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Business forms and business performance in UK manufacturing 1871–81

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Abstract

We explore which business forms were predominant in the later Victorian economy and why some forms were more effective among large British manufacturing firms during this period. With a dataset of 483 manufacturing firms in 1881 that either employed at least 1000 or had done so a decade earlier, we find that the great majority were partnerships. Public corporations attained higher capital–labour ratios and stronger employment growth than other business forms. The separation of ownership from control was most effective where it was most thoroughly practised, as by public, in contrast to private, corporations. Engineers were frequently encountered in all business forms and associated with expanding employment. But the large public manufacturing corporations employed almost twice the proportion of engineers and professionals in top management as other enterprises. Family firms, proxied by heirs, were present in management of three-quarters of partnerships but in only one-third of public corporations. Heirs reduced the employment growth of the firm, whereas engineers boosted it. Lords, mayors, and landed wealth in management were also associated with faster employment growth of enterprises.

KEYWORDS

business performance, corporations, partnerships, manufacturing, engineers, Victorian economy

Large databases can modify or transform understanding of economic or business history. The lack of them can lead to the neglect of business history as a research approach by other business disciplines.[1] The recent Maclean et al. large database of the Rowntree network, mapping interwar British firms' engagement in management education, exemplifies the possible links of history with other business disciplines.[2] Such data can help dispel deep-rooted interpretations of the historical extent and interest in management theory.[3] Other recent databases contributing to the reinterpretation of economic or business history or even management theory include the Bennett et al.'s *British business census of entrepreneurs, 1851–1911* (BBCE), derived from population censuses, and one by Acheson et al. principally based on post office directories.[4] Acheson et al. maintain that they are remedying the lack of large-scale data that has impeded understanding the role of private partnerships in economic development. In this paper, we use our database of all large British manufacturers employing 1000 or more employees in 1871 or 1881 to examine the development and performance of business organizations. We find the various arrangements of ownership and control associated with dissimilar corporate growth rates.[5]

The UK was the first industrial nation but no longer so clearly a leader by the late Victorian period. Most recent discussion on the strengths and weakness of the manufacturing economy of those years has focused on publicly quoted businesses and their managers.[6] Some of these were closely held, family firms or partnerships, often accused of being responsible for supposed British economic decline.[7] Victorian industrialists in these enterprises allegedly diverted their energies into country estates and their gentrification.[8] These generalizations, when not covering public corporations, are based on case studies or geographically small samples.[9] Our database provides sounder evidence for large manufacturing firms.

We show that, among the largest manufacturing businesses in 1881, the most common legal form of enterprise was the unquoted partnership, not the public corporation. Yet until the recent Acheson et al. work on Glasgow,[10] these had not received the attention of public corporations, which Shannon criticized for a high failure rate.[11] We find that family firms, proxied by heirs – present in management of three-quarters of partnerships but in only one-third of public

[1] Perchard et al., 'Clio in the business school', contend that the focus on numerical data led to the discipline of entrepreneurship largely neglecting business history as a research approach.

[2] Maclean et al., 'Management learning'.

[3] Maclean et al., 'Methodological openness'.

[4] Acheson et al., 'Persistence of partnerships'.

[5] Fama and Jensen, 'Separation of ownership and control'. The 'historical cognizance' of Kipping and Usdiken, 'History in organization', recognizing the limits of generalizability due to historical context.

[6] Acheson, et al., 'Corporate ownership and control'; eisdem, 'Corporate ownership, control and firm performance'; Aldous et al., 'Was Marshall right?'.

[7] Aldcroft, 'Entrepreneur'; Chandler, *Scale*; Lazonick, *Organization and technology*; Levine, *Industrial retardation*; Wilson, *British business history*, pp. 117–8.

[8] Wiener, *English culture*.

[9] For example, Chandler (*Scale*, p. 242) focused on Cadbury and Imperial Tobacco for his account of the shortcomings of British business. Cadbury was too small to enter the present data set and the British firm (also too small to be in the employers of 1000 or more in 1881 or 1871) that was to become Imperial Tobacco, subsequently, was sufficiently speedily innovative to obtain the first licence for the fundamental Bonsack cigarette machine (Alford, *Wills*, p. 170), ahead of Duke's American Tobacco, which Chandler's case study grossly mischaracterizes (Hannah, 'Whig fable').

[10] Acheson et al., 'Persistence of partnerships'.

[11] Shannon, 'The limited companies of 1866–83'.

corporations – did indeed reduce the employment growth of the large British firm. In our population only one-quarter were widely held public corporations. In fact, 9 per cent were, in effect, private companies, by the legal definition current from 1907 (had no more than 50 shareholders nor a public issue).

In the decade after 1871, the largest public corporations in British manufacturing increased in number and mean sizes at the expense of partnerships.[12] These public corporations attained higher capital–labour ratios than other types of business, reflecting cheaper access to capital and achieved stronger employment growth (when a range of controls are utilized) relative to partnerships, private corporations, and sole traders.

Most large manufacturing businesses in whatever legal form derived some advantage from human capital in top management, by employing graduates and a substantial proportion of engineers. With these, and when the enterprises were vertically integrated outside manufacturing, they grew employment faster. But large public corporations hired almost twice the proportion of engineers and professionals in top management as other enterprises. They were therefore likely to be better managed and expand more rapidly. Even so, after controlling for human capital, public corporations increased employment faster than other types of big firms. The large closely held manufacturing corporations did not match the employment growth of public corporations; their performance reflected the weaker divorce of ownership from control than in public corporations. Although the management of private corporations had five times more landed wealth than average, there is no direct evidence that management interest in landed wealth discouraged employment growth in any business type. On the contrary the indications are consistent with resources flowing from land to manufacturing business.

In the following section we discuss the database, and then we outline the distribution and evolution of different legal forms of large manufacturing enterprises in 1871–81. Next, the categories are considered in more detail to explain the pattern of change. We examine the human capital in management teams of these large firms and then the characteristics and distribution of founders, family managers, and professionals. Having established the different characteristics of legal forms of enterprises in the period, we assess whether these stimulated or permitted different behaviours, as predicted by agency theory. Finally, we test and quantify the alleged nepotism of the family firm and the power of landed wealth that have been at the root of many criticisms of the late Victorian economy.

I | DATABASE

The database utilizes the British Business Census of Entrepreneurs (BBCE), which identifies manufacturing employers in 1881 and 1871 from original population census manuscript returns.[13] From these were selected all manufacturers returning 1000 or more employees. Large firms, especially

[12] In British English, the term 'corporation' was more commonly used of municipal bodies than business firms ('corporation stocks' on the London Stock Exchange were municipal bonds). We adopt the common American usage of the term 'corporation' here as a synonym for what in British English was more fully described as the joint stock limited liability company. Simply using the word 'company' would fail to distinguish such entities from the many UK (and some US) companies that were unincorporated partnerships.

