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Press, 1986). For various studies of the connections between natural and social sciences during the nineteenth century, see I. Bernard Cohen (ed.), *The Natural Sciences and the Social Sciences. Some Critical and Historical Perspectives* (Dordrecht: Kluwer Academic Publishers, 1994).

**FROM POLITICAL ARITHMETIC TO SOCIAL STATISTICS:  
HOW SOME NINETEENTH-CENTURY ROOTS OF  
THE SOCIAL SCIENCES WERE IMPLANTED**

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Statistics is in many respects a hallmark of the modern age, and a central example of the novel discourses and cultural practices which gave rise to the modern intellectual world.<sup>1</sup> It is at once a technology and basic idiom on which all sorts of administrations and organizations depend; a fundamental tool for much scientific work, in virtually any field of empirical science; a part of everyday consciousness in major and minor ways, whenever citizens judge the economic performance of governments, or teachers and parents assess the academic achievement of students, or sportsfans scan the charts and tables filled with rankings and percentages in a daily newspaper.<sup>2</sup>

No one would deny these facts, although some might be inclined to say that they are obvious in an uninteresting way. Statistics have become so familiar, and our ways of using statistics so ingrained, that they are simply part of the taken-for-granted order of things. Statistics are likely to seem as a result simply a convenient tool, a kit of neutral and highly formalized techniques. Indeed the cynic would tend to say that statistics can be bent to virtually any purpose, that statistics can be cited to different effect on all sides of a question, as if they were like a form into which different contents can be indifferently pressed. Even statisticians themselves are liable to relegate statistics to the status of a tool; they are certainly concerned about the sound application of their techniques, but they often think of themselves as first and foremost technicians, preparing instruments for others to wield.

This image of statistics – a set of tools we find available, ready to hand – is not wrong; but as a way of understanding the longer-term development of statistics as a field it is decidedly partial – in both senses of the word. It reflects only a part of what statistics actually contributed to the development of the social sciences, and it leaves the rather skewed im-

pression that those contributions were mostly technical. The way that statisticians understand their field is itself an obstacle in the way of appreciating the wider historical significance of statistics. The discipline of statistics some time ago achieved its status as a branch of mathematics. But what we know as modern statistics was in fact assembled historically in piecemeal fashion, out of a wide array of practical applications. Indeed it was the varied practical applications of the "numerical method" which for long periods drove the field. In the early modern world, it started, one might say, with gambling (the longstanding spur to probability theory), and continued later with insurance underwriting; or with the perplexity of judges about how juries weighed testimony and reached their verdicts; and so forth. By all accounts the most powerful practical demand driving the development of statistics was the hunger for numbers of the state and civil society from the early nineteenth century onwards. It was those political and social demands which enormously increased the scope of social mathematics, and which led to institutionalized statistical bureaux. Those demands, moreover, created the *statist* as an occupational category, where before there had been only amateurs.

It is only over the last century for the most part that the statisticians' techniques have been systematized as the core of the field. In the process the techniques have been isolated and refined, and the content of the specific questions that statisticians were actually attempting to answer has accordingly fallen away as dross. The practical contexts in which statisticians once worked are likely to be forgotten as well. There is hence a considerable historical irony in thinking of statistics as pure, refined technique. Moreover, the modern image of the statistical discipline obscures a host of contributions which statistics has in fact given to other fields – not only methodological, but more to the point, conceptual and substantive contributions. Political arithmetic had formed already in the eighteenth century much of the agenda of modern demography; likewise early social statistics forged the way, prepared the ground, and suggested a good deal of the content, of later sociology.

If the present disciplinary image of statistics seems at odds in some respects with its past, how then should we understand the relation of past to present? Or, as Ian Hacking put the question some years ago, "how should we do the history of statistics?"<sup>3</sup> The answer is not as obvious as it might seem, for a good deal depends upon what "statistics" is taken to be. For a current-day professional statistician, what is at issue is likely to be the lineage of the modern discipline statistics, formalized as it has become as a branch of mathematics. If one were to ask a current-day statistician

to characterize his or her discipline, the answer would come back something like this: Statistics deals with the measurement of uncertainty. It provides techniques for validating our observations in experimental, and also non-experimental, sciences. The statistician is thus an under-laborer who tries to offer guarantees for our data, and who tries to clarify for us, and to formalize, the logic of drawing causal connections between phenomena. In sum, the self-characterization of a modern statistician is *methodological*.<sup>4</sup> Given that, it is hardly surprising that the history of statistics in the modern mathematical sense goes back by and large only to the late-nineteenth century – to the mathematical advances of Galton, Yule, Edgeworth, Pearson et al.<sup>5</sup> With the lineage of the discipline thus secured, what came before is liable to be relegated to the less differentiated or residual category of pre-history.

