



The first part of the proof shows that the set of all
  $\mathbb{R}$ -linear maps from  $V$  to  $V$  is a vector space over  $\mathbb{R}$ .
 This is done by showing that the sum of two linear maps is
 linear, and that the scalar multiple of a linear map is
 linear. The second part of the proof shows that the set of
 all linear maps from  $V$  to  $V$  is isomorphic to the
 matrix algebra  $M_n(\mathbb{R})$ . This is done by showing that
 the map  $T \mapsto [T]$  is an isomorphism between the
 space of linear maps and the matrix algebra.

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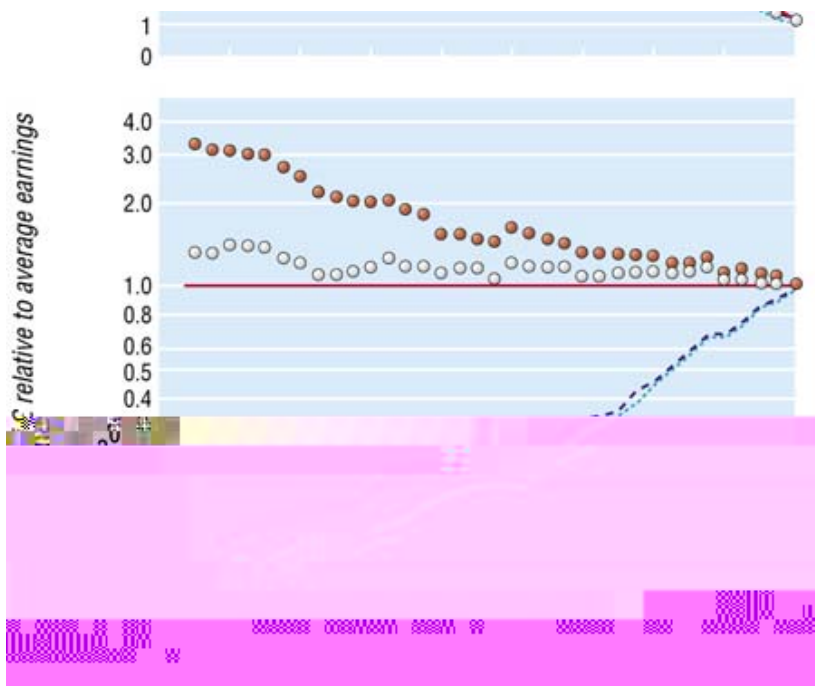
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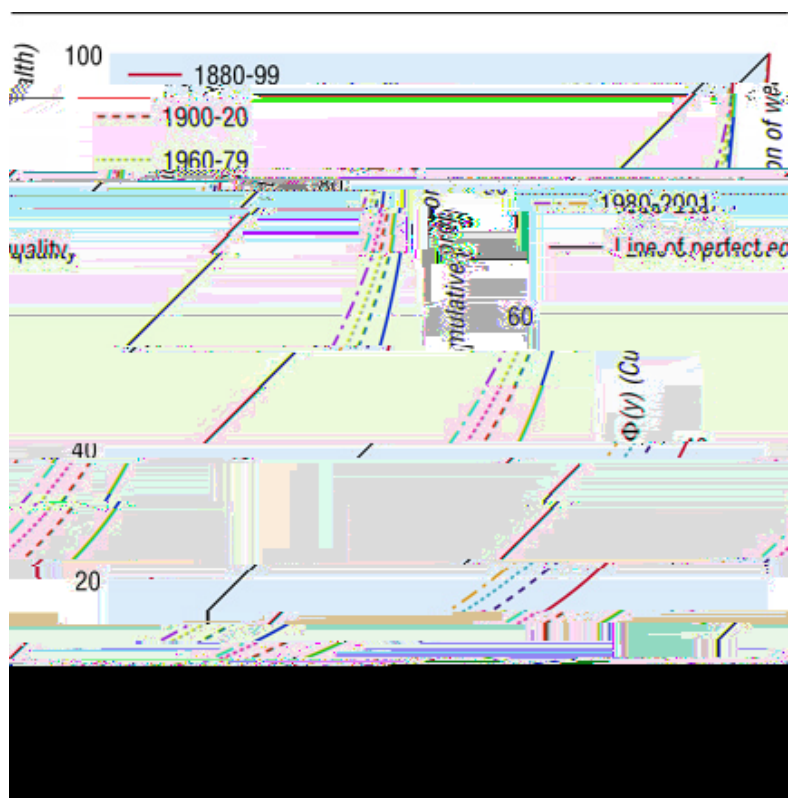
likely to talk shop and trade new information, theories, and tricks of the trade.<sup>19</sup> In the second half of the 19th century, James Paget did not cease to talk shop, even in old age, but he accompanied it with an extensive and lucrative private practice (see box).

