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Revealing Clio's Secrets: The Case for Historical Macromeasurement

Sean M. Clark

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Revealing Clio's Secrets: The Case for Historical Macromeasurement

Sean M. Clark, Dalhouise University, Nova Scotia, Canada

Abstract: An excessive focus on methodological training and recent case studies has left political scientists woefully ignorant of work done by scholars in other fields, particularly that of economic historians and historical demographers. Most glaringly, political science has missed the emergence of 'cliodynamics,' or the novel attempt to fashion broad historical trends into consistently measurable data over great lengths of time. I therefore not only submit a comprehensive survey of the population, economy, and conflict research offered by historiographers, but also explain how this data can be harnessed by political science.

Keywords: Hegemonic Transition, Population, Economic Size, War, Demographics, Millennia, Cliodynamics, Political Science, International Relations, History, Datasets

> "For if old men are considered wise because they have seen more than others, how much more wisdom can history lend us—if it be written correctly. For it contains the deeds of many ages and their reasons, so that one may easily find what to imitate and what to avoid, and be spurred on to great deeds by emulation of outstanding men."
> **Leonardo Bruni** (c1415)[1]

HISTORICAL MACROMEASUREMENT IS the science—and art—of quantifying aggregated human phenomena across long periods of time.[2] It is a methodology sustained by the idea that an observer can, within reason, accurately *count* the details of political, social, and economic events. According to the demographers, economic historians, and 'big' historians who have pioneered the development of macromeasurement techniques,[3] phenomena as diverse as population and economic output can be tallied and tracked for centuries on end. Such data can be used to demonstrate the validity of hypotheses regarding human behaviour. This is appealing to the social scientist, for the tape of human history is one of the few laboratories made available to him. Being unable to run experiments in the same manner as a physicist, a political observer must look to the events of the past

[1] Leonardo Bruni, *History of the Florentine People*, (from c1415; 1610). Cited in M.J. Cohen and John Major, *History in Quotations: Reflecting 5000 Years of World History*, (London: Cassell, 2006), pxx.
[2] Davenant offered a similar term, 'political arithmetic' as "the art of reasoning by figures on things relating to government." C. Davenant, *Discourses on Public Revenue*, (1697-8). The difference, however, is that historical macromeasurement aims to connect figures across many epochs.
[3] The term 'big history' comes from a class David Christian taught at Macquarie University in Sydney, Australia. It was a semester-long course which began with the origin of the universe. The title was applied only jokingly, but has since stuck. See Cynthia Stokes Brown, *Big History: From the Big Bang to the Present*, (New York: The New Press, 2007), pxii-xiii. Christian's *Maps of Time: An Introduction to Big History* is the most sophisticated (and exhaustive) of all such works.

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for a demonstration of concerted and consistent patterns. Only when examining human activity in historical aggregate can a social scientist garner the confidence necessary for a generalized claim.

The purpose of this paper is two-fold: first, **to argue that political science would do well to embrace historical macromeasurement**. This case is primarily made with a demonstration of how amenable political phenomena are to macroscopic quantification. Indeed, while traditional macromeasures have focused on historical demography and national accounts, war and other political metrics can be tabulated and analyzed across epochs in a similar manner. Second, this paper aims **to provide political scientists with a methodological toolkit from which their own interdisciplinary research can proceed**. Such work is necessary because not only is there considerable skepticism surrounding the use of historical macromeasures, but so too is there a serious lack of awareness among political scientists as to what has—and what can be—quantified across long periods of time. If made aware of the considerable resources lying at their disposal, perhaps political scientists will follow the many historians and economists welcoming of macromeasurement.

Macromeasurement and its Critics

> "History will bear me out, particularly as I shall write that history myself." (attributed to **Winston Churchill**).[4]

Many charge that history cannot—and therefore *should* not—be quantified. Such a conclusion is predicated on two chief criticisms, one ontological and one methodological. The former is the contention that social phenomena are unfit for study. Unlike speeding light particles or chemical reactions, human activity involves more than "facts of nature, [the] results of cosmic laws, or manifestations of divine will."[5] Blessed with consciousness, humans are the authors of their own world. Little surprise, then, that people respond when being watched.[6] The consequence is that "Human beings are the least controllable, verifiable, law-obeying and predictable of subjects."[7] Even societies as a whole are responsive creatures, with governments frequently adjusting their policies to head off particularly dire predictions.[8] All of this leaves humans, alone or in aggregate, as ill suited for scientific study.

Even worse is the fact that human observers are by no means dispassionate spectators of social activity. This tendency was confirmed by the results of the Stanford Prison Experiment, a chilling exercise where the lead scientist proved incapable of remaining calmly detached from the chaos that unfolded.[9] Put another way, it is impossible for political scientists to

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[4] Cited in Major and Cohen (2006), pxxvi.

