be

considered by the new administration makes a model summarizing the potential impact on democratic ideals within China of increased value and significance.

2.4.3 Military Stance on China

Potential conflicts and the possibility of escalating tensions with China and the United States are predicted to increase in the future. Strategic Command [46] has stated goals of acquiring better deterrence methods while acknowledging that the nature of such future conflicts is complex. The commander of the United States Strategic Command (STRATCOM), highlighted the attention warranted by China's actions following China's increase in military investments and actions in the South China Sea. The overarching priorities of the United States STRATCOM include deterring strategic attack against the United States and providing assurance to allies [46]. The effort and attention required in United States-China relations is not equivalent to a single democratic nation or those countries we term as close allies. *Strategic distrust* is a term describing United States-China relations. One of the three root causes of this distrust found in a study from the Brookings Institute was the insufficient comprehension or appreciation of each other's policy making processes and relations between the government and other entities [47]. An agreement on basic values of human rights may be one step leading towards a brighter future in United States-China relations and eliminating some mistrust in dealings between these countries. Official United States efforts in China regarding advancing human rights are outlined in the Human Rights in China and United States Policy report for Congress that is released for each new Congress session [18].

2.4.4 United States Efforts for Democracy

The United States financially supports the spread of democracy and expends a certain portion of the budget each year in so doing. The United States Agency for International Development (USAID) is the United States primary government agency responsible for administering civilian foreign aid. A portion of this budget is directly expended to promote democracy and provide governance assistance. The aid is distributed following a pattern where strategically important countries receive the majority of such assistance and additional countries receive only modest sums [48].

The United States spent \$43 billion in total obligations for international efforts across the globe in fiscal year 2014. Of those obligations the United States spent an approximated \$62 million, approximately one seventh of one percent of the total, on China [49]. The total amount of reported funds that the United States spent on governing justly and democratically in fiscal year 2014 was \$2.87 billion [50]. Approximately \$3.8 million, also approximately one seventh of one percent of the total, was appropriated for the promotion of democracy in China for the same year, a mere fraction of what the United States spent in other regions and nations of the globe [50]. “The Middle East and North Africa have long been the largest recipient of U.S. foreign assistance in the world” [51]. This research posits that the United States and China form one of the most significant strategic relationships of this century especially from a perspective of the risk of unconventional warfare, and that a potential way to reduce risk in this relationship is through greater shared ideals. One purpose of this research is to explore what changes result from additional focus and efforts within China. The shared ideals, realized through the spread of democracy, may have an impact at benefiting United States-China relations.

2.5 China Policy on Democracy

2.5.1 Politics in China

The democratic key values of human rights are not unique to Western culture mindset. Violations of human rights within China not only go against those rights upheld by the United States and the United Nations as unalienable, but these violations also conflict with the Chinese constitution. The constitution of the People's Republic of China guarantees the right to vote, freedom of speech, religion, press and assembly in articles 34-36 [52]. In practice, however, these rights are restricted by the ruling authoritarian government who regards such rights to be subordinate to government authority. A United States congressional study titled “Human Rights in China and U.S. Policy: Issues for the 114th Congress” completed in 2015 by Thomas Lum, Asian affairs specialist, examines ongoing human rights issues [18]. This report, as a congressional study, is available to the public and covers many of the current events at the time of Lum’s study relating to human rights in China. It should be noted that several studies have been completed by the Congressional Research Service to assist in informing United States leadership of policy issues and options in dealing with China. Human rights are closely linked to democratic ideals, and at least three such reports have been written after 2011.

Those seeking religious freedom and ethnic minorities are the groups that experience the greatest incidences of human rights violations. Furthermore, labor violations, primarily related to Chinese citizens working in factories, has been a source for social unrest and is a root cause for many protests [53]. Additionally, the reports address the restriction on information within China, a key factor in efforts for change [54]. The censorship within China is an effective source of control for the CCP and

proves to significantly impede the spread of democratic ideals. The human rights reports to Congress and their key findings, including the highlighted topics just mentioned, form the basis for the conceptual model created for this research. Policy efforts selected as influencing the modeled system are based on these reports as well.

2.5.2 Political Trends and Predictions in China

Within China, activists and the number of those championing the human rights cause continues to grow. Central Party School, a leading CCP think tank, issued a report in 2008 summarizing the trend of rising democratic consciousness creating an urgent need for political system reforms [55]. Further reports from think-tanks regulated by the CCP have highlighted the need for a systematic government change [56].

Chinese expert David Shambaugh, who has worked with the DoD, CIA, State Department and National Security Council to help develop United States policy, released an article predicting the collapse of the CCP [57]. Shambaugh maintains that the evidence is overwhelming in indicating concerns within the CCP that will result in a violent turnover within the regime [58]. Although this might not be the overwhelming belief among China experts (it is risky to predict the fall of an authoritarian regime) it warrants consideration given Shambaugh's experience. A violent turnover leading to instability within the nation would be of concern globally due to economic ties and other dependencies between China and other nations.

2.6 Summary

The United States and China have conflicting interests that have led to a rising tension and unconventional conflicts within recent decades. Nations with more similar beliefs like democratic values may see less conflict. China states several key democratic

values within its constitution and is expected to uphold a level of human rights as a member of the United Nations. The United States has a policy stance of promoting democracy globally although only a fraction of its overall spending supports efforts within China. This gap in spending may indicate an opportunity to see additional funding if a strategy of where the funds will be most effective is identified. Historically economic capitalism within China was expected to lead to a more democratic nation; however, data measured by Polity IV and Freedom House indicate otherwise. The new current administration has not yet specified a strategic stance within this region. Efforts identifying influence that would support United States goals may contribute to additional analysis and consideration of this matter. This is a motivation to investigate spreading democratic ideals within China from a high-level strategic perspective between nations.

III Foundational Model Philosophies

3.1 Chapter Introduction

This chapter introduces specific theories used in the construction of the system designed to address the research objectives. Literature reviews of several topics are included to provide an overview of foundational concepts concerning the application of both quantitative as well as qualitative methods for policy analysis. Topics include social movement theory, diffusion theory, and system dynamics. Explicit topics within system dynamics include soft variables and goal dynamics. These two sub topics aid in the understanding of the system framework of model organization. Discussion contained in this chapter sets the context with which the system dynamics methodology is applied in Chapters 4 and 5.

3.2 Social Movement Theory

Several paths exist for progress to occur on the issue of human rights within China:

- Enforced change from an outside entity (such as a military takeover)
- Enforced change from within (a revolution or coup causing a change in the leadership, government, or system of government)
- Pressure from an outside entity (such as trade sanctions)
- Pressure from within (reformation of policies in relation to an issue)

Brute force regime changes are costly, often temporary, and foster resentment. Grassroots efforts have, in recent years in particular, proven to be the most powerful source of dramatic political change in countries with diverse structures [59]. For these reasons,

kinetic approaches are not considered in the scope of this study. Non-kinetic methods are explored as a means to facilitate and leverage a movement towards democratic ideals which is already present within China.

Using system dynamics to investigate initiatives that spread the democratic ideals of human rights within China requires a framework. The enforced paths are not considered in this study as they often lead to instability and temporary solutions. To achieve the goal of spreading human rights within China non-kinetically, the system in place currently must evolve or rather, must reform. This requires that the system of governing and regime can adapt to and embrace reform. The process of reform can be modeled as a result of a social movement.

Social movements have occurred throughout history, creating change across the globe. At times they are directed at the government in order to spur change in a circumstance while at other times they are directed at raising awareness to change public opinion on a topic [60]. The definitions of a social movement are ambiguous; however, for the purposes of this research, a social movement is defined as “a set of opinions and beliefs in a population which represents preferences for changing some elements of the social structure and/or reward distribution of a society” [61].

3.2.1 Stages of Movements

There is a lifecycle to social movements. Christiansen [62] discusses a theory of four stages that provides insight into understanding key factors for many emerging movements. As a structure to understanding collective action in the form of social movement, there are four defined stages as depicted in Figure 1 [62], [63].



Figure 1 Stages of a Movement

These stages provide a framework which aids understanding of how lasting change can be brought about without transitioning the government or system of government in place. Of note is that the fourth stage of decline can result in success or failure of the movement in several forms.

3.2.2 Social Movement Theory

Social movement theory is an area of study that arose in the attempt to explain why public movements came to be. Klandermans suggests that two distinctive classes of theories exist in regards to social movements: classical approaches and contemporary approaches [64]. Classic theory emphasizes that a general expectation or deprivation causes protest while contemporary theory holds that resources and structure of reality can lead to a unified goal that allows for a movement to occur [64]. Several predominant theories in literature include theories labeled as social deprivation, framing, social movement impact, new social movements, emerging cultural perspective, resource mobilization, and rational choice [64]. While this review does not cover all theories, a general description of the classical and modern approaches is further discussed.

A classic social movement theorist, Tocqueville was among the first to note that unrest occurs when conditions are improving [65]. A similar conclusion is what led the rising contemporary theorists to seek new explanations for social movements. Several theories arose explaining the “relative deprivation theory” such as the J-Curve

hypothesis; however, a study investigating the theories surrounding this phenomenon deemed that the popular theories were not supported by evidence [66]. An explanation offered for the phenomenon by Taylor “is that people evaluate their outcomes against subjective rather than absolute standards” derived from reference groups and past experiences [66], and a modern approach to this theory asserts that a refined version of the theory may see a gap occur if there is a sudden downturn in improving conditions [67]. Regardless of the truth to Tocqueville’s original observations, an assertion that withstands criticism is that social movements arise when there is a gap in expectations. “Although discontent may be an essential condition for social movements, discontent does not always lead to a social movement or other form of collective behavior” [63].

A modern approach, such as the resource mobilization theory, holds that people protest utilizing social networks and are both resourceful and organized. Resource mobilization theory has, however, been criticized as underestimating the importance of harsh social conditions and the frustrations that result in an increased level of social movement as well as eliminating the emotional aspect involved in a movement [63]. A comparative political study completed in 2015 validated the importance of the internet in connecting people and sharing ideas and their influence to bring about change within CCP regime actions [68]. This supports the resource mobilization theory noting evidence that access to the internet and connecting grievances with citizens allows for the mobilization of a civil action creating change [68]. Another study relating several components key to the model within China, applies both modernization social movement theory as well as relative deprivation theory in its goal of relating civil unrest causes to the protests that have occurred in China [69]. For the purposes of this research,

components of each theory are applied within the system dynamics model. Relative deprivation is represented as a root cause for civil unrest, and resource mobilization theory is represented in the ability for the cause to take form in the shape of citizen action.

3.3 Diffusion Theory

Democracy and human rights are powerful forces even when they are encapsulated only in the form of an idea. Actions and structures exist that represent the physical forms defining the reality of democracy; however, in the realm of social movements, the idea that is perpetuated is at first an abstract concept that participants are trying to achieve. Therefore this research represents the diffusion of human rights, a proxy measure of democracy, by incorporating within the model the concept of spreading the ideology of human rights. Although there are not authoritative models that capture the spread of ideas, several similar areas of research prove useful and are utilized within this research's methodology. This section provides an overview of several applications of diffusion models.

3.3.1 Traditional Diffusion Model

The Bass model of diffusion is a widely known application model within management science [70]. It has typically been applied within marketing and is often used as a forecasting technique to understand the sales of new products. Using differential equations, the spread of the product adoption rate can be represented with regards to time. The following equations summarize the key interactions found within the Bass model. Equation 1 displays the formulation as Bass presented it [71]

$$\frac{d}{dt}S(t) = qT(t) + (p - q)A(t) - \frac{p[A(t)]^2}{T(t)}, \quad (\text{Eq 1})$$

where:

$S(t)$ = rate of adoption

p = innovation coefficient referring to a person accepting an innovation based on impersonal communication like advertising

q = imitation coefficient referring to persons requiring personal communication within the social system to become customers

$A(t)$ = number of adopters

$T(t)$ = number of total possible adopter or market saturation limit.

This equation has been adapted to represent interactions within a system to include basic marketing. If given enough time, the market becomes saturated and all potential adopters become adopters using these model parameters. They are influenced by the rates that represent imitation based on word of mouth and innovators, or those who are the initial adopters of the product based on product messaging.

This system has not only been used in marketing, but its foundational concepts have also been expanded to incorporate its concepts into innovations in several areas of research. For example, Bass model concepts have been used to model the diffusion of a nation's system of government transformation to democracy on a global scale based on polity data, illustrating the usefulness of such concepts in more than just the marketing realm of product adoption [72].

3.3.2 Additional Diffusion Models

Further models of diffusion found in literature include applications of an epidemiological model as depicted in Figure 2. This figure is adapted from a study quantifying the spread of ideas by creating a model that parametrizes the spread of Feynman diagrams through several theoretical physics communities [73]

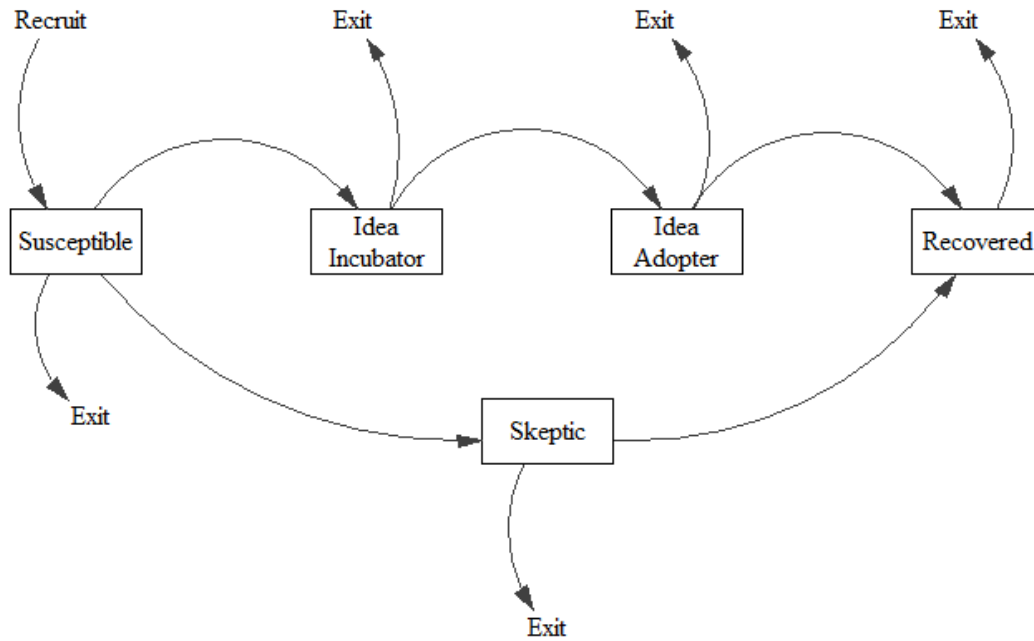


Figure 2 Traditional Epidemiological Diffusion

Figure 2 is included to describe the concepts of different diffusion approaches that clearly have varying assumptions guiding the interactions between variables within the proposed model. Diffusion models extend further to include portraying the spread of two political parties within a system utilizing non-linear relationships and epidemiological approaches [74], integrating diffusion modeling competition between two similar pharmaceutical drugs [75], and treating diffusion as an infectious disease to model the spread of gangs within a population [76]. The mentioned alternative diffusion models have all been published after 2000; however, a thorough study of techniques utilized in diffusion theory application highlights the different applications of those prior to 1998 relating to social movements [77]. Strang summarizes several assertions related to hypothesized factors effecting social movements such as the impact of suppression on dampening the amount of protests and delves into a deeper understanding of applied models' guiding mechanisms that cause the

formulations of the diffusion itself [77]. These additional models add value to the discussion of formalizing the relationships representing the spread of the idea of democracy. Future investigation may include comparisons of different diffusion model structures applied to this research.

Tangential to diffusion models, Kijek and Kijek [78] compare the Bass model with several other models to evaluate the diffusion of broadband internet within several countries. This study offers a comparison, concluding that of the commonly used diffusion models, it is difficult to identify a superlative model from the examined instances [78]. Within the scope of this research, an expansion adapting the Bass diffusion modeling concept is chosen to represent the spread of democratic ideals in China due to the nature of the simplicity of the Bass model with regards to the variables as well as representation of components of interest.

3.4 System Dynamics

The forward thinkers of the world constantly solve problems and try to make sense of what's happening around them. That is how Newton's Laws came about, how electricity was harnessed, and how virtually all modern technologies came to be. The engineers, inventors, and scientists gained insight into the way the world works. The drive for insight is the same objective with system dynamics modeling: gaining insight into a complex reality.

Often, these discoveries and forward leaps involve some sort of simplification: an assumption or abstraction that allows for applicability and usefulness. As of yet, it is not possible to create a perfect model of a complex political situation; however, even imperfect models can allow for discerning valuable results. With this in mind, system

dynamics can be used in an attempt to model difficult relationships, not only to see direct effects, but also to gain insights into the secondary and tertiary effects between correlated and subsequent connections. The connections within a system are often difficult to understand and many connections exist. System dynamics can assist in providing insight when intuition alone is insufficient. A key to system dynamics modeling is that it systematically accounts for the influence of complex relationships over time.

System dynamics is an analysis methodology for industrial practices developed at the Massachusetts Institute of Technology Sloan School of Management by Jay Forrester in the 1950s [12]. It was later expanded into World Dynamics as well as Urban Dynamics. It has grown in worldwide recognition within the academic community and is also utilized by corporations and industry to investigate such areas as economics, public policy, social sciences, and management among others [10]. Despite disagreements of approach and application among leading analysts in the field, there is an overall consensus on the value of system dynamics. Tang and Vijay [79] further explore the direction of these approaches. They conclude that, although the field has not expanded of late, the overall methodology is novel in combining reality and difficult policy decisions with system dynamics modeling methods.

3.4.1 Evolution

One of the greatest attributes of system dynamics is the intuitiveness inherent in the design of the method. Meadows mentions that the most easily understood but rarely applied systems thinking could provide several benefits [80]. Meadows created a primer to allow for an introduction to a progressive way of considering a system. It is widely

accepted that system thinking is a critical tool in addressing political, social, economic, and environmental challenges faced around the world [80].

The concept of thinking in the form of systems can be traced to ancient Greece [81]. Several different types of methodologies stem from systems thinking. Forrester was the first to develop the modeling theory relating to dynamic systems, therefore combining the idea of general systems with the concept of complex relationships over time [81]. Schwaninger has made a comprehensive effort to summarize all system movement efforts since its origins. These all culminate into several categories of systems thinking to fall into the positivist tradition and the interpretivist tradition. Schwaninger defines positivist as those systems thinking methods that focus on generating systems based on ascertained facts. He defines interpretivist as those systems that emphasize the art of defining systems and the value of subjective interpretations of phenomena [81]. Together these two categories have been combined by Forrester into what is today known as system dynamics.

Historically, several leaders within the system dynamics community have proposed a formalized representation of the steps involved in system dynamics modeling, which are provided in Table 3. This represents the steps inherent in the process which all present a similar methodology. Over the years, the general concepts underlying the methodology of system dynamics have gone unchanged.

Table 3 Proposed System Dynamics Methodologies

Randers (1980)		Forrester (1991)		Sterman (2000)	
	-Define the purpose of the model -Define the model boundary and identify key variables -Describe the behavior or draw the reference modes of the key variables -Diagram the basic mechanisms, the feedback loops, of the system	1	Identify	Identify a problem or system to modeled	1
2	Formulation	2	Hypothesize	Develop a hypothesis to explain the cause of the problem or behavior of the system	Formulation of Dynamic Hypothesis
3	Testing	3	Develop	Develop a model to capture causes/ behaviors	Formulation of a Simulation Model
4	Implementation	4	Validate	Validate the model to show that it reproduces the real-world behavior	Testing
	-Test the model's response to different policies -Translate study insights to an accessible form	5	Brainstorm	Devise possible solutions to the problem or modification of the behavior	Policy Design and Evaluation
		6	Solve	Test these solutions in the model to show that the possible outcome or impact of the proposed solution	

3.4.2 Systems Thinking

Systems thinking is the first step in utilizing a system dynamics methodology. It involves the investigation of interactions within a system [82]. A system begins with the clear articulation of system purposes and the basic components that have the largest impact in the system. Systems thinking, or mental mapping of a model, is then translated to a system dynamics model that can be simulated.

During model conceptualization, it is important to identify main system variables and define variable types. Figure 3 illustrates this principle and shows an example of a causal loop diagram.

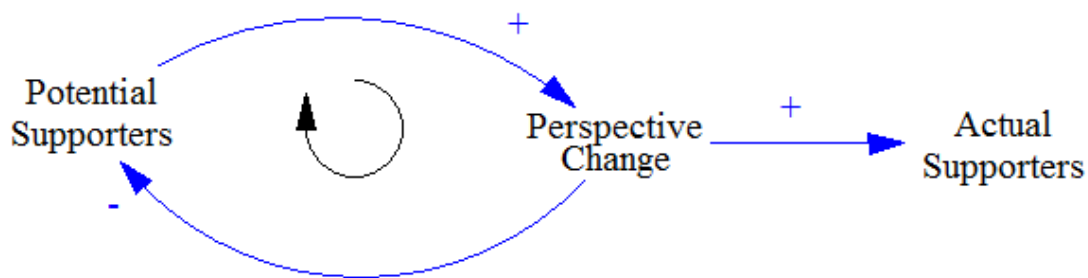


Figure 3 Causal Loop Diagram Example

Through constant discussion with the client or subject matter experts, the causal structure of a system can be developed. Simplification is of great value in this process; as with all models, a degree of generalization is often required. System dynamics does not address all of reality, but rather a scoped problem is a better use of the methodology. This abstraction is referred to as bounded rationality [83]. When depicting a system with such a model, it is important to note that while useful for understanding complex relationships, no model is a perfect representation of reality [80]. A system is more than the sum of its

parts. Representing a system using a system dynamics model is an iterative process. The first step in creating a model is to identify the problem and define objectives followed by model conceptualization and then model formulation [84].

3.4.3 Basic Concepts

The next portion of developing system dynamics concepts involves model formulation and a stock and flow diagram. The most rudimentary roots of a system in system dynamics are found in the stocks, flows, and delays that form the system and its behavior. These originate from its background in industrial dynamics [85]. A stock in system dynamics is an accumulation of “material or information that has built up in a system over time” [80]. A flow, also referred to in the literature as a rate, in system dynamic is “material or information that enters or leaves a stock over a period of time” [80].

Figure 4 illustrates a simple example of a stocks and flows. In this example the Chinese population is the stock. The flows are the birth and the death rates. Over time the Chinese population will increase if deaths are less than births, and it will decrease if the opposite is true.

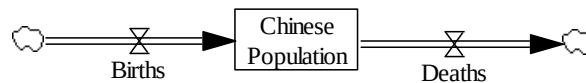


Figure 4 Stocks and Flows Example

These illustrations offer a visual presentation of differential equations. The double lines with the hour glass symbol represent the flow or rate into the stock, represented by a

rectangular box. Mathematically this diagram represents the formulation provided in Equation 1.

$$ChinesePopulation(t) = ChinesePopulation(0) + \int_0^t (Births - Deaths)dt \quad (\text{Eq 1})$$

where t = time and $ChinesePopulation(0)$ is given as an initial population. The Chinese population at time t is dependent on the rate of births and deaths within the system.

Another way to represent the flow into a stock is shown in Figure 5. Here the value of the rate or flow into the stock Chinese Population is represented as a bi-flow labeled “Net Births” which can be positive or negative.

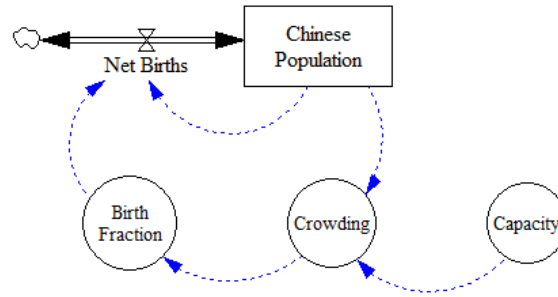


Figure 5 Net Flow Example

Formulation for this is presented

$$Crowding = \frac{ChinesePopulation}{Capacity} \quad (\text{Eq 2})$$

$$BirthFraction = f(Crowding) \quad (\text{Eq 3})$$

$$ChinesePopulation(t) = ChinesePopulation(0) + \int_0^t (Net\ Births)dt \quad (\text{Eq 4})$$

where Capacity is a constant set limit and the function $f(\text{Crowding})$ represents a fitted function which in this case is monotonically decreasing.

Modeling relationships between variables is not always inherent or accessible based on known formulations or data. Relationships of interacting components typically follows one of six fundamental modes of behaviors: exponential growth, goal seeking, s-shaped growth, oscillation, overshoot and collapse, and growth with overshoot [11]. Barlas later expanded on this categorizing additional behavior patterns to those listed in Figure 6.

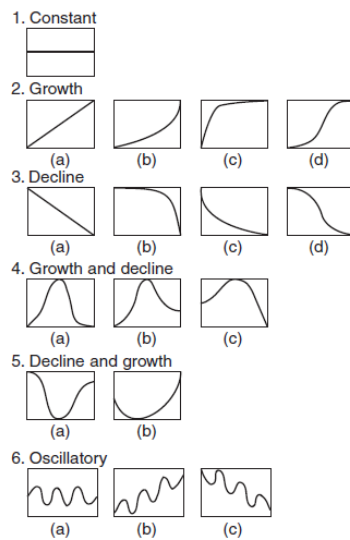


Figure 6 Typical Categories of Basic Dynamic Behavior [86]

A continuation of the marketing example is illustrated in Figure 7.

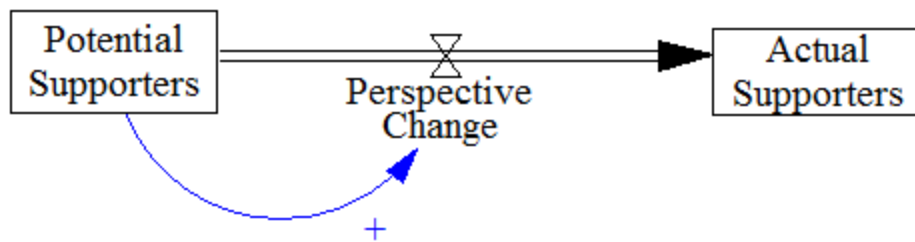


Figure 7 Stock and Flow Example

This figure offers a hypothesized relationship that the number of potential supporters within the system may have a positive influence on the prospective change flow. The arrowed blue line with the “+” sign represents a relationship within the system. In this case, the number of potential supporters influences the rate of perspective change which acts as a flow into the stock, actual supporters, in this example. The relationship between the effects of potential supporters on the rate of prospective change may be unknown; however, even if its type function is unknown, a fitting behavioral relationship can be applied to the model using an appropriate growth relationship from Figure 6.

Following this process, additional key variables impacting the stocks and flows should be identified and added to the model. This is illustrated in Figure 8 where key contributors to the system are now included.

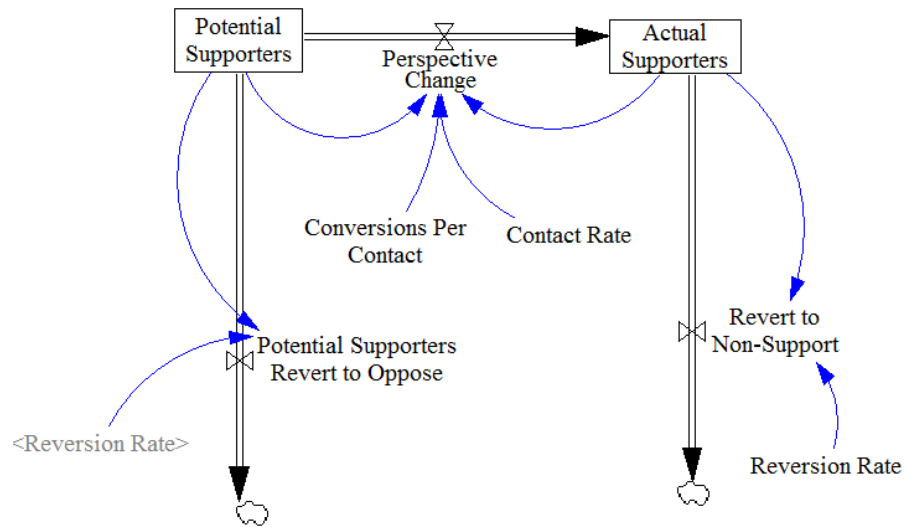


Figure 8 Stock Flow Example with Added Key Variables

The largest contributors of the system and their corresponding relationships and feedback loops within the system should be the result of continued discussion with those who understand the system being modeled. Transferring this model to a formulation follows this process that then allows for simulation and testing. Simulation of this system leads to analysis that can provide insight to policy makers and leadership while incorporating the potentially unforeseen effects of interacting variables within a system [11].

When there is a closed relationship change between stocks, a feedback loop is formed [80]. Figure 9 is a representation of a simple feedback loop using stocks and a flow to form a system dynamics system. The structure of this feedback loop portray a visual representation of the basic components of the Bass diffusion model discussed in Section 3.3.1.

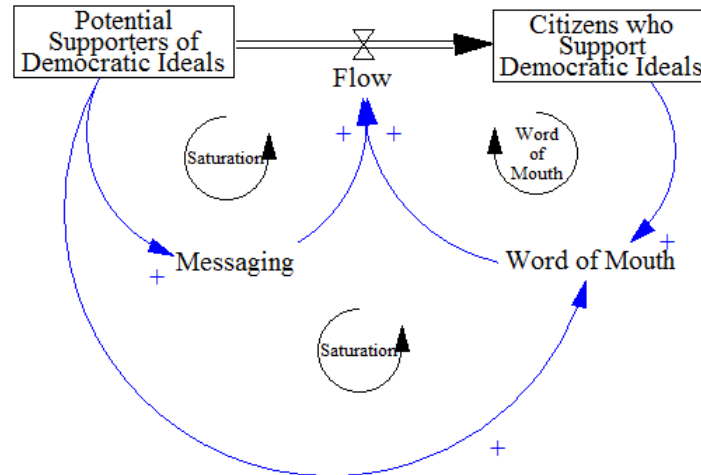


Figure 9 Feedback Loop System Bass Model Example

Feedbacks are either reinforcing or balancing depending on the effect of the variables on the flow. Together these components create the basis for a system. As seen in Figure 9, the feedbacks are all reinforcing as noted by the “+” adjacent to the arrows. Multiple stocks, flows, and contributing variables interact, forming relationships that are often non-linear.

3.4.4 Soft Variables

While system dynamics can be utilized to model quantitative variables, it is also a useful tool for modeling qualitative variables. System dynamics is an evolving field with the ability to address issues relating to variables that are difficult to measure, although it is not always a capability utilized or applicable when solving a specific problem. In matters regarding the spread of human rights in China; variables are often difficult to measure, or the data is simply not accessible or existent given the sensitivity and background of the topic. In operations research, it is far more common that these types of variables are in fact omitted due to the lack of data or direct measures with which to

represent them [87]. Forrester addressed difficult to measure variables, also referred to as “soft” variables, by asserting that “to omit such variables is equivalent to saying that they have zero effect - probably the only value that is known to be wrong” [85]. At its creation, Forrester purposed system dynamics to radicalize the realm of mathematical elegance for elegance sake by surpassing the fabricated constraints of quantitative variables [88]. Variables modeled included those that represented hypotheses concerning real-world intuition and not necessarily those that were directly calculable or statistically able to be fitted like those utilized in standard engineering approaches. Figure 10 illustrates the concept that most available information that may govern the effect within a system is not numerical in nature but rather qualitative. Forrester asserts that the mental database provides not only the greatest quantity of information, but it is also of greatest significance to modeling the system [12].

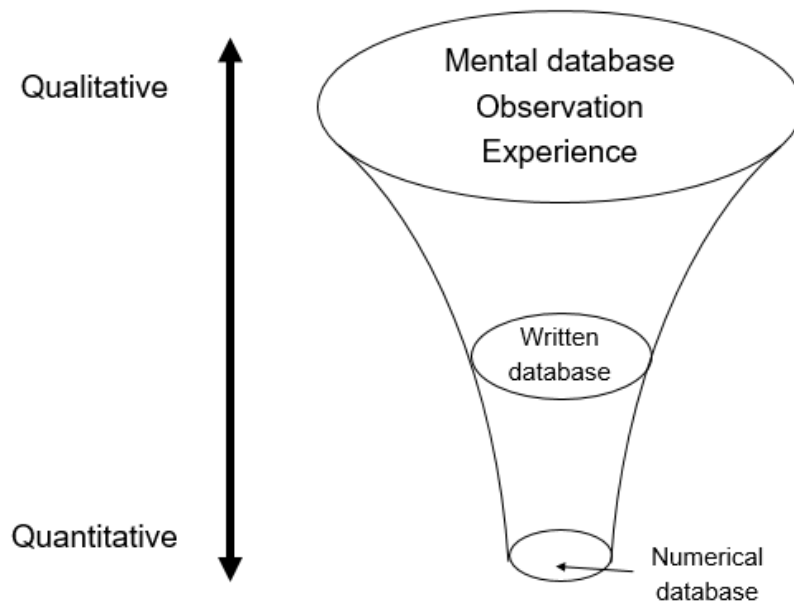


Figure 10 Mental Database Regarding Decreasing Databases Adapted From [89]

The orthodox approach to modeling stresses fitting the relationships and data to with appropriate exactness and precision. Precision is not the aim of system dynamics, but models should be as precise as necessary to fit the research question. Traditional approaches may limit insight and prevent the attainment of useful results based on simulated constraints. In the 1980's the spectrum of system dynamics began to expand to include purely qualitative models; mental models were created with no simulations [89]. The exercise of mapping the influence, also referred to as systems thinking, has been shown to be valuable in its own right.

The distinction between strictly quantifiable and qualitative variables is unnecessarily exacting. Wolstenholme [90] conducts an analysis comparing the benefits of a systems approach strictly utilizing qualitative techniques to one strictly utilizing quantitative techniques and concluded that success requires both approaches. Components with direct or proxy measures should be utilized to represent real-world application where possible; however, such an approach does not always fit the situation. When quantifiable data is not available, conjecture to possible real world measures in attempts to quantify values should be avoided [89].

As with other qualitative oriented modeling approaches used in operations research, a standard within the community is necessary to maintain a consistency and validity within the approach. Coyle [89] introduces the concepts of “hard” and “soft” variables, describing the two categories of quantitative and qualitative variables that apply to most systems. The quantitative, or “hard”, variables represent money, people, or other easily embodied items with clear units of measure. Qualitative, or “soft”, variables represent parts of a system such as effort, customer satisfaction, anger, or other variables

that are not easily embodied and do not have obvious unit or metric. Within this research, a mixed approach, utilizing both quantifiable and qualitative data, is applied.

Quantifiable measures tend to be evident in their representation of a variable; however, this is not the case with soft variables. Since 1998 several articles have been published that outline methods of approach when modeling with soft variables, or that apply methods to typically nontraditional realms of system dynamics such as political science [89], [91]–[94] . System dynamics is a science in which accurate data should be used. But the insights gained from modeling, even with imprecise data, do have value and provide a valid contribution. The methodology suggested for developing soft variables is key to maintaining the standard required to utilize system dynamics to its true potential [91], [94], [95]. The stages described in Table 4 represent a systematic approach for constructing soft variables [92].

Table 4 Soft Variable Construction Stages Adapted from Hayward *et al.* [92]

	Stage	Questions
1	Scale	Does the soft variable have a minimum or maximum value?
2	Units	Are there any suggested units of measure for the soft variable?
3	Nature	Is the soft variable a stock, converter, or flow?
4	Inputs	What outside elements have an effect on the soft variable?
5	Outputs	What outside elements does the soft variable affect?

Following the identification of a soft variable, the identification of interactions that exist with other components is required. Table 5 is transcribed from Hayward’s *et al.* [92] efforts in creating a standard for soft variable implementation.

Table 5 Soft Variable Use Considerations Adapted from Hayward *et al.* [92]

	Consideration	Questions
1	Effect	How many different model elements does the soft variable affect?
2	Combination	How are different soft variable effects combined before they influence another element?

The second consideration concerning the identification of soft variables addresses multiple variable interactions suggesting that groupings of variables should be simple. Based on Hayward's *et al.* research [92] following previously studied cognitive algebra and the typical linear and non-linear combinations proposed by Sterman [11], the different combinations of variables can be formulated as indicated by Table 6 [92]. It assumes that soft variable x and y lie within a scale of $0 < x, y < 1$.

Table 6 Combination of Soft Variable Effects Adapted from Hayward *et al.*

Description	Formula
Strict	xy
Strict Compromise	$\sqrt{xy}$
Lenient Compromise	$\frac{x + y}{2}$
Lenient	$x + y - xy$

Hayward *et al.* [92] summarizes efforts to standardize soft variable application within system dynamics models. An example of incorporating a soft variable utilizing this method is shown in Figure 11.

