

International Relations' Nomological Machines: The Neo-Neo Synthesis's Tale of Law-Like Explanations

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ABSTRACT. Objective/context: This article introduces debates on Nancy Cartwright's concept of nomological machines applied to international relations theory. What the neo-neo synthesis claims as the essence of the international system is a set of conditions imposed upon international phenomena for the latter to fit into the theories themselves. It argues that the law-like explanations tailored by neorealism and neoliberalism are by no means a representation of the world as it is, but rather a predication of the world as these theories want it to be. **Methodology:** It critically reviews the foundations of neo-neo theories, suggesting a philosophical methodology by reframing the ontological terms of neorealism and neoliberalism based on the concept of nomological machines. **Conclusions:** This article contends that neo-neo theories could benefit from a capacities-oriented approach, which offers a less categorical understanding of how explanations of international phenomena are tailored, allowing alternative principles to provide invaluable insights about the international system. **Originality:** This paper innovates by intersecting the ideas of nomological machines with the metatheoretical debate on international relations, thus enabling theoretical improvement.

KEYWORDS: international relations theory; neo-neo synthesis; nomological machines; philosophy of international relations; philosophy of science.

Las máquinas nomológicas de las relaciones internacionales: el cuento de las explicaciones tipo-ley de la síntesis neo-neo

RESUMEN. Objetivo/contexto: este artículo presenta los debates sobre el concepto de máquinas nomológicas de Nancy Cartwright aplicado a la teoría de las

relaciones internacionales. Lo que la síntesis neo-neo reivindica como esencia del sistema internacional es un conjunto de condiciones impuestas a los fenómenos internacionales para que estos encajen en las propias teorías. El artículo sostiene que las explicaciones tipo-ley diseñadas por el neorrealismo y el neoliberalismo no son en absoluto una representación del mundo tal y como es, sino más bien una predicción del mundo tal y como estas teorías quieren que sea. **Metodología:** el estudio revisa de manera crítica los fundamentos de las teorías neo-neo, sugiriendo una metodología filosófica al replantear los términos ontológicos del neorrealismo y neoliberalismo basándose en el concepto de máquinas nomológicas. **Conclusiones:** este artículo propone que las teorías neo-neo podrían beneficiarse de un enfoque orientado a las capacidades, que ofrece una comprensión menos categórica de cómo se adaptan las explicaciones de los fenómenos internacionales, permitiendo que principios alternativos proporcionen valiosas perspectivas sobre el sistema internacional. **Originalidad:** este trabajo innova al entrecruzar las ideas de las máquinas nomológicas con el debate metateórico sobre las relaciones internacionales, permitiendo así un avance teórico.

PALABRAS CLAVE: filosofía de la ciencia; filosofía de las relaciones internacionales; máquinas nomológicas; síntesis neo-neo; teoría de las relaciones internacionales.

As máquinas nomológicas das relações internacionais: a síntese neo-neo e o conto das explicações de lei geral

RESUMO. **Objetivo/contexto:** este artigo apresenta debates sobre o conceito de máquinas nomológicas de Nancy Cartwright aplicado à teoria das relações internacionais. O que a síntese neo-neo reivindica como a essência do sistema internacional é um conjunto de condições impostas aos fenômenos internacionais para que estes se encaixem nas próprias teorias. O artigo argumenta que as explicações de lei geral adaptadas pelo neorrealismo e pelo neoliberalismo não são de forma alguma uma representação do mundo como ele é, mas antes uma predicação do mundo como estas teorias querem que ele seja. **Metodologia:** o artigo revisa criticamente os fundamentos das teorias neo-neo, sugerindo uma metodologia filosófica ao reformular os termos ontológicos do neorrealismo e do neoliberalismo com base no conceito de máquinas nomológicas. **Conclusões:** este artigo afirma que as teorias neo-neo poderiam se beneficiar de uma abordagem orientada para as capacidades, que oferece uma compreensão menos categórica de como as explicações dos fenômenos internacionais são construídas, permitindo que princípios alternativos forneçam conhecimentos de grande valor sobre o sistema internacional. **Originalidade:** este artigo inova ao interrelacionar as ideias das máquinas nomológicas com o debate metateórico sobre relações internacionais, possibilitando assim o aprimoramento teórico.

PALAVRAS-CHAVE: filosofia das relações internacionais; filosofia da ciência; máquinas nomológicas; síntese neo-neo; teoria das relações internacionais.

Introduction

The inter-paradigm debate represents the theoretical core of international relations (IR), and its ability to confront post-positivist critiques has guaranteed a privileged epistemological status in the discipline. As a consequence of such theoretical triumph, neorealism and neoliberalism not only inform our understanding and perspectives about the international system but also shape how we approach international phenomena. Central concepts such as anarchy, agent rationality, war, cooperation, and complex interdependence, to name a few, have become an essential part of IR vocabulary.

The success of the neo-neo synthesis in generating explanations and predicting a variety of international phenomena has granted it a place of pride in the discipline, which in turn has come to suggest that these theories and the methods they entail are capable of producing quasi-universal claims about how international actors and the international system behave. Nevertheless, “universal methods and universal theories should be viewed with suspicion” (Cartwright 2007, 80). Given that, in many situations, those phenomena that happen to be different play a key role in questioning our canonical interpretations of the world.

