



Threat, Development and Innovation

Ameaça, Desenvolvimento e Inovação

Amenaza, Desarrollo e Innovación

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Abstract: In this paper I attempt to establish a causal connection between threat level and innovation. To achieve this goal, I first investigate development and systemic pressure from a neorealist perspective. Authors attribute to systemic forces significant domestic developments, and in some cases modes of production. In the purpose of developing a more systematic overview of state response to international imperatives, I propose a taxonomy of possible state behavior, based on a neorealist perspective. Among the possibilities, Internal-balancing and innovation are privileged in the analysis. The last section is aimed at explaining technological innovation through internal balancing in the light of the level of external threat variable. External threat is a hard variable to operationalize, hence, I engage with the main authors on the subject to define it. The paper is a theoretical exercise, and it aims at generating hypotheses presented at the end of the text alongside with of future research projects.

Key-Words: Threat; Development; Innovation; Internal Balancing

Resumo: Nesse artigo eu busco estabelecer uma relação causal entre o nível de ameaça externa e inovação. Para tal, primeiramente, eu investigo desenvolvimento e pressão sistêmica de uma perspectiva de longa duração. Autores atribuem a forças sistêmicas desenvolvimentos domésticos significativos e para alguns, até modos de produção. Com o objetivo de desenvolver uma análise mais sistemática, da resposta dos Estados aos imperativos internacionais, eu proponho uma taxonomia de possíveis comportamentos do Estado, ancorada na teoria neorrealista. Dentre tais possibilidades, o Balanceamento Interno e a inovação são privilegiadas na análise. A última seção tem por objetivo explicar a inovação tecnológica através do balanceamento interno à luz da variável de nível de ameaça externa. A ameaça externa é uma variável difícil de operacionalizar, portanto, eu discuto com os principais autores no tema para defini-la. O artigo é um exercício teórico, e busca gerar hipóteses apresentadas no fim do texto conjuntamente com possibilidades de pesquisa futuras.

Palavras-Chave: Ameaça; Desenvolvimento; Inovação; Balanceamento Interno.

Resumen: En este artículo intento establecer una conexión causal entre el nivel de amenaza y la innovación. Para lograr este objetivo, primero investigo el desarrollo y la presión sistémica desde una perspectiva de larga duración.

Los autores atribuyen a fuerzas sistémicas importantes avances internos y, en el caso de algunos, modos de producción. Con el propósito de desarrollar una visión más sistemática de la respuesta estatal a los imperativos internacionales, propongo una taxonomía del posible comportamiento estatal, basada en una perspectiva neorrealista. Entre las posibilidades, se privilegia en el análisis el equilibrio interno y la innovación. La última sección tiene como objetivo explicar la innovación tecnológica a través del equilibrio interno a la luz de la variable nivel de amenaza externa. La amenaza externa es una variable difícil de operacionalizar, por lo que me comunico con los principales autores sobre el tema para definirla. El artículo es un ejercicio teórico y tiene como objetivo generar hipótesis presentadas al final del texto junto con posibilidades de futuros proyectos de investigación.

Palabras clave: Amenaza; Desarrollo; Innovación; Balanceamiento interno.

Introduction

“In the short run, some states may have the good fortune of generous friends and fortuitous external circumstances (fortuna), but in the long run their viability can only be assured by their own efforts and the strength of their internal organization (virtù)”. (Resende-Santos, João, 2007, p. 65).