For the historian of the social sciences, by contrast, the history of “statistics” is likely to stretch much further back. More importantly, “statistics” itself is likely to be interpreted quite differently. The social statistics of the early- and mid-nineteenth century was arguably the original empirical social science. The early social statisticians, far from limiting themselves to techniques for managing masses of observations, had a far more ambitious agenda. If one were to go back to about 1840, and ask the statistician to characterize the discipline, this time his response would in fact be formulated not in methodological, but in *substantive* terms: statistics then was simply the empirical science of society. In the words of Dr. William Guy, writing in 1839: statistics involved “the application of the numerical method to living beings, in all their social relations.”<sup>6</sup> Or, as the prospectus of the Statistical Society of London expressed its position, statistics were “facts which are calculated to illustrate the conditions and prospects of society.”<sup>7</sup> In the early- and mid-nineteenth century the etymology of the term was still very much alive: statistics was State-istics, and statisticians were statist.

“Statistics” in this older sense left an important legacy. As Hacking puts it, “Statistics has helped determine the form of laws about society and the character of social facts. It has engendered concepts and classifications within the human sciences.” Moreover, the statistical way of thinking has been implanted in “a great bureaucratic machinery. It may think of itself as providing only information, but it is itself part of the technology of power in a modern state.”<sup>8</sup> In many respects the disciplinary history of statistics in which current-day statisticians have formulated their past obscures these contributions; like other disciplinary histories it has been conceived as a variety of de-contextualized “tunnel

history.”<sup>9</sup> It is, however, this latter, broader sense of statistics which is fundamental for understanding the so-called great transition; on any account statistics in that sense played a central and fundamental role in the rise of the social sciences.

Social statistics appeared fairly suddenly, as an innovation (if not entirely a creation) of the period, roughly, 1820-1850; indeed its sudden rise allows an unusually clear opportunity for the sociologist of science to observe and track the very formation of a new scientific discourse, before it became fully codified and institutionalized.<sup>10</sup> In the origins of social statistics, virtually all the features which the “social studies of science” practitioners tend to look for are there to be seen: a new domain being charted out; new concepts, fields of evidence, and methods of proof being invented and codified; a new rhetoric expressing and publicizing the potentials of the new science; a network of scientists slowly crystallizing into a new professional identity; and eventually new institutions emerging.

The central question to raise about these developments is simply, what did it mean to think statistically in the early-nineteenth century?<sup>11</sup> This is a conceptual problem of considerable moment, which needs to be located temporally from two directions, thinking ahead in time from the eighteenth century, and backwards from the late-nineteenth century. On the one hand, by contrast to the eighteenth century, there was something decidedly new in the use of social or public numbers in the early nineteenth century, so much so that one can speak of statistical thinking itself as an innovation of this period.<sup>12</sup> On the other hand, that innovation didn't owe much, if anything, to better mathematics; in fact, the early history of social statistics preceded by two or three generations the mathematical advances which statisticians think of nowadays as the foundations of statistics. By the light of conventional disciplinary histories, the transition from political arithmetic to social statistics hence belongs securely to the pre-history of modern statistics. And yet it should seem curious in some respects to speak of the early-nineteenth century as “pre-history,” since that was in fact the heroic phase of social statistics, what historians still refer to as the era of “statistical enthusiasm.”<sup>13</sup> It was likewise the moment when statistics came decisively to the forefront in public discourse. Hence the problem: if the early nineteenth century marked an innovation – the emergence of social statistics as a new style of thinking – and yet this innovation considerably antedated modern mathematical statistics, what then did it mean to think statistically? If the statistical way of thinking emerged before its familiar modern mathematical foundations were laid, on what, then, did those earlier statistics rest?

