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Abstract

At the beginning of the twentieth century, US tobacco manufacturers were not forging ahead of their leading European counterparts in technology, productivity or managerial techniques. On some indicators, including per capita cigarette consumption, the USA strikingly lagged much of the rest of the world. Fiscal discrimination against cigarettes, amplified by the monopoly pricing, strategic choices, and organizational overload of the American Tobacco trust, are among the retarding factors.

“Of all things American, nothing is more so than the cigarette,” wrote an enthusiastic booster of the addiction (with the assistance of the American Tobacco Company) in 1916.¹ The story of James Buchanan Duke, founder of the modern mass production industry, has been frequently told.² I shall follow my predecessors in treating cigarettes as a conventional economic “good”, eschewing the hindsight that the trillions of sticks sold killed millions of people. Despite this ending, the story has iconic status because it so clearly illustrates the application of the innovative Bonsack machine to the development of an essentially new product that was branded, advertised and marketed, nationally and internationally, to a standardized mass market of modern, urban consumers. Naturally, this is also a story of American leadership in the second industrial revolution, with the trust’s majority-controlled foreign subsidiary, BAT, becoming “among the most impressive American firms abroad.”³ Duke’s “visible hand” triumphed over Germany (which betrayed its usual limited entrepreneurial response in branded packaged products) and the UK (whose Imperial Tobacco trust compromised its initial brand skills by perpetuating family management, rather than creating the professional management hierarchy that this archetypal modern industry required)⁴. Key aspects of success were the economies of speed and forward vertical integration that Duke needed “to transform the high fixed costs that he had strategically incurred into low unit costs

¹ Young, *Story*, p.4.

² Chandler, *Visible Hand*, pp.382-91; McCraw, *Prophets*, pp.72-3.

³ Wilkins, *Emergence*, p. 91.

⁴ Chandler, *Scale*, pp. 247-249, 430-32.

and sustained competitive advantage.”⁵ Duke’s peccadillo – no one is perfect - was to attempt to do the same in cigars, where brand proliferation and the absence of economies of scale prevented the replication of his “massive output” in cigarettes.⁶

The power of this fable is underlined by its widespread acceptance by scholars with a more nuanced picture of the diversity of American demand and the complexity of entrepreneurial responses to it. Scranton acknowledges Duke’s achievement in meeting mass market demand in this quintessentially modern industry, before hastily moving on to products more congenial to his thesis.⁷ A European critic of Chandlerian oversimplification merely notes that Bonsack licensed his machine in Britain first, before acknowledging that US cigarette production soon overhauled the UK’s, excusing British underperformance on account of the larger US market.⁸ I labor these points, not to ridicule the storytellers, but to excuse myself. I have grumbled that a few facts do not fit this story, but I have often retold it.⁹

The next section presents new evidence on the different reality that actually requires explanation: the puzzle of US backwardness in cigarettes, relative to Europe and Japan, before World War One. Following an examination of political and cultural factors in the slow progress of the cigarette, the next section concludes that the visible hand of American Tobacco, in the form of monopolistic output restriction, product differentiation, alternative investment priorities and strategic and organizational overload, likely played a

⁵ Lazonick, *Business Organization*, p. 241.

⁶ Chandler, *Visible Hand*, p.390.

⁷ Scranton, *Endless Novelty*, pp. 4, 354.

⁸ Alford, *Wills*, p. 170.

⁹ Hannah, “American Miracle;” Hannah and Wada, *Miezaruru*.

role. A fourth section evaluates the sources of high productivity in tobacco manufacturing, in the USA and elsewhere, showing that Duke's Bonsacks had only a modest walk-on part in a complex play. The final section reviews the reasons for the earlier misleading interpretations and further challenges for research presented by this, hitherto unrecognized, case of American backwardness.

National markets and tobacco taxes.

Tobacco was grown and used widely in Europe and Asia as well as on its native continent. Table 1 shows the impressive size of the world market and the annual manufactured tobacco consumption per head in the major industrial and industrializing economies and the largest underdeveloped economy before World War One. Broadly, the level of consumption per head (the second column) varied with income levels and tobacco taxes (the last two columns). The notion of a tobacco "tax" is problematic where there was a state-operated tobacco monopoly (as in Austria, France Italy and Japan) or a privately franchised state monopoly (as in Spain): I have adopted Madsen's contemporary adjustments of reported state profits (for tax collection costs, capital charges and so on) to arrive at tax-equivalents. Except in China, where the state barely functioned, tobacco taxes often dwarfed other elements of cost, and varied more than the other major cost, tobacco leaf. In the highest tax country, Italy, tobacco taxes were six times the American level and accounted for more than two-thirds of retail tobacco prices:

Table 1. The Determinants of National Tobacco Consumption ca.1912.

	Consumption of manufactured <u>tobacco products</u> million		GDP per head (USA= 100)	Manufactured tobacco taxes (US cents per lb.)
	lbs.	lbs. per head		
USA	550	5.7	100	18
Germany	252	3.8	68	17
Austria	85	3.0	41	46
France	95	2.4	68	85
UK	103	2.3	92	80
Spain	41	2.1	38	73
Russia	236	1.5	29	16
China	600	1.4	11	2
Japan	70	1.4	27	39
Italy	43	1.2	47	107

Sources: Madsen, *State*, especially the statistical appendix, pp.214-255, with additional information from Anon, *Tabako*, vol. 4, pp. 682-684, 698 (Japan),); Wolf, *Tabak*, p.102; Knoll, *Deutsche Zigarettenindustrie*, p. 137 (Germany); Todd, *Statistics*, p.8; Board of Trade, *Third Report*, pp. 215, 218 (UK); Nutter, *Growth*, p. 415, Peacock, *Russian Year Book*, pp. 503, 623; Sokolnikov, *Soviet Policy*, pp. 193, 205 (Russia); Commissioner of Internal Revenue, *Annual Reports 1913 and 1915*; Department of Commerce, *Abstract*, p.254 (USA). The Chinese figures are the author's conjectural orders of magnitude (compare Commissioner, *Tobacco*, vol. 1, p. 62; Chen Han-Seng, *Industrial Capital*, pp. 88, 95; Cox, *Global Cigarette*, pp. 157,173; Cochran, *Big Business*, p. 43; Wolf, "Tobacco Industry", p. 91.) The data relate to calendar 1912 or the financial year 1912/1913, except for Spain, where they relate to calendar 1913. GDP per head ratios and additional population data are from Maddison, *World Economy*. Conversion of taxes in national currency units to US dollars is at average 1912 exchange rates.

this column is a proxy for international price differences. High prices explain the relatively low overall consumption levels in Italy, France and the UK, while low prices in the USA, Germany and China explain high sales, relative to incomes.

Traditional tobacco usages still dominated everywhere— the pipe in Japan, China and Britain, chewing tobacco in the rural USA, the more recent innovation of cigars in urban America, Germany and Italy – but cigarettes had been spreading rapidly. As Table 2 shows, Russia remained the major producer of cigarettes, as in the hand-rolling era, when the cigarette fashion spread westwards from the Tsarist and Ottoman Empires. However, Spain, Germany, Austria and the UK were well ahead of the USA in cigarette consumption per head, despite their lower incomes, while American cigarette consumption languished below Japanese levels. An alternative measure of cigarette development - the percentage of all tobacco use in the form of the cigarette (the penultimate column in Table 2) - shows all large European economies and Japan ahead, though the USA retained a slight lead on China.

Some of this US “backwardness” is cultural. Americans chewed tobacco and smoking tobacco sales did not exceed chewing sales by weight until around 1908.¹⁰ It seems reasonable to suppose that conversion to cigarettes was a larger step for Americans than the shift by Europeans and Asians from pipes and cigars. Yet when Americans did take to smoking, it was to cigars rather than cigarettes that they usually moved. As late as 1912, cigars accounted for nearly six times as much leaf tobacco use as cigarettes in the USA and by value cigars accounted for more than all other tobacco sales combined.

¹⁰ Robert, *Story*, p.274; Commissioner, *Tobacco*, vol. 3, pp.125, 135; Nicholls, *Price Policies*, pp. 9-11.

Table 2. The World's Leading Cigarette Markets, ca.1912.

	Cigarette Consumption		Cigarettes as a proportion	Price of
	Total (billion sticks)	Sticks per head of population.	of all manufactured tobacco sales. (% by weight.)	popular cigarette brand. (US cents per 10.)
UK	19.5	428	42	4.1
Spain	4.7	238	26	3.1
Russia	22.5	235	12-21	1.5
Austria	5.9	205	15	4.6
Germany	11.5	172	10	5.8
Japan	7.4	145	23	2.5
USA	13.2	138	5	5.0
Italy	3.4	97	17	5.4
France	3.7	94	9	5.7
China	10.2	24	4	2.0

Sources: As Table 1. The third column is calculated by applying the standard industry assumption that one cigarette weighs one gram (or 15.43 grains avoirdupois) to the cigarette numbers in column 1 and dividing the result into column 1 of Table 1. Actual cigarette weights varied by an (unknown) amount over time and between countries, but, where actual weight checks are available, they produce similar results. The most serious distortion is for Russian *papyrosi* (which were hollow for much of their length), where the lower additional figure in column 3 is Peacock's direct weight estimate. The cigarette prices in the fourth column are for the leading contemporary brands (e.g. Gauloises in France, Shikijima in Japan) or, where there were grades rather than brands, the average for the most popular grade or, where no other information is available, the overall average

In Britain cigars were smoked on special occasions or by the elite (and were vastly outnumbered by cigarettes), but in the USA cigars dominated the smoking market. The *fin de siècle* British press image of the plutocratic Yankee with an expensive, fat cigar was a misleading caricature, not because of the expensive cigar, but because its smoker was not rich: merely an east coast city-dweller enjoying an everyday pleasure.

