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目錄

Beyond Offensive and Defensive Realism: A Proposal for an Interaction-Structure Theory in International Politics

Abstract

This article examines the current problems in the neorealist theories of international politics and proposes alternatives and operational suggestions. The division between offensive and defensive version of neorealism is unnecessary. We need a parsimonious theory that offers greater explanatory power. Therefore, this article proposes the systemic "interaction-structure theory" of stability as an alternative within the materialist tradition of realism. Interaction capacity is both a source of explanation and the precondition for a system. In addition, the offense-defense balance should be viewed as the logic of explanation. This allows the theory to explore mobility, density, and fragmentation as the new independent variables that derive from technology, geography, and power distribution, respectively. Furthermore, the meaning of stability, the dependent variable, should also be expanded to be "the threat to peace" rather than merely the avoidance of war. The name "interaction-structure theory" avoids giving the theory an offensive or defensive label and describes the precise content of this alternative.

Introduction

Realism has a long and rich tradition. During the last century, landmark works of realism were published, including Carr's *The Twenty Years' Crisis*,[1] Morgenthau's *Politics among Nations,*[2] and Waltz's *Theory of International Politics*.[3] These monumental writings exhibit the evolutionary development of realism from classical realism to neorealism. Strictly adhering to system-level variables, Waltz's neorealist theory of international politics explains the international system as a whole, restricting itself to some "big" and "important" patterns in the system.[4] This approach is highly praised not only for its rigorous and scientific treatment of a theory but also for the harmony between this particular theory and real world.[5] With the sudden end of the Cold War, neorealism fell out of favor and began to receive a great deal of criticism;[6]

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[1] E. H. Carr, *The Twenty Years' Crisis 1919-1939* (London: Macmillan Press Ltd, 1946).
[2] Hans J. Morgenthau, *Politics Among Nations: The Struggle for Power and Peace,* (New York: Alfred A. Knopf, 1953).
[3] Kenneth N. Waltz, *Theory of International Politics* (New York: McGraw-Hill Publishing Company, 1979).
[4] *Ibid.,* pp. 69-71.
[5] Miles Kahler, "Inventing International Relations: International Relational Theory after 1945," in Ken Booth and Steve Smith, eds., *New Thinking in International Relations Theory* (Boulder: Westview, 1997), pp. 22-42.
[6] On the debates, see: David A. Baldwin, "Neoliberalism, Neorealism, and World Politics," in David A.

"one world, many theories" became the character of the new age.[7]

Regarding neorealism itself, the current trend is its continuing division between the two versions.[8] Defensive realism holds a more optimistic perspective,[9] while offensive realism maintains a more pessimistic view.[10] This offensive/defensive division has persisted for years, and the distinction is now widely accepted, employed, and even emphasized among scholars.[11] Nonetheless, does this division make sense? Is it worthwhile? Does it improve our understanding and generate advances in theories? This article argues that the division is unnecessary, and that it results in

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Baldwin, ed., Neorealism and Neoliberalism: The Contemporary Debate (New York, Columbia University Press, 1993), pp. 3-25; Joseph M. Grieco, "Anarchy and the Limits of Cooperation: A Realist Critique of the Newest Liberal Institutionalism," *International Organization*, Vol. 42, No. 3 (Summer 1988), pp. 485-507. John J. Mearsheimer, "A Realist Reply," *International Security*, Vol. 20, No. 1 (Summer 1995), p. 86. Ole Wæver, "The Rise and Fall of the Inter-paradigm Debate," in Steve Smith, Ken Booth, and Marysia Zalewski, eds. *International theory: Positivism and Beyond* (Cambridge: Cambridge University Press, 1996), pp. 151-163; Alexander E. Wendt, "The Agent-Structure Problem in International Relations Theory," *International Organization*, Vol. 41, No. 3 (Summer 1987), pp. 335-370; Dale C. Copeland, "A Realist Critique of the English School," *Review of International Studies*, Vol. 29, No. 3 (July 2003), pp. 427-441; J. Ann Tickner, "You Just Don't Understand: Troubled Engagements Between Feminists and IR Theorists," *International Studies Quarterly,* Vol. 41, No. 4 (March 1997), pp. 611-632; Dale C. Copeland, "The Constructivist Challenge to Structural realism: A Review Essay," *International Security*, Vol. 25, No. 2 (Fall 2000), pp. 207-210.

[7] Stephen M. Walt, "International Relations: One World, Many Theories," *Foreign Policy*, No. 110 (Spring 1998), pp. 29-46.

[8] The distinction between offensive and defensive realism stretches across neorealism and neoclassical realism, but this article only concentrates on neorealism. See Robert G. Kaufmann, "A Two-Level Interaction: Structure, Stable Liberal Democracy, and U.S. Grand Strategy," *Security Studies*, Vol. 3, No. 4 (Summer 1994), p. 683; Glenn H. Snyder, "Mearsheimer's World—Offensive Realism and the Struggle for Security," *International Security*, Vol. 27, No. 1 (Summer 2002), pp. 150, 171; Gideon Rose, "Neoclassical Realism and Theories of Foreign Policy," *World Politics*, Vol. 51, No. 1 (October 1998), pp. 144-172. For examples of both offensive and defensive versions of neoclassical realism, see Steven E. Lobell, "War is Politics: Offensive Realism, Domestic Politics, and Security Strategies," *Security Studies*, Vol. 12, No. 2 (Winter 2002/03), pp. 165-195; Jeffrey W. Taliaferro, "State Building for Future Wars: Neoclassical Realism and the Resource-Extractive State," *Security Studies*, Vol. 15, No. 3 (July-September 2006), pp. 464-495; Randall L. Schweller, *Unanswered Threats: Political Constraints on the Balance of Power* (Princeton: Princeton University Press, 2008); Steven E. Lobell, Norrin M. Ripsman, Jeffrey W. Taliaferro eds., *Neoclassical Realism, the State, and Foreign Policy* (New York: Cambridge University Press, 2009).

[9] Such as: Charles L. Glaser, "Realist as Optimists," *International Security*, Vol. 19, No. 3 (Winter 1994/1995), pp. 50-90; Jack Snyder, *The Ideology of the Offensive: Military decision Making and The Disasters of 1914* (Cornell: Cornell University Press, 1984); Stephen Van Evera, *Cause of War: Power and the Roots of Conflict* (Ithaca, New York: Cornell University Press, 1999); Jack Snyder, *Myths of Empire: Domestic Politics and International Ambition* (Ithaca, New York: Cornell University Press, 1991).

[10] Such as: John J. Mearsheimer, "Back to the Future: Instability in Europe after the Cold War," *International Security*, Vol. 14, No. 4 (Spring 1990), pp. 5-40; Eric J. Labs, "Beyond Victory: Offensive Realism and the Expansion of War Aims," *Security Studies*, Vol. 6, No. 4 (December 1997), pp. 1-45;Fareed Zakaria, *From Wealth to Power: The Unusual Origins of America's World Role* (Princeton: Princeton University Press, 1998); Christopher Layne, "The 'Poster Child for Offensive Realism': America as a Global Hegemon," *Security Studies*, Vol. 12, No. 2 (Winter 2002/03), pp. 120-164.

[11] Jeffery W. Taliaferro, "Security Seeking under Anarchy," *International Security*, Vol. 25, No. 3, (Winter 2000), pp. 128-161; Keir A. Lieber, "The New History of World War I and What It Means for International Relations Theory," *International Security*, Vol. 32, No. 2 (Fall 2007), pp. 155-191; Jack Snyder & Keir A. Lieber, "Defensive Realism and the 'New' History of World War I," *International Security*, Vol. 33, No. 1 (Summer 2008), pp. 174-194.

endless repetition and stagnates the theoretical developments. This division should be ended and research should return to the materialist tradition of realism by exploring existing concepts with an original approach and by attempting to build a theory with terminology that accurately captures the precise attributes it describes.

Currently, the quest for a parsimonious neorealist theory of international politics with great explanatory power remains at a standstill decades after the creation of Waltz's theory as illustrated in Mearsheimer's *The Tragedy of Great Power Politics,*[12] a major endeavor to establish a new landmark. This work reiterates the arguments of offensive realism, and the content of the proposed theory is almost identical to Waltz's theory. The means proposed to improve the theory's explanatory power contain the pitfall of tautology that Waltz himself wanted to avoid in the first place, and the central concept of "stability" in international systems is still weak in substance with the exception of the avoidance of war.

For neorealist systemic theories, the only explanatory variable is still structure, conceived as the distribution of power or polarity. Other frequently mentioned elements in the realist materialism tradition, especially regarding technology and geography, are not fully or systematically developed. Thus, the current stagnation in the development of systemic theories is not permanent, as the theories can be improved by considering these different elements. In fact, previous theories of international politics confused the "sources of explanation" with the "logic of explanation," and thus erroneously adhered to "structure" as the only source of explanation, "balance-of-power" as the only "logic of explanation," and the "sum of pole" as the only independent variable at the system level.

To pour new wine into an old bottle, Buzan's concept of "interaction capacity" should be both the precondition of a system to setup the boundaries and also a source of explanation.[13] Furthermore, the concept of "offense-defense balance,"[14] closely related to technology and geography, should be taken as a "logic of explanation" and

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[12] John J. Mearsheimer, *The Tragedy of Great Power Politics* (New York: W.W. Norton & Company, 2001).

[13] For existing discussions on interaction capacity, see: Barry Buzan, "Rethinking System and Structure", in Barry Buzan, Charles Jones, and Richard Little, eds., *The Logic of Anarchy: Neorealism to Structural Realism* (New York: Columbia University Press, 1993), pp. 20-80; Barry Buzan, "The Level of Analysis Problem in International Relations Reconsidered," in Ken Booth and Steve Smith, eds. *International Relations Theory Today*, (Univ. Park, Pennsylvania: The Penn State University Press, 1995), pp. 198-215.

[14] For existing discussions on offense-defense balance, see: Robert Jervis, "Cooperation under the Security Dilemma," *World Politics*, Vol. 30, No. 2 (January 1978), pp. 167-214; George H. Quester, *Offense and Defense in the International System* (New York: John Wiley & Sons, 1977); Sean M. Lynn-Jones, "Offense-Defense Theory and Its Critics," *Security Studies*, Vol. 4, No. 4 (Summer 1995), pp. 660-691; Stephen Van Evera, "Offense, Defense, and the Causes of War," Vol. 22, No. 4 (Spring 1998), pp. 5-43. Charles L. Glaser and Chaim Kaufmann, "What is the Offense-Defense Balance and Can We Measure It?" *International Security*, Vol. 22, No. 4 (Spring 1998), pp. 44-82; Stephen Biddle, "Rebuilding the Foundations of Offense-Defense Theory," *The Journal of Politics*, Vol. 63, No. 3 (August 2001), pp. 741-774.

not as a variable or a source of explanation.

Under this framework, we propose the systemic "interaction-structure theory" of stability. This theory explores new options at the system level including technology in the concept of "interaction capacity" and geography and distribution of power in the concept of "structure." These three aspects can then be abstracted into "mobility," "density," and "fragmentation." Based on each of these three variables, three hypotheses about stability can be made: 1) "The higher the mobility, the lower the stability;" 2) "The higher the density, the lower the stability;" and 3) "The higher the fragmentation, the lower the stability." Moreover, the meaning of stability is also broadened to "threats to peace" rather than the mere avoidance of war in order to encompass a more complete picture of the system. While the testing of these theoretical proposals will be left to future articles, this article addresses their testability by considering how to measure each key variable.

This article is organized into four major sections. The first provides a brief overview and commentary on the offensive/defensive division in neorealism and its obstruction of further theoretical development. The second section critiques Mearsheimer's work, showing the stagnation in neorealist systemic theory and addressing the need to explore new independent variables at the system level. The third section analyzes the existing concept of interaction capacity and the offense-defense balance, and proposes some new ideas that can be used to form a framework for a new system theory. The fourth section outlines the framework, theoretical proposals, and operational suggestions for future research.

Offensive/Defensive Versions? Unnecessary Division of Neorealism

The now widely accepted distinction between "offensive" and "defensive" versions of realism first emerged in 1991. Many argue, as Snyder does, that this distinction should be "helpful" in increasing our understanding of realism.[15] However, it is crucial to consider the purposes of the theories, and ultimately their levels of analysis.[16] Emphasizing only the offensive/defensive distinction may be convenient but results in misunderstanding and confusion.[17] In addition to offensive/defensive

[15] Snyder, *Myths of Empire,* pp. 11-12.
[16] Colin Elman, "Horses for Courses: Why Not Neorealist Theories of Foreign Policy?" *Security Studies*, Vol. 6, No. 1 (Autumn 1996), pp. 7-53; Kenneth N. Waltz, "International Politics is Not Foreign Policy," *Security Studies*, Vol. 6, No. 1 (Autumn 1996), pp. 54-57; Colin Elman, "Cause, Effect, and Consistency: A Response to Kenneth Waltz," *Security Studies*, Vol. 6, No. 1 (Autumn 1996), pp. 58-61.
[17] This is revealed in Zakaria's representative criticisms of defensive realism and Lynn-Jones's sharp response. See: Fareed Zakaria, "Realism and Domestic Politics: A Review Essay," *International Security* Vol. 17, No. 1 (Summer 1992), pp. 177-198; Sean M. Lynn-Jones, "Realism and America's Rise: A Review Essay," *International Security* Vol. 23, No. 2 (Fall 1998), pp. 157-183.

labeling, there are actually the differences between theories of international politics and theories of foreign policy (neorealism versus neoclassical realism).[18] Thus, for neorealism, the real disagreements between the offensive/defensive versions should center only on "the preference over actions" and "the consequences of anarchy." Nevertheless, these two disagreements are unnecessary.

Assuming Preference over Actions

Snyder, as the inventor of the offensive/defensive division, argues that both versions see security as the state's strongest motivation in an anarchic system. Offensive realism asserts that "offensive action" is the best way to achieve security, while defensive realism does not.[19] In other words, "offensive and defensive realists disagree about whether aggression pays."[20] Nonetheless, the two perspectives are actually answering the question about states' choice between offensive and defensive "actions" by assuming states' "preference over actions," which is a meaningless and unnecessary exercise. Neorealist theories aim to explain actions (the overall "outcome" of the system is the collective actions of individual state). As Powell suggests, it is reasonable to assume states' "preference over outcomes" in these theories, just as neorealists can assume that states prefer their own survival to elimination; if a state does not prefer survival, it will be eliminated and will no longer be an actor.[21] However, how to achieve this goal? It depends. Sometimes offense pays and sometimes it doesn't.[22] Theories must provide variables to explain the different choices between offensive or defensive actions rather than simply assuming that states prefer one type of action to the other.

Assuming Consequences of Anarchy

Taliaferro argues that anarchy is the common starting point for the two neorealist versions, but these versions differ on the implications of anarchy. For offensive realism, anarchy "always" provides incentives for expansion, but for defensive realism, anarchy only provides incentives for expansion "under certain conditions."[23] This disagreement is also unnecessary. After all, even if an anarchic system only provides incentives "under certain conditions" as defensive realism argues, in the end, it "always" does. This is because of the "uncertainty" that persists under anarchy. [24]

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[18] Taliaferro, "Security Seeking under Anarchy," p. 135.
[19] Snyder, *Myths of Empire,* p. 12.
[20] Snyder & Lieber, "Defensive Realism and the 'New' History of World War I," p. 192.
[21] Robert Powell, "Anarchy in International Relations Theory: The Neorealist - Neoliberal Debate," *International Organization*, Vol.48, No.2 (Spring 1994), pp. 314-337.
[22] See: Peter Liberman, *Does Conquest Pay? The Exploitation of Occupied Industrial Societies* (Princeton: Princeton university Press, 1996), pp. 4-5.
[23] Taliaferro, "Security Seeking under Anarchy," pp. 128-129.
[24] The point here looks similar, but is different from David M. Edelstein's arguments about uncertainty.

As Waltz writes, nations go to war because they see the long shadow of the future.[25] Nations might not face any immediate systemic pressure to expand, but they must prepare for contingencies in case the system changes one day. Even if the system is "benign" for more than two centuries,[26] there are no guarantees that it will remain this way in the future.

Although the system always provides incentives for expansion, the systemic trend of expansion is changing. If the variance of expansion should be attributed to the systemic incentives, the magnitude of the incentives must also be changing. Therefore, it is correct to argue that there are always systemic pressures for expansion because pressure is always "greater than zero." The crucial question is exactly how high or low the pressure is? This also depends on the situation. If a realist tries to argue that "always greater than zero" means "always high," then as Brooks notes, this actually rests on a "worst-case/possibility" assumption, which is psychological and not anarchy *per se*.[27] Indeed, for Brooks, this implicit assumption about mentality is exactly the distinction between offensive and defensive realism. However, this assumption does not need to be made because the mentality of each state actually differs. Systemic theories simply explain the collective similarity among these differentiating units within the same system and their collective differences across different systems.