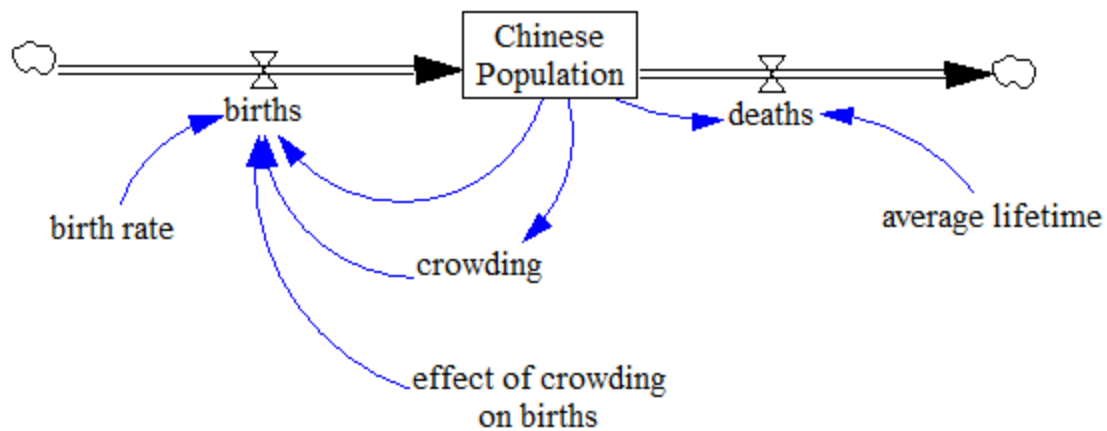


Figure 11 Basic Soft Variable Incorporation

This expands on the variable of crowding introduced in Figure 5 and separates the variable and its effect. Here the crowding variable can be modeled perhaps to have a value between 0 and 1 and this value can then be used in combination with its hypothesized effect to impact the flow. The hypothesized effect for crowding on the rate of births is that it is likely to cause growth and therefore a growth relationship, as depicted in Figure 6, is modeled.

3.4.4 Goal Dynamics

In addition to the use of soft variables, social modeling often requires the use of goal setting. There is typically a desired state within a system that the system aims to adapt to. For example, when one sets a thermostat, that could represent the desired temperature within the system. The heat flow used to change the temperature within the system may aim to meet this desired goal. A loop diagram of this process is offered in

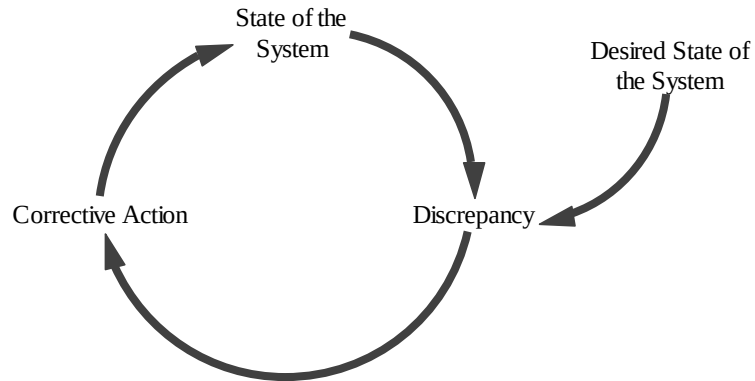


Figure 12 Causal Goal Dynamic Illustration

This causal goal structure can then be translated to a system dynamics presentation as shown in Figure 13.

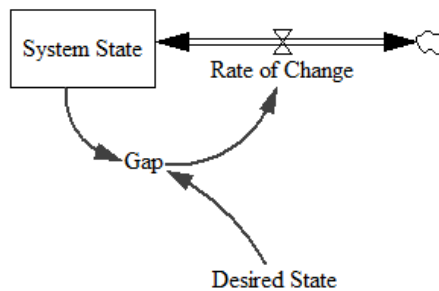


Figure 13 Simple Goal Dynamics Example

Goal setting is a foundational element in modeling social behaviors. To create a model more representative of reality, one should incorporate eroding goals. An eroding goal essentially represents the desired state of the system as a changing function based on endogenous variables rather than exogenous variables. This means that the goal changes based on the circumstances present within the system and is not a constant set outside of the simulation. This goal setting can occur in several forms, Barlas recommends several

strategies to best utilize this technique [96]. An example of a further expanded goal system within system dynamics is presented in Figure 14.

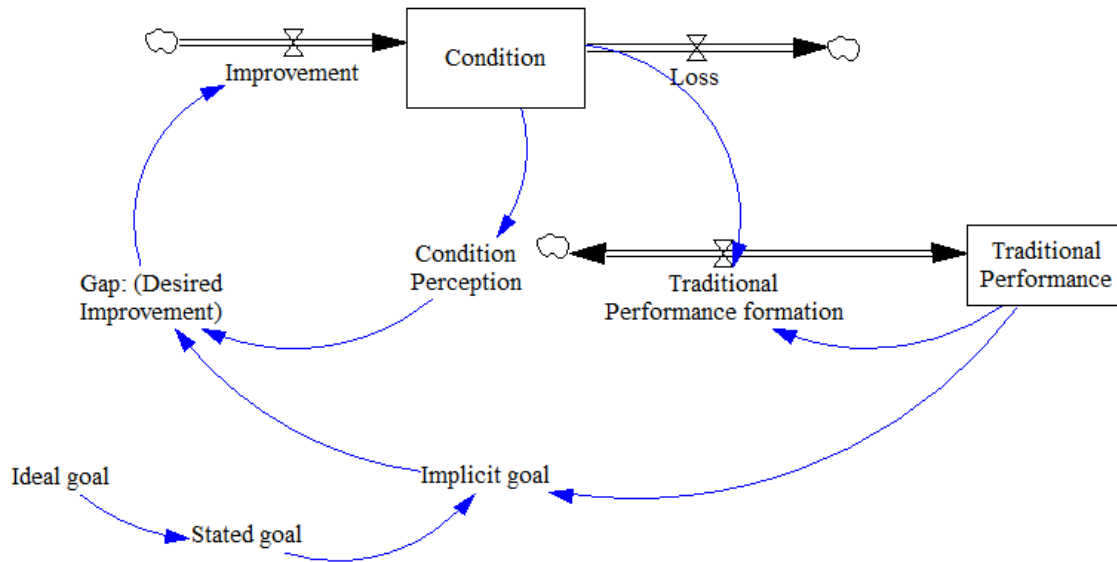


Figure 14 Model of Eroding Goal Dynamics

Modeling goals as eroding goals rather than strict exogenous goals allows for circumstances within the system to effect the goal. Within this system, the previously exogenous goal has now become an implicit goal endogenous to the system.

3.4.5 Model Validation

System dynamics considers dynamic behaviors of a system providing insight accounting for results affected by delays and feedbacks within a system. For topics regarding social or behavioral sciences, this method allows for an integrative means to comprehend them [79]. The greatest criticism of system dynamics appears in its lack of precision. This shift from detailed quantitative analysis towards qualitative analysis is noted not only by Forrester, but it is a distinguishing feature for the field; successors, such

as Coyle, make mention that this is one of its greatest contributions [89]. Its greatest criticism, however, is seen by some as one of its strength in allowing for the modeling of topics which lend themselves to non-quantitative studies.

A large and partially still unaddressed criticism of system dynamics methodologies finds itself linked to this imprecision in that field appears to have a lack of formal validation approaches when compared to more traditional discrete simulation validation and verification methods. However, progress in this area continues, and in the next section several attempted approaches to validate system dynamics models are discussed.

Forrester and Senge wrote on this issue in 1980 suggesting several tests to use as guidelines when creating models [97]. Sterman later expanded upon this by attempting to provide a more organized approach at model validation. Sterman writes that

system dynamics is a perspective and set of conceptual tools that enable us to understand the structure and dynamics of complex system. System dynamics is also a rigorous modeling method that enables us to build formal computer simulations of complex system and use them to design more effective policies and organizations [11].

Coyle has argued that there may not be additional value to the actual simulation of models but, rather, mapping out the understanding of a complex network of relationships with the feedback loops may be enough [95]. The insight given in depicting the system may be sufficient to answer critical questions depending on the problem being modeled.

Gaining an intimate understanding of a system throughout the modeling process is necessary in order to simply complete a system dynamics model. After an initial model is created, the question then arises as to how to determine the validity of the model: is the

model good enough? The utility of the model may speak to answering that question somewhat; however there have been attempts at more rigorous approaches.

One such approach that has stood the test of time was suggested in 1994 by Yarmen Barlas [98]. Barlas summarizes system dynamics model validation methods into several categories: Direct Structure Tests (of two types Empirical and Theoretical), Structure-oriented Behavior tests, and Behavior Pattern Tests. His suggestion is that each of these tests is required in a logical sequence in order to receive the mark of being valid. This appears to be a very thorough approach, but may be impractical in some operational cases. Although adjustments to ensure meeting standard are desired, they can become a frivolity in that the additional insight gained from a standard of this rigor may not typically be worth the effort [99]. As with all modeling, precision must be balanced against the accuracy of the answer required, the potential cost of an error, and the practical consideration (time, cost) of more detailed modeling.

Shrekengost takes a more relaxed approach, valuing the usefulness of the model over its adherence to a high rigor to pass validity [100]. Still, it appears there are guidelines for structural and behavioral validity even justified by those who hold his opinion. Shrekengost suggests several more structured techniques in order to assist in gaining confidence for a system dynamics model and its ability to meet the purpose of its design.

Each factor considered must not only be meaningful but also must correspond to a component in the real world [11]. In cases when concepts are abstract and precise measures are not possible, the purpose of the system can still be achieved. Results from modeling and simulation using these techniques do not produce precise results.

Reasonable validation techniques steer away from precise parameterization and design. Face validity, referring to the degree to which the model appears effective in terms of its stated aims, includes comparing the similarity between the system modeled and reality. Comparing real world behavior patterns with historical behaviors allows some confidence to be gained in the system.

The greatest difficulty with validating a system dynamics model is that the purpose of using this method is not precision in the first place. When considering basing a model on the premises of analyzing policy and exploring diverse scenarios, structural validity testing is suggested so that the model might be judged valid [101].

Given the goal of system dynamics, it is difficult to test for precision and validity in this manner. For that reason, avoiding sweeping claims based on results is suggested [79]. The imprecisions inherent in the method lends itself better to conservative qualified presentation of any conclusions found from simulation results. The clearest guideline found in the current literature appears to be that of using empirical testing to validate results as best as possible, following the sanity check of the initial usefulness of the model. Peer review and expert opinions can provide another check and will increase the credibility of the model as it is accepted in the community for which the system is intended. The test of time will be the surest tool for capitalizing the most useful criticisms and creating a useful system model for the problem at hand. Since elapsed time is not initially available, a more systematic approach is applied to test this initial research.

While there are several examples of those attempting to address validation of system dynamics models, few achieve the level of organization that Zagonel and Corbet [102] do in their methodical approach of categorized the majority of system dynamics

validation techniques found in the available literature. Their efforts resulted in categorizing validation systematically into five portions as seen in Figure 15.

System's mapping	Quantitative modeling	Hypothesis testing	Uncertainty analysis	Forecasting & optimization
S #2a -- F&S Str #1a	1 - Face validity (structural assessment through <i>deductive</i> process)			
S #2b -- F&S Str #1b	2 - Validity of decision rules (<i>structural</i> focus)			
	S #2c -- F&S Str #1c	3 - Physical conservation		
	S #3 -- F&S Str #5	4 - Dimensional consistency		
	S #6	5 - Integration error		
	S #5a -- F&S Str #3	6 - Extreme conditions tests (<i>equations</i> focus)		
	S #4 -- F&S Str #2	7 - Parameter assessment		
	S #7a -- F&S Beh #1a	8 - Basic-behaviors reproduction		
	S #7 b-- F&S Beh #1b	9 - <i>Endogenous</i> behavior-reproduction tests		
	S #1a -- F&S Beh #7	10 - Boundary adequacy tests (<i>modes of behavior</i>)		
		S #7c -- F&S Beh #1c	11 - Qualitative <i>problem-behavior</i> test	
		S #1b -- F&S Str #4	12 - Boundary adequacy (<i>problem endogeneity</i>)	
		S #2d -- F&S Str #1d	13 - Validity of decision rules (<i>policy</i> focus)	
		S #10 -- F&S Beh #5	14 - Assessment of surprise behaviors	
		S #11a -- F&S Beh #8	15 - <i>Behavior</i> sensitivity analysis	
		S #5b -- F&S Beh #6	16 - Extreme condition tests (<i>model behaviors</i> focus)	
		S #8 -- F&S Beh #3	17 - Behavior anomaly tests (changed <i>assumptions</i> tests)	
		S #9 -- F&S Beh #4	18 - Family member (generalizability)	
		Quantitative sensitivity analysis - 19	S #11b -- F&S Beh #8	
		Policy sensitivity analysis - 20	S #s 1+11c -- F&S Pol #4	
		Boundary adequacy (<i>policy implications</i>) - 21	S #1c -- F&S Pol #3	
			Behavior correspondence - 22	S #7d -- F&S Beh #1d
			Behavior prediction - 23	F&S Beh #2
			Changed-behavior prediction - 24	F&S Pol #2
System's mapping	Quantitative modeling	Hypothesis testing	Uncertainty analysis	Forecasting & optimization

Test categories:

Basic
Intermediate
Advanced

S - Sterman (2000); F&S - Forrester and Senge (1980); Str - Structure; Beh - Behavior; Pol - Policy implications

Figure 15 Assessment of System Dynamics Models [102]

These methods for assessment are rooted in Forrester and Senge's and Sterman's guidelines [11], [97]. This research addresses model validation in respect to suggested methods from Figure 15. While there are twenty-four tests mentioned, each test does not apply to every system dynamics model. Rather, for the purposes of this research, at least one test from each component found is addressed. For an expanded view of questions addressed within each test listed, refer to Appendix B.

3.5 Summary

System dynamics appears to be an apt choice in tools to better understand and evaluate the potential effectiveness of policy decisions of the United States-with regard to human rights in China. It allows for an understanding of complex and potentially non-intuitive effects while predicting general relationship impacts given varying policy decisions. This aligns well with the purposes of system dynamics and its applicability to many systems. The system used for this pilot model has been created based on guidelines gleaned through the writings of many experts.

This chapter discussed relevant theories foundational to the modeling methodologies applied in Chapters 4 and 5. This includes concepts of social movement theory that present a hypothesis for causes leading to government reformation. The concepts of diffusion models as applied to the spread of ideas were discussed portraying the use of a modified Bass diffusion model that is applied within the framework of this system. Also discussed is the approach of system dynamics and its specific application to predicting policy effectiveness. This discussion summarized the application of systems dynamics to qualitative problems, as well as a community standard for methods to utilize soft variables and apply goal dynamics within the model. These topics summarize the basis for the constructed system that models the spread of human rights within China. The methodology applying these theories to construct a system is discussed in Chapters 4 and 5.

IV General Methodology

4.1 Chapter Overview

This chapter provides an overview of the steps taken to follow traditional system dynamics approaches. Utilizing the steps defined in Chapter 3, Table 3, the following list of steps is adapted from conventional representations of systems dynamics methodology:

1. Problem Articulation
2. Model Formulation
3. Testing
4. Policy Design
5. Policy Evaluation

This chapter covers steps 1, 2 and 4 on this list. Problem definition, a high-level model overview, and suggested solutions via policy design are discussed. Chapter 5 discusses a more detailed formulation of each model component as a part of step two. Steps three and five are addressed in Chapter 6.

4.2 Problem Articulation

The literature review in Chapter 2 outlines the problem formulation. A summary of the discussion in Chapter 2 is provided here: According to Freedom House measures, China is considered “Not Free” with a rating of 6 for social freedoms and 7 for political rights on a scale of 1 (“Free”) to 7 (“Not Free”). A non-democratic status for a nation state with the size and global influence of China represents significantly higher statistical risk of conventional and/or nonconventional warfare with the United States than a democratic status would according to democratic peace theory. However, despite some predictions that China would become more democratic after the opening of economic barriers in 1970, China has remained at a level of 6 or higher on both Freedom House

scales since 1960. Instead of fostering the growth of human rights and democracy within China, the economic benefits have instead dramatically increased the overall power and influence of a government that is no more democratic than before the economic reforms. For example, the current Chinese president appears to be trending further away from civil liberties. The current political system, as is, does not appear to become more democratic without additional measures taken by outside forces. The problem formulation is therefore: China appears to remain perpetually undemocratic without additional input for transformation. A significant reflection of real transformation and progress in the growth of democratic ideology within China would be increased human rights, which are a primary focus in the Freedom House scale. The model has therefore been designed to represent a self-contained system of variables that influence human rights within China utilizing the impacts of eroding goals as circumstances change over time.

4.3 Model Formulation Overview

4.3.1 Overarching Components

The overarching base model resulting from this approach is large and somewhat difficult to fathom when first observed. The model is therefore subdivided into several components with collective themes for easier comprehension. These components are addressed in turn. The sections are:

- A: Condition State
- B: Government Perceptions
- C: Government Actions
- D: Information Access
- E: Citizen Perceptions
- F: Citizen Actions
- G: Population Sentiment

Together these sections form the feedback loops of a dynamic system. Figure 16 provides an overview of how the components relate and interact to each other in the system. Each arrow may represent multiple interactions.

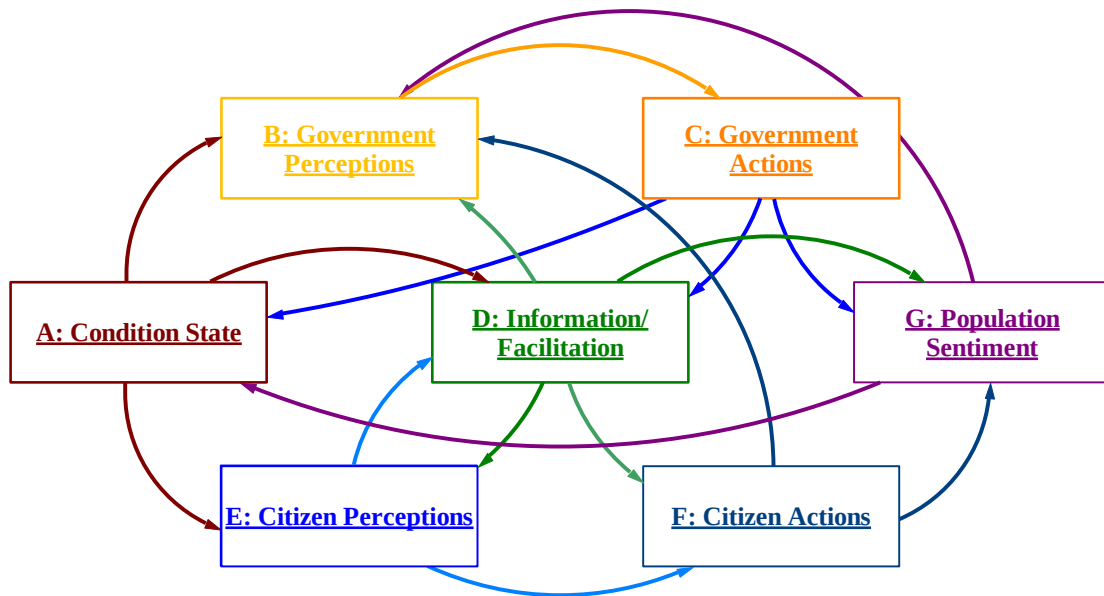


Figure 16 Base Model Component Overview and Interactions

Figure 16 identifies the key elements within the process. The chief purpose of this research is to investigate how to most effectively influence the condition of human rights within China. This is represented in component A. The Chinese government holds the power to act and change these desired conditions in a peaceful transition from the status quo. Their role in the process is depicted in components B and C of the model. Next, the citizens represent a key actor to this process and their efforts in a potential social movement creating change. Their role is depicted in components E and F of the model. Components D and G of the model depict additional key parts of the system: the current

state of sentiment within China (meaning the support for a social movement regarding human rights) and Information.

A detailed view of the model in its entirety, with all relationships, is shown in Appendix C. Chapter 5 discusses component formulation in more detail. This model does not account for all possible interactions or all possible components effecting the modeled relationship. However, the model represents the components deemed pertinent and most influential in regards to the research objective to understand what best effects the spread of human rights within China based on input from the literature as well as discussion with subject matter experts. This modeling process is an incremental process that adapts as mental models adjust to better represent reality.

4.3.2 Competing Goals

Competing goals are posited as the key mechanisms acting to influence human rights within China. These goals are framed in relation to specific desired conditions of human rights within China. The goals are each measured using the Freedom House scale with values from one to seven. For example, a goal value of 1 represents a desired condition state that aligns itself with the value of 1 on the Freedom House scale which indicates a “Free” state. The identified competing goals are shown in Figure 17.



Figure 17 Competing Goals

Government perspective represents the government in China (the CCP) and their desires. The status quo refers to the tendency towards tradition of systems. The authoritarian structure represents the basis of the government system constructs. Social movement goals represent the desires of a social movement leading to greater human rights. Finally, relative deprivation represents the desires caused by the emergence of a social movement accounting for those who may not support the movement but are discontent with their current condition. A list view of these goals and their associated values is shown in Table 7.

Table 7 Competing Goal Values

Type	Competing Goal	Value
Exogenous	Structure (Authoritarian)	7
Endogenous	Status Quo	Based on past values
Endogenous	Government Perspective	Function of competing goals
Endogenous	Relative Deprivation	Function of global awareness
Exogenous	Social Movement	1

The functions alluded to in Table 7 are further discussed in Chapter 5 within the formulation of the component that contains the goal.

4.3.3 Simulation Settings

System dynamics methodology states that one should set a horizon of simulation time appropriate to the problem. The general settings of the system simulated within the model is in time steps of one year from 2010 to 2040. Given the limited amount of open source data over each component, one year is the lowest denominator used in this pilot model. Future research integrating more detailed information that may become available would provide a higher level of fidelity in the model. Prolonged extrapolation or forecasting often misleads,; to avoid this thirty years has been used as a run period. Of course if one felt a social movement to alter China might take a longer time and sufficient confidence in date to predict a longer horizon were available, a longer horizon could be used. For this initial modeling attempt, a thirty year horizon seemed justified to demonstrate policy efficacy within the model. This presents a sufficient time span to provide understanding of the relationship effects that are discussed in Chapter 6. Additionally, the hypotheses presented to support the modeled relationships between the

components of the system are based on data and literature from recent years, therefore beginning the run period several years prior to the current date allows for a comparison of the modeled system to reality. Once a base model is constructed and simulates the problem of interest, policy design in order to implement improvements are constructed.

4.4 Policy Design

United States policy implementation regarding human rights in China has succeeded in single event instances in the past. This suggests strong substantiation of the possibility that further efforts within China could have positive long term effects and influence the system. The base model simulates the current condition within China. Policy strategies are developed based on options for various United States initiative. These strategies influence the base model to differing degrees within varying parts of the simulations. While these strategies were derived from United States stated policy actions regarding human rights in China, the efforts represent potential influences on the system that can be enacted by any force. These strategies are presented as exogenous variables within the system.

4.4.1 Background for United States Policy and Actions

The policy options that the United States is actively employing in its efforts to promote human rights within China according to reports provided to Congress [18] include the following list:

- Open criticism of PRC human rights policies and practices
- Quiet diplomacy
- Hearings
- Foreign assistance programs
- Sanctions
- Coordination of international pressure
- Public diplomacy

- Bilateral dialogue
- Support for dissident and pro-democracy groups in China and the United States
- Internet freedom efforts

These are captured within the model by grouping them into several root policy types:

- Policy 1: Top-down approach: Messages directed towards placing pressure on the Chinese government such as sanctions, open criticism of human rights policies and practices, international pressure.
- Policy 2: Bottom-up approach: Messages directed towards informing Chinese citizens such as Voice of America in China
- Policy 3: Grassroots approach: Facilitating free information access within China such as internet freedom, support for dissident and pro-democracy groups within China

These three root policy strategies form the base three variables for level of effort the United States can act upon in order to effect change within the system.

4.4.2 Measure of United States Policy and Actions Variables

Policy strategies are assumed unaffected by any other portion of the system – these are defined as exogenous variables and are used for policy analysis discussed in Chapter 6. Base model validation excludes these variables by setting values to 0. Each variable represents a soft variable attempting to capture the areas of impact that each policy strategy would utilize. They represent the level of effort the United States might promote towards achieving democratic ideals within each relative approach. 1 represents maximum efforts, meaning some general capacity at efforts extended to effect the system while 0 represents no effort.

Data is currently not accessible, or potentially existent, to measure the direct impact of each approach. A potential measure for each value comes in the form of United States dollars spent for budget sections. For the top-down approach, United States dollars spent on development assistance could be utilized as a proxy measure of equivalence. The bottom-up efforts could be approximated to United States dollars spent on the democracy fund. As discussed in Chapter 2, democracy is represented in the measures of freedoms of human rights and therefore promoting democracy specifically does effect and influence these outcomes. The current aid that the United States is providing to promote democracy in China is viewed as a threat against the regime [103]. Grassroots efforts could be approximated to United States dollars spent on internet freedom.

Due to the sensitivity of this topic, and difficulty of access to data within China, the recommendations of this study are not suited for dollars as a quantification amount. These measures require a quantifiable impact in proxy measurements in order to incorporate this level of fidelity. The results should be used as an *indicator* of which strategy has the *potential* largest impact in effecting the system. These considerations in policy analysis testing results are further discussed in Chapter 6.

4.4.3 Policy Strategy System Impact

Policy 1, top-down efforts, impact the external pressure directed towards persuading the government at a leadership level. Policy 2, bottom-up efforts, impact the system by attempting to persuade citizens thereby increasing the flow from those who oppose a social movement to those who support a social movement for human rights. Policy 3, grassroots efforts, impacts the system by increasing accessibility to information

and helps to facilitate an environment for a movement to grow by circumventing restrictive structure within the system. Table 8 depicts the strategies postulated.

Table 8 Strategy Variables

Stock Variables					
Min	Max	Unit	Label	Description	Source
0	1	-	Policy1: Top-down Efforts	Efforts aimed at persuading the Chinese government, placing external pressure on the government actions	[18]
0	1	-	Policy 2: Bottom-up Efforts	Efforts aimed at persuading Chinese Citizens to support a movement	[18]
0	1	-	Policy 3: Grassroots Efforts	Efforts aimed at facilitating a social movements ability to succeed	[18]

While United States policy strategy impacts are intended to represent the efforts of different policy actions available to the United States, these could be translated to efforts by any organization. Additional organizations or nations may concurrently provide input into the external pressure component, however, they are not considered within the scope of this initial model. These policies are implemented on a base system which is discussed for the remainder of this chapter.

4.5 Summary

This chapter provided an overview of the general methodology and construction of the model used to address the research objective. Chapter 5 provides further details for the construction of the underlying components used in the formulation of a pilot model. Without a template for this particular model, a wide array of research covering the expansive amount of theory related to component formulations comprises a principal portion of discussion in Chapter 5.

V Component Formulation

5.1 Chapter Overview

This chapter provides a more detailed discussion as to the formulation of each component within the model. Displays of model components will represent a simplified version of stock variables, their rates, and inter-component interactions distinguished by colored arrows. Full representation of variables within each component is provided in detail in Appendix D.

The remainder of this chapter addresses each component constructed within the model. Each variable contained within each component is discussed and the measure used to represent each stock variable defined. The relationships between variables are ascertained based on research relevant to the relationships. When specific data is not available, a hypothesized relationship is estimated and a coefficient of effect applied within the model. All variables contained within the model represent a theory or social hypotheses observed within literature; however, there is not a direct measure for each variable. For variables without direct measures when effects are known to exist the relationship is postulated based on the literature review. These are discussed within each section and measure description paragraphs are fully indented for clear separation of topic type. It is recommended in Chapter 7 that further research be conducted to investigate the quantitative nature of relationships between variables and to utilize proxy measures for each variable when direct data is not available.

5.2 Model Component A: Condition State within China

This portion of the model summarizes the current condition within the system in relation to the variables identified as pertinent in the emergence of civil discontent. The purpose of the model is to influence change within the human rights variables within this component. Figure 18 depicts the stock variables measured and the components that interact with these variables. The status quo goal is rooted in this component. The status quo refers to the tendency of a system to remain as it is [96]. The status quo goal value of human rights is set based on a delay value of what the human rights conditions were the year prior.

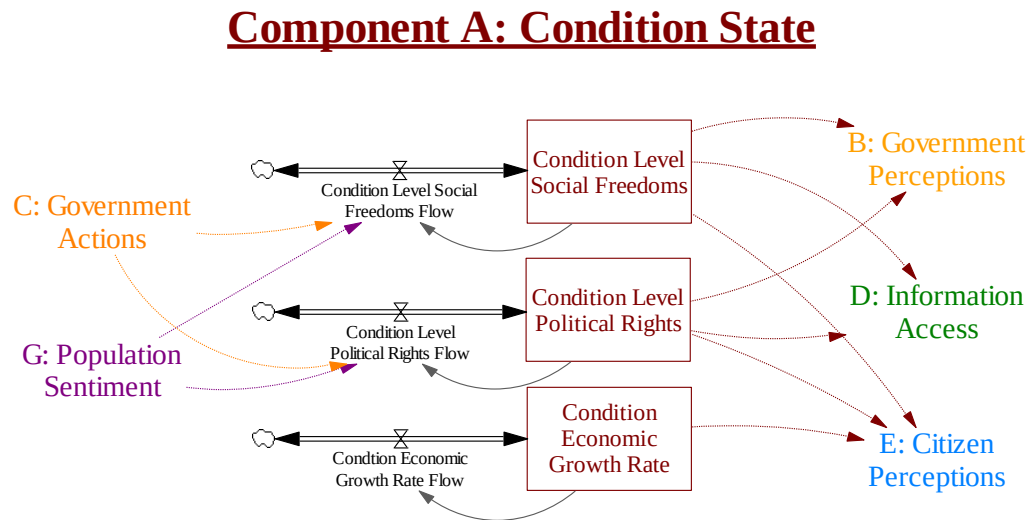


Figure 18 Component A

5.2.1 Background for Component A

Using relative deprivation theory, the hypothesized factors leading to a movement for human rights within China begin with social unrest [104]. Social unrest is rooted in certain conditions within China: economic growth rate, condition of political rights, and

condition of social freedoms based on the understood legitimacy constructs of the government.

To account for both the importance of economic condition in legitimizing the system of government in place and the theory of relative deprivation, the economic growth rate is presented as a measurement for economic status. This accounts for the circumstance that although the growth rate and GDP of China may be positive, if the rate of growth decreases between years, then social unrest is hypothesized to increase [62]. Future research may represent GDP as an endogenous variable with additional non-constant rates or inputs, however, within the scope of this model the impact of a social movement on the economy is not considered.

Additional forecasts of the GDP growth rate have been studied but were not adapted for use within the scope of this model [105], [106]. Future considerations may consider other measures of the economic situation in China to incorporate unemployment or other hypothesized instigators of social unrest.

5.2.2 Measure of Component A Variables

Condition Level Social Freedoms and Political Rights

These stocks are based on the one to seven Freedom house scale. The reference conditions for both social freedoms and political rights are initialized at the historical values available from Freedom House. These conditions receive input from the actions of the Chinese government. If there is a discrepancy between the current state and the actions of the government, the conditions may be effectively changed by up to 1 value on the Freedom House scale. If Chinese government actions with respect to the political rights or social freedoms are at a lower value

than the current condition (on the Freedom House scale), then the probability of the condition changing is based on the percentage of citizens in China who support a movement toward democratic ideal. This line of thinking references the evidence presented in the literature observing that the government appears responsive to public sentiment and lasting change is dependent on the momentum of support. The same logic applies if the actions are at a higher value. The probability of the condition changing is based on the percentage of citizens in China who oppose and those who do not support, a movement of democratic ideals.

Condition Economic Growth Rate

Economic growth rate is a percentage that may be positive or negative. This stock is measured as a percentage value of GDP growth rate. Worldbank data indicates a GDP growth rate of 10.64% in 2010 which is used as initial data input for the model [107]. Additionally a trend line fitting historical growth rates over the period of 2010-2016 was used to determine a rate of -.26% per year of growth and is incorporated in the model as an exogenous variable. The regression is presented as a function of time in Appendix D.

5.3 Model Component B: Chinese Government Perception

This portion of the model summarizes the government perception of current condition as well as their mentality on what human rights status should be. These perceptions then influence their reaction which leads to actions captured within component C of the model. Figure 19 exhibits the component interactions with the stock

certain point civil action may rise to a level as to lead to actual instability. Additionally, given the amount of perceived control, the government maintains the ability to shape public opinion through their control of information while also quelling discontent by responding to public activists [109]. Furthermore, relative deprivation theory posits that internal pressure, when accumulated, can lead to significant societal and cultural change such as a shift in regime or circumstance [104].

The government evolves and reforms, it does not simply shape citizens to conform to its way of thinking [110]. This is evidenced by the stark transformation of economic policies since 1970 that have enabled China to rise in stature in the global community. The goals of the government and policy makers within China are not necessarily equal to the reality of circumstances within its borders. The mentality is a reference used to determine actions which adjust to the circumstances within the system.

A study within China asserts that in addition to internal pressure directed by political actions of citizens, there is also an element of preemptively responding to potential actions [111]. This may be because of how legitimacy is conceived in an authoritarian government and due to this fact there tends to be a paranoia motivating the government to meet people's demands [111]. "Successful authoritarian states must be willing to respond to public pressure through policy adaptation while also retaining the capacity to shape public opinion" [109].

There is also merit to an argument for external engagement based on historical incidents providing evidence for long term change as a result of engagement [112]. The external pressures appear mainly in the form of government-level confrontation.

5.3.2 Measure of Component B Variables

Internal pressure

This stock is measured on a scale from 0 to 1 utilizing a soft variable measure approach. Internal pressure incorporates citizen actions from Component F. These inputs represent a relationship based on research conducted by Chinese experts as well as additional studies linking networking messages to influencing the Chinese government [68], [109]. Popular protests and civil action are tools used to influence specific policy decisions and provide one such input [109]. No internal pressure is represented as 0, a society that completely conforms to the current conditions of human rights. One represents a high level of civil unrest measured by efforts for social movement in the form of messaging, organization, and protests.

It is also hypothesized that the government has a tolerance for civil activism that represents the norm. This is because civil activism provides vital information that the government needs to understand the condition of its nation and maintain its legitimacy [109].

External pressure

This stock represents pressure from external groups or states to China [18].

Within this model it is used to represent policy efforts directed towards persuading the Chinese government to act in a manner consistent with a more “free” nation on the Freedom House scale. In reality, many influences may persuade government actions and these exist consistently through time. For the purposes of modeling, external pressure is set to 0 in the base model and it is

utilized in policy analysis. This then creates a system that any policy strategies tested represent efforts greater than ones currently existing thereby increasing the pressure on the system.

External pressure is measured as a soft variable in which value of 0 represents no additional pressure or efforts present from external entities of the system.

Government Perceived Control

This stock represents the threat level that the government perceives. The greater the perceived threat, the more likely the government is to act in a repressive manner as opposed to a responsive manner. This is measured as a soft variable where a value of 0 represents no control, or a high threat level, and 1 represents total control or a low threat level. The input into the flow is based on the percent of information the government intends to control as compared to the actual information that is controlled. A discrepancy arises as citizens act to circumvent government controls within the system.

Government Desired Level of Social Freedom and Political Rights

These stock variables represent the goal that the government has in relation to human rights. Each goal is measured utilizing the Freedom House measure which sets a value of 1 to full democratic freedom and a value of 7 to restricted authoritarian rule. The goals of the government are a function of other goals within the system.

- Structure- the tendency of the system structure of an authoritarian government [33]
- Status Quo – the tendency of a system to remain in its current state [96]

- Social Movement – the impact that a rising social movement for human rights can cause [61]

The hypothesized effects of each goal on the government's goal level are based on the literature and weighted by endogenous values in the system. This is shown in Figure 20. These weights are normalized within the system so the resulting weights of the three competing goals sum to 1.

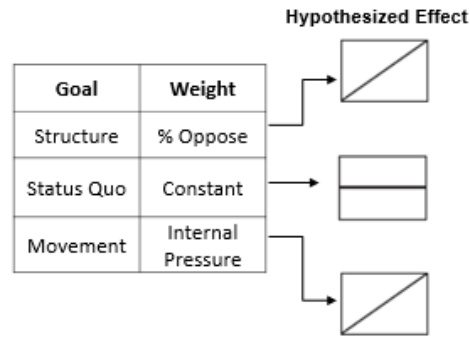


Figure 20 Government Goal Function

5.4 Model Component C: Chinese Government Actions

This portion of the model summarizes the government actions based on their goals of a desired human rights condition from component B. The time unit of the model simulation is in years, therefore a constraint to the system is that actions by the government are assumed constant throughout the year. While a smaller unit of time would be more useful in analyzing this system, the data was not currently available to this effect to make such fidelity possible. Figure 21 depicts the key stock variables distinguished by dark orange boxes as well as the interacting component effecting the flow of change.