[13] Bennett et al., *British business*; eisdem, *Age*. Data guide and publications using BBCE at www.bbce.uk. Hannah and Bennett, 'Large-scale Victorian manufacturers'. The Hannah and Bennett data are here supplemented by 45 other firms which employed 1000 or more in 1871 but fewer than that by 1881.

those incorporated, were least likely to respond.[14] Railways were the largest employers and non-responders, but the data set includes only manufacturing employees in 13 large railway-owned workshops. Newly searchable, continually expanding databases of contemporary newspapers; already fully searchable parliamentary papers; *Grace's Guide* (https://gracesguide.co.uk); the *Dictionary of Business Biography*; and the *Directory of Directors* allowed infilling for British non-responders, and for the largely destroyed Irish census records, to cover the whole UK.[15] Searching the factory visits by engineering institutes, factory inspectors, royal commissions, parliamentary select committees, journalists, and foreign dignitaries, with terms such as 'largest factory' and '000 hands', also provided employment data.

To measure management skill, professionals such as lawyers are identified in BBCE and elsewhere. Some respondents self-identify as engineer in census returns, while others have been identified as members of the Institute of Mechanical Engineers, the Institution of Civil Engineers, or smaller societies of gas or telegraph engineers, etc.[16]

Firm names do not always permit classification by legal form. A 'Company' may be an entity incorporated by statute, royal charter, or registration, but a few are also partnerships, sometimes issuing shares under a trust deed. The suffix 'Ltd' (for 'limited') unambiguously denotes incorporation, though statutory and chartered corporations possessing limited liability were not required to use it. Stock exchange directories and numbers of shareholders published by the Companies Registry in the year after registration provide reasonable guidelines for distinguishing public from private corporations. Partnerships can only firmly be identified when partners chose to advertise changes in newspapers, or in other public statements (such as commercial trials or giving evidence to select committees or royal commissions) or, occasionally, in wills or census returns. Our classification of any firm cannot always be guaranteed correct but will be broadly plausible. A full list of the firm names with all their data used later in this article is provided in the replication package.

Easily the greatest number of large manufacturing firms were in cotton textiles and in iron and steel (table 1). Public corporations dominated iron and steel (along with chemicals and railway engineering). Partnerships elsewhere, including cotton textiles, were the most common form.

II | THE STAGES OF CORPORATE EVOLUTION

Output growth required, and legislative change facilitated, shifts in organizational and legal forms by large British manufacturing firms. Sometimes sequential, the possible forms were sole proprietorship, family, partnership, private company, public company, and usually later multidivisional/international. Across the British economy at any time, firms were in different stages of this notional progression. Transitions by 1881 were generally in the anticipated directions. Of the 52 sole traders of 1871, 15 were partnerships by 1881, 28 of the 328 partnerships of 1871 were private corporations in 1881, and 32 were public corporations, while 12 of the 23 private corporations of 1871 were public corporations in 1881 (table 2). However, of the 75 public corporations in 1871, none had reverted to private corporation or partnership form in 1881, though one (James Shaw) had reverted

[14] Bennett and Hannah, 'British employer'.

[15] Searches made up to June 2021.

[16] From mention in obituaries from those institutions in *Grace's Guide* substantially, not from full institute membership lists.

TABLE 1 Industry and legal form of large manufacturing firms – 1881.

Industry	Legal form 1881					
	Private corporation	Public corporation	Government corporation	Partnership	Sole trader	Total
Iron and steel	15	41	0	34	7	97
Bricks pottery glass	0	1	0	8	0	9
Paper printing books	3	1	0	7	1	12
Drink	1	2	0	4	1	8
Food	0	2	0	6	1	9
Footwear	0	1	0	4	0	5
Clothing	2	2	1	19	1	25
Shipbuilding and marine	2	5	1	25	2	35
Railway engineering	0	21	0	7	1	29
Textile machinery	0	4	0	8	1	13
Other engineering	3	6	1	8	1	19
Cotton	11	12	0	55	12	90
Wool/worsted	0	4	0	21	4	29
Linen flax jute	4	5	0	31	4	44
Silk lace carpets	0	2	0	15	3	20
Textile finishing calico printing, dyeworks	1	0	0	14	0	15
Gas chemicals	0	3	3	0	0	6
Other chemicals	2	8	0	7	1	18
Total	44	120	6	273	40	483

Source: Authors' database.

TABLE 2 Manufacturing employers with 1000 or more employees in 1871 and 1881.

		1881					
		Sole trader	Partnership	Government	Private corporation	Public corporation	Total
1871	Sole trader	29	15	0	5	3	*52*
	Partnership	10	258	0	28	32	*328*
	Government	0	0	5	0	0	*5*
	Private corporation	0	0	0	11	12	*23*
	Public corporation	1	0	1	0	73	*75*
	Total	*40*	*273*	*6*	*44*	*120*	*483*

Source: Our database. Note: In 1881 258 partnerships remained of the 328 in 1871, 10 had become sole traders, 28 became private corporations, and 32 became public corporations. In 1871, 15 sole traders had become partnerships, raising the 1881 total of partnerships to 273.

to a sole trader, and one was municipalized. Another company, Merry & Cunninghame (a long-established Scottish coal and iron giant), recorded in the table as a partnership in both years, had incorporated and gained a stock exchange listing during the decade, but reversed this by 1881. The reason for both (market) exceptions were similar and clearly demonstrated how not to go public. To unload their shares on the public at initial public offering (IPO), the owners had guaranteed

10 per cent annual dividends on the ordinary shares, notionally removing the downside risk for new public holders while leaving them, absurdly, with all of any upside. This unequal bargain proved unsustainable. The former owners refused to honour their guarantees when profits fell in the 1870s depression but offered instead to repurchase the firm. Hence, both public companies' temporary[17] reversion to partnership or sole proprietor status by 1881 depended on whether one or more guarantors (or other intervening venture capitalists) acquired control during the fraught default discussions.

Thus, the proportion of organizational forms changed among the manufacturing firms employing 1000 or more, as table 2 shows. In both years, partnerships were most frequent, but both types of corporations were increasing their share strongly at the expense of partnerships. Government and municipal entities in the large manufacturing employer category also increased slightly. All these governmental entities had access to bond finance (whether through central government or municipal issues) on stock exchanges and/or to tax revenues.[18]

Family firms were not a well-defined category, because there was no clear dichotomy between family ownership and professional management in nineteenth-century Britain. Families hired professional managers, and professional managers (and their sons) bought or negotiated ownership stakes or profit-related bonuses from established families. Thus, a family firm might be a family-only partnership, or it might admit outsiders as partners. The average age of our 483 manufacturing firms in 1881 was about 50 years, which implies typically they existed for around a quarter century of life before general incorporation legislation.[19] Inevitably – given the nature of capitalist ownership – they were initially structured around partners and their families, with a legacy in 1881 of inherited business. But the shift from the traditional forms to the greater efficiency of joint stock companies was rapid – by other countries' standards – and professionalization was proceeding apace. In the 1881 United States, by contrast, major manufacturers such as the Du Ponts, Carnegie, and the owners of Baldwin Locomotive, Standard Oil, and Singer Manufacturing were still far from their future New York Stock Exchange listings. On the rate of change of business form for the large firms we measure between 1871 and 1881, partnerships and sole traders fell by about 15 per cent of the total, being replaced by corporations. Extrapolating this rate forward, as suggested by the rising numbers of new incorporations and public offerings of shares, it would be seriously misleading to describe large firms in British manufacturing industry by the beginning of the twentieth century as Chandler's 'family capitalism,' on the basis of partnerships, sole proprietorships, and private companies allegedly unwilling to admit outside shareholders and professional managers.