#### The finances of Sir James Paget

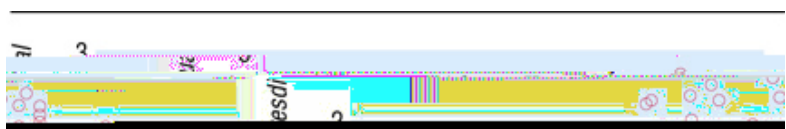
Born in 1814, Paget qualified as a doctor in 1836, aged 22. His early earnings were unimpressive, about £8/year to start with, and his largest income between 1836 and 1843 was £23 13s<sup>20</sup> (p 188). By 1846 he was earning about £50/year,<sup>21</sup> but until 1850 his income never exceeded £100 (p 188).<sup>21</sup> In his memoirs, he commented (on p 193) that, "If I had died before I was 47 [in 1861], I should have left my wife and children in extreme poverty. Before this time I had not been able to save a shilling ...".<sup>20</sup> Paget's private practice started in 1851, and initially his income was £400/year,<sup>20</sup> after which it "gradually and, with one trivial exception, every year increased till it exceeded £10 000 [year]," resulting in what he himself described as "the most lucrative surgical practice in London" (all on p 189). After a life threatening episode of septicaemia in 1871,<sup>22</sup> Paget stopped operating, after which his income "fell at once to about £7000, and then slowly decreased" (p 189). Paget had an extremely fashionable practice, not only being surgeon to the royal family, but also treating intellectuals such as George Eliot and G H Lewes. Paget's income was not acquired lightly, but was accompanied by a heavy workload. He visited patients between 8 00 am and 10 00 am, carried out 15-20 consultations at home between 10 00 am and 1 00 pm, then visited the hospital for one and a half to two hours, after which he visited more distant patients. A typical working day in his practice was 11-13 hours, with letter writing and other administration after dinner. He estimated that he travelled 5000-8000 miles (7500-12 000 km) a year visiting patients, often by train.



The relative worth of the pound sterling from 1830 to 2002. Top: Relative purchasing power of the pound (2002=100). Bottom: Purchasing power of the pound in each year, relative to average earnings (=1)



Lorenz curves for describing inequality.<sup>14</sup> The lines show the proportion of the total wealth ( $F(y)$ ; cumulative proportion of wealth; vertical axis) owned by the poorest percentage of the total population ( $F(x)$ ; cumulative proportion of population; horizontal axis). For distinguished doctors dying in 1880-99, the poorest 50% of the population therefore owned only 7.4% of the wealth, and the poorest 90% owned only 46.3% of the wealth. The diagonal shows the expected line when there is no inequality (and the Gini coefficient is zero). As lines move progressively towards the bottom right hand corner so inequality becomes greater (and the Gini coefficients increase)





Wealth at death (standardised residual on a log scale after regressing on linear and quadratic effects of year of death) in relation to age at death. The fitted line is a lowess curve

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# The wealth of distinguished doctors:

