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Political Bodies and Animal Œconomies: Reconsidering the Relationship between Healthcare and Statecraft in Late Seventeenth-Century England

This article considers the emergence of an art of governing called 'political arithmetic' in late seventeenth-century England because it shows us the birth of the now pervasive notion of the human body as a set of fiscally productive forces and the fabrication of the equally ubiquitous concept of the collective as a field of vital processes irreducible to the individual and amenable to statistical and administrative sciences. The article aims to remind us that government in the name of health addressed to biopolitical phenomena is not timeless. Biopolitics is understood here as a combination of the disciplining of bodies toward docility and utility and the regulation of aggregate life processes. As has been well documented, the political arithmetical writings of such figures as John Graunt (1620-1674), Sir William Petty (1623-1687) and Charles Davenant (1656-1714) largely reduced the commonwealth to sets of numerical tables.[2] This facilitated easier and quicker evaluation of collective fiscal strength and the productivity and worth of individuals understood in pounds, shillings and pence. Political arithmeticians wrote that a large and healthy labouring population was crucial to national wealth and power.[3] Some historians suggest that this mercantilist and statistical-administrative discourse informed contemporary healthcare practices.[4] That is, public health in the Restoration became

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[2] For example, by T. Aspromourgos, 'Political economy, political arithmetic, and political medicine in the thought of William Petty' in *Physicians and Political Economy: Six Studies of the Work of Doctor-Economists*, ed. by Peter D. Groenewegen (London: Routledge, 2001), pp 10-25; P. Buck, 'Seventeenth-Century Political Arithmetic: Civil Strife and Vital Statistics', *Isis*, 1:68 1977), 67-84; J. Hoppit, 'Political Arithmetic in Eighteenth-Century England', *Economic History Review* 49:3 (1996), 516-540; P. Kreager, 'New Light on Graunt', *Population Studies*, 42 (1988), 129-140; T. McCormick, 'Transmutation, Inclusion and Exclusion: Political Arithmetic from Charles II to William III', Journal of Historical Sociology 20:3 (2007), 259-278 and P. Slack, 'Government Information in Seventeenth-Century England', *Past & Present*, 184 (2004), 33-68.

[3] John Bellers neatly summarised this conventional view in 1699, 'regularly labouring people are the kingdom's greatest treasure and strength'. J. Bellers, *An Essay Towards the Improvement of Physick. in Twelve Proposals. By which the lives of many thousands of the rich, as well as of the poor, may be saved yearly. With an essay for imploying the able poor* (London: J. Morphew, 1714 [1699]), p. 124.

[4] The classic thesis making this argument is G. Rosen, *A History of Public Health* expanded 1993 edn (Baltimore: Johns Hopkins University Press), chapter 4 'Mercantilism, Absolutism and the Health of the People (1500-1750)', pp 57-106. Rosen's argument informs A. Borsay, 'An Example of Political Arithmetic:

(inchoately) biopolitical. I argue here that medical discourse did not understand the body as a set of fiscally productive forces and did not address the aggregate life processes constructed by political arithmeticians. Rather, anatomico-physiological and medical treatises published in late seventeenth-century England mainly continued to intervene upon the body with the aim of following Christ's healing example and ensuring stability and harmony through the maintenance of hierarchical order and the correct form of political and religious government.[5] Debates over the due and efficient functioning of the human body formed part of a concern with the government of belief and behaviour in a period of political instability.[6] The human body was understood to be the product of divine design and therefore the model for a correctly ordered commonwealth. The partial reduction of the body politic to numerical tables (wherein its members were rendered much more mobile and comparable than tradition allowed) by political arithmeticians was a radical reconstruction not taken up by those practicing healthcare. Indeed, as this article will demonstrate, in order to prove the stability and reliability of their claims, political arithmeticians continued to employ the traditional body politic model themselves, even as they advocated its reduction to numerical tables. I think it is useful to consider that statistical-administrative prescriptions for health might well be very comprehensible to us, but in Restoration England, political arithmeticians fought to establish their models as convincing, useful and peaceable by dedicating their

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The Evaluation of Spa Therapy at the Georgian Bath Infirmary, 1742-1830', *Medical History*, 45 (2000) 149-172. Borsay's introductory comments are upon 1660-1714 England. The Rosen thesis is also taken up in D. Porter, *Health, Civilization and the State: A History of Public Health from Ancient to Modern Times* (London: Routledge, 1999), at one point in R. Porter, *The Greatest Benefit to Mankind: A Medical History of Humanity from Antiquity to the Present* (London: Routledge, 1999), p.236 and in C. Wilson, *England's Apprenticeship 1603-1763* (London: Longman, 1984). James Tully also seems to assume this in J. Tully, *An Approach to Political Philosophy: Locke in Contexts* (Cambridge: Cambridge University Press, 1993), pp 247-249.