In other words, although defensive realism states almost the whole story, it is still a step away from completeness. The incentives for expansion under anarchy do vary "under certain conditions" but are "always" there. This is why the offensive/defensive division is unnecessary. Debates over the implication of anarchy are meaningless because both high and low levels of incentives are compatible with anarchy. As Waltz notes, there are different anarchic systems.[28] Certain anarchic systems may be more dangerous or benign than others, and thus provide more or less incentive for expansion. Glaser, for example, realizes this problem and suggests that the term "defensive realism" is misleading, suggesting "contingent realism" as a more appropriate term.[29] However, since neorealist theories aim to explain variations in

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For Edelstein, uncertainty lies in intentions. Although intention is almost always uncertain, beliefs about other states' intentions still affect a state's behavior. Here, however, uncertainty lies in material capabilities, and intentions are simply discounted. For Edelstein's arguments, see: David M. Edelstein, "Managing Uncertainty: Beliefs about Intentions and the Rise of Great Powers," *Security Studies*, Vol. 12, No. 1 (Autumn 2002), pp. 1-40.

[25] Kenneth N. Waltz, "Structural Realism after the Cold War," *International Security*, Vol. 25, No. 1 (Summer 2000), p. 40.

[26] Evera, "Offense, Defense, and the Causes of War," p. 9.

[27] Stephen G. Brooks, "Dueling Realisms," *International Organization*, Vol. 51, No. 3 (Summer 1997), pp. 447-450.

[28] Waltz, *Theory of International Politics,* p. 70.

[29] Charles L. Glaser, "The Security Dilemma Revisited," *World Politics*, Vol. 50, No. 1 (October 1997), p. 189.

international outcomes, they must be "contingent" in their very nature.

Waltz's Theory: Elegant but Unsatisfactory

As shown above, anarchy is a constant and can only explain continuities. Variables are needed to explain change.[30] Nonetheless, the variable in Waltz's neorealist theory, polarity, is very limited in its explanatory power. In the bipolar system of the Cold War, the U.S. and Soviet Union did not go to war with each other. This supports Waltz's theory that a "bipolar" system is more "stable" than a "multi-polar" system. Once the Cold War ended, so did this harmony between theory and reality.

Waltz argues that it is too early to make a judgment about the effects of the end of the Cold War on world politics,[31] but the end of Cold War does bring up existing problems in his theory. First, the system in the Cold War era was global, but the so-called multi-polar system of past centuries was largely European. Systems must have boundaries, but Waltz simply bypasses this issue.[32] Furthermore, the Soviet Union never achieved parity with the U.S. in terms of economy. If gaps between poles are acceptable, why are Britain or France not considered poles during the Cold War? The gap between Japan and the U.S. was even greater in the 1930s. Indeed, as Waltz argues, power encompasses everything and cannot be evaluated based on a single factor such as economy or military.[33] While this is a convincing argument it simply appeals to common sense to identify great powers. A more coherent standard should be developed.

Moreover, Waltz asserted that a bipolar system is more "stabile" than a multi-polar system. If there is a virtue of the bipolar system, it is the absence of wars between great powers. What Waltz meant by "stability" is actually the avoidance of war. If this is the case, then why should we replace a clear concept like "peace" with a subtle one like "stability?"[34] By any definition, even if the multi-polar system is really war-prone and unstable, the 19th century was the golden age of Europe but World Wars I and II occurred in the first half of the 20th century. The variation in stability within multi-polar systems is almost as great as that between multi-polar and bipolar systems.[35] Lacking explanatory power, Waltz's theory based on polarity is in

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[30] Jack Donnelly, *Realism and International Relations* (Cambridge: Cambridge University Press, 2000), p. 64; Greg Cashman, *What Causes War? An Introduction to Theories of International Conflict* (New York: Maxwell Macmillan International, 1993), p. 228.

[31] Kenneth N. Waltz, "Stuctural Realism after the Cold War," in Ikenberry ed., *American Unrivaled: The Future of the Balance of Power* (Ithaca: Cornell University Press 2002), p. 54.

[32] Barry Buzan and Ole Wæver, *Regions and Powers: the Structure of International Security* (Cambridge: Cambridge University Press, 2003), pp. 27-39.

[33] Waltz, *Theory of International Politics,* pp. 131-132.

[34] Robert Jervis, *System Effects* (New Jersey: Princeton University Press, 1999), p. 94.

[35] Charles W. Kegley & Gregory A. Raymond, "Must We Fear a Post-Cold War Multi-polar System?"

trouble.[36]

From Waltz to Mearsheimer: Lack of Progress

Given the difficulty that the systemic theory of international politics has faced, Mearsheimer, the current leading neorealist, launched a major effort to rebuild its reputation. This resulted in *The Tragedy of Great Power Politics,* which is considered the new landmark work succeeding Waltz's *Theory of International Politics* and the leading voice in the theoretical debate for years, even decades.[37] Mearsheimer's theory is said to be "coherent and without obvious inconsistency" and has "theoretical rigor."[38] However, Mearsheimer simply reiterates the meaningless division between offensive and defensive realism,[39] and his systemic theory is in fact largely identical to Waltz's, yielding no meaningful advances.

"Clarifying" the Power Structure: Tautology

The explanatory variable in Mearsheimer's theory is still the distribution of power. Different power architectures have different systemic incentives that explain the variation in stability across systems. In contrast to Waltz's "common sense" approach regarding power structure and polarity, Mearsheimer tries to introduce a more explicit meaning and a consistent standard. Mearsheimer argues that there are two kinds of power: "latent power", which is the economic and technological basis for building "military power," the armed forces of a state measured according to its ground troops and supporting air and naval forces.[40] Nonetheless, when Mearsheimer tries to identify the polarity of a system, his notion regarding power goes wrong.

The first problem is the gap between latent power and military power. Strong armies certainly need robust economies, but robust economies do not always translate

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The Journal of Conflict Resolution, Vol. 36, No. 3 (September 1992), p. 579.

[36] Scott Burchill, "Introduction," In Scott Burchill, and Andrew Linklater, eds. *Theories of International Relations* (Basingstoke, Hampshire: Palgrave, 2001), p. 24; John A. Vasquez, "The Post-Positivism Debate: Reconstructing Scientific and International Relations Theory After Enlightenment's Fall," In Ken Booth and Steve Smith, eds., *International Relations Theory Today* (University Park: Pennsylvania State University Press, 1995), p. 232.

[37] Eric Hyer, "Mearsheimer's Neorealist Predictions: The Haunting Specter of China as a Great Power," *Issues & Studies*, Vol. 39 No.2 (August 2003), p. 225; Christopher P. Twomey, "Avoiding Tragedy in Sino-American Politics," *Issues & Studies*, Vol. 39 No.2 (August 2003), p. 249.

[38] H. Snyder, "Mearsheimer's World—Offensive Realism and the Struggle for Security," p. 171; Gerald Geunwook Lee, "To Be Long or Not to Be Long - That is the Question: The Contradiction of Time-horizon in Offensive Realism," *Security Studies*, Vol. 12, No. 2 (Winter 2002/3), p. 197.

[39] This only causes a new wave of endless repetition. For example, Lieber repeats Mearsheimer's argument, while Rendall simply reasserts what Snyder stated and criticizes Mearsheimer's theory. See: Snyder & Lieber, "Defensive Realism and the 'New' History of World War I," p. 190; Matthew Rendall, "Defensive Realism and the Concert of Europe," *Review of International Studies*, Vol. 32, No. 3 (July 2006), pp. 523-540.

[40] Mearsheimer, *The Tragedy of Great Power Politics,* pp. 55-57, 83-87.

into strong armies. Prosperity may be pursued naturally by nations, but the ratio between latent power and military power varies. For example, since the end of World War II, Japan has not been considered a great power because it has a robust economy without a strong army or nuclear weapons,[41] despite the fact that the state now has far more latent power to use to build up its military power than it did in the pre-war era. Is the lack of military power despite its high latent power because Japan has lost its great power status?[42] This becomes a tautology.

The second problem is that Mearsheimer measures the power structure in regional terms. While it is important to pay attention to the boundaries of the system, this modification creates "outsiders" within a particular region. Mearsheimer does not automatically include an outside great power as part of a regional system but takes the presence of that power in a region as a policy choice. If a state commits its armies to another region, then it is included in the regional power structure.[43] This is also a tautology. For example, in the Cold War period, the U.S. committed its troops to Europe and was thus included in the power structure of the European region, making the region a bipolar system. However, why must the U.S. commit its troops to Europe? It is because Europe is a bipolar system!

Policy choices of certain nations may be outside the scope of a systemic theory, but the structure must be defined independently from its result since power structure serves as an explanatory variable.[44] Mearsheimer's theory actually confuses "structure" with "process." The Cold War system was clearly bipolar in terms of regional military power because only the two superpowers possessed unmatchable armed forces, and they achieved parity in Europe.[45] However, this is "polarization," not "polarity."[46] Translating latent power into military power is internal balancing, and committing troops to another region is external balancing.[47] Both of these are the "process" of balance-of-power, but Mearsheimer made them a part of the power "structure." This tautology is what Waltz wanted to avoid in the first place.

"Balanced" and "Unbalanced" Multi-polar Systems: Results not Causes

The problem with Mearsheimer's conception of power structure as regional military power is even more evident as we proceed with his argument. Like Waltz,

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[41] *Ibid*., 55-56.
[42] Kenneth N. Waltz, "Reflections on *Theory of International Politics*: A Response to My Critics," in Robert O. Keohane, ed., *Neorealism and Its Critics* (New York: Columbia University Press, 1986), p. 332.
[43] Mearsheimer, *The Tragedy of Great Power Politics,* pp. 348, 355.
[44] Waltz, *Theory of International Politics,* pp. 48, 58, 130.
[45] Stephen M. Walt, *The Origins of Alliances* (Ithaca: Cornell University Press, 1987), pp. 274-275.
[46] Cashman, *What Causes War? An Introduction to Theories of International Conflict,* p. 223.
[47] Waltz, *Theory of International Politics,* p. 118.

Mearsheimer argues that the system with the greatest stability is a bipolar system.[48] The only difference between Mearsheimer's and Waltz's theories is the distinction between "balanced" and "unbalanced" multi-polar systems, where the unbalanced system contains a "potential hegemon."[49] Mearsheimer asserts that the "unbalanced multi-polar system" is the most dangerous power structure and then identifies three periods of great power wars in Europe as illustrations.[50]

The theory's explanatory power looks excellent but is actually tautological. Power structure is defined by the process of balancing. Napoleonic France is a potential hegemon because the state decided to build up its military power while its latent power remained largely constant. Wilhelmine and Nazi Germany are potential hegemons because the outsider, the U.S., decided not to build up military power and commit troops to Europe. Whether a multi-polar system is "balanced" or "unbalanced" is just a status during the process of balancing, and this process reveals the two common problems of "buck-passing" and "chain-gang," which logically make the multi-polar system unbalanced and unstable because of either under-balancing or over-balancing.[51] In other words, when the power structure is conceptualized according to Mearsheimer's theory, an "unbalanced" multi-polar system is actually the result of multi-polarity, not a cause of instability.

"Stability" and the Puzzle in the Post-Cold War Era: Everything Unchanged

Given the flaw discussed above, it is not surprising that Mearsheimer's theory can do nothing to solve the problem that neorealism faced after the Cold War. As an amendment of Waltz's theory, the explanatory power of Mearsheimer's theory does not improve. Mearsheimer enriches the concept of stability, but it essentially remains Waltz's notion of the avoidance of war. The number, frequency, and deadliness of wars are all parameters that used to identify the differences between wars,[52] not to gauge the differences between peaceful periods. Despite the end of the U.S.-Soviet rivalry, the stability of the system remains unchanged after the Cold War because wars between great powers remain absent. Furthermore, the scope of Mearsheimer's theory is limited even further by his regional perspective that excludes arms races, low intensity conflicts, and proxy wars outside Europe.

Since power structure is taken to mean regional military power, it is easy to reach Mearsheimer's conclusion. As the Soviet Union collapsed and Russia succeeded, the

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[48] Mearsheimer, *The Tragedy of Great Power Politics,* pp. 337-344.
[49] *Ibid.,* p. 44.
[50] *Ibid.*, pp. 272-329.
[51] Glenn H. Snyder notes that this danger of being entrapped is nearly missing in Mearsheimer's theory, but he fails to discover the deeper theoretical defects identified here. About H. Snyder's comments on Mearsheimer regarding balancing, see: H. Snyder, "Mearsheimer's World—Offensive Realism and the Struggle for Security," pp. 165-168.
[52] Mearsheimer, *The Tragedy of Great Power Politics,* pp. 356-357.

U.S. cut its troops accordingly and stayed in Europe. The system remained bipolar.[53] Strikingly enough, Mearsheimer is simply surrendering his theory to reality rather than using the theory to explain reality. The Cold War is over, Europe remains bipolar, and the system remains stable; everything remains unchanged in Mearsheimer's world. The failure to explain the huge differences between the Cold War era and the Post-Cold War ear is a remarkable failure for a systemic theory that seeks to explain something "big" and "important." This failure of Mearsheimer's theory demonstrates how vacuous and disappointing systemic theories are when they are built on the power structure according to the balance-of-power and the avoidance of war. Clearly, new thinking is needed.

New Thinking in Existing Concepts

The above discussion has demonstrated that the offensive/defensive division is unnecessary, Waltz's theory is elegant but unsatisfactory, and Mearsheimer's revised theory is not really progressive. The failure of neorealist systemic theory to generate enough explanatory power has led to repeated efforts to find variables on the unit level, including institutions like democracy and ideation like perception. These developments are strongly condemned by Legro and Moravcsik as deviations from the materialist tradition of realism, which explains phenomena according to objective variances in material capabilities.[54] Nonetheless, objective material capabilities are not limited to structure or distribution of power as currently conceived by Waltz or Mearsheimer. The materialist logic of explanation is simply that actions are selected by their consequences,[55] much in the same way as in Darwin's theory of evolution.[56] Different aspects of power structure and other concepts can also fit within the materialist tradition.

"Technology" and "geography" are among the most-frequently mentioned factors in realism.[57] Mearsheimer, despite his adherence to power structure, also introduces these two factors in the form of nuclear weapons and large bodies of water.[58] However, in his theory, technology and geography are still subordinated to

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[53] *Ibid.*, pp. 380-381

[54] Jeffrey W. Legro and Andrew Moravcsik, "Is Anybody Still a Realist?" *International Security*, Vol. 24, No. 2 (Fall 1999), pp. 16-18, 34; for correspondences see: Peter D. Feaver, Gunther Hellman, Randall L. Schweller, Jeffrey W. Taliaferro, William C. Wohlforth, Jeffrey W. Legro and Andrew Moravcsik "Brother Can You Spare a Paradigm?" *International Security*, Vol. 25, No. 1 (Summer 2000), pp. 65-193.

[55] Waltz, *Theory of International Politic*s, pp. 74-78.

[56] Bradley A. Thayer, "Brining in Darwin: Evolutionary Theory, Realism, and International Politics," *International Security*, Vol. 25, No. 2 (Fall 2000), pp. 124-151.

[57] For example, Robert Gilpin, *War and Change in World Politics* (New York: Cambridge University Press, 1981), pp. 56-66

[58] Mearsheimer, *The Tragedy of Great Power Politics*, pp. 44-45.

power structure. Nuclear weapons are simply supporting elements that identify polarity. Likewise, large bodies of water also signify polarity in regional terms. Although technology and geography are understood as general concepts, they only serve as "structure modifiers" to adjust the raw distribution of power.[59] That is, unevenly distributed technological or geographical characteristics increase or decrease the power of a certain state.[60]

How can variables such as "technology" and "geography" be explored independently in a systemic way? Moreover, even if the traditional notion of "power structure" is still workable, how do we explore new variables? The concepts of "interaction capacity" and "offensive-defense balance" are helpful but are not fully integrated into systemic theories. Buzan introduces the concept of "interaction capacity" to Waltz's structural theory but then explores theories distant from neorealism.[61] In addition, "offensive-defense balance," which is highly related to technology and geography, is largely seen as a key variable in defensive realism and has been a major target of intense criticism.[62] "Interaction capacity" and "offensive-defense balance" are by no means new, but they can become the bases of the framework of new systemic theories.

Interaction Capacity and System

The introduction of interaction capacity is beneficial to system theory, because it provides another "source of explanation." The way that Waltz defines "system" makes "structure" a synonym, and makes it difficult to find any explanation at the system level other than structure.[63] Nevertheless, as Buzan suggests, two things are actually confused: system is the "unit of analysis," and structure is the "source of explanation." On the system level, there can be other "sources of explanation."[64]

Waltz insists that the simplest definition of system consists of only units and structure for the parsimony of theory, but an equally elegant design can also abstract

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[59] Taliaferro, "Security Seeking under Anarchy," p. 131.
[60] Keir A. Lieber, "Grasping the Technological Peace," *International Security*, Vol. 25, No.1 (Summer, 2000), p. 75.
[61] Among them are the Copenhagen school and English school. See: Barry Buzan, "From International System to International Society: Structural Realism and Regime Theory Meet the English School," *International Organization*, Vol. 47, No. 3. (Summer, 1993), pp. 327-352; Barry Buzan, Ole Wæver, and Jaap de Wilde, *Security: A New Framework for Analysis* (Boulder: Lynne Rienner Publishers, 1998); Barry Buzan; Richard Little, "Review: The 'English Patient' Strikes Back: A Response to Hall's Mis-Diagnosis," *International Affairs*, Vol. 77, No. 4. (October, 2001), pp. 943-946.
[62] James W. Davis, Jr., Bernard I. Finel, Stacie E. Goddard, Stephen Van Evera, Charles L. Glaser, Chaim Kaufmann, "Correspondence: Taking Offense at Offense-Defense Theory," *International Security*, Vol. 23, No. 3 (Winter 1998/1999), pp. 179-206.
[63] Powell, "Anarchy in International Relations Theory: the Neorealist - Neoliberal Debate," pp. 324-326.
[64] Buzan, "The Level of Analysis Problem in International Relations Reconsidered," pp. 208-209; Buzan, "Rethinking System and Structure", pp. 66-67.

the reality into units and "something else." The "something else" is the systemic "sources of explanation," and interaction capacity serves as this alternative component. Buzan conceptualizes interaction capacity as "the type and intensities of interaction that are possible" in the system; that is, "how much goods and information can be moved over what distances at what speeds and what costs."[65] It seems that this term refers to a type of material capability, which is nothing different from the notion of power structure. It is true that the only thing can be observed is the material capabilities of actors, but interaction capacity is simply a different way of understanding material capability.