## Supplementary information

i) *Adjusting monetary values for changes across time.*

ii) *The criteria for distinction in nineteenth century doctors.*

## *i) Adjusting monetary values for changes across time.*

Although it seems relatively simple to adjust monetary values across time, that is far from the case in practice. The commonest method, of adjusting against a Retail Price Index, is problematic in a host of ways, not least that products are not the same across time (a car bought now has many technical features which would not have been present in a car bought 50 years ago), and neither are needs the same (candles represented a large and essential proportion of household expenditure in the 19<sup>th</sup> century, but are now bought mostly for decoration), nor opportunities the same (to discuss the relative cost of air-travel makes no sense in a 19<sup>th</sup> century context) [ ].

The differences between methods of adjustment can be seen by comparing two of them, adjustment against Retail Price Index (RPI), and adjustment against average earnings. Figure S1 shows the summary data of Routh [ ] for four different occupational classes from 1913 to 1978, expressed in three different ways. Figure S1a shows the unadjusted (raw) average annual earnings of the groups, and it is clear that salaries in all groups have risen substantially and continually, with the differential between the highest and lowest becoming smaller over time. When adjusted for purchasing power on the basis of the RPI (figure S1b), the same groups also show a rise across time, although proportionately it is far smaller than for the actual monetary values in figure S1a; nevertheless it is clear that the purchasing power of all occupational groups rose from 1911 to 1978, with differentials once more becoming smaller. Finally, the values in adjusted against average earnings in figure S1c show a very different picture. The average earnings of skilled and unskilled manual workers, who form a large proportion of the workforce and hence dominate the calculation of the average wage, remain relatively constant with adjustment for average earnings. However the earnings of professionals on such a basis fell between 1911 and 1978, reflecting reduced wage differentials.

The effect of the different methods of adjustment on salaries of medical practitioners can be seen in figure S2, which is necessarily on a somewhat smaller set of data points, but for the period 1911 to 1955 has the unusual advantage of including quartiles and the upper decile, giving a sense of the dispersion of incomes. Such data are not available after 1955, but for comparison purposes, a 'typical' GP salary for 2002 (see [www.pssru.ac.uk/pdf/uc2004/uc2004\\_s09.pdf](http://www.pssru.ac.uk/pdf/uc2004/uc2004_s09.pdf)) has been included and plotted at the median. Figure S2a (which is the same as figure 7 in the main paper) shows that salaries adjusted for RPI also rose over the same time period. Adjusting salaries for average earnings (figure S2b) shows a rather different picture, with the median salary remaining relatively constant, but the lower quartile rising, and the upper quartile and particularly the upper decile falling over the period 1911 to 1955. The salaries of doctors became more homogenous (less dispersed) during the early twentieth century, and it is unlikely that that effect was reversed in the later twentieth century. The wealth of non-hospital doctors has also been included in figures S2a and S2b for comparative purposes.

Choosing an appropriate method of adjustment for comparing the wealth of doctors is not straightforward. The entire population has become better off relative to the RPI, with most people having substantially greater purchasing power than in the 19<sup>th</sup> century. Of necessity, most people cannot have become relatively richer over the same time period, because incomes on such a basis are adjusted for the average. For assessing differential wealth and differential incomes, adjustment probably makes most sense in terms of average

earnings, both because, as Officer puts it, “Average earnings are a logical measure for computing relative value of wages, salaries, or other income or wealth.” [ ], and because, as Sir William Petty, the 17<sup>th</sup> century philosopher, said, “people [are] not so much interested in their absolute incomes as in their income relative to other people, for [it is] on this that their station in society depend[s]” [ ]. The main paper therefore compares the wealth of doctors on the basis of adjustment for average earnings. The key analyses and figures will, however, also be reported here on the basis of RPI adjustment, for the purposes of comparison.

*b) Comparison between different professions using average earnings.*

Figure S3 shows the equivalent figure to that of figure 6 in the main paper, but adjusted on the basis of average earnings, rather than RPI.

