

An Empirical Investigation of Montesquieu's Theories on Climate

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Abstract—This project uses panel regression analyses to investigate the relationships between geography, institutions, and economic development, as guided by the theories of the 18th century French philosopher Montesquieu. Contemporary scholars of political economy perpetually misinterpret Montesquieu's theories on climate, and in doing so they miss what could be the key to resolving the geography vs. institutions debate. There is a conspicuous gap in this literature, in that it does not consider whether geography and institutions might have an interactive, dynamic effect on economic development. This project seeks to bridge that gap. Data are used for all available countries over the years 1980-2013. Two interaction terms between geographic and institutional variables are employed within the empirical analyses, and these offer a unique contribution to the ongoing geography vs. institutions debate within the political economy literature. This study finds that there is indeed an interactive effect between geography and institutions, and that this interaction has a statistically significant effect on economic development. Democracy (as measured by Polity score) and rule of law and property rights (as measured by the Fraser index) have positive effects on economic development (as measured by GDP per capita), yet the magnitude of these effects are stronger in contexts where a low percent of the national population lives in the geographical tropics. This has implications for promoting economic development, and it highlights the importance of understanding geographical context.

Keywords—Montesquieu, geography, institutions, economic development, political philosophy, political economy.

I. INTRODUCTION

ARE societies products of the natural environment or of manmade institutions? Why are some countries more economically developed than others? These types of questions have been asked for centuries. With such questions in mind, Montesquieu gives us extensive musings and considerations about the various relationships among climate, laws, culture, and economics. Contemporary scholars, who are still struggling to answer these same types of questions, often look to Montesquieu as an authority on the climate aspect. However, as they tend to focus solely on Montesquieu's thoughts on climate, they miss the greater theory that encompasses a number of other factors as well as the rather complex, interactive set of relationships among them. This shortsightedness and oversimplification of Montesquieu's theory has limited the scope of what contemporary scholars seek to explore. By missing his greater theory, they have missed an opportunity to apply their advanced statistical

methods to a comprehensive and dynamic theory that merits empirical investigation. This project attempts to help bridge that gap. First, it seeks to pinpoint what were Montesquieu's true intents regarding climate, laws, and economic development, and will it will use statistical methods to test his theory empirically.

This project uses statistical methods to test Montesquieu's theories on climate, laws, and economic development. It thus offers a unique interpretive strategy. The empirical models in this study employ two interaction terms between geographic and institutional variables. By doing so, this project helps fill an important gap in the literature on geography and institutions, and it therefore contributes to the ongoing debate between which matters most for economic development. The results indicate that the interaction between geography and institutions has a significant effect on economic development.

The following pages will first present a thorough examination of Montesquieu's understanding of the relationship between climate, terrain, and laws. Special focus will be given to an interpretation of Montesquieu as promoting an interactive relationship between climate (or geography) and the laws (or institutions). The next section will provide a literature review of contemporary scholars who lead the ongoing debate between the so-called "institutions hypothesis" and "geography hypothesis." The next section will offer a critique of the current scholarship, both regarding its understanding of Montesquieu and its either-or dichotomy of the institutions versus geography hypotheses. Subsequently, Montesquieu's theories on climate, laws, and economic development will be reevaluated. This will be followed by a series of empirical analyses, and some concluding remarks.

II. MONTESQUIEU ON CLIMATE AND LAWS

Montesquieu observes a correlation between despotic states and hot climates—a correlation that has persisted well into our day. In addressing this link, Montesquieu examines the relationship between laws and the nature of climate. Indeed, Book 16 of *The Spirit of the Laws* is titled "Lois dans le rapport qu'elles ont avec la nature du climat"¹ In the small introductory chapter of this Book, he begins with a proposition: "If it is true that the character of the spirit and the passions of the heart are extremely different in the various climates, laws should be relative to the differences in these passions and to the differences in these characters" [1, p-231]. Montesquieu thereby sets the task of determining the extent to which climate (and the physical environment more generally)

¹ "On the laws in their relation to the nature of the climate."

affects people's passions and characters, as this will then shed light on how laws are and should be related to the resultant passions and characters that arise from different climates.

Of course, while climate and geography are certainly important, Montesquieu hypothesizes that they are among a number of relevant factors. He tells us early on in *The Spirit of the Laws* that the laws of a nation ought to be considered in light of a number of contextual factors, with each factor conditional on the others. This makes the legislator's job a veritable balancing act. The laws, he says,

"Should relate to the physical aspect of the country; to the climate, be it freezing, torrid, or temperate; to the properties of the terrain, its location and extent; to the way of life of the peoples, be they plowmen, hunters, or herdsmen; they should relate to the degree of liberty that the constitution can sustain, to the religion of the inhabitants, their inclinations, their wealth, their number, their commerce, their mores and their manners; finally, the laws are related to one another, to their origin, to the purpose of the legislator, and to the order of things on which they are established. They must be considered from all these points of view" [1, p-9].

As previously noted, the focus here is on geographical factors, their influences on passions and behavior, and their relationships to laws. Accordingly, the following discussion will examine Montesquieu's thoughts on these matters and will leave his views on the remaining factors to future studies.

A. Climate, Passions, and Laws

To test his theory, Montesquieu begins rather scientifically by noting the effects cold and heat have on the "extremities of the body's surface fibers" [1, p-231]. He supports his reasoning with observations from an experiment performed on a sheep's tongue. He deduces that temperature evokes certain physical responses from the body. The cold contracts the extremities of the body, which increases their "spring" and encourages blood flow. This contributes, he says, to greater strength. Conversely, heat "relaxes these extremities" and "decreases their strength and their spring" [1, p-231]. It follows, according to Montesquieu, that colder climates make men more vigorous, courageous, and strong, as a result of purely physical causes. Hotter climates, by contrast, make men timider, indolent, and feeble.

Montesquieu suggests that the same person placed in different environments will adopt very different characteristics in response to that environment. He observes that "even the children of Europeans born in the Indies lose the courage of the European climate," and he further notes that "when a Germanic nation moved to Spain, the climate required quite different laws" [1, pp-234, 243]. By tracing the link to mere physical reactions, he removes any notions of genetic predispositions for one type of character or for one type of government. Montesquieu affirms the universality of human nature by demonstrating how it (in general and in aggregate terms) reacts similarly to different physical environments.