Component C: Government Actions

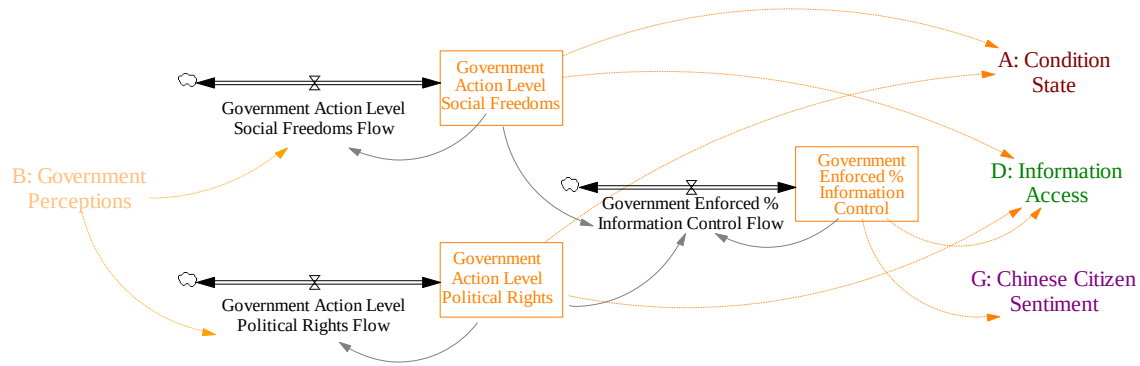


Figure 21 Component C

5.4.1 Background for Component C

As previously discussed, responsiveness in authoritarian regimes can be linked to regime legitimacy. Policy makers are likely to rely on a mix of responsive, persuasive, and repressive actions [109]. These are based on their perceived level of control and perceived threat level. If actions by the public appear to undermine the regime and cause instability then it is likely to spur repressive actions.

The government does tolerate a percentage of objective reporting however the underlying message aligns directly with government views. Messaging by the government has an impact on shaping public opinion as evidenced by Chinese-Japanese public opinion since 2000 [109]. Propaganda promoting the government desired message is an integral part of the media and no news outside of what the government permits is officially reported without consequence. Even if news is not censored by the CCP policing system, it is likely effected by the “soft power” of the CCP perspective [113].

When discontent is high, this indicates low government control of citizens and in such circumstances it is less likely for the Chinese government to permit objective

reporting or information [114]. This is denoted by a proxy level of proportion representing access to objective reporting that government permits in media based directly on the CCP perceived level of control. Freedom House has a rating that scales freedom of the press from 0 to 100 with 100 being the worst. China's press freedom status has been rated at or above 84 from 2010-2017 [115]. This value is higher than those seen in the early 2000s using the same Freedom House evaluations thus indicating a trend towards less freedom. Any message reported within the country must remain consistent with government policy. News organizations that are allowed objective content in their publishing must do so within the limits of tolerance that the government permits [116]. Such messaging is an action that effects the population sentiment, component G of the model as well as the information component, component D.

5.4.2 Measure of Component C Variables

Government Action Levels of Social Freedoms and Political Rights

The government actions for social freedoms and political rights are rooted in their respective goal levels desired by the government. These values are adjusted to accommodate which type of action the government engages with, repressive or responsive. The values of these leanings do not exceed the limits of the Freedom House scale. No actions are fixed at the same level as government goals in order to represent a government that is constantly adapting and reacting to conditions. The input to determine whether an action is repressive or responsive is based on external pressure and perceived level of control. An assumption of the model is that once a government determines to be responsive or

repressive, this is consistent at the same increment for both social freedoms and political rights actions.

Based on the methodology of Freedom House measures, it is unlikely that a country rated at 7 will produce actions cohesive with that of one rated a 1 on the Freedom House scale in the passage of a single year [33]. This is accounted for in the model by limiting adjustments of the actions to within 2 values (on the Freedom House scale) of the desired government mentality for each year. While the selection of [-2, 2] as a range appears reasonable, an investigation of the sensitivity to the values of the limit of adjustment from the norm are suggested in future research.

Government Enforced % Information Control

Government enforced control is a stock variable representing the tolerance the government has for objective information [114]. This value is initialized at 84% to represent the freedom of internet score based on Freedom House scores [115]. The subsequent values are based upon the average action level of the government with a hypothesized behavior that the higher the action levels the higher the enforced % information control.

An example of this logic flow is that the government perceives low control based upon the amount of content that citizen's access that is outside of their desired message. This low control leads to an increase in likelihood of repressive rather than responsive actions. The government then decides to repress and therefore the level that is acted upon within the social freedoms and political rights and messaging actions available to the government is up to 2 values higher on the Freedom House scale than the government's

actual goal for the desired levels. This represents an oscillating adjustment in dynamic goal setting as the government attempts to effect conditions to meet its desired level of control. These actions then are translated to a high enforced percentage of information control.

5.5 Model Component D: Information

Arguably, this component finds itself at the root of all change. Information is at the core of any social movement maintaining its course and leading to creating a lasting transformation within a nation. It is required to organize, it is required to share ideas, it is required to perceive conditions and it is required for awareness. Vital to the ability of a movement spreading is the ability for citizens to communicate the purpose and motivation surrounding the movement [117]. A movement does not gain momentum without communication and transparency. Additionally, access to information allows citizens to evaluate their circumstances on a global level which may lead to increased action and demands for human rights.

This component includes how citizens within China access information, the government control over the information, and the government limitations set on the mechanisms required of a social movement which are considered the ability to express opinions and the ability to organize. The simplified information access portion of the model is displayed in Figure 22.

Component D: Information Access

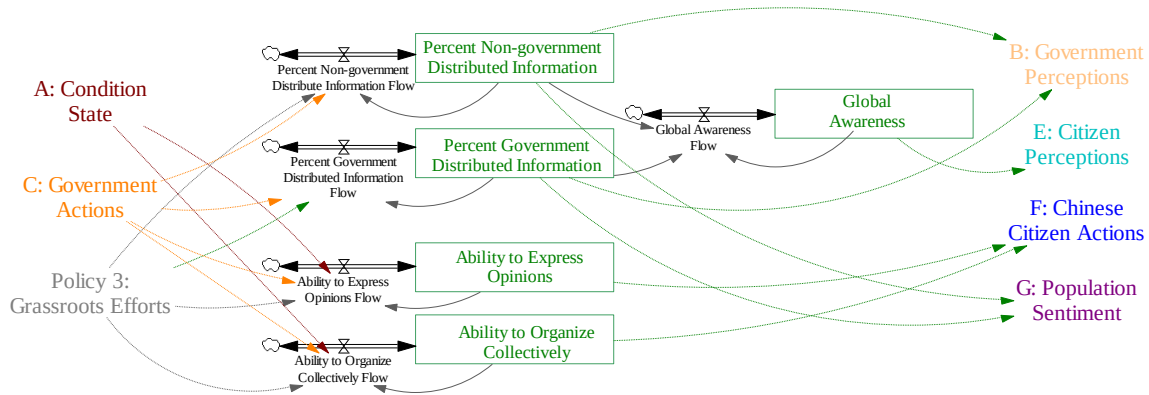


Figure 22 Component D

5.5.1 Background for Component D

How Chinese Citizens Access Information

eMarketer, a leading research firm for marketing in a digital world according to Business Insider [118], has conducted research estimating the amount of time adults in China engage in the major mediums of media [119]. This is separated into time spent on each medium and is displayed as a percentage of the total time spent from 2012-2017 as shown in Table 9. Given that the model simulation begins in 2010, these numbers are extrapolated to estimate earlier date values based on time and the percentages shown in Table 9.

Table 9: % Time Spent with Media Medium in China According to eMarketer Data

Type	Year					
	2012	2013	2014	2015	2016	2017
Digital	40.4%	45.3%	48.0%	49.4%	50.7%	52.0%
Mobile	21.0%	26.6%	29.8%	32.4%	34.0%	35.7%
Desktop/Laptop	19.4%	18.6%	18.2%	17.3%	16.7%	16.1%
Television	51.6%	47.9%	45.7%	44.7%	43.6%	42.4%
Radio	3.5%	3.3%	3.1%	3.1%	3.0%	2.9%
Print	4.5%	3.6%	3.1%	2.8%	2.7%	2.7%
Newspaper	3.8%	3.3%	2.8%	2.5%	2.5%	2.4%
Magazines	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%

Within this model, linear equations are built to extrapolate the percent of media consumed based on mediums using data from Table 9 and the time in years as an input. These regressions are shown in Appendix D. Although it may be reasonable to estimate that there is an upper level of media consumed, simple regression equations were developed given the scope of this model. An additional assumption of the model is that these percentages are indicative of the news sources the average Chinese citizen engages with and uses as their source of news.

News, as opposed to non-specific entertainment information, is vital to a social movement because it informs citizens of the condition of their situation and circumstances within their own borders. Globally, objective news provides Chinese citizens a reference of their relative status compared to the status of those outside of their borders. While entertainment media may also provide Westernized influences in the media realm which could promote democratic ideals passively, an ideal proxy measure of how well citizens are informed is their engagement with news sources. Other studies investigating the interaction of Chinese citizens with different news mediums and the

percentage of news they engage in exist, however, none appeared as comprehensive as the information displayed in Table 9.

Furthermore, worth considering in future efforts is the credibility that citizens apply to news sources. Citizens tend to place different levels of legitimacy depending on whether news is from official sources or spread by citizens [120].

Chinese Government Disseminated Information/ Great Firewall and Censorship

The Chinese government controls official media within China and biases messages to suit regime priorities. In addition to biasing news and information consumed by Chinese citizens, the government also has a state of the art censorship tool at its disposal to block unwanted messages from being propagated. This is known as the Great Firewall of China. Contrary to much popular research and articles, the purpose behind the strict censorship within China does not appear to be censoring government or leadership criticism but rather it appears to focus on limiting collective action of the citizens [116]. This may be because criticism of leadership or the government is an outlet that allows citizens to express views without any further impact whereas preventing groups from forming to action has seen greater benefit for the government. A study conducted by the Congressional Executive Commission on China notes that the government tends to permit a level of criticism from elite members of society in government controlled forums [121].

The ability to organize and the ability to express opinions are key components within a movement [63]. They represent a flow of information to pass between citizens and impact the extent to which the citizens are able to do actions corresponding to the four stages of social movements. These abilities are regulated by government enforced

control: the less control the government perceives, they believe that greater threat exists and therefore the less ability to organize.

External Information Sources

Two areas within the literature review revealed options for circumventing Chinese government controlled information: Radio Free Asia/Voice of America and VPN access. Although additional options exist and the structure within the model can account for television and print considerations, they were not included within the scope of this research.

Radio Free Asia and Voice of America operations in China are both avenues of spreading uncensored information to the people within China [54]. Radio listeners within China were reported at only .03% of the total population within China for these programs in 2009 [122] and 2014 [123]. Radio is seeing a decline in relevance in the age of new technologies. While these have been credible sources for truthful news to the .03% of the Chinese population that listen to the broadcasts, another approach may be necessary to reach younger generations as they increasingly look online for credible news. Chinese youth rate social media as the most credible media source [124]. This may indicate a need to focus efforts to engage objective news with Chinese citizens using micro-blogging, Weibo “tweets”, or other methods that are more prevalent.

Currently one option to circumvent the Great Firewall consists of going around it using a Virtual Private Network (VPN). While this allows users access to censored information, it is typically not worth the time and effort. A majority of users use China’s provided government influenced alternatives for blocked websites [125]. A survey conducted by Global Web Index cited the percentage of Chinese citizen respondents

using VPN at 32% [126]. The percentage of those who utilize VPN to access restricted news is estimated at 12% of the 32% [126].

In November of 2016, the Great Firewall of China received an upgrade blocking all encrypted connections. Furthermore all non-Chinese VPN services were removed [127]. This blocked opportunities of citizens to browse nets unidentified using VPN. In a further attempt to limit access to information outside of Chinese censorship control, China's Ministry of Industry and Information Technology revitalized a crackdown on VPN services at the start of 2017 [128]. All VPN access must be approved prior to use which severely limits access to information outside of the CCP control. Although this has been a rule already in place, it is unsure how this new crackdown on VPN usage will effect information access in the future in China [129].

5.5.2 Measure of Component D Variables

Percent of Government/Non-Government Distributed Information

These stock variables represent a change in the objective information with which Chinese citizens interact. The significant inputs for determining their values are based on a combination of the government enforced control, the estimated media medium interaction of citizens, and the estimated percentage of circumvention that is available or engaged in for each media medium.

Global Awareness

Global awareness is a hypothesized soft variable with a value between 0 and 1. The greater the objective information that citizens access, the greater their global awareness which directly influences their perception of their relative condition in component E.

Ability to Express Opinions/ Ability to Organize Collectively

Ability to express opinions and ability to organize collectively are both modeled as soft variables believed to be inherent to a social movement's success. The input for these values are based on the condition of political rights and social freedoms. Additionally the government enforced percent of information control influences their values.

Political rights and social freedoms have different effects on the freedom of expression and freedom to organize. The effect of the conditions are hypothesized to result in a steady decrease where a higher value of condition results in a lower ability to express opinions or organize collectively. Political rights condition are estimated to have a higher impact on the ability to organize collectively and social freedoms are estimated to have a higher impact on the ability to express opinions based on Freedom House methodology. These are then normalized to a 0 to 1 scale and weighted at 0.7 for the human rights condition predicted to have the greater impact and 0.3 for the other. These are then multiplied by the complement of the government percentage of enforced control. This represent a strict construct for the combination of hypothesized soft variable effects.

5.6 Model Component E: Chinese Citizen Perception

This portion of the model represents the emergence stage of the four stages of a social movement previously depicted in Figure 1. The main elements are depicted in Figure 23.

Component E: Citizen Perceptions

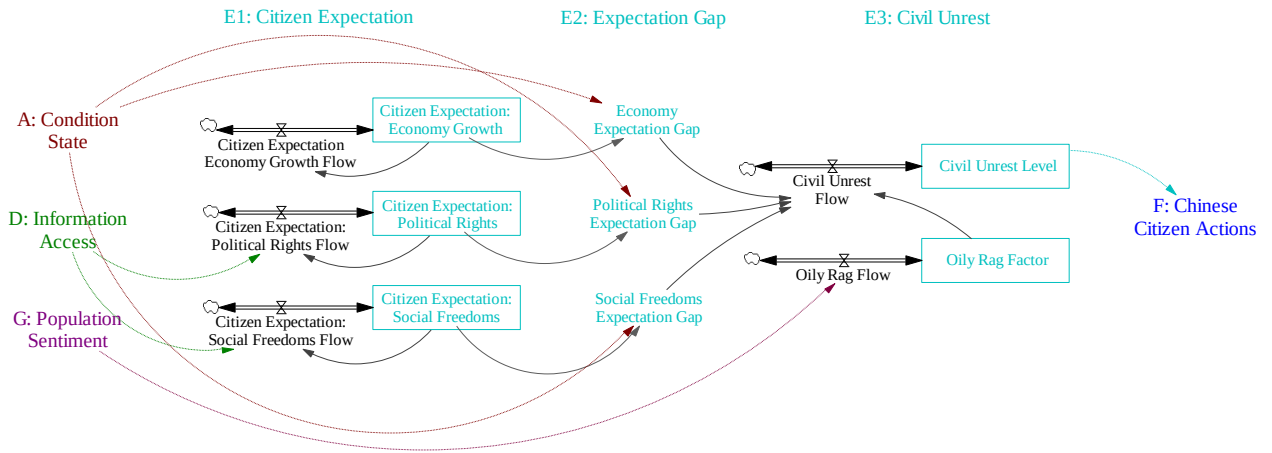


Figure 23 Component E

5.6.1 Background for Component E

Emergence of a movement for change arises when a general and mutual feeling of unrest about an issue exists within the community. This is consistent across the spectrums of historical civil movement and revolution analysis. Braha suggests that most often revolutions occur because of a gap in expectation socially, economically, and politically [104]. A mixed approach culminating in the emergence of a social movement is applied in the context of this model. China's source of legitimacy has been linked to its economy's performance [130], therefore economic performance as well as human rights are modeled. Relative deprivation theory posits that discontent arises as awareness of relative condition are made clear. The driving input in citizen expectation is based on global awareness (a stock variable from component D). The hypothesized relationship is a steady decline: an increase in global awareness is linked to a lower value on the Freedom house scale level of expectation. The gap between the reference conditions and citizen expectations are identified in portion E2 of the model. The potential building of

civil unrest depending on these three gaps is represented in portion E3 of the model.

These accumulating factors are portrayed in Figure 23.

Widespread discontent arises from a discrepancy in expectation according to relative deprivation theory. Economics is important to maintaining legitimacy within China [68]. Additionally as social deprivation theory asserts, a gap in expectation causes unrest. However, perhaps counterintuitively, it is hypothesized that increased social unrest occurs after prolonged improvements in economic development. This is known as the J-curve theory as presented by Davies [131]. This hypothesis emphasizes that the relative deprivation is of greater importance than the actual condition.

This model hypothesizes that there exists a Chinese citizen expectation for their level of human rights which is presented in the model as citizen expectation of political rights and citizen expectation of social freedom. This expectation is presented as resulting from their awareness relative to the globe based on the variable from component D estimating the percent of media consumed that is non-government messaged information.

5.6.2 Measure of Component E Variables

Citizen Expectation Social Freedoms / Political Rights

Citizen expectations are a function of the competing goals of the status quo and relative deprivation. Relative deprivation is based solely on global awareness and understanding where the highest value of global awareness (1) corresponds to the lowest value of human rights (1). The status quo goal is based on the previous year's condition using a delay. Together these goals are weighted and combined to form the citizen expectations for social freedoms and political rights respectively.

Citizen Expectation Economic Growth Rate

The expectation of Chinese citizens with respect to economic growth is dependent solely on the values of years prior in the model. Citizens are modeled to expect at least the level of condition that has existed the previous year. To initialize this variable, GDP growth rates from the year prior to the simulation start is used.

Oily Rag Factor

The literature review evidences that some social movements occur because of a spark or trigger. This has been referred to as an oily rag effect which has the power to rapidly increase the momentum of a movement based on an incident.

The input to this factor is the percent of supporters for the movement. The higher the percent of supporters, the more likely that an incident will spark due to discontent representing a growth behavior relationship.

Social Unrest

Social unrest represents a soft variable capturing the accumulation of key stressors leading to the emergence of a social movement. Social unrest is measured on a 0 to 1 scale where 0 represents no discontent or gap in expectation and 1 represents a high level of discontent. The gaps between expectation and condition are calculated and used as an input into social unrest. It is hypothesized that an increase in gaps results in an increase in civil discontent thereby representing a growth behavior.

5.7 Model Component F: Chinese Citizen Actions

In order for a social movement to succeed, communication must lead to organization which leads to action [63]. This portion of the model represents the coalescence and bureaucratization stages of the four stages of a movement depicted in Figure 1. Coalescence occurs when transparency exists and communication begins to associate a source of discontent which may lead to mass demonstrations. If civil unrest is high, the coalescence represents a movement becoming collective. Such efforts in this stage are severely hindered by lack of transparency and communication between citizens. Coalescence and bureaucratization stages differ in that bureaucratization represents formalized organization to a strategy based effort. For example, in these circumstances an organization that campaigns for human rights within China represents bureaucratization. The summary of hypothesized variables and overarching component interactions regarding these stages of social movements is exhibited in Figure 24.

Component F: Citizen Actions

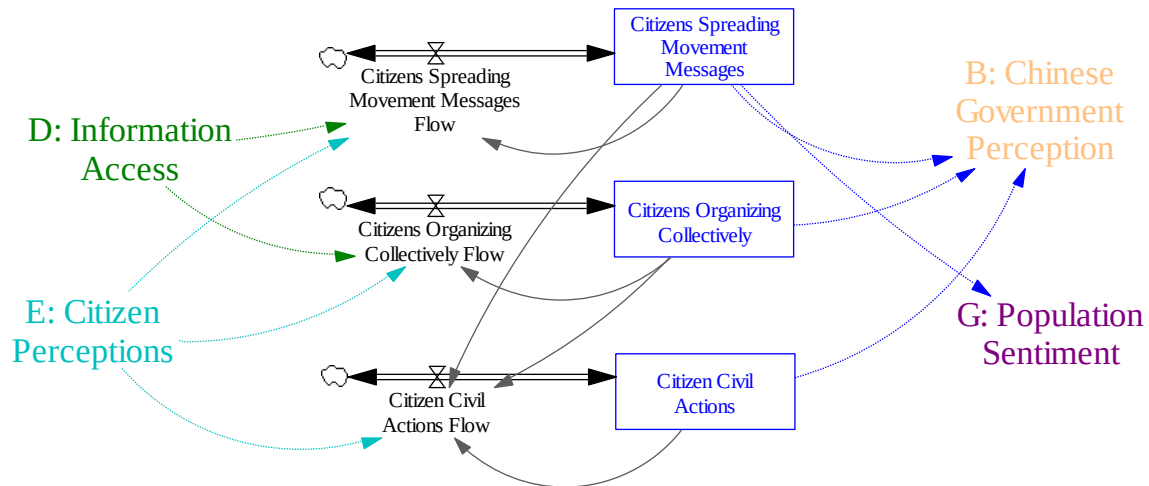


Figure 24 Component F

5.7.1 Background for Component F

This portion represents the second and third stages of a social movement. This formalization is initialized by the desire to spread a coherent message. In this case that message is for more rights, both political and social for Chinese citizens. A successful movement requires more than a temporary change in policy or response to an incident – true effect results from changing minds. This is done by attacking perceptions as seen in cases such as the Civil Rights movement in the 1960's [132]. Greg Satell asserts that for a movement to succeed it must also build connections, or a base of support as well as connect with the mainstream [132]. This is done over a period of time and is not an instant process.

A study conducted by a Taiwanese University [133] surveyed democratic beliefs of Chinese students who were studying abroad. This study showed that democratic belief decreased for 34% of students and increased for 22% of the students [133]. The conclusion suggested that the reason for a lack of impact on the change in democratic beliefs or even the slightly negative impact, was due to a lack of engagement in discussion about relevant topics. A simple access to information given previously conditioned views of democracy resulted in little to negative net effects in support of democratic ideals.

Public mobilization is likely to snowball once it reaches a sufficient tipping point which indicates that their growth is not necessarily linear [109]. Additionally, collective action in China tends to be more effective when it draws more participants, acts more forcefully, has an effective frame (issue linkage), or is led by those who are better

networked [134]. These assertions lead to a hypothesized non-linear effect of each stock variable found within component F.

The threat of citizen collective action prompts a swift response from the Chinese Government [111]. Citizen engagement is deemed crucial in causing a response from the government. Although not considered, the threat of collective action such as protests or the threat of accountability in reporting to higher officials result in government responsiveness [111]. This results in the hypothesis that all citizen activities to include spreading pro-democratic messages, organizing, and protests all contribute to increasing internal pressure.

Literature indicates that the number of protests is estimated anywhere between 80,000 to over 100,000 each year [135]. A substantial amount of data on protests in China is available and future research should incorporate this as a quantifiable metric measuring civil action. The most common protest type appears to relate to labor and work [53]. The number of protests, although believed to be relatively under reported given the governments censorship in the media, has increased over the years [135]. Though anecdotal or based on proxy measures, there appears to be evidence of growing social unrest despite the government's best efforts to censor its people. Given the limited extent of political freedoms, the people within China often have very few avenues to openly voice concerns to the government and therefore this may be reflected in the number of protests.

5.7.2 Measure of Component F Variables

Citizen Spreading Movement Messages

This represents the initiation of coalescence within a movement as citizens spread the message of the movement [62], [109], [132]. This is soft variable with values between 0 and 1, encapsulating ability of citizens to communicate social movement message based on transparency inherent in communication channels. It is hypothesized that as citizens spread democratic ideals' messages, internal pressure rises as does the efforts of citizens toward civil action [60]. Additionally the message efforts within this variable are linked to the message efforts of the social movement within component G.

Citizens Organizing Collectively

This represents the bureaucratization phase of a social movement as groups begin to organize to voice support for a common cause [63]. It is hypothesized that increased organization within a movement leads to an increase of internal pressure as well as an increase in civil actions [62], [109], [132].

Citizen Civil Actions

Civil actions is measured on a scale of 0 to 1 utilizing soft variable methodology. It represents the physical actions taken by citizens voicing their discontent in support of a human rights social movement. An example would be the number of mass incidents or protests that occur. It is hypothesized that pro democratic civil actions leads to higher level of internal pressure and is nonlinear in formulation [62], [109], [132].

5.8 Model Component G: Chinese Citizen Sentiment

This section of the model aims to depict the sentiment of Chinese citizens towards democratic ideals of the citizens.

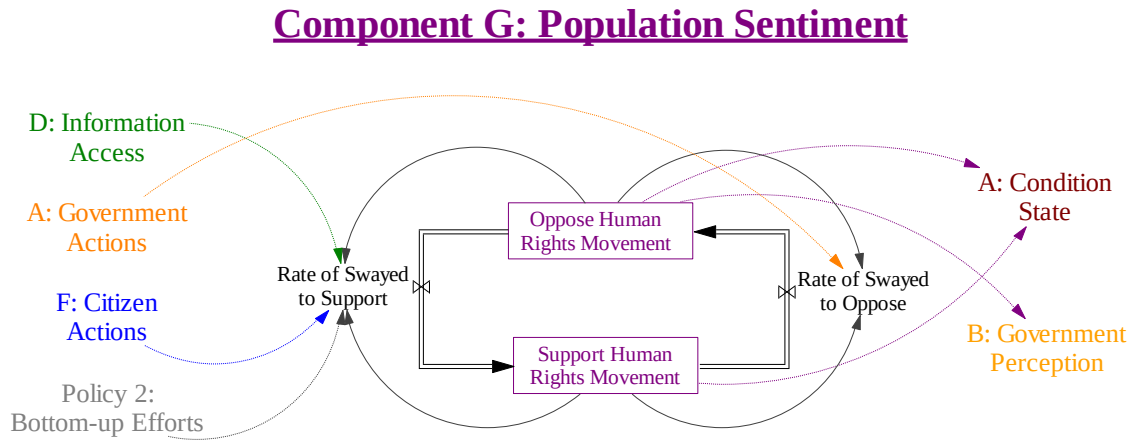


Figure 25 Component G

5.8.1 Background for Component G

The frame used for the spread of the idea of democracy in this context is based on the Bass diffusion model. In this case it is assumed that the entire population has an opinion on human rights: they either oppose or support human rights (although additional views exist in reality). Furthermore, it is likely that age may play a factor in the potential support or opposition of the movement as young children and elderly are likely to be unable to participate as a whole. Those who do not support a movement are grouped into the “oppose human rights movement” category. Those who do not oppose a movement are grouped into the “support human rights” category. The supporters are represented by active supporters and sympathizers to represent those who may internally agree with pro-democratic ideals although they are unlikely to act upon their beliefs. This distinction is important in that those who support a social movement actively or passively have

different impacts on the spread of the movement. This effect is unidentified authoritatively within the literature and is excluded from effects within the base model, although the structure to capture these two sub groups of supporters exists. The adapted Bass model is represented by a duplication of the original rate. The supporters of a movement form the “potential adopters” for the movement opposition and vice versa. This creates a circular rate between the two stock variables resulting in a feedback loop of competing rates of flow.

5.8.2 Measure of Component G Variables

Oppose Human Rights Movement

This is measured by people within the population who oppose a human rights movement. This is primed at 80% of the initial population and through word of mouth and government messaging efforts, supporters of the human rights movement are swayed to join the opposition.

Support Human Rights Movement

This variable is measured in units of people and is set at an initial value of 20% of the initial population. The messaging efforts combined with the word of mouth efforts increase the flow from those who oppose the movement to become those who support it.

The rates governing the flow between support and opposition of democratic ideals are based on the basic Bass diffusion model assertions. The total population of those who support democratic ideals is unknown and a sensitivity analysis is analyzed and presented in Chapter 6. A conservative range for this proportion is between 0 and .5 due to the

assumption that any greater proportion would likely be evidenced by a social movement in existence already.

The traditional innovators of a product are represented as those who become adopters strictly from messaging of the product and not by contact with those who have already become adopters. In the context of these beliefs it may be represented as those who are swayed to either support or oppose democratic beliefs upon any reasoning other than persuasion from a personal contact. Additional parameters for the relationships are estimated in Table 10. These capture hypothesized interactions.

Table 10 Bass Diffusion Model Adaptation Parameters

Parameter	Hypothesized Values
Support Message Effectiveness	1
Support Message Efforts	function (Policy 2 and Citizen messaging)
Support Contact Rate	function (Percent Objective Information Accessed)
Support Probability	0.015
Oppose Message Effectiveness	1
Oppose Message Efforts	function (Government human rights actions)
Oppose Contact Rate	function (Government % Enforced Information Control)
Oppose Probability	0.015

Total population is an additional consideration as the population is estimated to grow each year. The initial population value is an input based on World Bank 2010 data and set at 1.338 billion people [136]. The total population found within each stock level grows proportionally according to China's estimated population growth rate of .45% [136]. Each stock variable within this component is measured as a percentage of the overall population within China.

5.9 Summary

Chapter 5 provided a discussion of the construction of the underlying components used in creating a pilot model to better understand the spread of human rights in China. The reader is reminded that each of these components interact with each other as depicted in Figure 16. In addition more detailed representation are offered in Appendix D. Without a template for a model, a wide array of research covering the expansive amount of theory related to this topic was explored and key components indicated by the literature were selected for model interactions. These concepts were then used to create an initial system structure of interactions that matched intuition and experts insights and opinions. Components were modeled based on simplified relationships derived from hypotheses formulated in the literature. Data and proxy-measures were then added where applicable and possible within the scope of the research. Discussed throughout the justification of each component, assumptions and limitations are addressed, highlighting the initial efforts taken to create a structured system with which to gain understanding. The absence of proxy-measure data for all variables is the next step to creating a higher fidelity model that will prove of greater use to policy efforts. Of course, such measures have been referred to as the “Holy Grail” of information operations modeling. This initial model creates a structure with which to understand generalities of the system however further analysis is required to provide detailed policy decisions. Insight gained from the model and different sensitivity analysis conducted on key input variables is discussed in Chapter 6.

VI Vetting and Results

6.1 Chapter Overview

This chapter provides an overview of steps taken with regard to validation of the model. There are two general critiques in assessing this model which fall under verification and validation.

6.2 Introduction

Figure 26, provided by Mitre [137], represents a useful timeline regarding system dynamics. Verification considers whether the system is built as described, and validation concerns itself with whether the system answers the desired question.

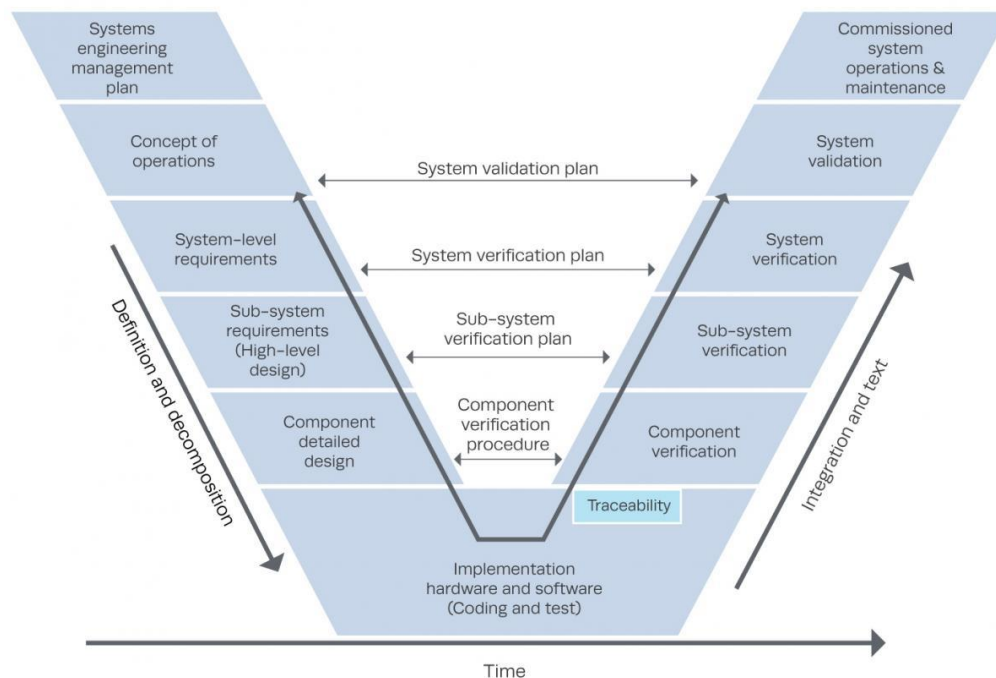


Figure 26 Verification and Validation [137]

This pilot model attempts to characterize a system in a novel way and the model provides a frame of understanding to approach policy strategies. This process requires an extensive

effort in the definition of concepts. Further assessments in this iterative process have led to model adjustments that improve the nature of the model and its usefulness. Therefore, the validation for this pilot model primarily falls in defining the system in order to capture the desired information. This system definition is accomplished in Chapter 4 and Chapter 5, with the description of model construction which characterizes the system based on the reality described by the literature and discussion with a limited number of subject matter experts. As the iterative process continues and new concepts are incorporated and others refined, adjustments to the assumptions or characterizations presented by this initial model may be improved. Additional validation occurs on the latter end of the verification and validation process and is discussed in Section 6.3 in the context of evaluating system dynamics validation techniques with regards to the model as a whole.

6.3 Validation

6.3.1 Soft Variables

For each variable, a source for the reasoning of its existence is provided. Additionally, an example of the application of the qualitative variable standards that were applied utilize the scale discussed in Chapter 3, Table 4. The following questions, adapted from the work of Hayward *et al.* [92], were considered for each soft variable.

- Scale: Does the soft variable have a minimum or maximum value?
- Units: Are there any suggested units of measure for the soft variable?
- Nature: Is the soft variable a stock, converter, or flow?
- Inputs: What outside elements have an effect on the soft variable?
- Outputs: What outside elements does the soft variable affect?

The following discussion provides an example of the logic that was applied throughout model construction to utilize these soft variable definition questions. The following example demonstrates how such reasoning was applied to the soft variable of social unrest. This variable represents a real-world phenomenon recognized as a key factor within social movements.

- **Scale: Does the soft variable have a minimum or maximum value?**

The minimum value of social unrest occurs when all citizens have no discontent as expressed by no action culminating in coalescence or bureaucratization of a social movement. A maximum value follows from the limited capacity of an overwhelming societal feeling of discontent. If the nation reaches that capacity, then there would be no reason to envisage more social unrest as that extra unrest would have no effect on any dynamical element.

- **Units: Are there any suggested units of measure for the soft variable?**

Once a maximum has been set, then a percentage of the maximum might be a natural unit. However, other units could be constructed such as results from surveys questioning the satisfaction with pertinent conditions or other similar material.

- **Nature: Is the soft variable a stock, converter, or flow?**

Social unrest is a culminating result of discontent based upon gaps in expectation and circumstance in addition to the oily rag effect of culminating factors resulting in a higher likelihood to “spark” a movement. It is most naturally a stock representing the culminating level of factors. It should be noted that the differential calculus and underpinning of system dynamics makes a discontinuity

(such as a spark that lights a fire) more difficult to model. It can be represented by a calculation of the rate of discontent. As the expectation gap decreases the social unrest level decreases as well, thus a natural flow in and out both exist in the variable.

- **Inputs: What outside elements have an effect on the soft variable?**

According to social deprivation theory, social unrest arises from a gap in expectation. The inputs to this system are the gaps in expectation believed to effect a social movement in China: economic growth, social freedoms, and political rights. These gaps each have a positive effect on the system in that as the gaps increase, the level of social unrest increases and vice versa.

- **Outputs: What outside elements does the soft variable affect?**

The output is related to the second two stages of a social movement: coalesce and bureaucratize. The higher the level of social unrest, the more likely that the social movement will see actions in both stages.

Soft variables utilized in this model are identified in Table 11.

Table 11 Soft Variables Construction

Component	Variable	Type	Min	Max	Source
A	Top-Down Efforts	Exogenous	0	1	[18]
A	Bottom-Up Efforts	Exogenous	0	1	[18]
A	Grassroots Efforts	Exogenous	0	1	[18]
B	External Pressure	Endogenous	0	1	[68], [109]
B	Internal Pressure	Endogenous	0	1	[68], [109]
B	Government Perceived Control	Endogenous	0	1	[109]
B	Government Desired Level Social Freedoms	Endogenous	1	7	[110]
B	Government Desired Level Political Rights	Endogenous	1	7	[110]
C	Government Action Level Social Freedoms	Endogenous	1	7	[111]
C	Government Action Level Political Rights	Endogenous	1	7	[111]
C	Government Enforced % Information Control	Endogenous	0	1	[140]
D	Global Awareness	Endogenous	0	1	[63]
D	Ability to Express Opinions	Endogenous	0	1	[68]
D	Ability to Organize Collectively	Endogenous	0	1	[68]
E	Condition Level Social Freedoms	Endogenous	1	7	[33]
E	Citizen Expectation Level Social Freedoms	Endogenous	1	7	[104], [130]
E	Condition Level Political Rights	Endogenous	1	7	[33]
E	Citizen Expectation Level Political Rights	Endogenous	1	7	[104], [130]
E	Social Unrest	Endogenous	0	1	[63], [104]
E	Oil Rag Factor	Endogenous	0	1	[109]
F	Citizen Spreading Movement Messages	Endogenous	0	1	[63], [132], [134]
F	Citizen Organizing Collectively	Endogenous	0	1	[63], [132], [134]
F	Citizen Civil Action	Endogenous	0	1	[63], [69], [132], [134]

6.3.2 Model Validation

Utilizing validation tests presented in Figure 15, a minimum of one validation source was chosen.