III | PARTNERSHIPS

With a small number of owners, partnerships might reduce the agency problems of widely held joint stock enterprises, though perhaps with limited managerial skills pools. Partnerships were prohibited from having more than 20 partners (exceptionally banks were legally restricted to 8). Partnerships with more partners were required to incorporate (usually registering under the

[17] The firms were more sensibly refloated to the public in 1889 and 1891.

[18] Usually London. Glasgow Gas was an exception being only locally listed. Manchester and Birmingham Gas had securities listed both locally and in London. Municipalities could go bankrupt or have some assets foreclosed by quoted bondholders.

[19] Thanks to Peter Solar for help with this calculation.

Companies Acts), even if they did so with unlimited liability. Some partnerships, though not registered, remained in place despite their excess numbers. Mutual trust within families or between long-standing colleagues facilitated such arrangements. Moreover, since the 1865 Partnership Act, liabilities of sleeping partners who shared profits, rather than making fixed-interest loans, could more securely be limited.[20] Unfortunately, partnership agreements are normally only accessible if they are preserved in firm archives. However, Scottish agreements in the Register of Deeds show examples of managers being offered a 5 per cent share of profits to acquire a capital interest.[21]

A potential problem of partnerships was the succession, which could require some legal and managerial ingenuity. Normally, liability ceased with death unless agreed otherwise, as in some deed of settlement partnerships and other ad hoc cases. When the last surviving partner in the large Sheffield coal and iron firm, Newton Chambers & Co, died in 1869 during a long, bitter strike against a wage reduction, the executors decided to continue operating under the 1863 partnership agreement. The company recovered under George Walker (managing on behalf of the widow and sons), incorporated, and made a public issue 12 years later in 1881. By then, the firm had achieved a greater output and employed 3500 with wages 57.5 per cent higher.

By contrast, James Edward, proprietor of A D Edward & Co – a Dundee flax manufacturer returning 1700 employees in 1871 – failed to ensure orderly succession when he died in 1876, and his executors were less successful than Walker. They closed the Logie Works, laid off all employees, and struggled for more than a decade to realize some value by leasing or selling the properties. They retained physical assets, but they lacked organizational capabilities and were no longer a significant employer by 1881.[22] Failure to address a partnership's problems of succession might raise the cost of capital and reduce the prospects for enterprise planning.

Some partners were possibly less interested in expansion than were corporations. Those in the brewery Whitbread at their 26 July 1866 meeting were divided between family members loath to expand the capital and internally promoted professional partner families advocating growth.[23] It is unlikely that partnerships failed to convert to corporations because of unfamiliarity with the corporate form. The norm was for one (or more) partner in our firms to have considerable experience as shareholder(s) – indeed often as director(s) – in publicly quoted businesses, usually a local bank, insurance company, railway, and/or gas/water utility.[24] The likelihood then is that management preferences, rather than knowledge limitations, were decisive in determining choices of enterprise form.

IV | PUBLIC CORPORATIONS

Before the 1907 act clearly defined it, the term 'public company' was widely used to mean one with a public share issue and/or with numerous equity holders. However, it was sometimes more

[20] *The Economist* predicted the 1866 extension of limited liability to sleeping partners would be a 'dead letter', if not accompanied by publicity requirements similar to the Companies Acts or continental *commandites* (16 Aug. 1866, p. 94). Arguably it was. The private limited company was much preferred as a contractual form perhaps because it limited the liabilities of active managers as well as passive investors.

[21] Morgan and Moss, 'Listing the wealthy'.

[22] *Dundee Courier*, 10 Mar. 1879, 2 Oct. 1882, 4 Oct. 1888. The *Dictionary of Scottish Business Biography*, *1860-1960* says the firm was the third largest in Dundee, employing 2500.

[23] Ritchie, *An uncommon brewer*, p. 63.

[24] As shown by Skinner's *Directory of Directors* (1881) entries for all our identified partners and sole proprietors.

narrowly construed to mean statutory companies (typically railways, tramways, or gas companies), formed by private act of parliament, rather than registered under the Companies Acts.[25]

The rising proportion of corporations is in keeping with a growing recognition that they were superior to other ways of organizing big business in providing perpetual succession, and by attracting and locking in both capital and professional managers.[26] Access to stock markets may have reduced their capital costs. The 1855 facilitation of limited liability by simple registration and its consolidation in the acts of 1856 and 1862 – for the average large firm at about one-tenth of the former cost – accelerated adoption in the next generation, particularly for the modestly sized. A majority of the top 100 manufacturing employers were already incorporated by the 1881 census, though partnerships still dominated lower down, and were even more dominant among firms employing fewer than 1000.

Yet, some contemporaries noting the high failure rate of new limited companies still could decry the advantages of corporations.[27] Merry & Cunninghame, a Scottish coal and iron company with £850 000 paid-up capital and 4535 employees, was one of only two of our companies actually reversing incorporation and stock exchange listing. In 1875 the enterprise gained the reluctant consent of hundreds of shareholders for managers to repurchase it as a private partnership.[28] The mean employment growth of the two reversing companies was 9 per cent compared with 26 per cent growth for those who switched to public corporations and 22 per cent for our companies in total. Hence, as table 2 shows in 1881, the direction of travel in the late Victorian economy was generally from partnership to public company, wider shareholding, and stock exchange listing, though the pace of movement varied.

V | PRIVATE CORPORATIONS

The distinction between private and public companies was not statutory until the 1907 Companies Act. Then, all existing registered companies were by default classified as public (and legally required to publish balance sheets) unless they declared no more than 50 shareholders and no public share issue. The distinctive nature of private companies had long been recognized de facto. We have applied the 1907 definition retrospectively in separating public companies from private ones on the census days of 1871 and 1881, though the distinction was then merely conventional.

One characteristic of the UK corporate form was the exceptional ability of private limited companies to mimic features of partnerships while avoiding some of their liabilities and inconveniences.[29] Consequently, between 1871 and 1881, they were numerically the fastest growing of our categories (table 2). Until 1900 there was no requirement for private companies to expose their finances (other than the size of their share capital) to public gaze. They could raise capital

[25] See the 1866 Bill to alter and improve the Law relating to voting in Public Companies, Second Reading. https://hansard.parliament.uk/Commons/1866-04-18/debates/2e45b22f-4f46-4f39-b014-d429f5eb3539/SecondReading.

[26] Blair, 'Locking in capital'.

[27] Shannon, 'The limited companies of 1866–83'.

[28] Some former partners and managers guaranteed shareholder dividends of 10% and were unable or unwilling to redeem that guarantee in the 1870s slump. The Sheffield steelmaker Brown Bayley Dixon made a similar mistake, but in that case its 1880–2 voluntary liquidation and reconstruction resulted in a new incorporation.