The great accomplishment of the early social statisticians was to diffuse and popularize a statistical view of things. The key change, which in time carried implications for a wide array of empirical sciences, lay in the idea of population. Social statistics made familiar the practice of thinking of a population as a system, which could be studied as a whole through the frequencies of its collective phenomena – without that aggregate being broken down into its individual constituents. The concept of population challenged fundamentally the conventional understanding prevailing until then of what statistical aggregates represented. At the end of the eighteenth century, statistical tables were still generally taken to be second-order summaries of a series of independently determined individual events – on the model of drawings from an urn or the repeated tosses of a coin. In some special cases, such as life-tables, there were interesting regularities observable in the aggregate patterns; similarly the long-observed stability in the ratio of male to female births provoked much comment. In general, however, aggregate-level information was not perceived as law-like or otherwise worthy of much interest. By contrast, in the period after 1820, it was aggregate *rates* which suddenly received disproportionate attention. Rates are of course composed by sets of individual events, but they were given a new importance and treated effectively as a new and separate order of facts. The conceptual changes which were taking place were not always well understood at the time; but in retrospect it is not difficult to sense the enthusiasm of contemporaries for what seemed a revolutionary development.

Population in this sense was a genuinely novel and fertile idea, and one without clear antecedents. Moreover it is important to remember that in this case social science was in the scientific vanguard, developing conceptions which later became fundamental in the biological and physical sciences. In a phrase, Malthus came before Darwin, and Quetelet before Clark Maxwell (social statistics before statistical mechanics).<sup>14</sup>

What is at issue here is not merely an historiographical problem of when to back-date the beginnings of statistics. The disciplinary history of the field does indeed present certain obstacles to understanding what came before. But more to the point, it is necessary to think of early social statistics as a new mode of representation, not a toolkit of techniques but a discourse about society in its own right. In this respect the contribution of social statistics was to conceive a new sort of object, society as a population, which could be the target of research, and ultimately of policy interventions. Conceiving this new object involved breaking from earlier, principally political, means of representing the community. It did not han-

pen immediately or transparently. Nonetheless, a gradual process, which could be described as making the social world thinkable for statistics, was somehow working an important conceptual shift.

Historians have dated the beginnings of social statistics fairly precisely, ca. 1820–1850, but of course they didn't come out of nowhere. There were earlier and important traditions of social numbers. The census goes back at least to classical antiquity, if not to the earliest civilizations. Across history regimes of many sorts have tried to estimate how many men they could bring under arms, or what tax revenues they could raise. By the eighteenth century there were fairly sophisticated life tables – aggregate information about births and deaths which made it possible roughly to track population trends. The numbers involved were often defective, which was itself a spur to early statisticians – the self-styled political arithmeticians – to work out means of statistical inference in order to arrive at a fuller and more accurate reckoning. Political arithmetic can fairly be called “the taproot of modern statistics”,<sup>15</sup> and yet the influential developments came later, in the transition from these prior traditions of political arithmetic to early-nineteenth-century social statistics. The representative political arithmeticians were figures of the late seventeenth century: John Graunt (1620-1674), William Petty (1623-1687), Edmund Halley (1656-1742), Charles Davenant (1656-1714). Their achievements were considerable, and unusually sophisticated for their day; yet in many respects they remained isolated achievements which successors admired but failed widely to build upon and extend. Hence the judgment of historians that political arithmetic quickly “faded from the scene”; “led nowhere”; “stagnated”; “was left to linger in the dusk”; or simply “petered out.”<sup>16</sup>

It was instead a later generation, born in the years around the turn of the eighteenth century, who whipped up enthusiasm for a new, rapidly developing statistical enterprise: Adolphe Quetelet (1796-1874), Adolphe d'Angeville (1796-1856), Andre-Michel Guerry (1802-1866), Dr. William Farr (1807-1883), Dr. William Guy (1810-1885), Florence Nightingale (1820-1910). These were no longer political arithmeticians, but social or “moral” statisticians.

The shift from political arithmetic to social statistics involved, in fact, a decisive and enormously consequential transformation. It is useful to try to capture schematically what that transformation involved by examining in turn: 1) the scale of statistics-gathering; 2) the conceptual framework to which the numbers were referred – what was counted? what were the numbers taken to be signs, symptoms and indicators of? and 3) how in the

end could the numbers be interpreted? These are rather general headings but they are serviceable for simplifying a complex matter.