[5] For example, see W. Petty, 'Anatomy Lecture (Dublin 1676)' in *The Petty Papers: some unpublished writings of Sir William Petty edited from the Bowood Papers*, 2 vols, ed by Marquis of Lansdowne (New York: A. M Kelley, 1967), 2, pp 171-179 and W. Cowper, *The anatomy of humane bodies, with figures drawn after the life ... by some of the best masters in Europe ... and curiously engraven in one hundred and fourteen copper plates, illustrated with large explications, containing many new anatomical discoveries, and chirurgical observations. To which is added an introduction explaining the animal oeconomy. With a copious index* (London: Sam. Smith and Benj. Walford, 1698), 'the Introduction Explaining the Animal Oeconomy'. Robert Martensen has argued that the body as constructed by Thomas Willis was mutually supportive of the Episcopalian model of government. The regulation of passions and the lower body by the brain, constructed as the 'chief mover' of the human body, appealed to Anglicans who considered the body politic to be composed in such a way as to be properly ruled by an upper centre of reason. R. L. Martensen, 'Habit of Reason: Anatomy and Anglicanism in Restoration England', *Bulletin of the History of Medicine*, 66:4 (1992), 511-535.

[6] This has been demonstrated in S. Schaffer, 'Godly Men and Mechanical Philosophers: Souls and Spirits in Restoration Natural Philosophy', *Science in Context*, 1:1 (1987), 55-86. The anatomico-physiological works of the influential figures Walter Charlton and Thomas Willis addressed the nature of the soul through debating important natural theological questions. For example, see W. Charlton, *Enquiries into Human Nature in VI. Anatomic Prælections in the New Theatre of the Royal College of Physicians in London* (London: Robert Boulter, 1680), Epistle Dedicatory, and, T. Willis, *Two Discourses Concerning the Soul of Brutes* (London: Thomas Dring and John Leigh, 1683), 'The Preface to the Reader'.

publications to members of the Privy Council and the Royal Society. If, when describing late seventeenth-century English public health, we focus upon those elements of the writings of Graunt, Petty and Davenant that constituted an incipient biopolitics, we run the risk of missing the point that biopolitics presented a radical challenge to a set of much more successful and enduring knowledges and practices regarding the relationships between the health of the individual and that of the collective and how these were and ought to have been governed. Being alert to the contestation, conflict, failures and counter-knowledges involved in the birth of biopolitical medicine does much to enable a critical re-evaluation of what we currently think 'public health' is, could and ought to be.

The Rosen thesis reconsidered

For George Rosen, the arts of healing were enrolled in the service of mercantilism. This was an art of government addressed to early modern state development. The preservation of the collective and its members was understood as more than the maintenance of law and order. Mercantile strategies sought to increase the productive capacities and the welfare of individuals in order to ensure commercial and military strength in competition with other European states.[7] Dorothy Porter poses the question, 'what was the relationship between the power structures of the body politic and the health of the subjects under its domain?' Porter's answers to this are founded upon the following statement: 'the growth of public health paralleled the rise of centralized government in this period. As the modern state began to emerge from the late sixteenth century, so incipient ideas of national health slowly gained ground'.[8] For Rosen, mercantilism was not merely a form of political reasoning addressed *to* the collective; it was a conception *of* the collective. He explains,

> As the rulers and their advisers saw it, what was required was first of all a large population; second, that the population be provided for in a material sense; and, thirdly that is should be under the control of government so that it could be turned to whatever use public policy required. It was recognized everywhere in some degree that effective use of population within a country required attention to problems of health. Obviously, any loss of labour productivity due to illness and death was a significant economic problem. Moreover, since population was a factor of production, it was essential to know the number and the "value of people". It was the recognition of this need in England in the seventeenth century that led to the first significant attempts to apply statistical methods to the public health. Efforts were made to ascertain the basic

[7] See Tully, pp 247-248.
[8] D. Porter, p.49.

> quantitative data of national life in the belief that such knowledge could be used to increase the power and prestige of the state. Characteristically, this new field of endeavour was given the name "political arithmetic".[9]

Rosen's classic account lends itself to a view of medicine becoming a social science, with 'social' being understood as a field of aggregate life processes and 'science' as the invented means to intervene upon it. Firstly, medical knowledge became statistical in the sense of mapping out numbers of christenings, deaths by specified diseases, sex ratios and the dispersions of these both temporally and spatially. Andrea Rusnock claims that quantitative analyses where brought to bear on discussions of English medical practices and therapies from the 1660s on.[10] Secondly, medical knowledge became administrative in the sense of fabricating ways of acting upon these statistically known processes across a range of differing locales in order to avert illness and to promote well being. In this way, the health of the individual became related to that of the collective in the form of disciplined bodies understood as members of a society revealed through statistical-administrative knowledges.[11] The task of healing and the task of managing the state's resources are thus brought together. In this way, Graunt, Petty and Davenant then provide the start of the story of state medicine wherein the healing professions were standardized and physicians were subordinated to a centralized administration; of urban medicine wherein the metropolitan environment both morally and physically was taken up as a set of problems to be solved by the physician; and, of labour medicine wherein the threat posed by the insalubrious poor to the well-being of the better sort was to be solved by the policing of health.

