

Is Political Science a Science?

The Evolution of Popper's Metaphor

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Abstract: In this literature review, we aim to answer the question, is political science a science? through revisiting the work of Gabriel Almond and Stephen Genco, titled *Clouds, clocks, and the study of politics* (1977). We will show the paradigm shift in understanding the subject matter of social sciences in terms of epistemology, ontology, and methodology, from the positivist clock-like model to the plastic model of the post-behavioralist schools, relying on the three-stage metamorphosis of Popper's metaphor of clouds and clocks. Then, we will show how our definition of science has transformed from methodology-focused iron-like rigidity of positivists to the substance-based pursuit of understanding plastic reality. The review fundamentally links the change in the perception of social science as a science to the transformation of our understanding of science as a whole, after the emergence of quantum mechanics and the uncertainty principle of Heisenberg. The end result of this critical review reveals that political science is a science because science itself is not only about regularities and strict laws of classical mechanics, but it is about malleable realities. Therefore, although the subject matter of hard science differs from that of political science, political science could develop on parallel with hard science.

Keywords: Clock-like model, plastic model, Popper's metaphor, clouds, Heisenberg.

INTRODUCTION

Our understanding of science has transformed from the classical clock-like model of positivism that restricts scientific studies to a set of rules and regular laws. A transformation of understanding science, and therefore political science has occurred with the development of quantum physics and Heisenberg's uncertainty principle that stipulates that the position and speed of particles cannot be determined perfectly. Political science has been influenced significantly by this transformation. Almond and Genco use Popper's analogy of clouds and clocks to explain the nature of the political investigation. According to Popper, reality is homogeneous and amenable to a single model of scientific explanation, in contrast to the meta-methodological homogeneity of the hard sciences. In this metaphor, clouds and clocks stand in for the ideas of determinacy and indeterminacy in physical systems. He suggests visualizing a spectrum of subjects, from the most irregular, disorganized, and unpredictable to the most regular, orderly, and predictable. Newtonian mechanics gave rise to the widely accepted idea that the universe runs like a clock. It won't take long to understand how their clock functions, contrary to what was previously believed about other deterministic phenomena. Because of this, Newtonian physics gained notoriety for the proverb that even the cloudiest clouds are clocks (Almond & Genco, 1977).

This clock-like model inspires the behaviorist school to produce what they claim is the true "scientific" investigation of political puzzles. The investigation is sufficiently thorough to yield



predictions based on quantitatively tested data (Ishiyama & Breuning, 2011). “Behavioralism’s defining elements include a focus on political actors and their behavior, value-free science, and the study of operationalizable questions through hypothesis formulation and empirical, quantitative research,” (Ishiyama & Breuning, 2011). Political science is about the “scientific” study of political phenomenon. The scientificness of this approach lies in the use of much mathematics and focus on the methodology. The five steps of the scientific method as follows: the causal theory, the hypothesis, the empirical test, the evaluation of the hypothesis, and the evaluation of the causal theory (Kellstedt & Whitten, 2019). These steps transform causal relationships into scientific knowledge. Grigsby explains that the behaviorist approach relies on the empirical observation of political behaviors, “devoid of normative judgment” (Ishiyama & Breuning, 2011). This would produce a science that is “value-free” and protect against the corruption of biases (Ishiyama & Breuning, 2011). These ideas can be summarized in Easton’s intellectual foundation stones : 1) regularities, 2) commitment to verification, 3) techniques, 4) quantification, 5) values, 6) systemization, 7) pure science, 8) integration (Ishiyama & Breuning, 2011). This framework cements the rigidity of behaviorism in understanding science in general and political science in particular. Therefore, throughout this article, post-behaviorists will challenge this framework, marking the evolution of Popper’s Metaphor.

