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Mental pictures, structural constraints: Kenneth N. Waltz's approach to theory

Serdar Ş Güner
Bilkent University, Turkey

Abstract

The aim of this article is to develop Kenneth N. Waltz's conceptualization of system structures based on the distribution of capabilities to those described by two traits at system-level: the distribution of capabilities across states and states' geographic positions with respect to each other, that is, the contiguity configuration. The development generates taxonomies of structures evaluated as mental pictures that guide, organize, and channel thoughts by identifying the ways system structures constrain international interactions. Mental pictures are argued to derive from a multiplicity of interrelated neurophysiological processes of the brain according to functionalism which is a monist doctrine of the philosophy of mind. Mental pictures establish structural constraints as products of an algorithm based on realism and system theory depicting a neo-Kantian view of how our minds impose order on sensory data.

Keywords

Neo-Kantianism, philosophy of mind, philosophy of science, structural constraints, structural realism, topology

This paper asks two questions: how can Kenneth N. Waltz's picture theory be reformulated and what can be gained from such a reformulation? Answers to these abstract questions help to understand whether Waltz's concept of structural constraints shed light upon the current Ukraine-Russia conflict. One might qualify that answers are irrelevant because the scope of the theory is the recurrence of phenomena like formations of balances of power. The paper claims otherwise: it is possible to ponder and to reflect on a singular event to explore how structural constraints confine international interactions.

Corresponding author:
Serdar Ş Güner, Faculty of Economics Administrative and Social Sciences, Bilkent University, Ankara, 06800, Turkey.
Email: sguner@bilkent.edu.tr

The paper proposes that not only the distribution of capabilities across states but also states' geographic positions with respect to each other, that is, the contiguity configuration, reflect states' positional pictures taking anarchy as the constant principle of organization of international politics. The proposed reformulation is based on three claims by Waltz. First, "To define a structure requires ignoring how units relate with one another (how they interact) and concentrating on how they stand in relation to one another (how they are arranged or positioned). How units stand in relation to one another, the way they are arranged or positioned, is not a property of the units. The arrangement of units is a property of the system" (Waltz, 1979: 80). Hence, Waltz's conceptualization implies that states' geographic positions or arrangement is a property of the system. Second, Waltz (1979: 98) maintains that "capabilities are attributes of units, the distribution of capabilities is not." Waltz's conceptualization implies the distinction between state and system-level traits. It follows that states' individual geographic positions are state-level attributes, but the contiguity configuration constitutes a trait at system-level. Third, Waltz (1979: 99) proposes that "Market structure is defined by counting firms; international political structure, by counting states. In the counting, distinctions are made only according to capabilities." The reformulation implies that structures of international systems are defined by counting states according to the contiguity configuration and distribution of capabilities.

The second task of the paper stems from Waltz's definition of theory as "a picture, mentally formed, of a bounded realm or domain of activity" (Waltz, 1979: 8). The dual aspect of the definition refers to physical substance of a domain and non-physical mental pictures implying that knowledge of international politics does not exist independently of mind. Waltz (1997: 913) indicates that "As the molecular biologist Gunther Stent has put it: "Reality is constructed by the mind . . . the recognition of structures is nothing else than the selective destruction of information (Stent, 1973: E17)." If mind constructs reality of the bounded domain of international politics, then Waltz's theory definition requires an answer to the question of how mind functions. The duality of mind and matter constitutes a central topic in the philosophy of mind (Chalmers, 1996; Churchland, 1996; Dennett, 1991). Therefore, there is need to concentrate on how Waltz's definition resonates in the philosophy of science and mind. The task necessitates appraisals of structures of international systems as mental pictures and their connections with reality (Churchland, 1984).

The reformulation reveals the complexity of mental pictures in simple terms using realism and systems theory. Waltz's definition relies on neo-Kantianism implying that material worlds of international politics are mental constructions which generate a multiplicity of positional pictures of states. Functionalism, as a materialist philosophy of mind, supports the conceptualization of positional pictures as being brain products. Mental pictures indistinct from brain are categorized in terms of taxonomies which illustrate how simple rules create complexities (Bendor and Hammond, 1992: 309). An advantage of the reformulation is its applicability in diverse areas of international politics. Positional pictures do not need to be assessed only by realism and system theory. States can occupy diverse positions in international systems regarding international issues like human rights, the problem of climate change and the response to pandemics. Pictures would then obtain using alternative concepts and measures and serve to open new avenues of theoretical research.

The article proceeds in five sections. The next section sets the philosophical foundations of the reformulation. The second section presents computational process yielding mental pictures using functionalism. The third section offers taxonomies of systems including dyads, triads, tetrads, and those systems of higher sizes. The fourth section discusses structural constraints in systems of different sizes. The fifth section concludes by a succinct application of the reformulation in the current Ukraine-Russia conflict and the possibility of mental pictures in the context of states' conformity with international norms using basic remarks evolutionary game theory produces about structural constraints in normative contexts.