The aim of this paper is to establish a causal connection between threat and innovation in a theoretical ground. There is a shortage of studies in external threat and its material impact on domestic structures. International Relations lacks a theory of threat, which is not the main objective here, although gives its contribution. In order to do so, different steps are taken. Firstly, a more profound connection between systemic pressure and development is undertaken. Secondly, the paper builds a systematic organization of state response. Finally, the independent variable, *level of threat*, is discussed in relation to innovation. This paper relies on literature review as it is mainly a theoretical exercise. Since a causal connection is being proposed, authors both from development /innovation studies and from those who treat state-building and the international system. It consists of a theoretical exercise. Authors from different scholarly traditions which dialogue with the thematic of systemic pressure and innovation are revisited. States can answer systemic threats through different ways (eg., emulating, maintenance, innovating). This will depend on diverse factors, although engaging in balancing behavior is what is expected. This paper is a theoretical and exploratory exercise, and as such, it does not have the ambition to draw definitive statements. It will focus on hypothesis generating and theory-building. This exercise is important to explain innovation and state response when confronted with systemic stimuli. Furthermore, such theoretical exercise can open venues to explore different kinds of relations between the domestic and the external, not only in a static manner, but also trying to unravel the engrains of history. Likewise, one would be very wise to consider how to invest resources and personnel once threat level lowers. The first section is dedicated to explaining the relationship between systemic pressure and development in a a-historical. Different authors are analyzed, including those exploring the genesis of states and those preoccupied with understanding the birth of capitalism. In the second section, I will engage with neorealist

theory and its further developments to delineate state behavior when facing systemic constraints. The technological dimension of innovation and innovative-capable states will be given priority. The third section debates level of threat. Although there are many components to take into account when analyzing level of threat, this paper adopts a materialistic view: the level of threat depends on your position on the distribution of material capabilities, or distribution of power. In this paper my stand is within the neorealist perspective, although I dialogue with other authors.

Systemic Pressure and Development.....

In this topic I propose an inquiry about the relationship between systemic pressure and the development of material capabilities. Several theories hold that interstate competition, and the demands of war, were at the birth of the modern-state system, capitalism and the “European miracle”. I briefly revise such theories with the purpose of establishing causality between threat, development, and innovation. I contend that there is a positive and strong relation between threat level and military innovation, beyond *spin-offs* or dual-use equipment. However, this topic is preoccupied with a more in-depth relation, a structural and macro historical one between systemic pressure and development of material capabilities, acting as a strong propeller of innovation. To this purpose, some main perspectives on the topic are outlined and theoretical suggestions are made.

To establish a connection between threat and innovation it a first causal relation between threat, or systemic pressure, and economic development will be analyzed. Before entering a short-term perspective, a more fundamental and deep connection must be inquired. A more profound relationship between the development of material capabilities and the pressures exerted by systemic forces lies at the heart of the ontological commitment made here. The analysis is situated in the *longue durée* of history, at the sociogenesis of states and their progressive development. The idea of an umbilical connection between interstate political rivalry and the development of productive forces is widespread through different intellectual traditions. Here I use states as a general terminology, although the argument is not restricted to this form of political organization.

The basic line of reasoning, which connects systemic pressure and the material mobilization which fosters development and innovation is not complicated: faced with growing threat, political units will mobilize their material and human capacities in order to respond, and, ultimately, seek survival- their overriding goal. This endeavor can take many forms, as it will be addressed further on, but it is reasonable to say that, when holding the necessary capabilities, states will pursue the benefits of innovation. It behooves this study, at this point, to outline some main theoretical perspectives which investigate the relation among the systemic pressure of competition among political units and the development of economic forces and technology. Traces of innovations associated with the demands of war date back to antiquity, although this is not the subject for this paper. Here I focus on making a brief historical overview of the birth of modern states guided by theorists of this period.

In a macro historical structural perspective, there are two main paths which connect systemic stimuli to innovation. The first is the realization that the intensity of the political disputes among European states was fundamental to the birth of capitalism, a mode of production which surpasses the former innovative pace. This perspective is held by Max Weber (1991), who observes that states had to compete for circular capital in order to obtain the necessary power to match-up in the interstate rivalry. Giovanni Arrighi (1996) endorses such argument, demonstrating that interstate rivalry facilitated the organizational apparatus necessary for capitalist expansion. Karl Marx (1983) observed that in a system where states were constantly in dispute for power, the demand for financing and the creation of the public debt played a fundamental role. Indeed, this is an instrument to finance military innovation up to the present. The U.S utilizes its financial dept and the power of the dollar to finance its wars. Marx also gave an important role for war and plunder in his analysis of primitive accumulation. This line of reasoning is endorsed by the *braudel*ian perspective: “Capitalism only triumphs when it becomes identified with the state, when it is the state” (Braudel, 1981). At the “home of the great predators”, military strength is required in order to protect daily economic life. Paraphrasing Marx, Fiori (2004) stated that the first encounter was not between the owner of the means of production and the owner of the workforce, but rather was between the owner of money and the owner of power. These authors are cited to illustrate the importance of war for development. They do not fit the neorealist perspective brought in this paper or the main causality proposed.