Quantum mechanics, which also turned the metaphor on its head, disproved this clock-like model. The dominant understanding of the social sciences now regards all clocks as clouds with varying degrees of cloudiness. Popper continues to make the case that indeterminism is insufficient to explain the autonomy of human ideas in the concrete world by asking the rhetorical question: is chance really more satisfying than determinism? (Almond & Genco, 1977). Popper responds that because quantum decisions cannot adequately capture rational human behavior, the model of unpredictable behavior is severely constrained.

Geertz states that “ the second law of thermodynamics, or the principle of natural selection, or the notion of unconscious motivation, or the organization of the means of production does not explain everything, not even everything human,” (Geertz, 2008), commenting on Langer’s Grande Idée, which describes the behaviorist comprehensive model of scientific inquiry. Similarly, it seems that the emergence of quantum mechanics has turned the table, proving that such clock-like model can be applied “where it applies and where it is capable of extension”, and it should be rejected “ when it does not apply or cannot be extended,” (Geertz, 2008). The way general relativity corrected our clock-like Newtonian conceptualization of time and space, and the way quantum mechanics reoriented our understanding of the very small-scale physical phenomena, post-behavioralism reevaluated the value-free model of behavioralism. Grigsby states that Post-behavioralism emphasizes that political science research must be relevant, that it must address pressing political issues, that science and values are inextricably linked, and that political science should not try to emulate the strict application of scientific methods used in

the natural sciences (Ishiyama & Breuning, 2011). Hence, the clock-like Grande Idée should be dismissed, as it will only confine our inquiry to reductionist questions, exactly like the adherence to Newtonian physics confines us to the study of large-scale world, ignoring the quantum phenomena. Simply, Albert Einstein's claim that God does not play dice cannot change the reality of the quantum universe.

In this critical review, we will show how Popper's metaphor has evolved from clock-like mode to the plastic model of understanding science, by revisiting Gabriel Almond and Stephen Genco's piece (1977), from the perspective of the status quo literature. This change of perceiving science has redirected the way we perceive political questions and the way we approach them, confirming the scientificness of political science.

RESEARCH METHOD

To reestablish the scientificness of political science, this paper will rely on an extensive critical literature review. This latter is founded fundamentally on Gabriel Almond and Stephen Genco's piece (1977). A variety of contemporary literature will be used to assess this piece, and to show how this 1977's piece is still relevant today.

Gabriel Almond and Stephen Genco's piece (1977) discusses how political science has recently tended to lose touch with its ontological grounding in its effort to become scientific. Political events and phenomena have a tendency to be seen as natural occurrences amenable to the same explanatory logic found in physics and other hard sciences. This tendency can be partially explained as a stage of the scientific revolution, where ontological and methodological presumptions from the remarkably successful hard sciences diffused in two steps, first to psychology and economics and then from these leading human sciences to sociology, anthropology, political science, and even history. The neopositivist school of philosophy of science, which endorsed this premise of ontological and meta-methodological uniformity, urged the social sciences—and political science in particular—to adopt the agenda of hard science. Recently, several economists, psychologists, and philosophers of science have begun to question the technique utilized in hard science's relevance to human subject areas (Almond & Genco, 1977). This paper aims at assessing the development of Popper's metaphor after the publication of Almond & Genco's piece. The recent progress achieved in social science that proves Almond and Genco's expectations of 1977 urges to reconnect today's available literature with the 1977's piece.

The question of this paper revolves around if political science is actually a science? Using Popper's three-stage metamorphosis of the metaphor of clouds and clocks, we will demonstrate the paradigm shift in understanding the subject matter of social sciences in terms of epistemology, ontology, and methodology, from the positivist clock-like model to the plastic model of the post-behaviorist schools.

Then, we will demonstrate how our concept of science has changed from the positivists' methodology-focused iron-like rigidity to the substance-based quest for comprehension of flexible reality.

The review establishes a key connection between the evolution of our concept of science as a whole with the development of quantum physics and the Heisenberg's uncertainty principle and the shift in how social science is perceived as a science. The review aims to demonstrate that political science is a science since science is about flexible realities as well as hard rules of classical physics and regularities. Political science might therefore advance alongside hard science, despite the fact that their respective fields have different subject matter.