Mental pictures and mind

Mental pictures guide, organize, and channel thoughts identifying the ways system structures constrain international interactions. They hint at an anti-positivist philosophy of science by putting the human mind at the center stage. Positivism rejects mental pictures and structural constraints as long as they are not conclusively verified or observed. A positivist philosophy of science would establish mental pictures as outputs of data measurements and correspondence rules converting theoretical entities into empirical observations. Waltz does not spend efforts in these directions. He is not a positivist; he rejects the view that all knowledge comes from experience and observations (Pond and Waltz, 1994). Waltz's rejection does not save him from being labeled as a positivist (Ashley, 1984; Cox, 1986; Keohane, 1986). The instrumentalist question is not whether structural constraints explain but whether they predict. Waltz (1997: 916) asserts that "success in explaining, not in predicting, is the ultimate criterion of good theory." Therefore, Waltz is not an instrumentalist. Some interpreters insist, on the contrary, that Waltz is both a positivist and an instrumentalist: "Advocates of positivism, like Kenneth Waltz, endorse Instrumentalism in an attempt to make IR more scientific" (Monteiro and Ruby, 2009: 17). Finally, in empiricist terms, structural constraints must be based observation and experimentation (Fetzer and Almeder, 1993: 45). Yet it is impossible to observe structural constraints but to advance hypotheses about them through mental pictures. Consequently, Waltz is not an empiricist − Wendt (1987: 351–355) searches support for existing but unobservable social structures similar to structural constraints. The principal empiricist problem is the difficulty to discern what is observed and what is unobserved. Were social structures observable, empiricists would need no theory to evaluate them. To wit, however, it is impossible to pick an international system and change its structure to observe how structural constraints vary in a laboratory.

Waltz's penchant for the philosophy of science stems from his quest to clarify the meaning of theory: "I started to read on the subject because I noticed a great variation in the way the word "theory" is used. . .What is a theory, and how does one go about developing one? Philosophy of science was the obvious place to start" (Nielsen et al., 2007: 112). Yet Fodor (1981: 114) notes that: "Modern philosophy of science has been devoted largely to the formal and systematic description of the successful practices of working scientists. The philosopher does not try to dictate how scientific inquiry and argument ought to be conducted. Instead he tries to enumerate the principles and practices that

have contributed to good science. The philosopher has devoted the most attention to analyzing the methodological peculiarities of the *physical sciences*" (italics mine). International Theory is not a physical science. There is no IR theory that attracts philosophers of science. Philosophers of science are mostly attracted to physical scientists' works which inform them about methods to follow and theories to construct. Fortunately, not all philosophies of science exclude mental entities. Idealism accepts that reality is fundamentally mental (Blackburn, 2016). Berkeleyan idealism admits that no object can exist "without the mind"; a necessary condition for existence is to be perceived (Audi, 2015: 100). Immanuel Kant instead affirms that the material world exists without the mind, but it takes shape in the mind, that is, the reality becomes accessible through mind. It is impossible to experience or discover the truth of our beliefs about the real world (Audi, 2015: 552). Kant's affirmation constitutes transcendental idealism favoring free mental creations.

Wæver (2009) claims that Waltz does not formulate his theory with a specific philosophy of science. Yet Waltz discloses his preference to follow Kant's transcendental idealism by declaring: "I consider myself a Kantian, not a positivist" (Halliday and Rosenberg, 1998: 379). Waltz's motive to follow transcendental idealism originates from an Austrian physicist-philosopher Boltzmann (1974: 33) who claimed that the "task of theory consists in constructing *a picture of the external world* that exists purely internally and must be our guiding star in all thought and experiment" (italics mine). Boltzmann's perspective of theory implies support for free mental creations and an equivalence with Waltz's theory definition. The definition implies the centrality of Neo-Kantian thinking generating the problem of how mind, a non-physical substance, interacts with international politics corresponding to physical substance in space.

Neo-Kantianism was a dominant philosophy of science among physicists such as Mach, Lorentz, Helmholtz, Maxwell, Kirchhoff, Bartoli, Ostwald, and later Einstein. It corresponds to the return to Kant to counter rising empiricism in physics in early twentieth century. Neo-Kantian belief among these scientists was that a priori thoughts, principles, and concepts generate knowledge and cognition representing the real world (D'Agostino, 1990; Heis, 2018; Yanow, 2006). These central figures of science were all concerned about how to simplify complex mathematical equations describing physical phenomena Hertz (1956) and Boltzmann (1974) relied on internal pictures of externality while working in such areas as theoretical physics, electromagnetism, mechanics, and existence of atoms in late nineteenth and early twentieth centuries (Cercignani, 1998; De Regt, 1999; Visser, 1999). Internal pictures of external reality summarize neo-Kantian Bildtheorie, that is, the picture theory of science. The essence of the theory is that human mind constructs material world in terms of pictures. Bildtheorie accepts that there exists no pure equivalence between thought and reality as it is impossible to affirm such an equivalence but that mental pictures facilitate representations of reality. A mental picture might look like a high-level abstraction; it might not meet the need of immediate explanations. It can channel thoughts. For example, Boltzmann has insisted on the existence of unobserved atoms but theoretical physicist Ernst Mach has opposed to the idea of atoms declaring that: "I do not believe atoms exist" (Bächtold, 2010: 3). Boltzmann poignantly remarks that such theories are "the laughingstock of empiricists and practical men" (Boltzmann, 1974: 34).