A related correlation Montesquieu points out is that between climate and the dominance of the passions. "As you

move toward the countries of the south, you will believe you have moved away from morality itself: the liveliest passions will increase crime; each will seek to take from others all the advantages that can favor these same passions" [1, p-234]. "There are," he adds, "climates in which the physical aspect has such strength that morality can do practically nothing" [1, p-269].

But not only will one lose the will to combat the call of passions in hot climate, one will also become listless in the face of oppression. Thus, "servitude will be less intolerable than the strength of spirit necessary to guide one's own conduct" [1, p-234]. Consequently, the role of the legislator becomes ever more significant where the populace is enervated by its surroundings and hence more susceptible to tyrannical ambitions. These leaders—whether they be tyrants or enlightened legislators—are presumably anomalies whose passions are less compliant to the forces of nature. This makes them crucial for determining the direction of their society.

Not only does an indolent populace make proper self-government impossible, it also makes moderate governance less likely. Moderate government is almost always the product of various checks on the ruling power(s), and an inactive, spiritless population fails to act as one of these checks. It follows that moderate governments will be less common among tropical climates, where the population is rendered inactive and spiritless. Tyranny, conversely, is more easily established in such environments, since the tyrant meets with less resistance.

B. Terrain, Industriousness, and Laws

Montesquieu further observes that "government by one alone appears more frequently in fertile countries and government by many in the countries that are not" [1, p-285]. In the same way that tropical heat enervates the people there, the natural abundance of readily available sustenance tends to make inhabitants dependent and tractable. A population of farmers "are not very careful of their liberty; they are too busy and too full of their individual matters of business" [1, p-285]. A dispersed, rural population has less communication than does a concentrated, urban center; an agrarian population also lacks the credible threat of capital flight. Today, these things continue to work against collective action and to undermine demands for responsive governments.

Non-agrarian peoples, by contrast, "enjoy a great liberty: for, as they do not cultivate the land, they are not attached to it...and if a leader wanted to take their liberty from them, they would immediately go and seek it with another leader" [1, p-292]. "Among these people," Montesquieu adds, "the liberty of the man is so great that it necessarily brings with it the liberty of the citizen" [1, p-292]. In places lacking natural abundance or resources, liberty may become "the only good worth defending" there [1, p-286]. Indeed, self-government may be a form of "compensation" to territories that lack natural endowments [1, p-285].

In more fertile regions the habit for entrepreneurship is therefore not cultivated as a means of survival. If the entrepreneurial spirit is fostered there, it is due to causes other

than necessity. Less fertile areas, conversely, are more inclined to develop an industrial spirit, as such places can be made inhabitable only by persistent industriousness. "The barrenness of the land makes men industrious, sober, inured to work, courageous, and fit for war; they must procure for themselves what the terrain refuses them" [1, p-287].

Montesquieu explains how this habit of industriousness encourages the concomitant development of moderate government. "Countries which have been made inhabitable by the industry of men and which need that same industry in order to exist call for moderate government," he states [1, p-288]. This is because the "continuous care" required to maintain such places calls for "the mores of a wise people rather than those of a voluptuous people, [and] the legitimate power of a monarch rather than the tyrannical power of a despot" [1, p-288]. "Power had to be moderate," he goes on, in environments "which nature made so that attention would be paid to her and that she would not be abandoned to indifference or caprice" [1, p-288]. Vigilance is thus a habit that permeates one's various spheres of life, from work to politics. Industriousness, it seems, translates to public spiritedness.

C. Legislators and Laws

While Montesquieu observes a rather persistent correlation between the natural environment, productivity, and regime type across countries, he by no means proposes a deterministic explanation. Climate *may* have a direct and dominant effect on people's characters, and this in turn can make them more prone to a certain type of government. Yet, laws can mitigate the effects of the environment on a people's character, thereby redirecting the population's original tendencies. This is made clear by the very title of Chapter Five of Book 14: "That bad legislators are those who have favored the vices of the climate and good ones are those who have opposed them" [1, p-236]. That is, laws can reduce or enhance the effects of climate and geography. Manmade laws or innovations can thus greatly reduce, if not eliminate altogether, the determinism of environment. Interestingly, Montesquieu also recognizes that bad laws can have similar effects on men's characters to those brought about by tropical climates. He notes that where "laws were badly made, lazy men appeared" [1, p-253].

Montesquieu reminds us that while climate may sometimes have a heavy hand in the formation of our characters, it is certainly not alone. Indeed, "many things govern men: climate, religion, laws, the maxims of the government, examples of past things, mores, and manners; a general spirit is formed as a result" [1, p-310]. Furthermore, "[t]o the extent that, in each nation, one of these causes acts more forcefully, the others yield to it" [1, p-310]. There is thus a dynamic relationship among these many factors, whereby a change in one effects a chain reaction (to varying degrees) among the others.

It is perhaps unsurprisingly that Montesquieu places nature (i.e., the natural environment) as the initial dominating force that shapes our characters. "The empire of climate is the first of all empires," Montesquieu affirms [1, p-316]. Climate is the

first player in what is to become a multi-player game. For this reason, "[n]ature and climate almost alone dominate savages" [1, p-310]. Savages are savages because they have not acquired the tools to combat the empire of climate; instead, nature rules above all else. There are, no doubt, numerous problems presented by the rule of climate, yet these faults can be checked (or exacerbated) by the laws.

Yet, finding the appropriate set of laws is far from a simple or straightforward task. "The differing needs of differing climates have formed differing ways of living, and these differing ways of living have formed the various sorts of laws," Montesquieu writes [1, pp-239-240]. That is, different climates, with their different effects, will require different sets of laws. This precludes a "one-size-fits-all" policy solution. "Laws should be so appropriate to the people for whom they are made," Montesquieu stresses, "that it is very unlikely that the laws of one nation can suit another" [1, p-8]. This makes the legislator's job all the more difficult, but all the more important.

Montesquieu emphasizes that "peoples of these [tropical] climates have greater need of a wise legislator" [1, p-235]. Bad legislators are those that reinforce the vices of the climate, whereas good legislators are those that counter such vices. He explains that citizens in the cold, English climate are more naturally apt to keep a watchful and restless eye on their government officials. In the extremely hot and muggy climates of India and (primarily southern) China, however, where passions are wont to rule, good or bad legislators can make all the difference.