Consider, first, the growing scale of public counting. Ian Hacking has used the phrase "avalanche of printed numbers" to characterize what was going on ca. 1820 and after; he estimates something like a 300,000 fold increase across the nineteenth century.<sup>17</sup> Moreover, counting which had often been private, amateurish, ad hoc, and periodic became public, professional and bureaucratic, systematic and continuous. What explains that huge growth in scale is of course for the most part the institutionalization of statistical bureaux. That is an important social process in its own right, but its central contribution to the new statistical way of thinking may have been only inadvertent and indirect. What seems to have happened is that the sheer accumulation of printed numbers provided a material condition for the new social statistics. Some social numbers (on births and deaths, for instance) had long been available; and political arithmeticians continued across the eighteenth century to add to the supply, often ingeniously drawing broad inferences from scanty date. But it was eventually the piling up of more and more numbers (Hacking's avalanche metaphor), in continuous time series, which seems to have been crucial in changing the way statisticians saw their statistics. By looking hard at the new numbers they began to see new *regularities* which had never before been apparent. They came to believe that their numbers revealed a new order of reality.

What, secondly, was the basic frame in which these numbers were arrayed? What were these numbers of? The shift here can be suggested (albeit all too neatly and schematically) by highlighting the adjectives in the transition from *political* arithmetic to *social* statistics. In a phrase the focus shifted from information about the body politic to information about the social body – the population. This was a fundamental transformation which requires more extended and nuanced treatment than it has yet received. To hazard a generalization: political arithmetic, and much of eighteenth-century German university statistics as well, tended to take the political realm or the commonwealth as its natural frame of analysis, and the sovereign as its audience. In Charles Davenant's phrase, political arithmetic was "the art of reasoning by figures upon things relating to, and of interest to, government."<sup>18</sup> The political arithmeticians made their enquiries with an explicit "view to considerations of state power."<sup>19</sup> Edmund Halley, for instance, reflected directly on the "Political Uses" of his 1694 life table drawn from the tables of births and funerals in Breslau. Although the table undoubtedly contributed to actuarial science.



Halley was clear that the first aim of political arithmetic was “to show the proportion of men able to bear arms in any multitude”; moreover, to underscore his basic conception, he added that “the strength and glory of a King [is] in the multitude of his subjects.”<sup>20</sup> The political motive was likewise transparently clear in Sir William Petty’s famous survey of Ireland, carried out in the 1650s, which was essentially an inventory of spoils for the victors – a count of lands, buildings, people, cattle designed to facilitate the exploitation or appropriation of those resources.<sup>21</sup> Or to cite an example from the continental tradition, an enumeration of the Prussian people was proposed in 1787, whose purpose was to present Friedrich Wilhelm II, on the occasion of his coronation, with a full accounting of his wealth and power, numbering his people, their dwellings and livelihoods.<sup>22</sup> Such examples do not, of course, exhaust the varieties of political arithmetic; not all political arithmetic was so narrowly or explicitly political in motivation. There is no need to exaggerate in any event, since it is enough to sense in retrospect the shift in emphasis that was involved. What made political arithmetic “political” were, in sum, two elements: its not infrequently explicit political aims; and its implicit conceptual frame of reference – the community conceived first and foremost as a political realm and as a creation of political will. In this second respect political arithmetic still shared something with the German tradition of university statistics, an early form of State-science which was not principally quantitative but which similarly arrayed its compendia of facts and figures about human populations in an explicitly political framework.<sup>23</sup>

By contrast to political arithmetic, social statistics were plainly about *society*, not specifically the political community. In this respect social statistics shared the ideological animus of other social discourses in the early nineteenth century.<sup>24</sup> If the state had earlier been conceptually superordinate over society, the point was now to insist on the autonomy of society – on the order which emerged spontaneously from social institutions. Moreover, the statisticians tended implicitly to reverse the logical priority: it was not political will which constituted the community, but the population which constituted a society; and while society of course included political institutions, the dynamics of society, far from being the result of political will or coercion, might well be in many respects beyond the reach of political control or direct manipulation.<sup>25</sup> This is of course not to imply that the propositions of the social statisticians had no political implications, or that statisticians had no political motives: on the contrary. Nonetheless, in the statisticians’ own emerging

idiom, what they dealt with were “laws of social life,” laws of population or of the social body. This was a new frame of reference for arranging social facts; it highlights, to use an over-worked phrase, the “discovery of society.”