In this article, however, I want to emphasize three points. Firstly, that contemporary publications by English physicians and anatomists do not evidence any attempt to address the health of the collective as understood by political arithmeticians nor place their endeavours in the service of fiscal strength. Secondly, the English state did not enact the proposals put to it by political arithmeticians. In Petty's case, having been close to the Cromwellian regime – he had served as physician to the army in Ireland – the

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[9] Rosen, pp 86-87.
[10] A.A. Rusnock, *Vital Accounts: Quantifying Health and Populations in Eighteenth-Century England and France* (Cambridge: Cambridge University Press, 2002), p.1.
[11] This process is described in P. Pasquino, 'Theatrum Politicum' in *The Foucault Effect* ed. by G. Burchell, C. Gordon and P. Miller (Chicago: University of Chicago Press, 1991), pp 105-118. Roy Porter begins his account of Graunt and Petty with the following statement: 'the development of what became demography and epidemiology became possible as part of the wider quest to apply science to society'. R. Porter, p.236.

government of Charles II naturally suspected him.[12] Despite being knighted and a favourite of the king's brother – who became James II two years before Petty's death in 1687 – none of his schemes were enacted by the Stuart monarchy. In any case, the Restoration English state – meaning the king and his Privy Council – was not an effective means to enact 'national healthcare' plans. The lack of centralized control in seventeenth-century English statecraft has been demonstrated by a number of historians.[13]

There was a further difference between political arithmetical and medical governance. Political arithmetical treatises often made reference to the established network of workhouses and thus to the disciplinary regulation of bodies. They also pointed to the regulation of statistically known life processes (albeit in a most inchoate form). In contrast, medical discourse fabricated individuals through pastoral practices. I understand medical practices to have been enactments of pastoral governance to the extent that they were a relation of guidance between a healer as a figure of authority and a patient or number of patients that called for confession, self-disclosure, exemplarity or discipleship through practices of critically reflecting upon and caring for oneself. This pastoral relationship was sometimes internalised, through the reading of guides to conduct, and so can be said to have then been a relationship of the (literate) person to his- or herself. Rather than describe health and assess the effectiveness of healthcare in the form of numerical tables, as did political arithmeticians, physicians sought to influence conduct through case studies and moral examples. Seen from the perspective of pastoral power, late seventeenth-century English medical encounters (recorded in the form of case notes, letters and publications) would seem to have often been more than a simple requirement of the submission of the patient to that of the physician, and the internalisation of that submission in the form of self-examination and self-mastery over the patient's health-related conduct. Rather, the ethical relations of both physician and healer to each other,

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[12] Petty was created a DM at Oxford in 1650 and was elected to the professorship of anatomy the following year and accepted as a fellow of the College of Physicians. He was appointed physician to the army in Ireland in 1652. However, Petty never practiced medicine after giving up his professorship at Oxford.

[13] For example, see P. Slack, *From Reformation to Improvement: Public Welfare in Early Modern England* (Oxford: Clarendon Press, 1999) and *Failed legislation, 1660-1800* (London: Hambledon Press, 1997) extracted from the Commons and Lords Journals ed. by J. Hoppit (with an introduction by Julian Hoppit and Joanna Innes. Compiled with the assistance of Edmund Green, Nyani Samarasinghe, and John Styles). Michael J Braddick has pointed out that late seventeenth-century English magistracy in relation to poverty, dearth and disease was enacted largely through local initiatives with an absence of routine oversight from the centre. M. J. Braddick, *State Formation in Early Modern England c.1550-1700* (Cambridge: Cambridge University Press, 2000), p.103.

to themselves, and to wives and husbands, masters and servants, parents and children, were often at stake.

The traditional body politic model

Late seventeenth-century English medicine was addressed to 'animal œconomies', understood in wholly different ways to the numerical-tabular body described by political arithmeticians. My use of the old spelling of economies throughout this article is intended to distinguish between seventeenth-century notions of parts of a whole and the careful management of resources from the late nineteenth-century construction of '*the* economy' as a fiscal system assembled and controlled by man (rather than God) and consisting partly of immaterial resources. In late seventeenth-century England, the word 'œconomy' had two meanings. Firstly, it denoted the management of the material resources of a household or other organized body. When it was understood as the management of money or financial resources specifically, it was only in the sense of an individual or a household. Secondly, the word 'œconomy' referred to the (*de facto* and *de jure*) organization, internal constitution and apportionment of functions of any complex unity, whether natural or manmade. Only from the 1890s has the word 'economy' referred to 'the organization or condition of a community or nation with respect to economic factors, esp. the production and consumption of goods and services and the supply of money (now freq. with *the*); (also) a particular economic system'.[14] Animal œconomies were generally described by late-seventeenth-century English physicians and anatomists as the result of a divine employment of geometric reasoning and took the form of a mechanical-corpuscular model built around the accepted fact of the circulation of the blood.