As Buzan explains, both structure and interaction capacity are concepts created for the construction of theories. "Structure" refers to the relative vicissitudes of different actors, but "interaction capacity" addresses the relative vicissitudes of every actor taken together.[66] For example, five great powers equally armed with either battleships or nuclear missiles are the same in terms of the system's structure, but they are different in terms of the system's interaction capacity. From this understanding, "technology" and "geography" can fit differently into a system theory. Technology is related to the interaction capacity *per se*, and geography is related to the environment in which interaction capacity operates. For example, systems of five continental or insular powers are all multi-polar, but the same interaction capacity operating in them will be dramatically different.

In addition to being another "source of explanation," interaction capacity also serves as the precondition for systems, a first step in exploring new variables in power structure. As Buzan notes, if there is no interaction between units, a system is essentially absent.[67] For example, could the ancient world be categorized as a bipolar system made up of Rome and the Han Empire? Similarly, in contrast to those tiny European "great" powers, can the 18th century world be considered unipolar when China is at her peak strength as a sole superpower? No, because the two sides of Eurasia largely acted independently from each other during that time. In other words, the magnitude of interaction capacity determines the scope of a system (either regional or global), and then which units are inside this system can be identified more accurately.

"Sources of Explanation" and "Logic of Explanation"

Interaction capacity itself is not a sufficient basis for the construction of new theories that save neorealism. Following Buzan's thinking, as the interaction capacity strengthens, the cost of trade and investment becomes lower and exchange increases,

[65] Buzan, "The Level of Analysis Problem in International Relations Reconsidered," pp. 204-205.
[66] Buzan, "Rethinking System and Structure", pp. 67-68
[67] *Ibid.*, pp. 71-79.

thereby contributing to an economic interdependence that stabilizes the system.[68] This argument is actually liberalist and directs the attention on interaction capacity to the civil aspect of transportation and communication. This aspect is similar to, but not the same as, the military aspect, which is often the major concern in realist writings. Since there are diverse aspects within a particular source of explanation, there should be "something" out there for theories to focus on.

What exactly is this "something" that can guide a theory in generating explanations within a particular source of explanation? As we proceed with Buzan's argument, he provides another source of explanation: "process," defined as "how units actually interact with one another within the constraints of interaction capacity and structure, and particularly on durable or recurrent pattern in the dynamics of interactions."[69] This is odd because actions (or considered collectively as outcomes), either changing or enduring, are the objectives to be explained. How could "actions" also be "sources" of explanation? This is actually a tautology. Either the actual interaction is cooperative, as in trading and investing, or the interaction is conflicting, as in the formation of rival alliances and wars. These enduring or changing patterns are what ought to be explained by theories.

Thus, rather than a source of explanation, "process" is a way to understand how certain aspects in a given source of explanation would affect the actual interaction between units. For example, arms build-ups, force deployment to other regions, and alliance formation are all "processes" in the balance-of-power. These processes are the logic that illustrates why different power structures like bipolarity or multi-polarity affect the stability of a system. Borrowing Buzan's phrase, two things are confused again: interaction capacity is a "source of explanation," and process is a "logic of explanation." In Waltz's and Mearsheimer's theories, "structure" is the source of explanation, and the "balance-of-power" process is the logic of explanation. There can be other "logics of explanation" in the same "sources of explanation," and different "sources of explanation" can also share the same "logic of explanation." This logic will lead to new variables.

The Logic: Offense-defense Balance

The last step required to build new theories is to find alternative "logics of explanation" that are different from the balance-of-power, and the offense-defense balance is our prime candidate. While balance-of-power largely focuses on the formation or clustering of military capabilities prior to their use, offense-defense balance largely focuses on the potential utilities of military capabilities if they are

[68] *Ibid.*, pp. 69-70.
[69] Buzan, "The Level of Analysis Problem in International Relations Reconsidered," p. 205.

actually used. Unfortunately, while the meaning of balance-of-power has varied over centuries,[70] offense-defense balance has been treated as a variable from its inception in the late 1970s.[71] Originally, the offense-defense balance was thought to be determined by technology and geography, but more factors have been included, such as number of troops, force posture and organization, doctrine, ideology, society, nationalism, and even perception.[72] The offense-defense balance becomes increasingly complicated and hard to measure. Although the balance itself is arguably similar to "power" conceived as a collective concept,[73] there is no available macro indicator similar to gross domestic product (GDP).

All the complicated factors are often fused into a brief, categorical manner such as "offense-dominant" or "defense-dominant," largely based on those authors' personal judgments.[74] Nonetheless, the offense-defense balance is, by definition, always "defense dominant," as Clausewitz argued in his rigorous discussion, and must be treated as a continuous variable.[75] Unfortunately, there is actually no scale that can be used to measure the offense-defense balance. That is, to what extent does defense have an advantage over offense? Even if the 3:1 rule of thumb[76] is introduced and used to consider every period, there are still no parameters that can be used to gauge the level of defensive dominance within a given period.

Thus, it is impossible to display the balance as a real continuum, and the balance can only be considered in a comparison between two connected periods. For example, period A is more defense-dominant than period B and period C more so relative to B, but the balance between period C and A is still undetermined. The balance in this case is still categorical, i.e., "more (or less) defense-dominant." Considering a variable in such a brief and relative manner is not necessarily a weakness,[77] and these determinations are actually possible and acceptable, and can be carried out in the same way as the determination of whether the system is unipolar, bipolar, or multi-polar. Indeed, polarity has not been measured according to a coherent standard, but this is correctable, and the actual sum of poles can also be identified.

One might now wonder why the balance-of-power has not been required to be

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[70] Indeed, Stephen Walt was measuring the balance of military power, but the balance in his theory is a dependent variable in nature. See: Walt, *The Origins of Alliances.*

[71] Jervis, "Cooperation under the Security Dilemma," p. 188.

[72] Snyder, *The Ideology of the Offensive: Military decision Making and The Disasters of 1914*; Evera, "Offense, Defense, and the Causes of War," p. 16; Glaser and Kaufmann, "What is the Offense-Defense Balance and Can We Measure It?" p. 60.

[73] Davis, Jr. *et al*, "Correspondence: Taking Offense at Offense-Defense Theory," pp. 196-197.

[74] Those arguments are summarized by: Yoav Gortzak, Yoram Z. Haftel and Kevin Sweeney, "Offense-Defense Theory: An Empirical Assessment," *Journal of Conflict Resolution,* Vol. 49, No. 1 (February 2005), p. 87.

[75] Lynn-Jones, "Offense-Defense Theory and Its Critics," pp. 666, 688.

[76] John Mearsheimer, "Assessing the Conventional Balance: The 3:1 Rule and Its Critics," *International Security*, Vol. 13, No. 4 (Spring 1989), p. 72.

[77] Glaser and Kaufmann, "What is the Offense-Defense Balance and Can We Measure It?" pp. 78-79.

quantified as rigidly as the offense-defense balance. This is simply because the offense-defense balance is mistakenly treated as a variable. A systemic theory that treats the balance as a variable is actually divided into two phases. In the first phase, the balance serves as a dependant variable explained by other factors. In the second phase, the balance serves as independent variable explaining stability.[78] In the first phase, the theory is actually explaining the results of real wars, because there are no simulations or direct statistical data available on the balance, and scholars have no choice but calculating the combat records to represent the balance.[79] However, such a two-phased application is redundant; it only makes a theory complicated and directs our attention away from the key issue. A theory does not need to include every link in the logic chain,[80] and measuring the balance can simply be bypassed.

In contrast, when structural theories (like Waltz's or Mearsheimer's) attempt to measure the power structure, they are measuring neither "power" nor "balance" *per se*, but polarity. As Waltz argued, identifying the great powers of an era may be rather easy, because a loose determination of overall polarity can be made rather than a precise calculation of the quantity of power.[81] Exactly how much the power of different states balance with each other is not really a concern. That is, balance-of-power in current theories is treated as a logic of explanation, and the variable measured is "polarity" in the structural source of explanation. Similarly, if the offense-defense balance is also treated as a "logic of explanation," instead of measuring the balance we can consider only a few simple variables derived from technology, geography, and distribution of power, which belong to either "interaction capacity" or "structure," the two sources of explanation. This style fits the realist tradition of focusing on material capabilities mentioned earlier.

Attempts at Theory Building

Taking the interaction capacity as another source of explanation and the offense-defense balance as an alternate logic of explanation, a new systemic theory of stability can be proposed, called "interaction-structure theory." (In contrast, the current theories from Waltz or Mearsheimer are called "structure theory") Interaction-structure theory alters the conception of the system. The system is now assumed to consist of only interaction capacity, structure, and units. Both interaction capacity and structure are on the system level (See Table 1). Three explanatory

[78] Biddle, "Rebuilding the Foundations of Offense-Defense Theory," pp. 744-745.
[79] Karen Ruth Adams, "Attack and Conquer?" *International Security*, Vol. 28, No. 3 (Winter 2003/2004), p. 51.
[80] David Singer, "The Level-of-Analysis Problem in International Relations," *World Politics*, Vol. 14, No. 1 (October 1961), p. 89.
[81] Waltz, *Theory of International Politics,* p. 131.

variables and their corresponding hypotheses and conceptions are explored from these two sources of explanation, according to the logic of offense-defense balance. The following sections will propose these variables, hypotheses, conceptions, and some operational suggestions. (Summarized as Table 2)

Table 1: Conceptions of Systems.

Systemic **Interaction-Structure Theory** of Stability			Systemic **Structure Theory** of Stability	
System consists of			System consists of	
System Level	**Interaction Capacity**	**Structure**	System Level	**Structure**
Unit Level	Units		Unit Level	Units

Table 2: Theories of International Politics.

Name of Theories / Descriptions	Systemic **Interaction-Structure Theory** of Stability			Systemic **Structure Theory** of Stability
Sources of Explanation	**Interaction Capacity**	**Structure**		
Logic of Explanation	**Offense-defense Balance**			**Balance of Power**
Conception of **Independent Variables**	Technology	Geography	Distribution of Power	
	System's Mobility (Range of Principal Means of Delivery)	System's Density (Distance between Poles)	System's Fragmentation (Scale of Poles)	System's Polarity Sum of Poles
Stability as a **Dependent Variable** and its Conception	**Threats to Peace** (The Ratio of Military Power Relative to Latent Power)			**Avoidance of Wars** Number, Frequency, and Deadliness of Wars

*Inside the bracket is the summary of operational suggestions for future testing according to the meanings of those variables.

Interaction Capability/Technology/Mobility:
The Higher the Mobility, the Lower the Stability

Following the neorealist notion of anarchy and the realist tradition of materialism, the central concern regarding interaction capacity is the use of military capability through a technological perspective. Units interact through armed forces. According to the logic of offense-defense balance, the higher the capability to exercise force in the system, the lower the stability will be in the system.

Although the technologically determined interaction capacity is conceived as system wide (system level), the uses of military capability still have to be abstracted into a clean, simple concept as an explanatory variable. We propose the concept of

"mobility:" the ability to deliver destruction. This comes from Buzan's original concept of moving "goods and information," where goods in military terms are soldiers, vehicles, projectiles, kindling, explosives, poison gases, pathogens, or nukes. Similarly, "information" in military terms is about the function of command, control, coordination, and communication, and can be performed by messengers, beacon towers, carrier pigeons, telegraphs, radios, and computer networks. These two dimensions can be subsumed into one. Since information itself is not lethal, the movement of destructive goods is enough to capture both goods and information.[82] Movement of information is a supporting element in directing the delivery of destructive goods, either by commanding troops and vehicles or by guiding the munitions.

Indeed, the movement of troops and munitions are generally conceived of as separate: the former fall under the common usage of mobility, and the latter is referred to as firepower.[83] The two concepts then became two different variables in the offense-defense theory; the former is said to favor offense, and the latter is said to favor defense. Nonetheless, there is only one form of logic underlying the offense-defense balance rather than two: increases in mobility and firepower both favor offense. The notion that firepower favors defense is either redundant or inconsistent,[84] because it ignores the range of firepower. On one hand, when the range of firepower is insufficient, firepower does favor defense because it stops the enemy from advancing. However, under these circumstances, the increase in firepower simply decreases the enemy's mobility, so the notion that firepower favors defense becomes surplus. On the other hand, when the range is sufficient, firepower-delivering weapons are able to hit any target without the need to move forward, and the idea of stopping them from advancing ceases to be valid. With sufficient range, projectiles are now moving forward, and it is hard to stop a projectile with another projectile. Under these circumstances, the notion that firepower favors defense becomes contradictory: an increase in firepower actually favors offense.

For this reason, only one form of logic makes sense. Increases in mobility and firepower both favor offense, and the two are simply different aspects of the same phenomenon. For example, an aircraft carrying and dropping bombs can be understood as a reusable gun-shell, while a guided missile can be understood as a

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[82] This is similar to the combination of transportation and communication. See: Thomas Falk and Ronald Abler, "Intercommunications, Distance, and Geographical Theory," *Geografiska Annaler. Series B, Human Geography*, Vol. 62, No. 2 (June 1980), pp. 59-67

[83] Barry Buzan, *An Introduction to Strategic Studies: Military Technology and International Relations* (Basingstoke: Macmillan Press, 1987), pp. 19-25.

[84] Richard K. Betts, "Must War Find a Way?" *International Security*, Vol. 24, No.2 (fall 1999), pp. 179-180.

one-trip bomber.[85] The firing of cannons or the flight of projectiles can be considered as both firepower and mobility. In other words, the question is only one of terminology in choosing between mobility and firepower. Mobility better fits the concept of interaction capacity, and is a suitable way of thinking about firepower, all forms of which require moving something towards a target. Whether the destructive effect is achieved when soldiers throw spears at an enemy or when nuclear-armed intercontinental ballistic missiles hit a city, a destructive good is being delivered. Therefore it is reasonable to situate firepower under the rubric of mobility.

Based on this perspective, mobility as an explanatory variable can be operationalized as the "range" of the principal means of delivery determined by the available technology in a given period. Following Morgenthau, these "principal means of delivery" in different periods include smooth-bored cannons on horse-driven carriages, rifled cannons on railway cars or battle ships, bombers powered by propellers, nuclear-armed jet bombers, and nuclear intercontinental ballistic missiles.[86] The range of these "principal means of delivery" can be numerically measured, and thus potential problems of ambiguity or subjectivity can be avoided. In addition, the numerically measured range can also be easily combined with other numerically measured variables, making it possible to test the theory rigorously.

The above-mentioned concepts and operational suggestions are largely focused on the "direct" use of armed force, but there is also an "indirect" use at play that is helpful to consider in defining the scope of systems. Artillery, aircraft, and missiles can deliver destruction from their positions but can also be transported before their actual use. This transport is "indirect" use of armed force and can also have an impact on the interaction capacity. Although military equipment is not ready for use during transportation, it can aid the ability to interact between units after unloading. This distinction is useful because mobility may not be strong enough to let two units interact directly but may be strong enough to let them interact indirectly, thus enlarging the scope of the system. Similarly, mobility may already be strong enough for indirect interaction, but can be even higher for direct interaction. Regarding this indirect use of armed force, military transportation is identical to civil transportation as in Buzan's original notion of interaction capacity. Then, technological breakthroughs in civil transportation like steam-powered ships or railways become the basis for deciding the scope of a system during a given period.

Structure/Geography/Density:
The Higher the Density, the Lower the Stability

[85] J.F.C. Fuller, *The Conduct of War, 1789-1961: A Study of the Impact of the French, Industrial, and Russian Revolutions on War and its Conduct* (New York: Da Capo Press, 1992), p. 240.
[86] Morgenthau, *Politics Among Nations,* pp. 373-376.

Following the notion of interaction capacity, geography can be understood as the environment where the capacity is acting, and a given interaction capacity operating in different environments will result in different overall interaction capacities. Geography is traditionally understood as obstacles to interaction, i.e., mountains, rivers, oceans, etc. Thus, according to the logic of offense-defense balance, the proposition is that the lower the geographical obstacles, the greater the overall interaction capacity, and thus the lower the stability will be in the system.

However, in this traditional conception, geography cannot be systemic. Despite local systems such as a mountainous city-state system of ancient Greece, a plains city-state system of ancient Mesopotamia, or an imaginary island-state system,[87] geographical characteristics are never distributed evenly throughout the system, even in regional terms. Thus, a novel conceptualization is needed that must be more abstract. Terrains may be different from place to place, but distance is one geographic dimension that can be understood systemically. With distance serving as a basic concept, the different terrains can be weighted (for example, plains as 1, mountain as 2, water area as 1.5, etc.) to produce a more systemic measurement of the geographical obstacles. The greater the distance (or the larger the weighted value of the distance), the lower the overall interaction capacity, and thus the greater the stability.