[29] Given this flexibility, Guinnane et al. ('Putting the corporation in its place') overstate the importance of separate legal forms such as the German GmbH or French SARL, while underrating the ubiquitous acceptance of de facto private companies in Britain before they received formal legal recognition in 1907.

privately or on the stock exchange without losing control by the existing ownership. Illustrative is medical supplier Southall Bros & Barclays's 1898 share issue and incorporation, ensuring the Southall and Barclay families continued to hold all voting rights.[30]

In 1881, 27 per cent of our large manufacturing (public and private) corporations were private. Intermediaries advertised that incorporation facilitated but did not necessarily require divorcing ownership from control. Some standouts maintained the personal liability of partners was superior. James Templeton, the Glasgow carpet manufacturer who returned 1120 employees in 1881, passionately denounced limited liability companies, especially public ones. He asserted that all the alleged advantages of private companies could be achieved by the right partnership contracts.[31] Johnson suggests private corporations had a propensity to impose unconscionable costs on innocent third-party creditors.[32] Control could be maintained with dummy shareholders, bypassing the legal requirement of an initial seven shareholders. Full- or part-time company secretaries and accountants experienced in auditing were readily hired and solicitors developed a lucrative side-line in drawing up corporate articles of association, while specialist agents, such as London's Jordan & Co, offered streamlined registrations. With compliant fellow-directors, owners could obtain limited liability – and the right to issue debentures to provide more acceptable collateral for a private or bank loan, while retaining full de facto control. Partible shares enabled the giving or selling of participation to heirs, relatives, or senior managers without the disruption and expense of a new partnership agreement with every change. These private conveniences may have rendered the closely held private corporation less beneficial for the British economy than the public corporation. In the financially decentralized United States, informally traded shares not listed on major national exchanges were more common than in the UK and possibly were competently supervised locally.[33]

VI | MANAGERIAL HUMAN CAPITAL AND MANAGEMENT TEAMS

Firms of 1000 or more employees were not generally run exclusively by one individual but rather by a team – or by managerial hierarchies. Ideas on the manageable average number of subordinates to superiors have changed, possibly because information-processing machinery has now reduced the demand for middle managers. In 1881 lower managers (overseers and foremen) might supervise dozens, so a firm employing 1000 in total might have as few as 20 at that level. Graiciunas theorized that a manager should not have more than five direct subordinates, which would imply at least four middle managers in a firm employing 1000, with 20 lower managers.[34] In 1928 the director of the International Management Institute in Geneva, Lyndall Urwick, stretched that to six, drawing on military experience.[35] In senior management especially, relations with subordinates and duties are more complex and not reducible to arithmetic ratios. But in firms employing 1000 we sometimes found only two partners in senior active roles, so the total managerial personnel at all levels in such firms might be only 25/26. In larger partnerships, such as Salts of Saltaire,

[30] Foreman-Peck, *Smith & Nephew*, pp. 30–1.

[31] *Glasgow Herald*, 31 May 1898.

[32] Johnson, *Making the market*, pp. 103–233.

[33] See, for example, Lamoreaux et al., 'Financing innovation', on Cleveland.

[34] Graiciunas, *Relationship in organization*.

[35] Urwick, 'Manager's span of control'.

with 3200 employees in integrated worsted and alpaca spinning/weaving, there were, just before they incorporated privately in 1881, hundreds of managers.[36] It was quite normal for lower managers or foremen to be promoted to higher positions where their local knowledge trumped the possibly wider experience of external recruits. Joseph Armstrong (1816–77), after apprenticeships to various engineers, eventually rose to become responsible for employing 12 900 in operations and manufacturing in our period in all GWR railway workshops.[37]

We have defined the top managerial team to be ideally at least two for the smaller firms and no more than six for the larger.[38] Scaling to treat all possible determinants of performance equally, we assume a firm with two engineers among four assessed persons is as 'engineer-intensive' as a team of two with one engineer. For partnerships, the focus is on senior partners and/or those with large shares. For corporations, it is typically the chairman and his deputy or the managing director. Occasionally, a director identified as a dominant shareholder and sometimes a senior manager in none of those roles is chosen: for example, the locomotive superintendent responsible for a railway workshop, or a manager, said to run the company while the senior partner was away as, say, a member of Parliament (MP) or government minister in London.

Chartered accountants have been described as the 'priesthood of industry' in the late nineteenth and twentieth centuries, providing auditing, liquidation, consulting, and management services.[39] There were Scottish and regional English self-regulating accountancy bodies before the Institute of Chartered Accountants of England and Wales received its royal charter in 1880. Our firms include many accountants as directors, managers, and partners, but in 1871–81 it would be more accurate to describe engineers as the industrial ecclesiasts. They outnumbered accountants/bookkeepers in our population of business leaders by four to one and in the number of firms in which they were in top management teams (table 3). Some broader literature suggests this would have stimulated growth, praising engineers as increasing the economic pie, while stigmatizing lawyers, accountants, and their like as mainly concerned with dividing it.[40] It is not hard to identify Victorian lawyers and accountants thirsty for profitable business growth, but our findings are consistent with the more positive interpretation of engineers.

By the middle of the nineteenth century, engineers constituted around 20 per cent of all *Oxford Dictionary of National Biography* noteworthy individuals associated with science or technology[41] and were the most prominent patenting occupational category then and into the twentieth century.[42] Of the engineers in our 1881 manufacturing leader population, 39 per cent were in public corporations, though public corporations themselves were only one-quarter of the total number of our enterprises. One-third of engineers in our population were in the industrial category of coal, iron, and steel, and almost half in four other categories: shipbuilding, railway engineering, other

[36] Reynolds, *The Great Paternalist*, p. 285.

[37] Institution of Civil Engineers 1877 obituary in *Grace's Guide*. Our statistics include only employees in manufacturing.

[38] Though the number assessed also depends on the availability of information for some relevant individuals. A very few firms are represented by only one sole proprietor, even though we know the person is likely to have had some managerial help. www.getflow.com/blog/optimal-team-size-workplace-productivity. 'five person teams find the balance between members and communication connections' and 'When asked for their optimal team size, experts usually settle somewhere on the low end of 4–20.'

[39] Matthews et al., *Priesthood of industry*.

[40] Murphy et al., 'Allocation of talent.'

[41] Hanlon, 'Rise of the engineer.'

[42] Bergeaud and Verluise, 'A new dataset.'

TABLE 3 Skills in top management of large manufacturing firms – 1881.

	Engineer	Accountant	Lawyer	Chemist	Salesman	Oxbridge	Other university	Total
Private corporation	18	4	5	2	1	10	6	46
Public corporation	75	23	11	13	6	16	20	164
Partnership	84	16	9	10	14	27	51	211
Sole trader	11	1	2	0	1	5	3	23
State enterprise	5	0	1	1	0	0	1	8
Total	193	44	28	26	22	58	81	452

Note: Table 3 numbers for firms by category with at least one of the listed skills or backgrounds in the top management team. A firm may have more or less than one of these categories in top management, so the row totals may exceed or be less than the total of business type. There were 274 partnership firms in 1881 compared with 211 with the listed characteristics recorded here. The grand total (452) is less than the whole sample size (483), and 31 firms had none of these skills or backgrounds (483–452). For instance, the glass manufacturers Pilkington Bros, then a partnership, had none of these categories in the management team.

engineering, and machinery. By contrast the 90 cotton textile firms (the second-largest sector by number of large enterprises) employed only 4 per cent of our engineers. This may be because, unlike iron and steel, by now the textile industry had lost its position at the cutting edge of technology,[43] or simply because the textile machinery industry was sufficiently well established and innovative to provide solutions by trained installers without textile management's technical input.