Perhaps due to its relative success in generating predictions about international phenomena, IR scholars have avoided the philosophical debate of neo-neo assumptions. Metatheoretical inquiries have been seen as a diversion by mainstream academia; however, some scholars have productively engaged with the philosophy of science and have made invaluable contributions to our understanding of what it means to explain international phenomena (Chernoff 2007, 2014; Lebow 2014, 2022; Kurki 2008; Kurki and Wight 2021; Suganami 1996; Wight 2006). Based on this body of literature, this article explores the philosophical underpinnings of the law-like nature of neo-neo theories. We propose to confront Nancy Cartwright’s conception of nomological machines and capacities with neo-neo theories to unravel the mechanisms underlying their production of explanations. In so doing, we reframe the ontological terms of neo-neo theories’ hunt for explanations of international phenomena.

Drawing on Cartwright’s description of nomological machines and arguments about how they can alternatively operate to reveal capacities, we argue that the neo-neo synthesis can benefit from relaxing its rigid approach to central elements of the international arena—namely, anarchy, rational behaviour, and the role played by the structure of the international system. In this process, the strictness of the law-based theoretical discourse is loosened, favouring a more

nanced interpretation of international phenomena through the very same lenses of neorealism and neoliberalism.

The article is divided into three sections apart from the introduction and conclusions. In the first section, we present Cartwright's arguments about nomological machines, central to our discussion of the neo-neo synthesis. Next, we briefly summarise the fundamental epistemological tenets of neorealism and neoliberalism, situating their theoretical logics under the framework of nomological machines. In the third section, we develop our understanding of how to fix neo-neo nomological machines and harness the full explanatory power of both theories.

1. Nomological Machines and Capacities

The various artifices IR scholars use to develop theories locate them in a long-standing tradition of positivist and neopositivist philosophical approaches to theory-building (Wight 2013). In particular, Karl Popper's philosophical reinterpretation of positivism reframed the social sciences in ways that a critical rationalism based on a hypothetico-deductive model of explanation has become pervasive as a metric for defining what (good) science is (Cartwright 2007, 179; Chernoff 2014; Dowding 2016; Hawkesworth 2015). To be sure, the hypothetico-deductive model resembles the archetypical explanatory model of natural sciences, where theories provide the conceptual framework from which scientists derive hypotheses to be tested against data extracted from the real, observable world, ultimately leading to the formulation or confirmation of overarching laws of nature. According to Hawkesworth:

Most of the research strategies developed within social science in the twentieth century draw upon either positivist or Popperian conceptions of the scientific method. The legacy of positivism is apparent in behaviorist definitions of the field that emphasize data collection, hypothesis formulation and testing, and other formal aspects of systematic empirical enterprise, as well as in approaches that stress scientific, inductive methods, statistical models, and quantitative research designs. (...) It emerges in claims that social science must be modeled upon the methods of the natural sciences, for those alone are capable of generating valid knowledge. (Hawkesworth 2015, 33-34)

The quest for a social-cum-natural science of IR has produced a theoretical body that operates under the tenets of a nomological machine, a powerful device capable of matching the observable world to the laws of nature, as described by

Nancy Cartwright (1999). Cartwright departs from a Humean post-logical-positivist approach to define a law of nature as “a necessary regular association between properties antecedently regarded as OK” (Cartwright 1999, 49). Laws can be either deterministic—the association derives *ipsis litteris* from the properties entailed in the law—or probabilistic—associations between properties are governed by chance (Dowding 2016). Every law describes real-world phenomena via properties, which can be measurable, tangible, or even abstract, and it is due to the operation of these properties through certain mechanisms inscribed into the law that generates the outcomes we observe in reality. Ultimately, a law holds for all cases that fall into the dicta of its properties.

Precisely here lies Cartwright's understanding of laws *vis-à-vis* what she calls nomological machines. For a law to work, its properties must operate as it ascertains. In a world pervaded by natural and social phenomena, we observe regularities that we aim to explain and develop concepts that ascribe specific features to each element at work in generating those regularities. Examples of observed regularities and related concepts are planetary orbits and mechanical celestial forces; water flowing in a pipe, velocity, and laminar flow; collective decision-making leading to suboptimal outcomes; and majority-based electoral systems producing bi-party systems, to name a few. For each concept-regularity pair, rules of combination have to be assigned to each element for a law to be written down. When those elements are present, we can expect the law to say something about a specific phenomenon based on how its properties are inscribed into the concepts, and the regularities observed in the real world combine to generate that phenomenon. A nomological machine, thus, has been put into operation.

Yet, for that to be possible in a chaotic world of countless phenomena, laws are cemented on certain *ceteris paribus* clauses that confine the observed phenomena into the realm of the properties of laws. Cartwright calls it shielding, to the extent that nomological machines must shield themselves from exogenous phenomena that might interfere in their operation (similarly to how an interfering signal disturbs your radio programme). According to her, laws hold “only *ceteris paribus*—they hold only relative to the successful repeated operation of a nomological machine,” which, in turn, “is a fixed (enough) arrangement of components, or factors, with stable (enough) capacities that in the right sort of stable (enough) environment will, with repeated operation, give rise to the kind of regular behaviour that we represent in our scientific laws” (Cartwright 1999, 50). This stable environment is ensured by shielding what we want to explain from any external interference not incorporated into the original model.