Malthus is a useful figure to mark the transition. His propositions on population growth outstripping the provision of resources were couched in mathematical form (that is already a sign of the times, even if the calculations were suspect); still more to the point was Malthus’s conviction that laws of population had their own independent dynamic, indeed were recalcitrant to political control.

The great pride of social statisticians was to have discovered hitherto unsuspected laws of social life; and to discern through the regularities of those laws a spontaneously generated order which was in many ways more remarkable than the artificial realms of the legislator and the sovereign. An English reviewer of Quetelet’s *Sur l’homme* (1835) struck the typical note of wonderment at this discovery: “[I]t might seem that human actions would, if registered, present as vast a variety as the caprices of the will, and that to discover any thing like a law in their production would be more absurd than to investigate the rules of the wind. . . . Yet, when we pass from individuals to masses, we find even in those actions which seem most fortuitous, a regularity of production, an order of succession, that can only arise from fixity of cause.”<sup>26</sup> These were sentiments which were becoming common in the 1830s and after. The political significance of this supposed spontaneous order, and its rhetorical emphases, were well caught later in a fable recounted by one of the principal German moral statisticians, Adolph Wagner: imagine, he suggested, a land ruled by an autocrat, who decreed at the beginning of each year the number of marriages which should take place that year; the number of suicides (and the number to be committed by each sex, by the different professions, and by what methods); the number of crimes (and the different crimes to be committed by young and old, male and female), etc. In fact, to draw the obvious moral of the fable, no state, no autocrat, has the power to accomplish such things; and yet, as Wagner concluded: “the natural organization of human society compels precisely these results” – as the tables of the social statisticians amply demonstrated, year after year.<sup>27</sup>

This raises, finally, the third element in the transition from political arithmetic to social statistics: what had happened that allowed social statisticians to begin speaking of social laws? How did they come to interpret their numbers as the sign of law-like regularities? What did the

numbers of the social statisticians represent, and how should they be interpreted? In the answers to such questions lies the core of what social statisticians thought they had discovered – what these laws of social life were all about.

The point on which all this turned was the notion of regularity or stability in the rates of phenomena.<sup>28</sup> Regularity was not itself a new notion. The political arithmeticians had already discovered some striking regularities in vital statistics, in patterns of births and deaths. Such regularities were widely commented upon, and not infrequently compared with the movements of heavenly bodies that astronomers had charted. Already in the eighteenth century it was a commonplace, for instance, that the number of boy babies born slightly exceeded the number of girl babies, by a ratio calculated in the range 19/18 to 22/21. This fact was familiar; but what did it mean? There seemed to be a fairly obvious functional sense to it, since men were more likely to die in wars; hence if boys and girls were born in equal numbers, there would likely be an imbalance in the proportion between the sexes. But how might that happy result come about? Probability theory didn't seem to be of much help, since it would be reasonable to treat the sex of babies as randomly determined, like the heads or tails of coin-tossing, and thus equiprobable. Some political arithmeticians adduced the actual imbalance in births as proof of divine providence: the ratio violated the laws of probability and fortunately so; it was proof of divine design.<sup>29</sup>

The regularities in aggregate statistics which eighteenth-century statisticians noted were, in fact, *biological* ones – births, deaths, marriages – which drew a lot of attention but did not in themselves suggest a path to discovering other regularities, much less social laws. What happened? The shift was partly an artifact of the avalanche of printed numbers. Statisticians were prepared a priori to look for regularities; that was part of their basic sense of what science was about, and how it ought to proceed.<sup>30</sup> The avalanche of numbers presented, fairly suddenly, a vast and growing set of new numbers to reflect on. What was apparently key was the appearance of continuous, annual series, rather than occasional or periodic enumerations. The statistical series seemed to reveal the existence of more and more regularities in social phenomena, more and more instances of rates of phenomena proceeding stably over time; it was like witnessing, as more than one observer noted, the emergence of a new order from the midst of chaos. The observation, for instance, that the number of dead (undeliverable) letters in the Paris post office remained virtually constant from year to year was repeated almost ritually as a