Another possible factor in the slow progress of the American cigarette was the cigarette prohibition movement: fifteen states prohibited the sale of cigarettes, while permitting other tobacco habits. However, these were states where cigarettes were little used and the laws were, in any case, sometimes not enforced, so this is unlikely to have been a major factor.¹¹ There are stronger clues to the differential progress of the cigarette in prices. The last column of Table 2 shows the retail price of popular cigarette brands before the First World War. These prices were, of course, originally at small coin “price points” in the national currencies – like the US price of a nickel for a pack of ten shown - but have been converted to cents (at average exchange rates for 1912) for ease of comparison. Low prices were clearly a key to high consumption in poorer countries like Russia, China and Japan, but the US price was, in a country used to cheap tobacco, a little higher than the West European average for cigarettes. The modest retail price of cigarettes in the UK explains some of that country’s fast rate of adoption. Consumers everywhere were willing to pay for the taste, convenience, modernity or higher level of finish of the cigarette, but the extra they had to pay varied. Cigarettes were around 75% more expensive per ounce than the cut pipe tobaccos that were the main alternative

¹¹ Tate, *Cigarette Wars*; Alston et al., “Social Reformers;” Young, *Story*, pp.271-76.

preferred by British smokers.¹² In the USA, by contrast, cigarettes cost around four times as much as plug or smoking tobacco, weight for weight; in Japan, France and Austria they were respectively two, three and six times the price of the cut tobacco that was the main local alternative.¹³ It appears that state tobacco monopolies (directly in their pricing policies) and internal revenue authorities (in their tobacco tax policies) showed some bias against what came to be seen as the modernization of tobacco taste. In Britain no tobacco leaf was grown domestically, so the most natural form of tobacco tax was a levy on leaf imports, which was, of course, inherently non-discriminatory between final uses.¹⁴ However the general practice was to tax the final products, facilitating bureaucratic or political discretion. This was, judging from the evidence on price relativities, used to deter the innovation of the cigarette in the USA and elsewhere. But non-tax factors were clearly also at work: Austria, for example, had higher cigarette consumption than the USA, despite an even more discriminatory tax differential.

The UK (the country where, Table 2 suggests, the cigarette had made most progress) had a price of just over four cents for ten Wills' Woodbines (actually one English penny for a pack of five). High taxes accounted for just under half this UK cigarette price. Since US cigarette taxes were exactly a quarter of the American retail price, this implies that the ex-tax price of the trust's Sweet Caporal brand was three-

¹² Prest and Adams, *Consumers' Expenditure*, pp.89-90.

¹³Commissioner, *Tobacco*, vol. 3, pp. 246, 267, 277, 284, 338; Madsen, *State*, pp. 220, 243, 249.

¹⁴Germany also had a leaf tax (on both domestic production and imports), but supplemented it in 1906 with a cigarette consumption tax, so British tax neutrality cannot be considered completely accidental.

quarters higher than Woodbines.¹⁵ The available cost accounts for these two brands are not directly comparable, but they do show there are three plausible explanations.¹⁶ First, the British and Irish smoked smaller cigarettes, possibly containing a quarter less tobacco in the case of the brands in question.¹⁷ Second, UK producers were further down the experience curve of large-scale manufacturing. By 1905 Woodbine - the mass market brand of one branch of Imperial Tobacco – was selling more sticks than *all* the US brands of the American Tobacco Company collectively.¹⁸ Since almost all Imperial's leaf was imported from America, lower raw material costs can be ruled out: if there was a British cost advantage, it was in manufacturing or selling costs. Third, the American Tobacco trust may have more thoroughly exploited its monopoly by restricting output and raising prices than Britain's Imperial Tobacco Company. There is evidence that all three factors played a role.

The chronology of the USA's falling behind in total sales of cigarettes is shown in Figure 1. The top line in the chart shows the expected pattern of steady sales growth in Russia, a mature cigarette economy, with demand primarily driven by rising real incomes, population and urbanization. As the cigarette fashion spread to America and

¹⁵ Woodbine cost accounts for 1900, up-rated by the 1909 duty increase, with allowance for reduced tobacco content and productivity increase, see Alford, *Wills*, pp. 245, 483. UK taxes were also payable on leaf purchase not product sale, so interest charges need to be added in comparing with US taxes.

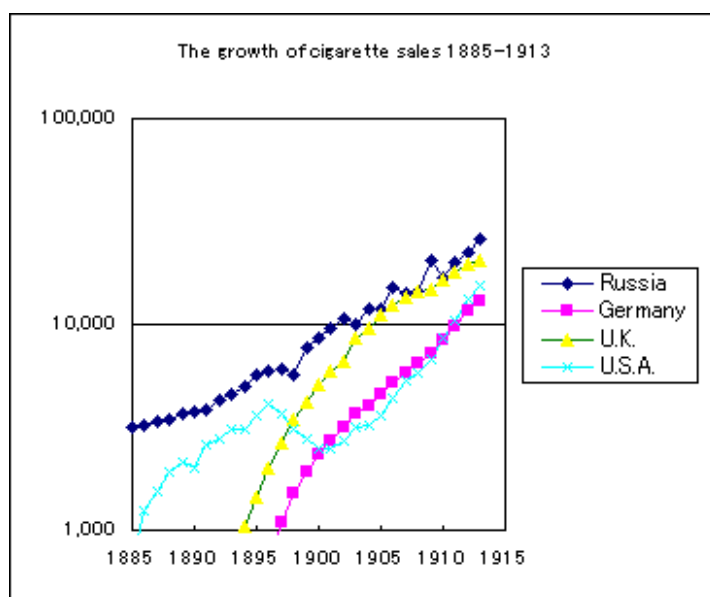
¹⁶ *Ibid.*, pp.244-45; Commissioner, *Tobacco*, vol. 3, pp.154-78, 329-51.

¹⁷ The average Wills cigarette in 1912 weighed 14.30 grains (Alford, *Wills*, pp. 476, 478) and Woodbines would have been below this; for Sweet Caporal weights averaging 17.59 grains in a small 1899 New York sample, see Young, *Story*, p. 133.

¹⁸ Alford, *Wills*, p.478; Commissioner, *Tobacco*, vol. 3, p.168.

Data for Figure 1

Year	Russia	Germany	U.K.	U.S.A.
1885	3,130			690
1886	3,250			1,247
1887	3,340			1,535
1888	3,470			1,911
1889	3,690			2,143
1890	3,740			1,996
1891	3,820			2,606
1892	4,250			2,770
1893	4,580			3,073
1894	4,980		1,044	3,102
1895	5,700		1,453	3,630
1896	5,930	700	1,998	4,098
1897	6,090	1,100	2,679	3,710
1898	5,710	1,500	3,450	3,080
1899	7,700	1,920	4,222	2,757
1900	8,620	2,320	5,130	2,501
1901	9,670	2,700	5,902	2,484
1902	10,760	3,150	6,674	2,737
1903	9,940	3,650	8,626	3,165
1904	11,820	4,000	9,670	3,217
1905	11,780	4,550	11,168	3,571
1906	15,050	5,200	12,394	4,424
1907	14,300	5,805	13,575	5,271
1908	14,600	6,471	14,392	5,760
1909	20,390	7,271	14,800	6,837
1910	16,730	8,353	16,389	8,664
1911	19,840	9,852	18,160	10,486
1912	22,530	11,518	19,477	13,184
1913	25,890	12,990	20,657	15,571



Sources: as Table 1. Prior to 1898 the US cigarette sales data include little cigars: I have arbitrarily assumed that little cigar sales grew by 30 million annually until backward extrapolation of the 1898 little cigar output of 457 million reaches zero, to derive a continuous US cigarette-only sales series. Data for German sales (and production, which was typically a few percent lower) are only available annually in the *Statistisches Jahrbuch* after the introduction of the cigarette tax in 1906. For prior years, I have interpolated missing years from the available statistics of production or sales in 1893, 1897, 1903 and 1904.

Western Europe, total sales might have been expected to grow faster than this, with growth tailing off to Russian levels as their markets matured. In the 1880s, only France (not shown on the graph) and the USA were well embarked on this growth curve, with similar early sales levels, but the French state monopoly soon dropped out of the race in machine-made cigarettes and concentrated on what the French called *scaferlati*: cut tobacco for the consumer to hand-roll cigarettes. The latecomers in machine-made cigarettes, Britain and Germany, only reached 1880s French and American levels of production in the mid-1890s. Both the British and the German markets then showed the

classic latecomer development pattern: growing much faster than Russia initially, but at similar rates as they mature. The United States also exhibited rapid growth in the 1880s, and was well ahead, but from 1896 cigarette sales stagnated, and were still below the 1896 level in 1905. US cigarette sales were overtaken by the UK's in 1898 and by Germany's in 1901.