The second path is the one that connects threat and development in more general terms. It was war who formed the European web of nation-states, and the preparation for war was what obligated the creation of internal structures of the states located in this web (Fiori, 2004). A key author to the discussion presented here is Gourevitch (1978), who proposes to go further in explaining the domestic consequences of systemic pressures. In his seminal work *“The second image reversed: the international sources of domestic politics”*, the author (1978, p. 883) states that: “political development is shaped by war and trade”. Systemic pressure has, hence, causal weight on domestic organization and especially, in development. There is substantial literature to back the second image reversed perspective. Otto Hintze, for example, argues that “all state organization was originally military organization, organization for war” (Hintze, 1975, p. 178). Perry Anderson (1974) explains the emergence of absolutism in eastern Europe from an international lens. Skocpol (1979) also gives causal weight to systemic pressures in explaining the French, Chinese and Russian revolutions (Dall’agnol, 2019). Gourevitch summarizes this relation as it follows:

“The international system is not only a consequence of domestic politics and structures but a cause of them. Economic relations and military pressures constrain an entire range of domestic behaviors, from policy decisions to political forms. International relations and domestic politics are therefore so interrelated that they should be analyzed simultaneously, as a whole” (Gourevitch, 1978, p. 911).

Pivotal to the effort made here is the body of literature developed by Historical Sociology. Charles Tilly (1990) argues, among other

historical sociologists, that the political organizational form of the states (or other types of political units) is determined by both internal and external requirements. In his conception, the primary function of the state is war and war-preparedness. States make war and war makes the state. War, in turn, requires a deep mobilization of the state's organizational, extractive, and material capacities. As a dynamic process, external imperatives will directly affect the state's modernization requirements. There is, in Tilly's conception, a clear causal venue between systemic pressure, development, and innovation, be it technological or organizational (as it will be treated further). This paper endorses Tilly's construct as it sees war in the genesis of state formation and further economic development.

Norbert Elias, while studying the sociogenesis of modern states in Western Europe, observed a sort of centripetal force that drove competing smaller units into the formation of modern monopolization of the use of force. In his work *"The Civilizing Process"* (1993), Elias perceived a clear compelling force originated in the systemic level. At peaceful times, power would become fragmented with upheavals and turmoil at the structures of political units. Power would become disperse, and the leader contested. In times of military competition, however, the centralizing power of the leader is high, and expansionism is stimulated. Political actors are impelled to expand in order to survive. Elias's historical sociology derives from the external competitive environment the expansionist behavior of political units:

"The soul preservation in social existence requires, in free competition, a permanent expansion. Who doesn't rise, falls. Victory, therefore, means, primarily-, be that or not the intention-, domination over the competitors and their reduction to a state of dependency. In this case the gain one is necessarily the loss of the other, be that in terms of land, military capability, Money, or any other form of concrete manifestation of social power. But beyond this fact, victory will mean, sooner or later, the confrontation and conflict with a rival whose strength is threatening to yours, and once again, this situation impels the expansion of one and the absorption, subjugation, humiliation and destruction of the other" (ELIAS, 1993, p. 134).

Other authors share this perspective. John Mearsheimer, for instance, claims that the nature of the anarchic system creates a perpetual incentive for expansion. In his theory of great power competition, Mearsheimer (2014, p. 2) argues that "the desire for more power does not go away, unless a state achieves the ultimate goal of hegemony". Since no state will likely achieve global hegemony, the world is condemned to great power competition. Gourevitch (1978, p. 896) states that "the anarchy of the international environment poses a threat to states within it: the threat of being conquered, occupied, annihilated or made subservient. The obverse of the threat is opportunity: power, dominion, empire, glory, 'total' security". His reasoning follows to infer the second image reverse logic: "this state of war induces states to organize themselves internally so as to meet these external challenges" (Gourevitch, 1978, p. 896).

