

COMPETITION AND PRODUCTIVITY: A REPLY TO HANNAH

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IN ZITZEWITZ (2003), I ARGUE that the UK and US tobacco industries had similar access to new manufacturing technologies but were monopolized at different times, providing a “diffs-in-diffs” case study with which to examine the effects of competition on productivity growth. US productivity growth was slower during the Trust era (1890-1911) than in the UK, and an initial US productivity lead was lost. After the breakup of the American Tobacco Trust, US productivity growth accelerated dramatically. At the same time, it slowed in the UK industry, which had merged to monopoly in 1902, and productivity leadership passed back to the US.

Leslie Hannah (2005a) concurs with most of this story. He does not dispute my conclusions about relative productivity levels and growth rates, and he agrees that the comparative acceleration of productivity growth in the US after 1911 was related to the increase in competition.¹ He does, however, question whether the US was more

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¹ We also agree on the likely reason that UK productivity growth continued to be strong from 1902 to 1912 – a transfer of Wills' superior technology to other plants that was enabled by the merger. It should be noted that Rostas (1948) and Broadberry and Crafts (1990) had earlier reported the faster productivity growth in the U.S. after 1911.

monopolized than the UK from 1890 to 1898. American Tobacco did have a market share of roughly 90 percent in cigarettes from 1890 to 1910, whereas the leading UK firm, Wills, had a share of roughly 55 percent until the 1902 merger. But Hannah argues that cigarettes were a small share of the US industry (at least by weight), and as a result, the industry-level one-firm concentration ratio was not very different, at least until American Tobacco consolidated the chewing and smoking tobacco industries in 1898.

Hannah also calculates productivity levels for a variety of countries in 1912, finding the highest productivity in France, whose industry was a state-owned monopoly. On the basis of this French Paradox (along with the surprisingly good productivity of the Japanese state monopoly), he argues that the relationship between monopolization and productivity in tobacco was more complex than I allowed.²

In doing so, Hannah provides some very interesting new data. My only complaint about his critique is that in both sets of calculations, Hannah aggregates tobacco products, and he does so by weight. One problem with this approach is that transforming tobacco leaf into cigars or cigarettes represents substantially more manufacturing output than producing chewing or smoking tobacco, once you adjust for this, the French and Japanese paradoxes basically disappear.³ In addition, cigarettes and roll-your-own smoking tobacco were not close substitutes, especially in the 1890s, before cigarettes became a mass-market product.

² I had already allowed for some complexity, noting the low productivity of the fragmented U.S. cigar industry and suggested the apparent peak productivity growth at intermediate concentration levels was consistent with the inverted-U-shape relationship in past cross-industry empirical work. Hannah's data on the low productivity of the fragmented German and Russian industries suggest that they provide additional examples of the left arm of the U. The high apparent productivity of the French monopoly, on the other hand, is truly anomalous.

³ Hannah (2005b) does acknowledge this point in discussing the French and Japanese results.

One can take different approaches to quantifying the output-to-weight ratio for different products, but they all lead to ratios that are much higher for cigars and cigarettes. In Zitzewitz (2003), I used data from the 1939 U.S. Census of Manufactures and from a 1896 Wills cost study to calculate value added per pound by product, finding ratios for cigarettes and cigars that were roughly 4 and 6 times that of other manufactured tobacco products, respectively (Table I).⁴ Using data from Madsen (1916), Hannah's source for most of his output and employment data, one can also construct value added-per-pound ratios for Austria, France, Italy, and Japan.⁵

⁴ One can also use value of sales data from the U.S. Censuses to calculate value-per-pound ratios; this yields similar results to value added. Due to data limitations I am forced to consider other manufactured tobacco products together; this undoubtedly masks some heterogeneity in output-to-weight, but presumably much less than is masked by aggregating all tobacco products. The UK value-added-per-pound data are from an 1896 cost analysis by the Wills firm [reported in Alford (1973) and my Table A1]. For the US, the ratios were calculated using value added data from the Census (at factory gate prices) and production data from excise tax records. Prior to 1931, U.S. value added data included indirect taxes, backing these out slightly increases the relative output-weight ratios of cigars and cigarettes.

⁵ Madsen (1916) reported value (at retail prices, including the state monopolies' markup) and weight produced by product for these countries, drawing on national sources. He also reported the total cost and weight of tobacco purchased across all products; if one assumes that the quality of tobacco used was uniform across products, one can estimate value added for each product.