RESULT AND DISCUSSION

The Notion of Plastic Control

According to Popper, a middle-ground model for comprehending human and animal behavior combines control and freedom as well as the notion of plastic control and lies between perfect clouds and perfect clocks. By introducing the idea of plastic control, Popper has succeeded in challenging the idea that our theories are in control of our behavior. We are not required to allow our theories to control us; rather, we are resisting their ability to dictate how we behave. We can critically evaluate them and reject them if they are in conflict with the evidence that is currently available (Almond & Genco, 1977).

The previous idea is connected to the notion of performativity. Some theories transcend mere description of social reality to shaping it, in a phenomenon known as performativity of social theory. In some cases, self-fulfillment, where the application of performative theories increases conformity between theories and social reality, is the most fascinating level of performativity. These hypotheses specifically become self-fulfilling if they promote experimentation, produce anomalies as a result of experimentation, and result in changes in practice (Marti & Gond, 2018). Such kind of theories pose a debatable problem because realists think that self-fulfillment endangers the realist approach that relies on developing "true and successful statements about the world. Hence, we think that the discussed clock-like model of social theory would restrict us to certain regularities, and prevents us from exploring reality that actually exists beyond the constraints of our theories; this is somehow an unintentional step towards altering social reality (Bergenholtz & Busch, 2016). The potential for self-fulfillment in social science theories has implications for how researchers view their own work (Marti & Gond, 2018). Eventually, If a theory results in anomalies, researchers can draw attention to these anomalies and engage in sense-making to persuade previously unpersuaded actors (Marti & Gond, 2018).

Moreover, Popper has offered a model of an open physical system, beyond the boundaries and regulations of positivism. He contends that social scientists cannot comprehend human and cultural phenomena using the same models as the physical sciences. As with human evolution, we can learn



more about these phenomena but we can never fully comprehend them because of their creative qualities (Almond & Genco, 1977). The malleability of the substance matter in social sciences and refers to it as “plastic matter”. This latter is placed somewhere between the subject matter of naturalists that are “highly deterministic, mechanical and of great precision,” and that of constructivists who think that reality is merely constructed by our concepts (Berg-Schlosser, 2016). Both naturalists and constructivists do not describe reality as it is. However, realists according to Berg-Schlosser take an intermediate position between regularities and subjective interpretations.

The Development of Inter-subjectivity

Speaking about Popper’s metaphor’s evolution necessitates understanding the shift from objectivity of the behaviorist school to the inter-subjectivity of post-behaviorism. This evolution of social theory accompanies an evolution of perspectives as well, from objectivity to inter-subjectivity. The third-person viewpoint is considered to be the most objective because it can be used to observe all kinds of objects and does not necessitate reflective awareness (Pauen, 2012). This perspective is what positivists claim to have in their search of laws, regularities, and general theories. In contrast, the second-person viewpoint is subjective. It is only applicable to beings that have the capacity for intersubjective relations, most notably people, though some forms of intersubjective relations may also be applicable to other sentient beings (Pauen, 2012). Hence, it is the perspective that should be taken to gather knowledge about “the plastic matter”, beyond the constraints of general theories, but also far from the subjectivity of the clouds, because it is a viewpoint in and of itself, giving access to some intersubjective facets of our world that are virtually inaccessible otherwise (Pauen, 2012).

The Ontological Evolution

Ontology is a fundamental notion in social inquiry, and it can be defined as “the study of being,” which is “concerned with the question of what exists,” (Berg-Schlosser, 2016). Giving its importance, and relying on Popper’s metaphor’s implications, Almond and Genco elaborate the ontological properties of politics. Popper’s model presents three different ways to understand social reality: as a clock, a cloud, or a set of plastic controls. The plastic control model best describes political science because it encompasses ideas, human behavior, choices, goals, and purposes, as well as the physical world itself (Berg-Schlosser, 2016).