The chronology of US cigarette taxation correlates well with some of this. The tax of 0.05 cents per cigarette was raised to 0.1 cents in July 1897 and to a peak of 0.15 cents in June 1898, and the differential with plug and other tobaccos was also then at its highest, as the federal government struggled to fund the Spanish-American War.¹⁹ In July 1901, however, the tax was lowered to 0.108 cents per cigarette (0.054 cents on cheaper ones) and tax rates then remained stable until July 1910, when they were raised to a uniform 0.125 cents. Even before the 1897/8 tax increases, the trust, despite rapidly falling costs, abjured a policy of significantly lowering prices to expand demand.²⁰ The recovery after the July 1901 tax reductions was slow and mid-1890s sales levels were only exceeded when the trust's contacts in government circles were making it clear, from 1906 onwards, that it faced a serious federal antitrust threat.²¹ The market response to the large but short-lived tax rises of 1897/98 (a 36% fall in sales between 1896 and 1901) was very different from the response, post-dissolution, to the smaller but permanent 1910

¹⁹ By 1898 the cigarette tax had tripled relative to mid-1890s levels, but taxes on plug and smoking tobacco only doubled; the later reductions restored the former tax levels in plug and smoking tobaccos (Commissioner, *Tobacco*, vol. 3, pp.51, 87, 155.)

²⁰ Between 1893 and 1899, manufacturing, selling, advertising and freight costs halved, saving almost as much as the increased tax, see *Ibid.*, p. 155.

²¹ Kolko, *Triumph*, pp.125-26.

tax rise (a 106% rise in sales between 1910 and 1913).²² It is important, then, to examine the policies of the trust and the strategic context in which it formed them.

The Strategies of the Trust.

There is no good scholarly history of the leading companies in the tobacco trust and so our understanding of the firm's core strategy has to be based on revealed behavior.²³ Duke's journalistic biographer's assertion that he "never entered a room where cigarettes were being smoked without a sniff of distaste" is, of course, unhistorical, but there is no reason to doubt its poetic truth.²⁴ Certainly Duke preferred to chew plug in his early days and graduated to cigars as he moved in the society circles of New York and London.²⁵ That Duke ignored colleagues' advice in the mid-1890s and decisively shifted the American Tobacco Company's domestic focus from cigarettes to other tobacco products is clear.²⁶ Duke himself stated that one of his motivations was genuine doubt about the future of the cigarette, though some have been inclined to suspect the serial monopolizer of lying to cover up his true intent.²⁷ This is not entirely implausible - he

²² Commissioner, *Tobacco*, vol. 3, pp.7, 155, 324.

²³ Anon., *American Tobacco* and Anon., *Lorillard* are slender volumes in more senses than one. Tilley, *R. J Reynolds*, and Cox, *Global Cigarette*, are excellent, but deal with subsidiaries that were quite independently managed. Durden, *Dukes*, is balanced, but concentrates on the family rather than the firm.

²⁴ Winkler, *Tobacco Tycoon*, p.262.

²⁵ Durden, *Dukes*, p.59.

²⁶ *Ibid.*, p.63.

²⁷ Tate, *Cigarette Wars*, p.32.

had a record of telling considerably less than the whole truth and of attempting to bribe witnesses –but even confirmed liars sometimes tell the truth.²⁸

Whatever his motives, Duke restricted the sales of cigarettes, in the textbook monopolistic manner, generating the profits required to finance diversification within, and the monopolization of, the whole manufactured tobacco industry. This was a bold, not to say foolhardy, plan, for, on its foundation in 1890 as a merger of five companies, the American Tobacco Company had around 90 per cent of US cigarette sales, but under 5 per cent of all tobacco manufacturers' sales revenue.²⁹ In its first major predatory pricing campaign, in plug, the trust lost \$4.1 million between 1895 and 1898, though it also needed tens of millions more to acquire established plug companies: the additional capital had to come not just from current profits but from capital issues to investors lured by the prospect of future monopoly profits in cigarettes and, eventually, plug.³⁰ Duke floated the trust's stock on the New York Stock Exchange in 1895 and then constrained domestic sales of mass-produced cigarettes in an attempt to rack up profits. Between 1895 and 1904, independent manufacturers doubled their cigarette sales, while sales by the trust actually fell, reducing its market share from around 90% at the time of the initial merger to around 75%; but this contrast understates output restriction by the trust, which bought ten competing, independent manufacturers in the years around the turn of the century. If these independents had maintained their market share, the trust's share of the US cigarette market would have declined to around 56% in 1906, implying a halving of

²⁸ Moody, *Long Road*, pp. 156-159, 204; Industrial Commission, *Report*, pp.317-28.

²⁹ *Ibid.*, vol. 1, p.325, vol. 2, pp.8, 242; Durden, *Dukes*, p.58; Department of Commerce, *Abstract*, p.700.

³⁰ Burns, "Outside Intervention," Commissioner, *Tobacco*, vol. 2, pp. 71-76; vol. 3, pp.51, 155.

the original trust's core sales in ten years.³¹ Clearly the trust was the major force restricting output for the domestic market in this period. The average wholesale cigarette price charged by the trust rose almost every year for more than a decade after 1897.³²

By 1900, the unexpected combination of the tax squeeze with the trust's own output restriction was devastating. Cigarette profits could no longer support Duke's still expanding predatory pricing ambitions in snuff, cigars and overseas markets. Fortunately his gamble in plug had paid off: in that year plug profits were rising rapidly, as the new monopoly was consolidated; two years later they were nearly seven times domestic cigarette profits. Cigarettes were by then making even lower profits than the trust's newly organized snuff subsidiary, and snuff, not cigarettes, was the most rapidly growing tobacco product category between 1895 and 1910.³³ It is conceivable that trust managers, despite their experience of the success of cheap cigarettes abroad, considered them as a niche, rather than mass market product at home.

Such a conjecture is compatible with the marked change in branding strategy for cigarettes. At the end of the nineteenth century, American Tobacco muted the mass market strategy for which its fablers lauded it, and re-focused on a policy of strong product differentiation and a move to the luxury end of the smoking market. The trust's top-selling Sweet Caporal brand (which had 50 % of the US market in 1898) was allowed to go into free fall, with a proliferation of new domestic cigarettes like Piedmont and new blended brands like Mecca gaining share at a variety of prices and higher manufacturing

³¹Ibid., vol. 1, pp. 228-31, 329-33, with allowances for pre-1898 little cigar output as in Figure 1.

³²Ibid., vol. 3, pp.155, 327.

³³ Ibid., vol. 3, pp.51, 138-39, 155. Contemporaries bracketed cigarettes and snuff together as the unimportant branches of the industry, see Ibid., vol.1, p. 50.

costs.³⁴ The initial thrust of Duke's attempt to increase appropriation of consumers' surplus by price discrimination came in his promotion of Turkish cigarettes, using substantial quantities of expensive, imported dark tobacco. These had previously been largely the preserve of immigrant hand-rolling workshops in New York, but Duke used partially mechanized techniques to increase his market share from 1% to 60% in this sector over a decade. He specialized in the cheaper end, where his cigarettes were known derisively as "imitation Turkish" in the trade, which attached some importance to hand-rolled quality. His factories were smaller than for mass-produced cigarettes, and some machinery could not be used: for example, Turkish cigarettes were usually oval rather than round, and packing had to be done by hand. The prize was higher prices and profits from selling a luxury rather than mass market product: many Turkish cigarettes sold at a premium price of a dime to a quarter for ten, twice the price of mass market brands or more. The average price of the trust's cigarettes in 1901 was 1% above the basic price of Sweet Caporal; by 1910 the product differentiation strategy was so successful that the average trust cigarette price was 26% above this cheap brand. The trust's Turkish sales (1.7 billion sticks in 1910) were well below American-style cigarettes (5.2 billion), but its Turkish profit per stick was more than double that on an American cigarette. However, the smaller, independent, and also partly-mechanized Turkish manufacturers, like Philip Morris (a tiny, then British, firm that had set up a New York factory in 1902), had lower unit costs. There were few scale economies in Turkish cigarettes, but with the trust's reduced sales and restrained advertising of mass market cigarettes, such product

³⁴Ibid., vol. 3, pp.16, 162-3.

differentiation at the luxury end remained profitable for the trust and even more profitable for small-scale producers.³⁵

In this context, the trust's parallel move into cigars appears not as the unfortunate exception that proves the rule of the triumph of the mass-produced American cigarette, but as an integral part of Duke's strategy of moving toward more differentiated, higher priced, smoking products. It was also a direct and urgent response to a major competitive threat: cigars could hardly be peripheral to the trust's market stance, because the US cigar manufacturers outside the trust had carried all before them, while cigarette sales were restricted. By 1901 big cigars (which five years earlier had sold in comparable numbers to cigarettes) outsold cigarettes by three to one. The cigarette's position in America might well have appeared hopeless: it apparently was difficult to sell as a luxury in competition with big cigars that cost at least a nickel: ten times the cigarette price per stick. Cigars had become the core of the US market for convenience smoking and this part of the industry remained highly competitive. The trust at its peak had only 16% of US production; there were more than 20,000 other US cigar manufacturers, and their aggregate profits exceeded the trust's own profits from all tobacco products.³⁶ As with

³⁵ Winkler, *Tobacco Tycoon*, p. 258; Young, *Story*, pp.57, 91; Kluger, *Ashes*, pp.49-51; Commissioner, *Tobacco*, vol. 1, pp.173, 228, 332, 334, vol. 2, pp.172-3, vol. 3, pp.155, 168, 173-78, 331, 339-51, 439-50.