A similar knee-jerk opposition to theoretical abstractions exists in IR as well. Indeed, not all foreign-policy advisers and observers of international relations would value and agree on the explanatory usefulness of theoretical thinking. The issue of theory versus the practice of international politics illuminates opposition to abstract thinking in IR constituting a lively debate (Avey and Desch, 2014; George, 1993; Neumann, 2002; Wallace, 1996). Some foreign-policy advisers may abhor IR theories, but can have a priori views or theoretical concepts in the back of their minds grounded in geopolitical and realist perspectives. One can be reminded of Zbigniew Brzezinski, the former National Security Adviser to Jimmy Carter, and his remark that "roughly 90 per cent of the research done in universities is useless and irrelevant to policy-makers" (quoted in Garnett, 1984: 1). Avey and Desch (2014: 227) similarly find that "policymakers often find contemporary scholarship less-than-helpful when it employs such methods across the board, for their own sake, and without a clear sense of how such scholarship will contribute to policymaking." There is an evident reason for such an attitude: policy advisers, diplomats, and IR practitioners have a penchant for pragmatism, not theoretical views of international politics. Advisers and policy makers tend to favor immediate explanations, quick responses concerning international political issues. They might not value abstract thoughts and assumptions which are necessarily distant from the observed reality and which provide no instant solutions for practical problems. Thus, sheer casual observation might be claimed to generate knowledge without any need of any theory. Theoretical understanding in IR can then be evaluated as superficial and artificial unlike in physics where, in general, immediate explanations of phenomena through observations cannot be formulated.

While Neo-Kantianism values mind and mental pictures, the philosophy of mind helps to zero in on the formation of mental pictures. The philosophy of mind has two central branches: Cartesian dualist and materialist theories. Identity theory and functionalism are the two central materialist theories (Fodor, 1981: 114). According to René Descartes, the realm of senses constitutes a category distinct from the realm of reality; mind and matter are distinct substances which exist separately. The mind is the seat of consciousness and core steering thought processes (Descartes, 1989). Cartesian dualism posits that brain and mind are distinct implying that the mental picture of the bounded domain is formed by a nonphysical substance. Dualism is a target of criticism by Ryle (1949). Ryle asks "How can a mental process, such as willing, cause spatial movements like the movements of the tongue? How can a physical change in the optic nerve have among its effects a mind's perception of a flash of light? This notorious crux by itself shows the logical mould into which Descartes pressed his theory of mind" (Ryle, 1949: 19). In accordance with Rylean criticism of dualism, it is possible to propose that Waltz's definition of theory as a picture emanating from a substance without having a position in space and being the origin of all thought activities runs a category mistake, that is, a presentation of things or facts of one kind as if they are elements of another one. Thus, Neo-Kantian thinking intersecting with the philosophy of mind generates a central problem under dualism. The interaction between two categories reveals workings of a "ghost in the machine" according to Ryle who maintains that to have a mind is not equivalent to possess a certain or special capacity but to possess a certain disposition (Audi, 2015: 804). Waltz's definition of theory can be saved from running a category mistake by

arguing that it refers to a disposition to form pictures instead of arguing that it refers to a certain or special capacity. Dualism does not develop the conceptualization analysis farther than a non-substantial entity as the origin of mental pictures. Materialist doctrines of identity and functionalism view mind as a computational force like neurological brain networks.

Identity theory and functionalism are monist materialist philosophy of mind doctrines opposing Cartesian dualism. They both imply that mind and international politics cannot be separated from each other. Yet they take opposite directions. Identity theory argues that mind and matter cannot be separated one from the other as they form a unity in the nonspatial realm of thoughts and sensations. Everything is in mind, therefore in the brain. Hence, if there is a picture of the bounded domain, then the picture constitutes a physical state of the brain. Jackson (2010: 114) maintains that "Far from dualism, Waltz's account of theory suggests a *mind-world monism* whereby mind is and remains constitutively intertwined with the world in a way that is often baffling to neopositivists and critical realists alike" (italics in the original). The mind-world monism here can be interpreted in two distinct ways: it can refer to idealism in terms of the philosophy of science or it can refer to identity theory in terms of the philosophy of mind. There is an important difference between the two interpretations, however: in idealism the unity forms in nonmaterial terms but the unity forms in brain in material terms according to identity theory. More succinctly, idealism accepts that everything is in the mind, therefore reality is fundamentally mental, and identity theory claims that everything is in brain. Therefore, monist doctrines concentrating on mind deserve attention.