Montesquieu prescribes some specific measures for combatting the enervating ills of climate. He speaks to lawmakers about the value of encouraging productivity based on a broadly inclusive labor force. "In order to conquer the laziness that comes from the climate," he instructs, "the laws must seek to take away every means of living without labor" [1, p-237]. Rewarding hard work and productivity, for example, is a mechanism that can help enliven an inactive community made indolent by the climate. Vanity and ambition are easily awoken, and these can be channeled toward positive results with the help of incentivizing laws.

Laws fostering languidness, by contrast, reinforce the ills of climate. A particularly bad set of laws in the Indies handed over land solely to the princes. This took "away from individuals the spirit of ownership" and thereby increased "the bad effects of the climate, that is, natural laziness" [1, p-237]. "Monasticism," he writes, "causes the same evils there" [1, p-237]. He observes that "the number of dervishes, or monks, seems to increase with the heat of the climate; [and] the Indies, where it is extremely hot, are full of them" [1, p-237]. The same is observed in southern Europe, he says, where those who lead a "speculative life" (as opposed to a physically active life) are provided grand palaces for their idleness [1, p-237].

Wise legislators therefore have the ability to combat the ills of climate. Yet, as we well know, "[e]nlightened statesmen will not always be at the helm" [2, p-75]. Montesquieu affirms that it is indeed rare to observe a "masterpiece of legislation"

come into fruition [1, p-63]. Nevertheless, the potential is there, as is made further evident by the cases that do exist. The power of laws can be seen firsthand in, for instance, the contrast between North and South Korea. Similarly, Deng Xiaoping can be credited with igniting a veritable commercial revolution in China with a new set of laws—represented by the slogan “to get rich is glorious”—that successfully directed the nation away from economic communism.

D. Montesquieu's Case Examples: The Indies & China

Montesquieu contrasts the legislators of the Indies and China to illustrate his point regarding the importance of legislators in tropical climates. The legislator of the Indies, he recounts, promoted a doctrine that equated inaction with perfection. The “legislator of the Indies,” he writes, “followed his feelings when he put men in an extremely passive state; but his doctrine, born of idleness of the climate, favoring it in turn, has caused a thousand ills” [1, p-236]. We can assume that this legislator “followed his feelings” as opposed to his reason in developing such a doctrine. Instead of combating “the idleness of the climate” with sensible and practical mores and laws, the prevalent doctrine in the Indies reinforced and exacerbated the ills of the climate. Yet, “the more the physical causes incline men to rest, the more the moral causes should divert them from it,” Montesquieu instructs [1, p-236]. The Indies lacked the moral (and legal) counterbalances to the climate, and so the inhabitants further succumbed to the climatic vices. Thus, in the Indies “one sees the point to which the vices of climate, left in great liberty, can carry disorder. *Their nature has a strength*” [1, p-271, emphasis added]. This contrasts to China, where the legislators “were more sensible,” as they took proper actions for encouraging activity and hard work among their populace [1, p-236]. Montesquieu draws on the examples of two Chinese provinces—Kiangsu (now Jiangsu) and Chekiang (now Zhejiang)—to illustrate how laws can encourage productivity. Interestingly, these two coastal provinces are still among the most prosperous in modern-day China [3]. Montesquieu praises these provinces because they “were made by men” [1, p-288]. This, coupled and complemented by wise legislation, made these regions the “finest provinces of the empire” [1, p-288].

Montesquieu only mentions the climate of the region after speaking of the industry and laws of the provinces:

“Thus, *in spite of* the climate in China, where one is by nature inclined to servile obedience, *in spite of* the horrors that attend an excessively large empire, the first legislators of China were obliged to make very good laws, and the government was often obliged to observe them” [1, p-288, emphases added].

This not only suggests that physical obstacles may be overcome with “good laws,” it reveals that climate and geography may be reduced to mere afterthoughts.

III. CONTEMPORARY LITERATURE REVIEW: INSTITUTIONS VS. GEOGRAPHY

Having examined Montesquieu's understanding of the relationships between laws, productivity, and climate, focus

will now turn to a discussion of contemporary scholarship. The prominent scholars on these topics can be separated into two categories: those supporting the “institutions hypothesis” and those supporting the “geography hypothesis.” They are relevant, and their arguments merit presentation, because their theories are largely what guide today's research on the relationships between institutions, geography, and economic development.

As will be explained, the general shortcoming recognizable throughout the literature is the either-or dichotomy between institutions and geography. This shortcoming may be corrected by a more complete understanding of Montesquieu. While the theories advocated by both sides do somewhat accord with Montesquieu's thoughts on the subjects, both sides nonetheless have, at best, a faulty and incomplete understanding of Montesquieu's climate theory.

A. The Institutions Hypothesis

Acemoglu, Johnson, and Robinson (henceforth, AJR) set out to determine empirically whether the climate theory or the institutions theory has more explanatory power with regard to economic performance [4]. They famously develop their own theory of institutional development, which includes a place for climate (albeit an indirect one). According to them, institutions have a direct effect on economic development, and environment simply influences where certain institutions were established. AJR look at the colonial experiences of many countries in an effort to determine why some former colonies have flourished while others remain mired in poverty. They argue that where Europeans settled, they established institutions that are conducive to economic productivity (e.g., property rights, rule of law, checks and balances, and other institutions generally associated with modern democracy). Where they did not settle, however, they erected extractive institutions, so that resources could be quickly and easily exported out of the host country and back to the metropole. These authors argue that Europeans decided where to settle based on mortality rates. This is where climate and environment come in, as the temperate zones proved more hospitable to Europeans, whereas the tropics were often rife with diseases (especially malaria) that greatly increased European mortality rates. The undeniable correlation between climate and economic performance is therefore explained, but, as AJR maintain, it is in the form of an *indirect* effect. Climate determined European settlement, which, in turn, determined the institutions that were put in place, which, in turn, determine current levels of economic development. It is thus institutions that *directly* affect economic performance, according to AJR.