Engineers, similar to accountants, showed versatility in spreading managerial ideas from successful firms through inter-firm and inter-industry mobility and consulting. Alexander Carnegie Kirk (1830–92), was manager of a major Clyde shipyard's engine works in 1874. His earlier career began with being apprenticed to Napier; then he served as a draughtsman for 6 years with Maudslay, Sons and Field; subsequently he was manager at Young's paraffin oil and chemical works for nearly 6 years; next he was manager to James Aitken & Co; and then he came to John Elder's.[44]

Until around the 1880s typically, membership of engineering institutions was not by examination at the end of training, but from mid-career peer assessment of the railways or bridges built or steam engines made.[45] Of our firms, 40 per cent recorded at least one engineer in their top management team (table 3 193/483). Gourvish finds similar professionalism in his study of the general managers of British railways (whose manufacturing workshops are also included in our population).[46] There were more than six times as many engineers in our top management teams as lawyers, which should have been good for economic growth according to Murphy et al.

The great majority of these top managers left school at the age of 14–16 years. Then, they either took a job (often a pupillage or premium apprenticeship with fees) or went to university (often at the age of 15–17 years with graduation before 21 years) or joined the family firm. Kirk probably paid a substantial fee for his premium apprenticeship training at Napiers (after an Edinburgh University arts degree and evening study at Leith Mechanics Institute), but by 1877 he had returned

[43] Mokyr, *Lever of riches*, p. 143.

[44] https://gracesguide.co.uk/Alexander_Carnegie_Kirk. Napiers was a leading light in Clyde shipbuilding at the Vulcan Foundry Glasgow.

[45] Guagnini, 'Worlds apart'.

[46] Gourvish, 'A British business elite'.

to Napiers as a senior partner. Very few top managers went to (generally free) board schools or their own factory schools. Also, not many went to 'public' (i.e. elite fee-paying) schools. Those that did favoured Harrow and Rugby more often than Eton. Commonly, top managers went to local grammar schools (then fee-paying mainly), but the dominant description in obituaries was 'privately educated'. This was usually not home tutoring but a small proprietary school (some boarding) run by a teacher with a reputation among local bourgeois networks. Some explicitly offered commercial subjects and or science/maths, as well as classics.

The dominant position in the literature is that all universities were better than no university, and they are sometimes implicitly ranked: continental European being the best, provincial or London UK next, and Oxbridge worst.[47] In some cases, our managers attended university without graduating, but it is not always possible to tell, and our measure is minimally a record of attendance, though frequently with evidence of graduation. Many future managers were sent as juveniles to France or Germany for some secondary or tertiary education or industrial/mercantile experience or to learn the language for commercial or other purposes. Most UK businessmen had not been to university. Up to 1886 64.2 per cent of Oxbridge graduates became clergymen and only 0.6 per cent businessmen.[48] It is therefore perhaps surprising that in the present sample 15 per cent had attended Oxbridge, and these graduates were in top management of 58 firms. Less surprising perhaps is that 19 per cent attended other UK universities and were in top management of 81 firms (table 3).[49] These percentages compare with the later but similar US figure of 39 per cent for about 300 CEOs with university education in 1900.[50] In both cases the group is mainly second- and third-generation businessmen, who were given options only available to an elite.

VII | FOUNDERS, HEIRS, AND PROFESSIONALS

The managerial top team could consist of founders, heirs, and/or 'professionals' (by which we mean all others: internal promotions or external recruits). There are totals of 483 firms and 1666 individuals running them, with a mean of nearly 3.5 leaders per firm. There are also fewer founders (223) than heirs (629) or 'professionals' (814). All individuals are identified by one of these three labels. In this classification we have tried to follow economic not legal realities. In practice most partnerships were founded by existing partners since each change of partner was legally, but not in economic terms, a new firm. Also, it is not always clear whether a son merely followed his father in the same firm or essentially transformed it. Someone with the same surname as a founder might be a professional not an heir: for example, a nephew recruited because of his skills and with no expectation of inheriting (though where distant relatives have inherited, they are noted as heirs). Public companies were not invariably managed by professionals. Where a founder of a firm converted to a public company, remaining a large shareholder and chairman or managing director, they are here counted as a founder. A sole proprietor is not necessarily a founder or heir. The individual may have been recruited as a professional and provided with a form of management buy-in, enabling paying off the founders' heirs out of profits.

[47] Chandler, *Scale*, p. 293; Pollard, *Britain's prime*, pp. 182–8.

[48] Anderson and Schnaper, *School and society in England*.

[49] Honorary degrees were common but not counted by us as degrees.

[50] Newcomer, *The big business executive*.

TABLE 4 Business forms and management in 1881.

	Founder	Heir	Professional	Total top	Employees	Management intensity
Private corporation	0.5	1.59	1.68	3.77	2051	544
Public corporation	0.36	0.63	3.23	4.22	2555	605
Partnership	0.55	1.64	1.03	3.22	1724	535
Sole trader	0.2	0.85	1.47	2.52	1746	692

Note: Average number in top management team per firm by institutional form in firms employing over 1000 in 1871 and/or 1881. Private corporations have on average 1.59 heirs in top management. Management intensity is average employees/total top management team. Professionals are defined as top management team members who are not heirs or founders.

As table 4 shows, there were fewer founders among sole trader leaders than in any other of the business forms.[51] Private corporations contrasted with public corporations in their lower number of professionals in the top management team and the greater likelihood of including an heir (table 4). Partnerships had the smallest number of professionals among their leaders and the greatest number of heirs. For the paucity of professionals, the average size of the enterprise cannot be the whole explanation, because partnerships averaged similar employee numbers to those of sole traders. Table 4 implies public corporations were less management intensive (605 workers per manager) than sole traders (692 workers per manager),[52] perhaps a reflection of the effectiveness of the greater proportion of professionals in public corporations.

VIII | PERFORMANCE

It is apparent that enterprise legal forms had different characteristics, but did these stimulate or permit different behaviours? The widespread diffusion of commercial knowledge might imply that entrepreneurs and firms, knowing all the options, chose their business form to optimize profits, efficiency, and growth so that enterprise form at the date we observe made no difference to profits, efficiency, or growth. No entrepreneur or manager could improve performance by operating with a different form.

Alternatively, entrepreneurs and managerial teams had diverse objectives, and managers and entrepreneurs who wanted an easy life would cluster in forms that did not drive them harder than they wanted, so some forms will be associated with less strong growth. Then, we would expect to find public corporations, working on behalf of shareholders, performing more strongly than partnerships, at least if agency problems were avoided. In this respect private corporations would be an intermediate case, between partnerships and public corporations. Sole proprietors' policy would be least constrained by the enterprise form but perhaps most constrained in their management capacity.

Since we lack output data for all this population, we approximated it by employment. In a competitive economy such as Victorian Britain in 1871–81, the growth of a firm's employment is a

[51] Sole traders could be former partners who had not replaced deceased or retiring founding partners or managers who had bought control from sole traders, partners, or their heirs. Sometimes, they bought with leveraged loans from family owners or others, akin to modern management buy-ins.

[52] This suggests we have not been misled by the better availability of leaders' names for public corporations to have overestimated their top team size.

TABLE 5 Large manufacturing business performance 1871–81.

Status 1871	Employment growth 1871–81	£ capital per employee (1881)
Private corporation	35%	166
Public corporation	24%	261
Government	26%	749
Partnership	15%	91
Sole	5%	88

Source: Authors' database.

TABLE 6 Percentage employment growth 1871–81 of large manufacturing enterprises by management team.