Distance is also numerically measured and thus can be combined with the range of principal means of delivery. Distance and the technologically-determined mobility are often fused into one concept, the "time-space convergence" model. That is, the time needed to cover a given distance varies according to the methods of transportation.[88] On this basis, when the average distance between units is constant, the change in range of principal means of delivery alters the overall interaction capacity. Similarly, when the range of principal means of delivery is constant, the change in average distance between units alters the overall interaction capacity. Even when distance and range vary simultaneously, these two variables can still be objectively considered by weighting their relative variance. For instance, when the increase in distance outpaces that of range, the system should still be more stable. The international system in late 19th century may be an example. While the system enlarged from a European one to a global one due to the revolution in civil transportation, nuclear intercontinental ballistic missiles did not yet exist, and the principal means of delivery was still cannons, of which the range only increased

[87] Jervis, "Cooperation under the Security Dilemma," pp. 194-195.
[88] Patrick O'Sullivan, *Geopolitics* (London: Croom Helm, 1986), p. 9; John C. Lowe and S. Moryadas, *The Geography of Movement* (Boston: Houghton Mifflin, 1975). Donald G. Janelle, "Spatial Reorganization: A Model and Concept," *Annals of the Association of American Geographers*, Vol. 59, No. 2 (June 1969), pp. 348-364.

marginally.

Distance is itself a clear and easily measurable concept, but it can be measured in different ways. Measuring the distance between frontiers or borders of states may be an option but this is more of a legal concept. The operational suggestion provided here is the distance between the units' "wealth-generating areas." [89] Interaction capacity is generated from the material resource of states, and those wealth-generating areas are thus the proper starting points to exercise the interaction capacity. The distance can be measured as the two nearest points anywhere in the wealth-generating areas of any two states. From this notion, the abstraction of geography is then "density," i.e., how close the wealth-generating areas are. A system with densely populated units is then less stable then a system with dispersedly populated units. Furthermore, since geography is understood as the environment but not the interaction capacity *per se*, density, which is about the spatial distribution, is reasonably categorized as structural.

Structure/Distribution of Power/Fragmentation:
The Higher the Fragmentation, the Lower the Stability

Given that the offense-defense balance is the logic of explanation, a new variable and its inference can also be explored from the traditional notion of power structure. The variable is the scale of units in a system, termed "fragmentation" of system. The proposition is that the bigger the units, the greater the ability to absorb attacks, and thus the greater the stability. Namely, a less fragmented system with bigger units is more stable than a more fragmented system with smaller units.

Throughout history, the scale of units has steadily increased from tribes to cities, from cities to nations, and from nations to multi-national empires. Empires can also be broken down into smaller units as happened in Rome and ancient China several times. Disorders and wars often followed these breakdowns. Years have passed since the European nation-states became the major unit type; there is now a trend toward regional integration, which may indicate the burgeoning development of new superpowers. Nonetheless, these changes in the scale of units in different periods are never systemically treated as an independent variable.

For example, the change in the scale of major actors in a system is conceptualized by Gilpin as "systems change," but he suggested that the process of change causes instability, as opposed to the idea that any certain scale is inherently more stabilizing than others.[90] Similarly, according to the conventional wisdom in Waltz's theory, the size of units is simply not considered. The distribution of power is

[89] Mearsheimer, *The Tragedy of Great Power Politics*, pp. 144
[90] See: Gilpin, *War and Change in World Politics,* pp. 39-44, 50-51, 228-230.

understood only as the "sum" of poles, that is, how many relatively large units populate the system. A system with two relatively powerful states is bipolar regardless of whether they are city-states, nation-states, or superpowers. Thus, as Waltz suggests, the integration of Europe is negative regarding stability, because this transforms a bipolar system into a multi-polar one.[91] Even though there are three superpowers, the system remains the same as a multi-polar system consisting of nation-state sized powers.

Actually, the listing of bipolarity as more stable by Waltz does not entirely focus on the "bipolar" nature but also on the necessity for "big poles." Although the enlargement of units may be accompanied by diminishing numbers of units, these two are different, as Waltz acknowledged.[92] For example, Waltz argues that bipolarity is more stable because poles can be self-efficient in their economies, they do not need to import natural resources, and they can develop complex weapons independently.[93] This virtue has nothing to do with bipolarity but rather with superpower status. Larger units are harder to defeat in one or two military strikes and they find it easier to recover and survive than small units.[94] One can imagine that if the units in an anarchic system are single humans, as in prehistoric times, there is no room for an individual to rest or rotate during a conflict. As the units become bigger, the pressures of conflict will lessen.

The scale of units can also be numerically measured in terms of area, and the square root of area is then also combinable with range and distance. However, even if scale is a clear and easily measurable concept, we must still agree on what to measure. Similarly to distance, the territory of states may be readily measured, but is still more of a legal concept. For example, England at its height as an empire had territory everywhere around the world, but its industrial bases was concentrated in its homeland. Similarly, Russia now has a territory of about 17 million square kilometers, but much of its production and economic activities take place west of the Ural. Thus, the operational suggestion is that the scale should also be measured according to the "wealth-generating areas" of states. In the case of most city-states or nation states, this will be largely identical to their territories, but for states that cover millions of square miles, sparsely populated areas should not be considered.[95]

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[91] Waltz, *Theory of International Politics,* pp. 201-202.
[92] Waltz, *Theory of International Politics,* pp. 131-139.
[93] *Ibid.*, 158-160.
[94] Jervis, "Cooperation under the Security Dilemma," pp. 172-173.
[95] This is similar to the concept of dividing the "rimland" of Eurasia from the steppes and desert of inner Asia as suggested by Spykman. See: Nicholas J. Spykman, *The Geography of the Peace* (New York: Harcourt, Brace and Company, 1944), pp. 40-44.

Major Actors

Density and fragmentation, by their definitions suggested above, can be measured in a complete manner by considering the average distance between and the average scale of the "wealth-generating areas" of every state. Nevertheless, a shortcut may be appropriate. Neorealism is always interested in the "major actors" in the system, that is, the great powers are the units of concern.[96] Density and fragmentation can thus be operationally calculated for only these powers and still capture most of the essence of the system. The flaws of inconsistency in identifying polarity discussed previously seem to return, but they are resolved with the different logic employed. Whether there are two or three and more great powers is crucial to Waltz's theory but is not a problem here because density and fragmentation generate explanations even if the system is "always" multi-polar. Then, gaps between major actors are acceptable, and even loosely defined parameters are sufficient to determine great power status as long as the standard is consistent.

The choice is now between the two concepts of latent power and military power. The point here is that latent power alone, wealth along with a compatible level of technology, is sufficient to identify great powers. As Kennedy's classic work on the rise and fall of great powers suggested, wealth and technology often foretell the emergence of new competitors within the global arena.[97] In addition, whether to translate latent power into military power are actions of states. Excluding military power from the definition of great powers avoids the pitfall of tautology to which Mearsheimer's argument was vulnerable. A compatible level of technology can be identified in a state's indigenous ability to produce state-of-the-art principal means of delivery, and wealth can be measured using macro indicators like GDP; this is a well-established approach to estimating the overall output of a nation. Given the macro value of wealth, the average distance and scale can be adjusted and weighted according to the relative share of wealth possessed by each great power. This approach can give a more accurate picture of the density and fragmentation of a system and can generate explanations according to the different relative share of wealth even within the same set of great powers.

Stability

Since military power is outside the definition of polarity, a different conception to enrich the poverty of stability is readily available. The new option is "threats to peace,"[98] with military power the main threat to peace. Regarding stability, the

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[96] Waltz, *Theory of International Politics*, pp. 130-131.
[97] Paul Kennedy, *The Rise and Fall of the Great Powers: Economic Change and Military Conflict from 1500 to 2000* (New York: Random House, 1987), pp. xv-xxv.
[98] Kegley & Raymond, "Must We Fear a Post-Cold War Multi-polar System?" p. 576.

concept "threats to peace" has three advantages over the current concept "avoidance of wars." First, "threats to peace" subsumes avoidance of wars: whether in use (war) or not (arms race), the buildup of military power threatens the peace. Second, "threats to peace" distinguishes between stability and peace. If there is no war, the system is peaceful, but a massive buildup of military power during peacetime is still a threat to peace, and the system is unstable. Third, "threats to peace" is distinguishable in terms of magnitude during peacetime. Different extents of military buildup reveal different degrees of stability.

In other words, stability as the dependent variable should be conceptualized as the ratio of military power relative to latent power. The ratio reveals the stability of system. Whether a state in an unstable system aims to expand or defend itself, the answer is to convert more latent power into military power,[99] and this would be a collective systemic outcome. Defining stability in this manner has a further advantage: no matter where the military power is deployed or used, it is all included in the theory. The scope of this theory will not be limited as occurs in Mearsheimer's regional perspective. The ratio can be measured using two macro indicators conceived by Goldsmith: "defense burden," defined as the percentage of GDP spent on military spending, and "human defense burden," defined as the percentage of the population in military service.[100] The actual choice will depend on the time scope and the availability of data.

The U.S. defense burden is illustrative. After the Second World War, the average U.S. military spending as a percentage of GDP was about 6%, significantly higher than that in the prewar era and the 19th century, revealing the tensions that existed during the Cold War. The defense burden rose to 9% in the 1950s and 1960s during the Korean and Vietnam Wars and then diminished to about 5% during the détente between the superpowers after the 1960s. In the 1980s, the defense burden rose again to 7% in tandem with the arms build-up of the Reagan Administration and the revival of the Cold War after the Soviet invasion of Afghanistan. Then, the defense burden dropped to about 3% when the Cold War ended, after which it rose slightly to 4% when the ongoing Global War on Terrorism began in 2001.[101] During the long peace between the great powers after the Second World War, the variations in the stability of the system are still clearly represented by the U.S. defense burden. The stability of systems in other eras can also be represented in a similar manner.

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[99] David Shambaugh, *Modernizing China's Military: Progress, Problems, and Prospects* (London: University of California Press, 2004), pp. 187-194.

[100] Benjamin E. Goldsmith, "Defense Effort and Institutional Theories of Democratic Peace and Victory: Why Try Harder?" *Security Studies*, Vol. 16, No. 2 (April-June 2007), pp. 200-201.

[101] Data from: "History Tables, Budget of The United States Government," *Government Printing Office*, hhttp://www.gpoaccess.gov/USbudget/fy06/pdf/hist.pdf, pp. 42-52.

Conclusion: Why Labels Matter

This article finds that the division between offensive and defensive realism is unnecessary. Regarding the neorealist theories of international politics, the task is still the quest for a parsimonious theory with greater explanatory power. Nonetheless, from Waltz to Mearsheimer, there has, in fact, been no advance at all. Thus, to get rid of the offensive and defensive labeling, this article proposes a parsimonious alternative within the realist material tradition. "Interaction-structure theory" uses systemic variables to explain the variation of stability in international systems. This article argues that interaction capacity is both a source of explanation and the precondition of a system. Furthermore, the offense-defense balance should be a logic of explanation rather than a variable. From this framework, three variables and their corresponding hypotheses, conceptions, and some operational suggestions are provided for future testing (summarized above in Table 2).

Before concluding, one last issue must be addressed. Why the somewhat cumbersome name: systemic "interaction-structure theory" of stability? As this new theory is clearly within the realist materialist tradition and the neorealist notion of systemic theory, why not add other prefixes and adjectives like neo, classical, neoclassical, or postclassical to realism to name this theory? Furthermore, since the underlying logic of explanation is the offense-defense balance, why is the theory not called another version of offense-defense theory? The answer is that labels matter! As shown in the debates between offensive and defensive realism, improper and unnecessary labels draw our focus away from the key questions. These "adjective + realism" formulas tell us nothing about the precise content of a theory because they refer to a broad family of many theories. The "adjective + realism" form is only a name for a research paradigm or tradition but not a proper name for a theory. The new theory proposed is indeed in line with neorealism, but there are multiple "neorealist" theories, and each theory should have its own name. The phrase "offense-defense theory" also tells us nothing about the theories' precise content, and so many theories with different purposes that stem from different traditions are all included under this heading.[102] In contrast, the systemic "interaction-structure theory" of stability does give an accurate description and a clear picture of this new theory. It is "systemic," tells us about the "stability" in international systems, and it explores variables based on "interaction" capacity and "structure." This form of naming will facilitate helpful exchanges regarding theoretical developments.

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[102] Sean M. Lynn-Jones, "Does Offense-Defense Theory Have a Future?" *CIAO: Columbia International Affairs Online*, http://www.ciaonet.org/wps/lys03/lys03.pdf (March 29, 2004), pp. 7, 18-34, 36-37.

Implementation of the Interaction-Structure Theory in International Politics: 1816~2008

Abstract

This article implements the interaction-structure theory, which is based on Waltz's structure theory with the concept of interaction capacity added. After illustrating the concepts and logic, the article provides measurements on each of the key concepts: mobility, density, and fragmentation as independent variables, and stability as dependent variable. Methods are then introduced to combine the three independent variables into a sole value and the hypothesis is stated. This in turn is tested with data from 1816 to 2008. The result is very positive, revealing the superiority of interaction-structure theory in capturing the mega-trend within the system. Further advances in international relations theory are expected.

I. Introduction

The end of the cold war shattered the illusion of a satisfactory theory. Waltz's neo-realism,[103] once dominating, is now ill at ease with current events and struggles with difficulty to grasp these events. After years of frustration and setbacks in explaining the international system as a whole, much of the scholarly efforts are devoted to theories of smaller scope and ambition with multiple institutional and ideational factors to explain only specific policies of certain states. These efforts do have positive fruitage,[104] but the field in which to reap a new grand theory such as Waltz's, especially the realist field, remains drowsy.[105]

Actually, neither the end of the cold war *per se* nor the Soviet's decision to stop the rivalry in such a rapid way troubles Waltz's grand theory.[106] Much the same as

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[103] Kenneth N. Waltz, *Theory of International Politics* (New York: McGraw-Hill Publishing Company, 1979).

[104] These efforts are the so-called neoclassical realism. See: Gideon Rose, "Neoclassical Realism and Theories of Foreign Policy," *World Politics*, Vol. 51, No. 1 (October 1998), pp. 144-172; Steven E. Lobell, "War is Politics: Offensive Realism, Domestic Politics, and Security Strategies," *Security Studies*, Vol. 12, No. 2 (Winter 2002/03), pp. 165-195; Jeffrey W. Taliaferro, "State Building for Future Wars: Neoclassical Realism and the Resource-Extractive State," *Security Studies*, Vol. 15, No. 3 (July-September 2006), pp. 464-495; Steven E. Lobell, Norrin M. Ripsman, Jeffrey W. Taliaferro eds., *Neoclassical Realism, the State, and Foreign Policy* (New York: Cambridge University Press, 2009).

[105] That is, theories of international politics, sometimes called "general theory." The term "grand theory" is adopted here. See: Colin Elman, "Horses for Courses: Why Not Neorealist Theories of Foreign Policy?" *Security Studies*, Vol. 6, No. 1 (Autumn 1996), pp. 7-53; Kenneth N. Waltz, "International Politics is Not Foreign Policy," *Security Studies*, Vol. 6, No. 1 (Autumn 1996), pp. 54-57; Colin Elman, "Cause, Effect, and Consistency: A Response to Kenneth Waltz," *Security Studies*, Vol. 6, No. 1 (Autumn 1996), pp. 58-61; Jeffery W. Taliaferro, "Security Seeking under Anarchy," *International Security*, Vol. 25, No. 3, (Winter 2000), p. 135. John J. Mearsheimer, *The Tragedy of Great Power Politics* (New York: W.W. Norton & Company, 2001), pp. 9-10.

[106] Critiques and debates, see: John Lewis Gaddis, "International Relations Theory and the End of the

with the end of World War Two and the Japanese surrender before invasion and occupation, grand theories like Waltz's do not deal with this issue. Although it occurred in a different manner, the cold war ended with the Soviets defeated like Italy, Germany, and Japan in the Second World War, and the internal characters or even personal styles explained their different ways of giving in.[107] Grand theory only deals with the mega-trend, but it is just this new trend in the system that besets Waltz's theory. Changes in the structure of the system occurred from time to time, just like the conclusion of World War Two resulted in a bipolar system replacing the multipolar one, but what is the new structure of the post–cold war era if it is still anarchic? The only answer consistent with Waltz's scheme is the multipolar system, but the great power rivalries that characterized the pre-war multipolar system are absent. Why? What Waltz can only say is the time has yet to come.[108]

To consider only the structure as polarity is both the virtue and the guilt of Waltz's theory. Theories should be parsimonious and still explain much of the world. To save neo-realism, an equally elegant theory with greater explanatory power is desirable,[109] and it is also crucial to avoid the introduction of any institutional or ideational concepts to keep in line with the realist materialist tradition.[110] Thus, this article tries to introduce a new theory, called the "interaction-structure theory." The theory adds the concept of interaction capacity as the precondition of the system and the new source of explanation, and uses the offense-defense balance as a different

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Cold War," *International Security*, Vol. 17, No. 3 (Winter 1992/93), pp. 5-58; William C. Wohlforth, "Realism and the End of the Cold War," *International Security*, Vol. 19, No. 3 (Winter 1994/95), pp. 91-129; Robert Jervis, "Realism in the Study of World Politics,"(International Organization at Fifty: Exploration and Contestation in the Study of World Politics) *International Organization*, Vol. 52, No. 4 (Autumn, 1998), pp. 971-991; Robert Jervis, "Realism, Neoliberalism, and Cooperation: Understanding the Debate," *International Security*, Vol. 24, No. 1 (Summer 1999), pp. 42-63; Stephen G. Brooks and William C. Wohlforth, "Power, Globalization, and the End of the Cold War: Reevaluating a Landmark Case for Ideas," *International Security*, Vol. 25, No. 3 (Winter 2000/01), pp. 5-53; David A. Lake, "Beyond Anarchy: The Importance of Security Institutions," *International Security*, Vol. 26, No. 1 (Summer 2001), pp. 129-160; Michael C. Williams, "Why Ideas Matter in International Relations: Hans Morgenthau, Classical Realism, and the Moral Construction of Power Politics," *International Organization*, Vol. 58, No. 4 (Autumn 2004), pp. 633-665; William J. Brenner, "In Search of Monsters: Realism and Progress in International Relations Theory after September 11," *Security Studies*, Vol. 15, No. 3 (July 2006), pp. 496-528; Mark L. Haas, "The United States and the End of the Cold War: Reactions to Shifts in Soviet Power, Policies, or Domestic Politics?" *International Organization*, Vol. 61, No, 1 (Winter 2007), pp. 145-179.