Easterly and Levine retest the AJR institutions theory against the geography theory [5]. However, Easterly and Levine also add the policy theory to the mix. Their definition of the institutions theory explicitly follows the AJR model, which maintains that “the environment's main impact on economic development runs *through* long-lasting institutions” [5, p-5, emphasis added]. “The policy view,” they describe, “holds that economic policies and institutions reflect current

knowledge and political forces” [5, p-6]. This policy approach downplays the role of history, and instead emphasizes a “one-size-fits-all” policy package as the key to economic development. This is the view largely adopted by nongovernmental organizations such as the World Bank and the International Monetary Fund (IMF).

Easterly and Levine’s empirical analyses find no support for the geography or policy theories, but their findings do support the institutions hypothesis developed by AJR. Easterly and Levine conclude that “endowments do not explain economic development beyond the ability of endowments to explain institutional development” [5, p-32]. “Endowments explain institutions,” they affirm, “which in turn explain economic development” [5, p-33].

Rodrik and Subramanian and Rodrik, Subramanian, and Trebbi concede that geography may have a small role to play, but they conclude that institutional quality is the primary determinant of economic development [6], [7]. Importantly, however, these authors also contend that geography has an impact on the quality of institutions. According to them, geography has at best weak direct effects on income level, but ultimately “the quality of institutions trumps everything else” [7, p-4]. Yet, geography can have strong, direct effects on institutional quality, which means it cannot be discounted. Here agreeing with AJR and Easterly and Levine, they find a strong *indirect* effect of geography on income *through* its influence on institutions. They explain geography’s impact on institutions largely through the “resource curse” logic (which will subsequently be described). Implicitly invoking Montesquieu, these authors advise that close attention ought to be paid to context when designing the legal framework and institutions of a nation. As Rodrik and Subramanian put it, “desirable institutional arrangements have a large element of context specifically arising from differences in historical trajectories, geography, political economy, and other initial conditions” [6, p-33]. They praise democracy more as a deliberative process and as a means for helping societies make choices about the institutions most appropriate for their contexts, rather than as a final solution in itself.

B. The Geography Hypothesis

Proponents of the geography hypothesis counter advocates of the institutions hypothesis by arguing that there are indeed *direct* effects of geography on both income levels and institutions [8]-[10]. Sachs, Mellinger, and Gallup describe the three primary ways geography affects economic development: (1) agricultural productivity; (2) the ease and cost of transportation and communication; and (3) tropical diseases [9]. The first of these, agricultural productivity, is the most straightforward. Most major food grains (wheat, maize, rice) either do not grow at all or grow very ineffectively in tropical climates.

Second, distance from coasts and rivers can make trade more difficult. Landlocked countries may thus be disadvantaged, particularly if their neighbors are not lucrative sources of exchange (think Switzerland versus the Central African Republic [11]). If “the history of commerce is that of

communication among peoples,” as Montesquieu suggests, then the landlocked countries surrounded by poor, less developed neighbors will be doubly disadvantaged, as they will suffer from a lack of trade and a lack of communication (and the knowledge and technology transfers that accompany these) [1, p-357].

Third, many diseases endemic to tropical and subtropical zones can have devastating impacts on the population and thus on productivity. High child mortality is one consequence of a rampant disease environment, and high child mortality tends to lead to higher fertility rates (families have more children with the hopes that some will survive). High fertility, in turn, leads to a more limited role for women in society. High fertility is associated with lower education rates for women, lower employment rates for women, and less political participation by women. Having more children also makes it more difficult for poor families to invest in education for all their children [9]. These factors make disease-prevention a political problem. In a related vein, Montesquieu offers a chapter titled “*On the laws relating to diseases from the climate*,” wherein he discusses how good laws seek to halt the spread of leprosy.

Today, malaria, in particular, is “intimately correlated” with poverty [8]. Gallup and Sachs argue that this geographically specific disease is in fact a significant cause of poverty. In the first place, it directly impacts productivity and human capital development. People afflicted with the disease are unable to work, and children with the disease are unable to attend school. In addition, malaria-induced anemia is common, and iron deficiencies are said to affect cognitive skills. In the commercial realm, malaria may also inhibit foreign investment and limit the formation of economic networks, as areas rife with malaria are inhospitable to outsiders. Moreover, domestic communication and interaction may also be curtailed, as the better-educated and more ambitious citizens move (permanently) away from malaria zones. Thus, “the transmission of ideas, techniques, and development of transportation systems may all be stunted by malaria” [8, p-95].

Climate and geography therefore appear to produce developmental heterogeneity within countries as well. In an innovative study, Dell, Jones, and Olken examine municipal-level data and find that the correlation between income and temperature holds [12]. As they explain, “the negative cross-sectional relationship between temperature and income exists within countries, as well as across countries” [12, p-203]. This implies that national characteristics (such as national institutions) cannot be the sole drivers of the relationship between climate and level of development.

Natural abundance—of crops, resources, or even labor—is often observed to have a perverse effect on the inhabitants of the society. The correlation between natural resource abundance and authoritarian government is commonly referred to as the “resource curse.” The oft-observed link “between dependence on commodity exports and poor economic (and political) performance is known as the ‘resource curse’” [13, p-220]. “Instead of being used as a

developmental tool,” heavy supplies of natural resources “become the goal of political victory; the ambition of leaders is not to reap the reward of investments in terms of development, but rather to prosper from cutting deals with investors” [14, p-195].

The prevalence of oil-fueled dictatorships is commonly recognized today, and governments that are not reliant on broad-based taxes for revenue are highly correlated with authoritarian regimes [15]-[23]. Resource abundance permits governments to be not dependent on (and therefore not answerable to) its people. Montesquieu supplements this by asserting that natural abundance instead makes a people dependent and liable to be ruled despotically. “The goodness of a country’s lands establishes dependence there naturally,” he argues [1, p-285].

It must be noted that the geography theories of development do not discount the role of institutions altogether. Just as advocates of the institutions hypothesis maintain that geography works indirectly through institutions, proponents of the geography hypothesis also tend to acknowledge that the various lines of causality are complex and intertwined—although, these scholars claim that a direct link between geography and development is included in the mix. As Sachs argues, “the logic of the geography-institutions linkage is also the logic of a direct geography-productivity linkage” [10, p-3]. Echoing Montesquieu, he further affirms that “there is good theoretical and empirical reason to believe that the development process reflects a complex interaction of institutions, policies, and geography” [10, p-9].