These ontological properties are denied for philosophical and methodological reasons that view human behavior as simply reactive, explained through the same clock-like natural logic. Such reasons try to fashion science as empirically falsified propositions. The implications of this restricted definition of science allude to the inapplicability of explanatory strategy of hard science to social science. Alternatively, these lawful regular relationships, which successfully explained the physical phenomena, will not explain social phenomena, but only some of the variables. Even political regularities have

different properties than physical regularities; they are soft regularities, because they result from plastic controlled processes, unlike the regularities of the hard sciences that result from iron-controlled processes. These soft regularities have short life-span because they are embedded in history, involving the repetitive passing-through memories (Almond & Genco, 1977).

An Example from Psychology

The evolution of Popper's metaphor concerns all social science and not just political science. In fact, all disciplines of social science are connected. For instance, psychology and politics are closely related when it comes to understanding voting behavior (to be explained in the following section). When studying human behavior, behaviorist psychologists like Pavlov, Watson, and Skinner were only interested in stimulus-response relationships. They used experiments on animals to better understand humans using the operant conditioning black box. According to Tomic, behaviorism can only provide a partial explanation for human behavior. For example, it falls short of providing a sufficient "explanation for language acquisition" (Tomic, 1993). Cognitivists eventually began to look beyond this "black box" of mechanical laws that were unable to explain what took place inside the human brain when we carried out particular behaviors. The behaviorist view of language, which Lin refers to as "ordinary languages," holds that it is governed by rules and is composed of conventions. (Lin, 1999). Human language is like the language of mathematics, i.e. rules can be applicable outside the realm of mathematics and can be extended to linguistics (Staal, 2003). In cognitive theory, Noam Chomsky criticizes this clock-like definition of language's properties that are explained in terms of iron-controlled processes, and substitutes it with a softer, plastic explanation, "language is a natural object, a component of the human mind, physically represented in the brain and part of the biological endowment of the species," (Chomsky, 2002). Hence, Chomsky considers language as primarily cognitive, and secondarily physical that can be optionally used for communication. This transcendental understanding of human language requires moving from the very abstract levels to the very concrete levels of analysis, which cannot be explained by the black box of positivism.

The Rational Choice Theory Example

Almond and Genco provide a practical example of the softness of political theories. In terms of voting behavior, demographic and attitudinal correlates of voting decisions are the covering laws which are the closest to scientific theory. Despite the deductive Downsian model's accurate laws, a causal analysis of the results of voting research over the previous 30 years reveals that these regularities are unstable.

Consider the Rational Choice Theory, which is "closely related to positivism and naturalism, and which appeals to public administration scholars because it provides a predictive science of politics that is sparse in its analytical premises, rigorous in its deductive reasoning, and broad in its apparent applicability (Staal, 2003). The voting paradox described by Boudon (2003) could not be explained by



this theory. The rational actor should never vote because the costs are always greater than the benefits, according to rational choice theory, because the impact of one vote on turnout in any election is so small (Nickerson, 2021). However, millions of people cast ballots annually in national elections (Nickerson, 2021). Here comes the power of psychological explanation, Wilson, Hoffman and Spitzer explain that psychologists have created several experiments, like the "ultimatum game," that defy the rational choice theory (Nickerson, 2021). The scope of political psychology revolves around the concern if one should focus on "elites or masses, attitudes or behavior, emotion or reason," (Schildkraut, 2004). Whether or not conventional rationality assumptions are true depends on predictable psychological processes. (Schildkraut, 2004). The widely held but false belief in international relations scholarship that cognitive biases and emotion only lead to mistakes which distorts the field's understanding of the connection between rationality and psychology in three different ways (Mercer, 2005). Mercer perhaps means that neither psychological nor rational models can offer full understanding of IR, but the traditional assertion that studying emotions and cognition deviates us from the truth is wrong.