[107] Ethan B. Kapstein, "Review: Is Realism Dead? The Domestic Sources of International Politics," *International Organization*, Vol. 49, No. 4 (Autumn 1995), pp. 751-774.

[108] Kenneth N. Waltz, "Structural Realism after the Cold War," *International Security*, Vol. 25, No. 1 (Summer 2000), pp. 5-41.

[109] As Waltz noted, theory should be parsimonious but explanatory power is the ultimate goal. Thus, adding something would defiantly make an elegant theory less parsimonious, but a slightly less parsimonious theory with much greater explanatory power is still justifiable. See: Kenneth N. Waltz, "International Politics is Not Foreign Policy," pp. 54-57.

[110] Jeffrey W. Legro and Andrew Moravcsik, "Is Anybody Still a Realist?" *International Security*, Vol. 24, No. 2 (Fall 1999), pp. 16-18, 34.

logic of explanation. [111] This allows the theory to explore new systemic variables in the realist material tradition other than polarity. These new variables are "mobility," "density," and "fragmentation" in the system. In addition, the central concern of the grand theory, which is the stability of system, is also conceived in a new notion to encompass a more complete picture in the system, not merely the avoidance of wars. The scheme provides a tempting opportunity to build a new grand theory.

This article is mostly an implementation of the interaction-structure theory. After the introduction, the article is divided into eight more sections. Section II is a brief description of the theory, illustrating its concepts and propositions. Section III defines the time scope as 1816 to 2008 and introduces measurements on each of the key concepts: mobility, density, fragmentation as independent variables, and stability as dependent variable. Then mobility, density, and fragments are measured in Sections IV and V. In Section VI, methods are introduced to combine the three independent variables into a sole value and the hypothesis is stated. Then, stability is measured in Section VII, and the theory is subsequently tested with the statistic data in Section VIII. The result is very positive, revealing the superiority of interaction-structure theory in capturing the mega-trend within the system. To conclude, Section IX subsumes the strengths and limits of the interaction-structure theory and its implications to the studies of international relations theory.

II. Interaction-structure Theory: Brief Description

To keep the theory as parsimonious as possible, the interaction-structure theory is just a further development of Waltz's structure theory, that is, about the systemic pressures on the units. As the name suggests, the interaction-structure theory adds just one more element into Waltz's scheme: the interaction capacity. The magnitude of the capacity decides the scope of the system. The difference between structure theory and interaction-structure theory is shown in Table 1 and Figure 1.

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[111] For existing discussion on interaction capacity, see: Barry Buzan, "Rethinking System and Structure", in Barry Buzan, Charles Jones, and Richard Little, eds., *The Logic of Anarchy: Neorealism to Structural Realism* (New York: Columbia University Press, 1993), pp. 20-80; Barry Buzan, "The Level of Analysis Problem in International Relations Reconsidered," in Ken Booth and Steve Smith, eds. *International Relations Theory Today*, (Univ. Park, Pennsylvania: The Penn State University Press, 1995), pp. 198-215. For existing discussion on offense-defense-balance, see: Robert Jervis, "Cooperation under the Security Dilemma," *World Politics*, Vol. 30, No. 2 (January 1978), pp. 167-214; George H. Quester, *Offense and Defense in the International System* (New York: John Wiley & Sons, 1977); Sean M. Lynn-Jones, "Offense-Defense Theory and Its Critics," *Security Studies*, Vol. 4, No. 4 (Summer 1995), pp. 660-691; Stephen Van Evera, "Offense, Defense, and the Causes of War," Vol. 22, No. 4 (Spring 1998), pp. 5-43. Charles L. Glaser and Chaim Kaufmann, "What is the Offense-Defense Balance and Can We Measure It?" *International Security*, Vol. 22, No. 4 (Spring 1998), pp. 44-82; Stephen Biddle, "Rebuilding the Foundations of Offense-Defense Theory," *The Journal of Politics*, Vol. 63, No. 3 (August 2001), pp. 741-774.

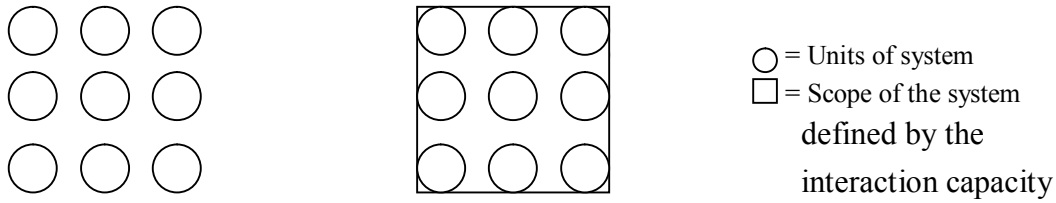
Table 1: Two Systemic Theories

Interaction-Structure Theory			Structure Theory	
	System consists of			System consists of
System Level	**Interaction Capacity**	**Structure**	System Level	**Structure**
Unit Level	Units		Unit Level	Units

Source: Author

Figure 1: Difference between the two Theories

Structure Theory Interaction-Structure Theory



Source: Author

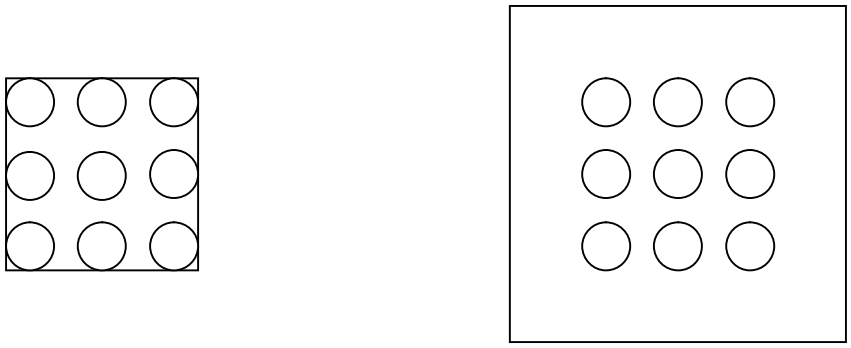
From the interaction-structure theory's conception on system, both interaction capacity and structure are systemic sources of explanation, and three different variables are explored with the offense-defense balance as the logic of explanation, unlike the traditional theory's balance of power. These three variables are: "mobility" – conceived as the interaction capacity allowed by technology; "density" – conceived as the spatial distribution of units; and "fragmentation" – conceived as the scale of units. These three variables and their causal logic are illustrated below.

a. Interaction Capability/Mobility:

Interaction capacity is conceived as "how much goods and information can be moved over what distances at what speeds and what costs."[112] Following the realist notion on anarchy, units interact with armed forces, and the central concern on interaction capacity is thus about the move of lethality, the "goods" in the military marketplace. Taking offense-defense balance as the logic of explanation, the higher the mobility in the system, the lower the stability in the system. This is illustrated as Figure 2.

[112] Buzan, "The Level of Analysis Problem in International Relations Reconsidered," pp. 204-205.

Figure 2: Conception of Mobility in Interaction-Structure Theory



System with weaker mobility
(illustrated by the smaller scope)

System with stronger mobility
(illustrated by the larger scope)

Source: Author

b. Structure/Density:

Density is conceived as the distance between the units. While mobility is about the interaction capacity itself, density is about the milieu in which the capacity operates. The farther the distance, the lower the interaction capacity, and thus, the higher the stability. A system with its units densely populated is less stable then a system with its units loosely populated. This is illustrated as Figure 3.

Figure 3: Conception of Density in Interaction-Structure Theory

System with higher density

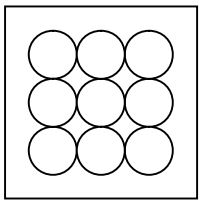
System with lower density

Source: Author

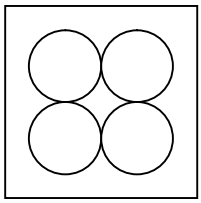
c. Structure/Fragmentation:

Fragmentation means the size of the units in a system. While mobility and density are about the exertion of interaction capacity, fragmentation is about the absorbing of interaction capacity. Big units can absorb more lethality than can small ones, and are thus harder to defeat in just one or two punches and can more easily recover and survive. A less fragmented system with bigger units is more stable than a more fragmented system with smaller units. This is illustrated as Figure 4.

Figure 4: Conception of Fragmentation in Interaction-Structure Theory



System with higher fragmentation



System with lower fragmentation

Source: Author

d. Stability: The Level of Threat to Peace

In interaction-structure theory, stability is conceived as "threats to peace," rather than just the avoidance of war.[113] This notion can encompass more pictures in the system. What threatens the peace? It is war and military power. Whether in actual use or not, the buildup of military power threatens the peace. A state in an unstable system acquires more military power either to expand or defend, and the overall level of military preparation in the system is thus an excellent indicator to describe the stability. For example, during and after the cold war, wars between the great powers were absent so the system was always peaceful, but the massive buildup of military power during the cold war disappeared so the system is now more stable.

III. Measurements of Variables and the Time Scope

After the outline of concepts and their causal hypotheses, measurements are discussed in this section. Measurements of variables are highly related to the time scope of testing because of the availability of data. Given that most statistical records only exist in the modern world, the time scope adopted is only from 1816 to 2008, using information largely from the National Material Capabilities (NMC) data set in the Correlates of War (COW) project.[114] Within this period, the following measurements are provided.

a. Mobility: Range of Principal Means to Deliver Lethality

Following the realist materialist tradition, interaction capability is determined by

[113] Charles W. Kegley & Gregory A. Raymond, "Must We Fear a Post-Cold War Multipolar System?" *The Journal of Conflict Resolution*, Vol. 36, No. 3 (September 1992), p. 576.

[114] "National Material Capabilities (v3.02)," *Correlates of War*, http://www.correlatesofwar.org /COW2%20Data/Capabilities/nmc3-02.htm; Forerunners of the project, see: J. David Singer, Stuart Bremer, and John Stuckey, "Capability Distribution, Uncertainty, and Major Power War, 1820-1965," in Bruce Russett ed., *Peace, War, and Numbers* (Beverly Hills: Sage, 1972), pp. 19-48; J. David Singer, "Reconstructing the Correlates of War Dataset on Material Capabilities of States, 1816-1985," *International Interactions*, Vol. 14, No. 2 (May 1987), pp. 115-132.

technology. Thus, the mobility in the system is largely about the weaponry. From a systemic perspective, the weaponry is not considered in detail, but only in general terms to identify the paradigmatic characters of technology that generate energy and drive weaponry, such as horse cavalry, gun powder, steam turbines, internal combustion engines, radios, nuclear bombs, rockets, computers, etc. – that is, very similar to the technological notion of revolutions in military affairs (RMA).[115] These technological characters then become the "principal means" to deliver lethality in each era, such as cannons, bombers, and missiles. How then do we indicate the mobility? The suggestion here is the "range" of those "principal means" to deliver lethality. By definition, mobility is about how much lethality can be moved over "what distances" at "what speeds and what costs." However, the speed and cost to move under a given technology set limits on the maximum operational distance affordable to the delivery means. Thus, the range itself is enough to represent the mobility in the system.

b. Defining the System: Breakthrough in Transportation

As described, interaction capacity determines the ambit of systems in interaction-structure theory, so some further discussion about mobility is needed. The range of principal means to deliver lethality is largely about the direct use of weaponry, but there is also an indirect dimension. This concept is helpful in defining the scope of the system. Cannons, bombers, and missiles can be ready to deliver destruction from where they are but can also be transported first and then deployed after unloading. The distinction between "direct" and "indirect" is meaningful, because the mobility may not be strong enough directly but strong enough indirectly, and thus it enlarges the scope of the system. In the "indirect" manner, mobility is synonymous to civil transportation. Then, certain technological breakthroughs like sailing vessels, steam-powered ships and railway can decide the scope of a system.

c. Density and Fragmentation: Major Actors

Within the scope of a given system, units are included. Then the density and fragmentation of the system can be calculated. Density is operationally defined as the **average distance between the states' "wealth-generating areas,"** and fragmentation is also operationally defined as the **average scale of states' "wealth-generating areas."**[116] By these definitions, density and fragmentation can be measured in a

[115] Andrew F. Krepinevich, "Cavalry to Computer: The Pattern of Military Revolutions," *The National Interest*, No. 37 (Fall 1994), pp. 30-42; Michael E O'Hanlon, *Technological Change and the Future of Warfare* (Washington D.C.: Brookings Institution Press, 2000), pp. 7-31; Robert R. Leonhard, *The Principles of War for the Information Age* (Novato: Presidio, 2000), pp. 5-8; Martin van Creveld, *Technology And War* (New York: The Free Press, 2002).
[116] Mearsheimer, *The Tragedy of Great Power Politics*, p. 144.

complete manner by counting all the states. Nonetheless, a shortcut may be appropriate. Realism is always interested in the "major actors" in the system, that is, great powers are units of concern.[117] How to identify great powers? Since military power is conceived as the indicator of stability, it is now outside the definition of great power. The criterion we suggest is only the economic might with comparable level of technology.[118] That is, those big states with sufficient potential to build military power independently are the major units. The technology level is thus determined by the indigenous ability to build those principal weaponry and transportation with the breakthrough importance of the time. Additionally, the wealth can be cited directly from existing scholarly works by a state's iron/steel production and energy consumption during the 1816~1960 period, and by gross domestic product (GDP) from 1960 to the present.[119] Given the relative wealth of each great power, the density and fragmentation are also weighted accordingly.

d. Stability: Military Burden

Stability is conceived as the overall level of military power within the system. This prompts the question: how much economic resource is converted into military power? To display the ratio, two macro indicators conceived by Goldsmith are equally useful in much of the time within the period we study: "defense burden" (DB), defined as the percentage of GDP that goes to military spending, and "human defense burden" (HDB), defined as the percentage of the population in military service.[120] As the indicators of relative wealth changed in 1960, the two indicators are also adopted in different periods. From 1816 to 1960, the HDB is adopted; from 1960 to 2008, the DB is adopted. The combined value is termed "military burden" (MB). By definition, HDB, DB, and MB can all be measured in a complete manner, but a similar shortcut of counting only the major units is also appropriate.

IV. Mobility in the System

The mobility in the system is measured by the "range" of the "principal means" to deliver lethality under the technological character in their time from 1816 to 2008. These "principal means" are cannons, bombers, nuclear bombers, and nuclear missiles.[121] Their range is summarized in Table 2 and explored in more detail in the

[117] Waltz, *Theory of International Politics*, pp. 130-131.
[118] Paul Kennedy, *The Rise and Fall of the Great Powers: Economic Change and Military Conflict from 1500 to 2000* (New York: Random House, 1987), pp. xv-xxv.
[119] Mearsheimer, *The Tragedy of Great Power Politics,* pp. 65-67.
[120] Benjamin E. Goldsmith, "Defense Effort and Institutional Theories of Democratic Peace and Victory: Why Try Harder?" *Security Studies*, Vol. 16, No. 2 (April-June 2007), pp. 200-201.
[121] Inspired from: Hans J. Morgenthau, *Politics Among Nations: the Struggle for Power and Peace,*

following sections.

Table 2: Range of Principal Means

	Cannons				Bombers	Nuclear bombers	Nuclear missiles
Period	*1810s~ 1860s*	*1860s~ 1890s*	*1890s~ 1900s*	*1900s~ 1930s*	*1930s~ 1940s*	*1940s~ 1950s*	*1950s~ Present*
Range	**3**	**5**	**10**	**30**	**2500**	**3000**	**13000**

Source: author

a. The Age of Cannons: Prior to the 1930s

In the 19th century and the early 20th century, the principal means of delivery was the cannon. Since more than a century is covered, this age can briefly be divided into four periods based on the barrels' length and their stiffness to withstand the explosive pressures speeding the projectiles. Besides, calibers and weights of cannons varied hugely. The rounds fired could be anything from two pounds for light field artillery to more than one ton for huge siege artillery. Thus, their range also varied. What we discuss here is the effective maximum of normal field and railway artillery pieces that could be relocated.