Another important strand in literature which aims at explaining international outcomes and foreign policy through international lenses is neoclassical realism. In its most recent development, Neoclassical Realism organizes four sets of domestic intervenient variables in its model: i)

leader's perception; ii) strategic culture; iii) State-society relations, and; iv) domestic institutions (Ripsman, Lobell, Taliaferro, 2016, P.16)². This paper does not adopt this perspective. What is clear from the mode is the increasing difficulty of building a framework or explaining decision-making. Irreconcilable ontological and epistemological theoretical propositions are put together, and supposed determinants are always increasing. That is in line with Walt's criticism when he argues that Neoclassical Realism incorporates domestic variables in an ad hoc manner with no relation of hierarchy amongst them (Walt, 2002, p. 211).

2. Neoclassical Realism was defined by Gideon Rose (1998).

States respond to the imperatives of the international system. If they don't, they are punished and, to the limit, cease to exist. In this topic, I aimed to offer a theoretical perspective, focusing on the effects of competitive pressure on the organization of states, according to the main theoretical perspectives. Development and innovation are indeed stimulated by threat and systemic pressure. Some perspectives explain the response and organization of modern states and other authors go further and associate interstate rivalry with the advent of capitalism. What matters is the causal connection clearly present in the literature presented between threat, development, and innovation throughout a macro historical structural lens of analysis. The next topic analyzes the phenomenon from a theoretical construct and its developments: neorealism. A more schematic way of state's responses to the external environment will be presented.

Internal-Balancing and State Response

It is now necessary to investigate the matter in a way that we can explain specific military build-ups, large-scale innovative projects and so on. This analysis entails a more instrumental understanding of the state's response to the international system's imperatives and incentives.

Neorealism, the theory I choose to engage here, is a systemic theory preoccupied in investigating the outcomes of the international system. In its original formulation (Waltz, 1979), it only provides general guidelines for explaining state behavior. However, the characteristics of the international system provide powerful incentives for certain types of behavior, addressed below. It is necessary to point out, however, that the neorealist theory developed by Waltz is not a foreign policy theory and does not intend to explain specific state policies. Waltz argues that in economics, students get along well with separate theories for firms and markets, and a student of international relations should also be able to get along with separate theories of foreign policy and international politics (Waltz, 1996). The author argues that no one has yet built a "great theory", which unifies both foreign policy and international politics. Nonetheless, the structural theory provided by Waltz can provide good theoretical tools for addressing state behavior, specifically in his analysis of balancing.

According to Waltz, in his *Theory of International Politics*, the structural characteristics of the International System are anarchy, the functional equivalency of units, and power distribution among states. In an anarchic environment, states must carry out a set of basic functions, which

results in their functional equivalency. What distinguishes states is their relative power towards each other, the distribution of capabilities in the system. The structure of the system, hence, only changes, as long as it remains anarchic, in the distribution of capabilities among units. The structure imposes an immediate consequence on states: they must take care of themselves; they have the responsibility of self-help. According to Waltz, given the imperatives of the International System, the state's most fundamental and overriding goal is survival. In order to accomplish any of their objectives, they must survive³. From anarchy derives the competitive nature of the system and the insecurity and uncertainty that pervade the life of states. The structure of the system has a consequence that lies at the root of the competitive logic: the *security-dilemma*⁴. States, as they are suspicious of other states' intentions, are impelled to enhance their capabilities continuously, compelling other states to respond in the same way, creating a spiral logic. From anarchy and the need for survival in a competitive system, we can assert that the Neorealist framework provides general predictions about state's response to the imperatives of the International System. These basic assumptions lead to a balance-of-power theoretical development:

"A balance-of-power theory, properly stated, begins with assumptions about states: They are unitary actors who, at a minimum, seek their own preservation and, at a maximum, drive for universal domination. States, or those who act for them, try in more or less sensible ways to use the means available in order to achieve the ends in view. Those means fall into two categories: internal efforts (moves to increase economic capability, to increase military strength, to develop clever strategies) and external efforts (moves to strengthen and enlarge one's own alliance or to weaken and shrink an opposing one)" (Waltz, 1979, p. 118).