[5] Peter Berger and Thomas Luckmann, *The Social Construction of Reality*, (New York: Anchor Books, 1966), p89.

[6] In what later became known as 'the Hawthorne Effect,' factory workers changed their behaviour upon observation. F.J. Roethlisberger and William J. Dickson, *Management and the Worker*, (Cambridge: Harvard University Press, 1939).

[7] Russell Kirk, "Is Social Science Scientific?" in Nelson W. Polsby, Robert A. Dentler, and Paul A. Smith (eds), *Politics and Social Life*, (Boston: Houghton Mifflin Col, 1963), p63.

[8] The welfare state arose, for example, in order to preempt the revolution predicted by Marxism, thereby confounding any demonstration of Marx's causal claims.

[9] In this experiment, chief researcher Philip Zimbardo (who also acted as the mock prison's 'superintendent') became so engrossed in the project that he overlooked the deplorable behaviour of his 'guards' against the volunteer 'prisoners.' It eventually took a confrontation with his girlfriend to end the experiment which had so terribly fallen off the rails. See C. Haney, W.C. Banks, & Philip G. Zimbardo, "Study of prisoners and guards in a simulated prison,"

remain completely removed from politics, nor historians from history, and so on. In fact, some step wholeheartedly into their realm study. Machiavelli's celebrated *The Prince* serves as perhaps the most ornate job application on record.[10] While the author's eagerness to please does not detract from the brilliance of his prose, it does demonstrate how political ambition can be a complicating factor—and certainly shatter all pretense of impartiality. Weber's support for the Weimar Republic offers a similar example,[11] as does Churchill's quote above. The conclusion is that when studying human activity, it is impossible to distinguish between participant and observer. Such obfuscation deals a deathblow to 'scientific' aspirations, for it is impossible to detach the observer from the object under scrutiny.

The methodological concern is that of inaccuracy, and it is a rather more complicated problem. Here the charge is that the measurement of human phenomena leads only to dangerously inexact results, gravid with the potential to mislead. Bull, for example, held that the "fetish" of quantification ignores crucially important qualitative differences among the phenomena being measured—hence his fear that fundamental differences between subjects are lost or obscured during measurement.[12] As Knorr and Verba suggest, minor nuance or a single word can communicate essence and yet still not lend itself to quantification.[13] What can require paragraphs to explain is often expressed in no more than a single coefficient. Such encapsulation strips away a mass of particularized details, a pruning that can make individual cases appear more or less alike than is truly the case.

Compounding this inaccuracy is the tendency of numbers to portray an undue level of precision. This mistake arises from the unique elegance inherent in mathematics. Numbers appear clean and uncluttered by doubt. The very act of quantification privileges simplicity over detail, leaving no more than a single figure meant to summarize all that happened. Thus rather than caveat and reservation, one gets a decidedly false sense of certainty. All of this implies a world of exactness, where 'A' is unequivocally distinct from 'B,' and where the counting is done under conditions of perfect information. Reality, of course, is far different. Instead of calm periodicity, the careful observer confronts tangled disorder.[14] Instead of precision and accuracy, numbers are rounded, averages are taken, and estimates are hazarded. The eternal danger of numbers, then, is that they are so commonly awarded a degree of accuracy which they have not earned.

Numbers face more than a disconnect between the perception of irreproachable veracity and actual reality: they can also be wrong. Counting errors are both easy to make and time-

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Naval Research Reviews, 9, 1–17. Washington, DC: Office of Naval Research (1973). This experiment was itself inspired by the 'Milgram experiment' of Stanley Milgram, "Behavioral Study of Obedience," *Journal of Abnormal and Social Psychology*, 67 (1963): 371–378.

[10] Niccolò Machiavelli, *The Prince*, Harvey Mansfield (trans), (Chicago, University of Chicago Press, 1998).

[11] Weber was a key advisor to the drafters of the Weimar Constitution and made every effort to use his considerable prestige as a social scientist and his knowledge as a comparativist to assist the transition from Wilhelmite Germany to a democratic republic. For a biography of Weber, see Dirk Kaesler, *Max Weber: An Introduction to His Life and Work*, (University of Chicago Press, 1989).

[12] Hedley Bull, 'The Grotian Conception of International Society,' in H. Butterfield and M. Wight (eds), *Diplomatic Investigations: Essays in the Theory of International Relations*, (London, 1966).

[13] Klaus Knorr and Sidney Verba (eds), *The International System: Theoretical Essays*, (Princeton: Princeton University Press, 1961).