C. Incorporating (Montesquieuan) Complexity

The recent trend in the literature has been to incorporate more “flexibility” with methodological models that seek to analyze the relationship between geography, institutions, and economic development. Parent and Zouache, for example, employ a Bayesian model-averaging method, which, they state, allows for the consideration of “geographical effects in a more flexible way”—i.e., one that includes a role for institutional factors [24, p-488]. In their view, the geography and institutions hypotheses are not so antithetical as previous scholarship might have one believe. These authors find that “spatial inertia” has a direct effect on the slow growth patterns observed in Africa and the Middle East [24, p-512]. Dell, Jones, and Olken also allow for additional complexity by their inclusion of “offsetting” variables [12]. Convergence and adaptation, according to them, are two mechanisms that can be used to offset the negative effects of temperature. Convergence refers to the “good neighborhood” effect that Collier observes. A landlocked, resource-scare country like Switzerland may flourish thanks, in part, to the advantages brought by its prosperous neighbors (see [11]). Countries or regions may also adapt to their climate by, for example, switching to more appropriate crops or industries, by utilizing different technologies, or by simply migrating away from the most inhospitable areas [12]. While Dell, Jones, and Olken do not discuss whether laws may offer a form of adaptation, their sentiment of combatting the ills of climate via human innovation harkens back to Montesquieu’s praise of the Chinese provinces that were “made by men” [1, p-288].

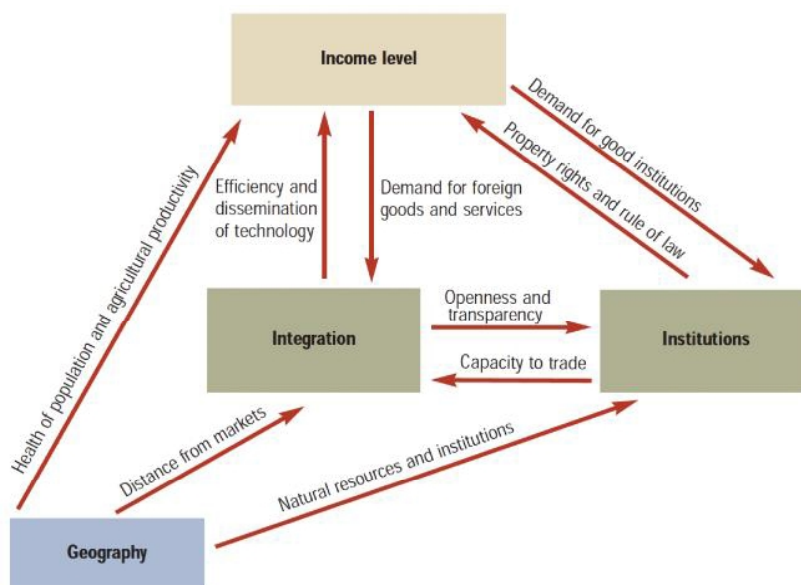


Fig. 1 The relationships among geography, integration, institutions, and income level [6, p-32]

Rodrik and Subramanian and Rodrik, Subramanian, and Trebbi use instrumental variables for the two endogenous variables in their models: institutions and integration (i.e., international trade) [6], [7]. While this instrumental variable method has been criticized by others (see, for example, [24]),

these authors make a compelling theoretical case for the complex and dynamic interaction among geography, institutions, integration, and development. As Fig. 1 demonstrates, there is a “complex web of causality” at work [6, p-31]. In this view, geography can have both direct and

indirect effects on economic development. In agreement with a number of the previous scholars, these authors note that geography directly influences income through its effects on agricultural productivity and human morbidity, and indirectly by its effects on market integration, transportation costs, the diffusion of knowledge and technology, and the disease burden [7]. Ultimately, however, they find that institutions are the primary determinants of economic development, overriding geography in the end.

Despite the growing complexity that is being incorporated into the scholarly research that examines the relationships between geography, institutions, and development, there have not yet been any that makes use of interaction terms in its methodology. As will be explained further in the methodological section of this paper, an interaction term between geographical and institutional variables may provide a helpful strategy for observing the complex and dynamic factors at play in the arena of economic development.

IV. VINDICATING MONTESQUIEU

Montesquieu is a familiar name in the majority of these scholarly articles, yet rarely is he given more than a passing reference. For many scholars in the field, Montesquieu has merely become a poster child for the geography hypothesis, but this sadly loses sight of Montesquieu's very intricate and complex argument regarding climate and institutions. The fact that his most influential work is titled *The Spirit of the Laws*, and not *The Spirit of the Climate*, seems to have been lost on many of those who invoke his name.

AJR, for example, depict Montesquieu as a firm proponent of the climate theory. They describe Montesquieu as arguing "for a *direct* effect of climate on [economic] performance" [4, p.-6, emphasis added]. Similarly, Easterly and Levine place Montesquieu as one of the founders of the geography hypothesis, which, they say, "holds that the environment *directly* influences the quality of land, labor, and production technologies" [5, p-3, emphasis added]. AJR and Easterly and

Levine's findings seem to provide compelling evidence against Montesquieu's climate theory (as they define it)—yet, these contemporary scholars overlook an essential component of Montesquieu's theory, and hence they miss a pivotal interplay between institutions and climate and, moreover, the consequences this has for economic performance.

Many in the geography camp are equally guilty of the oversimplification of Montesquieu's ideas. Dell, Jones, and Olken, for instance, merely note that Montesquieu "observed that hot countries tend to be poor" [12, p-198]. However, an important exception to this oversimplification folly can be found in Parent and Zouache [24]. They cite Montesquieu in his original language, and offer a rather refreshing interpretation. They offer the following formulation:

Climate => Passions => Laws (in Montesquieu)
 Geography => Behavior => Institutions (in modern terms);

and they add that with such a perspective "it can be considered that the two hypotheses [geography and institutions] are interrelated" rather than opposed [24, p-499]. The challenge, they concede, lies in determining the proper methodology for accurately reflecting this relationship.