Socialization Theory

However, according to Almond and Genco, the socialization theory would even challenge the psychological theory of voting behavior because it offered a somewhat better explanation up until the end of World War II, when a generation of fully socialized youth turned the theory on its head by inventing the cultural elements of youth rebellion (Almond & Genco, 1977).

This cultural youth rebellion and other cultural phenomena can be explained only by using the cultural approach. Almond himself with Verba published their *Civic Culture*, in which they explain the levels of support and participation in democratic practices through analyzing the data from five large countries. They identify three political cultures—participant, subject, and parochial. Hence, the individual subjective attitudes and behaviors are the basis for categorization of the authors' scheme (Ross, 2000). Marc Howard Ross discusses five main contributions of culture to the study of political phenomena: 1) culture frames the context in which politics occurs, 2) culture links individual and collective identities, 3) culture defines group boundaries and organizes action within and between them, 4) culture provides a framework for interpreting the actions and motives of others, 5) culture provides resources for political organization and mobilization (Ross, 2000). Geertz defines an important method that the cultural approach uses that makes it superior to positivism, and allows us to make interpretations, and therefore, we can go beyond the iron-controlled processes of clock-like models: thick description. In the thick description lies the object of ethnography "a stratified hierarchy of meaningful structures" (Geertz, 2008), in terms of which winks for example are "produced, perceived and interpreted" (Geertz, 2008).

Applying Quantum Uncertainty to the Study of Politics

Almond and Genco emphasize the possibility that social and political change can be explained by unintended coincidences or events with a low probability of occurring rather than by rigid or flexible regulations (clocks or clouds). For instance, academics can explain how Russia in 1917 was prepared for revolution and they can comprehend some facets of Lenin's personality that helped prepare the country for it. However, they are unable to articulate how the two events interlock to trigger the Bolshevik Revolution.(Almond & Genco, 1977).

Schildkraut shares similar vision, "perhaps the most satisfying part of being a scholar in this field, and of teaching it to others, comes from the field's ability to help us understand salient political realities that emerge from interactions among people and institutions,"(Schildkraut, 2004). This is an insightful reconciliation of the institutional versus agent-based debate. Furthermore, Paul Nesbitt-Larking developed an interconnected set of European-based theories and perspectives that emphasize both the individual's social context and citizens' ability to engage in strategic discursive and rhetorical agency (Nesbitt-Larking, 2014), attempting to explore the intersection between the individual and the social.

Almond and Genco claim that behaviorists in political science place a strong emphasis on generalization, which needs to be understood in the context of history. David Easton contends that as knowledge develops internal coherence and generality, it becomes more significant and reliable. The use of institutional, ideographic, and descriptive case studies is thus criticized by him (Almond & Genco, 1977).

Therefore, behaviorism had emerged as a reaction to the traditionalist school. Grigsby defines traditionalism as a methodology that focuses on the examination of political institutions (Ishiyama & Breuning, 2011) . She adds that it bases its scientific dependability on careful historical or legal research that aims to produce in-depth descriptions of the topic at hand (Ishiyama & Breuning, 2011).However, behavioralism came as a criticism of its failure. I think that this metamorphosis from traditionalism to positivism is in itself a paradigm shift.

The function of science is the establishment of general laws, at the expense of unique and low probability outcomes. They argue that regularities are essential, but they should not be the only proper objects of scientific political inquiry. Hence, social science should be seen as both conjunction of choice, and constraints and regularities that do not limit innovation(Almond & Genco, 1977).