Systems Mapping

- Face validity:

This test, founded upon Sterman's structure assessment considerations [11], asks whether the model structure is consistent with relevant descriptive knowledge of the system. The structure presented within this model, as well as all factor variables are founded within the literature review and discussion with experts. The structure presented represents what is believed to be pertinent. However, as further reviewing and consideration by a wider audience is applied, adjustments may be required in order to represent the system modeled to a higher degree of accuracy. Chapter 4 and Chapter 5 highlight the support behind each structure and its general interactions that create the rules governing the system.

- Validity of decision rules:

Rooted in a more advanced consideration of validation, this test questions whether the decision rules capture the behavior of the actors in the system. The system, as understood based upon literature, is represented to incorporate pertinent decisions and relationships included within the system. The competing goals inherent in the nature of the social condition within China are represented throughout the process. Among the three actors combined with the interaction of the goals, influences are realized within the system effecting the human rights condition. An example of capturing actor behavior is the government's decision to repress or respond to the internal and external pressures

based on their perceived control depicted in Figure 27 Example of Validity of Decision Rule.

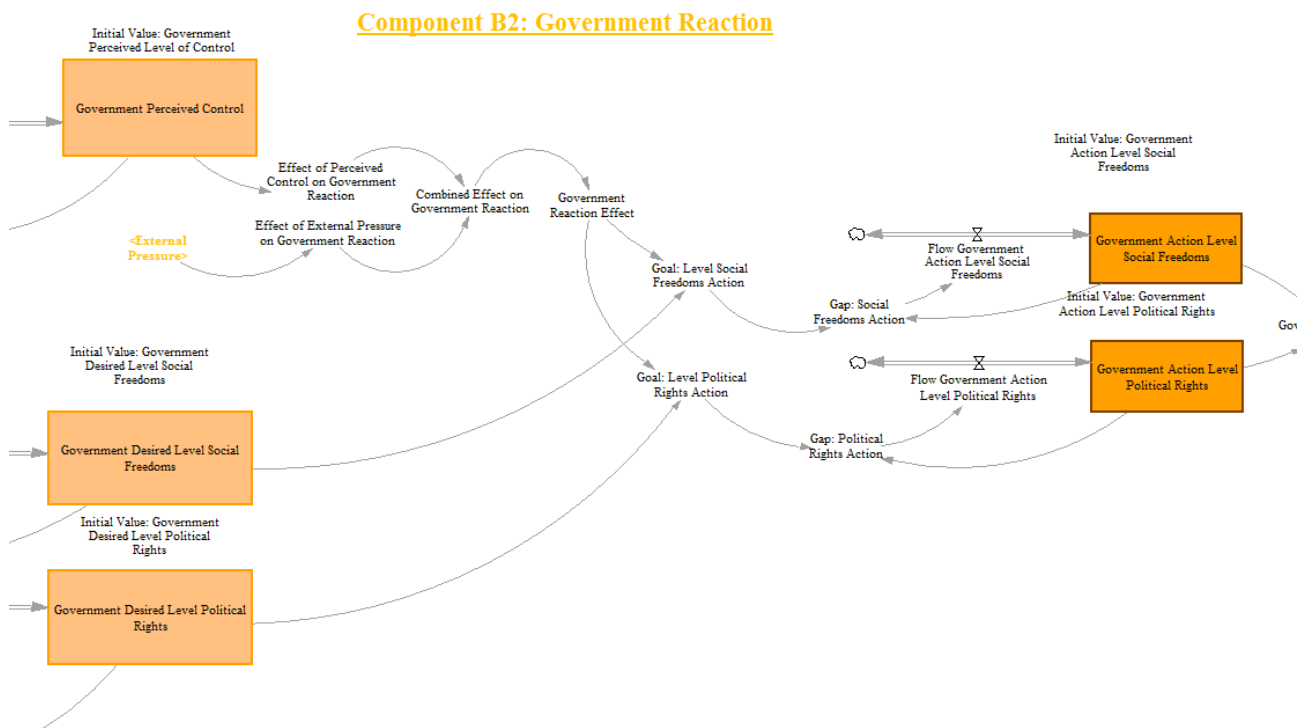


Figure 27 Example of Validity of Decision Rule

Quantitative Modeling

- Dimensional consistency

This test focuses on the consistency within the model. Each variable utilized within the model either translates to a direct representation of quantified data or qualitative understanding which is incorporated as a soft variable. These soft variable parameters were summarized in Table 11 and are shown to have real world meaning based upon the literature. Within the interactions, soft variable relationships and effects are dimensionless. Additional variables in the model remain consistent with their respective units: people, percent of media medium consumed, and percent GDP growth.

Therefore, the consistency within the model meets the requirement of dimensionality within parameters without having to introduce parameters that have no real world meaning.

- Parameter assessment

This test considers whether all parameters have real world counterparts in addition to evaluating their consistency to relevant descriptive and numerical knowledge of the system. Three quantifiable variables are considered for the numerical knowledge of the system. The data used to represent GDP growth, population, population growth, and media consumption of Chinese citizens are all based on data and extrapolated dynamic relationships with time. From 2010-2016, years that are simulated in the model, numerical evaluations conducted show that the population, media consumption habits, and GDP growth all align with historical data. For soft variables, descriptive knowledge was applied as discussed in Chapter 5.

Hypothesis Testing

- Qualitative problem-behavior test

Qualitative behavior testing concerns itself with the ability to reproduce behaviors of interest within the system. Endogenously, the systems of difficulty motivating the study are generated as seen in Section 6.3. The tendency for the system to bias towards a lack of-human rights is evidenced in that without exogenous variables of policy strategy impact, it remains at a relatively consistent state of “not-free” oscillating only slightly over the 30 year period between values of 6 and 7 on the Freedom House scale. Additional measures computing the correlation between model and data as well as

autocorrelation functions were not applied in validation testing due to the current lack of measurable data that is incorporated within the key components of the system.

- Boundary adequacy test (problem endogeneity)

This test considers the structure of the system and asks whether endogenous variables were utilized to address the key concepts in the system. The key concepts of goals, and their effects influencing the system over time, are all endogenous to the model. The exogenous variables of policy efforts and their interactions are inherent to assessment for potential impact and are not considered in problem endogeneity due to the nature of postulating a change to the system. All key components used for creating the baseline system are endogenous. Additional exogenous variables of influence were assessed; no single factor appears to have great impact on the system output of interest: condition of human rights within China.

Message effectiveness, a variable found in component G of the system, is an assumed value due to the lack of literature found supporting a clear relationship that can be applied within the system. For this reason, sensitivity analysis was conducted using the range of its values and the results are shown in the following figures.

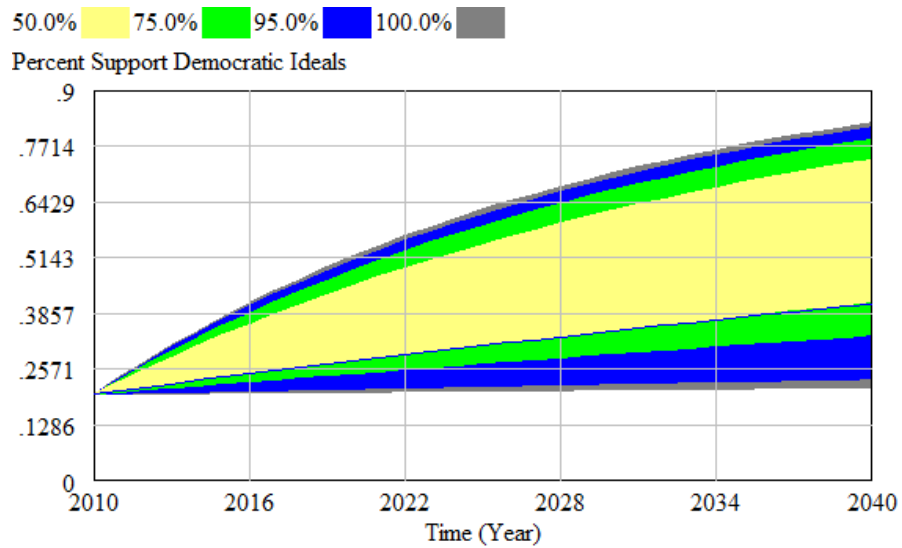


Figure 28 Message Effectiveness Sensitivity to Percent of Support

Figure 28 indicates that the message effectiveness has a clear impact on the system.

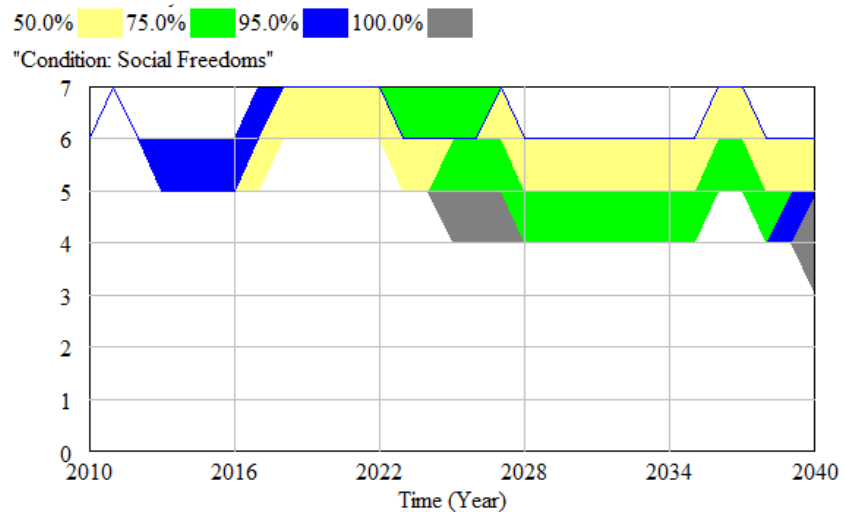


Figure 29 Message Effectiveness Sensitivity

Figure 29 illustrates the sensitivity of message effectiveness in altering a component of the desired output, condition of social freedom. The full range of message effectiveness value appears to impact the overall efforts within the system to a limited degree.

Another variable exogenous to the system is the applied initial proportion of population who support a democratic movement. This value, as a percentage of total population, ranges between 0 and 1. It is clear from the literature and evidenced by current events within China that the value does not lie at either extreme. A sensitivity analysis on the proportion of those opposing democratic ideals within China was applied and is shown in Figure 30.

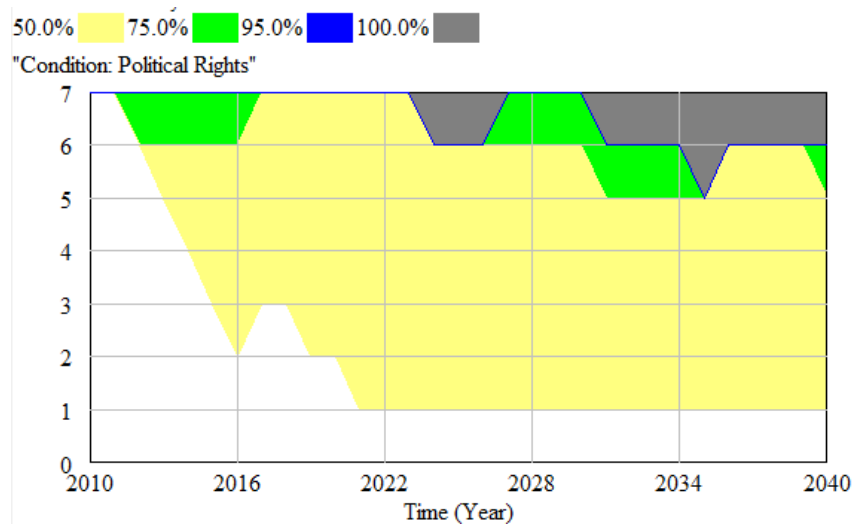


Figure 30 Proportion of Opposition Political Rights Sensitivity Analysis [0,1]

From these results, it is clear that the model is very sensitive to this input. This is evidenced by the wide variation in the results of the model incorporating the full spectrum of the output of interest. This pattern is similar to the output of social freedoms over time within the system. Literature, however, provides a means to better estimate the range of this value. It is postulated that a movement needs substantial support in order to succeed which, as of yet, has not occurred within China. If a majority of citizens believe in a social movement, indicators that are not currently present within China would exist.

This leads to a better estimate of possible values to fall within .5 and 1. An additional sensitivity analysis using the revised range is shown in Figure 31.

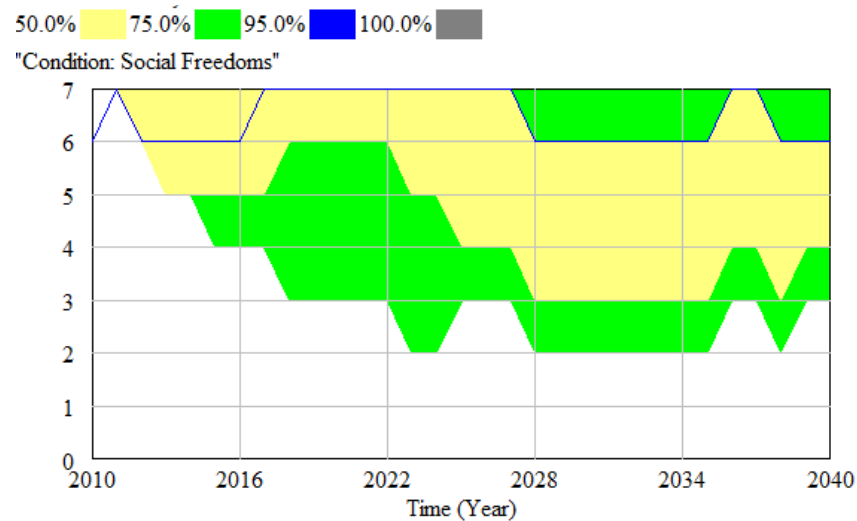


Figure 31 Proportion of Opposition Political Rights Sensitivity Analysis [.5,1]

The output falls further within the expected range of the condition. Figure 31 still indicates that the model is sensitive to the initial value of those opposing the movement; however, the range is improved.

These sensitivity tests were conducted using simulations utilizing a Latin hypercube design within Vensim. A uniform distribution was applied using the range of possible values of exogenous variables. The lack of variation within the model results in consistent outcome regardless of the number of simulations is increased. Analysis indicates that no single exogenous factor within the range of uncertainty based on literature appears to affect the outcome to a substantial effect based on face validity. Additional testing evaluating boundary adequacy are required for the validation of this model and results require a higher level of interaction testing in addition to examining single factors.

- Validity of decision rules

This test concerns itself with whether the decision rules within the system capture the behaviors of the actors in the system. Mental models of interactions governing the constructed system are derived from analysis of available literature. The actions and interactions developed, discussed in Chapter 4 and Chapter 5, are areas for further investigation and discussion as to whether they accurately represent reality as follow on effects develop this model.

Uncertainty Analysis

- Policy sensitivity analysis

Policy sensitivity analysis is addressed in Section 5.4. This considers the uncertainty of the efforts extended, as well as their impact to the overall system. Sensitivity analysis of these two factors is used in overall estimation of the policy. Future policy analysis should be conducted on optimization between all policy parameter combinations.

Additionally, optimization methods to find best combinations and to generate implausible results or reverse policy outcomes may provide additional insights for recommendations. The addition of further data incorporated in the model is suggested as a step prior to such tests.

Forecasting and Optimization

- Behavior correspondence

This question concerns itself with whether the model quantitatively is able to reproduce the behavior of interest in the system. The base model represented achieves this result. This was further discussed previously within this section, Section 6.3.

6.4 Results

The base model produces results that appear consistent with past model behavior. Figure 32 and Figure 33 present the historical condition of human rights and the system generated condition of human rights respectively. The timeline for historical data is from 1960-present and the generated data spans the years 2010 to 2040. This data supports a key assumption of the model in that China will remain “not free” unless additional efforts assisting reformation to a more democratic nation are pursued. This assumption is based on the evidenced lack of change of democracy status since the beginning of the current structure of government in place. Additionally, the previously held view that China may become more democratic as it embraces capitalist economic values is shown at best to be very low or at worst false based on historical evidence. This foundational assumption leads to characterizing a system that biases towards a “not-free” state on the Freedom House scale. It appears that “freedoms” remain a “hard sell” in the current structure of China; however, this does not preclude continuing to try. With the confines of this initial experiment, the model appears to be valid and promising.

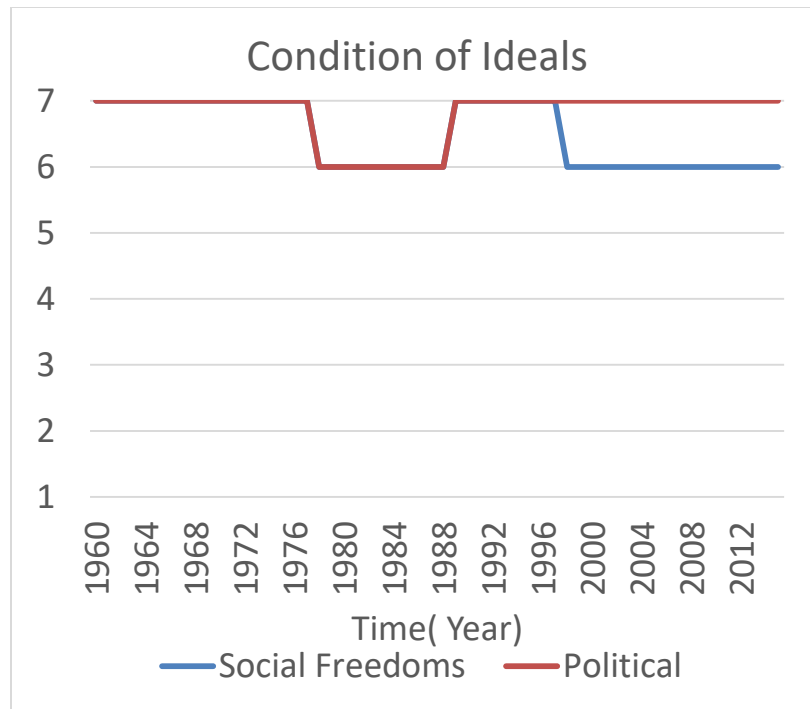


Figure 32 Historical Human Rights Performance

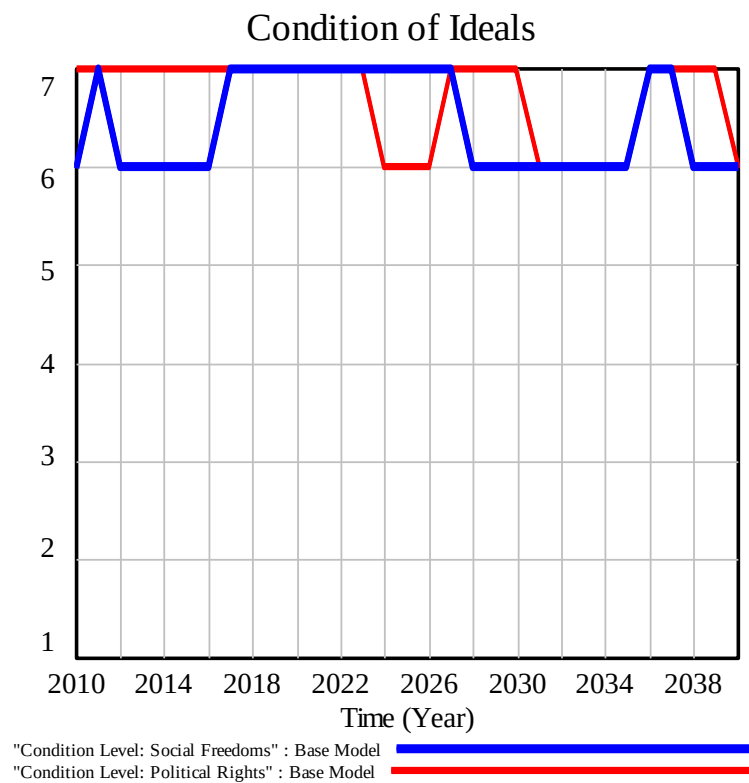


Figure 33 Base Model Human Rights Condition

6.5 Policy Analysis

As discussed in Chapter 4, policy strategy facilitation does not directly represent real world values of dollars spent. Rather three strategies were identified by grouping current efforts:

- Policy 1 – Top-down Efforts
- Policy 2 – Bottom-up Efforts
- Policy 3 – Grassroots Efforts

United States engages in efforts to promote human rights and democracy in China. Additional and more detailed analysis to determine which programs translate to each constructed strategy, is suggested prior to effecting policy actions. The resulting recommendations suggest future policy analysis initiatives to be identified for their ability to achieve goals within the three strategies presented. For example: a grassroots effort represents facilitating VPN which allows citizens to circumvent the Great Firewall of China. A top-down effort could be threatening or employing sanctions against China unless certain standards of human rights are met. A bottom-up effort could represent radio broadcasting pro-democratic messages, communicating via web based medium, or distributing leaflets within China. These representations are based on the interaction of the efforts within the model. The location of influence lends itself to measures aligning with each strategy policy to real-world representations as just discussed. This is shown in the visual map of the model in Figure 34.

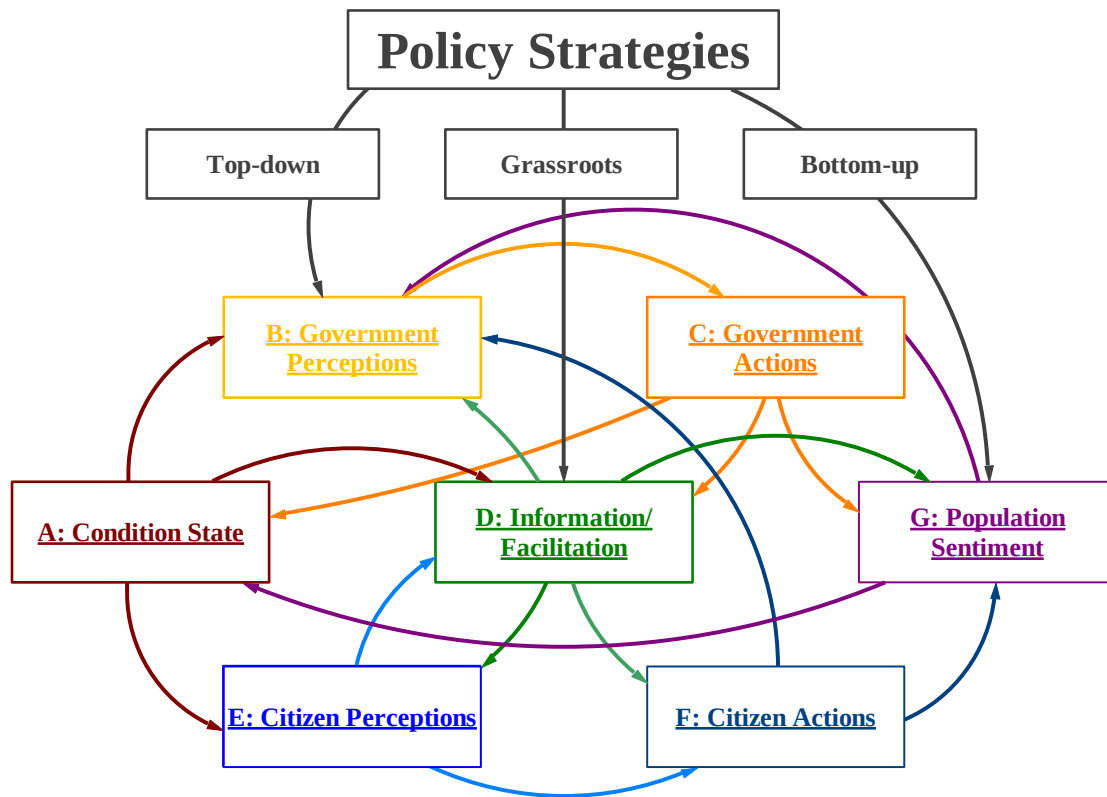


Figure 34 Policy Efforts Strategy Impact Visual

Testing conducted applied all efforts of policy strategy settings over a period of simulations utilizing a uniform distribution for parameter inputs and a Latin hypercube design space. The combinations of testing individual strategy values, individual strategy factors, and a combination of both individual strategy values combined with individual strategy factors were considered. Additionally, testing including each policy combination with respect to their values was considered. The resulting averages for each test are shown in

Table 12.

Table 12 Average Value System Condition (Scale of 1 to 7)

Policy	Sensitivity	Human Rights	Political Rights	Social Freedoms
1	Efforts	5.78	6.16	5.62
2	Efforts	5.79	5.81	5.77
3	Efforts	6.00	6.10	5.91

Policy	Sensitivity	Human Rights	Political Rights	Social Freedoms
1	Both	5.35	5.67	5.03
2	Both	5.82	5.77	5.88
3	Both	4.93	5.23	4.63

Policy	Sensitivity	Human Rights	Political Rights	Social Freedoms
1	Factor	5.24	5.57	4.92
2	Factor	6.13	5.77	5.86
3	Factor	4.86	5.17	4.54

Policy	Sensitivity	Human Rights	Political Rights	Social Freedoms
12	Combine	5.57	5.61	5.53
13	Combine	5.70	5.73	5.67
23	Combine	5.86	5.93	5.78
123	Combine	5.48	5.54	5.42

“Efforts” refer to varying the policy on its value between 0 and 1. “Factor” refers to varying the policy effect on the system which is dependent on the policy. “Both” refers to varying both the factor value and its effect on the system. Finally, “Combine” represents the efforts of policies varied for multiple policies. These values represent the average condition for the entire simulation spanning the thirty year horizon.

For a decision maker, it is important to understand which human rights are weighted or prioritized because political rights and social freedoms are not consistently dominant within any single policy (under efforts sensitivity refer to Policy 1 and Policy 2 results, for political rights and social freedoms). A second note of these results is that

combining all policies results in the best outcome for the average value of the human rights conditions when not accounting for factor sensitivities.

Additionally, when comparing the factor sensitivity to the effort sensitivity, it appears that the factor has a greater impact indicating that pursuing options to further narrow policy effect ranges would be beneficial. When factor effects are considered, the recommended policy is dominantly Policy 3, grassroots efforts. The potential of this policy alone provides better results than the combination of all policy efforts. Limiting the range of factor effect on the system would assist in providing a consistent recommendation regardless if effort or factor are varied.

The average value of the condition is not the only consideration. It is also suggested that the speed at which the condition reforms should be considered. This may be an important factor considering that the assumptions this model is based on are centered on a “not free” condition of China. It may be easier to achieve an improved condition from 4 to 1 as opposed to 7 to 4. A time weighted value of the policies was applied and results are shown in Table 13.

Table 13 Average Time Scaled Influence (Scale 0 to 1)

Policy	Sensitivity	Human Rights	Political Rights	Social Freedoms
1	Efforts	0.65	0.68	0.61
2	Efforts	0.62	0.58	0.66
3	Efforts	0.67	0.66	0.67

Policy	Sensitivity	Human Rights	Political Rights	Social Freedoms
1	Both	0.57	0.59	0.54
2	Both	0.64	0.59	0.69
3	Both	0.46	0.49	0.43

Policy	Sensitivity	Human Rights	Political Rights	Social Freedoms
1	Factor	0.55	0.57	0.52
2	Factor	0.62	0.58	0.66
3	Factor	0.45	0.48	0.42

Policy	Sensitivity	Human Rights	Political Rights	Social Freedoms
12	Combine	0.66	0.64	0.68
13	Combine	0.71	0.70	0.72
23	Combine	0.69	0.66	0.71
123	Combine	0.65	0.64	0.67

This is achieved by weighting the condition values by the time it takes to achieve that level of condition and then normalizing the value to a 0 to 1 scale. In this measure, a value of 0 represents a system with a freedom scale value of 1 for the entirety of the simulation. A value of 1 represents a system that remains at a value of 7 for the entirety of the simulation. This weighting rewards the speed of transition towards a value of 1. The recommendations are not wholly consistent across policies (refer to Policy 1 and Policy 2 effort sensitivity results for human rights in each table).

The next step for a decision maker is to prioritize the importance of results: the value versus the time as well as the specific human rights. Depending on the values of

importance placed on these measures, different Policies may become the focus of future research. An example of this is shown in Table 14 where both the value and time are weighted at .5 of the resulting score

Table 14 Combined Weighted Average of Time and Value

Policy	Sensitivity	Human Rights	Political Rights	Social Freedoms
1	Efforts	0.67	0.71	0.64
2	Efforts	0.65	0.63	0.67
3	Efforts	0.69	0.69	0.69

Policy	Sensitivity	Human Rights	Political Rights	Social Freedoms
1	Both	0.59	0.63	0.56
2	Both	0.66	0.63	0.69
3	Both	0.51	0.55	0.48

Policy	Sensitivity	Human Rights	Political Rights	Social Freedoms
1	Factor	0.58	0.61	0.54
2	Factor	0.68	0.63	0.68
3	Factor	0.50	0.54	0.46

Policy	Sensitivity	Human Rights	Political Rights	Social Freedoms
12	Combine	0.66	0.65	0.66
13	Combine	0.69	0.69	0.69
23	Combine	0.69	0.68	0.70
123	Combine	0.65	0.64	0.65

The value for the condition was first normalized to a 0 to 1 range prior to weighting with a value of .5. It appears that Policy 2 has a greater effect on the system than Policy 1 (refer to effort sensitivity of Policy 1 and Policy 2 in political rights and social freedoms as well as the combined Policy 1 and 2 results in these respective areas). Visual

representations of each value are presented in Appendix E. An example of these outputs are provided in Figure 35 and Figure 36.

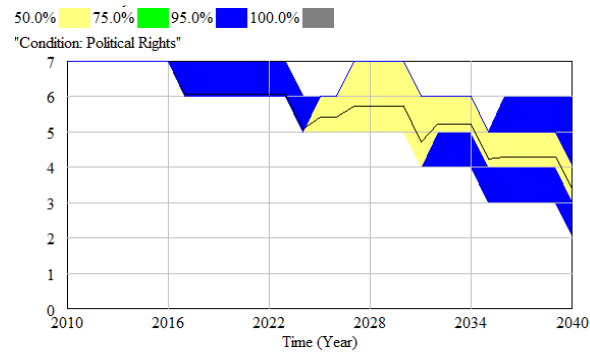


Figure 35 Policy 1 "Both" Political Rights Sensitivity

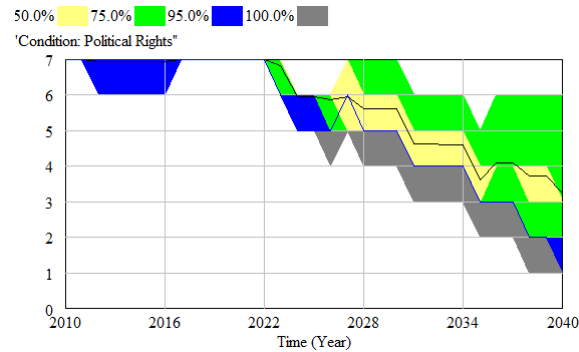


Figure 36 Policy 2 "Both" Political Rights Sensitivity

This comparison shows why the weighting of average value and time are important. Although Policy 1, top-down efforts, has an average value that is lower for political rights over the simulated period, the model suggests that Policy 2, bottom-up efforts, is able to more quickly realize a lower (better) value.

Overall a combined policy of using all three influences is suggested. At a cursory look, Policy 1 appears to have the greatest single influence on human rights, however, this model is characterized by a conservative estimate of effects of impact on the system. This is shown by the factor effect testing and in these tests Policy 3, grassroots efforts, is

clearly dominate in both average and time respects. This leads to the conclusion that Policy 3 should be further investigated in order to more fully understand the impacts upon the system.

Policy influences are realized on the system and have logical response that represents the effects desired in reality. A transition towards more human rights is gradual and may not follow a strict trend line. All simulated combinations applied in sensitivity testing confirmed this logical trend influencing the system towards this gradual increase in human rights (represented by lower values on the scale of one to seven).

Additionally, policy interactions do not follow necessarily intuitive results - the combination efforts of Policy 1, top-down efforts, and Policy 3, grassroots efforts, for example, illustrate an increase in the time weighted measure as opposed to single effort tests for each policy respectively. This may be due to the interactions attempting to influence the system too quickly causing further repressive action responses by the governments perceived control level. In reality, this may translate to any attempt to influence the system too quickly resulting in the Chinese government feeling threatened and responding opposite to the desired influence.

6.6 Investigative Questions Answered

Do the actions America is currently applying create lasting change? From the literature, it appears very difficult to force outside change and this is evidenced in the model as well. However, in conventional thinking, lasting change must come from within and the citizens themselves. An outside force or nation imposing its views upon another

and using messaging at a high level such as sanctions, threats, or messaging may help with small battles but the war will be won by the government reforming to the will of the people as powerfully demonstrated in recent decades in cultures as diverse as East German and Egypt. From this line of thinking it appears that this model is consistent with the popular view on this topic.

“The best way to advance human rights in the [United States]-China relationship is first and foremost to recognize that the engine of human rights progress in China today is the Chinese citizenry itself” [138]. From this, it appears that facilitating Chinese citizens to act upon their own beliefs and to provide them with objective information is one of the most promising long term impacts the United States can have on this issue. Currently it appears that the United States provides minimal assistance to NGO’s acting in this effort or for programs such as Voice of America in China. However, with the digital age replacing radio broadcasts as well as other mediums, it would be useful to research the potential impact for a campaign in utilizing digital media. “Breeching” the Great Fire Wall to facilitate internet and social media messages appears to be a promising approach.

The following research questions have all been addressed throughout this process:

1. What are the key variables involved in spreading democracy in China?
2. What are the interacting relationships between the key variables?
3. What United States policy strategies represent the best options of influence?
4. How do these strategies create influence?

The first two questions are defined in Chapter 4 and Chapter 5 discussion of the methodology applied in model construction. The third and fourth questions regarding policy analysis consideration and implementation effects have been addressed in Section 6.5 along which includes recommendations stemming from the discussion of their results.

6.7 Summary

The tests presented provide a level of validation for the model. Further tests, while not employed for this pilot model, may be appropriate as the model is further developed. The system dynamics process of modeling is an iterative process and constant improvement can be made as additional data or information is incorporated in the model to provide a better simulation of reality. Despite official validation methods, the critical question when assessing a system dynamics model pertains to whether it is useful for the stated purposes.

This model provides a visualization of a large and multifaceted concept. To increase precision in results, additional measures must be included; further validation must be conducted. For the purposes of creating a pilot model and examining generalized policy strategies in their influence of the diffusion of democratic ideals and reforming conditions in China, this model does prove useful. Therefore, at a minimum, this model is useful in accomplishing its purpose although additional validation would benefit the reality simulated by the model. This chapter summarized efforts in validation to include the creation of soft variables as well as traditional validation tests presented in literature. Additionally, sensitivity of exogenous variables within policy strategies was applied and results discussed. While a “soft” operations research model may not meet the engineering

rigor validation of a traditional model, if it aids in the assistance of addressing “wicked problems” without leading the analyst astray, it has met the test of being a useful model.

VII Conclusions and Recommendations

7.1 Chapter Overview

This chapter provides conclusions derived from the presented research. A highlight of results is provided as well as a discussion of the interpretation of significance and recommended actions based on this research. Following is a discussion detailing considerations for future research. This includes suggestions for expansions and model revisions to meet a higher fidelity of system dynamics rigor.

7.2 Research Outcomes

The spread of democracy within China is a sizeable scoped concept. This research addresses the issue from a system dynamics approach to investigate possible sources of influence available to an external actor that impact Chinese government reformation. This thesis presents an innovative approach to creating an initial system capturing pertinent elements effecting these circumstances. For this research a template was not found presenting the ideas of policy in regard to spreading democratic ideals within China. Additionally data did not line up with the desired measures within the system however combining analysis and insights from the literature and system dynamics principles, a pilot model was created. The voices and expertise provided from the literature review and discussions with available subject matter experts provided the basis for modeling and utilizing system dynamics in this research. System dynamics provides a way to visualize and simulate the complex interactions between multiple key variables. Rather than solely relying on suggestion of experts, this research attempts to take a systems view of the situation. Additional precision utilizing such an approach is feasible given access to data

that translates to reasonable measures of system elements. As an area of applied understanding, system dynamics takes an approach of mixing expertise (the art) with mathematical measurements (the science).