[14] Interestingly, this is a dilemma faced by mathematicians themselves. The transitions from Laplacian determinism, to quantum uncertainty, to Chaos Theory, to the 'reductionist's nightmare' reflect the ebb and flow of the idea that reality can be completely reduced to a series of mathematical equations. For a readable account of these swings, see Ian Stewart, *Does God Play Dice?*, (London: Penguin, 1997).

consuming to uncover. Data has to be constantly worked with in order to uncover the errors that even double-checking leaves behind. Even more devastating, however, is data incompleteness. One of the chief problems with statistics is that they require a 'leap of faith' that the sample accurately reflects the total population. Yet often sample sizes are too small or too incomplete to validate such a claim. Indeed, figures missed by the collection process can have profound implications on the accuracy of the results obtained. Crime statistics, for example, reflect only those crimes reported to the police.[15] A policing strategy based solely on the numerical data would therefore fail to address communities where retribution against informants was high.

All of these failures of inaccuracy pale in comparison to when good—or even halfway decent—data gets misinterpreted. On one hand, a reliance on datasets and spreadsheets, with their tendency to homogenize variables and describe vital differences with mere 'yes/no' dichotomies, frequently lead scholars down the wrong track. The realm of crime statistics can once again illuminate the danger. In one unfortunate case, a community faced an outbreak of disappearing milk bottles. The aggregate figures, denoted in total thefts, pointed to a massive upsurge in criminal activity. It was not discovered until later, however, that the 'wave' consisted pretty much of just one very active youth.[16] Even worse was the case where research on the relationship between IQ tests and heredity was misconstrued to provide 'evidence' of the genetic inferiority of African Americans.[17] Misunderstood data can thus point to decidedly false conclusions. On the other hand, simple numbers may provide a crutch for intellectual laziness, or even condemn a well-intentioned scholar into shallow quantification—all at the expense of detailed analysis. Numbers alone provide no substitute for deeper understanding. An early critic of the quantitative COW project described such danger as the propensity to "count first and think second."[18]

The Possibility—and Necessity—of Macromeasurement

> *"causes and effects are discoverable, not by reason but by experience."*
> *David Hume* [19]

There is a good deal of validity in the criticisms levied against macromeasurement. Nevertheless, it will be demonstrated that each of these can be overcome, leaving macromeasures as a worthy complement to any social scientist's toolkit.

The first charge, that of a lack of impartiality, is the most easily turned aside. On one hand, it is true that intersubjectivity plagues the social scientist, for no observer can remain completely detached from the social phenomena they are studying. Indeed, even the most nonpartisan analyst remains a member of a particular political community. Political observers

[15] Robert Reiner, "The Case of the Missing Crimes," in Ruth Levitas and Will Guy (eds), *Interpreting Official Statistics*, (Routledege, 1996), p188.
[16] Reiner (1996), p192.
[17] A. Jensen, "How Much Can We Boost IW and School Achievement," *Harvard Education Review*, 39 (1969) p11-12. The original purpose was to examine the feasibility of compensatory education programs, such as Head Start, to compensate for conditions that led to under-achievement among certain groups of students.
[18] Cited from Daniel S. Geller and J. David Singer, *Nations at War*, (Cambridge: Cambridge University Press, 2000), p7.
[19] Cited in Guillaume J. Wunsch, *Causal theory and causal modeling: beyond description in the social sciences*, (Leuven, Leuven University Press, 1988), p30

are thus participants in their own studies—a condition where truly independent evaluation becomes impossible. Nevertheless, macromeasurement offers a fine means of tempering this impurity, and does so for two reasons. Firstly, numerical estimates are cumulative in a way that qualitative arguments are not. Datasets can build upon one another. This facilitates the construction of a collective research project, the intellectual vibrancy of which provides bulwark against myopia and bias.

The cumulative nature of numbers similarly offers the potential for estimates to become more precise over time. This is a matter of both intensity and extensivity—that is, improving both the accuracy of the data as well as the breadth of the material included. Numbers encourage a level of precision which qualitative analysis leaves unclear. Nowhere is this better exemplified than with global population estimates. For all the great pioneer's genius, the development of centralized census offices and enhanced cooperation in international accounting has left modern figures substantially more accurate than those of the early demographer Gregory King. The same can be said for calculations of economic output, where decades of successive research have dramatically broadened the breadth of the figures obtained. In short, macromeasures can be improved and the range of error consequently reduced.

This leads to the matter of data reproduction, which is a further virtue of macromeasurement. Because they can be compared and contrasted, numbers are unable to leisurely hide amongst normative language or equivocative claims. Numbers are "easily contestable and likely to be contested."[20] Figures can be re-run, accounts can be re-balanced, and numbers can be re-counted—all while further detail can be added. This provides the raw material for the hypothesis testing that is so vital to the scientific method.[21] Numbers make social science possible. While macromeasurement cannot claim complete objectivity nor pure neutrality, there is no alternative better suited to the positivist ambition.