These constructions of natural bodies had consequences for statecraft. The homology between animal œconomies and the commonwealth was not simply a literary device but a shared set of important questions about the organization of and transformations undergone by bodies and the kind of authority exercised within and upon them.[15] Conclusions reached in one field of discourse were often declared to be so in the other.[16]

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[14] The Oxford English Dictionary Online www.oed.com [accessed 24 November 2009], s.v. 'Economy'.
[15] See J. Rogers, *Matters of Evolution*: *Science, Poetry and Politics in the Age of Milton* (Ithaca: Cornell University Press, 1996), pp 1-38.
[16] See N. Glaiser, 'A Due Circulation in the Veins of the Publick: Imagining Credit in Late-Seventeenth- and Early Eighteenth Century England', *The Eighteenth Century*, 3:46 (Fall 2005), 277-299. L. Desmedt,

Within serious debates about the legitimate grounds for rule, natural and civic bodies were compared in order to establish the divinely sanctioned means of regulating the members of a body and the proper relationships between them. The political turmoil in the middle of the century intensified such debate, as medical and political writers alike expressed an urgent need to establish consensual and peacemaking grounds for making true statements about the nature and purpose of bodies political and animal. As Katherine Bootle Attie has noted, Thomas Hobbes and his opponents aimed at restoring immortality to the body politic after the civil war and regicide: both political and scientific reform during the Interregnum were geared to envisioning and ensuring peace, prosperity and the perpetuity of organized communities.[17] Simon Schaffer argues that (the more optimistic) rival forms of medical knowledge in late seventeenth-century England and Scotland sought to quell faction and fanaticism by attempting to form peaceable agreement that would serve as a model for society.[18]

Within the traditional 'body politic' model, the commonwealth was understood physiologically, as a body with mutually dependent components each with a divinely allotted part to play.[19] Supporters of the body politic model held that natural (divine) law decreed that the members of the collective should act in accordance with their particular role and thus ensure stability and harmony through the maintenance of hierarchical order. Eve Keller quotes from a treatise upon nutrition and digestion by the physician and natural philosopher Walter Charleton (1620–1707) as one of numerous examples of political arrangements having been modelled upon understandings of the structure and regulation of the human body: 'the most perfect model or form of a Government… is the Body of a Man'.[20] Roger French draws attention to the fact that following the Civil War, the correspondence of the anatomical microcosm to the civil macrocosm was questioned by writers such as the physician and philosopher Francis Glisson (1599?–1677). It was no longer clear that god ruled through the person of the king and that the

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'Money in the Body Politick: The Analysis of Trade and Circulation in the Writings of Seventeenth-Century Political Arithmeticians', *History of Political Economy*, 1:37 (2005), 80-101.

[17] K. B. Attie, 'Re-Membering the Body Politic: Hobbes and the Construction of Civic Immortality', *Journal of English Literary History*, 3:75 (2008), 497-530, esp. 498.

[18] See S. Schaffer, 'The Glorious Revolution and Medicine in Britain and the Netherlands', *Notes and Records of the Royal Society of London*, 2:43 (1989), 167-190.

[19] The body-commonwealth analogy as outlined below was as true of the Galenic-humoral model as it was for the mechanistic-corpuscular model that came to dominate English anatomy, physiology and medicine in the late seventeenth century.

[20] E. Keller, *Generating Bodies and Gendered Selves: the Rhetoric of Reproduction in Early Modern England* (Seattle: University of Washington Press, 2007), p.102. Keller quotes from W. Charleton, *Natural History of Nutrition, Life and Voluntary Motion* (London: Henry Herringham, 1659), A3V.

power of the nobility and the hierarchical ordering of society were necessarily natural and proper. For Glisson, animal œconomies were governed by necessity, not by helpful plans born of communication, understanding and judgement between the parts as they were in the social body.[21]

Although not entirely stable, the body politic model endured in its credibility throughout the seventeenth century and thus physiology remained politically important. Political arithmetic was radical in as far as it challenged this model. The partial reduction of individuals and the collective to numerical tables of quantifiable value rendered the members of the social body mobile and comparable to an extent that starkly contravened traditional understandings of their place and function. Whereas disciplinary practices could be applied to the traditional social groupings and vocational categories, the fabrication of statistically known aggregate vital phenomena to be regulated constituted a profound departure from the body politic model and the medico-anatomical knowledge that mutually informed it. Political arithmeticians attempted to render comprehensible and acceptable their construction of the relationship between the individual and the collective by using physiological analogies. Political arithmeticians had to convince a readership wary of political instability and unfamiliar with an arithmetical and tabular model of the commonwealth that such a model was useful and peaceable. As the traditional body-commonwealth analogy and the numerical-tabular model were radically at odds, in using both, political arithmeticians were opening the way to rendering the former mere metaphor.

