

COMPETITION AND PRODUCTIVITY IN TOBACCO: A QUALIFICATION*

LESLIE HANNAH[§]

I INTRODUCTION

ERIC ZITZEWITZ RIGHTLY EMPHASISES the potential of using international comparisons to understand the historical dynamics of productivity change in the decades around the turn of the nineteenth century (Zitzewitz 2003). The essence of his econometric results is that the UK took the productivity lead in the first period, particularly from 1890, when it was less concentrated than America, but that antitrust action (the 1911 break-up of the US trust) then led to higher productivity in the USA. This note interrogates some of these findings.

II MONOPOLY VERSUS COMPETITION?

Zitzewitz's results for 1890-1911 depend on Britain being less concentrated than the USA (though he recognises that after 1901 both were near-monopolised). The evidence is thin. In the cigarette sector, it is true, American Tobacco had a domestic market share never falling below 80% from its founding merger in 1890 to 1901, whereas Wills' share in Britain in the same period was always above half but never exceeded 68%

* Thanks to Eric Zitzewitz and an anonymous referee for constructive comments on an earlier version.

[§] Author's affiliation: Faculty of Economics, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan. Email: lhannah@e.u-tokyo.ac.jp

(Commissioner of Corporations, 1909, Alford 1973). But cigarettes were a trivial (and for a time declining) part of the tobacco industry that constitutes his dependent variable, falling from 4% of US domestic leaf tobacco use in the early 1890s to below 3% in 1901 (Commissioner of Internal Revenue, 1892-1902). Even in the UK, the exceptionally concentrated cigarette sector never exceeded 15% of sales by weight in that period (Alford 1973). There was, moreover, considerable cross-elasticity of demand among tobacco products, so his decision to treat the tobacco industry as a whole is obviously the right one.¹

He seems to have been misled into exaggerating US monopolisation by the American habit of splitting tobacco manufacturing into many sub-industries (snuff, loose cut, cigars, cigarettes, plug, etc.), while UK sources quote concentration figures for the whole industry (Commissioner of Corporations 1909, 1915, Monopolies Commission 1961, Alford 1973). Of course, measured concentration will be higher using the former procedure, but it is a simple matter to convert the US figures to the UK basis.² The result for 1890 shows Wills, the dominant British firm, with a *higher* 7% share of the British tobacco market than American Tobacco's initial 3% in the USA. Concentration then rises faster in America, but the really rapid acceleration to dominant shares occurs almost simultaneously in both countries in turn-of-the-century mergers: American Tobacco is first to gain control of more than 50% of national tobacco sales by weight in 1901, but Imperial Tobacco matches that in 1902.

¹ During the Spanish-American War, for example, when US cigarette taxes were increased by 200% but cigar taxes increased by only 20%, the number of cigars smoked rose from equality with American cigarettes to three times their level (Commissioner of Corporations 1909).

² All tobacco outputs in both countries are measured in pounds avoirdupois, except US cigar and cigarette output, which is reported in numbers of sticks. I have used the standard industry assumption that one cigarette weighs a gram, applied this also to little cigars and adopted Zitzewitz's estimate of the weight of a big cigar. Alternative calculation of concentration ratios by value added or sales revenues, and other indicators of the degree of competition (e.g. contestability measured by actual market share shifts, or control of key, patented technology), suggest Britain should be viewed as more monopolised in 1890-1901.

III ALTERNATIVE PERFORMANCE DRIVERS

The driver of the superior British performance in the tobacco industry as a whole captured by Zitzewitz's dummy (which explicitly defines 1890-1901 as a period of lower UK concentration) is unlikely, then, to be the level of concentration, since levels did not actually differ substantially (or even consistently and unambiguously in the right direction) in this period. One possible interpretation of his results is that American Tobacco engaged more aggressively in predatory pricing, to finance diversification, and charged higher prices for cigarettes and other monopolised products than its British equivalent. This is supported by plausible contemporary criticism of American Tobacco's predation (Burns 1982, 1986), and by price-cost comparisons.³ Such monopoly pricing may have been a strategic entrepreneurial choice or a consequence of higher US tariffs on manufactured tobacco imports or of some other unknown factor. The increasingly concentrated industry structure, common to both countries in this period, may have been a necessary, but it was not a sufficient condition for egregious monopoly conduct.

It might even be argued that the concentration of output into large, integrated firms was beneficial, at least in the right circumstances. This is, of course, the orthodox Chandlerian 'visible hand' re-interpretation of American 'robber barons' like James Duke of American Tobacco. It is difficult to square Chandler's (1990) interpretation in *Scale and Scope* (a narrative account of the weaknesses of the family management of Imperial Tobacco in Britain, compared with the allegedly more professional and integrated management of Duke's American Tobacco) with Zitzewitz's productivity data (which notably shows the British performing better). Zitzewitz's comments on Duke's overpayment for exclusive technology licenses and managerial overload also ring true. But if Chandler's subjective performance assessments are strikingly misplaced, his interpretive framework may still be useful, if redirected to explaining the UK's success. British factories were clearly in the early twentieth century more effective in mechanised cigarette production: using more of the American-designed Bonsack machines than Duke

³ Sweet Caporal, the dominant turn-of-the century brand in the USA, had similar costs to Woodbine, the dominant British brand made with imported Virginia tobacco (apart from being maybe 25% larger), but was priced at 75% more ex-tax, see Hannah, forthcoming.