The following examples drawn from the natural and social sciences illustrate the operation of a nomological machine. In problems of convective heat transfer—when a solid medium exchanges heat with a fluid medium in its surroundings—physicists and engineers alike resort to Newton’s law of cooling, which is a basic formulation of the rate of heat transfer Q , which equals the product of heat transfer coefficient h , surface area A , and the difference between the temperature on the object’s surface T and the temperature of the environment T_{∞} , *i.e.*, $Q = hA(T - T_{\infty})$. Examining this equation allows us to see how a nomological machine is built on the mentioned description: it aims to explain a regularity, namely heat exchange between a solid object and a fluid in the environment. It establishes concepts that allow for explaining this regularity, such as the rate of heat transfer, heat transfer coefficient, and, more importantly, temperature. In defining these elements, it also sets the rules of combination for each of them—the equation itself. Nevertheless, this does not suffice to fully describe this nomological machine since shielding against the effects of the environment is still needed. A common effect would be neglecting radiation, for instance, or that the difference between the temperature of the object and the environment is relatively small. Shielding also occurs at the conceptual level. The heat transfer coefficient, for example, is estimated based on how the boundary layer of the fluid behaves relative to the surface (whether the flow is laminar or turbulent, for example) (Bergman *et al.* 2011). In both cases, the nomological machine only begins to operate once the concepts are fully determined and confined to *ceteris paribus* clauses and the shielding from the environment is properly described.

In a similar vein, game-theoretical models are themselves nomological machines. Typical settings in game theory depart from the following elements: agents, assumptions about the agents’ behaviour, environmental sets of incentives and constraints, and, frequently, equilibria. Rationality, in whatever manner defined, is a classic concept in game theory that allows for modelling social phenomena where collective decisions need to be made. Agents are assumed to behave rationally and can assess information about the environment, ponder the sets of incentives and constraints imposed by other agents and the institutional architecture that informs the rules of aggregating individual decisions, and devise the optimal strategy to generate the best outcome. Once agents make their decisions, a scenario unfolds. Game theorists are interested in finding the equilibrium point resulting from the strategic interaction of individual agents (Gintis 2009). Once again, concepts, regularities, and the rules of combination underlie the design of a game-theoretical nomological machine. Concepts such as agents, rationality, institutions, incentives, and constraints are fundamental to game theory, regularities stem from the various decision-making scenarios observed in the real world, and

the rules of combination are frequently specified in terms of utility functions in game-theoretical models. Shielding is also in play at all levels—rationality is commonly assumed to be perfect or nearly perfect, uncertainty is usually domesticated to fit into probabilistic models, and the rules of the game, as well as the environmental incentives and constraints, are equally understood by agents. As we can easily see, these elements are also shielded via *ceteris paribus* clauses.

Ceteris paribus conditions instantiate the circumstances under which a nomological machine operates, allowing for the emergence of regularities of the kind we are looking for in the first place. This becomes evident when we scrutinise how scientists formulate equations to explain regularities. In the process, there comes the moment when they must specify the conditions where the equation can be applied (as in the mentioned case of Newton's law of cooling equation). In so doing, the set of *ceteris paribus* conditions plays a special role in designing the explanatory mechanism entailed in the nomological machine: "They describe the structure of the machine that makes the laws true" (Cartwright 1999, 148). Therefore, for a nomological machine to operate repeatedly and generate explanations and predictions across time and cases, it has to rely on the *ceteris paribus* structure that shields it from interference from the outside world that might bring instability and uncertainty to its operation. Indeed, this *ceteris paribus* claustrophobia is necessary for the proper functioning of the nomological machine; otherwise, the machine would break down should the shield fail, and other factors interfere with its internal mechanisms.

This approach to the scientific endeavour, namely to tailoring explanations, is the central matter in Cartwright's critique of how laws are defined and valued in science. If laws depend on a nomological machine to generate them, and if nomological machines restrict the scope of explanation by establishing a single set of behaviours to be expected once the machine starts to operate, our understanding of the myriad factors capable of affecting real-world phenomena becomes profoundly limited, not to mention that our explanatory horizons become restricted to what the nomological machine says in its user guide. Instead of looking for potential behaviours a certain combination of factors might generate, we limit our attention to the components of the nomological machine and the *ceteris paribus* conditions that allow a specific set of regularities to emerge.

Against the law-like building of nomological machines, Cartwright argues that we should instead focus on capacities, which are ontologically more fundamental than laws themselves (Cartwright 1999; Hédoin 2014). In her understanding—which, accordingly, draws from a long tradition of Aristotelian thought—capacities allow us to approach phenomena with an open-ended perspective, which acknowledges that social, economic, political, and natural

phenomena might display a variety of manifestations. Capacities are to be understood as tendencies, abilities, and propensities to generate various kinds of behaviour that cannot be reduced to a single and unique outcome (Cartwright 1999, 59, 64). She explains in one of her examples that we say in economics that taxes affect prices, but what happens to prices depends on the various possible ways of building economics (Cartwright 1999, 64). Furthermore, she states:

The notion of capacity has three elements: (1) potentiality (capacities describe what a factor can do in the abstract, not what actually happens in full empirical reality); (2) causality (capacity claims are not claims about coassociation but about what results a factor can *produce*); and (3) stability (the ability to produce the effect in question must persist across some envisaged variation of circumstance). (Cartwright 1998, 45; emphasis in the original)

Capacities themselves do not presume any specific and predetermined behaviour; as they are scarcely observable in the real world, the nomological machine is needed to specify what exact tendencies we aim to observe in a given phenomenon. Think, for example, about the claim that a force can move a body, which is the underlying principle of Newton's second law. By claiming the capacity of a force, we do not establish a predetermined motion, but rather the propensity to generate that motion. To provide a specific kind of motion, we need extra suppositions (assumptions, shielding clauses) that will set the nomological machine running.