Physicians and anatomists described their endeavours as being in the service of the preservation of mankind and toward the public good. Seventeenth-century English political rhetoric shared these concepts. My argument here is that the arithmetization and tabularisation of the commonwealth was undertaken in order to facilitate more effective governance in the name of fiscal strength and that this particular understanding of the public good was not taken up by physicians or anatomists. If we are to re-evaluate current enacted understandings of ‘public health’, it is essential that both words be fully historicized. One should avoid speaking in one breath of ancient plague quarantine practices, medieval drainage systems and nineteenth-century bacteriology as ‘public health’ programmes serving ‘the public’. It is precisely by attending to the differences in

[21] R. French, *William Harvey’s Natural Philosophy* (Cambridge: Cambridge University Press, 1994) pp 299-301.

historical understandings of the individuals and the collective being governed in the name of health that allows one to reflect critically upon the present.

The numerical and tabular model of the commonwealth

This section will give examples of efforts by political arithmeticians to make the collective more amenable to government with an objective of maximizing fiscal strength. I will show the partial reduction of the collective to numerical tables to have been the primary means to do this. I will explore how health was understood and what the purpose of healthcare was held to be within the political arithmetical treatises of Graunt, Petty and the later figure of Davenant. This will require me to give an account of their prescriptions and relate this to their descriptions of how the parts of the social body were and ought to have been governed. Petty's writings included (slightly vague) suggestions for a hospital-based interventionist medicine. No Restoration writer understood public health as a spatially dispersed set of preventative practices. There are no descriptions of the medical policing of domestic and educational spaces. Contemporary physicians continued to take the three-dimensional space of the body as their object. The construction of the space between the body and the environment as a point of English medical address was a late eighteenth- and nineteenth-century event.

In seventeenth-century England, the mathematics were those sciences concerned with number or magnitude – arithmetic, geometry, astronomy and music. Of these, the first two became linked to practices of state development through being applied to commerce, navigation, surveying land and estates and understanding how machines worked. The mechanical arts produced knowledge and demonstrated truths about the natural world through geometry, the science which investigates the properties and relations of magnitudes in space, as lines, surfaces, and solids. Commerce had long employed a different form of mathematics: arithmetic being the science of numbers, the art of computation by figures. It was to this second form of mathematics that Graunt, Petty and Davenant turned when attempting to render the inhabitants of the kingdom more amenable to regulation aimed at the maximization of fiscal strength. These political writers saw counting as an essential part of the practice of managing resources, thus their use of arithmetic and their descriptions of it as a superior form of truth production. The earliest extant use of the term 'political arithmetic' appears in a 1672 letter by Petty to his

close friend the diplomat and government official Sir Robert Southwell (1635–1702).[22] Petty defined political arithmetic thus: 'The Method I take… is not yet very usual; for instead of using only comparative and superlative Words, and intellectual Arguments, I have taken the course (as a Specimen of the Political Arithmetick I have long aimed at) to express my self in Terms of Number, Weight, or Measure; to use only Arguments of Sense, and to consider only such Causes, as have visible Foundations in Nature; leaving those that depend upon the mutable Minds, Opinions, Appetites, and passions of Particular Men, to the Consideration of others'.[23] Petty's eldest son later explained that the term political arithmetic was chosen 'in as much as things of Government, and of no less concern and extent, that the Glory of the Prince, and the happiness and greatness of the People, are by the Ordinary Rules of Arithmetick, brought into a sort of Demonstration'.[24]

Petty's friend John Graunt wrote that his observations related to trade *and* to natural history, and, that he had applied his 'Shop-Arithmetick' to both.[25] Yet, the arithmetization of nature that Graunt and Petty constructed was not the arithmetization of animal œconomies. Human bodies remained understood as the divine employment of geometry in the creation of the microcosm. What Graunt and Petty did was to construct *a wholly new dimension of nature* through arithmetic – life processes irreducible to the individual (or the family). These vital phenomena were new political objects borne of arithmetical reasoning that did not enter medical discourse. In *Natural and Political Observations* (1662), Graunt considered that he had 'reduced several great confused Volumes [the Bills of Mortality] into a few perspicuous Tables, and abridged such Observations as naturally flowed from them'.[26] These carefully assembled and easily understood tables were of great importance. They provided the ground for all his subsequent arguments in words. Graunt was proposing a politics based largely upon truths of a numerical and tabular form. He stated that his natural and political observations stood as 'truth' as oppose to 'conceits, opinions and conjectures' precisely in as far as they were derived from numerical tables. Graunt described them as revealing