For behaviorists, systematization, and verification, the second and the sixth Easton's intellectual foundation stones, respectively, summarize the positivist theoretical framework: theories and generalizations could be based on reliable inferences from testable data, and predictions had to be testable in order to be falsifiable or verified. Research also needed to produce a body of systematic



information (Ishiyama & Breuning, 2011). Creating a general theory about real-world political phenomena is the highest ambition, as opposed to interpretivists who reject such notion. He continues by stating that the fundamental beliefs that Easton (1965, 6-8) articulated for the behavioral movement in *A Framework for Political Analysis* characterize the philosophy of science associated with such ambitions (Hill, 2012). Nevertheless, in contrast to rising curves of cumulative findings, Geertz contends that cultural analysis divides into disjointed yet coherent sequences of bolder sorties: it dives deeper into the same thing rather than picking up where others leave off. As a result, it is impossible to create a "General Theory of Cultural Interpretation" or the *Grande Idée* because the goal of theory development is to enable thick descriptions rather than codify abstract regularities. Two prerequisites exist for cultural theory: (1) generalization within cases rather than across cases: Unlike positivism, which starts with a set of observations and attempts to fit them into a governing law, inferences start with a set of signifiers and attempt to fit them into an understandable frame, (2) no ability to predict. In conclusion, interpretivists develop their hypotheses years after the phenomena actually occurs because they don't think a "general theory" actually exists. (Geertz, 2008). This view is quite the same as Almond and Genco's.

Quantification

The previous model is based on the Easton's fifth stone of behavioralism: quantification. According to Gary Goertz, quantitative researchers define a broader scope of theorizing: generalization about a larger number of cases: the analyzed cases are just a sample of a larger population. It is possible to draw conclusions about a larger population by leaving out anomalous variables because an adequate explanation does not need to be correct in all instances. For case selection, researchers favor random selection; they do not consider the value on the dependent variables otherwise bias would be created, statistically speaking (Mahoney & Goertz, 2006). This D-N model is criticized by qualitative researchers who tend to define the scope of their theories narrowly—inferences are generalizable to only a limited range of cases or the analyzed cases. With an increase in the size of the population, key causal relationships are missing. Thus, it is better to develop an entirely new theory to avoid creating causal heterogeneity.

Behaviorists link causality to the justification provided by the covering law. A general law is asserted when it is stated that a specific event is the result of a specific set of circumstances. This causal relationship is explained using Popper's concept of "cast-iron control." Such causality would be the only source of knowledge in a world without expectations (Almond & Genco, 1977).

Causality

The scientific method, according to Kellstedt and Whitten, requires that we conceptualize the world in terms of variables and causal inferences. Therefore, scientists should consider variables in terms of their



label and value in order to create an almost infinite number of causal theories. As a result, they completely reject normative statements while focusing on causality, generality, and parsimony when developing theoretical models (Kellstedt & Whitten, 2019). Similarly, Berg-Schlosser introduces Hume's regularity model in thinking about causality. In order to speak of strict causality (or XY), according to Hume, three conditions must be present: continuity, succession, and constant conjunction (Berg-Schlosser, 2016).

Qualitative researchers, however, take a different position in thinking about causality; Goertz explains that qualitative research aims at explaining the outcomes in individual cases to move backward toward the causes; thus, it favors the causes-to-effects approach to explanation—ideal cases should explain the outcome in all cases within the population. Furthermore, to explain single case outcomes, in qualitative comparative methods like Ragin's comparative analysis, it is evident that qualitative researchers think of causation in terms of necessary causes. This approach is completely in line with reason and sound science: (if-X then -Y thus X is a cause of Y). In the case of a small or medium N, qualitative researchers adopt the INUS approach to causation. An INUS cause is one cause within a combination of causes, which are all together sufficient for an outcome. Such an approach considers that separate combinations of variables can be different paths to the same outcome: equifinality. This latter is associated with qualitative comparative analysis by Ragin, and it has huge influence on such category of scholars when they think about causality. Moreover, King, Keohane and Verba have argued for their book thesis that both qualitative and quantitative research, despite their stylistic differences, share the same logic of inference, aiming at establishing a unified approach of research in social sciences, “our main goal is to connect the traditions of what are conventionally denoted “quantitative” and “qualitative” research by applying a unified logic of inference to both,” (King et al., 2021).