³⁶ The 1904 domestic tobacco profits of the trust were under \$27 million (ibid, vol. 2, pp. 26, 30, 33).The Bureau of Corporations was coy about independent cigar makers' profits, perhaps because they include returns to labor as well as capital, perhaps because (unlike the other independents whose profits they did report) they did not fit the Bureau's pre-conceived theories, but we can deduce they were considerably higher, by deducting from the 1904 census figure for value added in cigars, the relevant taxes, wages and

Turkish cigarettes, the cigar's triumph was facilitated by the market distortions created by the trust itself. If there were significant price cross-elasticities between cigars and other tobacco products, the trust's move to monopoly pricing in the minority of the industry it controlled would increase cigar sales: that, indeed, seems to have happened.

Duke's ambitions for changing this unfavorable and unfamiliar balance of competitive advantage by mechanizing the production of the differentiated products on which the trust increasingly focused were very real. He succeeded in partially mechanizing the production of Turkish cigarettes and little cigars, building up market shares of, respectively, 60% and 75% in these sectors. His investment in his own in-house tobacco machinery manufacturing company under Rufus L. Patterson, a young engineer hired in 1898, is a good example of the long-term, but inherently uncertain, payoffs from technology planning by the "visible hand", seeking not merely to react to external developments, but actively to shape the industry's future. Bonsack's earlier experimentation cost a few thousand dollars, but Patterson spent an astounding \$7-8 millions on the cigar machinery project over more than two decades, making it arguably the largest and longest sustained of US R&D programs at that time³⁷. There were severe technical problems both in bunching the filling (already achieved for small cigars by molds) and in wrapping it in natural leaf (much harder to manipulate than uniform

the trust's cigar profits (ibid, vol. 1, pp.149, 427-30, vol. 3, pp. 182, 192, 195, 197, 201; Commissioner of Internal Revenue, *Annual Report 1910*, p. 109; Department of Commerce, *Abstract*, p.470)

³⁷ Before the Frascati rules, R&D expenditure comparisons are fraught with difficulty, but, taking the lower figure and averaging over twenty-six years, this is \$270,000 per year, a sum not equaled by US chemical and electrical firms before World War One, compare Mack, *Cigar Manufacturing Industry*, p. 52 and Anon, "Rufus Lenoir Patterson," p.56 with Hounshell and Smith, *Science*, p.14 and Reich, *Making*, p.80.

cigarette paper). Nonetheless, he did by 1915 come up with a workable prototype for machinery that, fifteen years later, was to be producing most American cigars.³⁸ That was, of course, too late for the trust, which had also lost more than \$4 million on fruitless predatory pricing in cigars in 1902-1903 alone, and never made profits in the cigar sector at the level of its monopoly businesses. But the trust was no more able than Microsoft today to contemplate the possibility that the contrast between its high core profits and its high losses in new areas (where others made large profits) might betoken past good luck (in cigarettes), rather than current wasted investment (in cigars). American Tobacco's commitment was serious and sustained, as it waited patiently for its research engineers to deliver. It continued to employ 37,000 people in cigar manufacturing and retailing, ten times its domestic mass-produced cigarette workforce, and invested more in cigar assets and brand building, where it showed every sign of seeing its future, using recovering cigarette profits after the 1901 tax cut as a "cash cow" to fund this core strategy.³⁹

The managerial strains on Duke's organization of a massive and rapid increase in corporate size, as he expanded beyond the small (and apparently declining) cigarette industry into the large, growing and diverse plug, cigar and snuff sectors, must have been considerable. In the early 1890s he had controlled a specialist cigarette and smoking tobacco organization of only a few thousand employees and several million dollars sales, but the tobacco trust he created in the early twentieth century employed 100,000 and had

³⁸ Cox, *Competition*, pp.50-54; Mack, *Cigar Manufacturing Industry*, pp.55-6; Baer, *Economic Development*, pp. 197-201; Commissioner, *Tobacco*, vol. 1, pp.151, 289-90.

³⁹Ibid, vol. 2, pp. 33, 272-278, 286-288, vol 3, pp. 51, 87, 129, 139, 155, 182, 195, 198, 202, 230; Anon., *American Tobacco*, p.3.

sales of \$125 millions.⁴⁰ This both required a quite different order of management skills and shifted the management hierarchy's focus to the 95% of activities that now lay outside the domestic cigarette business, especially as plug and snuff manufacturing were more manager-intensive than cigarettes.⁴¹ The suggestion that the 250 highly diverse companies in the group were efficiently centrally managed by the cigarette combine's head office at 111 Fifth Avenue (whereas the British Imperial group, with one-twentieth that number of organizational units and one-sixth its number of employees, was merely a loose federation) is fantasy.⁴² Both groups imposed central costing standards, and both hired professional managers, but finance and advertising expenditures were more centrally controlled at Imperial.⁴³ Both allowed some separate selling organizations in subsidiaries, though the British may have been more inefficiently indulgent in this respect.⁴⁴ Family heirs were also more apparent in British top management, though it should be noted that a quite powerful reason that Duke's employment of his family was restricted to his own generation, breaching the family tradition, was that he did not have a son or son-in law (and he could not even stand the idea of women smoking, never mind managing). Significantly, he used many ex-family managers – the most obvious source of experienced tobacco professionals and sometimes a lever to gain agreement to merger terms - to administer his sprawling empire. Early on, names such as Ginter and Kinney

⁴⁰ Winkler, *Tobacco Tycoon*, p.116; Commissioner, *Tobacco*, vol. 2, pp. 139, 182, 242.

⁴¹Ibid., vol. 1, p. 51, for their higher ratios of salaries to wages than the cigarette sector.

⁴²Ibid., vol. 2, p.248; Tennant, *American Cigarette Industry*, p.6; Chandler, *Strategy*, p. 40. For the contrary view, see Chandler, *Scale*, pp.247-49.

⁴³Ibid., p. 386; Alford, *Wills*, p.309-10, 319; Commissioner, *Tobacco*, vol. 2.

⁴⁴Ibid., vol. 3, p. 343.

had disappeared from the senior management ranks, but later, as management strains multiplied, names like Lorillard, Helme, Drummond, Alvarez, Ogden, and Murai were necessarily retained. When the time came to move on, he chose the Hill dynasty, with its highly personal management style, to succeed him at American Tobacco and a son-in-law of the Wills family to succeed him at BAT. He certainly, like Imperial, established a central leaf buying department, but, unlike Imperial, he allowed many branches and subsidiaries to do their own purchasing of leaf.⁴⁵ Whereas Imperial directly owned all the assets of its constituents and dissolved their separate companies, Duke usually preserved the corporate form of subsidiaries and sometimes allowed the retained family managers to continue as minority stockholders (for example, the Reynolds family retained a third of R. J. Reynolds when it joined the trust) or, in the case of American Snuff, even as majority stockholders (ATC held only 43 % of the shares). As his family biographer generously notes, it is just possible that he was telling the truth when he testified that he wished he had done more of this.⁴⁶

Managing these giant firms, even the most bombastic business leader (and Duke had no Imperial rivals for that title) was doubtless tempted to leave alone subsidiaries that were not causing problems, while focusing on those where technical, legal or market pressures required urgent attention. Several ATC subsidiaries were secretly controlled (to dupe competitors or unions), so management there had to be at arm's length. Despite Duke's public statements to the contrary, the complex, inter-related structures of the American, Continental, Consolidated and Lorillard holding companies were, in some

⁴⁵ *ibid.*, vol. 1, pp. 252, 255-56; vol. 2, pp. 277-78.

⁴⁶ Durden, *Dukes*, p.166.

respects, centrally managed. Then the Northern Securities decision of 1904 induced a tightened organization, under a new holding company, American Tobacco. Thereafter the core subsidiaries that were treated by the Commissioner of Corporations as centrally managed accounted for a similar proportion of the trust's business as the dominant Wills branch of Imperial that was managed from its Bristol headquarters.⁴⁷ In difficult and novel circumstances, both firms were feeling their way – experimentally, unseeingly and with intermittent success - to a more efficient organization, but, on the face of it, the British were initially making a better job of it, whether judged by business outcomes or by the degree of managerial integration. This was not necessarily because Britons were better managers, rather, perhaps, luckier strategists, who had not bitten off more than they could chew. Wills had driven its rapid growth internally by focusing clearly on cigarettes, and its consolidation of smaller competitors into Imperial in 1901/2 little more than doubled its own capital; whereas the American Tobacco acquisitions around the turn of the century involved seven-fold capital growth and mainly in tobacco sectors unfamiliar to Duke.⁴⁸

It is frustrating that we have no reliable account of internal management decision-making while these managerial stresses of exceptionally rapid corporate growth were being absorbed by Duke's loose agglomeration of disparate companies, but it is plausible that strategic thinking suffered. The board had some Wall Street heavyweights, but they may have been focused on private enrichment from insider dealing at the

⁴⁷ Commissioner, *Tobacco*, vol. 2, pp. 234-35, 305, 308, vol. 3, p. 43; Alford, *Wills*, pp. 262, 324.