But how do we identify capacities? According to Cartwright, by assessing the structures and qualities of natural and social phenomena—primarily via experimentation—we can identify the underlying capacities that lead to the manifestation of those phenomena, especially regarding the observable regularities that scientists attempt to explain. As Cartwright states: “We try to find out what capacities can be harnessed to produce predictable behaviours” (Cartwright 1999, 138). As capacities are ontologically prior to laws, their discovery allows us to set the conditions and domains under which a certain law operates, acknowledging that the law itself is one of the possibilities entailed by the capacities—the possibilities prescribed by the *ceteris paribus* conditions stated in the law.

Indeed, harnessing capacities presumes the operation of nomological machines if one is willing to observe regularities in the real world. Once capacities are identified, the nomological machine runs according to the behaviours those capacities may elicit, this time in predictable ways. This poses a conundrum: If we acknowledge that the world is pervaded by nonlinear, unstable, and/or uncertain phenomena, how can we isolate capacities in a nomological

machine to ascertain that they are responsible for generating the observable regularity of our interest? The answer lies in the fact that nomological machines are built upon principles that we as scientists dictate (Cartwright 1998), and they are fundamental to generating the regularities that we aim to explain in the first place. In other words, our confidence in the design of the machine is what allows us to associate capacities with regularities (Cartwright 1999, 89).

Up to this point, we have focused on Cartwright's general ideas and arguments, eschewing a discussion of their impact on social sciences. In her interactions with other disciplines, she has primarily devoted attention to economics and how economists devise their socioeconomic nomological machines (Cartwright 1998; 1999). The main challenges for economists reside in the fact that the discipline lacks "widely accepted general principles," which requires economists to depart from thought experiments and assumptions that can be mathematically manipulated in a tractable model, and that they fail to isolate causal factors to explain how each works separately to generate a certain observable outcome (Hédoin 2014, 431-433). As Hédoin puts this more directly: "If economics is about discovering capacities and *if* economic models are socioeconomic machines that fail to isolate capacities because of overconstraint, *then* economics fails to help us to learn how capacities work in the empirical world" (Hédoin 2014, 434; emphasis in the original).

To a large extent, IR faces similar dilemmas: scholars in IR tailor explanations about regularities in the international system; the tenets of neorealism and neoliberalism are fashioned from a law-like, model-based approach to international phenomena, which ultimately leads to explaining observable regularities; these tenets are components of nomological machines that cannot apprehend the various factors we observe in the real world, which leads to their confining into claustrophobic *ceteris paribus* clauses that characterise the law-like machine. Once the machine is running and generates the regularities of our theories of interest, we claim that we have identified the explanatory link between the fundamental capacity entailed in the original design of the machine and the regularity itself. This is precisely the same plot followed by economists that ultimately confronts them—and IR scholars alike—with the problem of identifying capacities in the real world.

2. Neo-Neo Synthesis: Explaining or Shaping Reality?

To integrate Cartwright's nomological machines with the theoretical enterprises of the neorealist-neoliberal debate in IR, it is worth discussing the foundational narratives of the discipline and the locus of the neo-neo synthesis in the

paradigmatic development of IR theories.¹ The IR discipline has been narrated through great debates that unfolded throughout the twentieth century (Burchill and Linklater 2001; Lapid 1989; Smith 2021; Wæver 2021). According to the traditional account of the history of the discipline, the debates fostered ontological, epistemological, and methodological pluralism within IR, distinctively characterising the discipline itself. As the story goes, at the early stages of the discipline, theoretical discussions opposed classical realism and idealism in what has been coined as the first debate.² It was then reedited in the 1970s and 1980s through a dialogue between neorealism and neoliberalism—the so-called neo-neo debate or neo-neo synthesis—also known as the third debate. More recently, from the 1980s on, post-positivists have profoundly criticised the ontological, epistemological, and methodological assumptions of the previous debates.

The second debate, which took place during the behavioural revolution in social sciences, systematically changed the epistemological and methodological landscape of IR. For one, the principles of behaviourism launched an understanding of social science that resembles those of the natural sciences, namely scientific rigour based on quantitative methods, observation, and measurement of regularities (particularly, behaviour), generalisation of findings, and conclusions (Farr 1995; Kirkpatrick 1962). Neorealism and neoliberalism, hence, have followed these principles, establishing—in their terms—the scientific character of the IR discipline. In this sense, they can be seen not as rival theories but as theoretical approaches that share numerous similarities, especially ontological and methodological ones (Kaplan 1969; Kurki and Wight 2021; Lamy 2008; Nicholson 1992). Thus, the neo-neo synthesis is often identified as an inter-paradigmatic dialogue, not as a clash of opposing paradigms.

The inter-paradigmatic debate differed in terms of actors, specific concepts, dynamics, dependent variables, and disciplinary boundaries but had significant internal and structural similarities (Banks 1985). In general, the focus of this debate was on the criticism of the realist excess of state-centredness. Neorealism placed the state and force (military capability) at the centre of its theoretical analysis, whereas neoliberalism, though sharing these assumptions, sought to expand

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- 1 Some quarters of IR evoke Thomas Kuhn's (2017) conceptualization of paradigms to narrate the theoretical development of the discipline. Paradigms, according to Shapere (1964, 385), comprise "laws and theories, models, standards, and methods (both theoretical and instrumental), vague intuitions, explicit or implicit metaphysical beliefs (or prejudices)" that ultimately inform scientific practice within a given discipline. IR theories, thus, could be seen as paradigms in the discipline.
 - 2 For critiques of the conception that realism vs. idealism was the first IR debate, see Wilson (1998) and Quirk and Vigneswaran (2005).