Identity theory assumes that brain processes are equivalent to sensations, that is, sensations are brain states and brain states are sensations (Smart, 1959); "mental states *are* physical states in brain" (Churchland, 1984: 26) (italics in the original). It follows that the identity theory implies Waltz's mental picture as being equivalent to a sensation, a physical event, or an output of neuro-physiological events in the brain. Boltzmann, for example, did not observe atoms, atomic interactions, but constructed his picture in purely mental terms. He declares: "Mind and matter are not separated; they are only different sides or faces of reality" (Boltzmann, 1974: 196). Boltzmann's argument is in line with both idealism and identity theory. Nonetheless, there is a problem with the identity theory interpretation: it does not specify how those sensations are produced or what causal relations form a mental state. We ignore what theories or theoretical views have prompted Boltzmann to insist on the mentally constructed existence of atoms.

Functionalism, a materialist philosophy of mind (Block, 1983; Fodor, 1981; Putnam, 1975; Sellars, 1956) implies that a mental picture of international politics corresponds to neurophysiological processes of the brain similar to identity theory. In contrast with identity theory, it specifies how sensations are produced through causal mental states in the brain. It posits a multiplicity of interrelated mental states generating behavioral outputs. Hence, the functionalist argument answers the question of how Waltz's mind connects with international politics and solves the problem of nonphysical mind occupying no place in the physical realm by definition. Functionalism is fruitful not only because it helps to theorize and concentrate on how brains work and it is the current philosophy of

mind approach (Heil, 1998; Kim, 1996; Polger, 2004), but mostly because it sheds light upon how mental states within the brain interact and how pictures come out of these interactions.

Computational process

Realism and system theory constitute the two pillars of Waltz's theory. Therefore, in accordance with functionalism, realism (Mearsheimer, 2001; Morgenthau, 1960; Walt, 1987) and system theory (Angyal, 1969; Ashby, 1952; Bertalanffy, 1950, 1968) are assumed to interact and function as a cognitive process in the brain (Block, 1983; Fodor, 1981; Heil, 1998). Realism and system theory are interconnected and function together as computational operators giving direction, contrast, and appearance to mental pictures. They transpose sensory inputs, reduce the memory space and facilitate mental calculations. The interconnectedness of realism and system theory, similar to a computer software, can be argued as a speedy processor steering neurological interconnections in the brain processing the input of incoming international politics observations. In a sense, the brain offers the physical composition, the computer hardware, for the interconnectedness to operate. The mental picture becomes an output of an interaction between system theory-realism interactions functioning as a software.

Functionalism allows a multiplicity of mental states each having a causal role. Mind contains interrelated mental states having tasks to fulfill, that is, functions. Mental calculations correspond to an algorithm that starts to operate by system theory. The fundamental question is: "how many interacting states exist?" System theory answers the question by proposing a system size. Realism follows system theory by answering the second question: "what is the distribution of power across states?" Realism answers the question by assigning powers of each state. Once the algorithm pins down the distribution of power across selected number of interacting states, systems theory answers the third and the final question: "how are states located with respect to each other?" System theory answers the question by specifying the contiguity configuration in the system, that is, selected states' geographic locations with respect to each other. The algorithm ends once it generates an output in the form of a mental picture. Thus, the two interrelated mental states generate a picture of an international structure as output.

System theory has a primary function in mental picture construction because contiguity configuration and power distribution cannot operate unless one knows the number of interacting states. Thus, the second question requires an answer to the first. An alternative algorithm operates first by noting the system size followed by the specification of contiguity configuration that is in turn followed by the specification of the power distribution. Therefore, the algorithm incorporates two sequences: the system theory operates first, realism second, and the system theory third, or, alternatively, the system theory operates in the first and the second steps and realism in third and the final step ending the mental process. Overall, the system size, the power distribution, and the contiguity configuration produce together mental pictures of international systems selected states form. The algorithm displays a neo-Kantian view of how our minds impose order on sensory data (Breit, 1984: 20).

Taxonomies of mental pictures

Dyads

Mental pictures as listed do not correspond to structures real states form. They are imaginary and combinatory brain products. The simplest international system is a dyad consisting of two states. Let A and B denote the two states. Realism distinguishes between three different power distributions in the dyad: $A = B$, $A > B$, and $A < B$. Systems theory specifies two possible contiguity configurations where A and B share or not a common border. Consequently, the mental output consists of six mental pictures of international systems three power distributions and two contiguity configurations generate.

Triads

The number of three-state international system pictures is larger. Caplow (1959) offers eight power distributions in triads:

(1). $A = B = C$

(2). $A = B > C$

(3). $A = B + C$ and $B = C$

(4). $A > B = C$ and $A < B + C$

(5). $A > B = C$ and $A > B + C$

(6). $A > B > C$ and $A = B + C$

(7). $A > B > C$ and $A < B + C$

(8). $A > B > C$ and $A > B + C$

Once realism establishes triadic power distributions as listed above, it is the turn of the system theory to determine geographical positions of the three states. The system-size jump from dyads to triads necessitates the determination of how the third state is physically located. Similar to dyads, all three states can be contiguous or discontiguous. Triads offer two more configuration possibilities. In one, two states are contiguous and the third one is distant. In the other, one state is placed between the other two. The latter configuration is largely discussed in terms of wing allies, central states, and two-front wars (Harkavy, 1977) and classified as the principle of "the odd and even numbers system" in international politics (Namier, 1942: 14).