The first three periods fall within the 19th century. The cannons from the 1800s were mostly smoothbore, muzzle-loaded, and made of bronze,[122] and this "state of the art" remained largely static until the 1860s, when rifled, steel-made, breech-loaded barrels appeared.[123] Projectiles also evolved from ball-like to cylinders with sharp noses. These improvements increased the accuracy as well as the durability of the barrels, but overall, the range increased only moderately over time. To subsume them generally, the ranges of the different periods were 3 kilometers prior to the 1860s, 5 kilometers from the 1860s to the 1890s, and 10 kilometers from the 1890s to the 1900s.[124]

The technique to produce barrels improved rapidly around the beginning of the 20th century. With the introduction of novel metal fabrication, it became possible for longer and stronger barrels to accommodate more charge to speed the projectile, and the range increased accordingly.[125] The increase was significant, because this was the first time in human history that the weapon's range extended beyond the horizon: the cannons were largely fired at targets they could not see directly. This was a

(New York: Alfred A. Knopf, 1967), pp. 373-376.

[122] Bruce McConachy, "The Roots of Artillery Doctrine: Napoleonic Artillery Tactics Reconsidered," *The Journal of Military History*, Vol. 65, No. 3 (July 2001), pp. 619-620.

[123] Stanley L. Falk, "Artillery for the Land Service: The Development of a System," *Military Affairs*, Vol. 28, No. 3 (Autumn 1964), p. 107.

[124] For more information, see: Jeff Kinard, *Artillery: An Illustrated History of Its Impact* (Santa Barbara: ABC-CLIO, 2007), pp. 163-220.

[125] For more information, see: Bruce I. Gudmundsson, *On Artillery* (Westport: Praeger Publisher,1993), pp. 1-42.

meaningful threshold to define a new age.[126] At its extreme, a huge, railway transported cannon could deliver a projectile to more than a hundred kilometers with extremely high barrel wear, which was not really practical.[127] More practical designs had a range of up to 30 kilometers, and this was the range of the cannon from the 1900s to the 1930s.

b. The Age of Bombers: 1930s~1940s

The limits of cannons in delivering projectiles were twofold. Firstly, to increase the range meant to increase the pressure within the barrel, giving the projectile more kinetic energy, but the friction between barrel and projectile also consumed the energy. Thus, as the range increased, the wear of barrel increased rapidly until it reached an unacceptable level. Thus, the range could not increase any further no matter how huge or heavy the barrel was. Bigger cannons only delivered heavier shells. Secondly, the projectiles only sped up within the barrel, but the air resistance was highest at sea level. A projectile could not speed up again once it reached higher altitude where the air resistance is much lower. In contrast, an airplane is a totally different way of delivery. An airplane is constantly propelled during its flight, and, ideally, the range can increase indefinitely as more fuel is carried.

However, bomber aircrafts were not the "principal means" but were largely for liaison and reconnaissance only during their early age.[128] Due to the fragile materials used and the weak power of the engines equipped, as well as the difficulties in communication and navigation, airplanes did have longer range but could hardly deliver enough lethality with their small payload.[129] Things changed in the 1930s, when metal frames and skins, supercharged engines, and radio devices all matured.[130] These technologies made bombers the "principal means" of delivery. The range of

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[126] Jonathan B. A. Bailey, "The First World War and The Birth of Modern Warfare," in MacGregor Knox & Williamson Murry, eds., *The Dynamics of Military Revolution 1300-2050* (New York: Cambridge University Press, 2001), pp. 150-151.

[127] Paul Eisenstein, "World's Largest Gun," *Popular Mechanics*, Vol. 181, No. 5 (May 2004), pp. 42-45; Paul Eisenstein, "World's Largest Gun," *Popular Mechanics*, Vol. 182, No. 1 (January 2005), p. 54.

[128] Michael Paris, "The First Air Wars - North Africa and the Balkans, 1911-13," *Journal of Contemporary History*, Vol. 26, No. 1 (January 1991), pp. 97-109. Irving Brinton Holley, *Ideas and Weapons* (New York: Yale University Press, 1953), pp. 45-60. Brereton Greenhous, "Evolution of a Close Ground-Support Role for Aircraft in World War I," *Military Affairs*, Vol. 39, No. 1 (February 1975), pp. 23-24.

[129] Malcolm Smith, "'A Matter of Faith': British Strategic Air Doctrine before 1939," *Journal of Contemporary History*, Vol. 15, No. 3 (July 1980), p. 428. Phillip S. Meilinger, "The Historiography of Airpower: Theory and Doctrine," *The Journal of Military History*, Vol. 64, No. 2 (April 2000), pp. 472-478, 480-483; Phillip S. Meilinger, "Trenchard and 'Morale Bombing': The Evolution of Royal Air Force Doctrine Before World War II," *The Journal of Military History*, Vol. 60, No. 2 (April 1996), p. 251.

[130] Martin van Creveld, *Command In War* (Cambridge: Harvard University Press, 1985), p. 193; Jane Morgan, *Electronics in the West: The First Fifty Years* (Palo Alto: National Press Books, 1967), pp. 32-38.

bombers also varied by their size and weight, and by the different mix-up of bombs, fuel, and armor.[131] At weights of about 30-60 tons, however, which were achievable from the 1930s to the 1940s, bombers could routinely bombard a target about 2500 kilometers away.[132] This was the range of principal means in the age.

c. The Age of Nuclear Bombers: 1940s~1950s

Bombers dominated the sky for more than a decade, and the technology changed thereafter. Three factors prevented bombers from gaining longer range. The first factor was speed. As the range increases, it takes more time to finish a trip, but the bigger the bomber, the more time it needs to maintain for every flight hour. This means a bomber cannot hope to bombard a target very often as the range increases. The second factor was the bombs that were carried. Conventional explosives have their limits in destructiveness, but the longer the range, the less the bomb. This means a bomber cannot deliver much lethality as the range is extended. The third factor was combat losses. The bigger the bombers, the smaller the number, but number was the trump card for bombers to break through the air defense. Taken together, bombers with extended range decrease in number, sortie rate, survivability, and bomb load. In other words, although it was already possible to build intercontinental bombers in the 1930s, it resulted in only a few bombing trips with symbolic value at most.

New technology altered the way of delivery. About 1945, the jet engine became available and gradually replaced propellers on aircrafts. Jet bombers could be bigger and faster because of their greater thrust, but the benefits were largely compensated by their higher fuel consumption. What was really important in defining the new age was the nuclear bomb. This was really revolutionary in terms of how humans generate power. With a nuclear payload, by which the destructiveness of a given payload increased dramatically,[133] fewer bombers and fewer sorties were required. Even with heavy losses, just a small squad of bombers that survived could still destroy its targets.[134] This paved the way for longer range. Similarly, the range of nuclear bombers still varied by their size, weight, and different mix of bombs and fuel. At the weight about 90 tons, however, which was achievable from 1945 to the 1950s, a nuclear-armed bomber could effectively bombard a target about 3000 kilometers

[131] For some general comparisons, see: Robert Jackson, *The Encyclopedia of Military Aircraft* (Queen Street House: Parragon, 2002), pp. 36, 52-56, 93, 200, 214-217, 247, 358.
[132] Kenneth P. Werrell, "The Strategic Bombing of Germany in World War II: Costs and Accomplishments," *The Journal of American History*, Vol. 73, No. 3 (December 1986), pp.707-708; Melden E. Smith, Jr., "The Strategic Bombing Debate: The Second World War and Vietnam," *Journal of Contemporary History*, Vol. 12, No. 1 (January 1977), p. 183.
[133] L. W. McNaught, *Nuclear Weapons and Their Effects* (London: Brassey's Defence Publishers, 1984), pp. 3-10.
[134] Marc Trachtenberg, *A Constructed Peace: The Making of the European Settlement, 1945-1963* (Princeton: Princeton University Press, 1999), pp. 87-88.

away.[135] This was the range of principal means in the age.

d. The Age of Nuclear Missiles: 1950s to Present

Technology evolved as the nuclear bomber reached its peak. For centuries, rockets were among the means to deliver lethality, but they never dominated the way of delivery like cannons or bombers did. A rocket is similar to an airplane in terms of the way to accelerate, and its range is also indefinite ideally. In addition, with its oxidizer carried alongside its fuel, rockets can reach much higher speeds than any airplane can. Thus, the rocket is the ideal way to deliver lethality. However, a rocket is just a bomber that never returns and this character produced problems. A bomber that is used just once is bound to be more expensive, and there are also problems of navigation. Rockets always deviate during their flight, and there is no pilot onboard. In other words, highly sophisticated electronics are needed when the range is long, and this made rockets the most expensive and almost unaffordable way to deliver a given weight of payload at a range longer than what bombers could achieve.[136]

A technological breakthrough solved this problem. In 1952, the first thermo-nuclear device was set off and was soon weaponized.[137] Unlike fission bombs, fusion bombs have even more destructiveness, and thus the high cost of rockets is never an obstacle. Rockets with a relatively long range and low accuracy are still enough to deliver thermo-nuclear warheads. In 1957, the first satellite was launched into orbit. This was a peaceful way of demonstrating the ability to deliver warheads globally. Two years later, the first intercontinental ballistic missile went into service, and it became the principal means of the age.[138] From then on, nuclear ballistic missiles improved in their propellant, navigating, targeting, and warhead design.[139] Solid-fueled, road mobile, and multi-warhead missiles replaced the liquid-fueled, fix-sited, and single-warhead missiles, but the range was largely the same. The actual range of nuclear missiles also differs by their weight and size, but the threshold to be categorized as an intercontinental missile is 6400 kilometers, and its maximum range

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[135] Michael E. Brown, *Flying Blind: the Politics of the U.S. Strategic Bomber Program* (Ithaca: Cornell University Press, 1992), pp. 77-78.

[136] Aaron Karp, *Ballistic Missile Proliferation: the Politics and Technics* (New York: Oxford University Press, 1996), pp. 38-40; Michael J. Neufeld, "Hitler, the V-2, and the Battle for Priority, 1939-1943," *The Journal of Military History*, Vol. 57, No. 3 (July 1993), p. 538.

[137] Barton J. Bernstein, "Crossing the Rubicon: A Missed Opportunity to Stop the H-Bomb?" *International Security*, Vol. 14, No. 2 (Autumn 1989), p. 133; David Holloway, "Research Note: Soviet Thermonuclear Development," *International Security*, Vol. 4, No. 3 (Winter 1979/80), p. 194.

[138] Myron J. Smith, *The Soviet Air and Strategic Rocket Forces, 1939-1980: A Guide to Sources in English* (Santa Barbara: ABC-Clio, 1981), pp. xxxv-xxxvii; James C. Dick, "The Strategic Arms Race, 1957-61: Who Opened a Missile Gap?" *The Journal of Politics*, Vol. 34, No. 4 (November 1972), p. 1070.

[139] US Department of Defense, *The Militarily Critical Technologies List Part II: Weapons of Mass Destruction Technologies* (Washington, D.C.: Office of the Under Secretary of Defense for Acquisition and Technology, 1998), p. II-5-2.

is around 13000 kilometers. This is the range of the time.

V. Density and Fragmentation in the System

In this section, the scope of the system is determined by the breakthrough in civil transportation, major actors and their relative share of wealth are identified with macroeconomic indicators, and then the density and fragmentation are calculated according to the method provided previously.

a. Scope of System: from Europe to World System

In the interaction-structure theory, the scope of the system is not taken for granted but is determined by interaction capacity. It is known that the international system has not been global but regional throughout most of human history.[140] Different civilizations developed in their own regions independently because of the insufficient level of interaction capability with primitive technology.

Actually, regions were not totally isolated even in ancient times. With their own legs, humans can always walk anywhere as long as the land is connected, just like what happened very early in prehistory.[141] However, this is not what we mean by "interaction," because of the small quantities involved. Interaction is not just reaching; a higher level of exchange is required. Individuals may acquire what they need in a waste area, but this is not the case for larger groups of people. They have to depend on what they can carry, and this is limited by the means of transportation. For example, animal-driven wagons cannot hope to travel more than 500 miles after consuming their entire payload, approximately a trip of one or two weeks at most.[142] Thus, regions are defined as places suitable for living but separated from each other by huge deserts, tundra, steppes, forests, and oceans.[143] These living places on continents are just like the islands in seas.[144]

That is why the modern nation-state system is originally a European one, and the issue here is when it expanded. From one perspective, the system was already worldwide after the European revolution of sea power after 1500,[145] but this is only

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[140] William H. McNeill, *The Rise of the West: A History of the Human Community* (Chicago: University of Chicago Press, 1963).
[141] William H. McNeill, *A History of the Human Community Volume I: Prehistory to 1500 3rd Edition* (Englewood Cliffs: Prentice Hall, 1990), pp. 9, 194.
[142] Creveld, *Technology And War*, p. 114, 234, John Keegan, *A History of Warfare* (New York: Alfred A. Knopf, 1994), pp. 304-305.
[143] This is the "rimland" of Eurasia, which divided from the steppes and desert of the inner Asia suggested by Spykman. See: Nicholas J. Spykman, *The Geography of the Peace* (New York: Harcourt, Brace and Company, 1944), pp. 40-44.
[144] Robert Gilpin, *War and Change in World Politics* (New York: Cambridge University Press, 1981), pp. 58-59.
[145] George Modelski, *Seapower in Global Politics, 1494-1993* (London: MacMillan Press, 1988);

half of the story. Sailing vessels did allow the European nations to engage overseas and deep into the ocean,[146] but this largely happened around the Atlantic, especially the northern part. Why? The reason is similar to that illustrated above. The course of sailing vessels is limited by the wind and much manpower is required to operate the rigging,[147] so their payload and speed are actually limited. Sailing vessels are powered by wind and their range is indefinite as long as food and fresh water are replenished from the coasts, but this is also unsustainable in large number. While America was still within weeks of sailing from Europe, it took months to sail from Europe to Asia. From 1500 to 1800, vessels that sailed from Europe to Asia were only 50 ships per year,[148] far from being a routine. In this regard, the system in the sailing age did expand to encompass America, but it was not a global system yet.

Only after natural energy could be harnessed more deliberately could mankind overcome the natural obstacles between the two sides of Eurasia. With the introduction of machines, interaction capacity could then cover a distance of several thousands of kilometers. Machines of breakthrough importance were the steam-powered locomotives and steam-powered ships after the 1800s. Nevertheless, it took time to make them perfect. Years after their introduction, railway networks only started to spread out in the 1830s,[149] and the first intercontinental railway was completed only later. Additionally, only after 1893 did the total tonnage of steamships surpass that of sailing ships.[150] Indeed, whether to build the line or more ships is a policy choice after the required technology matures, and this should be kept out of the definition of interaction capacity to give us a pure technological picture. However, the decreasing cost to build large quantity is itself a sign of maturity. Thus, it is reasonable to argue that railways and steamships brought about a global system in the 1890s.

George Modelski, "Long Cycles of World Leadership," in William R. Thompson, ed., *Contending Approaches to World System Analysis* (Beverly Hill: Sage Publications, 1983), pp. 115-119; George Modelski, *Long Cycles in World Politics* (Seattle: University of Washington Press, 1987), p. 96; George Modelski, "A System Model of the Long Cycle," in George Modelski ed., *Exploring Long Cycles* (London: Frances Pinter, 1987), pp. 112-128.

[146] R. B. Wernham, "Queen Elizabeth and the Portugal Expedition of 1589," *The English Historical Review*, Vol. 66, No. 258 (January 1951), pp. 1-26; R. B. Wernham, "Queen Elizabeth and the Portugal Expedition of 1589 (Continued)," *The English Historical Review*, Vol. 66, No. 259 (April 1951), pp. 194-218.

[147] N. A. M. Rodger, "Weather, Geography and Naval Power in the Age of Sail," in Colin S. Gray and Geoffrey Sloan, eds., *Geopolitics, Geography, and Strategy* (London: Frank Cass, 1999), pp. 178-179.

[148] "Table 2-6 Number of Ships Sailing to Asia from Seven European Countries, 1500-1800," *The World Economy*, www.theworldeconomy.org/publications/worldeconomy/Maddisontable2-6.pdf

[149] J. A. Patmore, "The Railway Network of the Manchester Conurbation," *Transactions and Papers*, No. 34 (June 1964), pp. 160-161; A. G. Kenwood, "Railway Investment in Britain, 1825-1875," *Economica*, Vol. 32, No. 127 (August 1965), pp. 316-317, 313-322.

[150] Heinrich E. Friedlaender, *Economic History of Modern Europe* (New York: Prentice-Hall, 1953), pp. 134-135.

b. Major Actors and Their Relative Share of Wealth

As the scope of the system has been determined, we can now identify the major actors and their relative share of wealth in the system. This coding forms the base to calculate density and fragmentation in the system. How many and what major actors are there in the system? Just like Waltz has argued, counting the major actors may be very difficult but rather easy actually: for more than three centuries, there have been loosely at most eight major actors out of 150 or more states around the world.[151] We begin with this notion. From 1816, there were five major actors in Europe: United Kingdom, France, Austria, Russia, and Prussia. As time went on, issues were adding and excluding of major actors according to the concepts and measurements described above. The landmark changes of major actors and their relative share of wealth are summarized in Table 3. Let us illustrate it in more detail.