marvelous fact. More remarkably, there appeared to be regularities equally striking in the realm of "moral facts." Here the statistics of deviance, which had been gathered for very different purposes, brought forth an unexpected result. Even the statistics of homicide and suicide looked astonishingly stable: what might be taken as the paradigmatic expressions of impulsive, irrational behavior appeared to occur in the aggregate (through what was evoked as the "law of large numbers") with a strange and awesome, indeed awe-inspiring, regularity. In the city of Paris, for instance, as the excellent municipal statistics revealed, the rate of suicide in each quartier hardly varied year by year; even the means of suicide (by drowning, poison, etc.) seemed remarkably constant in their proportions. Or, as an English reviewer of Quetelet noted of murder (which would seem of all crimes "to depend the least on human foresight, would seem the most fortuitous"): "Yet experience proves, not only that murders vary very little in their annual amount, but that the instruments with which they are committed are annually employed in nearly the same proportions."<sup>31</sup>

In the face of these "astonishing" regularities, social statisticians quickly claimed to have uncovered a new order of facts, which not only revealed unsuspected "laws" of social life, but also opened the way to a new kind of science. A social physics seemed to be already in the making.

What did social statisticians make of these regularities? What produced them? There was no clear, certainly no generally persuasive answer. Yet social statisticians convinced themselves without serious difficulty that they had indeed discovered a new order of facts; moreover, if these social facts (rates of aggregate phenomena) were so stable, they must, as most assumed, be the constant effects of some as yet unknown constant causes. The general idea was that by looking at individuals observers would see only a myriad of peculiarities, but in the aggregate those peculiarities would cancel each other out, leaving only general, common features – an idea later popularized among generations of sociologists by Durkheim's analysis in *Suicide*.

If the contemporary statistical reasoning is reconstructed in this way, it charts clearly the path that social or moral statisticians followed in creating "social facts." The next step was to subject the new facts to simple statistical manipulations. Consider a straightforward example. Quetelet comes upon a set of measurements – the chest dimensions of a group of five thousand-odd Scottish soldiers. He plots the figures, and claims that they trace what would later be called a normal distribution, the familiar bell-shaped curve. He then takes the mean chest girth of the group to

represent its "type" – *l'homme moyen* of the group. So far this involves just a bit of arithmetic. But note what *l'homme moyen* represents to Quetelet: it is, he says, as if Nature had aimed at producing this type – the ideal value for the group; in the event, the actual distribution occurred, dispersed around the mean, because the soldiers for different "accidental" circumstances in their lives failed to realize fully the ideal standard.<sup>32</sup>

Of course *l'homme moyen* is, Quetelet admits, nothing more than an "être fictif." And yet it is hard to resist the conclusion that it is more representative as a type of the species, and in some sense more real, than any actual individual. There is no need to belabor the point. It was by such arguments that Quetelet and others helped to create the new habits of mind and new conceptual practices which make up the statistical view. What is a mean? It is just a bit of arithmetic. But the number comes to be also a way of representing a group, a whole population. Social statisticians were at the threshold here, in this reconstruction, of representing groups numerically, and hence of comparing groups numerically, without any necessary reference to the particularities and peculiarities of culture, history, language, geography.<sup>33</sup> These are powerful techniques. They were only conceivable based on the confidence that aggregate numbers reflect or *indicate* something real, essential, and fundamental about populations, something which no amount of observation individual by individual could produce. It is in this sense that early social statisticians created a new mode of representing the social universe, and hence a new object to act upon. These were essential first steps, one may fairly say, in making the world thinkable for statistics.