(despite operating in a highly-taxed UK tobacco market only one-fifth the USA's size) and employing more power per tobacco worker⁴. The British also led in mass marketing cheap, branded cigarettes: in 1911 cigarettes accounted for 39% of the British tobacco market, but only 6% of the American.

Rapidly modernising Britain apart, the role of the machine-made cigarette at this time is easily exaggerated. Many slow adopters of machine-made cigarettes had respectable productivity performances: France, for example, had levels of cigarette consumption only a little higher than the USA, but achieved high productivity. Table I shows pre-war tobacco productivity performance and concentration levels in the major industrial countries.⁵ Exceptionally, the long-term effect of pure monopoly is observable in France, Italy and Austria (where there were state-owned, statutory monopolies) and the shorter-term impact in Japan (which had nationalized its tobacco manufacturing industry in 1904). Private ownership was the norm in all other large markets, though in Spain the quasi-private company maintained a 100% market share by franchising the state monopoly. Canada and Australia were also even more concentrated than the US and UK, since Imperial and American Tobacco had subsumed their interests there in joint local subsidiaries of BAT (Cox 2000, Wilkinson 1914). Germany and Russia experienced the most consistently competitive regimes in the private sector: their one-firm concentration ratio probably stayed around 10% even after the turn of the century (Bormann 1910, Cox 2000, Wolf 1918, Kopylov 1976).

⁴ Total UK cigarette production in 1912 was 75% above the USA's: both countries then overwhelmingly produced on Standards (derived from Bonsacks). The 1907 UK census of production shows 50% more power per worker in UK tobacco than in the 1909 US census of manufactures.

⁵ I have preferred physical productivity measures, on grounds of data reliability and availability, and of consistency with Broadberry, though the Anglo-US relativities are not very different from Zitzewitz's value-added measures. For an attempt at product quality adjustment, see Hannah, forthcoming.

TABLE 1.
 PRODUCTIVITY IN MANUFACTURED TOBACCO, CIRCA 1912

	Output per person employed (lbs per year)	Estimated one-firm concentration ratio
France	5,030	100
Australia	3,283	89
UK	3,212	60
Canada	2,852	80
USA	2,721	21-68+
Italy	2,412	100
Austria	2,277	100
Spain	2,023	100
Japan	1,933	100
Russia	1,358*	10
Germany	1,337	10

*cigarettes only.

+before and after divestiture.

The extreme observations in Table I appear at odds with Zitzewitz's hypothesis: showing good performance is compatible with monopoly (France) and weak performance with competition (Russia and Germany). The productivity results for the other countries are more striking for their similarities, irrespective of concentration level, than their differences.⁶ At this time the typical American manufacturing worker produced twice as

⁶A linear function would suggest a positive correlation between concentration and productivity, but Zitzewitz draws on the theoretical and empirical literature to suggest an inverted 'U' relationship. If that function were fitted, the top of the

much as the average British worker, three times as much as the French, ranging up to nearly nine times as much in the case of Japan (Broadberry 1997), so the similarities in tobacco are abnormal. What was driving this exceptional global convergence of tobacco productivity levels? This is not the place to discuss the engineering professionalism of state managers in Japan or France, or the contrasting (and counter-stereotypical) national degrees of product standardisation and fiscal discrimination against cigarettes (Hannah, forthcoming). What is clear is that the American Tobacco trust, for these or other reasons, was apparently already a drag on the USA's, normally markedly superior, manufacturing performance.

IV COMPETITION'S LATER TRIUMPH

Zitzewitz is on firmer ground in attributing the later, improved, US performance to increased competition. After the 1911 antitrust order to split the tobacco trust into fourteen separate companies, US concentration remained below the international norm and the market was contestable: three substantially new entrants (Reynolds, BAT, Philip Morris) eventually superseded the three initial oligopoly incumbents (American, Lorillard, Liggett) in the increasingly important cigarette sector. Broadberry's comprehensive study confirms the finding that American tobacco productivity moved rapidly ahead of the two leading (and significantly more concentrated) European producers (Broadberry 1997). How can this be reconciled with the earlier evidence of a *positive* link between high concentration and high productivity? One possibility is that large corporations, including large state corporations, were initially effective in spreading productivity-enhancing best practices, at least where competition had already driven technological and market breakthroughs. This happened, for instance, after the 1901 Imperial Tobacco merger, or, even more rapidly, after the 1904 Japanese nationalisation of private tobacco manufacturers (Zitzewitz 2003, Anonymous 1980). There was a clear danger, however, of these initially beneficial modernising impulses soon giving way to

inverted 'U' would still be at a significantly higher concentration level than previously suggested by the studies he cites.

the quiet and debilitating enjoyment of monopoly by private or state managers. America's radical antitrust laws forestalled this among its tobacco firms. Zitzewitz's hypothesis, identifying the vigour of competition as the source of the mid-century forging ahead in US tobacco productivity, can be sustained; but only if we first recognise the contrary (and ultimately misleading) signals given by the productivity achievements of earlier dominant firms, of the kind famously celebrated (if in this case nationally misallocated) by Chandler. Lessons from history are not simple.