Hence, the two inferences are complementary— we cannot come up with causal explanations without relying on description, and this latter is useless if it does not lead to explanation. KKV makes this point clear, stating that without good description, we cannot build meaningful causal explanations, and without good description, description loses most of its appeal (King et al., 2021) . This view is very similar to Almond and Genco, given the plastic nature of social inquiry.

Methodology

Political science adopted the positivist tradition after successful pioneering work in psychology and economics. For them, the methodology rather than the content itself is the main criterion for evaluating the quality of the research. Berg-Schlosser holds a similar perspective, and he defines methodology as a reflection on one's understanding of scientific practices and instruments (Berg-Schlosser, 2016), and he also thinks of it as the criterion to measure the validity of the research. For positivists, quantification is a key stone in scientific methodology. Almond and Genco acknowledge its merits while also



criticizing its exercises that pass for science but lack substance. They use Holt and Richardson's emphasis on math and statistics as the only means of advancing science as an illustration. Almond and Genco counter that mathematical models typically do a poor job of capturing the complexity of social phenomena (Almond & Genco, 1977).

According to Easton's first and second intellectual pillars of behaviorism, regularities lead to the "rigorous study of political behavior" that ensures predictions in the same way that natural scientists could make them, and methods should be sophisticated in their own use of scientific data collection (Ishiyama & Breuning, 2011). The best example of these traits can be found in McClosky's *Consensus and Ideology in American Politics*, where he proposes five hypotheses and supports them with a systematic examination of empirically gathered data. He explores the question of ideology and consensus from the point of view of agreement on values, and in terms of their understanding, the relation of their opinion to their party performance and the consistency of their views on public affairs. He collects data on the reactions of political influential and the electorate to various items and expresses them as game rules, and then he summarizes and discusses the results of the data in five points that match his already established hypotheses (McClosky, 1964). Moreover, Hansen and Porter argue that the use of numbers in description surpasses the traditional representative role attributed to numbers to highlight their ability to constitute reality. On the other hand, they shadowed the role of the linguistic sign system, as they have superior positive value compared to the interpretive nature of words. They borrow Robson's three properties of numbers: numbers through mobility give objects one particular property that leaves aside all other qualities, which make this object travel transnationally. Numbers are more stable than words, as even the least polysemic words are more complex than any other number. Numbers are also easily more combinable than words (Hansen & Porter, 2012). This mathematical, rigid model is challenged by interpretivists who acknowledge the plasticity of the subject matter of social sciences. For example, Geertz explains with Ryle's image of Berber, Jews and French colonizers in the highlands of central Morocco in 1912, the inference and the implications an ethnographer attempts to reach, relying on thick descriptions (Geertz, 2008).

Quantification is criticized for its reductionist justification and emphasis on form over substance. These flaws have also affected graduate curricula, which are heavily loaded with positivist elements. Graduate students who receive intensive training in multivariate quantitative methods have less time to develop a sophisticated understanding of what has previously been said and thought about political life. As a result, someone with little knowledge of political theory can have a PhD in political science (Almond & Genco, 1977).

Although some criticize the curricula for encouraging students to focus more on the content of politics than on the methodology. They view the methodology as the primary focus of scientific inquiry and the subject matter as tertiary (Kellstedt & Whitten, 2019). On the other hand, the reality they work with is



extremely complex and multidimensional, evolving over time in a variety of ways, and to some extent being influenced by the researchers themselves (Berg-Schlosser, 2016). There are different approaches to investigate reality, and he adopts the realist approach because it considers the substance of social investigation to be as important as the methodology (Berg-Schlosser, 2016), because the subject matter of social inquiry is malleable, a view he shares with Almond and Genco.

Defining Science First!