The second criticism of macromeasurement, that of inaccuracy, suffers from an equally misguided concern. Although it is true that historical estimates are frequently quite wide of the mark, imperfect results should not lead to a castigation of the methodology as a whole. Instead, they should serve as a reflection of the dangers of unrefined technique. Fortunately, there are several measures that can help attenuate the forces of both a chaotic world and technical imprecision. The first is to reveal the origins of the data. Numbers must always be placed in context, for the tentative nature of the figures cited only becomes clear if the reader is made aware of both the complexities surrounding the data and the assumptions guiding the methodology. A further measure is to ensure that the numbers balance within a larger theoretical whole. By this it is meant that all figures must be compared or cross-checked for their fit with data from different, yet related, sources. As Tuchman notes, corroborative detail "is the great corrective."[22] For example, population numbers must make sense in relation to the current understanding of mortality, life expectancy, food production, and ecological carrying capacity. Biogeographical literature is particularly useful in this matter, for even social phenomena operate within decidedly physical bounds. Herodotus, Freeman, and

[20] Angus Maddison, *Growth and Interaction in the World Economy: The Roots of Modernity*, (Washington: AEI Press, 2005), p3.
[21] On the necessity of testable hypotheses, see Ernest Nagel, *The Structure of Science*, (London: Routledge & Kegan Paul, 1961); Gary King, Robert O. Keohane, and Sydney Verba, *Designing Social Inquiry: Scientific Inference in Qualitative Research*, (Princeton: Princeton University Press, 1994); and James E. Dougherty and Robert L. Pfaltzgraff, *Contending Theories of International Relations* (Longman, 2001), p46.
[22] Barbara Tuchman, *Practicing History*, (New York: Knopf, 1981), p34.

Parkman all walked the same earth as their studies for this very reason.[23] At minimum, such verification will uncover discrepancies to be later resolved. At best, this balancing helps guard against simplistic or wrongheaded conclusions.

That macromeasurement can work is clear. But the story goes further: when studying the broad dynamics of human activity, macromeasurement *needs* to work, for it can provide the raw data against which hypotheses can be tested. No matter how elegant or insightful, research can only be accepted as true if there exists systematic evidence to support it.[24] Theory is useless unless verified.[25] More importantly, the "objectivity" of the scientific approach "lies essentially in the possible falsification of one's assumptions when one's views are brought face to face with the empirical reality."[26]

> "Science....tries to answer questions by inventing a theory explaining the occurence of the kind of event or relation considered in the question. The theory is then confronted with facts in order to see if it is "true"; the search for the truth-content of a theory, by confronting the latter with facts, distinguishes science from ideology."[27]

It is as part of this endeavour, this effort to test how effectively contemporary theories describe the world around us, that macromeasurement can make its greatest contribution.

The Methodology of Macromeasurement

> "In mathematics I can report no deficiencies, except it be that men do not sufficiently understand the excellent use of the Pure Mathematics..."
> **Francis Bacon** [28]

Despite their neat appearance, numbers in the social sciences are inherently imprecise. This is because, quite unlike in a physics experiment, the tape of history cannot be played, rewound, and then played again. Lacking such experimental control, it is extremely difficult for observers to isolate the relevant variables and thus uncover underlying causal relationships. Political science therefore faces a degree of indeterminacy that makes the natural scientist blanch.

All is not lost, however, for in place of atomic exactitude there can be assigned what Durand refers to as the 'indifference range.' This is "the range within which there is no reason for preferring one figure to another. Outside it figures become increasingly unlikely not because they can be proved wrong, but because there are good arguments against them."[29] Here the cumulative nature of macromeasurement is of great use, for the knowledge accu-

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[23] Tuchman, *Practicing*, p50.
[24] J. David Singer, "The Incompleat Theorist: Insight without Evidence," in *Contending Approaches to International Politics*, Klaus Knorr and James N. Rosenau (eds), (Princeton: Princeton University Press, 1969), p62-86.
[25] Robert Jervis, "Rational Deterrence: Theory and Evidence," *World Politics*, Vol. 41, No. 2 (January 1989), p183-207.
[26] Wunsch (1988) p131.
[27] Wunsch (1988) p75.
[28] Cited in Morris Kline, *Mathematics for the Nonmathematician*, (New York: Dover Publications, 1967), p1.
[29] Colin McEvedy and Richard Jones, *Atlas of World Population History*, (London: Penguin, 1978/1985), p353, citing John D. Durand, *Historical Estimates of World Population: An Evaluation*, (Population Studies Center, 1974).

mulation which it offers permits the establishment of 'common sense' boundaries of what is plausible and what is not. Macromeasures similarly illuminate the margin of data error by simply asking if the latest figures available are similar to or wildly divergent from those of previous studies. The closer the agreement, the greater the implied confidence in the findings. Even more, macromeasures can help narrow the indifference range for a particular subject by fitting the surrounding pieces of evidence in the form of a straightjacket. Together these bind tighter the range within which truth is likely to be found.