Internal efforts and external efforts translate into two kinds of balancing behavior: internal-balancing and external-balancing⁵. The latter refers to a state seeking allies and acting to weaken opposing allies. Also, a state can *buck-pass* or *bandwagon*. In this paper I focus on internal balancing. Resende-Santos (2007) argues that there is a latent theory of internal-balancing in Waltz's formulation. Internal balancing, simply put, is the response of the state to systemic constraints, by increasing their material capabilities and improving their strategies.

According to Resende-Santos (2007), internal-balancing can be done either by emulation, innovation or counter-measuring. A state can choose to maintain its current strategy as well. Counter-measuring can be understood as fundamentally quantitative (increasing one's capabilities). Innovation and emulation have qualitative aspects (for example, better organizational ways of mobilizing resources). These options of internal balancing can be juxtaposed by a state, for example, combining emulation and innovation.

Internal balancing is still underdeveloped in literature⁶. Albeit Waltz conceptualizes this sort of state behavior he does not systematically develop it. In this sense, some studies have attempted to fill this gap. Resende-Santos studied states responses to structural incentives, observing that in the cases of military organizational and technological full-scale emulations the process can be long enduring. Elman (1999) analyzed military responses to external constraints. Investigating a specific

3. Mearsheimer (2014), in a different perspective, argues that beyond survival, conquering the best position in the International System is a constant goal for states.

4. John Herz (1950) famously argued that, in order to survive, states will look at their adversaries and attempt to surpass them. The response by the other state will be the same and this will generate a dilemma where the main consequence is an arms-race among contenders.

5. External-balancing has been well developed by the literature. See, for example: (Snyder, 1984; Walt, 1987).

6. Albeit recently there has been some important publications, for example: Dawood, 2018 L; Brooks, S; Wohlforth, 1981; Parent, J.; Rosato, S, 2015).

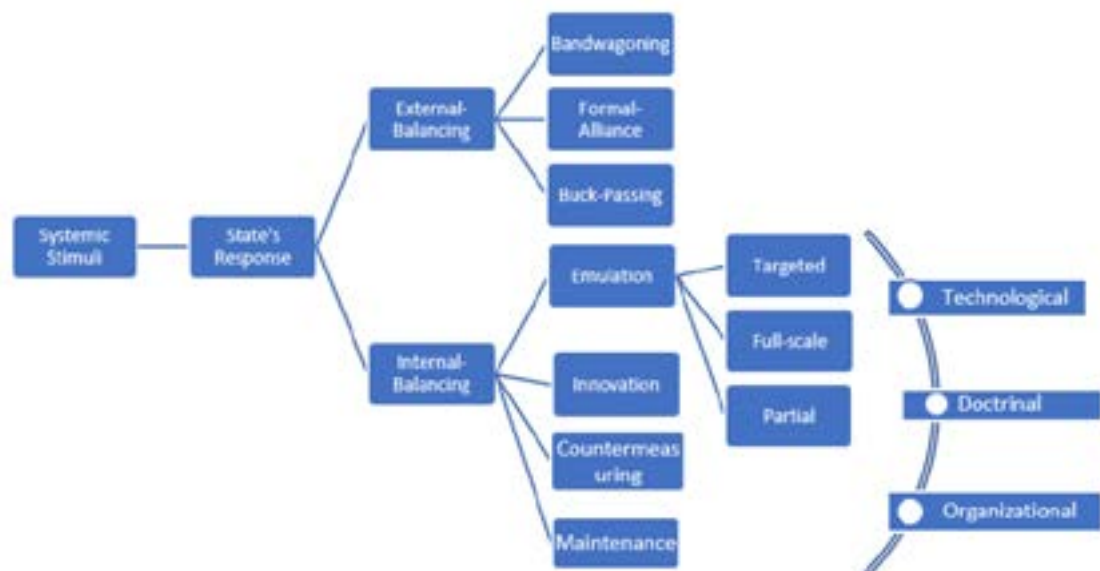
dimension of military response, military doctrine, Posen brilliantly unraveled its nuances in a scenario of high international competitiveness. It is necessary to point out that balancing does not necessarily have to be military, since, for example, states can balance economic strategies. Other actors can balance; firms can emulate and innovate.