In the previous sections, I have discussed various views about the nature of political inquiry including the subject matter of political science, ontology, epistemology, and methodology. Now, I return to the main question, is political science a science? However, one must first comprehend what science is in order to be able to respond. According to Almond and Genco, science is not a collection of techniques drawn from mathematical physics as the neo-positivists would have us believe. Rather, science is an effort to investigate and comprehend a specific area of empirical reality (Almond & Genco, 1977). The strategies employed to accomplish this goal should be secondary. Instead of changing the subject to fit preconceived notions about how science should be conducted, good science adapts methods to the topic at hand.

Similarly, Keohane explains that political science would be an oxymoron if one adopted a narrow definition of science, which would require mathematical modeling of its hypotheses, exact quantitative testing, or even experimental validation. He defends the nomenclature by taking a more thorough stance. Instead, he describes science as a set of procedures that are widely known and used to produce descriptive and causal inferences based on the self-aware application of techniques that are also open to public scrutiny. Consequently, political science is the study of politics using scientific methods (Keohane, 2009). For Keohane, everything starts with a puzzle that appears when what we observe does not fit with our perceptions based on an established theory, with a puzzle comes conventionalization that depends on our definitions of key words. Following that, a political scientist has to infer from established premises. However, this descriptive or causal inference is subject to errors because on one hand it relies on interpretations, and on the other hand it might miss some variables. Grigsby extends these ideas by explaining the foundation of post-behavioralism. For post-positivists, “science was unavoidably based on normative assumptions” (Ishiyama & Breuning, 2011); thus, the value-free model that was popularized by behavioralists was not possible at first place.

CONCLUSION

Is political science a science? is the question we tried to address in this literature review. by reinvestigating the 1977 publication, *Clouds, clocks, and the study of politics* by Gabriel Almond and Stephen Genco. Using Popper's three-stage metamorphosis of the metaphor of clouds and clocks, we could demonstrate the paradigm shift in understanding the subject matter of social sciences in terms of

epistemology, ontology, and methodology, from the positivist clock-like model to the plastic model of the post-behavioralist schools. Then, we could demonstrate how our definition of science has changed from the positivists' methodology-focused iron-like rigidity to the substance-based quest for comprehension of plastic reality.

We could establish a fundamental connection between the evolution of our understanding of science as a whole following the development of quantum mechanics and the Heisenberg uncertainty principle and the change in how social science is perceived as a science. The conclusion of this critical review shows that political science is a science because science itself deals with malleable realities as well as regularities and strict laws of classical mechanics. Political science could therefore advance alongside hard science, despite the fact that their respective fields have different subject matter. In addition, the review has also demonstrated the relevance of Gabriel Almond and Stephen Genco's 1977 piece to political science studies today. The piece could establish the fundamentals to start viewing political science within the framework of malleable realities. Contemporary literature of interpretivism could develop on the foundation of this 1977's piece.

Liberation from the narrow positivist definition of science that relies primarily on mathematical methodology, and from the behavioralist focus on the black box imagination of social reality leads us to define science and politics in a more malleable terms and hence to assert the scientific of political science and other social sciences like psychology and economics. This transcendental understanding of both science and political science directs us to develop middle-range theories about real world phenomena rather than mislead our scientific inquiry with meta-theories in search for an illusory general theory or *Grande Idée*.

Therefore, I should introduce the concept of meta-theory, which is a second-order theory concerned with the growth of first-order theories that are supposed to examine the effects of X on Y. Meta-theory is a theory that uses theories about empirical phenomena as its subject of explanation (Bergenholtz & Busch, 2016). Therefore, positivist theories primarily produce meta-theories rather than examining real-world problems. According to KKV, there are standards by which we can judge the importance of our research questions: An inquiry that is "important" in the real world should be the first step in any research project (King et al., 2021), and a research project should, secondly, specifically contribute to a body of scholarly literature by enhancing humankind's capacity to create verifiable scientific justifications for certain aspects of the world (King et al., 2021). Hence, the reproduction of mere meta-theories will not add much to our social inquiry, and that is why there was an urge to shift paradigm from positivism to post-behavioralism, from strict clocks to plastic reality.

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