*ii) The criteria for distinction in nineteenth century doctors.*

An important question concerns whether the doctors included in the ODNB differ in their criteria for distinction from those included at the end of the 20<sup>th</sup> century. In particular, as it has been put in an editorial comment, “Our hunch would be that in the mid-nineteenth century it was mainly ‘society’ doctors and surgeons who got in; now it would be worthy medical academics pioneering new treatments or concepts, who traditionally haven't cared much for financial reward”. The question therefore is whether the richest doctors in the 19<sup>th</sup> century are marked by the absence of contributions to the academic, professional and intellectual practice of medicine.

This question has been assessed by considering the sample of all medically qualified individuals in the ODNB who died in the same decade as Sir James Paget (i.e. 1890 to 1899). They are shown in table S1, ranked from the least wealthy to the most wealthy.

At the top of the list is Sir William Jenner, Professor of Medicine at UCL, President of the Royal College of Physicians of London, and Physician to the Queen. However his medical achievements were substantial, and undoubtedly justify his inclusion in the ODNB, and also meant that he was much in demand as a physician in private practice. He wrote classical accounts of the treatment of rickets and of diphtheria, and differentiated typhus from typhoid.

Next in terms of wealth is Sir William Gull, whose medical achievements, amongst others, included the first descriptions of myxoedema and anorexia nervosa. Once again, diagnostic ability, coupled with the respect of peers, meant that he was far from being merely a society doctor. Gull and Jenner were in a class of their own in terms of their wealth, each leaving over £300,000.

At the top of the next group comes Sir Richard Quain, elected FRS for his work on fatty degeneration of the heart. Next in line is Sir William Bowman the ophthalmic surgeon and anatomist, whose name is attached to at least six anatomical structures, including Bowman's

of Surgeons, and was particularly well known for his textbook of surgery. Sir George Murray was, according to the ODNB, “primarily, a scientist and a collector, particularly of items for the museum of anatomy and surgical pathology”. Sir Thomas Spencer Wells, the gynaecological surgeon, also President of the Royal College of Surgeons is, of course, still remembered for his eponymous forceps which were a part of his many pioneering contributions to the newly emerging techniques needed in surgery of the abdomen. Finally, the fifth surgeon was Sir James Paget, whose contributions to medicine were manifold and began the present account. Of the non-surgeons, Sir William Roberts, was elected FRS for his multifold contributions to physiology. John Sutherland was an expert on sanitary science and public health. Perhaps the only two member of this group who could possibly be considered as ‘society doctors’ are Walter Hayle Walshe (although his students may well have disagreed, and he undoubtedly had a wide and well-respected knowledge of medicine and pathology), and William Sharp, whom although medically qualified, practised mainly as a homoepathist, and for whom the ODNB is relatively scathing about his achievements, and says that his, “...claim to recognition rests on his encouragement of the teaching of science in schools and for the establishment of local museums”.

Of the 13 doctors leaving between £20,000 and £50,000, most had substantial achievements. Sir John Bucknill was an influential and liberalising psychiatrist who was elected FRS; the

However Murrell, in 1879, was assistant physician at the Royal Hospital for Diseases of the Chest in the City Road ([www.victorianlondon.org/dickens/dickens-d.htm](http://www.victorianlondon.org/dickens/dickens-d.htm)), and is perhaps best known nowadays for being the first to introduce nitroglycerin into clinical practice for treating angina [ ]. In this case at least, therefore, it is clear that being a doctor to society was not the same as being a ‘society doctor’ in the pejorative sense.

*Doctors dying between 1990 and 1999.* The analysis of the previous section concentrated on the wealthiest of the doctors who died between 1890 and 1899. It would probably be invidious to attempt such an analysis for those doctors who died a century later, between 1990 and 1999, and are included in the ODNB. Nevertheless, table S2 provides a listing of those individuals for the convenience of the interested reader who might wish to work through them, comparing them with those who died a century earlier.