Macromeasurement is, therefore, a discipline guided by cross-calculation and tempered by common sense. This may strike some as a banal observation, yet the power of such disciplined thinking should not be underestimated. Carefully reasoned estimates have proven remarkably prescient despite lacking the luxuries of modern data collection. For example, the first attempts at estimating global population were made before the world had been fully explored—much less systematically charted and subject to census. Nevertheless, the results ascertained were startlingly accurate, putting the modern scholar—ever so dependent on reference libraries, electronic journal subscriptions, and wireless Internet connections—to considerable shame.

3.1 Population Estimates (Continent, by Year)

	McEvedy & Jones: *1650*	**Riccioli:** *1661*	**King:** *1696*	**McEvedy & Jones:** *1700*
Europe	105	100	100	118
Asia	375	500	340	420
Africa	58	100	95	61
America	12	200	65	13
TOTAL	**550**	**900**	**600**	**612**

*Source: McEvedy & Jones, 1978/1985, p354. See also the improving accuracy of successive editions of Hubner's annual *Geographisch-statistiche Tabellen*. By the mid-1800s these global totals managed within 10% of the McEvedy & Jones estimates.

The lesson here is that careful reasoning can breed dependable results. Before such a claim can be made, however, the assiduous scholar must complete three steps. First, during data collection, the observer must gauge the quality of the material obtained, an evaluation best made in light of the following questions:[30]

- is the data the product of the author's own observation, or the result of hearsay?
- have other scholars made or reported the same observation?
- in what circumstances was the observation made or reported?
- how reliable are those making or reporting the observation?
- what motivation may have influenced how the observation was reported?
- what biases may have influenced how the observation was made or reported?

[30] Taken from Ian Dey, *Qualitative data analysis : a user-friendly guide for social scientists*, (New York: Routledge, 1993), p224.

Data is only as worthy as he who collects it, and thus the work of the sycophant and propagandist must give way to the statistician and polymath. Quality matters.

Once the data is collected it is up to the author to test its validity. The general threshold of macromeasurement is that the numbers balance; that is, the data must fit sufficiently well with other research so as to form a larger theoretical whole. This search for 'fit' is best done by cross-checking the findings in three separate ways. The first is to compare the new findings with similar work, as existing literature provides a ballpark range for confidence. Any gross exceptions and extreme or negative examples that result from this comparison require urgent explanation. In contrast, findings that reinforce existing conclusions are to be heralded as corroborative evidence and seen to add weight to theoretical claims.

It is similarly critical to ensure that inputs correspond with outputs. Modern standardized accounts demonstrate this technique admirably, for national output estimates are cross-checked in three ways. An economy's income (total wages, rents, and profits), demand (the sum of final expenditures by consumers, investors, and government), and production (the sum of value added in different sectors—such as agriculture, industry, and services—net of duplication) functions must all balance out if the estimate is to enjoy any measure of validity.[31] Even more, results once again earn a high degree of confidence if the same numbers are arrived at through different pathways.

Given that any human activity is predicated on physical limits, figures must also square with corresponding physical evidence, such as population density and biogeographical detail. For example, given the similarities between the two species, estimates of early hominid populations must roughly agree with contemporary data regarding modern primate populations.[32] Demographic material can be of similar use, serving as a vital cross-check on estimates of per capita income in the distant past. Here work on urbanization, such as that of de Vries (1984) and Rozman (1973),[33] provide similar boundaries for plausible population estimates. So too do biological estimates of biome support levels and anthropological estimates of contemporary Paleolithic peoples.

The third quality control step is to reveal the data's origins. A transparent methodology not only facilitates reproducibility, but also prevents excessive and undue confidence in the findings. Indeed, it far easier to comprehend the data's tentative nature if one is made aware of the complexities surrounding it. In the same vein, a detailed description of the assumptions guiding a project's methodology make the reproduction of results by third parties possible.

> "Quantification clarifies issues which qualitative evidence leaves fuzzy. It is more readily contestable and likely to be contested. It sharpens scholarly discussion, sparks off rival hypotheses, and contributes to the dynamics of the research process. It can only do this if the sources of the quantitative evidence and the nature of the conjectures

[31] This framework can also be expanded to include measures of labour input and capital stock, labour, and total factor productivity. Maddison (2005), p83.

[32] McEvedy and Jones (1978), for example, were heavily influenced by the work of George Schaller. See Schaller, *The Year of the Gorilla*, (1965), (p104, 200).

[33] J. de Vries, *European Urbanization, 1500-1800*, (London: Methuen, 1984); and G. Rozman, *Urban Networks in Ch'ing China and Tokugawa Japan*, (Princeton, NJ: Princeton University Press, 1973).

and proxy procedures are described transparently so that a dissenting reader can augment or reject parts of the evidence, or introduce alternative hypotheses."[34]

As we will see, there is no shortage of data. One need only know where to look.