	Heirs	Founders	Professionals	Engineers
Some	12	27	19	23
None	27	13	17	11

Note: 'Some' and 'None' refer to firms with or without the management categories listed along the top table. Excluding zero employee figures from the growth calculations gives a qualitatively similar pattern of employment growth.

fair indicator of sales growth and therefore of competitiveness. Labour productivity is unlikely to decline. Therefore, output growth is usually equal to or greater than employment growth. Table 5 shows partnerships and sole proprietors in the largest manufacturing firms expanded most slowly – perhaps being least able to cope with large scale management. Despite the 1881 distribution (more than double the partnerships than public corporations), there was greater 1871–81 total employment expansion of public corporations (62 000 as compared with 56 000).[53]

Government employment growth in government-owned manufacturers and their high capital–labour ratio reflected primarily the performance of municipal gas enterprises and the royal dockyards. The two capitalist corporation forms differed in their growth rates and their capital per employee, perhaps because ownership was more divorced from control in the public corporation.

The capital–labour ratio was higher for public corporations as would be expected if stock market finance cost less than other forms. But characteristics may have differed simply because the enterprise forms were not distributed randomly over industries. If public corporations were concentrated in the largest, capital-intensive sectors, the high capital–labour ratios could be due to industry type rather than business form. The difference in growth sample means of corporation and non-corporation status does not necessarily indicate the effect of the corporation. Therefore, the regression analysis of tables 7–9 was undertaken to control for industrial structure and other influences.[54]

The family firm is rarely precisely defined but might be approximated by the presence of heirs in the total team and contrasted with (presumably dynamic) founders. Measuring their performance by employment growth in the descriptive statistics of table 6, heirs were indeed on average apparently a drag on growth. Enterprises with some heirs in management grew their employment on average by 12 per cent, whereas those with no heirs grew employment by 27 per cent. Founders in management – 27 per cent employment growth compared with 13 per cent growth for those with

[53] 120 public corporations in 1881 with a mean increase 1871–81 of 518 employees compared with 273 partnerships in 1881 on average increasing employees by 205.

[54] Variance inflation factors for all regression equations were low, indicating an absence of multicollinearity.

TABLE 7 Log capital–labour ratio, 1881, OLS regressions.

	(7.1)	(7.2)	(7.3)
Private corporation	−0.097	−0.0980	−0.099
	(−0.77)	(−0.78)	(−0.78)
Public corporation	0.267***	0.237**	0.237**
	(3.66)	(3.07)	(3.11)
State	0.214	0.124	0.167
	(0.37)	(0.22)	(0.28)
Sole trader	−0.073	−0.0753	−0.078
	(−0.51)	(−0.52)	(−0.50)
London stock market		0.126	0.156
		(1.22)	(1.47)
Employees 1881 (log size)			−0.111
			(−1.89)
Founder			0.004
			(0.08)
N	307	307	307
r^2_a	0.376	0.376	0.381
r^2	0.419	0.421	0.430

Note: Robust *t* statistics are in parentheses. Industries and constant are included but not reported. Partnership is the base business comparison. There are many zero or missing 1881 capital figures, reducing the effective sample size to 307 and eliminating far more partnerships than public corporations, but partnership numbers are still greater than public corporation numbers (133 versus 115). $^{**}p < 0.01$; $^{***}p < 0.001$.

no founders – conferred a boost. Professionals in total appeared to exercise little effect but some of them (engineers) did.

We hypothesized that legal status influenced the firm's capital–labour ratio. Raising capital was cheaper with public corporation status. The regression model to test for the impact of legal form on the log of capital–labour ratio (table 7, equation 1) controls for industrial structure (18 types of industry).[55] Equation 7.2 tests quotation on the London stock market and 7.3 tests scale effects measured by employment size to find out whether these were additional significant determinants of the capital–labour ratio, independent of enterprise legal form.[56] Also, the variable 'founders' in equation 7.3 might be expected to be a negative influence on capital if founders did not wish to lose control of equity.

These results are consistent with public corporations averaging 31 (= 100 (exp(0.267) − 1)) per cent more capital per worker than partnerships or other business forms in equation 7.1.[57] This is compatible with public corporations giving better access to capital. The variable 'founders' was

[55] There are many zero or missing 1881 capital figures, reducing the effective sample size to 307 and eliminating far more partnerships than public corporations, but partnership numbers are still greater than public corporation numbers.

[56] The correlation matrix in the Appendix shows, for eq. 7.3, the highest correlation was between 'corporation 1881' and 'London Stock Exchange' at 0.4586. Replacing 'corporation 1881' with 'partnerships' in the regression, 'London Stock Exchange' was still not significant, but all variables except 'government' were negative and significant. The correlation of 'partnerships' and 'London Stock Exchange' dropped to −0.35346.

[57] For the calculation see Halvorsen and Palmquist, 'Interpretation of dummy variables'. Econometric exercises in the appendix to relax exogeneity assumptions do not change the conclusions of the simpler approach.

statistically insignificant when added to the regression, as was size and London stock market finance.[58]

To assess what the public corporation coefficient might mean, suppose we could represent manufacturing production with a constant returns-to-scale Cobb–Douglas production function. Then, a 31 per cent rise in the capital–labour ratio, comparable to the abovementioned magnitudes for public corporations, with a capital coefficient of 0.33, would increase labour productivity by 10 per cent, other things being equal. When combined with our estimates of employment growth the greater relative output could be substantial.[59]

Adverse shocks affect firms differently by size, so a control for enterprise size must be added to estimate the influences on employment growth of enterprise form. As part of the process of creative destruction, smaller survivors will tend to be faster growers than larger enterprises that can absorb more mistakes (deeper pockets), or missed opportunities, and remain in business. Larger firms may also be closer to managerial constraints on growth, given the relative novelty of managerial hierarchies in large enterprises.[60]

We therefore adopt a pseudo-Gibrat specification.[61] Each firm's employment size this period, and therefore growth rate relative to the previous period, changes according to a random shock. The magnitude and frequency of past opportunities successfully exploited by an enterprise is measured by its current size. A run of positive shocks gives rise to a larger firm, and conversely, negative shocks create a smaller firm – or an exit.

This survivor bias implies that a dynamic industry population will show a growth rate of firms that is not simply random, dependent on the distribution of shocks, but also is faster the smaller the enterprise. Employment growth as a negative function of size is our basic equation, to which we add institutional, technological, and economic features of the firms.

The proportionate growth effect is excluded or is undefined for enterprises that enter or exit during the observation periods. In our sample, there are nine firms employing 1000 or more in 1871 and employing zero in 1881, with a total of 14 208 jobs in 1871. There are seven firms with zero employment in 1871 but at least 1000 in 1881, with a total 13 200 jobs. Three of the nine (apparently) exiting firms in 1871 were sole traders, five were partnerships, one was a private corporation, and none were public corporations. Public corporations had the most staying power (contrary to Shannon's concerns)[62] and sole traders the least. The partnerships' proportion of exits was about equal to their share in the 1881 largest manufacturers population. Three of the exiting firms, but only one of the entrants, were founder managed. Founder-managed firms were 8 per cent of the 1881 sample, broadly consistent with a similar performance to that of partnerships.