At a minimum, this research has accomplished a new level of systems thinking approach to the problem at hand by identifying interactions and relationships hypothesized to be pertinent to the system. The pilot model presented is open for criticism of potentially incorrectly hypothesized variables and/or missing or redundant variables and interactions. The result of this research's culminating efforts are a step towards modeling the system and concepts. Its intent is to contribute to the discussion of an approach at impacting the human rights condition in China as well as creating and validating a new approach to applying system dynamics to an ambiguous policy. At a maximum, this model is assumed to be generally correct in its approach and can provide insight into which strategy of external actors represents the greatest effect in providing change to the system. Presuming that it meets a sufficient level of fidelity within the community of policy experts – it will provide a motivation for guiding policy efforts by the United States by suggesting that efforts should be aimed at increasing facilitation tools for the modeled movement in order to have the greatest desired impact within China.

This research is unique in that it attempts to define the system involving the spread of human rights within China. While previous research has explored components of civil unrest, formulating models such as factors leading to increased protests, there does not appear to publicly exist a model applying relevant theories in relation to a mathematically constructed model representing efforts and impact within China.

This research utilizes a system dynamics approach in balancing an emphasis on two key components used to represent the spread of human rights in the form of measured democratization in China: political rights and social freedoms. These two concepts were explored to identify components that are vital to effecting this system. These components were then explored further to hypothesize interactions based on literature and expertise. Each element affects other elements reinforcing or balancing. System dynamics is highly visual, implicit mental models are made explicit which allows for an expansion to share and critique with a purpose to create a system that better represents reality. The purpose of this system is to investigate policy strategies that will improve system behavior. To this end the research achieves its goal.

Additionally, this research provides an opportunity for critical thinking. Modeling decisions and application within the system dynamics realm can be criticized, but these do not detract from the accomplishment of this research as an exercise of pursuing a deeper understanding of a complex topic. A high level of mathematical rigor is often an ideal, however this should not prevent operations researchers from pursuing methods such as system dynamics which allow investigation when precise measurements are not available. To this end, this work suggests that system dynamics is an apt tool for policy analysis as well as information warfare, both of which find themselves incorporated within this study.

7.3 Discussion and Recommendations for Future Research

“All models are wrong; some models are useful” [139]. The model presented is a pilot investigation at visualizing and simulating effects pertinent to the modeled system.

The proposed initial model is undoubtedly imprecise; all models are abstractive of reality. Its potential usefulness, the purpose driving this research, however, is discussed previously within this chapter. In order to increase the validity and fidelity of the presented model two areas are recommended for evaluation and further consideration. There are encompassed in two categories: system dynamics application assessment and potential absent relevant topical data and information. The following sections recommend further considerations that were not incorporated within the scope of this project. Additionally, validation adhering to system dynamics standards is a continuous process that does not cease as improvements to model structure and behavior are realized.

7.3.1 Model Boundaries

Policy Strategies

The strategies presented in the analysis portion of this research remains constant throughout the simulation. In reality, it is likely that policy adjusts over time according to different inputs. A dynamic presentation of policy efforts is suggested for future investigation.

Measures

The measures chosen such as Freedom House scale for democracy and soft variable modeling parameters can and should be reexamined to determine if additional and/or more appropriate measures could be applied. In the soft variable discussion, suggested proxy measures are identified when considered, however future discussion with experts and additional literature review may lead to more practical measures or create requirements for further intelligence.

Exogenous Factors

As modeled, the exogenous input into the system created is only considered based on identified grouping of United States efforts. Additional efforts exist found within human rights groups across the globe as well as additional nation efforts. The efforts modeled in the system are applicable to similar endeavors by any group; however, this model does not distinguish a separation of effects by other exogenous entities.

7.3.2 Model Modifications

Diffusion

The Bass model was used as a basis for the spread of the movement. This relies on several assumptions and the adjustment to the model requires further efforts to validate the relationship proposed. Additionally, the proposed relationship assumes that citizens fall within two categories at all times, those who oppose democratic ideals and those who support democratic ideals. In reality, the views on this topic are surely on a spectrum and perhaps another method of modeling the relationship such as using an epidemiological diffusion model adapted to this scenario may be better suited. Additional models found in literature which may be pertinent to this scenario were discussed in section 3.4.2.

Social Movement Theory

This model takes assumptions based on social deprivation theory, however within the literature there remains an extensive amount of potential other causes for emergence in a social movement. Additional social movement theories can be examined changing the causes for unrest modeled in component E of the model.

Stage 4 Social Movement Scenarios

Figure 1 identifies four stages of a social movement. The fourth stage of decline can be represented as repression, co-optation, success, and failure. This model accounts for success at reformation of the government and the impacts of repression; however, it does not consider failure or co-optation. This assumption is presented as the belief that a desire for human rights is universal and inherent within human nature to desire a level of rights. Thus, regardless of circumstance this desire cannot be extinguished from all members of a society. Although the literature indicated otherwise, freedom may well be a relative concept in different cultures. Expansion on the model may vary this assumption to include modeling the full scope of possible results on this social movement.

7.3.3 Additional Variable and Relationship Considerations

Repression Efforts

The Chinese government's repression could potentially be measured as a lagged variable in the estimated spending on stability maintenance. This number has gone unreported officially since 2013 and analysts say numbers that are reported by the CCP are likely to be significantly underreported [140]. Numbers since 2013 are estimated at approximately \$126 billion and in 2014 approximately \$130 billion [141]. The rise in 2014 is estimated at 8.7 percent. This spending represents the main component measured in repression as it is the funding provided to maintain social internal stability.

Impact of Social Unrest

Within the model social unrest directly effects citizen actions which result in potentially impacting government perceptions and rise of supporters within the movement. This model presents this as a focus on political reform within the government

however additional possible consequences of social unrest such as economic focused may affect the system and are not considered in this sphere [117]. As mentioned below when discussing the impact of the Hong Kong Umbrella movement, a lack of greater effect may be linked to the lack of impact on economy, therefore a greater impact on economy may cause a greater effect on government reformation.

Demographic Influences

While the demographic response may vary on every tier in the realm of possibilities, the suggested potential sources for greatest differentiation in democratic ideal movement responses are an area for further investigation. The literature review suggests including the difference in geographic region (urban vs rural, coastline cities vs inland cities), education level, and affluence. China is vast in geographic land mass but the diversity between regions is not considered within this initial model. There is a hypothesized difference between rural and urban responses in a movement promoting democratic ideals due to issues that are pertinent within each respective region.

Existing Sources of Contention

Currently within China there exists a level of oppression for specific groups which may be a source for the democratic ideal movement. For example, labor disputes, land seizures, religious oppression (Falun Gong, Christianity, etc.), and regional oppression such as Tibet are all potential sources for discontent.

China as a Nation

This model does not incorporate additional conflicts causing social unrest within China such as border conflicts. Additionally, Taiwan and Hong Kong aspects are not incorporated in the model. Hong Kong, returned to China control under a fifty year

contract in 1997, is a source that would be pertinent to democratic ideal diffusion studies. The Umbrella movement is a social movement of democracy that occurred in 2014. There is speculation as to its actual effects. It appears to have had mixed effects in achieving its goal of political rights that initiated its emergence [138], [142]. Despite 42% of voters supporting political reforms prior to the initiation of the Umbrella movement, the reforms have not been realized as an effect of the movement at the time of this writing [143]

The Hong Kong umbrella movement potentially:

- Politicized Citizens [144]
- Increased Awareness [144]
- Failed due to lack of impact on the economy [145]
- Failed due to goal misinterpretation [146]

The Hong Kong Umbrella movement may be a strong indicator of responses and actions expected within the whole of China. Further investigation into causes and impacts associated with it may provide additional insight that can be applied to adjust the presented model of this research. Furthermore, translating the efforts involved in Tiananmen Square may provide useful parameters for such a model.

Censorship Relationships

A study by Hobbs and Roberts has shown that as censorship increases, a larger portion of users attempt to access information outside of Chinese control leading to investments in censorship evasion technology [125].

Online Protest Effect

It is hypothesized that the limiting effect on expression and group organization cause the government to be more responsive to other methods of collective action, so

much so that even online protest and attention can cause effective change without the need for action. This is potentially supported by the potential online protest effect Hongjin Wu was able to achieve [147].

Credibility of Information

Chinese citizens perceive credibility based on information sources which may impact the spread of messages in support of the government or a pro-democracy movement. A study reported discrepancy in trust depending on the source of news: either official news media outlets labeled ‘Official’ or news disseminated by citizens labeled ‘Citizens’[120]. The trust, labeled low and high as seen in

Table 15 could be used as an assumption across media mediums.

Table 15 Percentage of Trust in News Source

	News Source	
	Official	Citizen
23%	High	Low
20%	Low	High
32%	Low	Low
25%	High	High

7.3.4 Further Data Sources

A list of data sources which may be useful for future research in identifying variables and relationships pertinent to this question is presented in Table 16. For each source, it is recommended to first achieve an understanding of the methodology used in capturing the reported data presented prior to accepting the values as presented. The reporting agency may have a biased view that alters the values of data presented. For example, the credibility of National Bureau of Statistics of China economic data on China

is concluded as less credible than economic data on China produced by the United States and Europe [148].

Table 16 Relevant Data Sources

Label	Description	Data Range	URL
GDELT	Database monitoring world news media	1979-2017	http://www.gdeltproject.org/
World Bank	Global development data including economic, social, and political data collected and presented	Varied	http://data.worldbank.org/
Asian Barometer	Survey data indicating views on democracy and other pertinent topics within mainland China and surrounding nations in Asia	Varied between 2001-2014	http://asianbarometer.org/
US Foreign AID	Data separated into categories of United States aid provided to other nations	Varied	http://explorer.usaid.gov/
National Bureau of Statistics of China	China based		http://data.stats.gov.cn/

This list is not inclusive and additional databases and information exists that may be pertinent to this topic which were not viewed during this research process. For example:

- Yu Jianrong – Researcher promoting reform within China
- Dui Hua Foundation – Compiles a Political Prisoner Database and Mass Incident Database

7.4 Summary

This chapter provided an overview of the significance of the research posed in this thesis. The concluding action recommendation is for future United States policy to focus on means that facilitate the existence of a movement. This involves further exploration of methods that allow Chinese citizens to circumvent government censorship

and media propaganda in order to access objective information and communicate ideas. The limitations and suggestions for further model examinations, as well as suggestions for additional model expansions and modifications, are presented for consideration in detail within this chapter. While the proposed model may be considered as inadequately representative of the inherent complexity of the factors and relationships in the eyes of a China expert, it is a step that characterizes and frames many complex aspects in the dynamic system in a way that can provide useful insight.

Appendix A: Freedom House Methodology

The following appendix is directly from Freedom House methodology [33].

Checklist Questions

The bulleted subquestions are intended to provide guidance to the analysts regarding what issues are meant to be considered in scoring each checklist question. The analysts do not need to consider every subquestion during the scoring process, as the relevance of each varies from one place to another.

Political Rights (0–40 points)

A. Electoral Process (0–12 points)

1. Is the head of government or other chief national authority elected through free and fair elections?

- Did established and reputable national and/or international election monitoring organizations judge the most recent elections for head of government to be free and fair? (Note: Heads of government chosen through various electoral frameworks, including direct elections for president, indirect elections for prime minister by parliament, and the electoral college system for electing presidents, are covered under this and the following sub-questions. In cases of indirect elections for the head of government, the elections for the legislature that chose the head of government, as well as the selection process of the head of government himself, should be taken into consideration.)
- Have there been undue, politically motivated delays in holding the most recent election for head of government?
- Is the registration of voters and candidates conducted in an accurate, timely, transparent, and nondiscriminatory manner?
- Can candidates make speeches, hold public meetings, and enjoy media access throughout the campaign free of intimidation?
- Does voting take place by secret ballot or by equivalent free voting procedure?
- Are voters able to vote for the candidate or party of their choice without undue pressure or intimidation?
- Is the vote count transparent, and is it reported honestly with the official results made public? Can election monitors from independent groups and representing parties/candidates watch the counting of votes to ensure their honesty?
- Is each person's vote given equivalent weight to those of other voters in order to ensure equal representation?
- Has a democratically elected head of government who was chosen in the most recent election subsequently been overthrown in a violent coup? (Note: Although a peaceful, "velvet coup" may ultimately lead to a positive outcome—particularly if it replaces a head of government who was not freely and fairly elected—the new leader has not been freely and fairly elected and cannot be treated as such.)

- In cases where elections for regional, provincial, or state governors and/or other subnational officials differ significantly in conduct from national elections, does the conduct of the subnational elections reflect an opening toward improved political rights in the country, or, alternatively, a worsening of political rights?

2. Are the national legislative representatives elected through free and fair elections?

- Did established and reputable domestic and/or international election monitoring organizations judge the most recent national legislative elections to be free and fair?
- Have there been undue, politically motivated delays in holding the most recent national legislative election?
- Is the registration of voters and candidates conducted in an accurate, timely, transparent, and nondiscriminatory manner?
- Can candidates make speeches, hold public meetings, and enjoy media access throughout the campaign free of intimidation?
- Does voting take place by secret ballot or by equivalent free voting procedure?
- Are voters able to vote for the candidate or party of their choice without undue pressure or intimidation?
- Is the vote count transparent, and is it reported honestly with the official results made public? Can election monitors from independent groups and representing parties/candidates watch the counting of votes to ensure their honesty?
- Is each person's vote given equivalent weight to those of other voters in order to ensure equal representation?
- Have the representatives of a democratically elected national legislature who were chosen in the most recent election subsequently been overthrown in a violent coup? (Note: Although a peaceful, "velvet coup" may ultimately lead to a positive outcome—particularly if it replaces a national legislature whose representatives were not freely and fairly elected—members of the new legislature have not been freely and fairly elected and cannot be treated as such.)
- In cases where elections for subnational councils/parliaments differ significantly in conduct from national elections, does the conduct of the subnational elections reflect an opening toward improved political rights in the country, or, alternatively, a worsening of political rights?

3. Are the electoral laws and framework fair?

- Is there a clear, detailed, and fair legislative framework for conducting elections? (Note: Changes to electoral laws should not be made immediately preceding an election if the ability of voters, candidates, or parties to fulfill their roles in the election is infringed.)
- Are election commissions or other election authorities independent and free from government or other pressure and interference?
- Is the composition of election commissions fair and balanced?

- Do election commissions or other election authorities conduct their work in an effective and competent manner?
- Do adult citizens enjoy universal and equal suffrage? (Note: Suffrage can be suspended or withdrawn for reasons of legal incapacity, such as mental incapacity or conviction of a serious criminal offense.)
- Is the drawing of election districts conducted in a fair and nonpartisan manner, as opposed to gerrymandering for personal or partisan advantage?
- Has the selection of a system for choosing legislative representatives (such as proportional versus majoritarian) been manipulated to advance certain political interests or to influence the electoral results?

B. Political Pluralism and Participation (0–16 points)

1. Do the people have the right to organize in different political parties or other competitive political groupings of their choice, and is the system open to the rise and fall of these competing parties or groupings?

- Do political parties encounter undue legal or practical obstacles in their efforts to be formed and to operate, including onerous registration requirements, excessively large membership requirements, etc.?
- Do parties face discriminatory or onerous restrictions in holding meetings, rallies, or other peaceful activities?
- Are party members or leaders intimidated, harassed, arrested, imprisoned, or subjected to violent attacks as a result of their peaceful political activities?

2. Is there a significant opposition vote and a realistic opportunity for the opposition to increase its support or gain power through elections?

- Are various legal/administrative restrictions selectively applied to opposition parties to prevent them from increasing their support base or successfully competing in elections?
- Are there legitimate opposition forces in positions of authority, such as in the national legislature or in subnational governments?
- Are opposition party members or leaders intimidated, harassed, arrested, imprisoned, or subjected to violent attacks as a result of their peaceful political activities?

3. Are the people's political choices free from domination by the military, foreign powers, totalitarian parties, religious hierarchies, economic oligarchies, or any other powerful group?

- Do such groups offer bribes to voters and/or political figures in order to influence their political choices?
- Do such groups intimidate, harass, or attack voters and/or political figures in order to influence their political choices?

- Does the military control or enjoy a preponderant influence over government policy and activities, including in countries that nominally are under civilian control?
- Do foreign governments control or enjoy a preponderant influence over government policy and activities by means including the presence of foreign military troops, the use of significant economic threats or sanctions, etc.?

4. Do cultural, ethnic, religious, or other minority groups have full political rights and electoral opportunities?

- Do political parties of various ideological persuasions address issues of specific concern to minority groups?
- Does the government inhibit the participation of minority groups in national or subnational political life through laws and/or practical obstacles?
- Are political parties based on ethnicity, culture, or religion that espouse peaceful, democratic values legally permitted and de facto allowed to operate?

C. Functioning of Government (0–12 points)

1. Do the freely elected head of government and national legislative representatives determine the policies of the government?

- Are the candidates who were elected freely and fairly duly installed in office?
- Do other appointed or non–freely elected state actors interfere with or prevent freely elected representatives from adopting and implementing legislation and making meaningful policy decisions?
- Do nonstate actors, including criminal gangs, the military, and foreign governments, interfere with or prevent elected representatives from adopting and implementing legislation and making meaningful policy decisions?

2. Is the government free from pervasive corruption?

- Has the government implemented effective anticorruption laws or programs to prevent, detect, and punish corruption among public officials, including conflict of interest?
- Is the government free from excessive bureaucratic regulations, registration requirements, or other controls that increase opportunities for corruption?
- Are there independent and effective auditing and investigative bodies that function without impediment or political pressure or influence?
- Are allegations of corruption by government officials thoroughly investigated and prosecuted without prejudice, particularly against political opponents?
- Are allegations of corruption given wide and extensive airing in the media?
- Do whistleblowers, anticorruption activists, investigators, and journalists enjoy legal protections that make them feel secure about reporting cases of bribery and corruption?
- What was the latest Transparency International Corruption Perceptions Index score for this country?

3. Is the government accountable to the electorate between elections, and does it operate with openness and transparency?

- Are civil society groups, interest groups, journalists, and other citizens able to comment on and influence pending policies or legislation?
- Do citizens have the legal right and practical ability to obtain information about government operations and the means to petition government agencies for it?
- Is the budget-making process subject to meaningful legislative review and public scrutiny?
- Does the government publish detailed accounting expenditures in a timely fashion?
- Does the state ensure transparency and effective competition in the awarding of government contracts?
- Are the asset declarations of government officials open to public and media scrutiny and verification?

Additional Discretionary Political Rights Questions:

A. For traditional monarchies that have no parties or electoral process, does the system provide for genuine, meaningful consultation with the people, encourage public discussion of policy choices, and allow the right to petition the ruler? (0–4 points)

- Is there a non-elected legislature that advises the monarch on policy issues?
- Are there formal mechanisms for individuals or civic groups to speak with or petition the monarch?
- Does the monarch take petitions from the public under serious consideration?

B. Is the government or occupying power deliberately changing the ethnic composition of a country or territory so as to destroy a culture or tip the political balance in favor of another group? (–4 to 0 points)

- Is the government providing economic or other incentives to certain people in order to change the ethnic composition of a region or regions?
- Is the government forcibly moving people in or out of certain areas in order to change the ethnic composition of those regions?
- Is the government arresting, imprisoning, or killing members of certain ethnic groups in order change the ethnic composition of a region or regions?

Civil Liberties (0–60 points)

D. Freedom of Expression and Belief (0–16 points)

1. Are there free and independent media and other forms of cultural expression? (Note: In cases where the media are state controlled but offer pluralistic points of view, the survey gives the system credit.)

- Are print, broadcast, and/or internet-based media directly or indirectly censored?
- Is self-censorship among journalists common, especially when reporting on politically sensitive issues, including corruption or the activities of senior officials?
- Are libel, blasphemy, or security laws used to punish journalists who scrutinize government officials and policies or other powerful entities through either onerous fines or imprisonment?
- Is it a crime to insult the honor and dignity of the president and/or other government officials? How broad is the range of such prohibitions, and how vigorously are they enforced?
- If media outlets are dependent on the government for their financial survival, does the government withhold funding in order to propagandize, primarily provide official points of view, and/or limit access by opposition parties and civic critics? Do powerful private actors engage in similar practices?
- Does the government attempt to influence media content and access through means including politically motivated awarding of broadcast frequencies and newspaper registrations, unfair control and influence over printing facilities and distribution networks, selective distribution of advertising, onerous registration requirements, prohibitive tariffs, and bribery?
- Are journalists threatened, arrested, imprisoned, beaten, or killed by government or nongovernmental actors for their legitimate journalistic activities, and if such cases occur, are they investigated and prosecuted fairly and expeditiously?
- Are works of literature, art, music, or other forms of cultural expression censored or banned for political purposes?

2. Are religious institutions and communities free to practice their faith and express themselves in public and private?

- Are registration requirements employed to impede the free functioning of religious institutions?
- Are members of religious groups, including minority faiths and movements, harassed, fined, arrested, or beaten by the authorities for engaging in their religious practices?
- Are religious practice and expression impeded by violence or harassment from nonstate actors?
- Does the government appoint or otherwise influence the appointment of religious leaders?
- Does the government control the production and distribution of religious books and other materials and the content of sermons?
- Is the construction of religious buildings banned or restricted?
- Does the government place undue restrictions on religious education? Does the government require religious education?
- Are individuals free to eschew religious beliefs and practices in general?

3. Is there academic freedom, and is the educational system free of extensive political indoctrination?

- Are teachers and professors free to pursue academic activities of a political and quasi-political nature without fear of physical violence or intimidation by state or nonstate actors?
- Does the government pressure, strongly influence, or control the content of school curriculums for political purposes?
- Are student associations that address issues of a political nature allowed to function freely?
- Does the government, including through school administration or other officials, pressure students and/or teachers to support certain political figures or agendas, including pressuring them to attend political rallies or vote for certain candidates? Conversely, does the government, including through school administration or other officials, discourage or forbid students and/or teachers from supporting certain candidates and parties?

4. Is there open and free private discussion?

- Are people able to engage in private discussions, particularly of a political nature (in places including restaurants, public transportation, and their homes) without fear of harassment or detention by the authorities or powerful nonstate actors?
- Do users of personal online communications—including private e-mail, text messages, or personal blogs with a limited following—face legal penalties, harassment, or violence from the government or powerful nonstate actors in retaliation for critical remarks?
- Does the government employ people or groups to engage in public surveillance and to report alleged antigovernment conversations to the authorities?

E. Associational and Organizational Rights (0–12 points)

1. Is there freedom of assembly, demonstration, and open public discussion?

- Are peaceful protests, particularly those of a political nature, banned or severely restricted?
- Are the legal requirements to obtain permission to hold peaceful demonstrations particularly cumbersome and time consuming?
- Are participants of peaceful demonstrations intimidated, arrested, or assaulted?
- Are peaceful protestors detained by police in order to prevent them from engaging in such actions?

2. Is there freedom for nongovernmental organizations? (Note: This includes civic organizations, interest groups, foundations, etc.)

- Are registration and other legal requirements for nongovernmental organizations particularly onerous and intended to prevent them from functioning freely?
- Are laws related to the financing of nongovernmental organizations unduly complicated and cumbersome?

- Are donors and funders of nongovernmental organizations free of government pressure?
- Are members of nongovernmental organizations intimidated, arrested, imprisoned, or assaulted because of their work?

3. Are there free trade unions and peasant organizations or equivalents, and is there effective collective bargaining? Are there free professional and other private organizations?

- Are trade unions allowed to be established and to operate free from government interference?
- Are workers pressured by the government or employers to join or not to join certain trade unions, and do they face harassment, violence, or dismissal from their jobs if they do?
- Are workers permitted to engage in strikes, and do members of unions face reprisals for engaging in peaceful strikes? (Note: This question may not apply to workers in essential government services or public safety jobs.)
- Are unions able to bargain collectively with employers and able to negotiate collective bargaining agreements that are honored in practice?
- For states with very small populations or primarily agriculturally-based economies that do not necessarily support the formation of trade unions, does the government allow for the establishment of peasant organizations or their equivalents? Is there legislation expressly forbidding the formation of trade unions?
- Are professional organizations, including business associations, allowed to operate freely and without government interference?

F. Rule of Law (0–16 points)

1. Is there an independent judiciary?

- Is the judiciary subject to interference from the executive branch of government or from other political, economic, or religious influences?
- Are judges appointed and dismissed in a fair and unbiased manner?
- Do judges rule fairly and impartially, or do they commonly render verdicts that favor the government or particular interests, whether in return for bribes or other reasons?
- Do executive, legislative, and other governmental authorities comply with judicial decisions, and are these decisions effectively enforced?
- Do powerful private concerns comply with judicial decisions, and are decisions that run counter to the interests of powerful actors effectively enforced?

2. Does the rule of law prevail in civil and criminal matters? Are police under direct civilian control?

- Are defendants' rights, including the presumption of innocence until proven guilty, protected?

- Are detainees provided access to independent, competent legal counsel?
- Are defendants given a fair, public, and timely hearing by a competent, independent, and impartial tribunal?
- Are prosecutors independent of political control and influence?
- Are prosecutors independent of powerful private interests, whether legal or illegal?
- Is there effective and democratic civilian state control of law enforcement officials through the judicial, legislative, and executive branches?
- Are law enforcement officials free from the influence of nonstate actors, including organized crime, powerful commercial interests, or other groups?

3. Is there protection from political terror, unjustified imprisonment, exile, or torture, whether by groups that support or oppose the system? Is there freedom from war and insurgencies?

- Do law enforcement officials make arbitrary arrests and detentions without warrants or fabricate or plant evidence on suspects?
- Do law enforcement officials beat detainees during arrest and interrogation or use excessive force or torture to extract confessions?
- Are conditions in pretrial facilities and prisons humane and respectful of the human dignity of inmates?
- Do citizens have the means of effective petition and redress when their rights are violated by state authorities?
- Is violent crime either against specific groups or within the general population widespread?
- Is the population subjected to physical harm, forced removal, or other acts of violence or terror due to civil conflict or war?

4. Do laws, policies, and practices guarantee equal treatment of various segments of the population?

- Are members of various distinct groups—including ethnic and religious minorities, LGBT and intersex people, and the disabled—able to exercise effectively their human rights with full equality before the law?
- Is violence against such groups widespread, and if so, are perpetrators brought to justice?
- Do members of such groups face legal and/or de facto discrimination in areas including employment, education, and housing because of their identification with a particular group?
- Do women enjoy full equality in law and in practice as compared to men?
- Do noncitizens—including migrant workers and noncitizen immigrants—enjoy basic internationally recognized human rights, including the right not to be subjected to torture or other forms of ill-treatment, the right to due process of law, and the rights of freedom of association, expression, and religion?
- Do the country's laws provide for the granting of asylum or refugee status in accordance with the 1951 UN Convention Relating to the Status of Refugees, its

1967 Protocol, and other regional treaties regarding refugees? Has the government established a system for providing protection to refugees, including against refoulement (the return of persons to a country where there is reason to believe they fear persecution)?

G. Personal Autonomy and Individual Rights (0–16 points)

1. Do citizens enjoy freedom of travel or choice of residence, employment, or institution of higher education?

- Are there restrictions on foreign travel, including the use of an exit visa system, which may be issued selectively?
- Is permission required from the authorities or nonstate actors to move within the country?
- Do state or non-state actors determine or otherwise influence a person's type and place of employment?
- Are bribes or other inducements needed to obtain the necessary documents to travel, change one's place of residence or employment, enter institutions of higher education, or advance in school?

2. Do citizens have the right to own property and establish private businesses? Is private business activity unduly influenced by government officials, the security forces, political parties/organizations, or organized crime?

- Are people legally allowed to purchase and sell land and other property, and can they do so in practice without undue interference from the government or nonstate actors?
- Does the government provide adequate and timely compensation to people whose property is expropriated under eminent domain laws?
- Are people legally allowed to establish and operate private businesses with a reasonable minimum of registration, licensing, and other requirements?
- Are bribes or other inducements needed to obtain the necessary legal documents to operate private businesses?
- Do private/nonstate actors, including criminal groups, seriously impede private business activities through such measures as extortion?

3. Are there personal social freedoms, including gender equality, choice of marriage partners, and size of family?

- Is violence against women—including domestic violence, female genital mutilation, and rape—widespread, and are perpetrators brought to justice?
- Is the trafficking of women and/or children abroad for prostitution widespread, and is the government taking adequate efforts to address the problem?
- Do women face de jure and de facto discrimination in economic and social matters, including property and inheritance rights, divorce proceedings, and child custody matters?

- Does the government directly or indirectly control choice of marriage partners and other personal relationships through means such as requiring large payments to marry certain individuals (e.g., foreign citizens), not enforcing laws against child marriage or dowry payments, restricting same-sex relationships, or criminalizing extramarital sex?
- Does the government determine the number of children that a couple may have?
- Does the government engage in state-sponsored religious/cultural/ethnic indoctrination and related restrictions on personal freedoms?
- Do private institutions, including religious groups, unduly infringe on the rights of individuals, including choice of marriage partner, dress, gender expression, etc.?

4. Is there equality of opportunity and the absence of economic exploitation?

- Does the government exert tight control over the economy, including through state ownership and the setting of prices and production quotas?
- Do the economic benefits from large state industries, including the energy sector, benefit the general population or only a privileged few?
- Do private interests exert undue influence on the economy through monopolistic practices, cartels, or illegal blacklists, boycotts, or discrimination?
- Is entrance to institutions of higher education or the ability to obtain employment limited by widespread nepotism and the payment of bribes?
- Are certain groups, including ethnic or religious minorities, less able to enjoy certain economic benefits than others? For example, are certain groups restricted from holding particular jobs, whether in the public or the private sector, because of de jure or de facto discrimination?
- Do state or private employers exploit their workers through activities including unfairly withholding wages and permitting or forcing employees to work under unacceptably dangerous conditions, as well as through adult slave labor and child labor?

Key to Scores, PR and Ratings, Status

Political Rights (PR)		
Total Scores	PR Rating	
36–40	1	
30–35	2	
24–29	3	
18–23	4	
12–17	5	
6–11	6	
0–5*	7	
Civil Liberties (CL)		
Total Scores	PR Rating	
53–60	1	
44–52	2	
35–43	3	
26–34	4	
17–25	5	
8–16	6	
0–7	7	
Combined Average of the PR and CL Ratings (Freedom Rating)		Freedom Status
1.0 to 2.5		Free
3.0 to 5.0		Partly Free
5.5 to 7.0		Not Free

* It is possible for a country's or territory's total political rights score to be less than zero (between -1 and -4) if it receives mostly or all zeros for each of the 10 political rights questions and it receives a sufficiently negative score for political rights discretionary question B. In such a case, it would still receive a final political rights rating of 7.

Appendix B: System Dynamics Validation Assessment Questions

The following questions outline the questions addressed by the tests listed in Figure 15.

SYSTEM'S MAPPING

1. Face validity (structural assessment through deductive process)
Q: Is the model structure consistent with relevant descriptive knowledge of the system?
2. Validity of decision rules (structural focus)
Q: Do the decision rules capture the behavior of the actors in the system?

QUANTITATIVE MODELING

3. Physical conservation
Q: Does the model conform to basic physical laws such as conservation laws?
4. Dimensional consistency
Q: Is each equation dimensionally consistent without the use of parameters having no real world meaning?
5. Integration error
Q: Are the results sensitive to the choice of time step or numerical integration method?
6. Extreme conditions tests (equations focus)
Q: Does each equation make sense even when its inputs take on extreme conditions?
7. Parameter assessment
Q: Do all parameters have real world counterparts? Are they consistent with relevant descriptive and numerical knowledge of the system?
8. Basic-behaviors reproduction
Q: Does the model generate the various modes of behavior observed in the system?
9. Endogenous behavior-reproduction tests
Q: Does the model pass behavioral reproduction tests without the aid of exogenous inputs driving the model in predetermined ways?
10. Boundary adequacy tests (modes of behavior)
Q: Does the behavior of the model change significantly when boundary assumptions are relaxed?

HYPOTHESIS TESTING

11. Qualitative problem-behavior test
Q: Does the model qualitatively reproduce the behavior(s) of interest in the system?
12. Boundary adequacy test (problem endogeneity)

- Q: Are the important concepts for addressing the problem endogenous to the model?
13. Validity of decision rules (policy focus)
Q: Do the decision rules capture the behaviors of the actors in the system? (policy focus)
 14. Assessment of surprise behaviors
Inspection for unusual, novel, unexpected or surprise behaviors. Q: Does the model generate previously unobserved or unrecognized behavior? Does the model successfully anticipate the response of the system to novel conditions?
 15. Behavior sensitivity analysis
Q: Do the modes of behavior generated by the model change significantly when assumptions about parameters, boundary, and aggregation are varied over the plausible range of uncertainty?
 16. Extreme conditions tests (model behaviors focus)
Q: Does the model respond plausibly when subjected to extreme policies, shocks, and parameters?
 17. Behavior anomaly tests (changed assumptions tests)
Q: Do anomalous behaviors result when assumptions of the model are changed or deleted?
 18. Family member (generalizability)
Ability to generalize. Q: Can the model generate the behavior observed in other instances of the same system?

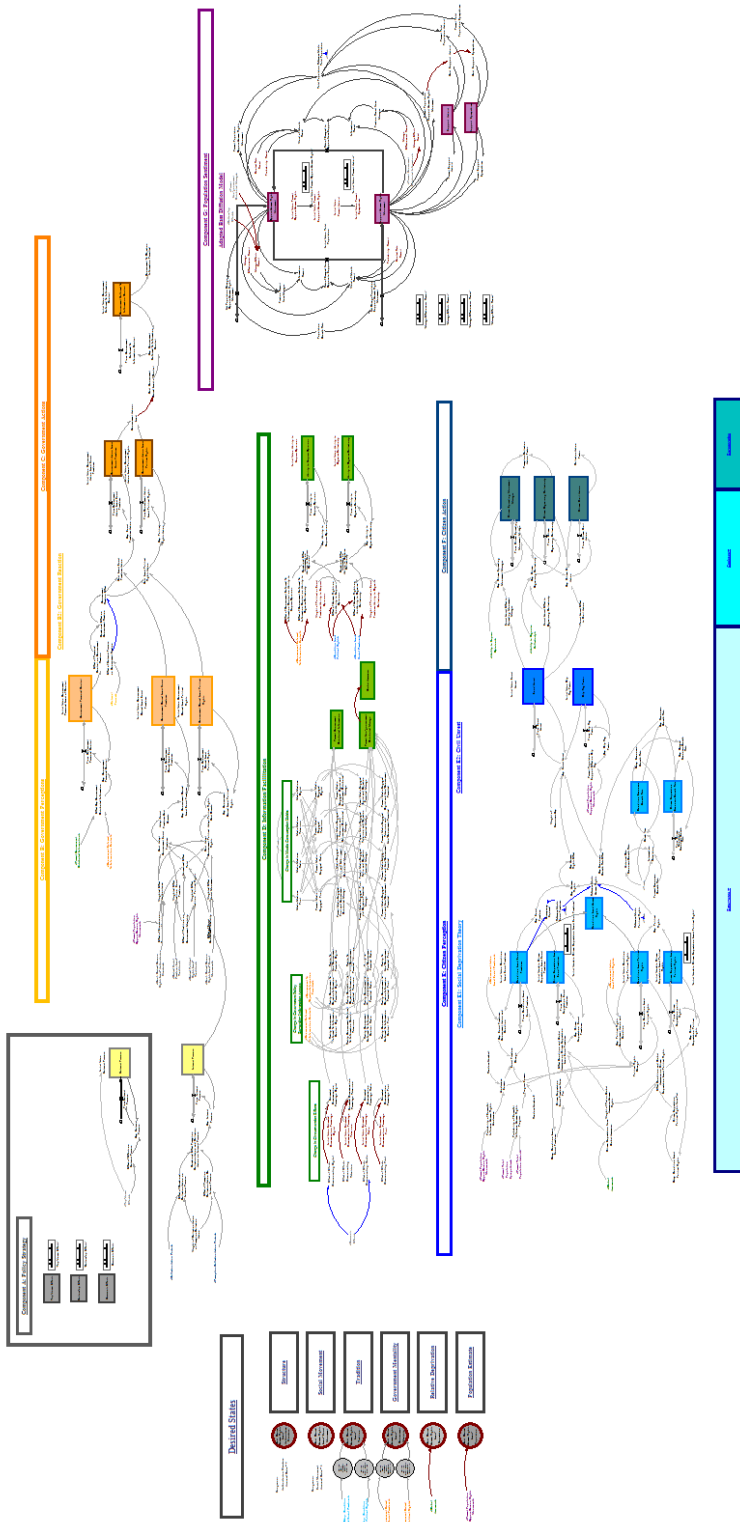
UNCERTAINTY ANALYSIS

19. Quantitative sensitivity analysis
Q: Do the numerical values change significantly when assumptions about parameters, boundary, and aggregation are varied over the plausible range of uncertainty?
20. Policy sensitivity analysis
Q: Do the policy implications change significantly when assumptions about parameters are varied over the plausible range of uncertainty? Is the level of aggregation appropriate?
21. Boundary adequacy tests (policy implications)
Q: Do the policy recommendations change when the model boundary is extended?