## Notes

1. This is the revised text of a talk delivered to a conference on "The Great Transition: Discourses on Society and the Rise of the Social Sciences (1750–1850)" held at the Swedish Collegium for Advanced Study in the Social Sciences, Uppsala.
2. For a wide-ranging discussion of the diffusion of probabilistic and statistical thinking, see Gerd Gigerenzer et al., *The Empire of Chance: How Probability Changed Science and Everyday Life* (Cambridge: Cambridge University Press, 1989).
3. Ian Hacking, "How Should We Do the History of Statistics?," *I and C* [formerly *Ideology and Consciousness*] 8 (1981), 15–26.
4. This is the point of view, for instance, of Stephen Stigler's *The History of Statistics: The Measurement of Uncertainty before 1900* (Cambridge, Mass.: Harvard University Press, 1986).
5. Indeed the beginning might even be fixed at a particular date – in 1877, for instance, when Francis Galton clashed with the preeminent English statistician of the preceding generation, the vital statistician William Farr, in a meeting organized by the British

Association for the Advancement of Science. Galton complained that among the recent papers communicated to Section F (Economic Science and Statistics) of the Association, "not a single memoir treats of the mathematical theory of Statistics." In response Farr defended, as Karl Pearson later put it, "that old type of statistics which had no theoretical basis," but perhaps considerable practical utility. It was clear that Galton's was the scientific voice of the future. This was a moment, emblematically, when refinement of technique supplanted practical policy as the guiding principle of the field. See Karl Pearson, *The Life, Letters and Labours of Francis Galton* (Cambridge: Cambridge University Press, 1924), vol. II, pp. 347–348.

6. William Guy, "On the Values of the Numerical Method as Applied to Science, but Especially to Physiology and Medicine," *J. Statistical Soc.* **2** (1839), 45. See also, Guy, "On the Original and Acquired Meaning of the Term 'Statistics'," *J. Statistical Soc.* **28** (1865), 478–493; and V. John, "The Term 'Statistics,'" *J. Statistical Soc.* **46** (1883), 656–679.
7. *Journal of the Statistical Society of London* **1** (1838), 1.
8. Hacking "How Shall We Do the History of Statistics?," p. 15.
9. See L. Graham, W. Lepenies and P. Weingart (eds.), *Functions and Uses of Disciplinary Histories* (Dordrecht: Reidel, 1983). My own aim here follows a more contextualist maxim, which is well expressed by Peter Buck: "Particular statistical theories and practices may have universal application in principle, but they bear the imprint of the particular social arrangements they were meant to explain." See his essay, "People Who Counted: Political Arithmetic in the Eighteenth Century," *Isis* **73** (1982), 28–45.
10. See Ian Hacking, "Statistical Language, Statistical Truth, and Statistical Reason: The Self-Authentication of a Style of Scientific Reasoning," in Ernan McMullin (ed.), *The Social Dimensions of Science* (Notre Dame, Indiana: University of Notre Dame Press, 1992).
11. This paper presents only a bare synopsis of an answer. It draws from a wide field of recent historical work which the interested reader should consult further. See in particular, Ian Hacking, *The Taming of Chance* (Cambridge: Cambridge University Press, 1990); Stigler's *History of Statistics*; Theodore Porter, *The Rise of Statistical Thinking 1820–1900* (Princeton: Princeton University Press, 1986).
12. This is the common thesis, developed in rather different ways, by Hacking, *Taming of Chance* and Porter, *Rise of Statistical Thinking*.
13. Harald Westergaard had described an "era of enthusiasm, 1830 to 1849," in his *Contributions to the History of Statistics* (London: King, 1932), pp. 136–171.
14. See, for instance, Francois Jacob, *The Logic of Life: A History of Heredity*, tr. by Betty Spillman (New York: Vintage, 1976), pp. 169–175; Theodore Porter, "From Quetelet to Maxwell: Social Statistics and the Origins of Statistical Physics," in I. B. Cohen (ed.), *The Natural Sciences and the Social Sciences* (Dordrecht: Kluwer, 1994), pp. 345–362; and John Theodore Merz, "On the Statistical View of Nature," in *A History of European Thought in the Nineteenth Century* (Edinburgh: Blackwood, 1912), vol. II, pp. 548–626.
15. The phrase is Walter Willcox's, in his article on "Statistics," in the *Encyclopedia of the Social Sciences*, vol. xiv, p. 357.
16. These are the summary judgments respectively of S. Bauer, "Political Arithmetic," in Palgrave's *Dictionary of Political Economy*, vol. I (London, 1925), p. 26; J. Hollander, "The Dawn of a Science," in I. Clark (ed.), *Adam Smith 1776–1976* (Chicago, 1978), p. 11.