[22]The Oxford English Dictionary Online www.oed.com [accessed 24 November 2009] s.v. 'Political arithmetic'. The OED cites 1672 Sir William Petty, *Let.* 10 Mar. in *Petty-Southwell Corr*. (1928) 60, 'I have left the Political Arithmetick'.
[23] W. Petty, *Political Arithmetick* (London: Robert Clavell, 1691 [1690]), preface.
[24] Ibid., dedication.
[25] J. Graunt, *Natural and Political Observations upon the Bills of Mortality* (London: Tho: Roycroft, for John Martin, James Allestry, and Tho: Dicas, 1662), the Epistle Dedicatory. Sometimes ascribed to William Petty.
[26] Ibid, the preface.

unexpected 'facts' to him, thus as having some kind of independence from his 'opinions' about the collective. He reported that he admitted *new knowledge*, 'as I found reason, and occasion from my Tables'.[27] These tables had been set out so that 'learned pens' might revise and augment them.[28] For Graunt, the reliability of the numerical table *per se*, as producer of natural and political truth, was not open to question. Rather, it was the particular numbers that might prove erroneous.

This reduction of the Bills was not merely a selective rearrangement of existing knowledge so as to enable ready comparison between years, seasons and parishes in respect to christenings and burials. The very nature of the collective was being reformulated. Graunt's numerical tables made possible wholly new political statements about vital processes. He brought forth anomalies and made predictions about health and sickness based on comparisons of a large number of recorded deaths by specified diseases. Health and sickness here was not of the individual human body as such, but rather of the metropolis at large. To take one example of this level of analysis, in order that people might 'better understand the hazard they are in' Graunt simply provided a list of notorious diseases showing the numbers of deaths by each one. The reader was to consider these figures relative to each other and to the sum total of deaths. Similarly, through an argument based on numerically-expressed relative proportions, Graunt sought to convince 'any man… well in his Wits' that his chances of dying a lunatic in Bedlam were one in a thousand. This was because Graunt had established that one person per 1,500 had done so over the last seven years.[29] Arithmetic thus enabled a new form of prognosis, wherein an individual was to reflect upon the sum total of recorded deaths by specified diseases. The behaviour of the individual in respect to their health was thus to be influenced in part by this knowledge of disease levels and patterns in the aggregate.

Graunt also used arithmetical reasoning to evaluate the reliability of diagnoses of cause of death by searchers and physicians.[30] Numerical tables and physiology were combined to promote marriage.[31] Graunt described the relationship between some diseases both in terms of the physiology of the human body and in terms of recorded aggregate numbers.

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[27] Ibid.
[28] Ibid.
[29] Graunt, p.31.
[30] Ibid, p.35.
[31] Ibid, p.37.

It was precisely through the latter that 'the state of health in the City may at all times appear'.[32] In addition to introducing vital objects, patterns and relationships existing at the level of the aggregate – Graunt's observations departed from medical discourse in another fundamental way. Daily habits, diet, bodily functioning, the consumption of medicines by individuals and healer-sufferer pastoral relationships were not of political arithmetical concern. *Natural and Political Observations* was not a treatise upon life and the living body. I read it as a book about death. Graunt's numerical tables and the arguments about the social body he based upon them concerned fatalities. This stood in direct contrast to contemporary medical and anatomical discourse, which only considered life.[33]

Death was, for Petty, an expense. As he succinctly put it, 'And suppose that by the advancement of the art of Medicine, a quarter part more may be borne and a quarter part fewer dye. Then the King will gain and save 200,000 subjects per annum, which valued at 20£ per head, the lowest price of slaves, will make 4 million per annum benefit to the Commonwealth'.[34] For Petty, the solution was to impose state control upon the healing services available to the people of England and upon what they paid for those services. He proposed 'comparitive and contrasted observations in hospitalls'.[35] The enclosed space of the wards, laboratories and botanical gardens of Petty's model hospital would produce a state-certified physician of piety, ingenuity and devotion, and, it would simultaneously produce reliable medical knowledge through recording and comparing the condition of patients and the effects of medicines in a co-operative, comparative and standardized fashion.[36] I want to emphasise that this state-directed healthcare was an unrealised proposal. Seventeenth-century English physicians were not instruments of the state. Paul Slack has noted that attempts by the crown to manipulate the licence-bestowing Royal College of Physicians were limited in success.[37] William Birken considers medicine to have been an attractive profession to pursue for dissenters excluded from priesthood.[38] Public office and medicine did not find alignment in seventeenth-century England. Petty himself made this point. That physicians did not