Power equalities reduce the mental number of pictures because contiguity configurations do not spawn extra mental pictures when states with equal power occupy the same geographic position. The power distribution of $A = B = C$ yields four pictures corresponding to each contiguity configuration. A higher number of pictures results for the distribution $A > B > C$, because each of the three states possessing different amounts of capabilities can be the distant from two contiguous states or can be the central state. It follows that computational procedures produce eight pictures for each $A > B > C$

distribution variant associated with the conditions of $A < B + C$, $A = B + C$, and $A > B + C$. The pictures connected with the power distribution of $A > B > C$ and $A < B + C$ are listed below:

In total, there exist 24 pictures connected with the distribution $A > B > C$. Overall, the total number of triadic mental pictures is 53.

Tetrads and larger systems

The number of triadic pictures versus dyadic ones demonstrates the complexity the addition of one state to a dyad. The addition of one state to a triad creates a higher degree of complexity. Willis (1962: 361) lists 17 power distributions in four-state systems, that is, tetrads:

(1). $A > B + C + D$

(2). $A \leqslant B + C + D$, $A = B = C = D$

(3). $A \leqslant B + C + D$, $A = B = C > D$

(4). $A \leqslant B + C + D$, $A > B = C = D$, $A = B + C + D$

(5). $A \leqslant B + C + D$, $A > B = C = D$, $A < B + C + D$

(6). $A \leqslant B + C + D$, $A = B > C = D$

(7). $A \leqslant B + C + D$, $A = B > C > D$

(8). $A \leqslant B + C + D$, $A > B = C > D$, $A = B + C + D$

(9). $A \leqslant B + C + D$, $A > B = C > D$, $A < B + C + D$, $A + D > B + C$

(10). $A \leqslant B + C + D$, $A > B = C > D$, $A < B + C + D$, $A + D = B + C$

(11). $A \leqslant B + C + D$, $A > B = C > D$, $A < B + C + D$, $A + D < B + C$

(12). $A \leqslant B + C + D$, $A > B > C = D$, $A = B + C + D$

(13). $A \leqslant B + C + D$, $A > B > C = D$, $A < B + C + D$

(14). $A \leqslant B + C + D$, $A > B > C > D$, $A = B + C + D$

(15). $A \leqslant B + C + D$, $A > B > C > D$, $A < B + C + D$, $A + D > B + C$

(16). $A \leqslant B + C + D$, $A > B > C > D$, $A < B + C + D$, $A + D = B + C$

(17). $A \leqslant B + C + D$, $A > B > C > D$, $A < B + C + D$, $A + D < B + C$

Each of the 17 power distributions is mentally coupled with new contiguity configurations in tetrads. There exist five distinct tetradic contiguity configurations spanning those where all four states are contiguous and discontiguous. Tetrads add three extra configurations. It is possible that there are three contiguous states and one distant state, three states arranged as wing and central states and the fourth state is distant, or two pairs of

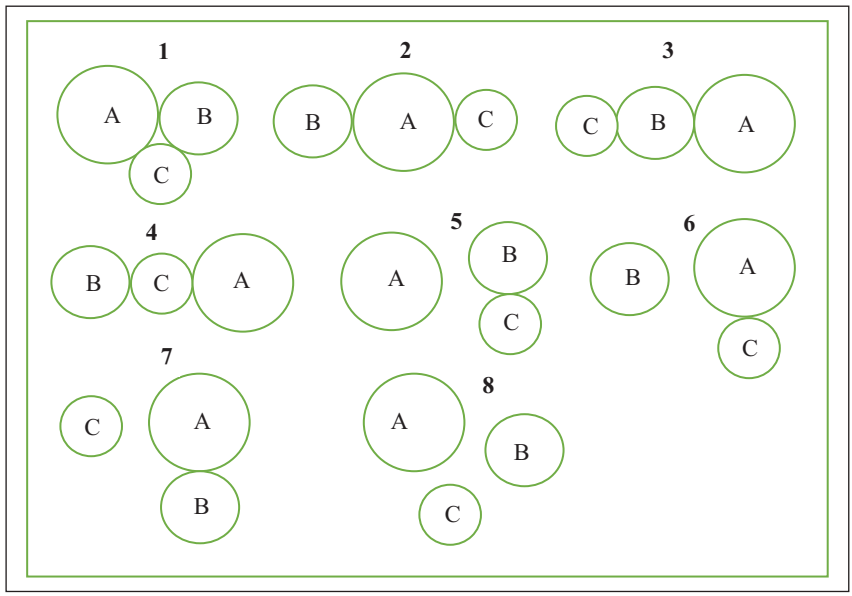

Figure 1. Mental pictures spawned by $A > B > C$; $A < B + C$ and four contiguity configurations.