⁴⁸ *Ibid*, pp. 263-4, 269; Bunting, *Statistical View*, pp. 41-2.

expense of stockholders rather than strategy for cigarette development.⁴⁹ The years around the turn of the century were years of corporate deal-making, financial restructurings, new capital issues, multiple acquisitions, and overseas adventures that must have absorbed a considerable amount of the twelve hour days that Duke reputedly put into management. The enormous size of the commitment to cigars and its failure to yield results parallel to those in other tobacco sectors clearly preoccupied senior management. It is possible that the failure to promote mass market cigarettes in this period, especially after the 1901 tax reductions, was simply a case of managerial overload. Some of these problems were resolved by 1905, when Duke also passed on his international responsibilities for BAT to a colleague, though his own excruciating divorce that year, burgeoning interest in his family's non-tobacco investments, and the brewing antitrust problems cannot have helped any time management problems. Whether a desire to modify the trust's perceived monopolistic behavior, a resolution of the severe managerial strains of rapid diversification, learning through BAT from British experience in cigarettes, or some other unknown factor caused the trust from around 1907 to resume its role as the main contributor to cigarette sales growth in the USA, catching up by 1910 with aggregate German sales levels (see Figure 1), is currently unknown.

Monopolists do, of course, have more managerial discretion than most businessmen and Duke used it to the full. Whether he maximized profits is moot, since strategic plays like cigars produced poor returns, but it would be a brave historian who second-guessed the choices made by a man who became immensely wealthy and was,

⁴⁹ Commissioner, *Tobacco*, vol. 2, for the accusations, and a complex (and debatable) attempt at unraveling their accounting.

with pardonable exaggeration, dubbed by a colleague “the greatest merchant in the world.”⁵⁰ Duke’s refusal to be drawn into selling cigarettes at under a nickel for ten, except selectively in the south and to deter entry, prevented most Americans having an option that many overseas smokers enjoyed, but was arguably a profit-maximising strategy, especially in the east coast urban markets on which his product differentiation campaigns were focused.⁵¹ The common stockholders in the 1890 merger (mainly Duke and his associates: the public largely held preferred stock and bonds) had by 1908 enjoyed a monopolist’s return, in income and capital gains, some three times that on the average manufacturing stock.⁵² It may be that no plausible strategy of exploiting consumers and passive investors (other than the impractical commandment “thou must always foresee everything perfectly and be right”) would have been more personally profitable than the one Duke chose.

There is a possible defense, in broader terms, of his strategic shift to product differentiation: that, in what was one of the wealthiest economies of the time, mass production and marketing of cigarettes was inappropriate. Diversity of taste in tobacco – in plug, snuff, cigars or Turkish cigarettes – could be seen as one of the fruits of wealth: a symptom of the choices offered by American economic success, not a signal of failure. But two obvious counterfactuals suggest doubts about this. First, the UK offered an alternative vision of much more rapid conversion of tobacco users to the cigarette, combined with a more wholehearted pursuit of mechanized mass production and low

⁵⁰ Winkler, *Tobacco Tycoon*, p.149.

⁵¹ Commissioner, *Tobacco*, vol. 1, pp. 229-230, vol. 3, pp168-169.

⁵² Burns, “Competitive Effects”, p.719 n.6; Commissioner, *Tobacco*, vol. 1, pp.118-23, vol. 2, pp.64, 312.

prices, rather along the lines the fablers exaggeratedly credited to Duke. Wills pursued a less monopolistically exploitative and more cigarette-focused strategy. Its cigarette prices were lower than ATC's and this enabled it to maintain its UK cigarette market share around 53% between 1895 and 1901 by rapid internal growth (without mergers), while its market share in other manufactured tobacco declined to a mere 5%⁵³. Its low price, high volume strategy produced a profit rate and absolute profits higher than the trust's in cigarettes, though (operating in a high-tax tobacco market less than one-fifth the size of the USA's) its total profits were less.⁵⁴

American consumers may not have liked the small, unflavored Woodbines that Wills successfully sold in the UK: British snobs also apologized for Virginia ("Sorry, it's only a Virgin") when not offering an up-market Turkish cigarette. Yet the British-Virginia cigarette sold well, in larger sizes, in Australia.⁵⁵ The British threat to build cigarette factories in the USA was forestalled for a quarter century by Duke's offer of the 1902 BAT merger, but events after the 1911 break up of the trust reinforce the suggestion that a variant of the British mass market strategy might have worked earlier in the USA. In the next fifteen years, free of Duke's control, US cigarette sales grew nearly four times faster than in the previous fifteen years and already by the late 1920s the USA matched British 1912 levels of cigarette consumption per head.⁵⁶ This transformation was initially driven by the Camel brand. Camels were launched in July 1913 by R. J. Reynolds, a medium-sized successor company explicitly excluded by Duke from cigarettes.

⁵³ Alford, *Wills*, pp.460-61.

⁵⁴ Ibid, pp.324, 460, 470-71, 476, 478; compare Commissioner, *Tobacco*, vol. 3, p.155.

⁵⁵ Walker, *Under Fire*, pp. 54-55.

⁵⁶ Commissioner of Internal Revenue, *Annual Report 1927*, p.98.

Extraordinarily (it is rare for a new entrant's new brand to capture an established market so quickly), Camels were within two years selling more than any previous US cigarette brand and within four years had nearly 40% of the, already much larger, US cigarette market.⁵⁷ A significant feature of this success, besides a return to high Virginia tobacco content in the mass production of domestic blended cigarettes and a slightly lower price in real terms, was a massive increase in advertising. Duke had advertised extensively in the early days, but had suppressed advertising of mass market cigarettes to modest levels after attaining a monopoly.⁵⁸ In this environment, the revealed preferences of consumers for heavily advertised and expensive cigars and Turkish cigarettes cannot be taken as unambiguous indicators of exogenous taste differences. We should be cautious in assuming it would have been more profitable for Duke to behave as the fablers thought he did (or as the British actually did), though more open to the possibility that it might have been preferred by American consumers. The verdict delivered by post-1911 US smokers, when new entry and competition facilitated freer explorations of their consumption possibility frontier, lends some credence to that view.

Mechanization and Productivity.

It is difficult to find words that adequately describe the richly varied panoply of American tobacco enthusiasms before World War One, but the adjective that is most frequently used in the historical literature on international productivity differences is

⁵⁷ Tennant, *American Cigarette Industry*, pp. 75-78.

⁵⁸ Commissioner, *Tobacco*, vol. 3, p.164.

“European”. In the United States, we are told, “(t)he extraordinary development of mass production ... would hardly have been possible without its vast national market, its relatively egalitarian income distribution, and the unparalleled willingness of its immigrant consumers to accept standardized substitutes for traditional products.”⁵⁹ By contrast, textbook Europeans are supposed to have held stubbornly to archaic regional tastes (plug? snuff?) and reinforced class divisions in consumption (cigars? Turkish cigarettes?), rather than embracing the standardization of consumption (Camels?) of the melting pot. In tobacco, the American melting pot operated in these pre-war years at an extremely low temperature. The British and Irish brought their taste for Virginia (or what, in their newly adopted language, they learned to call “bright tobacco”) cigarettes, southern Europeans liked dark tobacco, and Russians and Californian Asians preferred *papyrosi* (cigarettes with a hollow cardboard mouthpiece where the filter tip now is, manufactured by the trust in San Francisco), but Italians and Germans opted for cigars, while Swedes took snuff, and they all, together with Greeks and Turks, brought varied craft skills in tobacco as well as varied tastes. Whatever it was that Borden, Campbell, Heinz, Kellogg and their like did to the tastes of immigrants in food (and I suspect that is exaggerated, too), American Tobacco signally failed to do in tobacco. On top of that, many native-born Americans refused to pander to new-fangled, foreign tastes and stuck to navy-plug, flat-plug, or fine-cut. The result was a pattern of consumption that has been held in Europe to explain low productivity. It is worth considering whether that was also the outcome in US tobacco manufacturing.

⁵⁹ Tolliday and Zeitlin, eds., *Power*, p.286.

There are three relevant estimates of comparative productivity for the period before World War One. Broadberry's study of physical productivity differences (based on census data on tobacco manufactured) found US tobacco productivity in 1909 8% higher than the UK in 1907 and 1% below it (with a similar two-year lag) in 1914.⁶⁰ Zitzewitz developed a time series for the same two countries' tobacco manufacturing, beginning in 1879, that showed British productivity, defined in terms of value-added, overtaking the US in the early twentieth century.⁶¹ Finally, I have suggested a reworking of Madsen's data for 1912 to produce productivity estimates for a wider range of countries (Table 3). The raw data on weight of tobacco manufactured per employee, normalized on the USA = 100 (the first column of the table), shows Germany lagging, but otherwise little trace of the normal US manufacturing leadership.⁶²

These productivity calculations make some heroic assumptions and there is room to debate the differences among the results, but the remarkable thing about them - and about all countries in Table 3 - is the uniformity of outcomes. It should be recalled that at this time the typical American manufacturing worker produced about twice as much as the average British or German worker, three times as much as the average

⁶⁰ Broadberry, *Productivity Race*, p. 196.

⁶¹ Zitzewitz, "Competition."

⁶² One reason for the difference in results is that the denominator in Table 3 includes all labor (including the self-employed and salaried staff), whereas Broadberry's denominator includes only operatives. The USA had an unusually large number of small family firms (thousands of whose, often hand-working, owner-managers are excluded by Broadberry), while in the UK and France tobacco output was more concentrated in large factories, so the difference matters.