DATA APPENDIX

Data in Table I relate to calendar 1912 or the financial year beginning in March-July 1912, except for Spain, where they relate to calendar 1913. Productivity figures are calculated (using the figure for all employment in the denominator) for continental Europe and the British dominions from data in Madsen (1916, table facing p. 214, and pp. 222, 235, 243, 255.), with output taken to be consumption less imports plus exports. An allowance of 10% of insured employment is made for voluntarily insured and uninsured German workers and also of 10% of wage-earners for non-wage-earner labour in Canada and Australia. Madsen's data for the US, UK and Japan has been superseded by publications not available at the time he wrote. The UK figure is from the 1912 Census of Production (Board of Trade, 1931, p. 218.) and Japan from Anonymous 1980, pp. 683, 698-699, 734-735, 776-777. The USA's output is Madsen's adjustment of the official data for the fiscal year ending 30 June 1913, with employment from the 1914 census, less 2%. For Russia, the productivity data relates to cigarettes only, with Nutter's (1962) output data divided by Mints' (1975) employment data, on the assumption that one Russian cigarette weighed only 0.75 gram. The concentration ratios are the author's estimates for 1912 from the sources quoted in the text, and are least securely based for Canada, Germany and Russia. Further adjustments of the data, for international differences in labour quality and in output quality, change some rankings, but reinforce the central reported finding: of productivity convergence, with some monopolies doing well (Hannah, forthcoming).

REFERENCES

- Alford, B. W. E, 1973, *W. D. & H. O. Wills and the development of the UK tobacco industry, 1786-1965*. (Methuen, London)
- Anonymous, 1980, *Tabako Senbaishi (History of the Tobacco Monopoly)*. (Nihon Tabako Sanyo Kabushiki Kaisha, Tokyo)
- Board of Trade, 1931, *Third Report of the Census of Production for 1924*. (HMSO, London)
- Bormann, Kurt, 1910, *Die deutsche Zigarettenindustrie* (Zeitschrift für die gesamte Staatswissenschaft, Tübingen)
- Broadberry, S.N, 1997, *The Productivity Race: British manufacturing in historical perspective, 1850-1990*. (Cambridge University Press, Cambridge)
- Burns, Malcolm R, 1982, 'Outside Intervention in Monopolistic Price Warfare: The Case of the "Plug War" and the Union Tobacco Company.' *Business History Review* 56, no.1, pp.33-53.
- Burns, Malcolm R., 1986, 'Predatory Pricing and the acquisition costs of competitors.' *Journal of Political Economy* 94, no. 2, pp.266-96.
- Chandler, Alfred D, 1990, *Scale and Scope* (Belknap Press, Cambridge, MA)
- Commissioner of Corporations, 1909, *Report on the Tobacco Industry*, vol. 1. (GPO, Washington DC)
- Commissioner of Corporations, 1915, *Report on the Tobacco Industry*, vol. 3. (GPO, Washington DC)
- Commissioner of Internal Revenue, 1892-1912, *Annual Report*. (GPO, Washington DC)
- Cox, Howard, 2000, *The Global Cigarette: Origins and Evolution of British American Tobacco 1880-1945*. (Oxford University Press, Oxford)
- Hannah, Leslie, forthcoming, March 2006, 'The Whig Fable of American Tobacco, 1895-1913,' *Journal of Economic History*.
- Kopylov, V. I, 1976, 'Tobacco Industry,' in *Great Soviet Encyclopedia*, (Macmillan, New York)

- Madsen, A. W, 1916, *The State as Manufacturer and Trader: An Examination of Government Tobacco Monopolies*. (Unwin, London)
- Mints, L. E, 1975, *Trudovye resurcy SSSR*. (Nauka, Moscow)
- Monopolies Commission, 1961, *Report on the Supply of Cigarettes and Tobacco and of Cigarette and Tobacco Machinery*. (HMSO, London)
- Nutter, Warren G, 1962, *Growth of Industrial Production in the Soviet Union*. (Princeton University Press, Princeton NJ)
- Wilkinson, H. L, 1914, *The Trust Movement in Australia*. (Critchley Parker, Melbourne)
- Wolf, Jacob, 1918, *Der Tabak: Anbau, Handel und Verarbeitung*. (Teubner, Leipzig)
- Zitzewitz, Eric W, 2003, 'Competition and Long-Run Productivity Growth in the UK and US Tobacco Industries, 1879-1939.' *Journal of Industrial Economics* Vol. 51, No.1, pp.1-33.