Managements are assumed to have chosen or accepted their legal form because it was compatible with permitting or causing desired performance objectives. Apart from size and industrial structure that could affect employment growth and need controlling, management skills and

[58] The latter may simply be because closer regional stock markets such as Manchester or Glasgow were a favoured substitute for distant London among many industrialists. Fewer of our firms operated in southern English counties than in Scotland or Lancashire

[59] $\text{Log}(Y/L) = \log A + \alpha \log(K/L)$, where α is the output elasticity of capital, Y is output, K is capital, and L labour. Supposing that greater employment growth over the decade was 15% and labour productivity growth was 9%, then relative output growth was 24%.

[60] Booth ('Occupations', p. 336) noted the revolutionary growth of professional occupations in such hierarchies in 1851–81.

[61] Sutton, 'Gibrat's legacy'; Geroski et al., 'Are differences in firm size transitory?'.

[62] Shannon, 'The limited companies of 1866–83'.

TABLE 8 Employment growth 1871–81, OLS regressions.

	8.1	8.2	8.3	8.4
Private corporation 1871	0.225	0.218	0.205	
	(1.36)	(1.53)	(1.53)	
Public corporation 1871	0.143*	0.133*	0.146*	
	(2.47)	(2.05)	(2.20)	
State 1871	0.378	0.265	0.319	
	(1.37)	(0.99)	(1.13)	
Sole trader 1871	−0.0114	0.000195	0.00359	
	(−0.14)	(0.00)	(0.04)	
Ln. employees1871	−0.528***	−0.552***	−0.573***	−0.572***
	(−9.03)	(−9.34)	(−9.86)	(−9.48)
Non-manufacturers	0.472***	0.469**	0.425**	0.423**
	(4.26)	(3.17)	(3.02)	(3.03)
Eng. prop.		0.421***	0.396***	0.412***
		(3.76)	(3.68)	(3.63)
Chem. prop.		0.543**	0.457*	0.546**
		(2.68)	(2.22)	(2.79)
Sale. prop.		1.285**	1.283**	1.238**
		(2.68)	(2.75)	(2.78)
Oxbridge			0.146**	0.150**
			(2.67)	(2.64)
Other UK university			0.0938*	0.0894*
			(2.11)	(2.04)
Date				0.000066*
				(2.29)
N	467	465	465	467
r^2_a	0.424	0.468	0.482	0.483
r^2	0.452	0.496	0.512	0.509

Robust *t* statistics are in parentheses. Industry dummies and constants are included but not reported. Partnership is the base case in (1). 'Prop.' signifies the category is a proportion of total top management. 'Eng. prop.' is the proportion of engineers in top management, and 'Sale. prop.' is the proportion of salespersons in top management. Non-manufacturing employment is a ratio with 1881 employment. It captures vertical integration. Number of observations is less than the full sample because of the log transformation of zero employment observations in 1871 and 1881. Eng. prop. is undefined when the denominator (total top management) is zero. 'Oxbridge' and 'Other UK university' are insignificant as proportions. Date is the pre-1881 incorporation date. *$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

personnel might be influences. The extent of vertical integration out of manufacturing to retail services or extractive sectors may also be relevant.

Consistent with the descriptive statistics of table 5, the ordinary least squares (OLS) regression of table 8 equation 1 shows 15 ((= exp(0.143) − 1) × 100) per cent faster employment growth of public corporations relative to partnerships, significant at the 5 per cent level, even when controlling for industry and firm size. The small number of state corporations displayed precocious but not statistically significant employment expansion. In table 8 private corporations did not distinguish themselves from the base case, partnerships, nor did sole traders. Vertical integration was a

positive influence on manufacturing firms. We found non-manufacturing employment, as a proportion of manufacturers' total employment, statistically significant. Much of this was backward integration to coal, iron ore, and limestone mining by iron and steel firms, but some was forward integration by textile enterprises to wholesaling in apparel.

Also significant was the variable 'engineers as a proportion of top management', indicating the importance of human capital (equations 8.2–8.4). Public corporations employed almost twice the proportion of engineers and professionals in top management as other enterprises and therefore can be expected to reap the advantages.[63] But public corporation form remained statistically significant even when the effect of engineers was controlled. Sales and chemist members of top management team appeared also to boost employment growth. No effect was found for bankers, lawyers, or accountants in the management group (not reported). However, university graduates in the top team were associated with faster employment growth in manufacturing.

Equation 8.4 uses an alternative measure of the impact of public corporations, the pre-1881 incorporation date. This shows that more recently incorporated businesses achieved a very slightly stronger impact on 1871–81 growth. Public corporations' employment since the 1856 Act grew about 12 per cent faster over the decade from 1871 than that of other business forms. This is rather less than the public corporation 1871 dummy results (equations 8.1–8.3), which must average the age impact of incorporation.[64]

IX | LANDED WEALTH

The nepotism of the family firm and the power of landed wealth have been at the root of many criticisms of the late Victorian economy. We can test whether business heirs in company management retarded manufacturing growth, but we need to take into account the very high proportion of partnerships with heirs in top management by excluding business legal form from the regression. The assumption in the literature is that Victorian owners and managers ensured that money flowed from business to land and often retarded the growth of firms and economic development.[65] Thompson suggests gentrification may have resulted in successful business people becoming large landowners and therefore being given honorific positions.[66] Others have maintained that there is little evidence from probate records of movement to suggest that wealthy businessmen became substantial landowners.[67] In several cases the reverse flow can be seen. The Duke of Devonshire essentially bankrolled the three Barrow firms in our list using his landed wealth.[68] Many big landholders had enough money to invest in business as well as land. Moreover, numerous Scottish managers (whose assets are known at death from probate lists not generally available in England)

[63] In 119 public corporations, 75 engineers compared with 118 in the remaining 364 firms.

[64] $0.000066 \times 1856 = 0.123$, $0.000066 \times 1875 = 0.124$.

[65] Wiener, *English culture*.

[66] Thompson, 'Life after death'.

[67] Nicholas, 'Businessmen and land ownership'; idem, 'Clogs to clogs in three generations?'; Smith, 'Land ownership and social change'.

[68] In 1873, over 80% of all Devonshire investments were concentrated in Barrow-in-Furness, and some 90% of dividend income came from that source. In that year, the seventh duke probably enjoyed the largest current income of any aristocratic millionaire (Cannadine, 'Landowner as millionaire').

had most of their money outside the returned firm, in other firms' shares rather than, or as well as, in land.[69]

A basis for systematically testing the landed wealth caused retardation hypothesis are Bateman's (1876–83) figures for all large landholdings. His numbers are derived from the government's New Domesday survey of 1874 updated to 1883, so they capture most management with large landholdings accumulated in 1871–81 or earlier. A qualification is that Bateman covers only estates with more than 2000 acres. The acreage has usually been used in regressions of the diversion of business talent/money to landholding. It was common to have much smaller landholdings than 2000 acres, typically 50–250 acres, enough for a substantial country mansion perhaps with a hobby farm. Also available from Bateman are annual rentals in pounds sterling. Grouse moors had lower rentals per acre than good farmland near cities, so rentals are a better measure of income or wealth.

A related potential diversion from business was legislating and ruling. It was the norm rather than the exception for top businessmen to be at least a councillor/alderman locally (or chairman of a water or dock board) and a magistrate (justice of the peace). We therefore control for whether, in the intercensal period 1871/81, management who were also MPs, lords (defined as members of the House of Lords), or mayors (including a few proto-mayors: chairmen of local boards) influenced enterprise employment growth. The literature suggests MPs and lords in business were simply decorative[70] or that they were useful as legislators.[71] Ten enterprises (mainly in coal iron and steel) had at least one lord in their top team, and one firm (Wigan Coal & Iron) had two. In all, 132 MPs were distributed over about one-quarter of the largest manufacturing firms.