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*Figure captions.*

*Figure S1*

Income for Higher Professionals (●—●), Lower Professionals (■—■), Skilled workers (□ - - □) and Unskilled workers (○- - ○) . a) Raw income unadjusted for year; b) Income adjusted for Retail Price Index; c) Income adjusted for Average Earnings.

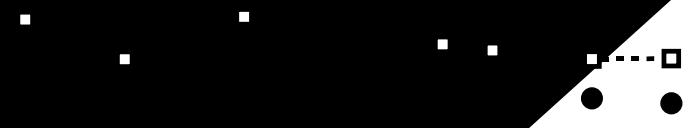
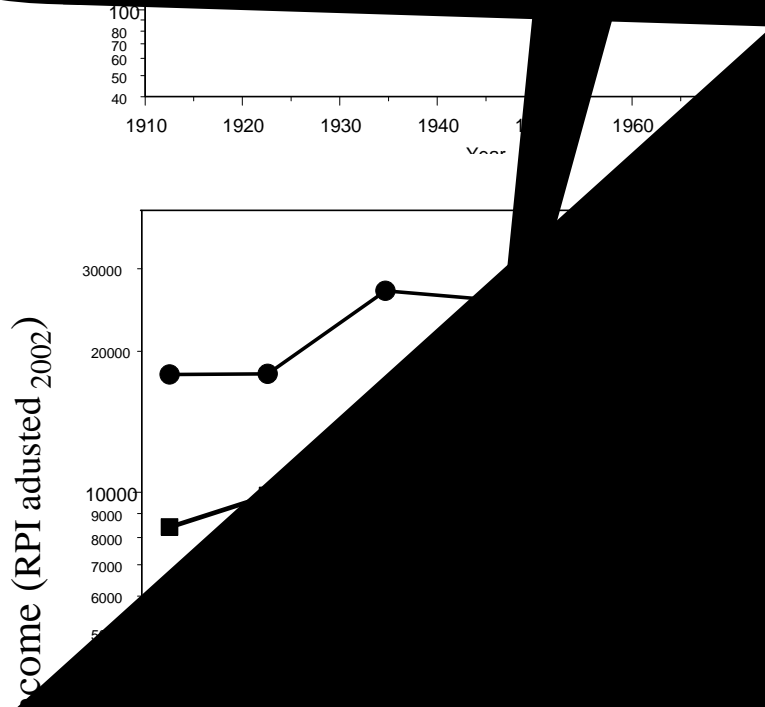
*Figure S2*

Wealth of medical practitioners in general (median (open squares), quartiles (open triangles), and upper decile (open circles)) for 1913/4, 1922/3, and 1955/6, and median wealth of distinguished doctors in the ODNB (hospital doctors (solid circles); other doctors (solid squares)). Distinguished doctors are plotted at approximate mid-point of working life. a) Adjusted for RPI, and b) Adjusted for average earnings.

*Figure S3*

Wealth at death of distinguished individuals in ten different occupational groups, as categorised by the ODNB, for those dying between 1880-99 and 1980-2001. Error bars indicate  $\pm$  one standard error. , Adjusted for average earnings.