This study is concerned with innovation. But why seek this sort of balancing behavior given the International System's constraints and incentives? According to Resende-Santos (2007, p. 23), "unit-level factors, such as regime insecurity and domestic politics, cannot provide satisfactory explanations for why states emulate and whom they emulate". It is important, however, to state that although this paper is preoccupied with the international angle of analysis, it does not deny, and indeed it asserts, that there are necessary explanatory conditions on the domestic level⁷. But they are not treated here.

7. See: Dall'Agnol, 2024.

Figure 1 presents a synthesis of literature's development of balancing behavior. States will protect their survival and goals by seeking external friends or mobilizing their internal resources (human and material) to prepare for any possible competitive outcomes, including wars. Three dimensions encompass military internal-balancing behavior: organizational, doctrinal, and technological (Resende-Santos, 2007). States can emulate, countermeasure or innovate targeted practices of each of these dimensions, juxtapose them in a combination, or choose to emulate partially or fully the one that is most successful.

Figure 1- Military Balancing Options



Source: Dall'Agnol, 2024.

As it was stated, this paper gives priority to innovation and, specifically, to its technological dimension. Military innovation occurs mainly within great powers. A state must have an extra margin of security and

resources to spare in order to undertake the risks of innovating. But when a state will innovate? Explaining the nuances of the process of innovation and predicting when a state will innovate as opposed to engaging in other strategies is a gap in the literature that has to be more solidly engaged with. Moreover, the question of when an innovation will fail and when it will succeed is still not sufficiently explored. Here I propose a causal connection between the imperatives of the International System and technological military innovation. To do so, however, one has first to translate systemic pressure into a variable. I propose the level of threat as it directly generates a state response. I will engage with the debate of how to instrumentalize this variable and how to connect it to innovation in the next topic.

Threat and Innovation.....

Up until now, I have attempted to first demonstrate, in a structural perspective, the relationship between the development of material capabilities and internal resource mobilization and the pressure of a competitive international system. Subsequently, I engaged in a more systematic conceptualization of state behavior when faced with the constraints of the international system. Neorealist literature was presented alongside further developments on specific forms of state response. However, it was argued that the main purpose of the present paper was to establish a causal connection between the international system's incentives and innovative behavior. Firstly, nevertheless, one has to attain to the following question: what specifically do states respond to? What, in the international system, thrives them to innovate? Here, in agreement with the main authors cited, I argue that states will respond to threat. The level of threat represents the systemic pressure that presents itself before states. In a second image reverse logic, the level of threat is a determinant of state behavior. Nonetheless, as it was stated, to establish a causal link one must translate threat into a variable. But what qualitative and quantitative elements constitute threat? How can one measure threat? As it will be briefly reviewed, different authors present diverse definitions and elements which are necessary for instrumentalizing threat. Here, as it will be argued, I define threat level as the relative material distribution of capabilities in the international system. The position of a state in the system's distribution of power will present the objective level of threat.

Resende-Santos (2007) argues that International Relations lacks a theory of threat, a concept, in his terms, very difficult to operationalize. Authors have attempted to utilize the level of threat variable developing theoretical constructs that incorporate different factors in a manner to make the analysis more precise. Stephen Walt (1987), in his balance-of-threat theory, argues that states balance threats. According to the author, threats are posed in a dynamic scenario and some are more immediate and intense than others. States will respond to the pace and qualitative characteristics of threats. States will respond to more urgent and serious threats. Walt identifies four components of threat: aggregate power, offensive military capabilities, geographic proximity, and aggressive

intensions. Resende-Santos (2007) relies on Walt's notion to construct a parameter for assessing threat level. According to him, shifts in the aggregate power – the neorealist's main construct of threat level – matters, but it is not the only variable that has to be incorporated for determining the level of threat. The author states that shifts in the level of threat can be consistently incorporated to the neorealist structural theoretical framework, beyond a relative distribution of power analysis, by incorporating three other variables. For Resende-Santos (2007, p. 86) the level of threat is a “function of a number of geostrategic factors, important among which are the state's relative military power, its geographic assets and liabilities, the offensive capabilities of the adversary, and the ability of external balancing options”. Geography certainly qualitatively entails the *sort* of threat. Posen (1984) argues that geographically surrounded states will innovate and integrate its military practices more often. The incorporation of variables can be good for analysis, making it more precise, although sometimes detrimental to theoretical exercise.