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[32] Ibid, p.18.
[33] See M. Foucault, *The Birth of the Clinic*: *An Archaeology of Medical Perception* (London: Tavistock, 1973) trans. by .M. Sheridan Smith. Foucault describes the construction of death in anatomico-physiological discourse – from around 1780 to 1820 – as a gradual process and as something located in localized parts of the body.
[34] *Petty Papers*, 2, p.176.
[35] Ibid.
[36] W. Petty, *The Advice of W.P. to Mr Samuel Hartlib for the Advancement of some particular Parts of Learning* (London, 1648), pp 16-17. Publisher not noted.
[37] *From Reformation to Improvement*, p.72n.
[38] W. Birken, 'The Dissenting Tradition In English Medicine of the Seventeenth and Eighteenth Centuries', *Medical History*, 39:2 (1995), 197-218.

have the same relation to the civic realm as other university-qualified practioners – clergy and lawyers – is evidenced by a statement Petty made in his *Anatomy Lecture* given at the Royal College of Physicians at Dublin in 1676. He wrote that medicine as an art was not respected and that this was because (i) the art of anatomy had been neglected for around 150 years (ii) there were not enough hospitals that were able to offer a genuine restoration to health and so attract sick people out of their (unpoliced) homes and (iii) because medicine was not aligned to the legitimacy and authority conferring state. Petty was clear on this last point:

> A Third Reason [medicine is held in contempt] is because Phisitians are not qualifyed as Divines, Lawyers, and Soldiers are. For all those are Instruments of Government and are paid by the State; and the People must have such divines, Armyes, and Administrators of Justice as the State apoints, and the people must pay them what the State pleases. Whereas Phisitians have onely their personall art to make their fortunes by, which as the world goes is better done by Craft; for in medicine there is an Art as well as Craft, and the latter is more profitable than the former.[39]

Petty was concerned for the sustainability of the whole by ensuring an efficient and equitable relationship of parts described through number. He calculated that a tenth part of the commonwealth did not contribute to the whole and were thus 'supernumerary'. That nine-tenths were able to support a begging and stealing one-tenth with food and raiment meant that they produced an 'overplus'.[40] Similarly, using unpublished arithmetical measurements and calculations by the herald Gregory King (1648-1712), Charles Davenant reconstructed the parts of the collective and their relationships to each other. Davenant described the members of the commonwealth as improperly and dangerously divided into 'two ranks of Men', these being the 'Debtors' and the 'Creditors'.[41] Those individuals lending money to the state were the creditors, who 'like their Condition and think themselves at ease'. The majority of the public were those that King had termed the debtors. That is, they paid high taxes to a state that needed to service a massive national debt. This majority comprised 'all the Landed Men, All Merchants likewise who pay Customs, and all Shop-Keepers and Retailers'. The debtors saw the high taxes they paid pass into the pockets of indolent and selfish individuals via a government that only served the interests of the latter. This offended Davenant's civic

[39] *Petty Papers*, 2, p.176.
[40] Ibid, pp 12-13.
[41] C. Davenant, *An Essay upon the Probable Methods of Making a People Gainers in the Ballance of Trade* (London: James Knapton, 1699), p.123.

(or humanist) republican sensibilities. He wrote that idleness and a devotion to one's own advantage or welfare to the exclusion of regard for others went hand in hand with the consumption of luxury.[42] The traditional vocational groups and social categories were retained in Davent's descriptions of the social body, yet the relative value and utility of individuals and their families was now to be assessed largely in terms of their drain upon or contribution to fiscal strength.[43]

The continued dominance of the traditional body politic model

The quantification, comparability and mobilization of the parts brought about by largely reducing the commonwealth to numerical tables was understood by political arithmeticians as the most effective means to maximize fiscal vigour. The traditional body politic model did not lend itself to this. Graunt never employed the traditional body politic model when directly addressing commercial strength. The political arithmetical writings of Petty used physiological metaphors when specifically addressing fiscal processes only once: Petty appealed to the circulation of the blood when making an argument about the regulation of money flows.[44] Even as they pointed the way towards its dissolution, Petty and Davenant continued to employ the body-commonwealth homology. In his posthumously published work *Political Arithmetick* (1691), Petty employed the Harveian model of nutritive circulation when arguing that there was 'Mony sufficient to drive the Trade of the Nation'.[45] For Petty, the quicker the flow of money around the commonwealth, the less money was needed in order to urge onward the buying and selling of commodities. He wrote that 'if every Man did pay his expense weekly, and that the Money could circulate within the compass of a week, then less than one Million [pounds] would answer the ends proposed.'[46] However, due to hoarding, plus the fact that housing rents were paid in large quarterly sums and land rents in even