Yet, even this interpretation by Parent and Zouache misses a large extent of the dynamics at play. Climate influences the passions, which in turn determine productivity and industriousness (taken here to be economic development). This generally follows Parent and Zouache's interpretation. Yet, for Montesquieu, the laws appear to function more as an interruption rather than an outcome of the passions. This is where Parent and Zouache misstep. The interruption by laws can either change the trajectory of climate's impact on the passions, or it can reinforce the original trajectory. Fig. 2 provides a visual representation. Of course, different laws will interact with different climates in different ways.

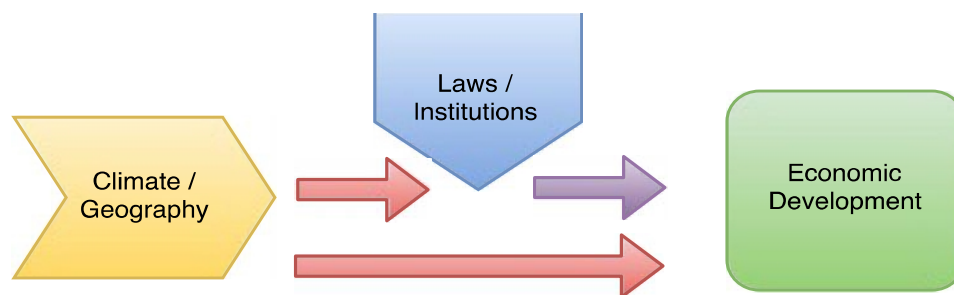


Fig. 2 The dynamic relationships between climate/geography, laws/institutions, and economic development, as described by Montesquieu

Climate and geography, unencumbered, will indeed have a direct effect on economic development. This is accomplished in part by the quality of land, natural resources, and the like, but also in part by the influence climate has on the passions and behavior of the inhabitants. The cold induces one to be active, while the heat induces inactivity. Lack of abundance will incline people toward industriousness, whereas natural

abundance will incline people toward repose. Legislators can come in and disrupt these inclinations, or they can help guide them along. This interaction of climate and laws, however, is still incomplete. It leaves out some of the critical components at play in what Montesquieu calls the "general spirit." Recall that he also includes mores, manners, religion, examples of the past, and "maxims of the government" [1, p-310]. The above

formulation is therefore only a partial representation of Montesquieu's conception of the general spirit, but it gleans out the components of interest for this project, and it can be useful for better understanding a portion of the puzzle.

Despite the missing elements, it is nonetheless clear that Montesquieu envisions a much more complex relationship between climate and development than a simple, straightforward line of causation. As has been seen, the oversimplification of Montesquieu's so-called "climate hypothesis" is reflected in a number of scholarly works today. This common misinterpretation has obscured a broader theory that may in fact help us discover the more intricate relationships that exist between geography, institutions, and economic development. This study therefore attempts to use a more comprehensive interpretation of Montesquieu's thoughts on climate to guide the empirical analyses of geography, institutions, and economic development.

A. Mind/Body Allegory?

It is perhaps no coincidence that Montesquieu characterizes northern regions as cool, rational, and in control of passions, while he characterizes southern regions as warm, voluptuous, and controlled by passions. It is possible that Montesquieu is drawing a parallel between the north and the mind, and between the south and the body. Many of his predecessors (notably, Plato and Aristotle) portray regime types as corresponding to certain individual dispositions. In Plato's *Republic*, Socrates describes a city in speech that is meant to be a more visible version of the individual soul. That is, the city is the macro and the individual soul the micro. As Socrates says,

"Perhaps there would be more justice in the bigger and it would be easier to observe closely. If you want, first we'll investigate what justice is like in the cities. Then, we'll also go on to consider it in individuals, considering the likeness of the bigger in the *idea* of the littler?" [25, §-369a, p-45].

There is reason to believe that Montesquieu expands on this by equating higher temperatures with a higher susceptibility to appetite, bodily pleasures, and passions. Those in colder climates, Montesquieu maintains, "have little sensitivity to pleasures," whereas "one will have more of it in temperate countries," and "in hot countries, sensitivity will be extreme" [1, p-233]. He thus suggests that "[a]s one distinguishes climates by degrees of latitude, one can also distinguish them by degrees of sensitivity, so to speak" [1, p-233].

The parallel Montesquieu draws between climatic regions and the mind/body is perhaps most striking in the concluding chapter of his *Book on climate* (Book 17, Chapter Eight). This final chapter briefly discusses the placement of the "*capital of the empire*" [1, p-284]. Montesquieu concludes that the north is a better location for the ruling capital. This is because:

"One of the consequences of what we have just said is that it is important to a very great prince to choose well the seat of his empire. He who puts it in the south will run the risk of losing the north, and he who puts it in the north will easily preserve the south" [1, p-284].

Thus, establishing the ruling seat in the north (mind) will lead to easy preservation of the south (body), whereas setting the ruling seat in the south (body) will lead to the possible loss of the north (mind).

Montesquieu adds that he does "not speak of particular cases: as mechanics has its frictions which often change or check its theoretical effects, politics, too, has its frictions" [1, p-284]. This suggests that he is not necessarily recommending that nations across the globe move their capitals northward, but instead it hints that he may have something more theoretical in mind. One could reasonably interpret that Montesquieu is encouraging the mind to rule the "empire" of the body. In a later section, he writes that "[r]eason has a natural empire; it has even a tyrannical empire: one resists it, but this resistance is its triumph; yet a little time and one is forced to come back to it" [1, p-591]. Montesquieu may be suggesting that it is indeed more natural for mankind to be ruled by reason than to be ruled by the physical environment. "Men, by their care and their good laws, have made the earth more fit to be their home," he writes [1, p-289].

If the climate-mind/body allegory stands, it does not necessarily detract from the observed correlations between geography, regimes, and economic development. It merely adds a philosophical layer to the practical applications of understanding the various relationships at play. The next section will shift focus to the empirical investigation of Montesquieu's theories.

V. DATA AND METHODOLOGY

The empirical section of this paper will present the results of three ordinary least squares (OLS) panel regression models. Data are collected for all countries for the years 1980 to 2013 (given data availability). These regressions are meant to explore the relationships between geography, institutions, and economic development more fully with the hope of shedding some light on the complex interactions between these variables as described by Montesquieu. Interpreting his argument through data is a way of giving a new form of expression to his theories, as well as offering empirical validation of his qualitative descriptions.