the types of actors in the international arena—incorporating non-state ones—and other expressions of state capability beyond the military sphere. Furthermore, Holsti (1985) argues that the similarities of these theories reinforce the inter-paradigmatic character of the neo-neo debate. Nevertheless, the inter-paradigmatic narrative, although compelling, is disputed in the discipline. For instance, Smith (1996) states that the conception of an inter-paradigmatic debate is misleading since “the proponents of each paradigm literally do not see the same world” (19), meaning that there is no competition between neorealism and neoliberalism. Wæver is also sceptical about the existence of an inter-paradigmatic debate:

Did it exist, the Inter-Paradigm Debate? Partly no, it was not actually an intense [...] debate occupying the minds of International Relationists, but an artificially constructed “debate,” mainly invented for specific presentational purposes, teaching and self-reflection of the discipline. (Wæver 1996, 161)

Despite these disputes about the history of the discipline, scholars understand that both theories emerged from the same ontological and methodological bases and are cemented on the same rationalist principles that characterised social sciences at that time. To a large extent, they resort to an ideal of science that is profoundly marked by the pursuit of explanations of observable regularities; in this process, the hypothetico-deductive model is extensively mobilised. We shall explore this next.

a. Ontological and Epistemological Foundations of the Neo-Neo Debate

Baldwin (1993) synthesises the neo-neo debate in terms of six assumptions: (1) the nature and implications of international anarchy; (2) intentions vs. capabilities; (3) absolute gains vs. relative gains; (4) possibilities for international cooperation; (5) the role of international regimes and institutions; and (6) hierarchical agenda and state priorities. These assumptions define the ontological and epistemological tenets of the mentioned theories, which are essential to understanding how the debate and subsequent synthesis unfold.

The concept of international anarchy is common ground to both theories, although their interpretations of its implications differ substantially. Neorealism perceives anarchy in an essentially competitive manner, functioning as the ordering principle of international relations, boosting states' selfish behaviour and the quest for survival (Grieco 1993; Waltz 1979). Neoliberalism, on the other hand, conceives

international anarchy as allowing cooperation, which culminates in the interdependent behaviour among international actors (Axelrod and Keohane 1985).

Neorealists emphasise the role of capabilities, especially in military terms, since it is the states' ultimate ability to wage wars that guarantees survival and independence in an anarchical environment. This leads states to prioritise security issues in the international agenda. On the other hand, neoliberals focus on intentions and interests, as they affect agents' preference formation and the assessment of gains. Consequently, states do not prioritize themes *a priori* because they have several different priorities in the international agenda other than security (for example, international trade, environmental policy, migration, etc.), and each of these priorities generates different gains assessed in absolute terms. Neorealists argue against the neoliberal perspective on gains, claiming that states evaluate gains comparatively, guiding their actions to obtain more benefits than others in their quest for power or, ultimately, to maintain the status quo (Baldwin 1993; Nye Jr. 1988).

Finally, both theories believe in the possibility of international cooperation. However, neorealism sees it as fragile, temporary, and dependent upon state power. At least in part, this is due to the interpretation posed by neorealism that states seek relative gains. Neoliberalism understands cooperation as a desideratum in international relations. Such conceptions of cooperation influence how both theories perceive the role of international regimes and institutions. Neorealism does not deny the existence of international regimes and organisations, but diminishes their importance and range since they are subjected to state interests, which, in turn, are guided by the constraints of international anarchy (Grieco 1993; Jervis 1999; Waltz 2008). At the same time, neoliberals believe that international regimes and organisations are fundamental components of IR, mitigating the effects of international anarchy due to decreased transaction costs (Axelrod and Keohane 1985; Sterling-Folker 2021).

These images of neorealism and neoliberalism reflect the epistemological foundations upon which each theory builds its explanations of international phenomena. Departing from similar concepts—such as anarchy, war, and cooperation—they are committed to a rationalist, prediction-oriented approach to international theory, where “one must discover some law-like regularities within it [the international system]; and [...] develop a way of explaining the observed regularities” (Waltz 1979, 116). These regularities manifest themselves as general patterns in the international arena (Keohane and Nye Jr. 2012, xxviii), which may be used to generate predictions or causal inferences, especially of a probabilistic kind (Lebow and Risse-Kappen 1996, 5; Keohane 1994, 29; Waltz 1979, 68; see

also Lebow 2022 for a critique of the *modus operandi* of neopositivist theories, a label commonly ascribed to neorealism and neoliberalism). This is precisely where Cartwright's nomological machines come into play.

b. Neo-Neo Nomological Machines

As discussed previously, the neopositivist turn in social sciences has been cemented on the hypothetico-deductive model that informs the epistemological and methodological tenets of social research. To be sure, IR has adhered to the fundamentals of the critical rationalist epistemology, epitomised by the neo-neo debate. Neorealist and neoliberal theories alike endeavour to explain regularities in international relations in a law-like fashion, which, in turn, requires them to assemble specific scenarios where their assumptions, concepts, and mechanisms can operate. In other words, for these theories to explain the chaotic and complex world of international phenomena, the neo-neo synthesis relies on the design of nomological machines that are carefully shielded from external interference.

Nomological machines work “in the sense of stable configurations of components with determinate capacities properly shielded and repeatedly set running” (Cartwright 1999, 151), and they “also are self-sustaining, complete systems that possess their own ‘laws’” (Hédoïn 2014, 436). It is by the force of their internal laws and shielding via *ceteris paribus* clauses that nomological machines generate predictions and, ultimately, explanations about the regularities observed in the real world. By shielding international phenomena from external interference, neo-neo nomological machines derive the outcomes of war and conflict (according to neorealists) or cooperation (according to neoliberals). In either case and as a consequence of the nomological assemblage, neo-neo theories purport to be universal, for their nomological machines are capable of unravelling the mechanisms operating beneath the international scene. But how are these machines assembled in the first place?