S1b





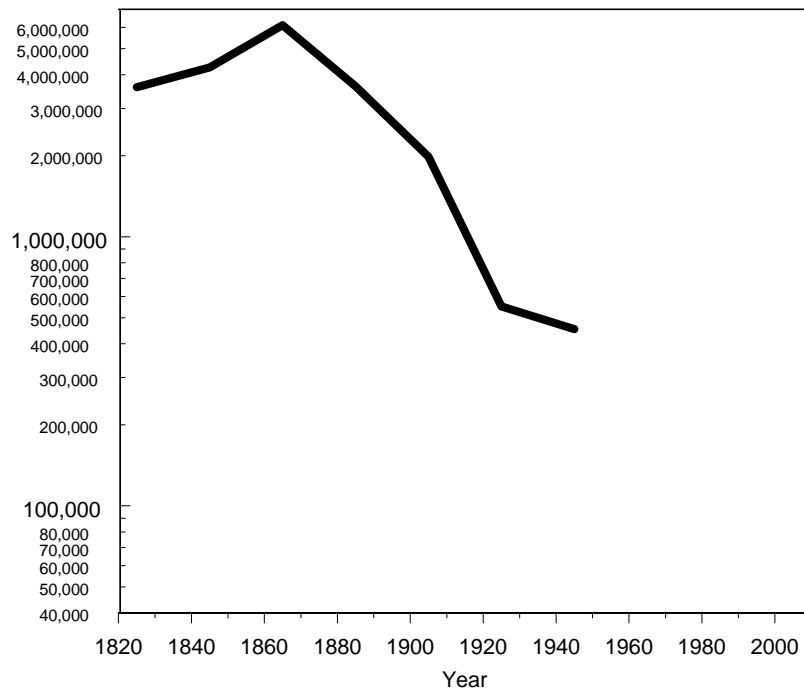


Figure S3

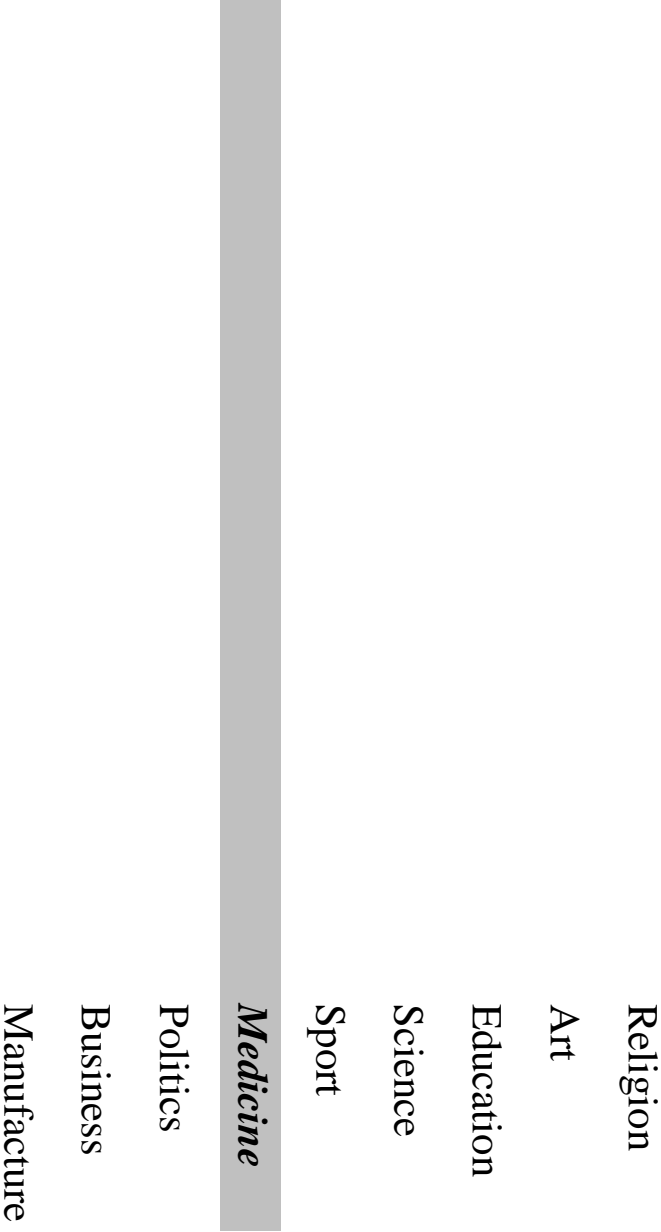


Table S1: Doctors in the ODNB who died between 1890 and 1899, ranked by wealth.

<i>Birth</i>	<i>Death</i>	<i>Wealth at death (£)</i>	<i>ODNB short description</i>
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Table S2: Doctors in the ODNB who died between 1990 and 1999, ranked by wealth.

*ODNB short description*