Table 3. Productivity in Manufactured Tobacco, ca. 1912.

	Output per person employed (to the base USA = 100)			
	Weight of Output	Labor “Quality” Adjustment	Product Quality Adjustment	Both Adjustments
France	185	208	134	151
Australia	121	na	117	na
UK	118	127	155	166
Canada	105	na	na	na
USA	100	100	100	100
Italy	89	101	152	174
Austria	84	95	99	112
Spain	74	84	98	111
Japan	71	74	54	56
Germany	49	52	92	98

Sources: Hannah, “Competition,” for col.1; as Table 1 for cols. 2-4. The denominator is all persons employed, including operatives, staff and the self-employed. Col.2 assumes that the wage differential between men and women operatives reflected 50% gender prejudice and 50% lower productivity (see text and note 65) and adjusts the denominator for the latter only. Col. 3 would ideally use specific country-pair value added to adjust for product mix, but attempts to derive value added from national gross output values, except for the USA where the data are unusually good, reflect the assumptions made (particularly on leaf costs by product and the division between profits and taxes in state enterprises), rather than meaningful national price/quantity ratios. However, the value added in cigars and cigarettes was generally higher than in snuff, plug or cut tobacco. Col. 3 simply revalues the 1912 product weights for all countries by the ex-tax value-added/weight ratios implicit for the USA in 1909 in Table 4, i.e. by \$1.59 per lb for cigars, 99c for cigarettes, 26c for snuff and 12c for other tobacco. This would be especially misleading for Germany (where cigars – judging by price, mainly of low quality - accounted for 62% of output weights) and Italy (similarly, with 44%), against a median cigar share of only 13%. For those two countries only, cigar output is valued at the cigarette rate, but this possibly still flatters their output quality.

French worker, ranging up to nearly nine times in the case of the Japanese.⁶³ The output-per-person-year figure for tobacco, by contrast, is everywhere in the same ballpark: this was an industry in which, remarkably, the whole world was developed, or was as near to that outcome as we are likely to find.⁶⁴ (Perhaps more accurately, the whole world was *underdeveloped*, because, even in the USA, most tobacco manufacturing, notably cigars, was still done by handicraft - or modestly mechanized – processes. Even standard cigarettes were still profitably hand-made in low income regions of Cuba, Saxony or Iberia). The USA did not show its normal early twentieth century pattern of forging ahead, and this is particularly surprising in that in America this was still (just, at 52%) largely men’s work, whereas tobacco operatives in the rest of the world, and especially in Latin countries, were predominantly female: around 95 % in Italy and Spain and 87% in France. Both the high productivity of Frenchwomen and the power of male-dominated unions in US cigar manufacturing suggest caution in inferring, from men’s wages everywhere being around twice those paid to women, that men were more productive, though, where women were less skilled, less experienced and earned less at piecework, their productivity was clearly lower.⁶⁵ The second column makes an adjustment for this on the assumption that half the wage differential was due to gender prejudice and shows the USA in even poorer light. Nor does the further adjustment for product quality in the last two columns fundamentally change the USA’s mediocre productivity ranking. If the whole world was developed, it seems reasonable to characterize this – as our earlier

⁶³ Broadberry, *Productivity Race*, pp.2, 48-57.

⁶⁴ Clark, “Why isn’t the whole world”, is a thought-provoking discussion of why this cannot happen.

⁶⁵ Brissenden, *Earnings*, p. 377; Madsen, *State*, p.43; Oakeshott, “Women”, pp.567-572.

analysis also suggests - as a consequence of US tobacco manufacturers behaving badly, rather than because the rest of the world did particularly well.

However, the country that forged ahead of the pack in Table 3 - France – had a tobacco industry with characteristics that, in other contexts, have usually been described as American. France had the most standardized output of any country in the table: *scaferlati* (cut tobacco for pipes and home-rolled cigarettes) and the cigarettes made from such tobacco accounted for 81% of production by weight and 76% by value.⁶⁶ It also had one of the most professionally managed, long-established and centralized management hierarchies in an industry which in many countries, including the USA, was still in the hands of small, medium and large family firms, only just beginning to experience bureaucratization and the divorce of ownership from control. The French *Régie* had for long recruited on merit by competitive examination, and employed some of France's top engineers from the *grandes écoles* in senior management positions.⁶⁷

The precocious performance of the Japanese state monopoly should also be noted: it had vastly reduced the normal nine-fold US productivity advantage, half a century before that was approached by other Japanese manufacturing industries. As in France, demand was relatively standardized, though Japanese cut tobacco (77% of 1912 output by weight) was still mainly smoked in the traditional long-stemmed, small-bowled *kiseru*, and was finer cut than the tobacco used in cigarettes.⁶⁸ The Japanese tobacco manufacturing monopoly had been established as recently as 1904, by bureaucrats

⁶⁶ Ibid, p.218.

⁶⁷ Eveno and Smith, *Histoire*.

⁶⁸ Anon., *Tabako*, vol. 4, pp.682-84.

knowledgeable of French achievements, following the established Meiji era habit of copying the best in the West (the local model provided by Duke's Japanese subsidiary was explicitly rejected). The Monopoly Bureau of the Ministry of Finance recruited well qualified engineering and law graduates from the top imperial universities: the head of the Bureau in 1912, Osachi Hamaguchi, was a graduate of Todai and a future prime minister of Japan. Within several years, the Bureau substantially raised prices and revenues, concentrated its consequently stagnant output on large factories and nearly doubled the productivity level that had been achieved under private management. However, contemporary complaints that standardization of demand by state monopolies failed to match consumer preferences and the ambiguous impact of the imperfect product quality adjustments in Table 3 suggest that more research would be advisable before inferring the general superiority of the socialist "visible hand."⁶⁹

Countries like Germany, whose capitalist producers specialized in cigars, found it difficult to match productivity in countries like Britain and France, which concentrated on cigarettes and smoking tobaccos. The US failure to forge ahead can also be traced to the influence of the cigar. Table 4 disaggregates the US tobacco industry's value added and employment for 1909 into four specialist product sectors; disaggregated physical output data is also available for that census year. Cigar manufacturing accounted for over three-quarters of the labor in US tobacco manufacturing and labor productivity in cigars (in terms of value added or physical output) was markedly lower than in other sectors.

⁶⁹ Madsen, *State*, pp.45-6, 267-71.

Table 4. Productivity in US Tobacco Manufacturing, 1909.

	Number of wage-earners.	Value-added per wage-earner		Physical output per wage-earner
		Inc. tax	Ex. tax	
Cigars	129,518	\$999	\$839	528lbs.
Chewing and Smoking Tobacco	24,338	\$2,895	\$1,911	16,581lbs.
Cigarettes	8,159	\$3,097	\$2,243	2,258lbs.
Snuff	1,698	\$5,356	\$4,357	16,689lbs.

Sources: employment and value-added data are from Department of Commerce, *Abstract*, p.470; tax adjustment and physical output data from Commissioner, *Tobacco*, vol. 3, pp. 49, 51, 84, 87, 127, 129, 138-9, 153, 155, 181-2, 192, 194, 440, 442; and Commissioner of Internal Revenue, *Annual Report 1914*, p.150. 98% of the wage-earners (those enumerated in column 1) were in factories specializing in the four main product categories shown, to which the value-added data in the next column conform, and are the denominator in all the productivity calculations. However, data for the tax adjustment in column 3 and the physical output in the numerator of column 4 additionally include the 3,097 tobacco workers (2% of the workforce) in mixed product factories, and relate to a differently defined year. This may bias the results in the last two columns.

The US cigar sector did no better in physical productivity terms than Germany's, though it did better in terms of value added per worker, but it was US performance in other sectors that enabled it to outpace Germany. Burns has usefully drawn attention to the wide range of mechanization and productivity improvements in plug, smoking tobacco and snuff.⁷⁰ The data in Table 4 confirm both the quantitative significance in the USA of these sectors' employment levels and their favorable productivity performance (higher in physical productivity terms and not much below cigarettes in value-added terms). Burns also particularly lauds the trust for achieving

⁷⁰Burns, "Economies."

economies of scale and production efficiencies by concentrating manufacture of these products into fewer, larger factories. However, the survivor technique evidence that he uses cannot refute the alternative hypothesis that large bureaucracies like American Tobacco prefer larger factories for their administrative tidiness, or, more charitably, as a way of neutralizing the managerial diseconomies of scale inherent in enormous enterprises.

It seems perverse, moreover, to credit the trust with the major contribution to productivity improvements in a sector where productivity growth had been very rapid in the earlier period of vigorous competition between family-owned firms in chewing and smoking tobacco and snuff, when a wide range of new tobacco machinery was being adopted. As Burns candidly notes, “the independent manufacturers were rather highly concentrated in 1897”: that is before the trust bought most of them in the following five or so years, thus turning a series of specialty oligopolies into a diversified near-monopoly.⁷¹ We can measure productivity growth in this sector (manufactured tobacco other than cigars and cigarettes), in the period of family control in the nineteenth century (when efficient firms with large plants were gaining share largely by internal growth) and in the later period when the trust was digesting them (further concentrating output into fewer, even larger plants). Value added per worker increased by an outstanding 119% in 1879-89; by a, still impressive, 92% in 1889-99; but by something nearer the average for US manufacturing - 28% - in 1899-1909.⁷² In other words, the trust brought the initially

⁷¹ Ibid, p.466.