contiguous states while each pair is distant from the other. The power distribution of $A \leqslant B + C + D$, $A = B = C = D$, for example, produces five pictures corresponding to each of the five contiguity configurations in tetrads. Seventeen power distributions combined with five contiguity configurations generates more tetradic pictures than 53. There are eight distinct geographic placements of five states: all contiguous, all discontiguous, two pairs of contiguous states and one distant state, two subsystems where of three contiguous states separated from two contiguous states, three contiguous states and two distant states which are discontiguous, four contiguous states and one distant state, three states forming a subsystem where there is one central and two wing states and two distant but contiguous states or two distant and discontiguous states. The number of mental picture outputs increases geometrically. Consequently, the move from dyads to triads, tetrads, five-state state systems and international systems of size larger than five demonstrates the creation of complexities on the basis of simple rules. Overall, the picture rules are embedded in brain algorithms computing changing contiguity configurations and power distributions depending on the system size.

Structural constraints

Each picture in Figure 1 above displays a way states can be arranged mentally in the distribution $A > B > C$; $A < B + C$. Structures denote states' arrangements generating constraints that reduce the range of state interactions (Waltz, 1979: 80–81). Therefore, each mental picture helps to assess reduced range of states' interactions in structural terms: "Short of predominating, a system's structure acts as a constraint on the systems'

units. It disposes them to behave in certain ways and not in others, and because it does so the system is maintained" (Waltz, 1979: 58). Mental pictures help to assess constraints under which states of equal power and occupying different geographical positions and states of different power occupying similar geographical positions interact: "Systems theories explain why different units behave similarly and, despite their variations, produce outcomes that fall within expected ranges" (Waltz, 1979: 72).

Waltz does not specify the direction and the magnitude of structural constraints. Mental pictures guide and organize assessments of structural constraints by differentiating between state-level and system-level interpretations. Spykman (1942: 444) claims that "A sound foreign policy must not only be geared to the realities of power politics, it must also be adjusted to the specific position which a state occupies in the world. It is the geographic location of a country and its relation to centers of military power that defines its problem of security." Spykman's concern is foreign policy at state-level. In contrast, each picture limns, *grosso modo*, constraints that shape and shove states' interactions at system level. They do not indicate foreign policy determinants. States occupying the same position and therefore being constrained similarly can adopt dissimilar foreign policies depending on their internal traits and domestic politics.

It is possible to evaluate structural constraints to explore their magnitude and direction by keeping the contiguity configuration constant and letting the distribution of capabilities vary. To illustrate, in the triadic contiguity configuration of one state being positioned between the two others, the central state is constrained to prevent an alliance of the wing states. As the central state's power increases the constraint to prevent wing states' alliance diminishes in magnitude. The wing states' interactions in turn are reduced under their cumulative capabilities toward the central state; the lesser their common capabilities, the lesser become their incentives to form an alliance to target the central state. It is also possible to evaluate structural constraints by keeping the distribution of capabilities constant and varying contiguity configuration. However, it is difficult to imagine that, for example, two powerful contiguous states being distant to the third smaller state transforms into a configuration of all states being geographic neighbors or one in which a state becomes the central one. The fictive difficulty can be circumvented by imagining weapon systems ignoring distance and transforming a distant state a neighbor by exploring types of structural modifiers (Taliaferro, 2001: 137). Therefore, structural modifiers can lower or elevate the impact of structural constraints as if contiguity configuration transforms.

Kautilya, an Indian royal advisor, offers clues to ponder about structural constraints in his work *Arthasastra*. He claims that: "The king who is situated anywhere immediately on the circumference of the conqueror's territory is termed the enemy. The king who is likewise situated close to the enemy, but separated from the conqueror only by the enemy, is termed the friend (of the conqueror). . .In front of the conqueror and close to the enemy, there happen to be situated kings such as the conqueror's friend, next to him the enemy's friend, and next to the last, the conqueror's friend, and next, the enemy's friend's friend" (Seabury, 1965: 8). Hence, if two states are geographic neighbors, then they are enemies. Kautilya's precepts determine friend-foe dualities as emanating from geographic positions. Structural constraints do not dictate neighbors to be mutual enemies, however. They reduce the range of interactions posing limitations on neighbors' friendly

interactions. Another clue on structural constraints comes from Boulding (1962). Boulding offers the principle of the further the weaker by his theoretical concept of the "loss-of-strength gradient" that measures the rate at which power diminishes over distance from states' home base. The loss of strength gradient implies changes in the distribution of capabilities implying structural changes and therefore changes of structural constraints. To illustrate, take a dyad of states *A* and *B* and assume that *A* musters more capabilities than *B*. The impact of the asymmetric power distribution upon *B* diminishes over distance. The more distant is *A*, the lesser becomes the magnitude of the inequality between *A* and *B* implying a diminution in the impact of structural constraints in interactions between *A* and *B*. Hence, the distance between two states of unequal strength implies a change in structural constraints permitting a wider range of interactions between *A* and *B*.