A typical neo-neo nomological machine is designed with the following components: anarchy, behavioural premises (namely, rationality), and agent interactions (states and/or non-state actors). These components operate in precisely specified ways to generate the predictions entailed in neo-neo theories. These ways are predetermined via specific statements about what theorists mean by them and shielded from external interference via *ceteris paribus* clauses.

Anarchy is, perhaps, the most fundamental component of neo-neo nomological machines. From the outset, anarchy is defined negatively by the absence of a central international authority, which is the foundational characteristic of the international system. Nevertheless, as straightforward as it looks, anarchy is devoid of structural elements to characterise it. In other words, it is thought to

be the nature of the international system that leads states to behave and interact in certain ways. Neorealists affirm that anarchy is ultimately “associated with the occurrence of violence” (Waltz 1979, 102) and “ordered by the juxtaposition of similar units, but those similar units are not identical” (Waltz 1979, 114; see also Mearsheimer 2021), whereas neoliberals claim that anarchy also allows for international cooperation, with institutions mitigating the state’s selfish behaviour (Keohane and Nye Jr 2012). In both cases, anarchy is a component of neo-neo nomological machines that, when combined with other components, generate well-specified outcomes in the international arena (*i.e.*, conflict or cooperation).

As anarchy cannot operate in solitude, other components are assembled into the neo-neo nomological machines to produce their distinct outcomes. Behavioural assumptions play a significant role in characterising international actors and their subsequent interactions in the international arena. More precisely, actors are intrinsically rational, which means that “they have consistent, ordered preferences, and that they calculate costs and benefits of alternative courses of action in order to maximize their utility in view of those preferences” (Keohane 1994, 27). Such preferences are exogenously given and relatively fixed (Fearon and Wendt 2006), allowing not only for the symbolical operation of the nomological machine to be assembled but also for the formalisation of the machine itself. Rational behaviour, for instance, is the underlying assumption in game-theoretical settings of international interaction, and it is rigidly formalised and shielded from external considerations about cognitive psychology to produce equilibrium outcomes associated with war or cooperation.³

The game-theoretical approach to international phenomena illustrates the perfect nomological machine assembled by neo-neo theories. International games are played in an anarchical arena where rational agents make decisions informed by their internal preferences and strategies. These settings are frequently translated into a mathematical form that simplifies interactions (Powell 1999). In so doing, theorists on both sides of the neo-neo synthesis are capable of solving for the setting. The initial assumptions and inputs allow for the emergence of regularities associated with the outcomes predicted by the theories. But these regularities can only emerge after the machine is adequately shielded from external interference, namely those that act upon agent behaviour and the anarchical nature of the international system. Once the nomological machine is properly assembled,

3 For a discussion on the theoretical disputes between cognitive psychology and rational choice theory, see Lenine (2020).

it operates in a repetitive mode according to the theoretical tenets of neorealism or neoliberalism.

Take as an example nuclear race models or deterrence models based on two-player games, such as the “Chicken” and “Prisoner’s Dilemma” models (Snyder 1971). They were supposed to represent the Cold War bipolar setting by establishing “decision rules for two actors and then predicted the pattern of interaction in the system” (Herrmann 2006, 171). Even after other states had gone nuclear, two-player models still prevailed, being shielded from this external deviation. It is also interesting to note that most nuclear arms race models operate based on three shielding conditions: reduction in the number of players, absence of coalitions, and reduced possibilities for action. Such restrictions make these nomological machines less informative, although simpler and more predictable. In so doing, they create shielding conditions and allow their self-functioning when producing explanations on interactions present exclusively within the machine. Thus, analyses “are locked into the very special game they are playing” (Cartwright 1999, 147). No exogenous factor can distort the rules determined by the game, as it would imply disrupting the basic premises of equilibrium and rationality. It evidences a high level of abstraction where “the model specifies abstract functional relations between the parts that can be instantiated in various different institutional arrangements” (Cartwright 1999, 147).

Game-theoretical approaches have also been widely used to understand international cooperation. Bargaining and reciprocity are two relevant concepts for analysis, as well as anarchy, although it is instantiated in different terms concerning neorealism. For example, Axelrod (1984) explores tit-for-tat strategies in Prisoner’s Dilemma situations, using simulations to identify the outcomes of interactions among different types of actors that resort to these kinds of strategies. Keohane (1986) analyses reciprocity in international relations, marked by the absence of a unified entity that promotes cooperation (*i.e.*, anarchy), concluding that cooperation is possible even without “centralized enforcement of rules” (Keohane 1986, 1). Both studies assume that anarchy is what defines the international system, with possibilities for cooperation and conflict. Therefore, models produce cooperation when actors play repeatedly over time, for they have the possibility of learning. To some extent, these models imply that “actors acquire preferences either as a result of differential reproduction or a process of imitation or adaptation” (Herrmann 2006, 88).