FORECASTING AND OPTIMIZATION

22. Behavior correspondence
Q: Does the model quantitatively reproduce the behavior(s) of interest in the system?
23. Behavior prediction
Pattern prediction, event prediction, shifting-mode prediction
24. Changed-behavior prediction
(prior to worry about number forecast; behavioral forecast)

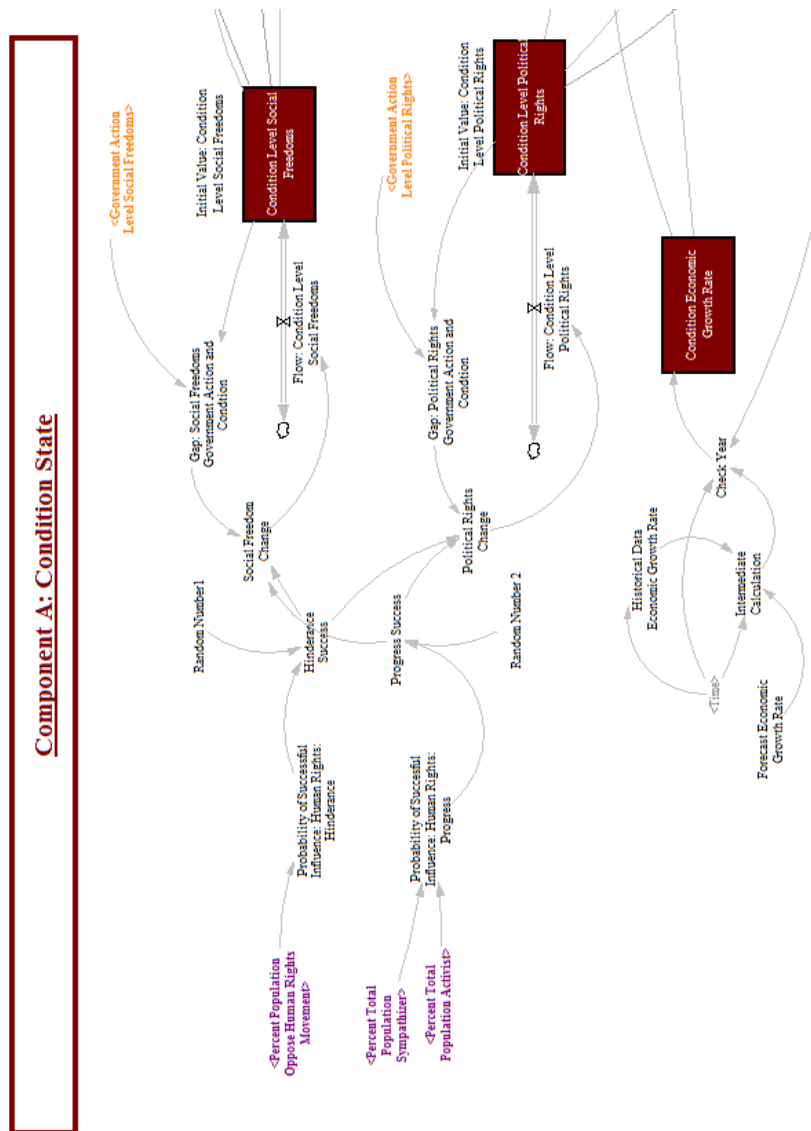
Appendix C: Vensim Full Model



Appendix D: Component Details

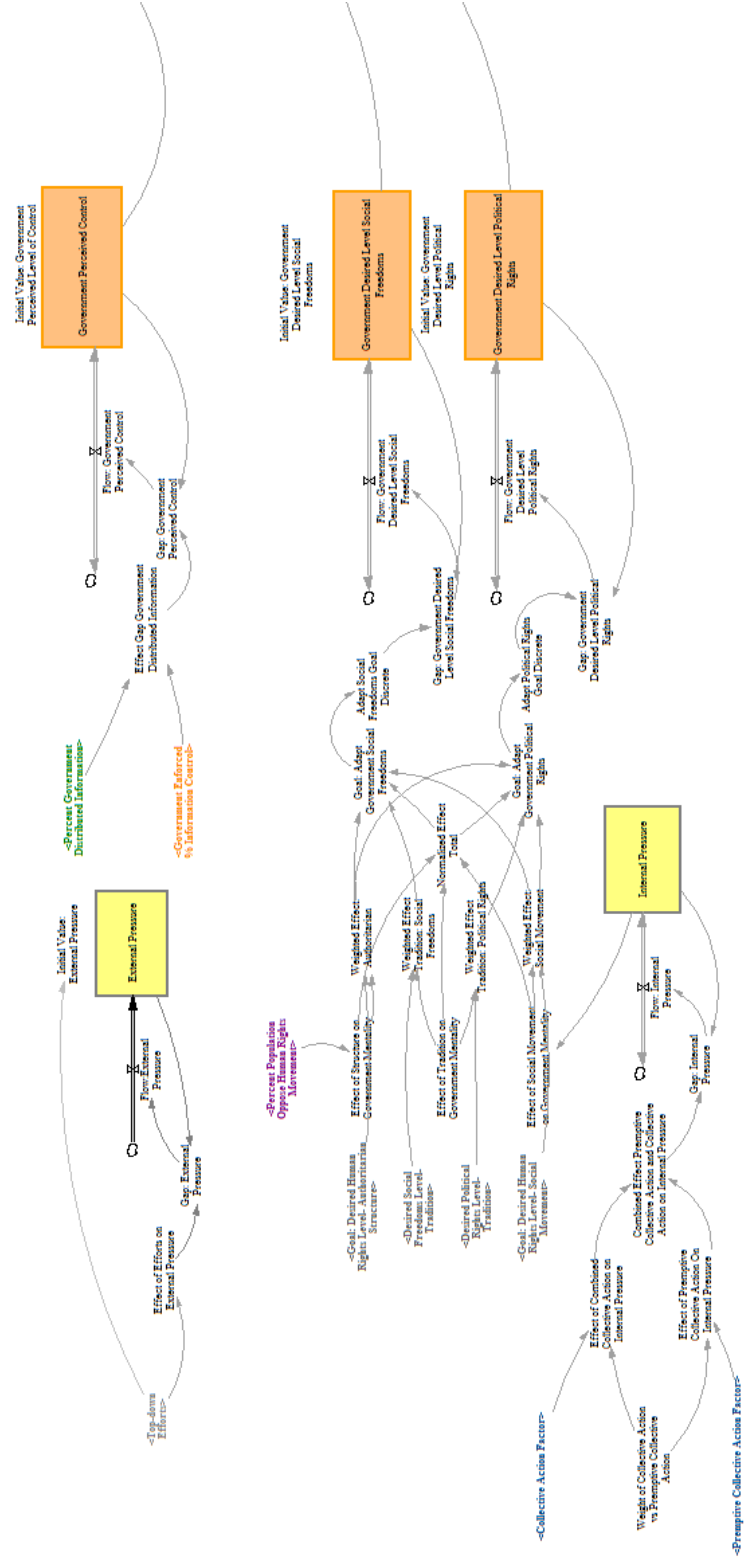
The following appendix provides a more detailed view of each component modeled within the system as well as any additional tables or regression analysis done for respective component data.

D1 Component A



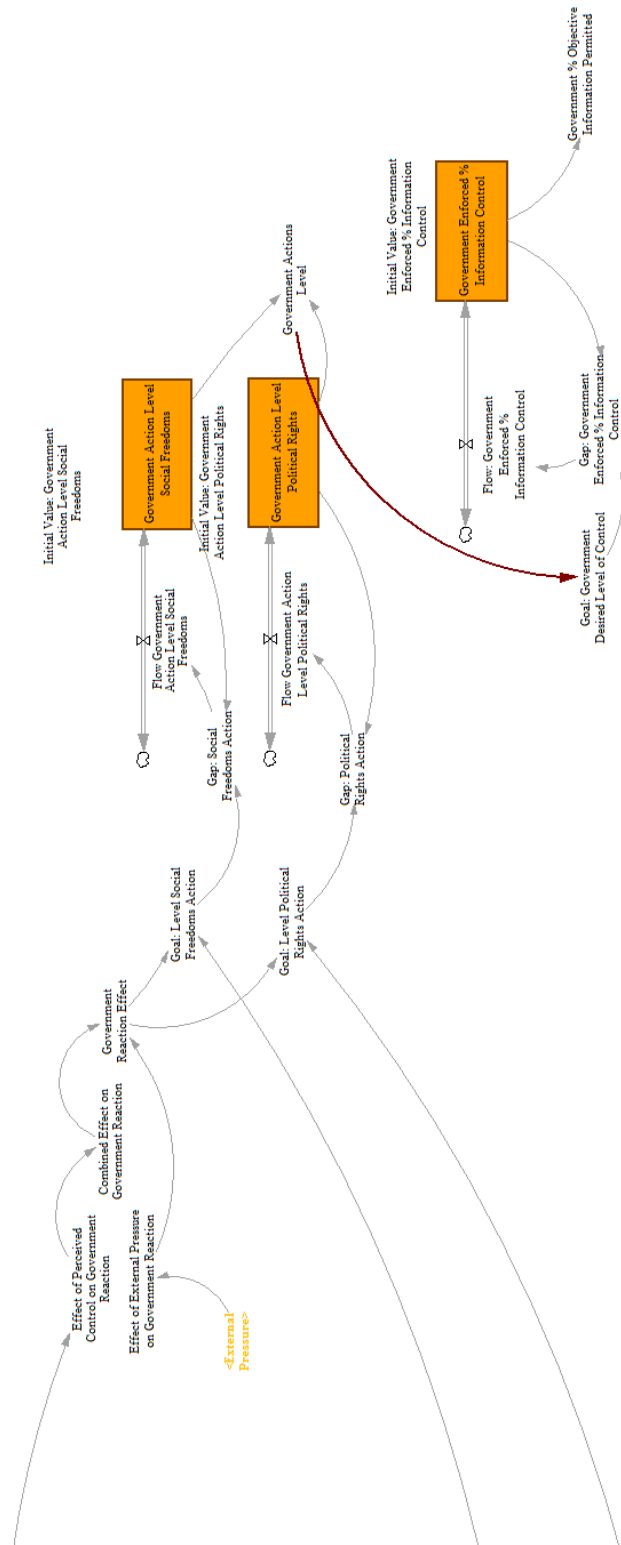
D2 Component B

Component B: Government Perceptions



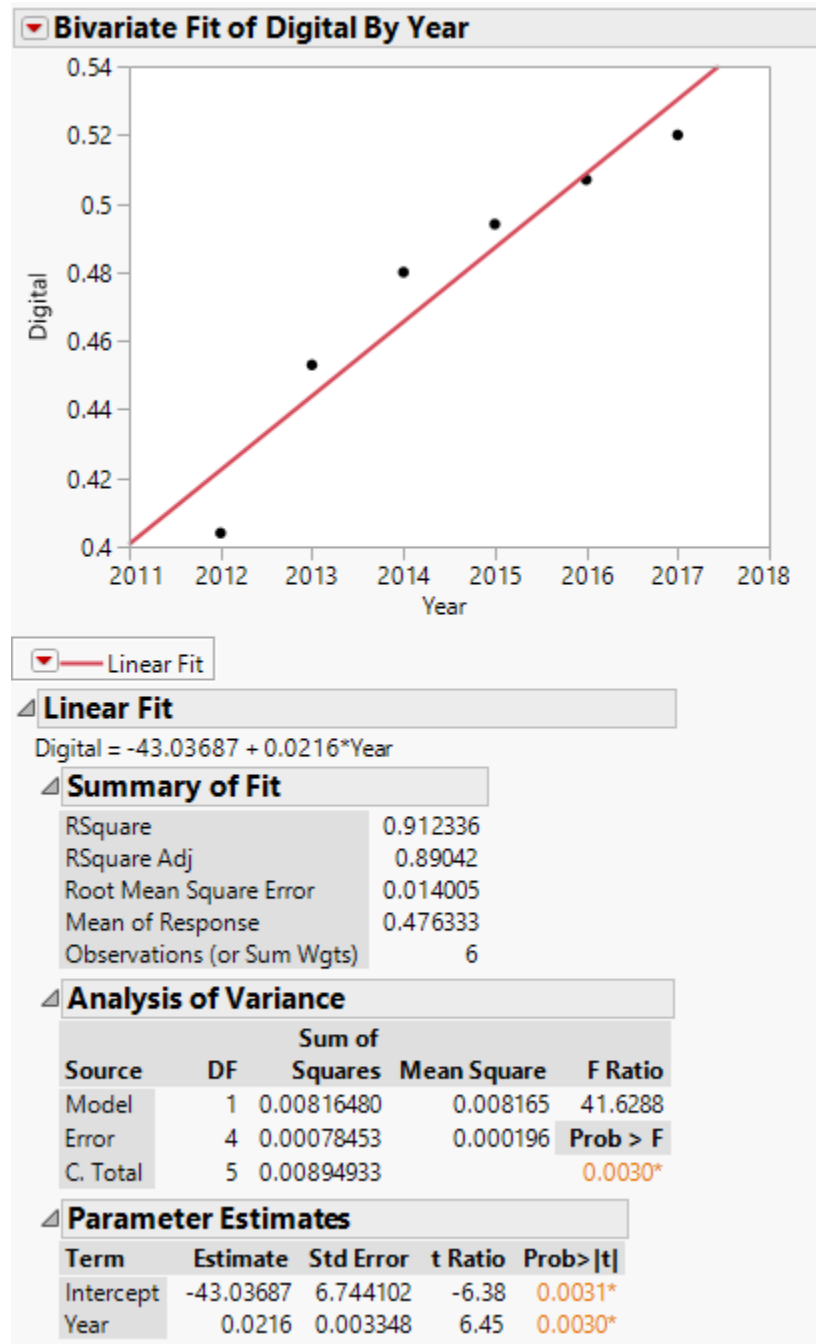
D3 Component C

Component C: Government Actions

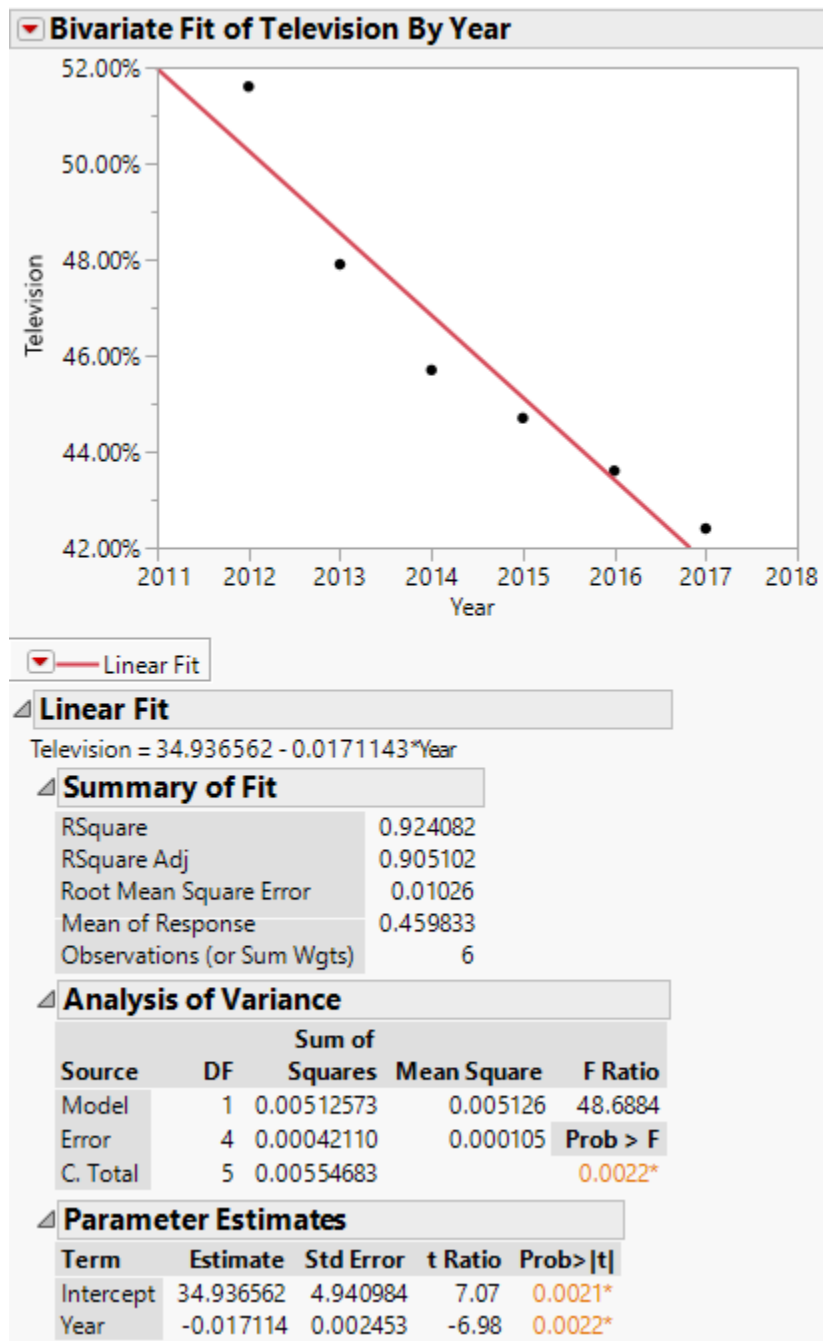


D4 Component D

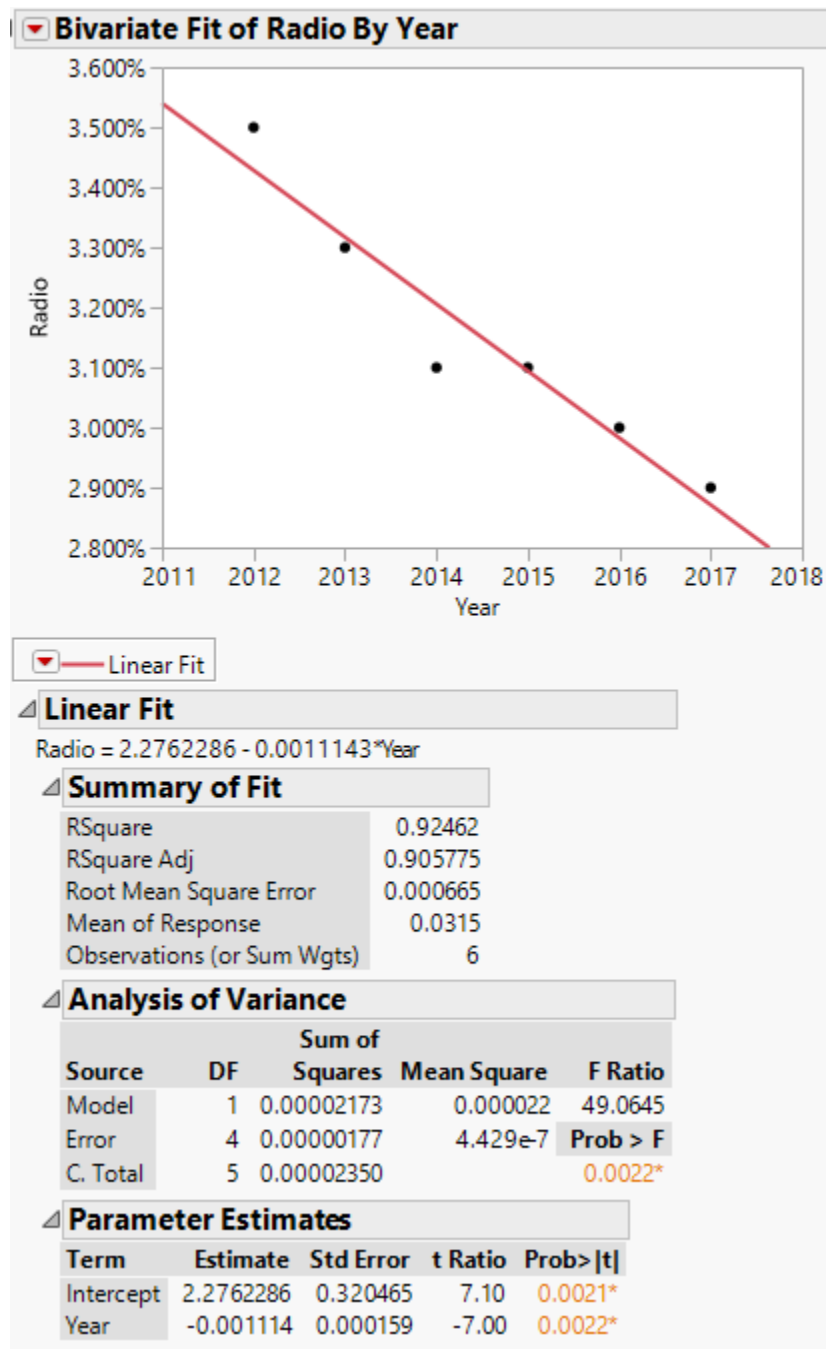
D4.1 JMP Fit Digital Media Medium Trend



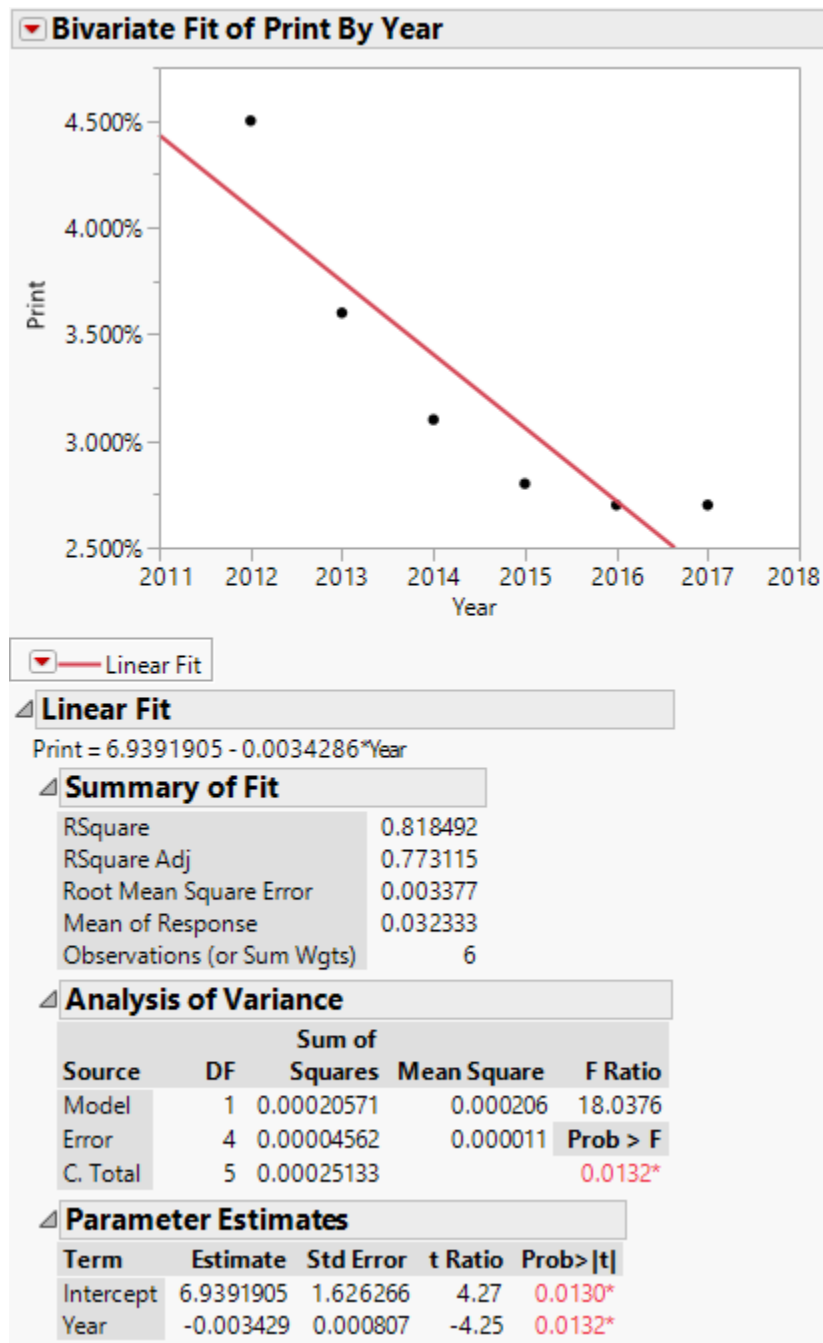
D4.2 JMP Fit Television Media Medium Trend