Table 3: Relative Share of Wealth (Smallest as 1)

	1816	*1860*	*1871*	*1890*	*1910*	*1919*	*1935*	*1945*	*1955*	*1970*	*1991*	*2000*
UK	5.4	19.7	26.5	32	15	8	8.1	-	4.7	1.4	1.2	1.2
France	2.6	4	5.5	10	6	1.5	3.6	-	2.4	1.2	1.2	1.2
Austria	1.1	1.3	2	4	4	-	-	-	-	-	-	-
Russia	2.4	1	1	3	5	-	6.7	1	10.6	4.0	-	1
Germany	1	3	6.5	16	20	-	8.7	-	4.3	1.9	1.7	1.7
US	1.1	4.3	8	35	48	19.1	28.3	5.3	27.2	7.4	7.7	7.9
Italy	-	-	-	1	1	-	1	-	1	1	1	1.1
Japan	-	-	-	-	1	1	2.5	-	1.5	3.5	4.5	2.7
China	-	-	-	-	-	-	-	-	-	-	-	4.1

Source: John J. Mearsheimer, *The Tragedy of Great Power Politics* (New York: W.W. Norton & Company, 2001), pp. 71, 74, 220, 241-248; "National Material Capabilities (v3.02)," *Correlates of War*, http://www.correlatesofwar.org/COW2%20Data/Capabilities/nmc3-02.htm; "Historical GDP Shares," *U.S. Department of Agriculture Economic Research Service*, http://www.ers.usda.gov/data/macroeconomics/Data/HistoricalGDPSharesValues.xls; "PPP GDP 2000, World Development Indicators database, World Bank, April 2002," *Proportionen der Weltbevölkerung*, http://www.pdwb.de/archiv/weltbank/gdpppp00.pdf

The system was already trans-Atlantic in the 1800s and the United States was added to the great power club in 1816. The year 1860 was also a landmark because of the growth of the US economy. Germany and Italy unified in 1871. Prussia was renamed and enlarged, but Italy was still utterly weak economically. Only after 1890 did Italy share more than 1 percent of world wealth and was added at this point. The global system appeared in the 1890s, but there was no Asian actor added at this time because of the lack of comparable technology. Things changed in 1910. Japan shared more than 1 percent of world wealth and developed its indigenous capability to build contemporary principal weaponry about the same time,[152] so this Asian power was

[151] Waltz, *Theory of International Politics,* pp. 131,162.

[152] Seymour Broadbridge, "Shipbuilding and the State in Japan since the 1850s," *Modern Asian*

added at this point. The end of the First World War destroyed several great powers: Germany, Austria, Russia, and Italy, all excluded at this point. After the great depression, Germany and Italy largely recovered from the ashes of war, and Soviet Russia rose up from civil war with a large scale of successive economy projects. The three were all added back in 1935.

As the Second World War ended, only the US and the Soviet Union stood as great powers. From this point, for Waltz and by common sense, the two were always the only great powers until the collapse of the Soviet Union in 1991. However, as the relative share of wealth indicates, Italy and Japan were in fact much weaker in the pre-war era but were categorized as great powers. They were even more qualified as great powers in the cold war era since military power is removed from the definition of great power in interaction-structure theory. Thus, to make the judgment more consistent, several great powers can be added. In 1955, previously knocked out great powers are recovered and all added back again. In addition, one more landmark is added because of the shift in relative wealth: 1970, as Japan became the third largest economy in the system.

After the cold war, Russia suffered from a decade of deep depression. The tide finally turned around 2000 and Russia was added back as great power. At the same time, China finally departed from its long backwardness after years of rapid growth. China's economy surpassed Italy in plain GDP and ranked second by GDP in purchasing power parity (PPP), which is more representative and adopted here. Additionally, China developed its own indigenous capability to produce state-of-the-art principal weaponry nowadays: solid-fueled, road mobile, and multi-warhead intercontinental ballistic missiles, rather than the previous design in the 1980s which is a generation behind.[153] As we define great powers in terms of wealth and technology, China is thus qualified as a great power after 2000. For similar reason, other states like India with a remarkable economy only, are not included.

c. Density and Fragmentation of the System

Density is now calculated as the average distance between the "wealth-generating areas" of great powers. These areas are identical to their territories for the United Kingdom, France, Austria, Germany, Italy, and Japan. However, for the United States, Russia/Soviet Union, and China, the areas are significantly smaller than their territories, because those unsuitable to live are taken out. For the United States,

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Studies, Vol. 11, No. 4 (October 1977), pp. 601-613.

[153] David Shambaugh, *Modernizing China's Military: Progress, Problems, and Prospects* (London: University of California Press, 2004), pp. 274-281; Evan S. Medeiros, Roger Cliff, Keith Crane, James C. Mulvenon, *A New Direction for China's Defense Industry* (Santa Monica: RAND, 2005), pp. 51-106.

Alaska is excluded. For Russia/Soviet Union, Siberia and Inner Asia are excluded. For China, Tibet and Xinjiang are taken out. In addition, the distance is gauged in two ways. First, if the most nearby great powers are actually connected directly, or can be reached through the wealth-generating areas of other minor powers, the distance is code 0. Second, if the most nearby great power is separated by oceans or other similar obstacles of nature separating regions, the distance is measured as the two nearest points of their wealth-generating areas. The average is weighted according to the relative share of wealth provided in Table 3 and summarized in Table 4.

Table 4: Density of System: 1816~2008

	1816	***1860***	***1871***	***1890***	***1910***	***1919***	***1935***	***1945***	***1955***	***1970***	***1991***	***2000***
UK	40	40	40	40	40	40	40	-	40	40	40	40
France	0	0	0	0	0	40	0	-	0	0	0	0
Austria	0	0	0	0	0	-	-	-	-	-	-	-
Russia	0	0	0	0	0	-	0	5780	0	0	-	0
Germany	0	0	0	0	0	-	0	-	0	0	0	0
US	4200	4200	4200	4200	4200	4200	4200	5780	4200	4200	4200	4200
Italy	-	-	-	0	0	-	0	-	0	0	0	0
Japan	-	-	-	-	6200	6200	6200	-	6200	6200	6200	800
China	-	-	-	-	-	-	-	-	-	-	-	800
Weighted Average	355	566	700	1468	2084	2932	2286	5780	2393	2590	3484	1850

Source: author (kilometers)

Similarly, fragmentation is calculated as the average area that generates wealth as describe above. The average is also weighted according to the relative share of wealth provided in Table 3 and summarized in Table 5.

Table 5: Fragmentation of System: 1816~2008

	1816	***1860***	***1871***	***1890***	***1910***	***1919***	***1935***	***1945***	***1955***	***1970***	***1991***	***2000***
UK	244	244	244	244	244	244	244	-	244	244	244	244
France	547	547	547	547	547	547	547	-	547	547	547	547
Austria	550	550	550	550	550	-	-	-	-	-	-	-
Russia	4000	4000	4000	4000	4000	-	4000	4000	4000	4000		3200
Germany	250	250	500	500	500	-	450	-	240	240	360	360
US	4860	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100	8100
Italy	-	-	-	300	300	-	300	-	300	300	300	300
Japan	-	-	-	-	377	377	377	-	377	377	377	377
China	-	-	-	-	-	-	-	-	-	-	-	6720
Weighted Average	1363	1420	1669	3161	4286	5333	4501	7449	5165	3873	3810	4672

Source: author (1000 square kilometers)

VI. Combining the Explanatory Variables and the Hypothesis

As the three explanatory variables – mobility, density, and fragmentation – have been defined and measured, it is now time to combine them and propose the

hypothesis of interaction-structure theory. All three variables are something relative to distance, and thus are combinable. However, certain calculation is required and must follow the causal logic of the theory. Three steps are employed. First, since interaction capacity defined by technology is the linchpin of the theory, we combine the variables differently in three ages: pre-nuclear, fission nuclear, and fusion nuclear. Second, technology is evolving and is really a continuum. However, to divide the period, we keep the landmark timing of mobility in agreement with that of density and fragmentation. Then the combined value is taken as equal in the period. Third, the combination is done by omission, square rooting, and other techniques according to the logic of theory. The three ages are now described below.

a. Age of Pre-nuclear: 1816~1945

In the age of pre-nuclear covering the period 1816~1945, even the smallest great power was simply big enough to withstand heavy bombardment given the limited destructiveness of chemical explosives, so the fragmentation is omitted. Only mobility and density are combined by dividing. The range from mobility is divided by the average distance from density. Since the cannons are movable prior to firing, the indirect dimension of mobility is also introduced as an adjustment. All the value from 1816 to 1930s is multiplied by 24, the average speed of marching in kilometers per day.[154] Long-range artillery after the 1910s may be said to paralyze the battlefield, but movements parallel the front are still possible.[155] Now we get the results of this age. The smaller the value, the higher the stability.

b. Age of Fission Nuclear: 1945~1954

In the age of fission nuclear covering the period 1945~1954, fragmentation makes a difference because of the massive but still limited destructiveness from fission bombs.[156] The larger the territory, the higher the ability to absorb nuclear bombardment. Thus, the average area from fragmentation is square rooted into distance, and this distance is added with the average distance from density. Then, the range from mobility is divided by this combined value, and we get the results of this age. These values we get are still presented as ratio and are comparable with the previous age of pre-nuclear. The smaller the value, the higher the stability.

c. Age of Fusion Nuclear: 1955~2008

In the age of fusion nuclear covering the period 1955~2008, the almost unlimited

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[154] Martin van Creveld, *Supplying War* (London: Cambridge University Press, 1977), p. 234.

[155] Larry H, Addington, *The Patterns of War since the Eighteenth Century* (London: Croom Helm, 1984), pp. 91-103; Christopher Bellamy, *The Evolution of Modern Land Warfare: Theory and Practice* (New York: Routledge, 1990), pp. 46-47, 61-62, 68-76.

[156] Ward Wilson, "The Winning Weapon? Rethinking Nuclear Weapons in Light of Hiroshima," *International Security*, Vol. 31, No. 4 (Spring 2007), pp. 162-179.

destructiveness of thermo-nuclear is really a threshold: this is the first time that humans have more destructiveness than they need.[157] Thus, a radically different way of combination is employed. During this age, the range allowed almost exceeds the entire scope of the Earth, so the variation of distance relative to the range is meaningless when it becomes larger than 1. Thus, we take the range/distance in 1955 as 1, and the values of range thereafter are omitted. Nonetheless, density itself is still crucial. The shorter the distance, the less the necessity to employ nuclear weapons, and thus the nuclear parity is not sufficient to deter every conventional attack.[158] The ability to absorb conventional attacks differs little since great powers are all big enough, but the average area from fragmentation can provide additional buffer when targets are deep into their territories. This effect is minor because most of the economic activities are somewhat concentrated in the peripheries.

Thus, the average distance from density is subtracted with 2500, the range of conventional weapons, and added with the square root of the average area from fragmentation and multiplied by 0.25, representing the average depth in territories for extra buffer. After the subtraction, the values from 1955 to 1999 are all larger than 0. This means the buffer is deep enough to shield great powers from conventional attacks; the larger the value, the higher the stability. Nonetheless, these values are not readily comparable with that from the previous age presented in ratio. Thus, since we have taken the combined value from 1955 to 1969 as 1, those values thereafter can all convert into a ratio relative to it, and made reciprocal to keep in agreement with the logic of the previous age; the smaller the ratio, the higher the stability.

After 2000, one more adjustment is introduced because of the information/network revolution. The rapid drops in the price of electronic parts made the long-ranged precision-guided munitions (PGM) radically cheaper than ever.[159] This development affected the interaction not on the nuclear level but on the conventional level: in situations other than total annihilation, PGMs do have more destructiveness, closer to that of fission nukes.[160] Thus, after 2000, the combined

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[157] Barry Buzan, *An Introduction to Strategic Studies: Military Technology and International Relations* (Basingstoke: Macmillan Press, 1987), pp. 19-25.

[158] Robert Powell, "The Theoretical Foundations of Strategic Nuclear Deterrence," *Political Science Quarterly*, Vol. 100, No. 1 (Spring, 1985), pp. 75-96.

[159] Martin C. Libicki, *Illuminating Tomorrow's War* (Washington D.C.: Institute for National Strategic Studies, 1999), p. 24; Joseph S. Nye Jr., *The Paradox of American Power: Why the World's Only Superpower Can't Go It Alone* (New York: Oxford University Press, 2002), p. 42. Bill Sweetman, "The Falling Price of Precision," *Jane's International Defense Review*, Vol. 35, No. 4 (April 2002), p. 46; Robert S. Dudney, "The Gulf War II Air Campaign, by the Numbers," Air Force Magazine, Vol. 86, No. 7 (July 2003), p. 39. Bill Sweetman, "Force Overcome the Obstacles of New-generation Cruise Missiles," *Jane's International Defense Review*, Vol. 38, No. 5 (May 2005), p. 50. Christopher Byrnes, "Sea Power 21: The Impact of Tactical Tomahawks in the Joint Arena," *U.S. Naval Institute Proceedings*, Vol. 131, No. 7 (July 2005), pp. 74-75.

[160] Steven Canby, "Military Doctrine and Technology," in Jonathan Alford, ed., The Impact of New Military Technology (Montclair: Allanheld, Osmun & Co. Publishers, 1981), p. 33; Alvin Toffler and

value of density and fragmentation is subtracted with 3000, the range in fusion nuke representing that of PGMs. This value is smaller than 0 and means the buffer is not deep enough to shield great powers from conventional attacks. However, the increased destructiveness of PGM also made the fragmentation crucial: the larger the average area, the more ability to absorb the conventional attacks. Thus, we take the value as an absolute value and divide by the square root of fragmentation into a ratio; the smaller the ratio, the higher the stability.

Now we can get all the results in the age of pre-nuclear, fission nuclear, and fusion nuclear. All of them are represented as ratios and are comparable with each other. The smaller the value, the higher the stability. The entire process of mathematic operation is summarized in Table 6 and the final value is illustrated as Figure 5.

Table 6: Operation that Combines the Three Explanatory Variables

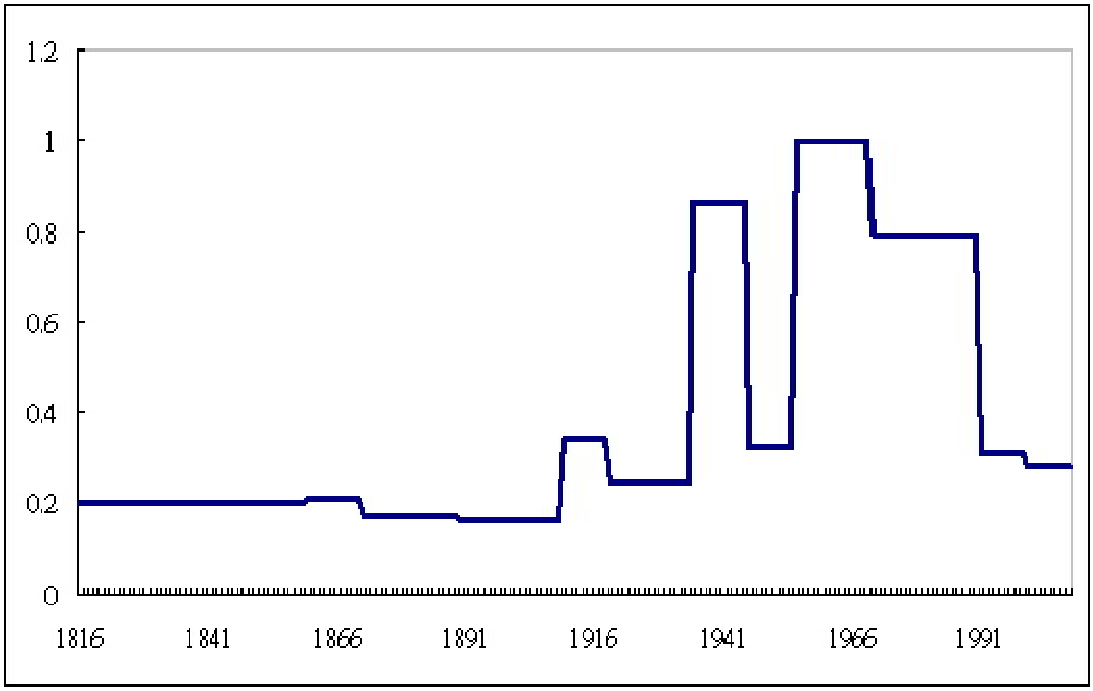
	1816 ~1859	*1860 ~1870*	*1871 ~1889*	*1890 ~1909*	*1910 ~1918*	*1919 ~1934*	*1935 ~1945*	*1946 ~1954*	*1955 ~1969*	*1970 ~1990*	*1991 ~1999*	*2000 ~2008*
(M)obility in kilometers	3	5	5	10	30	30	2500	3000	13000	13000	13000	13000
	0.0084	0.0088	0.0071	0.0068	0.0144	0.0123	**0.8660**	←M/D				
(D)ensity in kilometers	355	566	700	1468	2084	2932	2886	5780	2393	2590	3484	1850
	0.2024	**0.2120**	**0.1713**	**0.1634**	**0.3454**	**0.2455**	←M/D*24					
								0.3525	←3000/(D+F^0.5)			
(F)ragmentation in 1000 square kilometers	1363	1420	1669	3161	4286	5333	4501	7449	5165	3873	3810	4672
							D+F^0.5*0.25-2500→		461.3573	581.9984	1472.836	
						1955 as 1 and Reciprocal→			**1**	**0.7927**	**0.3132**	
									[abs(D+F*0.25-3000)]/F^0.5→			**0.2820**
	1816 ~1859	*1860 ~1870*	*1871 ~1889*	*1890 ~1909*	*1910 ~1918*	*1919 ~1934*	*1935 ~1945*	*1946 ~1954*	*1955 ~1969*	*1970 ~1990*	*1991 ~1999*	*2000 ~2008*
Final Value	**0.2024**	**0.2120**	**0.1713**	**0.1634**	**0.3454**	**0.2455**	**0.8660**	**0.3525**	**1.0000**	**0.7927**	**0.3132**	**0.2820**

= Omission = Operation Method

Source: author

Figure 5: The Value of Combined Explanatory Variables (CEV)

Heidi Toffler, *War and Anti-war: Survival at the dawn of the 21st Century* (Boston: Little Brown, 1993), pp. 72-73; Robert Tomes, "Revolution in Military Affairs--A History," *Military Review*, Vol. 80, No. 5 (May 2000), pp. 100-101; Benjamin S. Lambeth, NATO's Air War for Kosovo: A Strategic and Operational Assessment (Santa Monica: RAND, 2001), pp. 41-42.