Triads offer rich perspectives of structural constraints. There exists a peculiar evaluation of friendships in a triad where a state is taken between the other two called wing states. If, for example, the state *A* is the central state taken between wing states *B* and *C*, then, according to Kautilya, *A* is the enemy of both *B* and *C* that are friends. Structural balance theory seconds Kautilya's view by its principle of "my neighbor is my enemy, the neighbor of my enemy is my friend" (Auster, 1980; Cartwright and Harary, 1956; Harary, 1953, 1985; Heider, 1946, 1958). The peculiarity of this structure stems from, for example, the central state *A* facing the constraint of preventing the formation of a *BC* alliance to preclude fighting a two-front war. The constraint vanishes if *A* is a hegemon, that is, *A* musters more capabilities than the sum of capabilities of *B* and *C*. It is then the turn of the wing states to suffer pressures working against their friendship while the hegemon faces no constraints at all. Another structure peculiar to triads is the one where two states are neighbors and the third one is distant. If *A* and *B* are contiguous, then *A* and *B* are concerned more with each other and less with *C* posing as a friend or a "balancer." Structural constraints favor *C* more than *A* and *B* as their interactions are squeezed in the direction of assuring *C*'s alliance in their reciprocal conflicts. The "balancer" loses its favorable position if it gets weaker so that *A* and *B* are not constrained to seek C's cooperation in their interactions.

In larger systems such as tetrads, structural constraints arise in a more complex fashion. Tetrads add one more state to triadic interactions. There could be a subsystem containing a central state taken between two wing states and a distant one, or two distant dyads composed by equal or unequal neighbors, or three states contiguous to each other and the fourth state is distant. If three states are contiguous to each other and the fourth state is distant, the fourth can be interpreted as a balancer. If the fourth state's power is still considerable even abated over distance, the competition among the three for the fourth state's friendship remains acute unlike in the case of a weaker fourth state. In systems of five or more states structural constraints diversify and get compounded. The hegemon is always immune to structural constraints regardless the system size and geographic positions in the system. Nothing can put the hegemon's security in jeopardy in any system.

Taxonomies help to organize how structural constraints can be evaluated across different systems. Waltz's theory assesses structural constraints that "encourage states to do some things and to refrain from doing other" (Waltz, 1997: 915). Structural constraints

remain unobservable, and their existence is assumed. An immediate question then arises whether structural constraints are like phlogiston, a substance burning materials lose once used to explain combustion (Derry, 1999: 185). We now know that phlogiston does not exist and oxygen is the necessary condition for combustion. Would structural constraints share the same fate as phlogiston? The debate between scientific realism and constructive empiricism allows clues for answers (Chakravartty, 2007; Churchland, 1979; Churchland and Hooker, 1985; Van Fraassen, 1980). Scientific realism which is "largely unacknowledged by political scientists" (Wendt, 1987: 336) does not distinguish between observable or non-observable forces. Structural constraints' existence does not depend upon our thoughts or language we use according to scientific realism. Do structural constraints refer to real but unobservable forces independent of mental workings of picture making? The question becomes central in scientific realist terms. If structural constraints mental pictures imply produce successful explanations of international politics, structural constraints can be argued to exist. Thus, scientific realism supports Waltz's conjecture of structural constraints provided that they are demonstrated to shape and shove international interactions. A precise distinction between observable and unobservable entities is impossible to draw according to scientific realism (Okasha, 2002: 66). Wendt (1987: 351) states that "Neorealists might be seen as scientific realists to the extent that they *believe* that state interests or utilities are real but unobservable mechanisms which generate state behavior" (italics added). Structural constraints belong to the set of unobservable mechanisms as Wendt indicates. The problem is to transform Wendt's assertion into "Neorealists might be seen as scientific realists to the extent that they *explain* that state interests or utilities are real but unobservable mechanisms which generate state behavior" (italics mine).

Is it necessary that structural constraints are observed? The answer is no. It is difficult to draw a precise distinction between observables and non-observables. No one saw molecules, but explanations are built upon their assumed existence. Hence, scientific realism does not eliminate explanations based on unobserved structural constraints. This is exactly where constructive empiricism deviates from scientific realism (Van Fraassen, 1980). If, for example, central states are observed to spend efforts to prevent alliance between the wing states, then scientific realism would accept these observations as grounds and supports to structural constraints. Constructive empiricist view would take these observations as supporting the adequacy of explanations only. One must have the proof of the existence of these constraints. In short, the observations do not constitute the final proof of the existence of structural constraints for constructive empiricism.