What Can We Measure?

Until now macromeasurement has focused on just two core trends: population growth and economic output. Data for a third phenomena, military battles, has been collected and studied in great detail. Unfortunately the breadth of this material is relatively narrow, being generally limited to the past 200 years. Mentioned below are several similar 'mesoscopic' datasets, all which would benefit greatly from historical extension. Also offered are several prospective macromeasures, and a brief introduction of where data could be obtained to create them.

Existing Macroscopic Datasets

Historical demography was the first true macromeasure, tracing back to the time of Petty and King. As a consequence of 300 years of concerted accumulation, population figures are the most reliable historical estimates available. In terms of sources, a useful survey can be found in Livi-Bacci (2007).[35] Of even greater use to the political arithmetician, however, are the country-specific population figures offered by McEvedy and Jones (1978).[36] While handy in and of themselves, these figures—which trace from the Neolithic to the present—can also serve as a benchmark against which to cross-check other economic, wealth, and political measures. Population grows in times of plenty, for example, and contracts during wars and famine, thereby providing yet another excellent opportunity to test for data fit. As for future projections, the most popular come from the UN World Population Prospects (2006 Revision), which extend their estimations into the next century.[37]

Second only to population estimates are figures of economic product. Outside of collections offered by national governments,[38] three sources outclass all others in terms of breadth and detail. Mitchell (1992) offers by far the most intensive collection of economic figures—albeit at the cost of dating back no further than the beginning of the Industrial Revolution.[39] Sabillon (2005) sacrifices much of this detail, but provides far deeper historical trends, specifically for sector growth estimates dating back to the 16th C.[40] The modern titan in this field, Angus Maddison (2003), goes even further back in history, anchoring his country-specific GDP estimates with the year 0 AD.[41] Although often overlooked in contemporary research, together these sources provide a thorough, quantitative understanding of global economic dynamics for the last 2,000 years.

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[34] Angus Maddison, *Contours of the World Economy: the Pace and Pattern of Change, 1-2030 AD*, (Cambridge University Press, 2007), p1.
[35] Massimo Livi-Bacci, *A Concise History of World Population*, (Maiden, MA: Blackwell Publishing, 2007).
[36] McEvedy and Jones, (1978).
[37] UN Population Division, Projections Database: http://esa.un.org/unpp/ .
[38] For example, the United States Bureau of the Census, *Historical Statistics of the United States: Colonial Times to 1970*, 2 vols (Washington, 1975).
[39] B.R. Mitchell, *International Historical Statistics* (3 Vols), (Basingstoke: Macmillan, 1992).
[40] Carlos Sabillon, *World Economic Historical Statistics*, (New York: Algora, 2005).
[41] Angus Maddison, *The World Economy: Historical Statistics*, (Paris: OECD Development Centre Studies, 2003).

Existing Microscopic & Mesoscopic Datasets

*Micro*scopic data is that which extends no further than a few decades, while *meso*scopic data is that which extends no further than a century or two. The amount of such research has grown considerably over the last half century, particularly in regards to the former. Although outside the scope of this paper, a vast wealth of microscopic data can be found at the United Nation's data entry portal.[42] The OECD offers a similarly impressive array of material,[43] as do the handy Penn World Tables,[44] and of course the impressively wide-ranging ICPSR archival project at the University of Michigan.[45] Also worthy of note are two additional microscopic datasets: the Polity IV and Freedom House databases. Polity IV is concerned primarily with political measures running between 1946 and 2008. These events include wars, political violence, displaced people, state failure, international organization membership, and so on.[46] As for Freedom House, it offers historical freedom data running between 1972 and 2007.[47] Of course microscopic datasets sacrifice extensivity for intensity—a lack of historical breadth that unfortunately constrains their usefulness to the post-war era.

In terms of mesoscopic datasets, the focus has been on conflict. Of the leading datasets, first and foremost is the Correlates Of War (COW) database, a collection of all interstate wars between 1815 and 1992.[48] It is one of the most commonly used datasets in political science. Thanks to this high level of use, the COW records have been subject to intense scrutiny and therefore enjoy common acceptance as highly accurate. Further datasets include the International Institute for Strategic Studies' (IISS) Armed Conflict Database (though it extends back only to 1997),[49] and Uppsala Conflict Data Program (UCDP), which traces armed conflicts between 1946 and the present.[50] In addition, the U.S. Army Concepts Analysis Agency CDB90 dataset summarizes 660 battles fought between 1600 and 1982, offering subjective assessments of variables such as "surprise", "morale", and "logistics."[51]

Together these datasets provide comprehensive, accessible data extending to the medium term. What is required, however, is to extend this collection further back into time. Thankfully, there are many works of history from which this data can be harvested. The most prominent examples are as follows:

- Charles Phillips and Alan Axelrod, *Encyclopedia of Wars*, 3 vols, (Fact on File: 2004).
- Bryan Perrett, *The Battle Book*, (London: Arms & Armour, 1996).
- Stephen Badsey, David Nicolle, and Stephen Turnbull, *The Timechart of Military History*, (Herts: Worth Press, 1999).