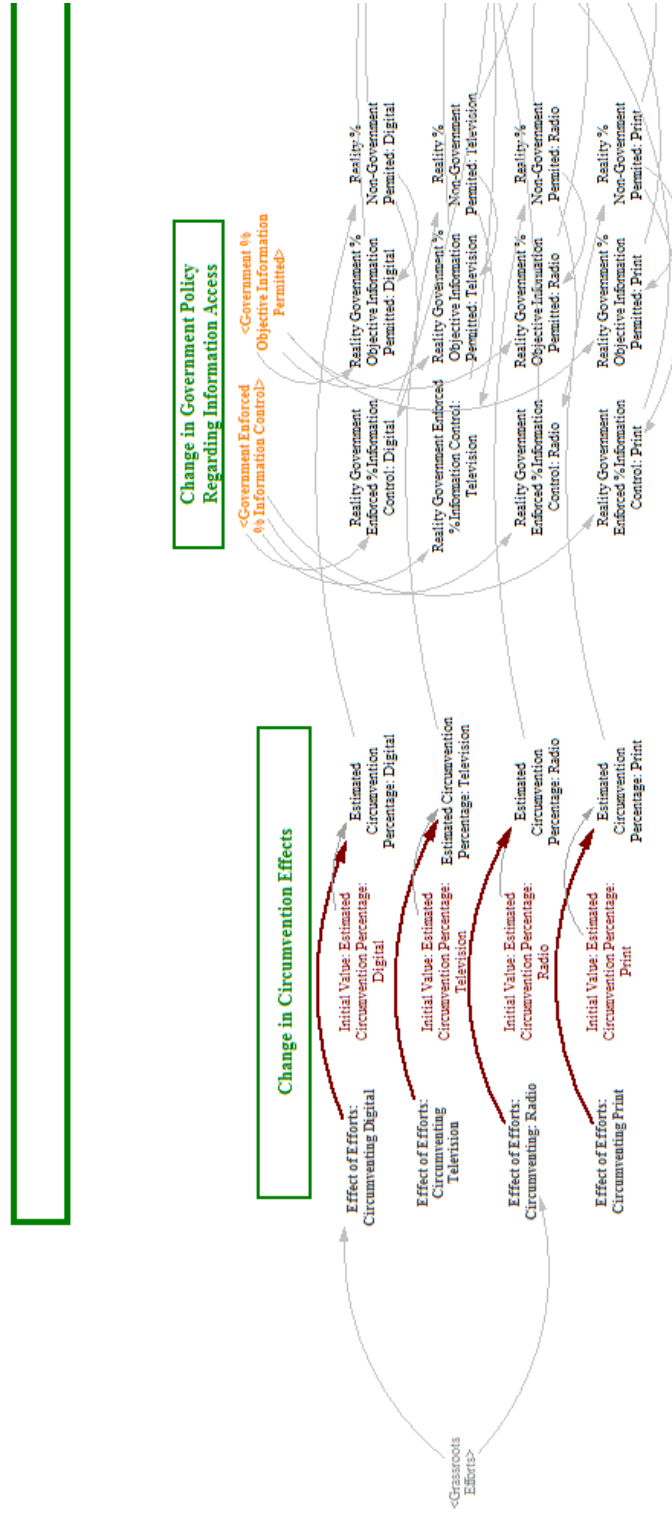
D4.3 JMP Fit Radio Media Medium Trend



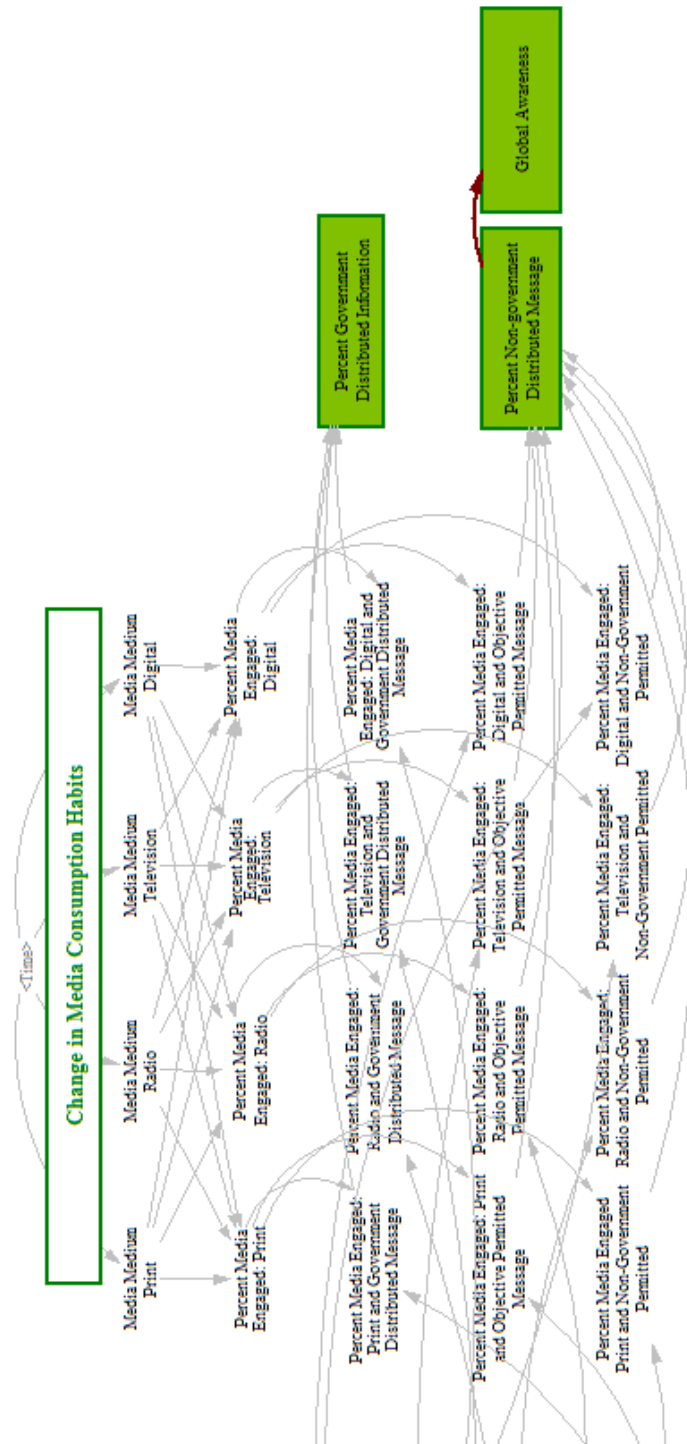
D4.4 JMP Fit Print Media Medium Trend



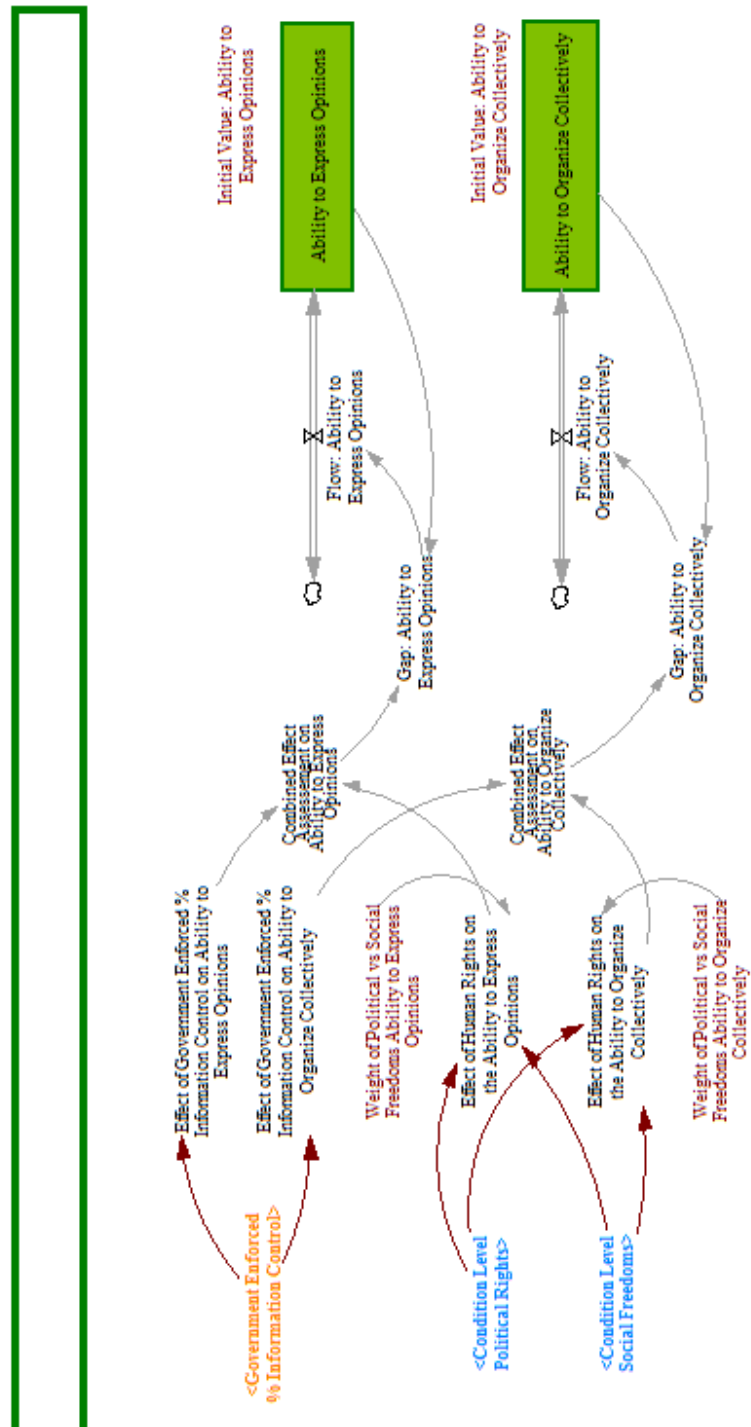
D4.5 Component D Detail Part 1/3



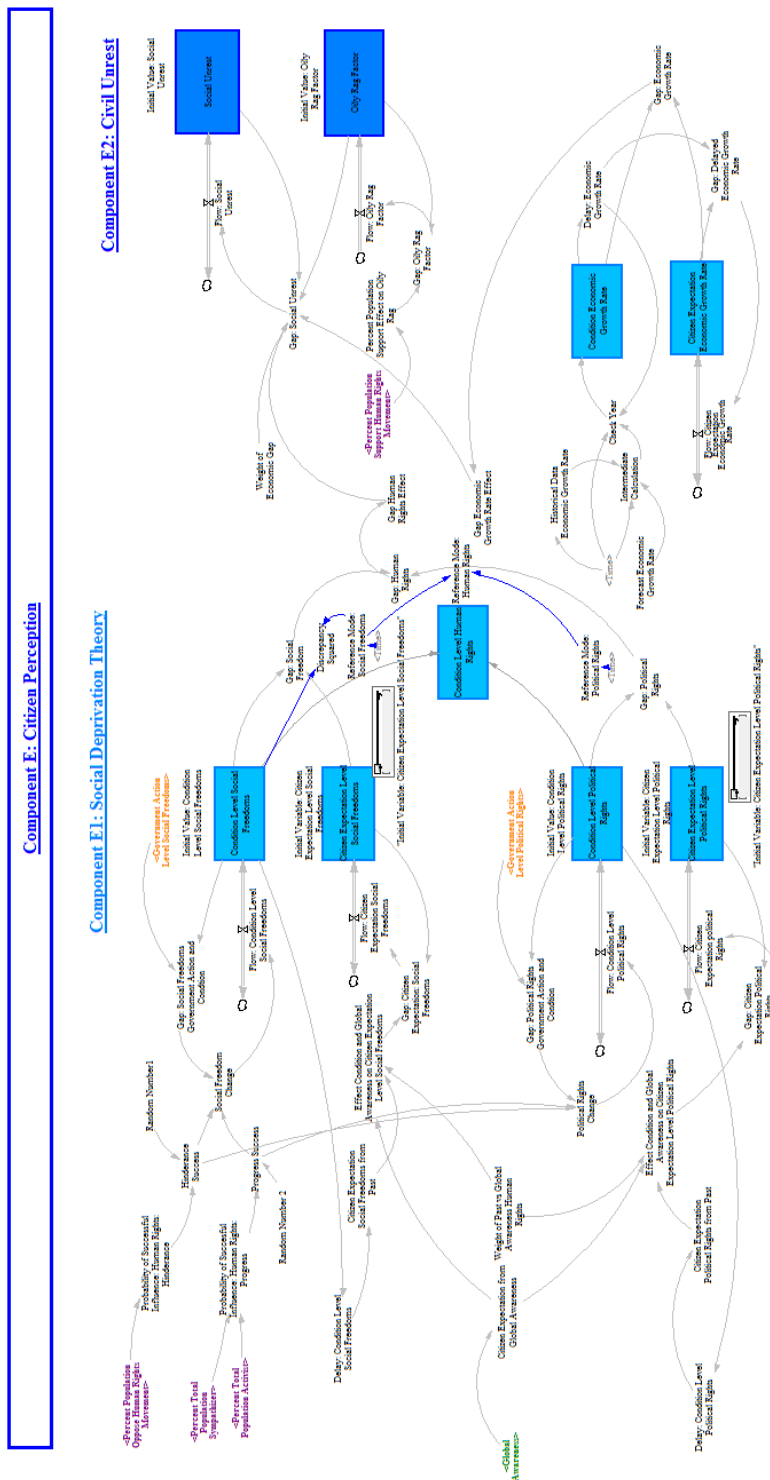
Component D: Information/Facilitation



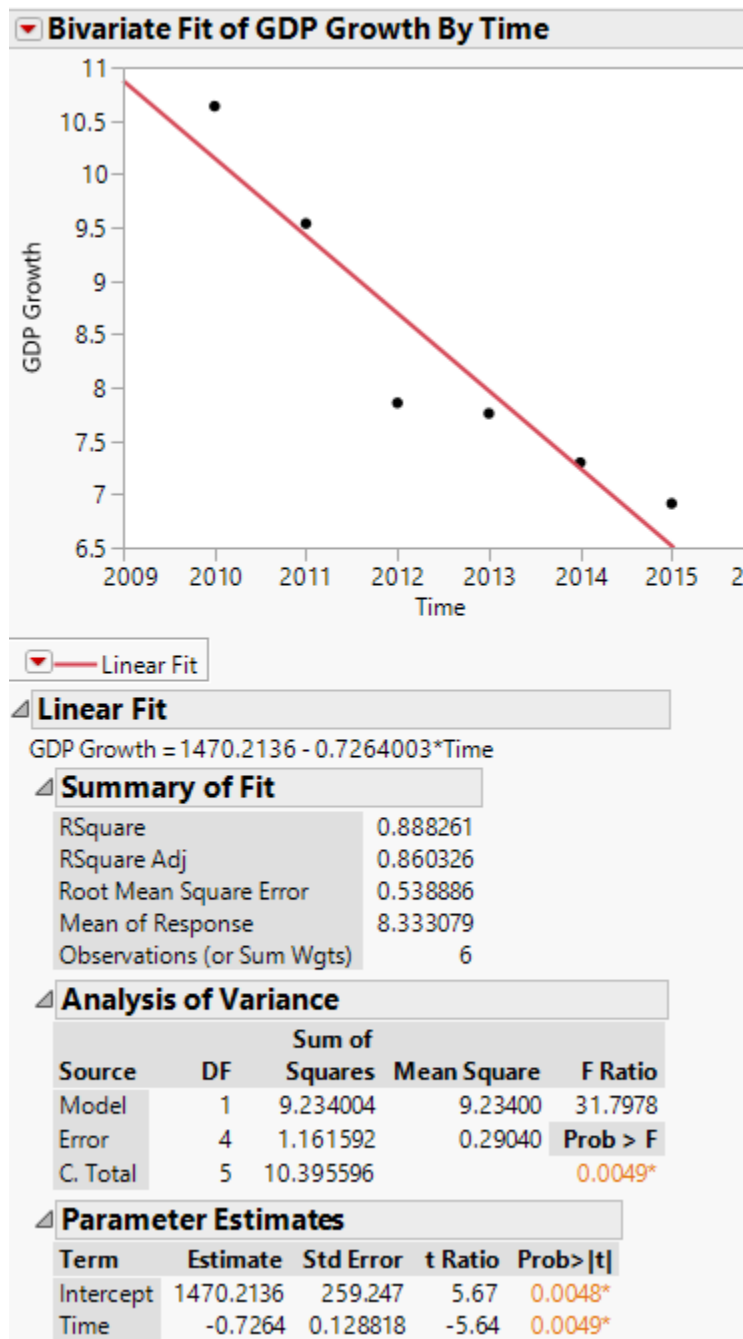
D4.7 Component D Detail Part 3/3

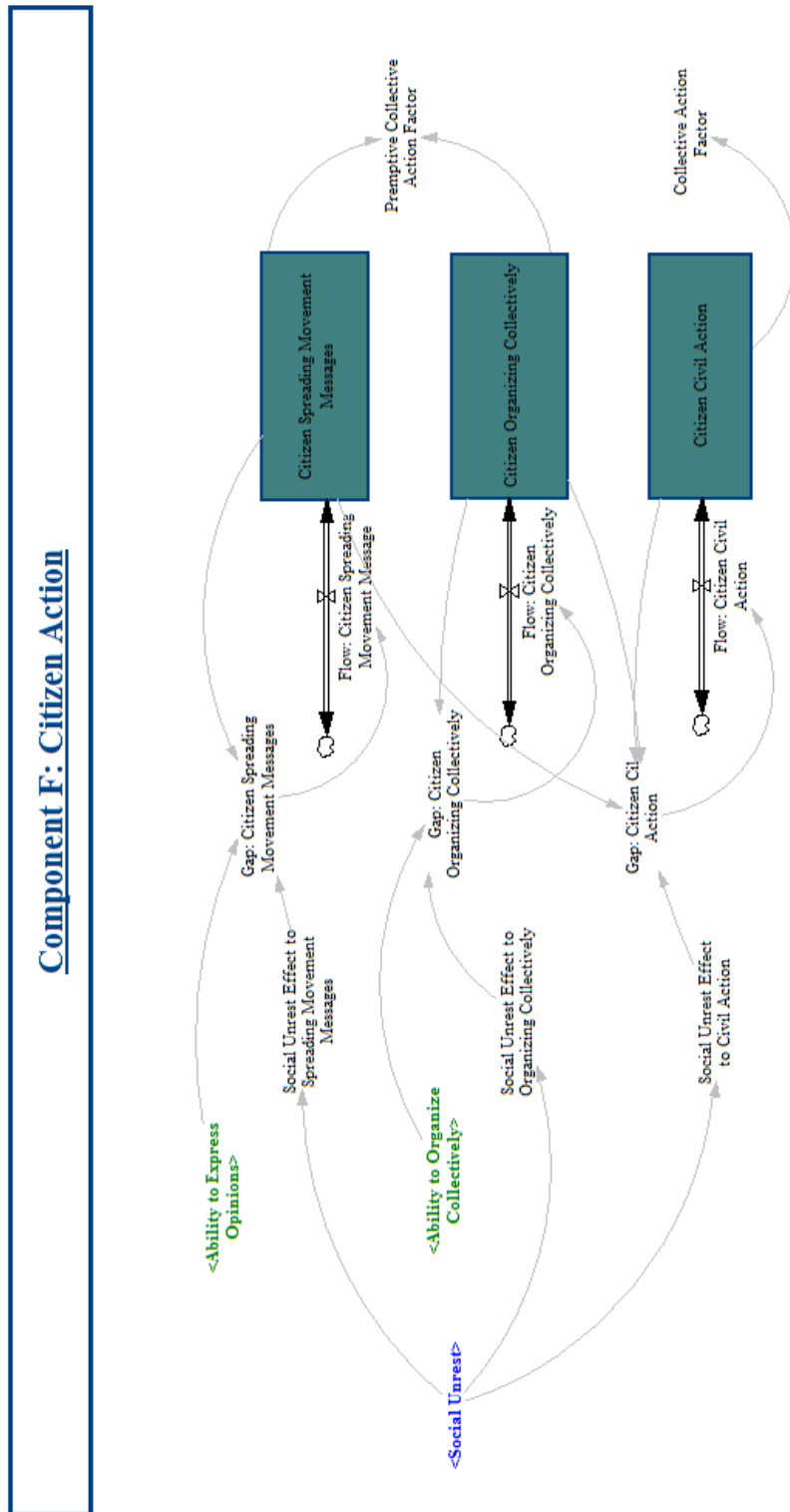


D5 Component E



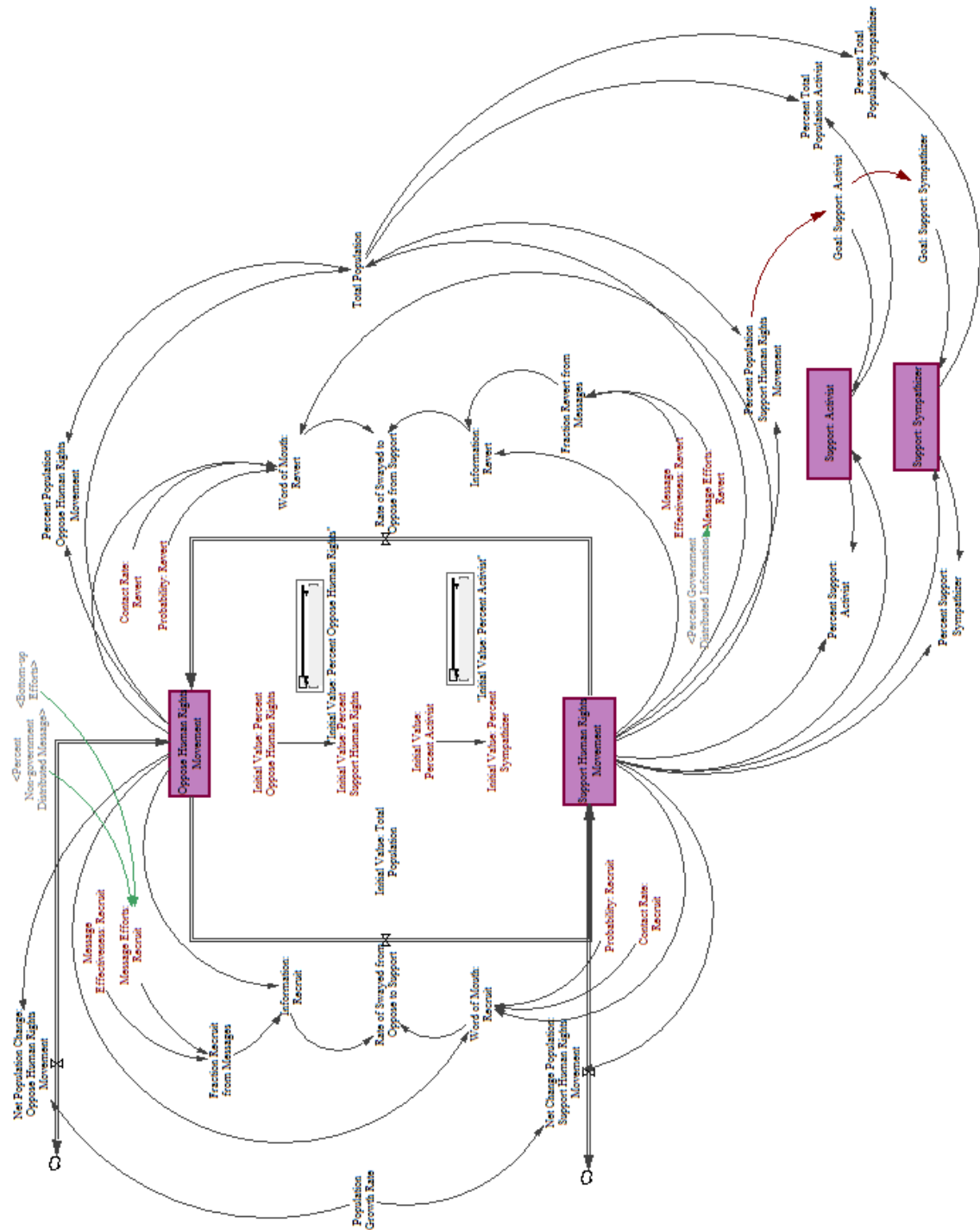
D5.1 JMP Fit GDP growth over time using fit line from 2010-2015 data





D7 Component G

Component G: Population Sentiment



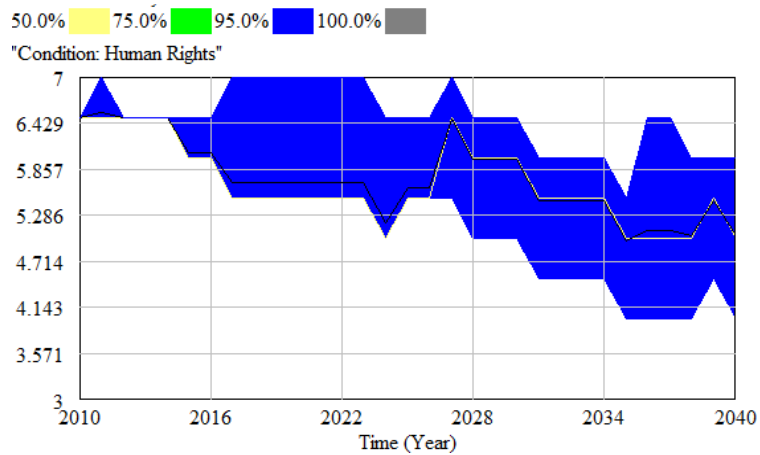
Appendix E: Result Policy Sensitivity Graphs

Efforts refers to the uncertainty associated with the variable on a [0,1] scale. Factor addresses the effect of the variable on the system. Both refers to varying both efforts and factors throughout a test of simulations. The y axis for each chart is measured based on the Freedom House scale [1,7]. The x axis is measured in time. The units on the y axis do not always start at 0. The colors are coordinated with the percent of values within each range for the simulations run. For an example of sensitivity graph analysis result discussions, the reader is referenced to Section 6.3.3 and Section 6.5.

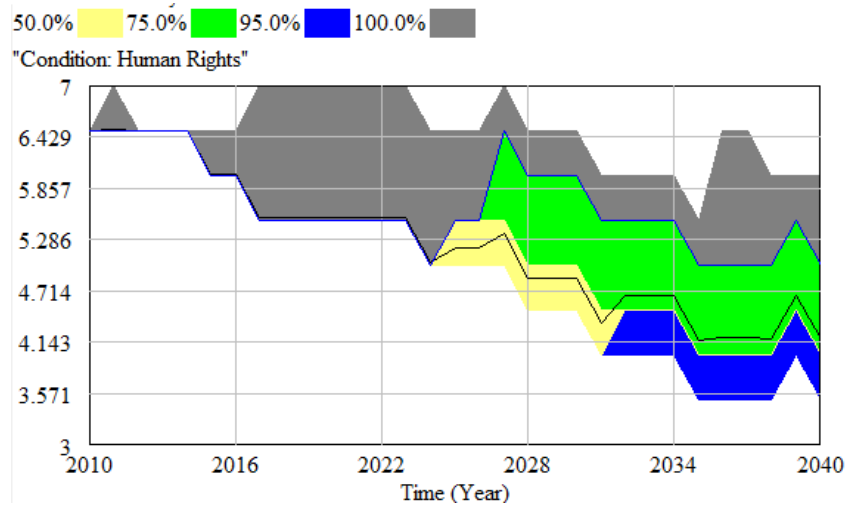
E1 Policy 1 Sensitivity Charts

Human Rights

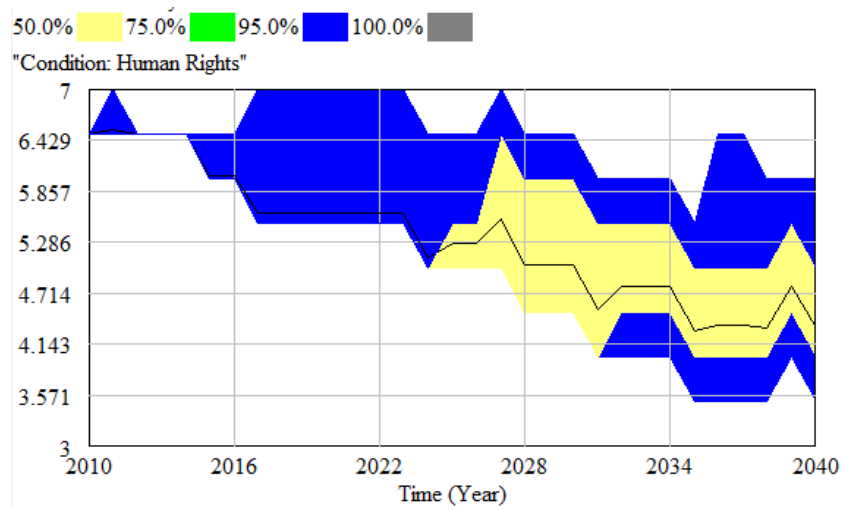
Efforts:



Factor:

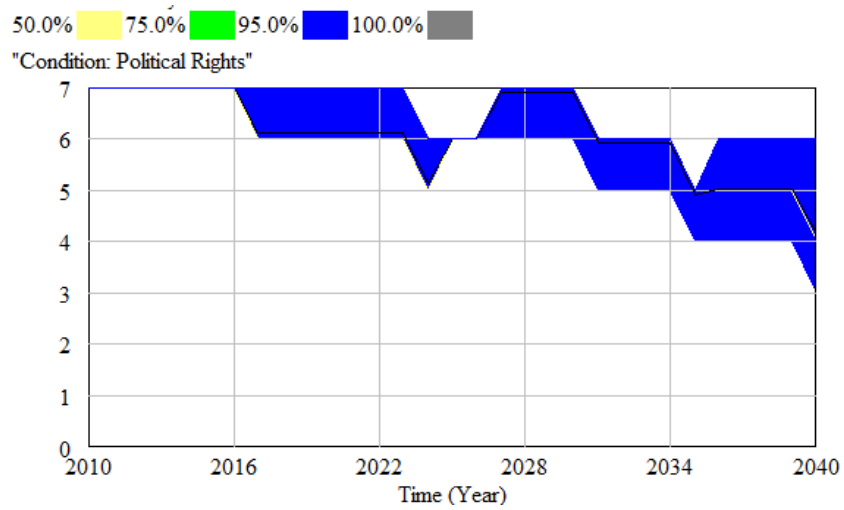


Both:

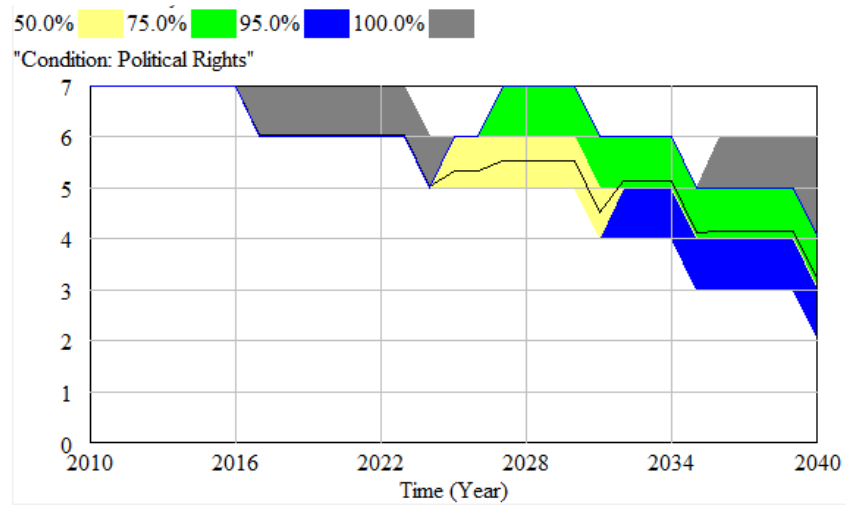


Political Rights

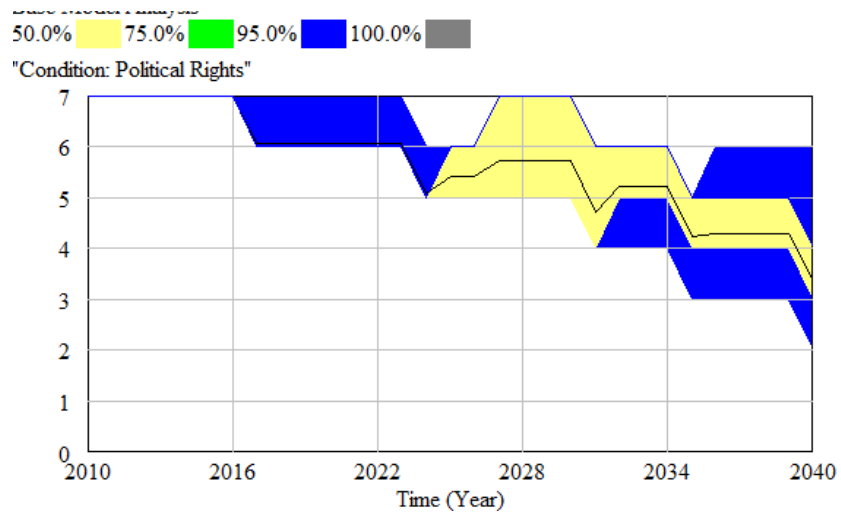
Efforts:



Factor:

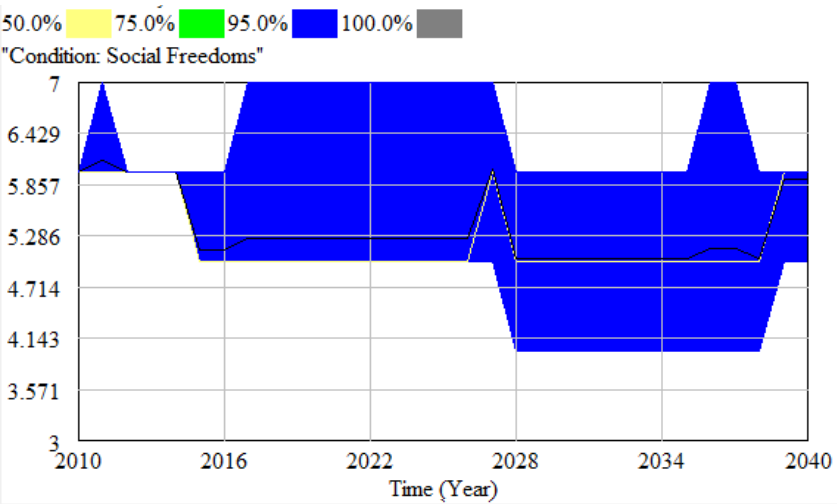


Both:

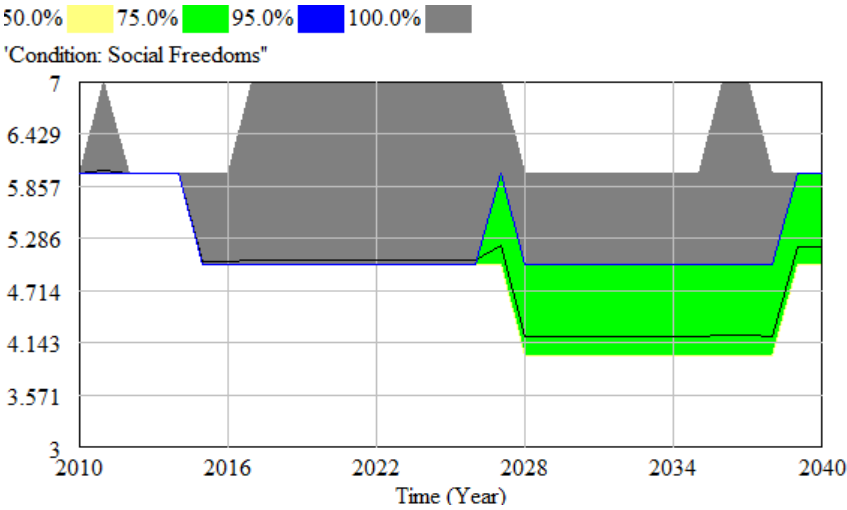


Social Freedoms

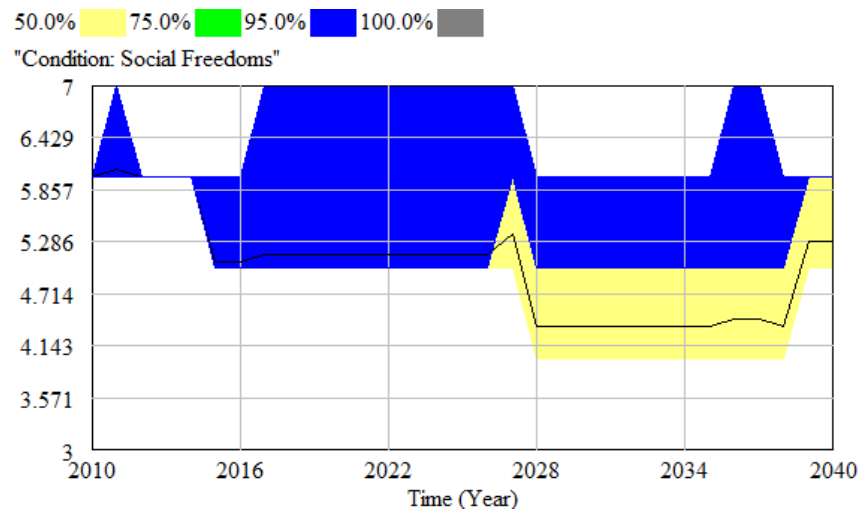
Efforts:



Factor:



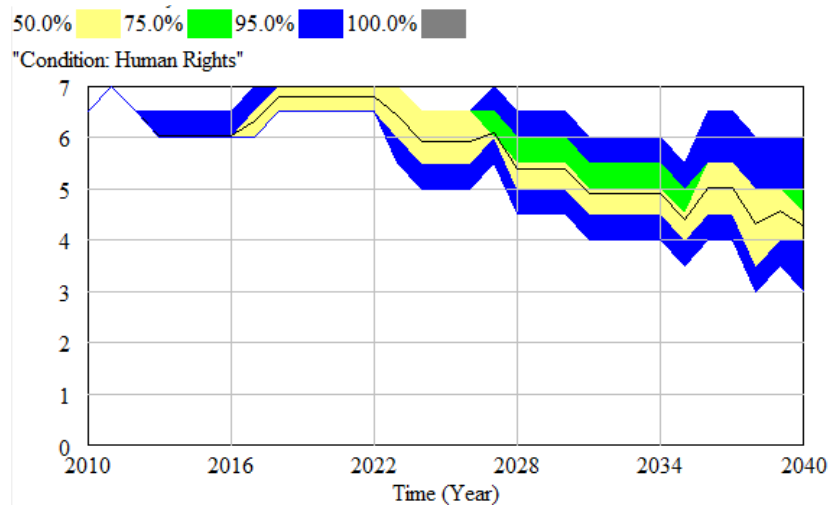
Both:



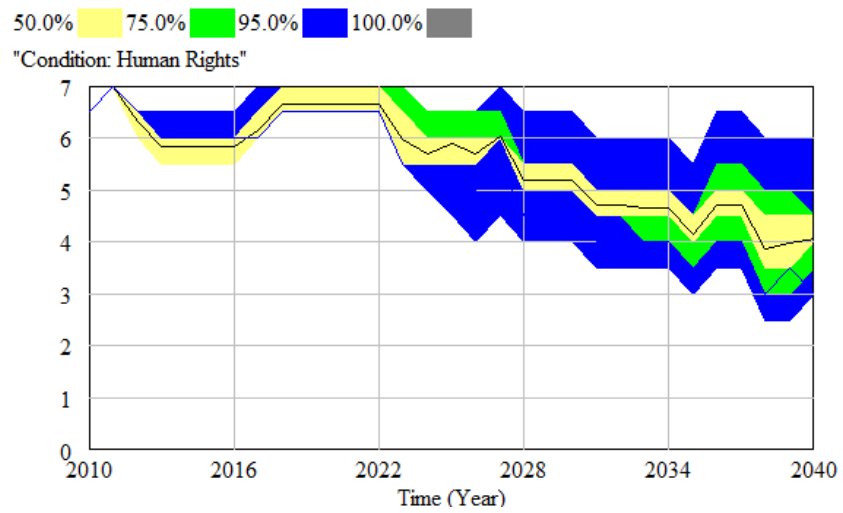
E2 Policy 2 Sensitivity Charts

Human Rights

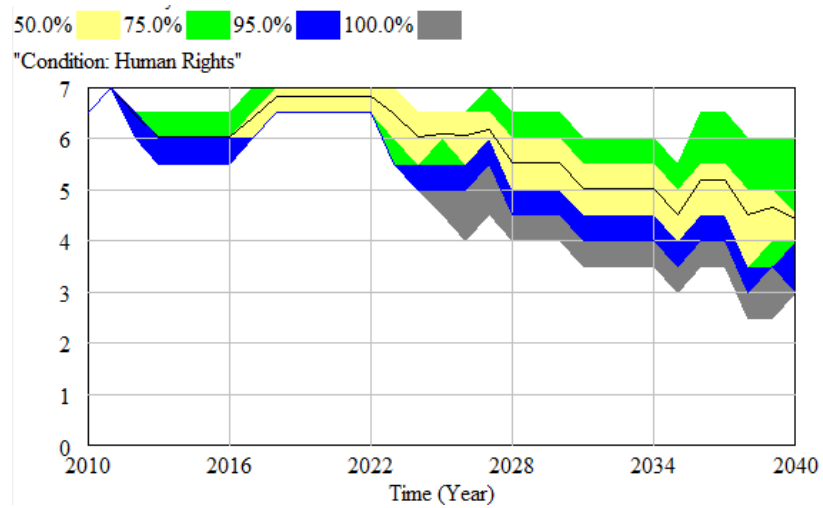
Efforts:



Factor:

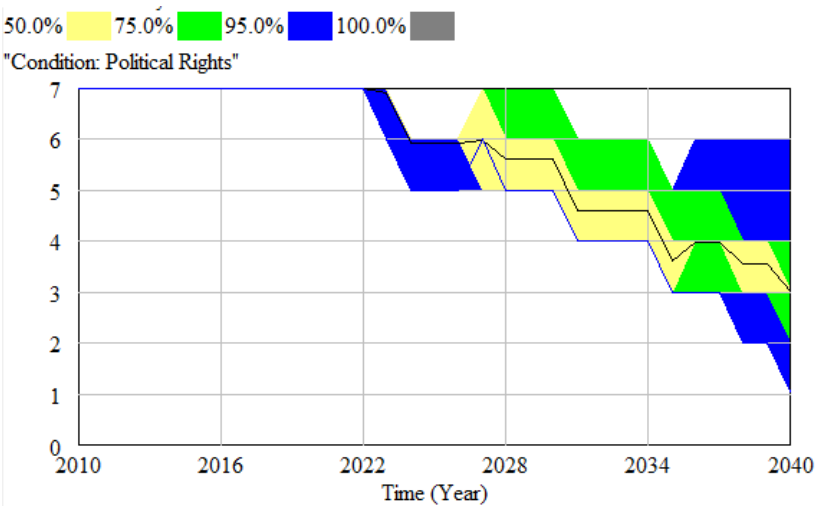


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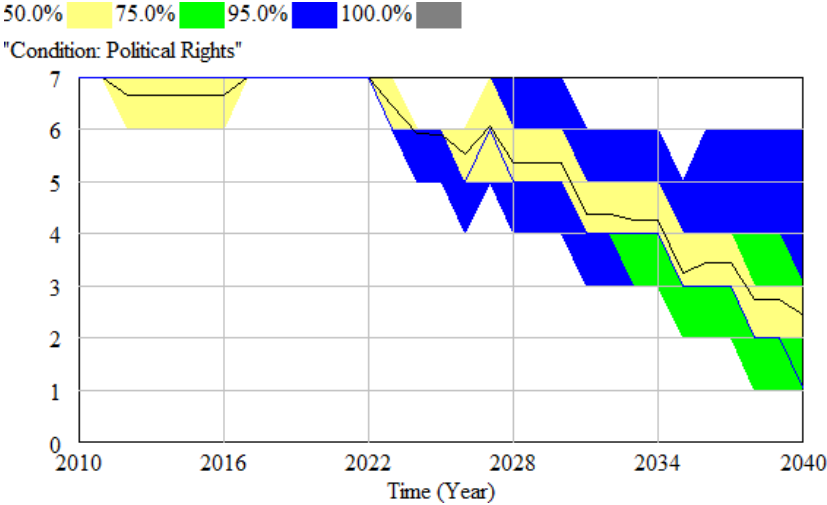


Political Rights

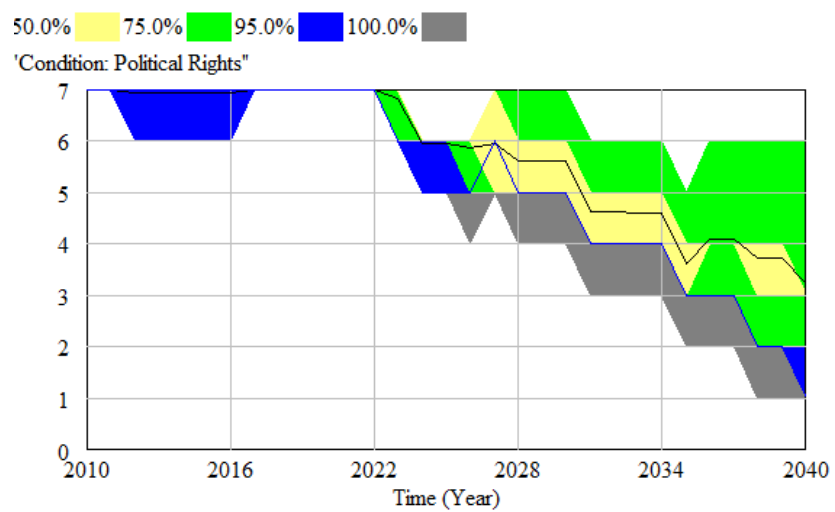
Efforts:



Factor:

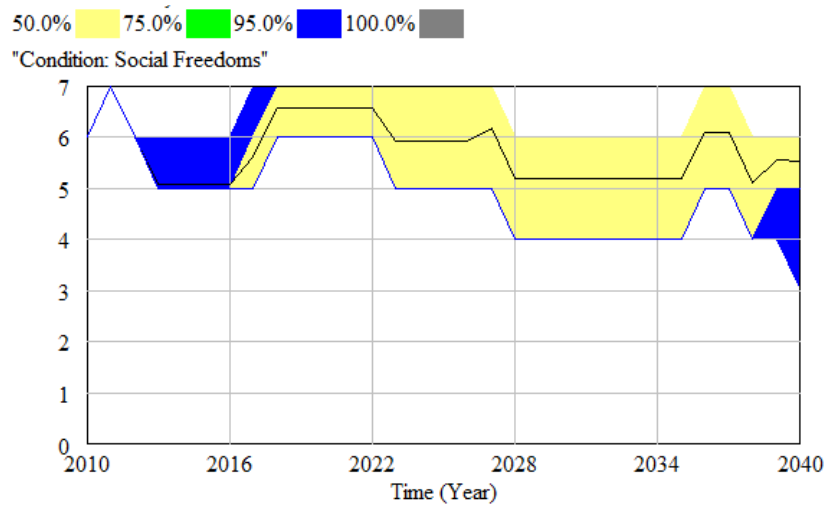


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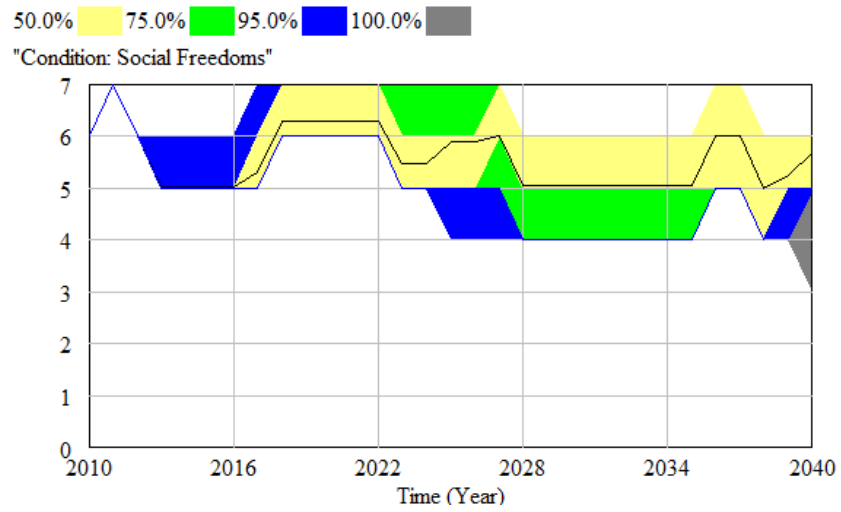