Geography certainly provides a more accurate description of a specific sort of threat, and it can be argued as the source of many types of military behavior, but it is not necessary to add it as a component of level of threat *per se*. As for Stephen Walt's incorporation of “aggressive intentions” as a component of threat level, one can argue that intention entails perception, and they are both problematic variables. One cannot set apart intentions and capabilities as components of threat, since usually the former is only materialized in the light of the last⁸. The level of threat can be measured solely in relation to the aggregate distribution of power (or relative material distribution of capabilities). Offensive capabilities is also a troubling variable. As argued by Diniz (2002), it is not possible to distinguish offensive from defensive technologies, since full defense implies elements of attack. External balancing options such as buck-passing or alliance making to counter a threat, or geographic imperatives alter the qualitative aspects of specific threats, it must be agreed that balancing options and geography will affect the state's response to threats. What I argue, however, is that these elements do not have to be included as components of the *level* of threat, since they will alter primarily the *type* of threat and the characteristics of *state's response*. As the objective here is theoretical construction, it is maintained that a causal link between threat and innovation is better achieved through the proposed definition of relative distribution of material capabilities.

8. See: Snyder (1984).

It behooves this study, at this point, to put forward some of the existing literature on the impacts of threat on innovation. Barry Posen (1984) attempts to understand changes in military doctrine in a threefold manner: i) choice between offense-defense-deterrence; ii) doctrinal integration and; iii) doctrinal innovation. Utilizing two theoretical frameworks (organizational theory and balance of power theory), the author finds that theory explanatory power is correlated to the level of threat. He argues that “in times of relative international calm we should expect a high degree of organizational determinism. In times of threat we should see greater accommodation of doctrine to the international system-innovation should be more pronounced, innovation more likely” (Posen,

1984, p. 80). The larger the threat, the greater the explanatory power of balance of power theory. Conflicting organizational interests and bureaucratic disputes which might resist innovation will lose importance in a high-level threat scenario. One can infer from this analysis another hypothesis: the greater the level of threat, states will behave more as unitary actors proposed by balance of power theory as opposed to more fragmented states identified by organizational theory. Elman (1999) tests the same theories regarding military response. According to the author, both models have something to offer in attempts to explain state's military responses, although "in the long run, especially as the threat and severity of war increase, the neo-realist model comes into its own (Elman, 1999, p. 97). Both Posen and Elman sustain their theoretical findings from a systemic perspective. The reasoning of the authors has a causal logic as follows: with the growth of external threat, competition tightens, consequentially state's civil leaders are compelled to centralize decision-making. Consequently, the command structure becomes more rigid and integrated, mitigating organizational interests and disputes, and civilians respond to the threat, mobilizing resources in the best feasible way. This will thus result in innovation. In this paper, however, the causal mechanism links level of threat and innovation in a direct manner. They are proportional because the system expects them to be. The distribution of power will make the states balance.

It is important to note that innovative behavior is constant, but not all states innovate. In order to innovate, the state must have an extra margin of security and spare resources to maintain their ongoing activities and assume the risks of innovating. A middle power like Brazil can innovate in some aspect (e.g., aerospace), although it is less likely to occur. These are innovative-capable states, although this does not change the causal mechanism proposed, and neither state that other countries cannot innovate. However, the payoffs from successful innovation are large, providing the innovator with competitive advantage. Therefore, states that possess the necessary material-technical-scientific capacity will innovate. Here, in accordance with Resende-Santos (2007), I contend that rising competition will generate innovative behavior. "The international system, like the market, generates ceaseless technical and organizational innovation. The system is in motion because of it". The anarchic and competitive nature of the international system entails a security dilemma scenario and impels states to innovate continuously. The innovative balancing behavior will be greater when states are faced with threats. In this case, systemic pressure will enhance innovative pace and scale. Innovation's timing, pace, and scale will correspond to the timing and magnitude of external threats. If a state's relative capabilities position is threatened or fall, they will be compelled to mobilize resources and personnel and innovate. If they fail, they will be punished by the system.