Two interactions terms—each involving an institutions variable and a geography variable—will be given focus in the discussion portion of this section, as these will offer a novel contribution to the geography-institutions debate, and to the study of Montesquieu more generally. Following standard procedure, variables of lesser interest will be interpreted using the base model (Model 1) that does not include any interaction terms. The two interaction terms will be interpreted using their respective models (Models 2 and 3).

A. Variables

1. Dependent Variable

Logged GDP per capita: Logged Gross Domestic Product (GDP) per capita is chosen as the dependent variable for all three models because it is a widely used measure of economic development, and it also arguably measures a society's level

of productivity. Moreover, GDP per capita represents a quantifiable way of determining whether (and to what extent) laws and institutions have been able to overcome the ills of climate. Data are from the World Bank, and are in current US dollars [26].

2. Primary Independent Variables of Interest

Population in the Tropics (%): This represents the geography variable. It refers to the percent of the national population living in geographically tropical areas. Data are from the database assembled by Gallup et al. [27]. A greater proportion of the population living in the tropics is expected to be negatively associated with economic development.

Property Rights & Rule of Law (ROL): This is one representation of the institutions variable. This measure is taken from the *Economic Freedom of the World* index's category for "legal structure and security of property rights" [28]. The scale ranges from 1 to 10. This variable is expected to be positively correlated with GDP per capita.

Polity Score: This is a second representation of the institutions variable. Two institutions variables are used for matters of robustness. While Polity score is a measure of regime type, property rights and rule of law are measures of specific institutions. They are expected to yield similar results. Data are from the Polity IV Project, and the scores range from -10 to 10 (with -10 referring to the most autocratic regime, and 10 referring to the most democratic regime) [29]. This variable is also expected to be positively correlated with GDP per capita.

3. Control Variables

Resource Rents (% of GDP): This variable refers to a country's total natural resource rents. It is "the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents" [26]. Data are from the World Bank. Following the resource curse logic, this variable is expected to be negatively correlated with GDP per capita.

Agriculture, Value Added (% of GDP): This variable represents the net output of agriculture (including forestry, hunting, and fishing) in a country after adding up all outputs and subtracting intermediate inputs [26]. Data are from the World Bank. Following Montesquieu's reasoning that agricultural societies are more prone to having despotic governance and lower economic development, this variable is expected to be negatively related to GDP per capita.

4. Interaction Terms

(Model 2: *Population in the Tropics * Polity Score*) and (Model 3: *Population in the Tropics * Property Rights & Rule of Law*): These two interaction terms will exhibit the combined, interactive effects that the geography and institutions variables have on GDP per capita.

B. Statistical Models

- The base model (Model 1) for the subsequent analyses will be:

$$\ln GDPpc = \beta_1 + \beta_2 PopulationTropics + \beta_3 PropertyRights \&ROL + \beta_4 Polity + \beta_5 ResourceRents + \beta_6 Agriculture \quad (1)$$

- Model 2 builds on the base model by including an interaction term between *Polity* and *Population in the Tropics*:

$$\ln GDPpc = \beta_1 + \beta_2 PopulationTropics + \beta_3 PropertyRights \&ROL + \beta_4 Polity + \beta_5 ResourceRents + \beta_6 Agriculture + \beta_7 Polity * PopulationTropics \quad (2)$$

- Model 3 builds on the base model by including an interaction term between *Property Rights and Rule of Law* and *Population in the Tropics*:

$$\ln GDPpc = \beta_1 + \beta_2 PopulationTropics + \beta_3 PropertyRights \&ROL + \beta_4 Polity + \beta_5 ResourceRents + \beta_6 Agriculture + \beta_7 PropertyRights \&ROL * PopulationTropics \quad (3)$$

C. Results and Discussion

Results from the regressions can be found in Table I. First, interpretations of the base model (Model 1) that does not include any interaction terms will be offered. This will give a general idea of the relationships between the dependent variable (logged GDP per capita) and the various independent variables. Next, interpretations of the interactions terms and their graphical representations will be given.

1. Geography Variable

In the base model with no interaction terms (Model 1), *Population in the Tropics* is negatively related to GDP per capita and statistically significant at the 0.01 level. This suggests that for every additional percentage point of people living in the tropics, GDP per capita decreases by 78.8%. This is quite a substantial amount!

Population in the Tropics remains highly significant in Model 2 (with the interaction term between *Population in the Tropics* and *Polity Score*), but it loses significance in Model 3 (with the interaction term between *Population in the Tropics* and *Property Rights & Rule of Law*). However, the coefficients for the constituent terms become fairly irrelevant once the interaction term is included.

2. Institutions Variables

In Model 1, *Polity* is positively related to GDP per capita and is significant at the 0.01 level. For every 1-unit increase in a nation's Polity IV score, GDP per capita increases by 3.23%. The variable for *Property Rights and Rule of Law* is also positively related to GDP per capita and is significant at the 0.01 level. For every 1-unit increase in this score, GDP per capita increases by 16.3%.

3. Control Variables

The variable for *Resource Rents* is positively related to GDP per capita and is significant at the 0.05 level. For every percentage point increase in rents received from natural resources (as a percent of total GDP), a country's GDP per capita increases by 1.39%. This is the opposite of the expected direction, yet the magnitude of the effect is fairly minor. The

variable for *Agriculture* is negatively related to GDP per capita, and is significant at the 0.01 level. For every percentage point increase in the value added by agriculture (as a percent of total GDP), a country's GDP per capita decreases by 6.84%.

4. Interaction Terms

The interaction term from Model 2 demonstrates the interactive effects of *Polity* and *Population in the Tropics* on GDP per capita. As can be seen from Fig. 3, the effect of *Polity* on GDP per capita remains positive (above zero) at all

levels of *Population in the Tropics*, although *Polity* loses significance when the national population living in the tropics reaches around 97%. The negative slope indicates diminishing returns. That is, the strength of the effect of a nation's Polity score on its GDP per capita is highest when the percent of the population living in the tropics is very low, and the strength of the effect steadily decreases as the percent of the population living in the tropics increases (and, again, Polity score becomes insignificant as the population living in the tropics approaches 100%).