Concluding remarks

Waltz (1979: 40) assumes that interactions among states and structures interact. Unobserved structural constraints steer those interactions without pinpointing specific choices; they "limit and mold" international politics (Waltz, 1979: 74). How would then mental pictures help to assess structural constraints in Ukraine-Russia conflict? The answer can reveal only a few and important phenomena. The mental picture of a dyad consisting of two contiguous elements controlling unequal amounts of capabilities corresponds to a simple configuration. The dyad implies that Ukraine

is its weaker member without the Western help. As result, Russia-Ukraine interactions confine Ukraine more than Russia. NATO help relaxes delimitations structural constraints impose on Ukraine. It also adds a substantial number of states involved in the conflict. Involved states' geographic locations complicate the picture of the direction and the magnitude of structural constraints. Yet, it is possible to affirm that Ukraine becomes less limited in its choices due to the improvement of Ukrainian war-making capabilities. How such a unilateral material improvement lead to specific foreign-policy changes is out of the theoretical scope. Structural constraints can indicate only general directions toward which interactions can evolve into.

If Ukraine gets successful in getting back territories lost to Russia by receiving NATO help, Russia could not be considered to remain at rest. Russia could become confined to align with China imitating Ukraine's alignment in the process of competition (Waltz, 1979: 74). If Russia is not constrained to prevent a hypothetical Sino-U.S. alliance, then it becomes exempt of facing constraints central states must deal with in triadic pictures. In contrast, any Sino-Russian alliance opposing Ukraine-NATO alliance clarifies who is opposing whom in the conflict. A clarification of opposing sides elucidates the nature and the magnitude of structural constraints at global level. The mental picture of two opposing alliances at global level implies a drastic reduction in structural constraints and range of interactions. Two global alliances opposing each other dispose sides to behave in a certain and perhaps a unique way contributing to global stability or instability.

It is possible to develop further research projects on the development of mental pictures the article proposes by considering alternative topologies, that is, distance functions. Alternative topologies can describe how states are distanced from each other and positioned in the international system. States can be differently placed in international systems by other traits than their power like their obeyance to international norms, culture, or other traits. Hence, "isms" are not necessarily harming international theory, instead they enrich it (Lake, 2011). Functionalism does not imply that different brains must experience same pictures (Block, 1983). Thus, there can be topologies using different positional indicators under the condition that states' positional values remain central in mental pictures. The possibility of alternative topologies is reminiscent of Poincaré's view that "our choice among the many geometries that pre-exist in our minds" (Miller, 1984: 20). It is possible that structural constraints relate to topological traits different than system size, power, and geography. The existence of a multiplicity of distance functions demonstrates a "plasticity of mind" (Churchland, 1979) and eliminates fixed structures of thought. The problem of a reduction of multiplicity is to pinpoint which trait at system level can accomplish the same role system size, power distribution and contiguity configuration play in mental assessments.

A fundamental problem arises about the clarification of structural constraints different topologies imply. Waltz's analogy is difficult to achieve in an alternative topology using, say, states' conformity with international norms. States' positional pictures based on international norms are possible but require additional arguments. The following question becomes central: "What is the conventional nature of the normative approach to international politics?" A normative topology must imply an alternative meaning of structural constraints. Structural constraints an operating system based on international law norms differ from those generated by system theory and realism. Instead of thinking

in terms of constrained choices due to the number of states, power distribution and geographical distribution, it becomes more attractive to talk about how states find that obeyance to international norms are rewarding when they are placed among states that respect or not international law. Evolutionary game theory offers a rigorous perspective about structural constraints that take form of changing punishments or rewards given states' deviation or sticking to international norms. Depending on those rewards and punishments states' positions can be stabilized in a binary fashion over time like obedient and disobedient states. States can be measured by scores of their respect for an international norm like human rights, environmental protection, or cooperation during pandemics. Thus, it is possible that mutant behavior of disobedience among a majority of obedient states becomes rewarding and paves the way for disobedience to become a stable norm. A population of states can evolve ultimately into either purely disobedient or in a purely obedient states with zero distance from each other. There could be a mixed case as well where the evolution stabilizes at the existence of two groups of states in the population with one consisting of obedient and the other disobedient states. Thus, from an evolutionary view, states can find behavior in conformity with international norms either rewarding or not depending on the size of the population of states and on the proportions of obedient and disobedient states in the population. Both norms can be evolutionarily stable exposing structural constraints upon states' behavior leading to some stability that can be evaluated as a convention (Lewis, 1969; Smith, 1982; Young, 1993).

A theory defined as a mental picture of a bounded domain demonstrates how the philosophy of mind contributes to abstract thinking in international politics and pollinates the discipline of IR. The interaction between mind and brain, the former consisting itself of an interaction between system theory and realism and the latter allowing the mind to function, constitutes an effort to demonstrate that mental pictures and structural constraints constitute a genuine ground of discussion. Waltz still invites IR scholars to ponder on how IR theories connect with different branches of philosophy of mind and science. We should accept his invitation to widen and enrich our theoretical and philosophical perspectives.

ORCID iD


Serdar Ş Güner https://orcid.org/0000-0002-4659-3847

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Author biography

Serdar Ş. Güner is an associate professor of international relations at Bilkent University, Ankara, Turkey. His research interests cover international relations theories, game theory and its applications, international and water conflicts, bronze-age interactions in the Middle East, philosophy of science and mind.