In table 9 we take the core manufacturing employment growth explanatory variables as lagged employment, human capital variables, and vertical integration, along with industrial structure. Adopting the usual assumptions of OLS regressions, we test in equation 9.1 whether heirs and founders as a proportion of top management (respectively averaging 0.4 and 0.16) debilitated firm growth.[72] Heirs do seem to correlate with lower firm growth, but their impact on employment growth was far less than the positive effect of the human capital variables. The beta coefficient of 'engineers' proportion in top management' (0.22) was twice the absolute value of heirs' proportion (−0.11). Founders, also a negative influence, were not significantly so. The partnership variable was not significant when combined with the heirs that dominated it (equation 9.2). Thereafter, the heirs variable subtracted as much from growth as the public corporation was shown to add (table 9).

The variable MPs in top management in equation 9.3 was not significant at the 5 per cent level, but the presence of a mayor or equivalent was. The equation also showed a lord on the top management team was a very substantial boost to growth. Lords generally brought with them substantial landed wealth, so the indicator became insignificant when landed wealth measures were included. It was therefore dropped from equation 9.4. The rental measure of landed wealth was significant and showed a positive association with a firm's employment growth, consistent with resources flowing from large estate incomes into industry, rather than vice versa. Mayors and proto-mayors were also associated with faster employment growth of their firms.

[69] Morgan and Moss, 'Listing the wealthy'.

[70] Armstrong, 'Company promoter'.

[71] Braggion and Moore, 'Political connections'; Cannadine, *Lords and landlords*.

[72] The appendix shows for Eq. 9.1 the highest correlation was for founder and heir proportion at −0.3126 and for non-manufacturing and log employment 1871 at 0.306. The founder was still not significant when heir proportion is dropped from the regression.

TABLE 9 Other associations with employment growth 1871–81, OLS regressions.

	(9.1)	(9.2)	(9.3)	(9.4)
Heir prop.	−0.181**	−0.157*	−0.147*	−0.126*
	(−2.83)	(−2.21)	(−2.52)	(−2.18)
Founder prop.	−0.126	−0.108		
	(−1.40)	(−1.12)		
Ln empl1871	−0.573***	−0.573***	−0.580***	−0.542***
	(−9.35)	(−9.45)	(−11.32)	(−12.67)
Non-manufacturers	0.401**	0.404**	0.368**	0.327*
	(2.91)	(2.92)	(2.91)	(2.47)
Eng. prop.	0.394***	0.391***	0.346***	0.330***
	(3.59)	(3.63)	(3.75)	(3.47)
Chem. prop.	0.606**	0.586**	0.672**	0.630**
	(3.22)	(3.99)	(3.36)	(3.26)
Sale. prop.	1.112*	1.150*	1.222*	1.083*
	(2.47)	(2.57)	(2.75)	(2.50)
Oxbridge	0.153**	0.150*	0.111*	0.112*
	(2.59)	(2.59)	(2.14)	(2.31)
Other UK university	0.087*	0.0920*	0.0984*	0.094*
	(2.06)	(2.13)	(2.34)	(2.22)
Partnerships 1871		−0.053		
		(−0.94)		
MP			0.046	
			(1.21)	
Lord			0.409**	
			(2.80)	
Mayor, etc.			0.221**	
			(3.52)	
Bateman rents				0.066**
				(2.76)
N	465	465	465	465
r^2	0.512	0.513	0.538	0.530

Note: Robust *t* statistics are in parentheses. Industry dummies and constant are included but not reported. 'Heir prop.' and 'Founder prop.' are heir and founder proportions of top management team. 'Eng. prop.' is the proportion of engineers in top management, and 'Sale. prop.' is the proportion of salespersons in top management. 'Bateman rents' is the wealth measure of managers' large landed estates in £10 000. 'Mayor, etc.' includes chairmen of local boards. 'MP' is Member of Parliament. Lord, mayors, and MPs are measured in numbers per firm. 'Ln. empl1871' is the log of 1871 employment. See also notes for Table 8. *$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$.

X | CONCLUSION

Most recent work on the late Victorian British manufacturing economy has been concerned with public and private corporations' characteristics and performance, deflecting attention from Chandler's classification of British business. The wider database of this paper shows corporations in 1881 were still a minority among large firms and permits a more informed assessment of

manufacturing performance with different business legal types and managerial human capital in the 1871–81 period. A mean of nearly 3.5 top management leaders per firm for the large manufacturer public corporations in 1881 does not seem consistent with 'personal capitalism', either in its presumed exiguous hierarchy or supposed effects. These public corporations in 1881 created more employment starting in 1871 than the more numerous large partnerships. But a characteristic of 'family capitalism', heirs in management teams – present in three-quarters of partnerships but in only one-third of public corporations – appears more supportive of Chandler. Heirs did indeed reduce the employment growth of the firm and were responsible for some of the performance difference between corporations and partnerships. There were naturally more heirs in large firms in the early industrializer (the UK) than in latecomer economies such as the United States, so there was more scope for the Buddenbrooks' effect.[73] In any case, the employment-constraining effect of heirs in UK management was small compared with the positive impact of human capital.

Private corporations failed to match the employment growth of public corporations in this large firm population. Their performance, measured by UK employment growth, was no improvement on partnerships. They managed to constrain the performance advantages of the divorce of ownership from control apparently delivered by public corporations. Yet, they were a minority in the present sample of the largest manufacturing firms, far outnumbered by public corporations, the opposite of Chandler's presumed predominance in Britain of closely held family firms.[74] Public corporations were more capital intensive than partnerships and sole traders, presumably because of their access to cheaper capital. This would have enabled large public corporations to expand relative to other business types.

Contrary to much literature, professionals were widespread in all the large enterprises but most common in public corporations. Engineers were especially frequently encountered and associated with expanding employment. The lower employment of engineers and professionals by partnerships compared with public corporations slowed their growth. Other human capital, such as in the form of university graduates, made separately identifiable and positive contributions to the growth of employment. Perhaps more surprising was the boost to business from the large landholders and those with time to chair local councils or water or dock boards and act as magistrates. Both lords and mayors were associated with faster employment growth of enterprises.

A limitation of this study is that the 483 large manufacturing employers of our database may not have been representative of the larger number of smaller enterprises – although the biggest firms are likely to have been close to the frontier of best practice. There is little international comparative evidence, so the findings can rarely be placed in an international context here, but university education of management personnel is an exception, as is size of firms and whether they were quoted. There is scant evidence that the UK performed poorly on these dimensions in the 1870s, and some indication that its large, quoted manufacturers predated similar scale, ownership dispersion, or even labour productivity elsewhere around 1881.[75] More quantitative research on industrial organization in other countries in the same period would be helpful in clarifying the significance of our results for relative national economic performance.

[73] This refers to the semi-autographical novel *Buddenbrooks* by Thomas Mann (1901), which tells the story of a German merchant family over several generations, showing its gradual decline as modernity beckons and the twentieth century approaches.

[74] Chandler, *Scale*, p. 249.

[75] Hannah and Bennett, 'Large-scale Victorian manufacturers'.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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