Source: final value in Table 6

Now the causal hypothesis of the theory is provided: According to the value in Figure 5, the higher the CEV, the lower the stability should be. However, the exact magnitude of variation is still unknown here, so what the hypothesis really implies is only directional. The stability should go upward or downward as indicated by those turning points between two eras.

VII. Dependent Variable: Calculating the Military Burden

As the independent variables have been combined and the hypothesis has been stated, we turn to the dependent variable, which is the stability of system. As suggested, we now calculate the human defense burden (HDB) and the defense burden (DB) respectively and connect them into the military burden (MB) as we conceived. As we had done in combining the three independent variables, the landmark timing is kept in agreement with the threshold year of 1955.

Regarding HDB from 1816 to 1954, the statistics on population and armed forces are from the NMC in COW. By summing up the populations as well as the number of armed forces of every great power in the different periods identified, the total armed forces are divided by total populations. In contrast to the straightforward HDB, some problems arise in calculating DB from 1955 to 2008. Military expenditures and GDP data are absent in the NMC from COW, so other sources are needed. Nonetheless, much of the military expenditures and GDP data after 1955 are unavailable or unreliable. Military expenditures are often classified, at least partially, and can hardly

be obtained in the context of cold war rivalries. [161] Furthermore, in authoritarian states, the budgets disclosed nowadays may still have propaganda purposes in mind and may be highly distorted.[162] Thus, a shortcut is adopted by considering only the United States, which may be the most righteous and open great power on military matters. Fortunately, the United States alone counts for much of the military spending in the system. The omission is acceptable.

The HDB and DB should be merged into MB. The two values are all expressed in percentages but are not directly connectable because the DB values are always higher than those of HDB: actually, plain DB value in the 2000s is even higher than HDB value in 1954. Two steps are taken here. First, we compare the two values in the conjunction period of 1946 to 1954. The immediate aftermath of the Second World War is excluded to prevent any possible distortion from wartime. Eight years, from 1947 to 1954, are picked and the ratio between DB and HDB is about 4.5 to 1. Thus all the DB values are divided by 4.5 and then linked up with the HDB in 1955. Now we get the MB, and its variation from 1816 to 2008 is illustrated as Figure 6.

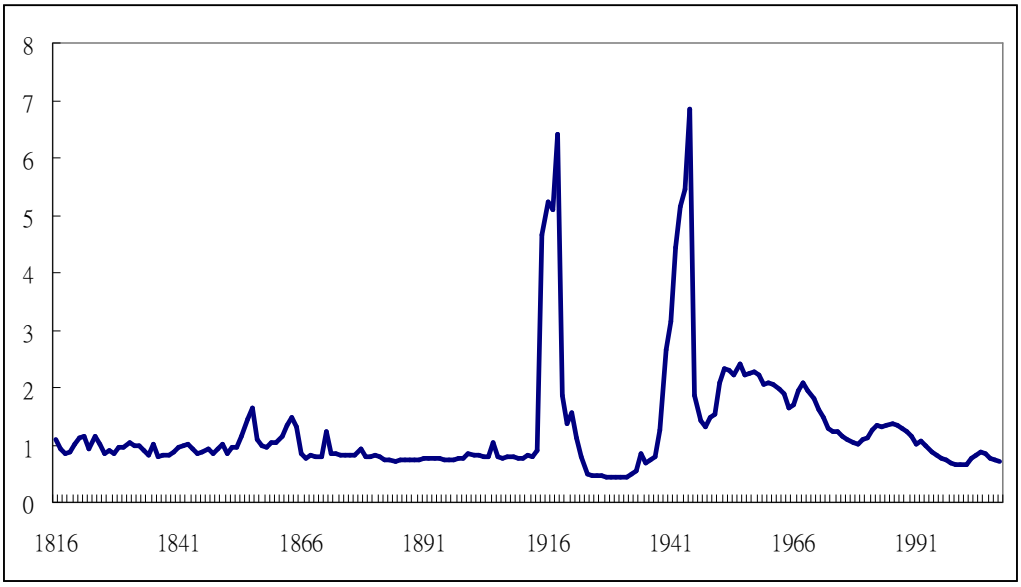


Figure 6: Military Burden (MB) from 1816 to 2008

Source: "National Material Capabilities (v3.02)," *Correlates of War*, http://www.correlatesofwar.org /COW2%20Data/Capabilities/nmc3-02.htm; "History Tables, Budget of The United States Government," *Government Printing Office*, hhttp://www.gpoaccess.gov/USbudget/fy06/pdf/hist.pdf, pp. 42-52.

As Figure 6 reveals, MB clearly captures the mega-trend in the system. The

[161] Stockholm International Peace Research Institute, *SIPRI Yearbook 2006 Armaments, Disarmament and International Security* (Oxford: Oxford University Press, 2006), pp. 269-280.

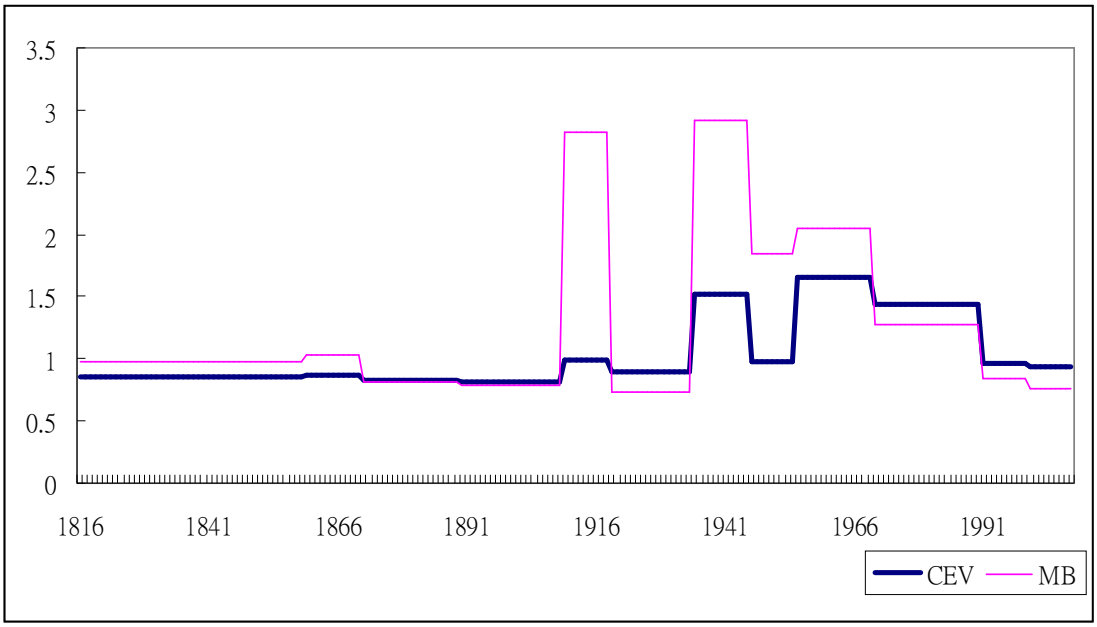
[162] China is one of the most notable cases, see: Richard A. Bitzinger, "Analyzing Chinese Military Expenditures," in Stephen J. Flanagan and Michael E. Marti eds., *The People's Liberation Army and China in Transition* (Washington D.C.: National Defense University Press 2003), pp. 177-193.

system is generally stable throughout the 19th century except for the Crimea war and the wars of German unification. The two peaks are the two World Wars in which the system was extremely unstable, and the gorge between the two peaks is the interwar era in which the system was very stable. After the Second World War, MB is generally higher than that in the 19th century, revealing the tensions during the cold war. The rise of MB in the 1950s and the 1960s are the Korean War and the Vietnam War, and there is also a general trend of diminishing in MB after the 1960s, due to the détente between the superpowers. In the 1980s, MB rose again, representing the arms build-up of the Reagan Administration, but was still lower than that in the 1960s, and then MB dropped significantly as the cold war ended. The MB in the post–cold war era is generally low, but it increased a little alongside the ongoing Global War on Terrorism started from 2001. In addition, MB in post–cold war era is also generally the same as that in the later 19th century, and a little higher than that in the interwar era. The late 19th century was a period of flourishing and avoidance of crises, with only regional contingences such as the Boer War and the Russo-Japanese War. In contrast, the interwar era is indeed the most stable period of the two centuries. All this is in agreement with the events that characterize the post–cold war era: no great power wars but several regional conflicts.

VIII. Testing the Theory

As the hypothesis has been stated and the variables have been measured, the theory can now be tested. To test the hypothesis of combined explanatory variables (CEV) in Figure 5, MB values in Figure 6 are all averaged in every period defined in Table 5 and taken as equal. Then the two values are converged by CEV all added with 0.65 as constant and MB all multiplied with 100 to show their relative rise and fall. Note here that the higher value in MB means more resources are devoted to the military, and thus, lower stability. In other words, the trends of relative rise and fall in CEV and MB should positively correspond with each other as the hypothesis suggests. The result is illustrated as Figure 7.

Figure 7: CEV and MB from 1816 to 2008



Source: Figure 5 and 6.

As Figure 7 reveals, the trends in CEV and MB correspond with each other generally. Although the magnitude of variation is sometimes divergent and not really correspondent, this is simply undetermined in the first place in the hypothesis, which is only directional. In terms of upward or downward direction inferred by the turning points on the two folding lines, the relative rise and fall of CEV and MB all match. The theory is valid.

IX. Conclusion: A Good Start

Interaction-structure theory uses novel concepts and logic to explore and merge new systemic variables, namely, "mobility," "density," and "fragmentation," in the realist material tradition, and the stability is also conceived differently to encompass a more complete picture in the system. With the actual implementation conducted by this article, the interaction-structure theory did a fairly good job to explain the "mega-trend" in the system. The combination of mobility, density, and fragmentation as independent variables does explain the stability in the system as dependent variable. Undeniably, there is always room for improvement, but interaction-structure theory has proved itself and can be a good start for a newer generation of development in realist grand theory.

There are indeed puzzles that deserve attention. While a certain level of deviation between CEV and MB is usual and tolerable in terms of statistics, the gaps between what CEV inferred and the actual MB are overly huge in 1910-1918 and 1935-1969, if the relative comparison in magnitude were close to a real continuum. In these periods, largely coincident with the two World Wars, the Korean War and the Vietnam

War, the system should become unstable as the CEV suggests, but the MB value is way too high, especially in 1910-1918 and 1935-1945. Theoretically, these gaps in magnitude can be explained with intermediate theories. As proposed by scholars, factors like domestic politics, nationalism, perceptions, and war plans, etc., can explain the outbreak of the Great War.[163] This may not be convincing but it does explain why the war was so bloody and prolonged as the deadlock formed. A similar rationale can also apply to the Second World War, the Korean War, as well as the Vietnam War.

Indeed, many of these domestic explanations had been mistakenly pushed to the extreme that overrules the systemic pressures completely. Nevertheless, trying to tackle "important anomalies" only within a grand theory is equally problematic.[164] One can imagine, for example, if the struggles for some square miles of no man's land between trenches are still obedient to systemic pressure, how can any interests and objectives not deserve a fight? Much of the events throughout the centuries became anomalies. "The better the theory, the fewer the anomalies."[165] If the argument were adapted to agree with the "anomalies" of 44 years, it would jeopardize the good explanations for the other 148 years. Given the utilities of a grand theory in explaining much of the time from 1816 to 2008, the "anomalies" cover only 29% is really acceptable. Furthermore, a few anomalies in the mega-trend are even admirable. Their existence and relatively short lives actually tell us of the robustness of the system. As Waltz noted, under the systemic pressures, nations are still free to act stubbornly but at the costs of punishment from the system.[166] Resistance dies hard, but the systemic pressure finally prevails.

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[163] Jack Snyder, *The Ideology of the Offensive: Military decision Making and The Disasters of 1914* (Cornell: Cornell University Press, 1984); Stephen Van Evera, *Cause of War: Power and the Roots of Conflict* (Ithaca, New York: Cornell University Press, 1999); Jack Snyder, *Myths of Empire: Domestic Politics and International Ambition* (Ithaca, New York: Cornell University Press, 1991).

[164] The debates, see: Keir A. Lieber, "The New History of World War I and What It Means for International Relations Theory," *International Security*, Vol. 32, No. 2 (Fall 2007), pp. 155-191; Jack Snyder & Keir A. Lieber, "Defensive Realism and the 'New' History of World War I," *International Security*, Vol. 33, No. 1 (Summer 2008), pp. 174-194.

[165] Mearsheimer, *The Tragedy of Great Power Politics,* pp. 10-11.

[166] Waltz, *Theory of International Politics*, pp. 74-78.

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國科會補助計畫衍生研發成果推廣資料表

日期:2011/08/05

國科會補助計畫	計畫名稱: 跳脫國際政治的攻勢及守勢現實主義：體系穩定的互動結構理論
	計畫主持人: 楊仕樂
	計畫編號: 99-2410-H-343-004- 學門領域: 國際關係

無研發成果推廣資料

99 年度專題研究計畫研究成果彙整表

計畫主持人：楊仕樂	計畫編號：99-2410-H-343-004-
計畫名稱：跳脫國際政治的攻勢及守勢現實主義：體系穩定的互動結構理論	

成果項目			量化			單位	備註（質化說明：如數個計畫共同成果、成果列為該期刊之封面故事...等）
			實際已達成數（被接受或已發表）	預期總達成數(含實際已達成數)	本計畫實際貢獻百分比		
國內	論文著作	期刊論文	1	3	100%	篇	其他期刊論文一篇已接受，其他期刊論文一篇審查中，TSSCI 論文一篇審查中。
		研究報告/技術報告	0	0	100%		
		研討會論文	6	6	100%		於六場研討會發表六篇論文。
		專書	2	2	100%		專書論文兩篇已預定出版。
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	
	參與計畫人力（本國籍）	碩士生	4	4	100%	人次	研究助理在資料蒐集、資料整理、邏輯思考、與研究方法等方面，已獲得訓練。
		博士生	1	1	100%		研究助理在資料蒐集、資料整理、邏輯思考、與研究方法等方面，已獲得訓練。
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		
國外	論文著作	期刊論文	0	2	100%	篇	SSCI 論文兩篇審查中。
		研究報告/技術報告	0	0	100%		
		研討會論文	0	0	100%		
		專書	0	0	100%	章/本	
	專利	申請中件數	0	0	100%	件	
		已獲得件數	0	0	100%		
	技術移轉	件數	0	0	100%	件	
		權利金	0	0	100%	千元	

	參與計畫人力（外國籍）	碩士生	0	0	100%	人次	
		博士生	0	0	100%		
		博士後研究員	0	0	100%		
		專任助理	0	0	100%		
其他成果 (無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。)		參與國內各相關學會與國防部之多場研討會與座談會，進行學術對話、提供政策建議。					

	成果項目	量化	名稱或內容性質簡述
科教處計畫加填項目	測驗工具(含質性與量性)	0	
	課程/模組	0	
	電腦及網路系統或工具	0	
	教材	0	
	舉辦之活動/競賽	0	
	研討會/工作坊	0	
	電子報、網站	0	
	計畫成果推廣之參與（閱聽）人數	0	

國科會補助專題研究計畫成果報告自評表

請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現或其他有關價值等，作一綜合評估。

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估

■達成目標

□未達成目標（請說明，以 100 字為限）

□實驗失敗

□因故實驗中斷

□其他原因

說明：

2. 研究成果在學術期刊發表或申請專利等情形：

論文：■已發表 □未發表之文稿 □撰寫中 □無

專利：□已獲得 □申請中 ■無

技轉：□已技轉 □洽談中 ■無

其他：(以 100 字為限)

其他期刊論文一篇已接受刊登

SSCI 論文兩篇已投稿進入審查

TSSCI 期刊論文一篇已投稿進入審查

其他期刊論文一篇已投稿進入審查

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）(以 500 字為限)

本研究如預定計畫，完成了現行國際政治理論的檢討與改良，提出國際政治的「互動結構理論」，並以一八一六至二〇〇九年間國際體系的變動，對理論推論進行實證檢驗，並將研究成果撰寫成兩篇學術論文，投稿國外重要的 SSCI 期刊，以有助於日後能由國際知名出版社出版專書。本研究基於互動能力解釋來源與攻守平衡解釋邏輯的互動結構理論，較現有單純的結構理論更能解釋國際體系穩定的變異，使吾人更能掌握戰爭和平的大趨勢，以利於一個更和平穩定世界的出現。本研究精進了國際政治的理論化研究，獲得了一解釋力較佳的新理論，並促進了理論發展的持續累積。