Social Freedoms

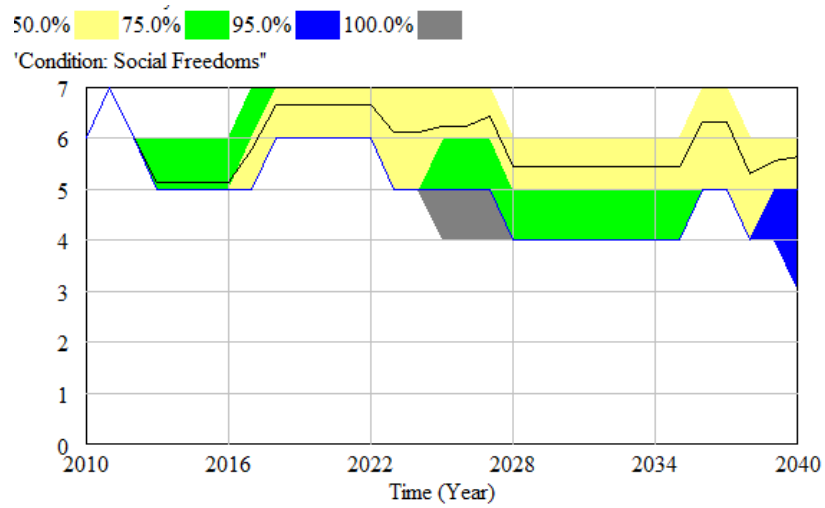
Efforts:



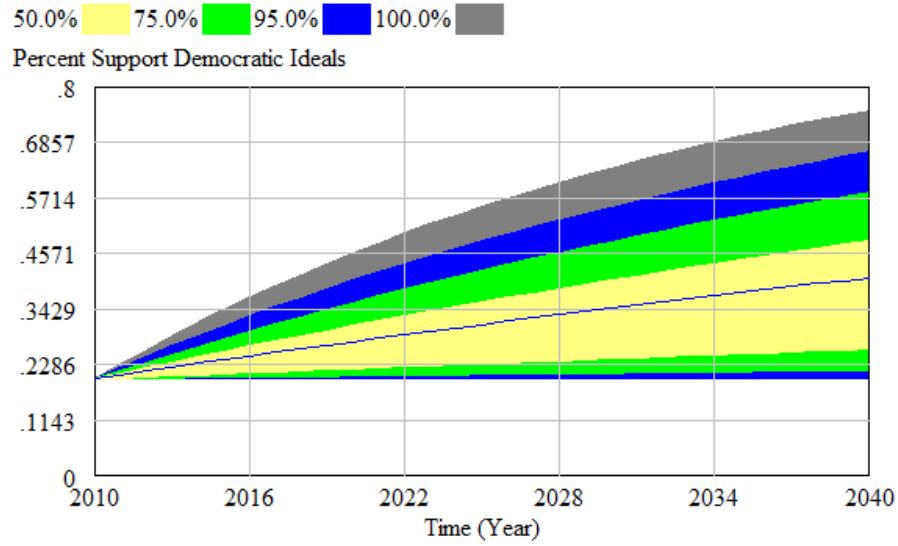
Factor:



Both:



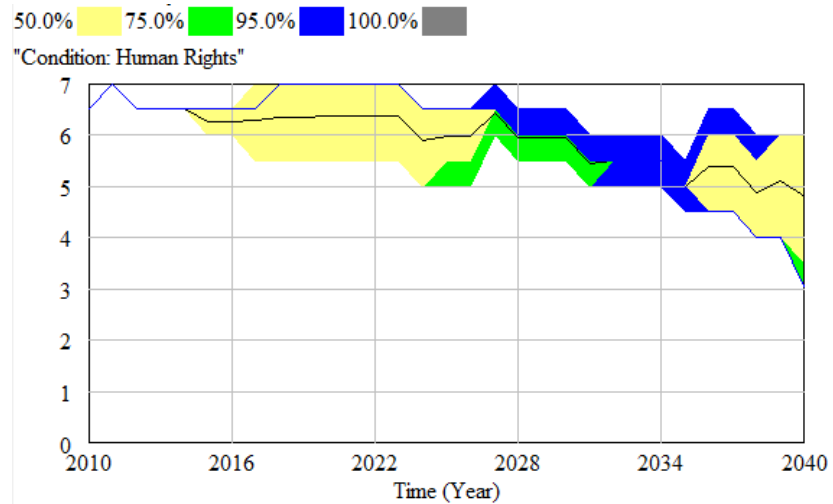
Effect of Policy 2 on Percent supporting democratic ideals movement varying both:



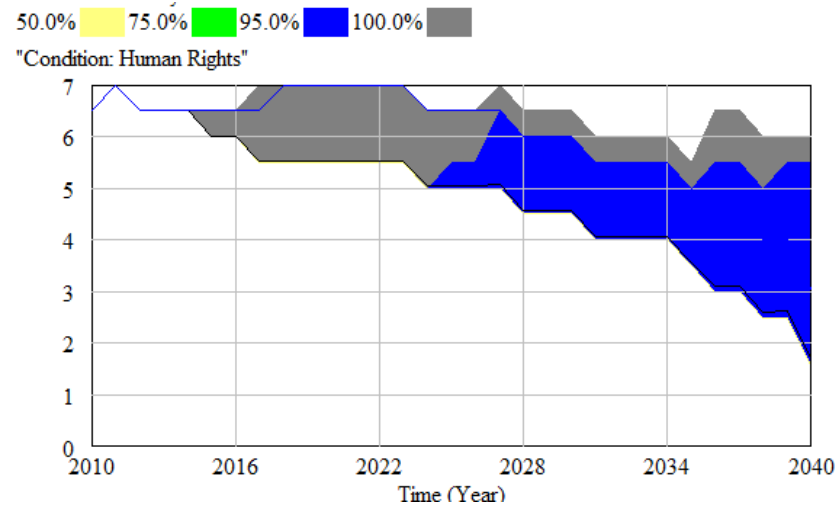
E2 Policy 3 Sensitivity Charts

Human Rights

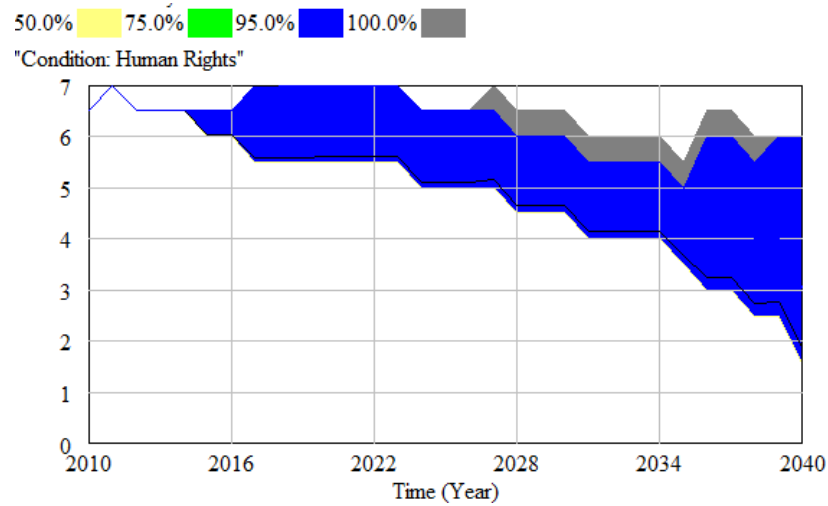
Efforts:



Factor:

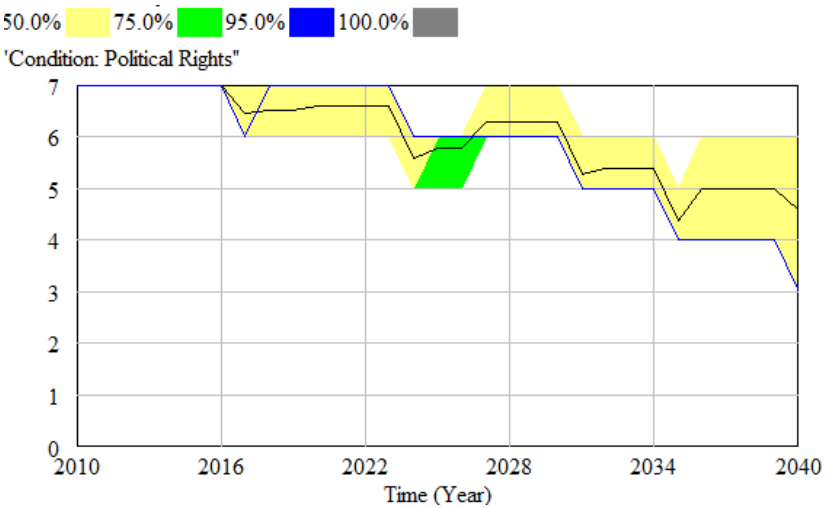


Both:

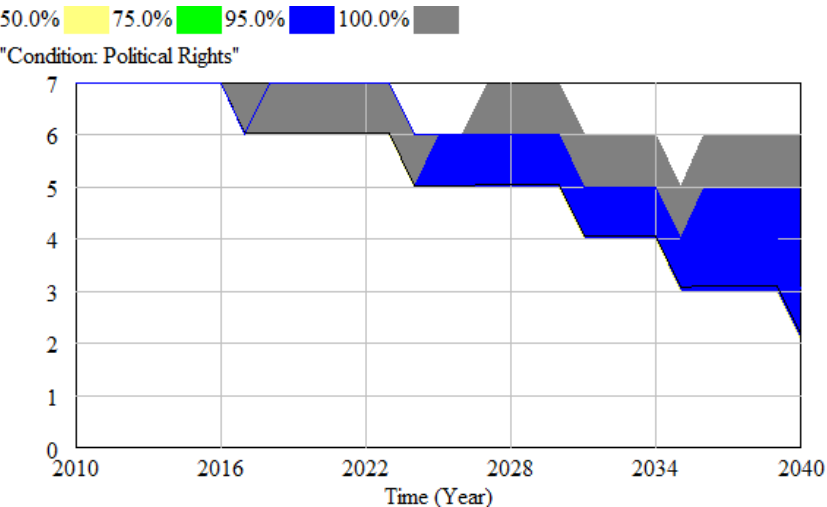


Political Rights

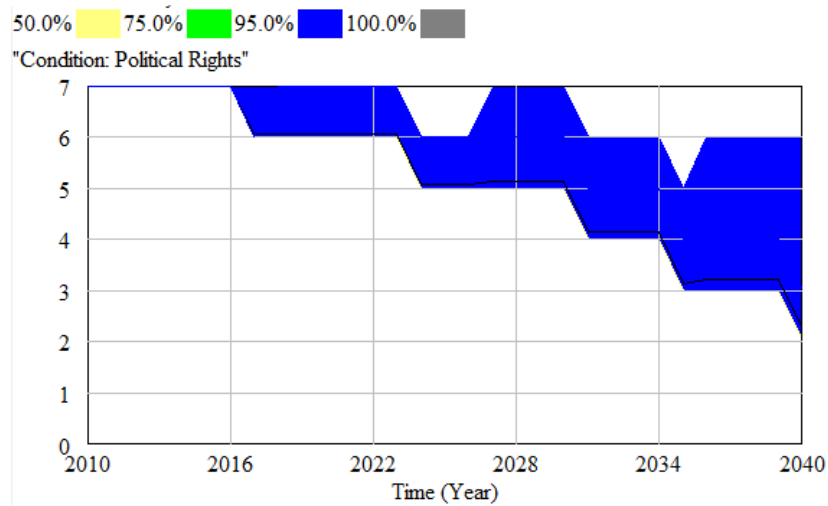
Efforts:



Factor:

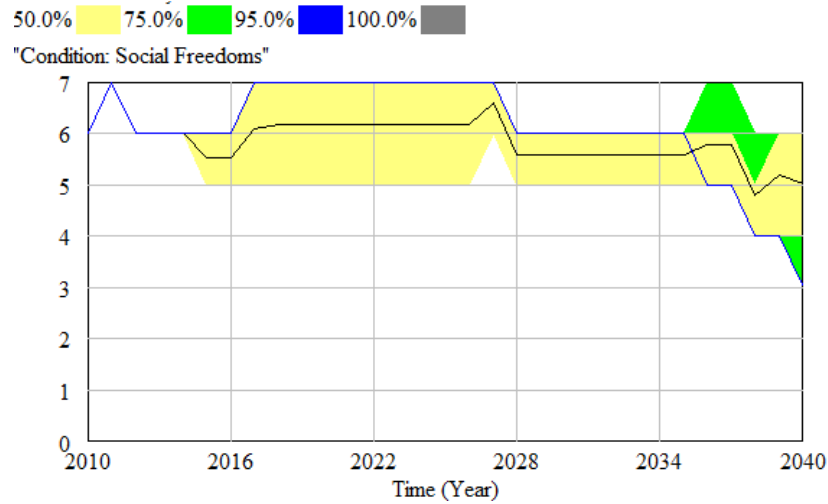


Both:

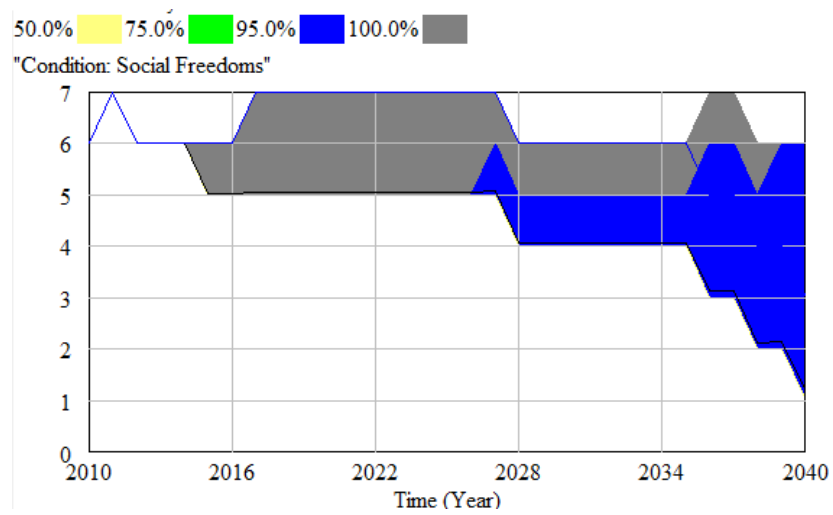


Social Freedoms

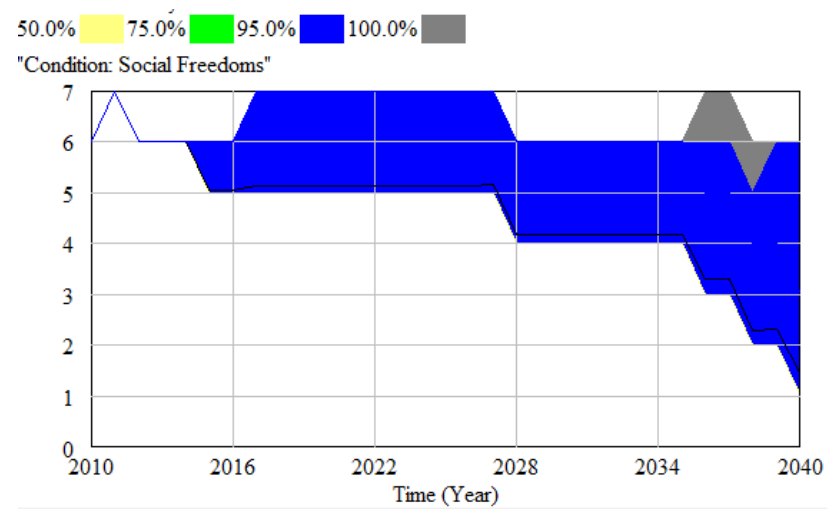
Efforts:



Factor:



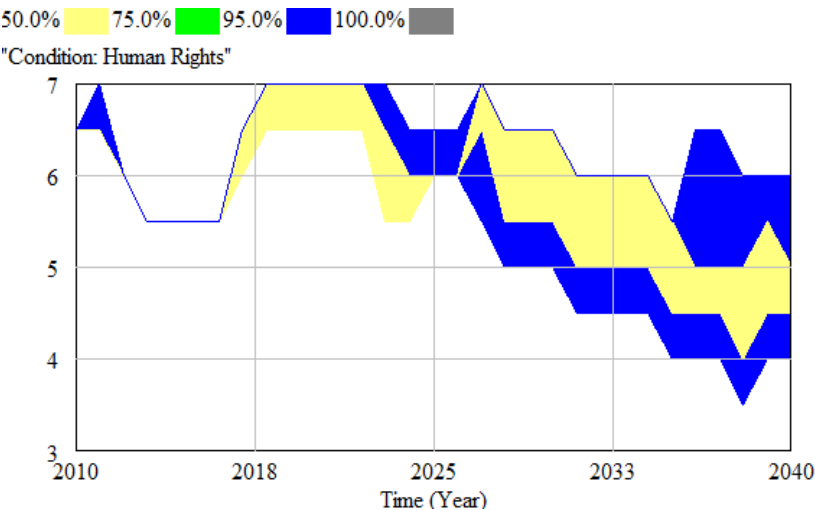
Both:



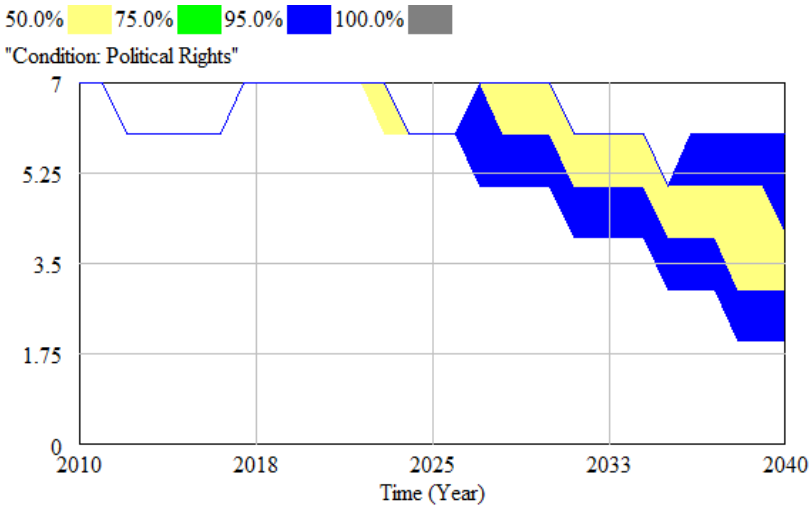
E2 Combined Policy Sensitivity Charts

Policy 1 and 2

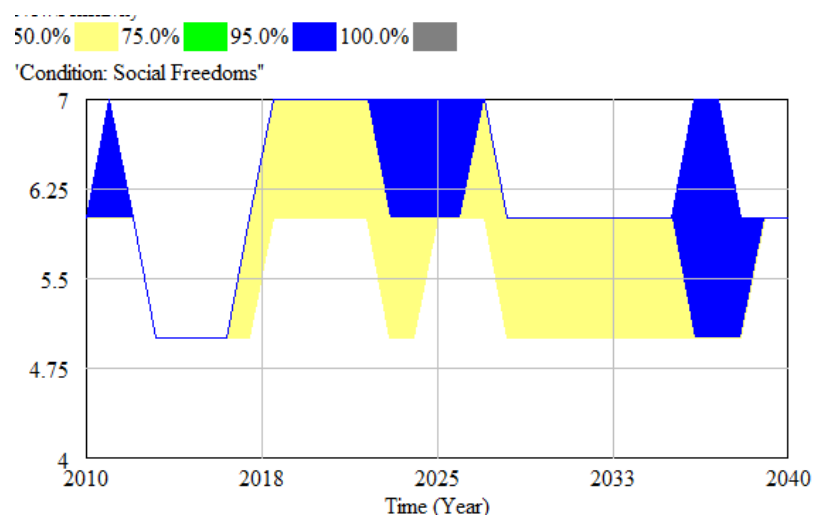
Human Rights:



Political Rights:

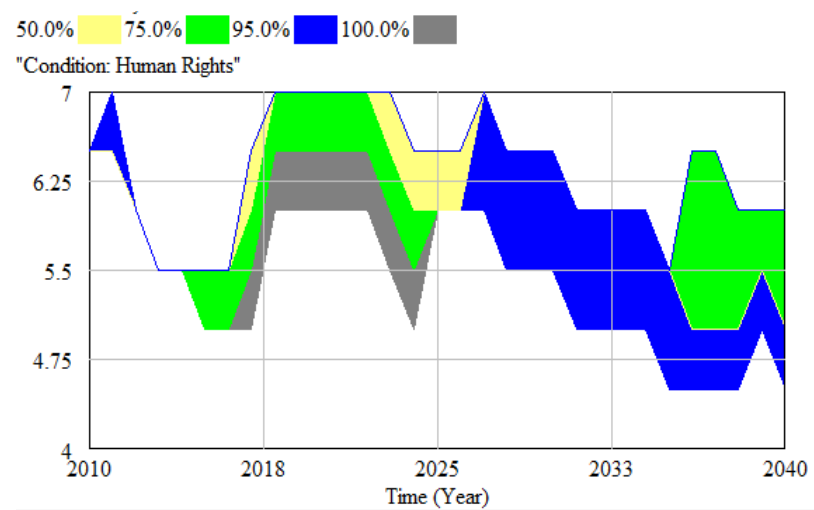


Social Freedoms:

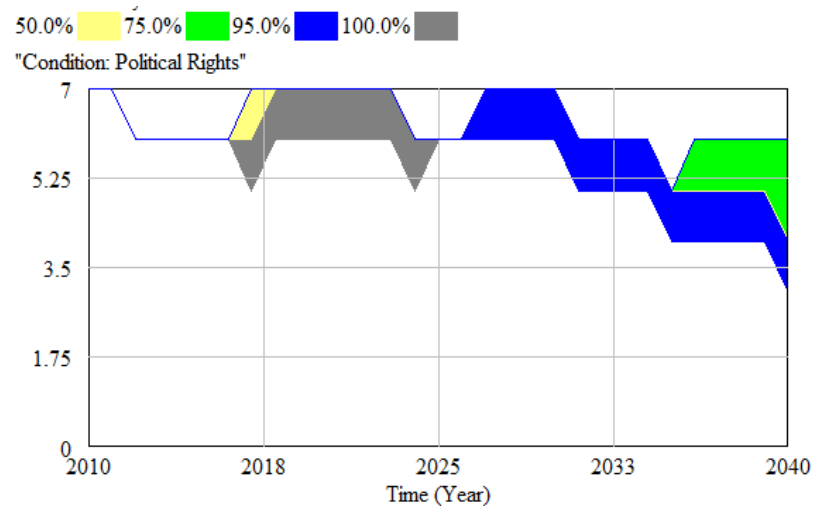


Policy 1 and 3

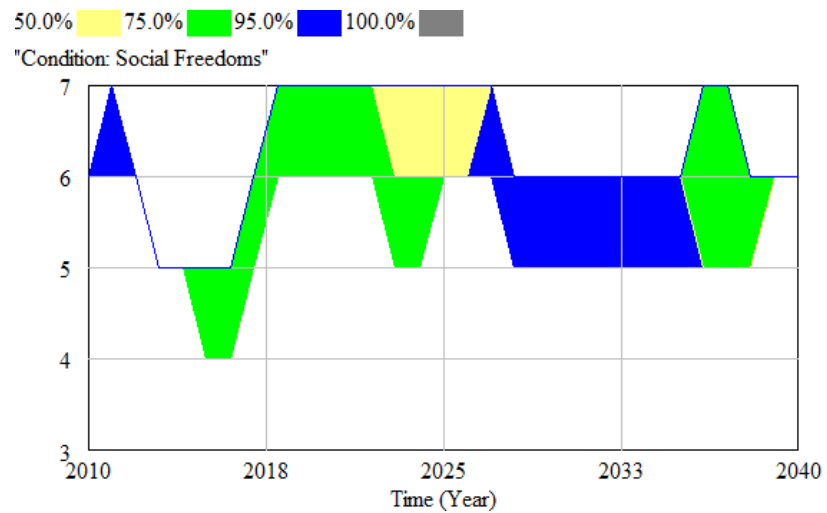
Human Rights:



Political Rights:

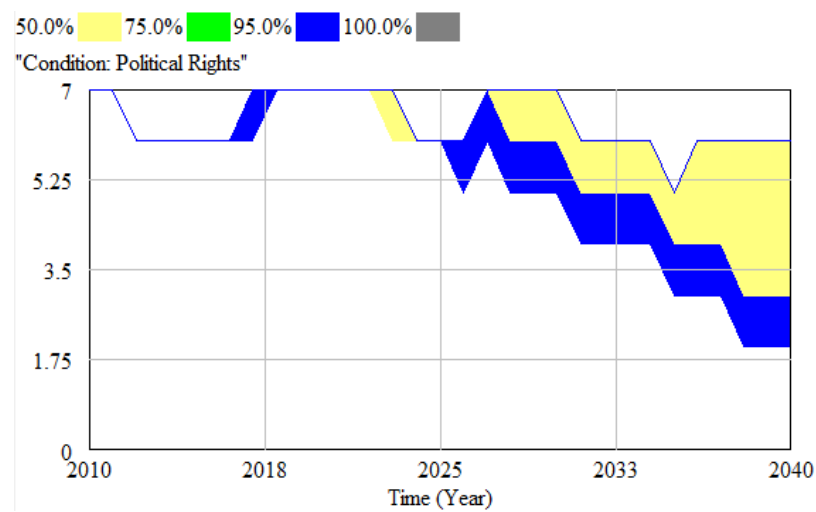


Social Freedoms:

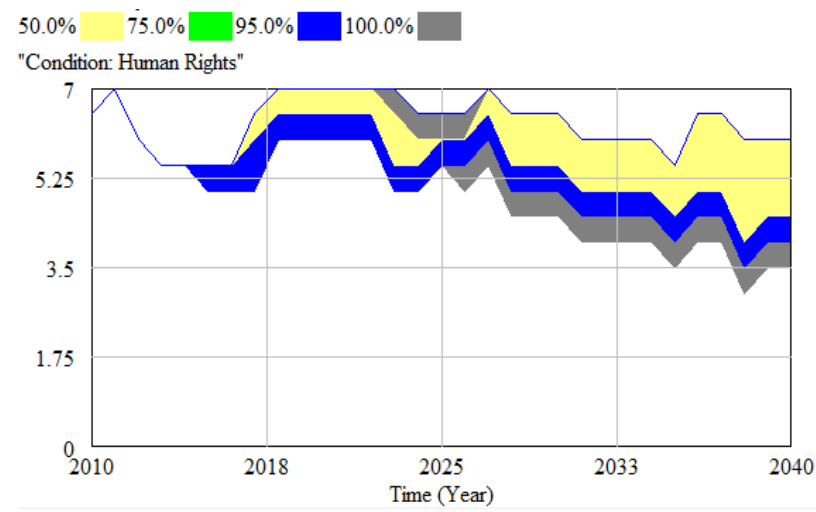


Policy 2 and 3

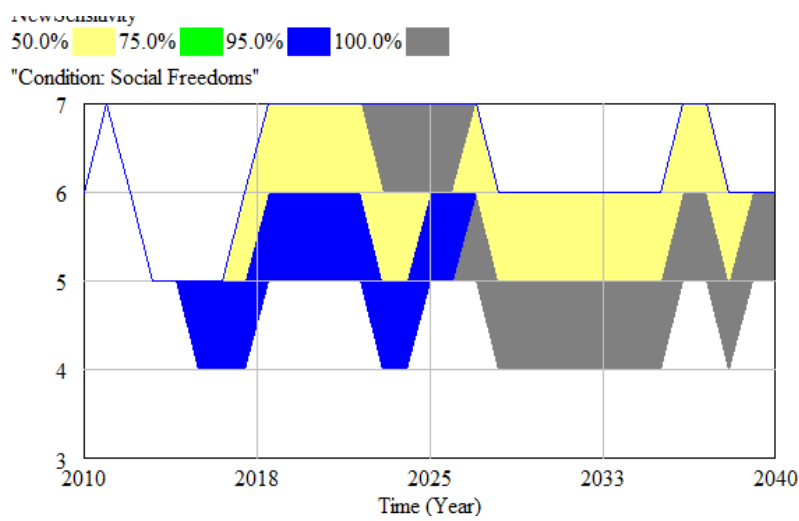
Human Rights:



Political Rights:

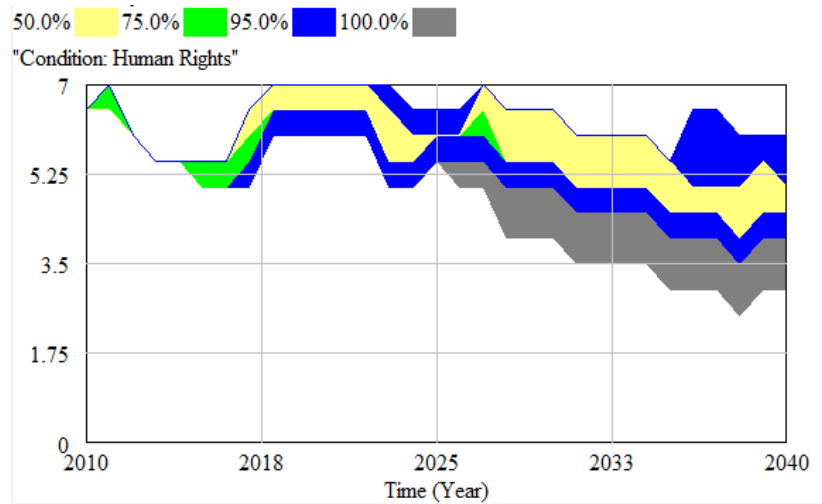


Social Freedoms:

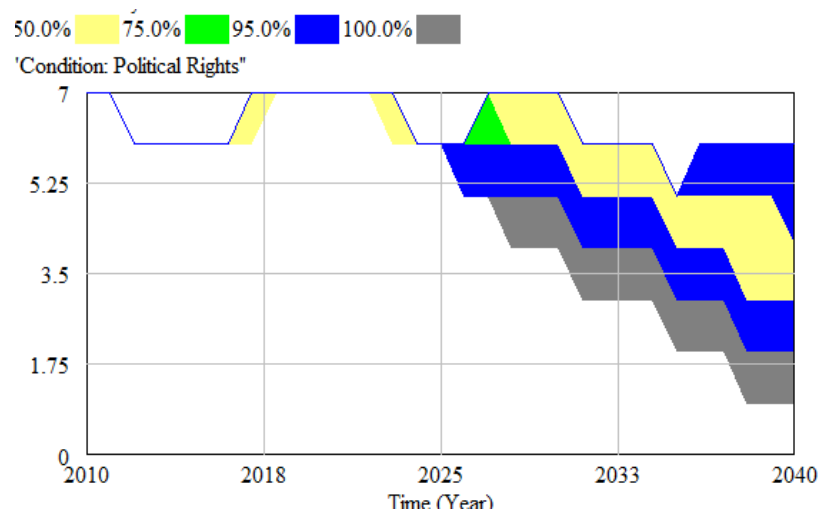


Policy 1, 2 and 3

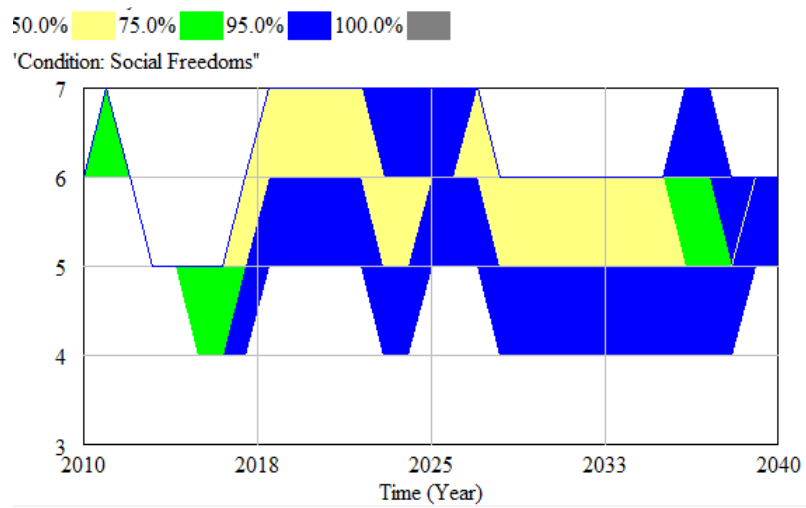
Human Rights:



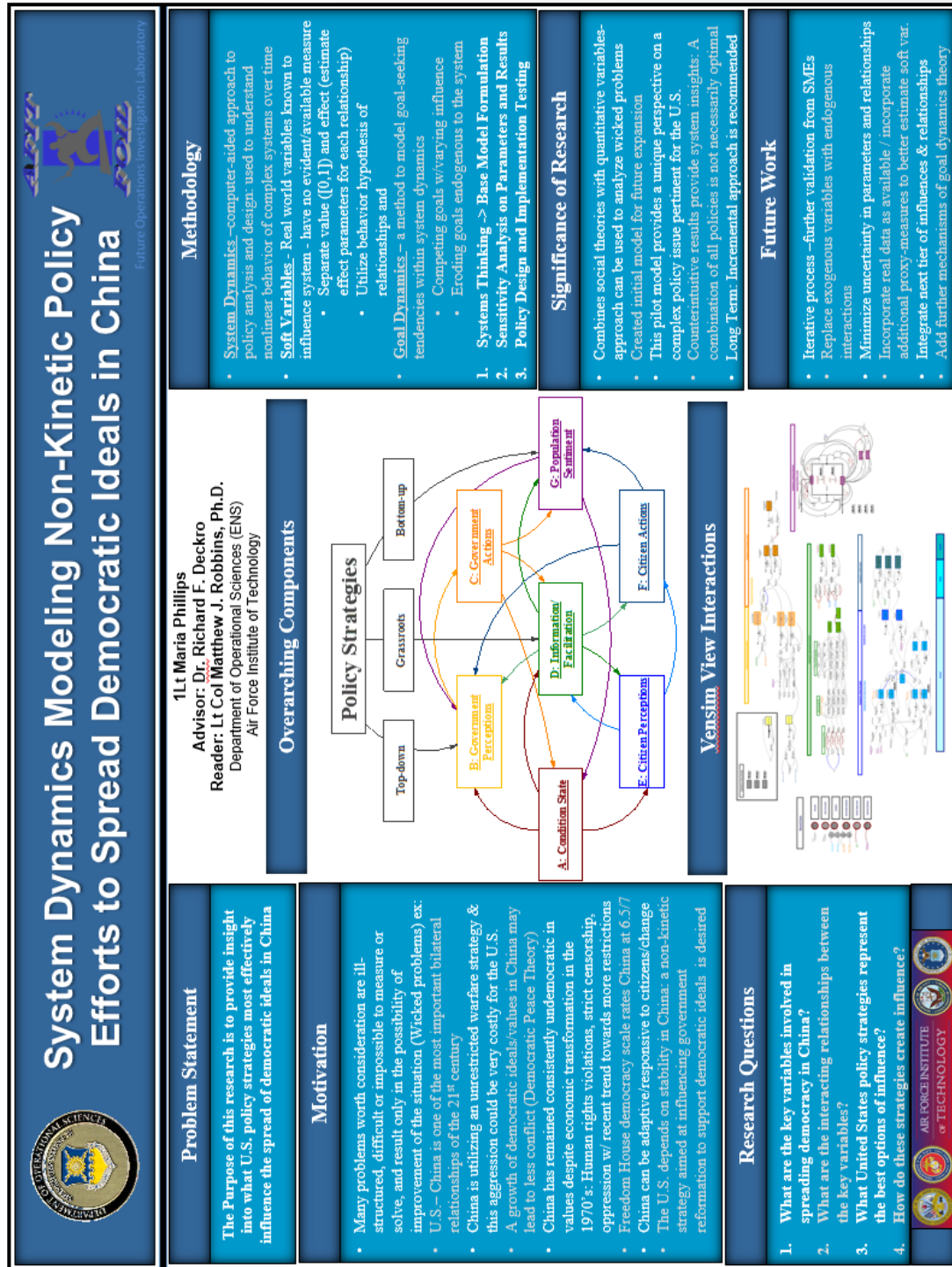
Political Rights:



Social Freedoms:



Appendix F: Quad Chart



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14. ABSTRACT Shaping the next century of global politics and power, United States-China relations comprise one of the most significant bilateral relationships in the world. A new era of unrestricted warfare is one example of how aggression from China could be very costly for the United States. The growth of democratic ideals within China decreases the risk of detrimental impacts according to democratic peace theory. This thesis explores a multifaceted system of relationships that regulate the diffusion of democratic ideology within China, as defined by a proxy-measure characterized as human rights by Freedom House. Relative deprivation theory coupled with an adapted Bass diffusion model are leveraged as constructs leading to the emergence of a social movement influencing China's system of government. Non-kinetic policy strategies directed towards reforming government are assessed utilizing system dynamics. Subsets within system dynamics theory, goal dynamics incorporating soft variables, are investigated and implemented within the model as a means to evaluate interactions between actors while accounting for competing objectives. The resulting model provides a pilot operational assessment of driving factors, marrying both policy and strategic influence objectives with mathematically structured analysis as applied to this realm of research. Results suggest areas of study for future development that potentially further United States objectives within China. Thus, this research illustrates the value of applying a system dynamics approach to connect quantitative and qualitative factors in a way that provides a more thorough understanding of complex geopolitical interactions.					
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