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[42] *Probable Methods*, p.102.
[43] This is illustrated by 'A Scheme of the Income and Expences of the Several Families of England, Calculated for the Year, 1688' in C. Davenant, *Probable Methods*, between p.16 and p.17. The table was drawn up by Gregory King.
[44] From the early 1650s through to the mid 1670s, fellows of the (Royal) College of Physicians and Oxford University discussed and argued Harveian physiology, and placed it within a new mechanical-corpuscular model that became dominant. The circulation of the nutritive blood was an accepted matter of natural fact in late seventeenth-century England and the money-blood analogy was a common component of Restoration body politic models . The natural fact of the circulation of the blood had began as a radical statement about bodies in the early seventeenth century and through a process of conflict, contestation and discontinuous and opportunistic alliances between political and medical practitioners became by the mid-seventeenth century the grounding principle upon which all models of the body were to be built. See R. G. Frank, *Harvey and the Oxford physiologists* (Los Angeles: University of California, 1978).
[45] *Political Arithmetick*, pp 110-112.
[46] Ibid.

larger half-yearly sums, six million pounds were needed 'to make good the three sorts of Circulations mentioned'.[47] His calculations of the due and efficient quantities of Restoration coinage – understood in terms of circulating flows – served as the basis for subsequent politicial prescriptions regarding the competency of different tradesmen and their appropriate wage levels. In *A Treatise of Taxes and Contributions* (1662), Petty employed the body politic model as part of his argument that the number of retailers across England should be reduced. He described the retailers as performing 'subdistributions' of foodstuffs and manufactured goods to the remote parts of the kingdom while not being producers. He considered a large proportion of them as 'yielding of themselves no fruit at all, otherwise then as veins and arteries, to distribute forth and back the blood and nutritive juyces of the Body Politick, namely the product of Husbandry and Manufacture'.[48] To give one further example of his use of the physiological model, when Petty suggested that the actions of merchants should not be interfered with unless imports should be found to exceed exports, he asserted that trade should be governed as one would a natural system. 'We must consider in general, that as wiser Physicians tamper not excessively with their Patients, rather observing and complying with the motions of nature, then contradicting it with vehement Administrations of their own; so in Politicks and Oconomicks the same must be used'.[49]

Writing at the close of the century, Charles Davenant's definitions of the public good and prescriptions for political health rested as much upon the body-commonwealth analogy as they did upon tabular and numerical proofs. Davenant described the commonwealth as a body of distinct and interrelated parts, subject to health and sickness, strength and weakness, restoration and decay, obstruction and flow. He wrote of the application of fiscal and political remedies to the various distempers of which the commonwealth was incident. In the introduction to his treatise *The Probable Methods of Making a People Gainers in the Ballance of Trade* (1699) Davenant stated that,

'It shall not here be argu'd, whether the Skill of Physick be now brought to Perfection, or whether it is yet capable of further Improvements; but this may be safely pronounc'd, That the Knowledge of the Sinews, Muscles, Arteries and Veins, with the late discovery

[47] Ibid.
[48] W. Petty, *A Treatise of Taxes and Contributions* (London; Robert Hartford, 1677), p.11.
[49] Ibid, p.41.

of the Circulation of the Blood and all the Parts of Anatomy, conduce very much to render this dark Science more plain and certain.

In the same manner, such as would understand the Body-Politick, its true Constitution, its State of Health, its growth or Decay, its Strength or Weakness, and how to apply Remedies to the various Distempers to which it is incident, must study and look narrowly into all the distinct parts of the common-wealth, its Trade, the Current Money, (which is its flowed Blood) the Arts, Labour and Manufactures, and the number of its People; with many other things which altogether are the Members of which the great Body is compos'd.'[50]

Conclusion

This article has demonstrated a reinvention of physiology as a device for governance from around 1660 to 1680 and has argued that this was something that resulted from the appropriation of accounts of the animal œconomy by political arithmeticians. The constant interplay between animal and political arithmetical œconomies in the sense of resource management shown here did not feature in medical discourse until much later. Physicians did not take up the quantitative gloss provided by political arithmeticians. I have argued that medical discourse was not addressed to fiscal strength and that physicians were not instruments of the state. Restoration anatomists, physiologists and physicians understood the regulation of bodies in different ways to the nascent biopolitics of political arithmetic. They considered the body a work of divine geometry (rather than arithmetic) and sought to know and cure it in order to follow Christ's healing example and (in light of the importance of the body-commonwealth analogy) to ensure stability and harmony through the maintenance of hierarchical order and the correct form of political and religious government. Lastly, medical governance took a pastoral form, rather than the disciplinary mode of the workhouses often referred to by political arithmeticians or the regulation of statistically known life processes. Biopolitics was not a successful enterprise in seventeenth-century England.

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