⁷² Department of Commerce, *Abstract*, p. 700. For general skepticism on the benefits of the 1898-1902 merger wave, see Lamoreaux, *Great Merger Movement*; O’Brien, “Factory Size.”

high rate of productivity growth, driven by mechanical innovations induced by competition between its predecessors, down to modest levels, indulging in some bureaucratic tidying up. Even the modest productivity increase in the decade of trust control may have been illusory: the recorded increase in “value added” probably derived more from increased monopoly profits than from enhanced efficiency.⁷³

The fable leads us to believe that America led in cigarette productivity, but there, too, the picture was mixed. US cigarette productivity (see Table 4) was, in physical output terms, lower than other sectors (except cigars), though it commanded a high price, relative to weight, than many tobacco products, so its value added per worker was slightly greater than for smoking and chewing tobaccos. The new cigarette technology palpably added value: Bonsacks were remarkable machines to watch and rarely failed to enthrall the economic tourists of their day.⁷⁴ In 1890 Duke had been willing to pay over to the Bonsack Machine Company one-twelfth of his initial cigarette profits for exclusive use of the machine, so he evidently rated it highly.⁷⁵ It was also constantly being improved: early best outputs of 200 cigarettes per minute, already more than twice that of rival machines, were by 1913 up to 450 as standard. Yet cigarette machines were a case of multiple, simultaneous invention and were easy to manufacture. Bonsacks were only securely monopolized by the trust (and in the domestic market only) between 1890 and 1895 and Bonsacks made in New York, Dresden and Paris were widely available

⁷³ Compare the trust’s 1899 and 1909 costs and profits in this sector in Commissioner, *Tobacco*, vol. 3, pp.51, 87, 128, 139.

⁷⁴ Provost, *L’Industrie*, p.64.

⁷⁵ Winkler, *Tobacco Tycoon*, pp.79. 82; Commissioner, *Tobacco*, vol. 3, p. 155; but compare the less extravagant payment a professional engineer could negotiate in Alford, *Wills*, pp. 144-57, 229.

internationally. Many less efficient but serviceable rival machines were successfully produced worldwide and profitably used by other cigarette companies. The French state monopoly licensed Bonsacks before Duke, but found their expenses of upkeep high, so also used slower Decouflé machines, which Duke also felt had sufficient promise to justify buying the US rights to pre-empt competitive use.⁷⁶ The Ikegai Ironworks, in Japan, had difficulty manufacturing western textile machinery designs to the required tolerances, but could turn out dozens of copied cigarette machines at ¥400 (\$200) each by 1899/1900.⁷⁷

The emphasis in the fable on the paper-wrapping part of the cigarette production process is, moreover, misleading. Speed was the impressive essence of that part, but cigarette manufacture was, in fact, one of the slowest of all contemporary manufacturing processes. It typically took one-and-a-half years – and sometimes three - to make a cigarette, from the initial leaf processing to the final packaging and dispatch to jobbing wholesalers. The largest capital cost of a cigarette manufacturer was thus tobacco stocks and work in progress, rather than factories and machinery, and the prized “manufacturing” skill was leaf blending.⁷⁸ Field’s choice of American Tobacco as his prime manufacturing example of the capital-saving bias of the modern corporation is therefore particularly inapposite: the Bonsack’s saving of capital was infinitesimal.⁷⁹

⁷⁶ Commissioner, *Tobacco*, p. 266; Provost, *L’Industrie*, p. 307.

⁷⁷ Hanabusa, *Ikegai*, p.149.

⁷⁸ Ibid, pp. 61-62; Tilley, *Reynolds*, p. 174; Alford, *Wills*, pp. 179, 181.

⁷⁹ Field, “Modern Business Enterprise,” p. 477. If the “economies of speed” were between a very slow handworker taking, say, an hour to make a cigarette and the Bonsack a split second, the inventory cost

Moreover, contemporary technical manuals emphasize the wide range of other mechanical contrivances for processes like curing, drying, compressing, stemming, fermenting, ageing, conditioning, damping, stoving, cooling and cutting leaf (processes common to other tobacco products), saucing, twisting and shaping plug, pulverizing snuff, and the final packaging (which again was common to the whole range of branded tobacco goods, with a variety of different proprietary technologies for packing).⁸⁰ In cigar-making there were also important productivity gains from reorganizing table-top work-flow in teams and ancillary equipment for handworkers.⁸¹ The importance of machinery innovations thus depends on three factors: the efficiency of the machine compared with alternatives, its application horizontally to other sectors of tobacco manufacture, and its proportionate importance vertically in the extended process of manufacturing.

The Bonsack performed well on the first, not at all in the second and modestly in the third respect. We can measure its overall impact more precisely in 1889, when Duke discontinued hand-rolling. That still meant employing 350 girls on making and packing the cigarettes, in addition to the workers in the earlier stages of tobacco preparation, so the impact on total employment was less than the 48:1 ratio of the output of one machine to one skilled handworker would suggest. The early machines required a loader, an operator and a catcher, though this was eventually reduced to one, or, on faster machines, two attendants, with the help of a skilled development engineer. His annual commission,

saved out of, say, 500 days, would be under 0.001%; American Tobacco was a standard Hicksian labor-saving innovator.

⁸⁰ Balanced accounts of technical innovation in tobacco manufacturing include *ibid.*, pp. 139-57, 161-3, 225-33; Provost, *L'Industrie*, pp. 50-447; Tilley, *Bright-Tobacco Industry*, pp. 568-592.

⁸¹ Cooper, *Once a Cigar Maker*, pp. 18, 30, 170-76.

equivalent to the wages of 70 girls in 1889, negated some of the savings, but the local women and girls now employed were paid less than half as much as the skilled immigrant males that Duke had employed on hand-rolling. Duke's twenty four Bonsacks of 1889, producing 834 million cigarettes, were replacing 1,080 hand-rolling jobs.⁸²

The industry-wide labor-saving impact in the 1880s of all sources of productivity change - including such factors as learning-by-doing as well as increased mechanization – can be obtained by applying the labor productivity levels for tobacco manufacturing in the 1879 census to the tobacco output levels of the 1889 census and comparing the result with the actual 1889 employment levels. The total labor saving over the decade was 34,308 workers in cigars and cigarettes and 35,471 in other tobacco, so Duke's Bonsacks, saving the work of 1,080 hand-rollers, contributed 1.5% of the productivity improvement in the whole US tobacco manufacturing industry in the 1880s. If half the cigarettes made by the other members of the combination of 1890 were from Bonsacks operated as efficiently, these machines and Duke's accounted for 3.7% of the industry's labor productivity gains. This was less than their share of tobacco sales, so their productivity achievement, even with a generous allowance for other machinery innovations used, is unlikely to be much above the industry average. This contribution could have increased in the following decades, with increased efficiency of the Bonsacks, or of the derivative Standard machines manufactured by the trust. However, as the invention was only one part of the production process of a product whose initially small share of domestic US leaf tobacco use peaked at just over 6% in 1896 before declining to below 3% for several

⁸² On the assumption that they saved 45 jobs per machine: 48, less 3 operators (Tilley, *Bright Tobacco*, pp.476, 572; Commissioner, *Tobacco*, vol. 3 p. 149; Roberts and Knapp, "Paving").

years after 1901 (when Duke sold fewer cigarettes in the USA than in 1890), not regaining its 1896 level until 1911, it is difficult to envisage the number becoming very large in the three decades following the 1881 patent.⁸³ The pre-war story of improving productivity in tobacco manufacturing is clearly more accurately, if less picturesquely, told as one of widespread and pervasive advance on a broad front of mechanical contrivances, at least in the USA.

Bonsacks were ten times more important for Britain, with twice as many machines installed in a tobacco market less than one-fifth the size. As we saw in Table 2, cigarettes – overwhelmingly made on American-designed Bonsacks and Standards – accounted in 1912 for 42% of UK tobacco sales. Several decades later, when cigarettes achieved that market penetration in the USA, new inventions were eclipsing the pioneering American technology of the fable: Bonsacks were obsolescent and were being replaced by Molins machines (with speeds in excess of 1,000 cigarettes a minute), using a technology developed by Cuban-American immigrants to Britain, financed by Imperial Tobacco.⁸⁴ Cigarettes in their final, and curiously belated, triumph in the USA were largely manufactured by imported technology, just as their earlier, precocious triumph in Britain had been based on the American Bonsack.

American Tobacco may not have been able to outstrip the French monopoly's productivity in manufactured tobacco overall, or British productivity in cigarettes, and the behavior that led to this, it has been noted, has, in other industries, been seen as distinctively European. One major difference with European economies is nonetheless

⁸³ Commissioner of Internal Revenue, *Annual Reports*, various dates.