As we can note from these examples, the neo-neo synthesis relies on building nomological machines to generate explanations and predictions for which they are famous. To be sure, neorealism and neoliberalism create law-like theoretical constructs of international relations that foster nomological machines

that, in turn, produce the regularities we observe in the international system, namely war or cooperation. Nevertheless, in so doing, each theory shields itself from variables that might affect the predictions it produces, which responds to the rigid theoretical discourse these theories proclaim. In other words, they shape international phenomena by the force of their understanding of the components of the very nomological machines they build. However, by ignoring that the international system is constituted of capacities, the neo-neo synthesis crystallises a profoundly limited understanding of what each component of its nomological machines *is* and *does* to international phenomena. A capacities-oriented approach is necessary to fix the neo-neo machines.

3. Fixing IR's Nomological Machines: Capacities and Explanation

Neo-neo nomological machines are plenty and guide our understanding of international phenomena, namely what falls into the categories of conflict and cooperation. Taken in isolation, they provide us with rigid pictures of the international system, where specific regularities are worth observation and theorisation. This stems from neo-neo theories' attempts to explain real-world phenomena not only by the force of their individual theoretical tenets but also by excluding each other's interpretations and alternative views of the international system.

Indeed, any theory has to rely on a set of assumptions and concepts that, once combined, yield the theoretical discourse that examines and ultimately explains the world. Nevertheless, the specific law-like nature of neo-neo theories in IR, instead of enhancing their ability to tailor explanations about the international phenomena of their interest, creates a theoretical claustrophobia that excludes a significant number of factors that are useful to comprehend the intricate dynamics of the international system. More importantly, by eschewing a deeper ontological investigation of the basis of their explanations, neo-neo theories fall into the trap of reproducing a theoretical discourse limited to predicting what is going to happen by the operation of a nomological machine. In other words, they fail to explain *why* the phenomena of interest take place since they are confined to the law-like workings of the nomological machine. Relaxing the law-like element is paramount to illuminating these dynamics, and a capacities-oriented approach, as suggested by Cartwright, might be helpful in this process.

As Cartwright states, "Knowledge of capacities is more basic in that it is both more embracing and more widely useful than knowledge of regularities" (Cartwright 1999, 77). Capacities are more embracing because, instead of talking about what things do in law-like terms, they tell what is in the nature of things to

do given the exercise of their capacities under certain circumstances. For example, Newton's law of gravity states that all matter, by possessing mass, attracts each other. This law holds for most objects and materials we encounter in our daily routine, which are subjected to the effects of our planet's gravitational pull. But for subatomic particles, whose masses are negligible, gravity is not as important a factor as electric forces. Coulomb's law comes into play, and gravity by itself cannot tell whether two particles will attract each other because, depending on their electric charges, we may observe repulsion between them. This does not mean that gravity plays no role. The particles do keep their capacity of gravitational attraction by virtue of possessing mass, but in comparison to the electric forces in play, the effects of gravity are negligible. In this example, the regular behaviour expected due to gravitational forces does not yield, for other forces assume prominence in this specific setting. Hence, forces are prior to the behaviour—they are manifestations of the capacities possessed by matter.

The key here is that capacities are primary, whereas regularities are derivative. As the example of the law of gravity demonstrates, an object possesses the capacity of attraction, but how this capacity will manifest itself depends on the analytical setting in the first place. The regular behaviour, therefore, is not immediately derived from the law because other capacities may elicit different types of behaviour and, therefore hinder the gravitational effects. Similarly, the underlying capacities of the international system generate various types of behaviour across countries; however, they do not have to be predetermined in a law-like fashion for the same reason that the analytical settings might influence how these capacities are exercised.

Anarchy is perhaps the most emblematic example of how a capacities-oriented approach to international phenomena is more productive than the original law-like perspective of neo-neo theories. Anarchy is a pervasive characteristic of the international system, considered by both theories in their accounts of state behaviour. In their readings, though, what results from an anarchic system is thought to be axiomatic—what we observe, according to each theory, is a set of regularities that fall into one of the categories of war or cooperation. Nevertheless, the traditional outcomes of war and cooperation are not directly derived from the components of anarchy and actor behaviour, but from a normative decision entailed in the theoretical discourse. If anything, these components have the capacity to produce either war or cooperation, but to do so, a specific nomological machine has to be assembled in the first place. There is no philosophical desideratum in anarchy or any other component by itself that leads to the immediate conclusions postulated by each theory individually. However,

if anarchy were to be understood rather as a capacity in Cartwright's terms,⁴ instead of rendering one specific type of outcome, it could be seen as capable of generating a variety of different behaviours.

It is worth exploring Waltz's influential understanding of anarchy, given that it illustrates the usefulness of the capacities-oriented approach we have been discussing here. According to him, international anarchy is invisible. He describes anarchy not by its ontological elements but rather by the observable implications of its existence—state behaviour, the logic by which states function, the distribution of relative power (measured primarily by military capabilities), and the quest for survival, to name a few (Waltz 1979). How the structure of the international system is organised necessitates anarchy; nevertheless, since anarchy is not a concrete, tangible element, Waltz can only talk about it in terms of what it elicits. As a consequence, anarchy constitutes a capacity of the international system that expresses itself in the mentioned various observable ways. We read anarchy by the force of its manifestations, which are far more diverse than a single set of behaviours pre-defined by a law of the international system operated via a nomological machine.

This is not to say that nomological machines must be jettisoned altogether. Instead, neo-neo nomological machines must be designed to unravel the *capacities* of the international system. Only by setting our nomological machines under the right and specific conditions entailed in theory can we reveal the underlying capacities of the international system and, then, the regular behaviour they may elicit. To be sure, “we get no regularities without a nomological machine to generate them,” and we can only be confident in our machine because of “our recognition that it is just the right kind of design to *elicit the nature* of the interaction in a systematic way” (Cartwright 1999, 89; emphasis added).