Beforehand presenting some hypotheses and final remarks concerning the main object of this paper, some propositions regarding temporalities and the relation between threat and innovation are now presented. One can associate systemic competition with innovation as the very propeller of material development. In this case, threat is the preponderant

ontological source of innovation. In a middle-range temporal scenario, threat level will generate arms-race and competition that will impact positively the defense industrial base and be the source of important innovations. Specific short-term threats and their qualitative characteristics will have a large impact on specific defense innovative projects and enhance their chances of success. Nonetheless, *in an atemporal scenario, threat level, understood as the relative distribution of capabilities, will promote innovation.* These are, of course, conjectures which need further investigation.

That being said, this study sustains that in a ceteris paribus scenario, threat will have a directly proportional relation with innovation, as it is the very structural incentive that causes it. Innovative-capable states will increasingly innovate in the face of increasing threat. Pace and scale of innovation will also increase in relation to increasing threat. It is argued here that factors like geography, perception, intentions and external-balancing options do not affect the level of threat in absolute terms, derived from the distribution of power. However, as has been argued, some factors do affect state behavior. The most obvious is geography, the choice for land or a sea-based strategy, for example. However, this does not alter the basic systemic pressure to innovate. External balancing options, on the other hand, seem to have a potential large effect on a state's response. The availability of balancing options may lead a state to bandwagon or buck-pass instead of innovating or emulating. Regardless of this effect, in theoretical terms, one can reasonably assume that this does not change the direct positive relation between threat and innovation in general terms.

Concluding Remarks

In this study, I have proposed to investigate the relation between threat and innovation in theoretical terms. In this sense, I have attempted to construct propositions regarding state behavior when faced with systemic pressure. Systemic incentives, through threat, generate development. In the first topic, I backed this argument with a substantial amount of literature ranging from those who investigate the relation between interstate rivalry and the advent of capitalism towards those who attempt to explain the sociogenesis of states and the international sources of domestic behavior. As competition derived from the system increases, the states are expected, although not obligated, to engage in balancing behavior. Balancing options include both engagement with other states or internal efforts of mobilization of resources and strategic choices. Here I have focused mainly on the debate of internal balancing since my objective was to discuss innovative behavior.

This article was divided into topics that represent a temporal analysis of the object of inquiry. In this sense, the first section was dedicated to a perspective on systemic pressure and material development. Different theoretical perspectives attribute to unit competition the development of domestic material capabilities and forms of organization. External forces will constrain and compel state behavior. Section two was dedicated to a more systematic review of state response to the international system. In this sense, a clearer connection between systemic imperatives and forms

of state behavior, such as innovation, was made. In order to establish a sounder causal link between systemic pressure and innovation, however, one has to identify the way in which the system influences state behavior. This is translated into a variable, namely, the level of threat, subject of the discussion made in the third topic. Level of threat, besides possible different observable attributes and components was here defined as the relative distribution of material capabilities, or in more general terms, the states position in the system's distribution of power. A positive and strong causal relation was established between level of threat and innovation. At this point, some further considerations will be made.

My main premise is the following: mainly innovative-capable states will militarily innovate in a directly proportional relation to the level of threat, measured in terms of the relative distribution of power. Hence, *ceteris paribus*, the greater the level of threat, the more likely an innovation will succeed. Large-scale projects, as the technological pillars of innovation, will be more likely to succeed in the face of high level of threat. However, this goes beyond defense projects, *spin-offs* and dual-use equipment, it has a wider effect on innovation. Furthermore, time, pace and scale of innovation will be affected by level of threat. The larger the threat, the innovation will assume greater speed, scale and urgency. Threat requires preparedness, response and creativity.

Finally, it was further conjectured that the nuances of the relation between innovation and state behavior has different effects if one addresses temporality. Long-term systemic pressure can produce a "wave" of different innovations and development strategies and direct and short-term threats will generate specific innovative projects, for example. However, this is a matter for future research.

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