⁸⁴Hall, *Making*, pp. 29-38.

evident: these factors prevented America forging ahead, but they did not lead to falling far behind. If the USA got some things wrong in this industry, there was still something that kept its productivity nearer to the European leaders than they themselves were to higher American productivity in manufacturing generally. This appears to have owed only a modest amount to the technological prowess of Bonsack (who sold more machines abroad) or to the visible hand of Duke (whose post-1895 actions were often negative). It can as plausibly be traced to productivity advances achieved earlier by the traditional family tobacco firms that the trust took over. Perhaps some is due also to the independents who still accounted for most tobacco manufacturing value added in the USA. We do not know what caused the collective performance of these many contributors: perhaps it was the positive selection bias implicit in the choices Europeans made when becoming Americans; perhaps market competition was (in cigars and, until quite late, elsewhere) still working well in an unusually large and increasingly integrated US market; perhaps this industry was infused with the go-getting business culture that made immigrants to New York more entrepreneurial than culturally identical immigrants to London; and perhaps high US wages (driven by resource abundance and other industrial successes) induced higher work effort in tobacco as well.⁸⁵ There was, as Marshall put it in a different context, “something in the air” in America that drove even its mediocre performers like those in manufactured tobacco to levels that could still look a relatively well-performing Europe in the face.

The roots of Whig error

⁸⁵ Godley, *Jewish Immigrant Entrepreneurship*, introduces some of these issues.

The story I have told diverges somewhat from the traditional fable of American Tobacco, and it is worth asking why an evidently misleading narrative has held currency for so long. Much of this is due to the false dichotomies of the “robber baron” tradition (and of allergic reactions to it) that inhibit recognition that businessmen like Duke have both negative and positive effects. Technical innovation, economies of scale, monopoly prices, overweening ambition, large failed strategic bets, greed and predatory behavior are often bedfellows. It is not easy to conclude where the balance of advantage to the public interest (or even to stockholders) lies, and any historian is strongly tempted to duck balanced judgment in favor of a clear narrative theme. The problem is certainly not systematic or deliberate falsehood, for the canon of the fable rests on a factual narrative that is eerily accurate in detail, but misleading in substance.

The fable can most obviously be faulted for sins of omission. Evidence selection favors the relentless narration of an upbeat, one-sided story of successful American implementation of modernization and managerial integration, led by cigarettes. Where there is *no* clear statistical evidence – such as on whether Duke employed proportionately more professional managers in his cigarette enterprises than Wills - narrative details are selectively piled up to create the, possibly false, impression that he did; where there *is* statistical evidence, it is rarely cited. The fable tells us that Duke’s take-off into mass production was facilitated by the reduction of the cigarette tax in 1883 (which is true), but not how dramatic were the effects of the 1897/8 reversals of that tax cut. The fable tells us that Duke’s marketing innovations were essential for transforming the industry using the Bonsack (which is true), but not that he then presided over a decade-long stagnation

of the US cigarette industry, which compromised the extent of the machine's use. The fable tells us that the cigar was a diversion of the trust's strategy (which, in a sense, it was), but not why it was central to Duke's vision, nor that cigar employment, revenues, R&D spending and output greatly exceeded those for cigarettes. The fable tells us that Duke attained the massive sales total of five billion sticks in the USA (which he did), but not that the British, German, Japanese and Russian cigarette industries (and the American cigar industry) had done so earlier, nor that this contrasts with a normally higher U.S. rank in mass market, consumer goods and transforming, machine technologies. The fable tells us that British managers were from old-established tobacco families (which is true), but not that this was the norm everywhere (except state monopolies), nor that the business performance of the old, pre-trust tobacco families, and of the Wills -and later the Reynolds - families in modern marketing and technology, was overwhelmingly positive. The fable tells us that Imperial Tobacco formed a price umbrella that induced "gentlemanly" competition from new entrants (and new entry there was, even if the, endearingly stereotypical adjective's meaning is unclear), but not that American Tobacco's more ample price umbrella did so far more (so whether the more numerous US entrants were "ungentlemanly" remains an unresolved mystery). The fable tells us that German producers developed no really strong cigarette brand (which is true), but not that Duke's post-1900 product differentiation strategy led to similarly low sales for the top American brands. The fable misrepresents the historical contingencies faced by the actors, and the knowledge and constraints within which they operated, presenting historical outcomes as the linear product of the modernizing intentions of far-seeing professional businessmen, rather than of more complex and somewhat less unidirectional interactions

and processes, in which old and new struggled in the uncertain, uncharted strategic space of the messy present, to produce outcomes that were often unanticipated.

These biases mirror those analysed by critics of the Whig interpretation of history in the political sphere, with the heroic visible hand of corporate management taking the place of liberty and democracy in the Whig fable and driving a similar, grotesquely partisan, airbrushing of the evidence.⁸⁶ The worlds in which both fables prospered were worlds in which a fundamental truth (whose triumph and desirability were being peddled) was so self-evident that it was easy to read back into the historical evidence things that simply were not there. Historical explanation becomes compellingly easy if the goodies can, however capriciously and anachronistically, be labelled “professional” (or “Whig”), while the baddies can be tagged “family” (“Tory”) with parallel arbitrariness. It helps also if we use hindsight to endow historical persons with a clear vision of the future they are creating: narratives are more intuitively appealing when the characters know where they are headed (though real life is rarely like that). The criticism is not of the objects of the fablers’ praise (there is nothing wrong with liberty, or with good management), but of misplaced zeal to propagate what are profoundly unhistorical, predestinarian myths about the origins of what happened later. The USA really was in the 1960s the world’s leading manufacturer of cigarettes (and of very much else), and the job of the business historian was to demonstrate the inexorable path of virtuous progress to that end point promoted by America’s vital few.

⁸⁶ Butterfield, *Whig Interpretation*. This is a pervasive problem in business history, extending well beyond the present case, see Hannah, “Marshall’s Trees”; Lamoreaux, Raff and Temin, “Against Whig History.”

The factual errors that this imperative induced are the most revealing (because unconscious) indicators of bias, even among the most skilled business historians. For example, Alfred D. Chandler Jr., in a rare slip, credits the post-dissolution American Tobacco Company, rather than R. J. Reynolds, with the Camel revolution.⁸⁷ This – of course, unwittingly - fits his thesis more comfortably than the truth: that the return to the core mass production strategy that actually put the USA back on its path to later global dominance (and forced American Tobacco to change its own cigarette strategy) was devised by a company that earlier operated as an unusually independent subsidiary of the trust; was largely impervious to Duke’s strategic prejudices; and was run by an old established North Carolina tobacco family that knew its marketing, but had no previous experience of manufacturing cigarettes. They also rejoiced in the dissolution of the trust: “Watch me and see if I don’t give Buck Duke hell!” a North Carolina journalist reported Richard J. Reynolds saying.⁸⁸ The fablers, predictably, can see in that antitrust dissolution (for Reynolds – and US consumers - a liberation from the dead hand of the tobacco trust) at best a regrettable intervention that slowed the development of a fine corporation by compromising its competitive advantage.⁸⁹

Of course, all historical narratives require the selection of evidence and the reader might legitimately enquire why she should believe the present story rather than the traditional fable. The evidence base is hardly new: almost all the sources quarried here were published decades ago and were available to – indeed, widely cited by - the

⁸⁷ Chandler, *Scale*, p. 249.

⁸⁸ Daniels, *Tar Heel Editor*, p. 476.

⁸⁹ Chandler and Hikino, “A Historical Perspective,” pp. 228-9.

fablers.⁹⁰ One advantage of the present version is that it rests on a reasonably firm statistical base, which is at least a discipline on authorial bias, albeit (of course) not a foolproof cure. By contrast, the fablers simply assumed an uncomfortably large amount of their story of American leadership ought to be true, without the need to provide evidence⁹¹. On the whole, historians should favor accounts that explain what happened, over alternative narratives that, however compellingly, explain something that did not happen.

Not the least of the damage done by the fable was that it asked misplaced questions. It also hid from sight some of the issues addressed here: for example, what happens to international productivity differences when American consumers behave like Europeans and a monopolistic trust reinforces their diverse tastes, while French and Japanese state monopolists use their visible hand to drive the standardization of consumer demand. This perspective enables us better to understand the contingencies and trade-offs in the economic decisions faced by the businesses, governments, NGOs and consumers that, in revealingly different ways, drove these societies' diverse choices. It also exorcises some of the sillier stereotypes of cultural and technological determinists.

The stage was set by 1912 for one of the world's most interesting - but still largely unexplored - natural experiments in industrial economics. There was an unusually level playing field – in terms of initial productivity levels and technical potential - between all countries. The global tobacco industry as it actually existed after the antitrust

⁹⁰ An exception is Cox, *Global Cigarette*, which stimulated me to rethink some of the issues. For American Tobacco's international performance, see also Hannah, "Strategic Games."

⁹¹ For similar criticisms, in the context of other industries, see Broadberry and Crafts, "Britain's Productivity Gap," pp. 534-35, 548-49, 553-55.

break-up of 1911 provided a remarkable laboratory of industrial organization, prompting questions on state versus private ownership, on monopoly versus oligopoly, and on nationally-owned versus multinational enterprises. We see glimpses of the outcome in the private sector: the new US multi-firm oligopoly that replaced American Tobacco overtook the productivity levels of Britain's Imperial Tobacco in the inter-war years. Yet, despite its growing relative inefficiency, Imperial generated such high monopoly profits that it became the second most valuable firm on the world's stock exchanges, until Britain also adopted an antitrust policy.⁹² If this article succeeds in refocusing attention on such questions of comparative industrial organization that really require analysis, it will have succeeded in its major purpose. We might then be able to construct a new business fable which serves the true purpose of the genre: to illuminate rather than obfuscate the issues.

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