TABLE I.
REGRESSION OUTPUTS

VARIABLES	(Model 1)	(Model 2)	(Model 3)
	Log GDP pc	Log GDP pc	Log GDP pc
Resource Rents (% GDP)	0.0139** (0.00558)	0.0147*** (0.00566)	0.0132** (0.00553)
Agriculture, value added (% GDP)	-0.0684*** (0.00897)	-0.0684*** (0.00892)	-0.0681*** (0.00873)
Property Rights & Rule of Law	0.163*** (0.0319)	0.162*** (0.0316)	0.231*** (0.0390)
Population in the Tropics	-0.788*** (0.176)	-0.545*** (0.178)	0.0236 (0.337)
Polity IV Score	0.0323*** (0.00794)	0.0621*** (0.00984)	0.0338*** (0.00758)
Pop_Tropics*Polity		-0.0451*** (0.0134)	
Pop_Tropics*PR&ROL			-0.146** (0.0622)
Constant	8.312*** (0.284)	8.119*** (0.271)	7.852*** (0.301)
Observations	1,789	1,789	1,789
Number of id	109	109	109

Robust standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

The interaction term from Model 3 provides us with the interactive effects of *Property Rights and Rule of Law* and *Population in the Tropics* on GDP per capita. As Fig. 4 demonstrates, much like with Polity score, the Fraser score measuring property rights and rule of law remains positive at all levels of *Population in the Tropics*, and it also loses significance when the population living in the tropics reaches around 97%. This score similarly displays diminishing returns. The effect of property rights and rule of law on GDP per capita is strongest when the population living in the tropics is very low, and the strength of this effect steadily decreases as the population living in the tropics increases (and, here again, the Fraser score loses significance as the population living in the tropics approaches 100%).

The two interaction terms thus display very similar patterns. Yet, it is worth pointing out that the magnitude of the effects from the *Property Rights and Rule of Law*Population in the Tropics* (Model 3) interaction term are greater than those from the *Polity*Population in the Tropics* (Model 2) interaction term. The effects of the former (Model 3) on GDP per capita range from approximately 0.23 to about 0.1. The effects of the

latter (Model 2) on GDP per capita range from around 0.061 to about 0.02. This implies that specific institutions or institutional qualities—namely, property rights and rule of law—have the ability to raise GDP per capita more than does democracy as such. This is consistent with the results from Model 1.

VI. CONCLUSION

The interaction terms performed in this study not only offer a more accurate and comprehensive representation of Montesquieu's theories regarding climate, laws, and productivity, they also provide rather compelling support to his argument. Geography and institutions do appear to interact, and their interaction has discernible effects on economic development. From the analyses presented here, it seems that when an overwhelming majority of the population of a country lives in the tropics, democracy and property rights and rule of law are not enough on their own to improve GDP per capita.

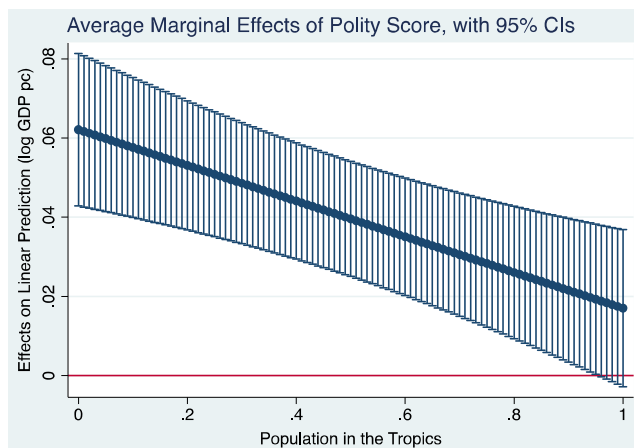


Fig. 3 The graphical representation of the interaction term of Polity score based on the percent of the population living in the tropics, and their interactive effects on GDP per capita

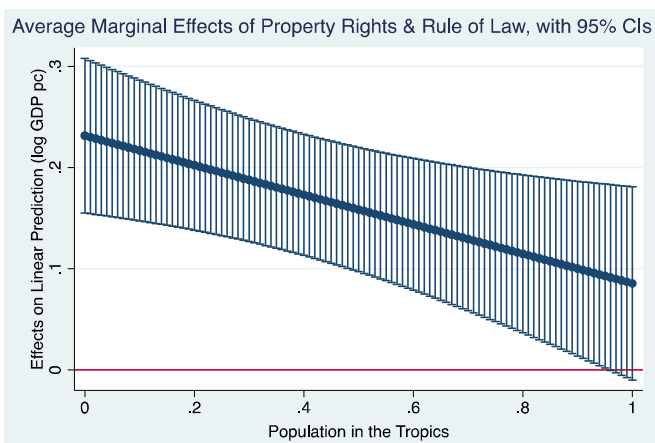


Fig. 4 The graphical representation of the interaction term of property rights and rule of law based on the percent of the population living in the tropics, and their interactive effects on GDP per capita

This has implications for promoting economic development in developing countries. Democracy or democratic institutions, for example, cannot be considered panaceas for developmental woes. Recently, many developmental scholars have emphasized the role of context and have criticized the effectiveness of “one-size-fits-all” policy strategies (see for example [30], [31]). What this implies is that nondemocratic mechanisms for promoting economic development ought to be considered, despite the pejorative connotations associated with nondemocratic regimes. Country examples can attest to this. Singapore, for instance, is an economic powerhouse, but it is at best quasi-authoritarian. Developing countries, such as Rwanda, have taken note of this and have achieved developmental successes by following the Singaporean model. Montesquieu is among the strongest advocates for understanding a country’s context in order to find the set of laws that fit it best.

Contemporary scholars of political economy have an incomplete and often overly simplistic understanding of Montesquieu. Yet, the key elements they miss in

Montesquieu’s works may in fact prove to be crucial pieces of the puzzles they are trying to solve. This highlights the value that philosophy offers to political economy—a value that often goes unused (or misused). The empirical analyses in this study offer preliminary examples of how a closer reading of Montesquieu’s works may contribute to the development of statistical insights for the field of political economy. A worthwhile project for future research would be to include variables for education, state capacity, and religion. These represent other “manmade” factors that may help overcome geographic obstacles that inhibit economic development

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