But how can we achieve that with our current neo-neo arsenal of nomological machines? Shifting our attention to the ontology of capacities is the first step in the process of fixing neo-neo machines; however, more practically, we need to investigate at the ontological level what we mean by anarchy, rational behaviour, and the structural settings under which agents interact in the international system. Capacities lie beneath the international phenomena of our interest, and to unravel their operation to generate the outcomes we observe, we need first to unbind them from the strict conceptualization entailed in neo-neo theories. Take, for instance, rational behaviour. Typically, agent rationality is framed in terms of

4 Cartwright (1999, 84-85) uses the terms nature and capacity interchangeably, arguing that her point about capacities could be perfectly framed in terms of natures. We prefer to stick to capacities, for it is a less controversial term than nature.

utility-maximising behaviour based on transitive preferences. Most game-theoretical applications in IR depart from the core assumptions entailed in rational choice theory (Gintis 2009; Hindmoor and Taylor 2015), which is fundamental to solving for the game setting. In many cases, however, the predicted scenarios of a game's solution do not yield, such as the tragedy of the commons and the inability of states to reach international agreements over various issues. If we understand rationality as a capacity instead, we may be able to fix our neo-neo machines that operate under its umbrella to encompass scenarios where alternative outcomes other than the equilibrium one are obtained (Lenine 2018). In other words, by interpreting rationality as a capacity that operates in tandem with other capacities of the international system, we can extrapolate from the rigid equilibrium solutions imposed by solving archetypical game-theoretical settings.

The capacities-oriented approach relaxes the law-like explanations produced by neo-neo theories by freeing international phenomena from the shielding clauses entailed in the theoretical discourse. Instead of shaping the world to fit into neo-neo nomological machines and operate under the framework of laws of the international system, capacities allow for a variety of different but theoretically cemented behaviours to manifest themselves. It is by saying, for example, that anarchy might generate a cold war between superpowers in a bipolar setting or cooperation between Third World countries oblivious to the bipolar dispute that we can provide meaningful explanations about international phenomena—especially those that simultaneously occur at a given moment. The usual strategy of ignoring what neo-neo theories define as marginal phenomena is characteristic of the law-like nature of their nomological machines, and this is precisely what capacities aim to correct, for they allow both types of behaviour to manifest themselves and even coexist.

At the heart of this discussion is the issue of how we produce explanations about the international system and what we are explaining. If IR is to be a science capable of saying something meaningful about the world, it cannot rely on law-like nomological machines that confine phenomena to some specific, even ideal, conditions to explain the underlying patterns and/or forces of those phenomena. Instead, we should seek to understand the more fundamental elements that constitute the international system and are capable of producing a variety of different behaviours, ultimately as observable and predictable regularities. The predictions generated by neo-neo machines, hence, derive their explanatory power not from an idealised accuracy that depends on a set of rigid *ceteris paribus* clauses and conditions to emerge, but rather from their ability to represent the interaction of different capacities of the international system that operate to produce a certain effect. Therefore, by resetting our neo-neo machines to capacities instead of laws and by devoting serious efforts to investigating the ontological basis of the

former, we are able to appreciate the various phenomena we see in the international arena without predetermining a single course of outcomes, especially in the face of real-world complexity.

Conclusions

The inter-paradigm debate has consistently informed how we see, analyse, and interpret international relations and, to a large extent, has become the landmark of IR as a discipline. Despite its theoretical and empirical achievements, various international phenomena do not fall into the predictions produced either by neorealism or neoliberalism—the end of the Cold War being the most widely cited example of such failure. While some have argued that neo-neo theories are deeply flawed at the level of their assumptions, others have diminished the importance of their empirical failures in the face of their success in explaining the mechanisms operating in the international system. However, as a result, the necessary philosophical debate about how neo-neo theories produce explanations has been avoided.

Neorealism and neoliberalism approach international phenomena via specially designed devices that operate under particular conditions to generate specific, observable outcomes. These devices are built upon law-like tenets entailed in the neo-neo theoretical discourse, and they are, by themselves, shielded from external interference of factors that might produce alternative outcomes than those predicted by these theories. Operating by repetition, they yield the well-known predictions of the neo-neo synthesis.

In other words, neorealism and neoliberalism design nomological machines to generate law-like explanations about international phenomena, where a law of the international system explains regularities observed by analysts in the real world. However compelling this approach might sound, it dangerously confines our explanations to shielding conditions entailed in neo-neo theoretical discourses. What they see is a world where behaviours are predetermined and shielded from external interference, whose complexity is subsumed to a set of *ceteris paribus* statements that produce the outcomes expected by the theory.

Neo-neo explanations, far from being a definitive representation of the world as it is, predicate what the world should be according to the theoretical discourse of the neo-neo synthesis. Consequently, neo-neo nomological machines are assembled to produce the world as these theories see it, connecting the outcomes with the theoretical discourse in a law-like fashion. This means that the predictions of neorealism and neoliberalism are always obtained, given that their nomological machines operate to produce the same predetermined behaviours.

Nevertheless, the explanation can only be meaningful if, and only if, it unravels the various capacities of the international system instead of confining international phenomena to a claustrophobic set of *ceteris paribus* conditions. Throughout the article, we have advanced the argument that resetting neo-neo nomological machines to unravel capacities allows alternative behaviours to emerge from the same constitutive elements of the international system. By redesigning neo-neo nomological machines to a capacities-oriented framework, which allows for the emergence of a variety of behaviours depending on how the capacities of the system interact, more meaningful explanations can be generated.

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