- 8; H. Westergaard, *Contributions*, p. 44; J. A. Schumpeter, "The Common Sense of Econometrics," *Econometrica* 1 (1933), 7; Schumpeter, *History of Economic Analysis* (New York: Oxford University Press, 1954), p. 31. See also A. M. Endres, "The Functions of Numerical Data in the Writings of Graunt, Petty, and Davenant," *History of Political Economy* 17 (1985), 245–264.
17. Hacking, *Taming of Chance*, p. 2.
  18. Charles Davenant, "Of the Use of Political Arithmetic," in Charles Whitworth (ed.), *The Political and Commercial Works of Dr. Charles D'Avenant* (London, 1771), vol. I, p. 138.
  19. Buck, "People Who Counted," p. 29. Buck's interpretation of the shifts in late-eighteenth-century political arithmetic is largely consistent with the view I have suggested above: "[W]hat had been a scientific prospectus for the exercise of state power became a program for reversing the growth of government and reducing its influence on English social and economic life . . . Until the 1750s it was taken for granted that populations were political creations, dependent on assertions of sovereign authority for their existence as aggregates open to statistical study . . . But by 1800 the logic underlying such exchanges had been reversed: F. M. Eden's *Estimate of the Number of Inhabitants in Great Britain and Ireland* carried the epigraph 'THESE CONSTITUTE A STATE'" (pp. 28–29).
  20. Edmund Halley, "An Estimate of the Degrees of Mortality of Mankind drawn from Curious Tables of Births and Funerals at the City of Breslaw," *Philosophical Transactions* 17 (1693), 601; Halley, "Some Further Considerations on the Breslaw Bills of Mortality," *ibid.*, 656.
  21. William Petty, *The Political Anatomy of Ireland* [1691], in Petty, *The Economic Writings* (New York: Kelley, 1963), vol. I, pp. 121–231.
  22. Hacking, *Taming of Chance*, p. 29.
  23. On German university statistics see Paul Lazarsfeld, "Notes on the History of Quantification in Sociology – Trends, Sources and Problems," in Harry Woolf (ed.), *Quantification – A History of the Meaning of Measurement in the Natural and Social Sciences* (Indianapolis: Bobbs-Merrill, 1961), pp. 147–203.
  24. See, for instance, Gianfranco Poggi, "The Place of Political Concerns in the Early Social Sciences," *Arch. Europ. Sociol.* 21 (1980), 363–371; Robert Wokler, "Saint-Simon and the Passage from Political to Social Science," in Anthony Pagden (ed.), *The Languages of Political Theory in Early Modern Europe* (Cambridge: Cambridge University Press, 1987), pp. 325–338.
  25. The obvious parallel with metaphors of the invisible hand in political economy has hardly been explored.
  26. "Objects and Advantages of Statistical Science," *Foreign Quarterly Review* 16 (1835–1836), 212.
  27. A. Wagner, *Die Gesetzmässigkeit in den scheinbar willkürlichen Handlungen vom Standpunkt der Statistik* (Hamburg, 1864), trans. by T. Porter and cited in Porter, *Rise*, p. 169.
  28. See Stephen Turner, *The Search for a Methodology of Social Science* (Dordrecht: Reidel, 1986), pp. 60–91.
  29. The Prussian pastor Sussmilch, for instance, published a widely cited treatise on the "divine order" reigning in demographic affairs. As V. John later characterized his views, "Sussmilch looks upon God as the eternal and sure arithmetician who orders everything temporal and nature according to measure, number, and weight"; John,

- "The Term 'Statistics'," p. 669.
30. See John Herschel (unsigned), "Quetelet on Probabilities," *Edinburgh Review* **92** (1850), 1–57. See also S. F. Cannon, *Science in Culture: The Early Victorian Period* (New York: Dawson, 1978).
  31. "Objects and Advantages of Statistical Science," p. 212.
  32. See Hacking's discussion in *Taming of Chance*, pp. 105–114.
  33. See Talal Asad, "Ethnographic Representation, Statistics and Modern Power," *Social Research* **61** (1994), 55–88, for one way of drawing the implications of social statistics' abstractive power.