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[42] UN Statistics Division Database, http://unstats.un.org/unsd/databases.htm .
[43] OECD Stat Extracts, http://stats.oecd.org/WBOS/index.aspx .
[44] Center for International Comparisons of Production, Income and Prices http://pwt.econ.upenn.edu/ .
[45] Inter-University Consortium for Political and Social Research. Table of contents at: http://www.icpsr.umich.edu/ICPSR/access/subject.html .
[46] Polity IV Project, http://www.systemicpeace.org/polity/polity4.htm .
[47] Freedom House, *Freedom in the World*, Country Ratings. http://www.freedomhouse.org/template.cfm?page=439 .
[48] Correlates of War, http://www.correlatesofwar.org/ .
[49] IISS, http://www.iiss.org/publications/armed-conflict-database/ .
[50] Data on Armed Conflict, http://www.prio.no/CSCW/Datasets/Armed-Conflict/ .
[51] Used to excellent effect in Stephen Biddle, *Military Power: Explaining Victory and Defeat in Modern Battle*, (Princeton: Princeton University Press, 2004).

- Ernest Dupuy and Trevor Dupuy, *The Encyclopedia of Military History from 3500 B.C. to the Present*, (Harpercollins, 1986).

Potential Macroscopic Datasets

Given the surfeit of historical material, it should be relatively straightforward to expand existing mesoscopic battle surveys into macroscopic breadth. There are, however, other phenomena that would benefit from a similarly broad examination. Because non-battle concerns are blighted by the relative paucity of early data, it will be necessary to have various proxies stand in for the metrics in question. This is obviously a complicating factor, but the challenge can, as we shall see, be overcome with a turn to strategies involving data fit.

The first matter of interest is early economic size. Here the curious can take advantage of the considerable research done with demography, for population can be used as a surrogate for economic size—at least for the period prior to the Industrial Revolution. Such a measure holds potential because pre-modern economic growth deviated little from that of population. In this epoch Adam Smith was correct that "the most decisive mark of the prosperity of any country is the increase in the number of its inhabitants."[52] The reason is because under conditions where technological innovation cannot be sustained, rising population levels eat away the fruits of innovation, leaving population growth and wealth levels deeply intertwined. As such, "population and resources develop along more or less parallel lines."[53]

Another proxy for both wealth and political success is territorial extent. Prior to the Industrial Revolution, the primary means of growing an economy would be to increase a nation's stock of factor inputs. This task was generally achieved with imperial expansion, thus—at least prior to the Atomic Revolution—wars of empire were frequent. To trace geographical extent over time would therefore be to track a country's relative international standing. Yet as far as the author is aware, no such study has been done, even though there exists sufficient geographic research to suggest this would be possible. Popular historical atlases include the following:

- Patrick K. O'Brien (ed), *Oxford Atlas of World History*, (New York: Oxford University Press, 1999).
- Geoffrey Barraclough (ed), *The Times Atlas of World History*, (Maplewood, NJ: Hammond, 1978).
- Hermann Kinder and Werner Hilgemann, *Atlas of World History*, 2 Vols, Ernest A. Menze (trans), (London: Penguin, 1978).

A final macroscopic phenomenon to measure would be that of technology. Finding a proxy for previous technological frontiers is not easy, yet there are several potential avenues to explore. The most obvious is life expectancy. Health is both a primary concern among inventors and a reflection of mankind's conquest over the unseen. As such, tracing mortality data would provide a rough estimate of society's ability to exercise its dominion over that which is understood only through reason and experiment.[54] A second potential proxy is food

[52] Adam Smith, *The Wealth of Nations*, (London: J.M Dent & Sons, 1964) vol.1, p62.
[53] Livvi-Bacci (2007), p58.
[54] Good surveys are provided in Livvi Bacci (2007); Christian (2005) p187; Maddison (2001), p30; and Sabillon (2005), p103. See also Mark Cohen, *Health and the Rise of Civilization*, (New Haven: Yale University Press, 1989).

production.[55] The virtue here is that long-term yield growth relies on improved seed varieties and harvesting techniques, both of which are a clear reflection of the technological conditions of the day. Tracing weapons development would serve useful in a similar manner, as lethality trends can be used to measure expansion of the technological frontier. Dupuy (1995) in particular has made this information available.[56]

Each of these proxies is worthy of further research, but there is no need to stop here. The beauty of macromeasurement is that it offers as many paths to measurement as one's imagination can conceive.

Conclusion

"If we did not believe in the progress of Science, that is the covergence over time of scientific speculations towards more truthful explanations, we would probably give up the whole business." **Guillaume Wunsch** (1988)[57]

Numbers can make for a hazardous implement, and this has, from time to time, made them deeply unpopular. "Figures don't lie, but liars figure," as the old saying goes. St. Augustine certainly agreed: "The good Christian should beware of mathematics and all those who make empty prophecies. The danger already exists that the mathematicians have made a covenant with the devil so to darken the spirit and to confine man in the bonds of Hell."[58] Perhaps the contemplative Bishop of Hippo was being overly dramatic, but this does not expunge the underlying reasons for concern. Numbers can be incomplete, leaving worthy conclusions by the wayside. Faulty data can nurture erroneous conclusions, even if driven by no more than mistaken assumptions regarding that which is counted. Numbers can also breed disagreement, particularly arguments over what should be counted or what is constituted as 'counted.' Numbers can even fall victim to caprice, being buried or manipulated to achieve some devilish ends. All of this can—and *has*—happened.

So imperfect a past makes it clear that numbers alone cannot tell the whole story. They are, however, extremely useful. Indeed, so long as one has cast their lot with positivism, numbers remain an indispensable tool. Easton summarizes such thinking quite nicely:

> "There are discernable uniformities in political behaviour. These can be expressed in generalizations or theories with explanatory or predictive value. The validity of such generalizations must be testable…by reference to relevant behaviour."[59]

The core assumption, then, is that one can identify patterns and then test them against the empirical evidence. In this effort only numbers will suffice, for they are needed to make sense of experience: quantification is a necessary companion to observation and comparison.

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[55] See, for example, A.K. Bowman and E. Rogan (eds.), *Agriculture in Egypt from Pharaonic to Modern Times*, (Oxford University Press, 1999).

[56] Dupuy describes this as the TLI Value ('Total Lethality Index'), or how many people a weapon could kill per hour, if facing a uniformly arrayed opponent, in a formation roughly one person per m2 dense. See Trevor N. Dupuy, *Attrition*, (Falls Church, VA: Nova Publications, 1995), p26-27.

[57] Wunsch (1988), p198-9.

[58] Cited in Kline (1966), p2.

[59] David Easton, "The Current Meaning of Behaviourlism," *in Contempory Political Analysis*, James C. Charlesworth (ed), (New York: Free Press, 1967), 16.

Collections of observations ('data') provide the opportunity to begin to search for "connections and patterns, similarities and differences."[60] Only then can we learn and act more effectively in preparation for the future. For all the failures, weaknesses, and imperfections of numbers, only with quantification can we make sense of human experience.

It is a back and forth, then. Numbers must be based on meaningful conceptualizations, while meaningful conceptualizations must be informed by numbers.[61] Numbers and thoughtful analysis must go hand in hand. As Edmund Burke noted, "to read without reflecting is like eating without digesting."[62] Numbers are therefore actually a *complement* to qualitative analysis. In fact, the two are inseparable, for the selection of variables implicitly requires at least some matter theory.[63] Without it the curious are doing no more than intellectual fishing. Induction and deduction cannot remain apart.

In the end, not only are there recurring themes in international history, but so too can these be measured. This fact has been recognized for some time. "When Kant wished to illustrate the notion that even historical events whose occurrence seems quite random and unpredictable may in the mass show notable regularities, he turned to population."[64] This anecdote is telling, for despite all our unique whims and desires, all our independent thoughts and compulsions, humans are driven by common purposes and subject to universal constraints. Despite all that makes each human special, there are commonalities that leave us more similar than different.

About the Author

Sean M. Clark

Sean Clark is a 3rd Year PhD Candidate at Dalhousie University and a Doctoral Fellow with the Centre for Foreign Policy Studies. A graduate of the University of Saskatchewan (B.A. in International Studies) and the University of Toronto (M.A. in International Relations), Sean's core area of interest regards the rise and fall of great powers. Before undertaking his PhD, Sean spent time volunteering with NGOs in Africa and South America, as well as working as a Policy Analyst with the Government of Nunavut. Currently, in addition to working on his dissertation, Sean teaches undergraduate courses in international relations, comparative politics, the evolution of war, and World Wars I and II.

[60] Derek Rowntree, *Statistics Without Tears*, (London: Penguin, 1981 [2000]), p15.
[61] Dey (1993), p29.
[62] Cited in Dey (1993), p83.
[63] Bruce Russett, "The Young Science of International Politics," *World Politics* 22:1 (October 1969), 87-94, p93.
[64] E.A. Wrigley, *Population and History*, (London: Weidenfeld & Nicolson, 1969), p8. Referring to Immanuel Kant's *Ideas for a universal history of mankind*. See G.A. Rabel, *Kant*, (Oxford: 1963), p134.

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