Table I. Measures of relative output-to-weight ratios by tobacco product
 (Index: Manufactured tobacco = 1.0)

	Indirect taxes included?	Cigarettes	Cigars
Value added per pound			
UK 1896	No	4.2	NA
US 1909	Yes	7.6	5.7
US 1909	No	8.4	7.2
US 1914	Yes	5.5	4.7
US 1933	No	3.7	6.0
US 1939	No	4.4	7.1
Austria 1912	Yes	9.7	7.0
France 1912	Yes	3.3	2.6
Italy 1912	Yes	4.8	2.9
Japan 1911	Yes	2.3	5.7
Employees per pound			
US 1904	N/A	7.2	16.2
US 1909	N/A	7.4	17.1
US 1914	N/A	5.1	18.5
US 1919	N/A	4.8	20.8

Source: Author's calculations based on data in Madsen (1916) and, for the U.S. and UK, the sources cited in Zitzewitz (2003). For the countries with state-owned monopolies, "indirect taxes" refer to the state owned monopoly's profit.

As Hannah points out (footnote 6), the value added per pound of a product includes markups, which can reflect differences in market power and demand elasticity across products as well as differences in real output. An alternative proxy for output-per-pound is the labor input required per pound. These ratios tend to be higher, especially for cigars, reflecting the labor-intensity of cigar manufacture in the US. Neither proxy is perfect, but they both suggest that the amount of manufacturing represented by a pound of product was markedly higher for cigars and cigarettes.

Table II recalculates productivity for the countries with data available in Madsen (1916), adjusting for product mix. Once one adjusts for product mix, the relative performance of France and Japan appears lower.⁶ Given that cigarettes and especially cigars differ across countries, using the country-specific value-added weights may be most appropriate; with these weights, the private US and UK near-monopolies outperform all or nearly all of the state monopolies.

Table II. Product mix and productivity by country

	Product mix (by weight)			Output per employee, by output definition (index: UK = 100)					
	Cigarettes	Cigars	Lbs	Value added		Labor input		Value added at national prices	
				1896 UK	1909 US (gross of tax)	1909 US (net of tax)	1909 US		1914 US
UK 1912	48%	2%	100	100	100	100	100	100	100
Austria 1912	17%	14%	69	59	45	46	67	86	86
US 1909	3%	24%	93	81	51	54	106	148	82
France 1912	9%	6%	153	90	65	65	85	107	74
Italy 1912	17%	44%	69	99	68	74	144	196	66
Spain 1912	26%	13%	61	57	47	48	66	80	NA
Japan 1912	17%	0.0%	72	43	36	35	34	37	34

Sources: Data for the U.S. and UK are from the sources used in Zitzewitz (2003); for other countries, data are from Madsen (1916).

The question of how and whether to aggregate is also important to considering whether American Tobacco and Wills were “monopolies” in the 1890s. Cigarettes accounted for about 3 percent of US production by weight; in the UK their share increased from 0.5 to about 10 percent during the decade. Cigarettes’ importance in

⁶ It is worth noting that Madsen (1916) devotes one of his chapters on the French industry to consumer and retailer complaints about the quality of the French monopoly’s products (stockouts, packages with less than the stated quantity, nails in place of cigarettes or filler in place of tobacco, cigarettes that fall apart), suggesting that a quality adjustment may likewise be in order. Madsen’s agenda is to expose the inefficiency of state monopolies, of course, but the fact that he chooses the French tobacco industry as the centerpiece of his study may be informative.

terms of revenue or value added is greater, however, and in terms of contribution to profit, is even more so.⁷

More importantly, the U.S. cigarette and manufactured tobacco markets were not as linked as Hannah implies. Cigarettes were a luxury product in the US in the 1890s and were priced at a significant premium to smoking tobacco. Even while pricing smoking and chewing tobacco below cost, American Tobacco was able to earn margins of 30-35 percent in cigarettes, suggesting that their lack of a monopoly in manufactured tobacco did not significantly constrain cigarette pricing.⁸ Until 1895, cigarette pricing was also not constrained by its remaining competitors, as American Tobacco owned exclusive rights to the leading cigarette machines, leaving the competitive fringe at a significant cost disadvantage.⁹ Wills, in contrast, was facing growing competition from firms such as Ogden and John Player, until the merger to monopoly in 1902. The historical evidence I cite suggests that Wills' management regarded this competition as a threat, and increasing productivity and sales in cigarettes as its primary means of meeting it.

So while the tobacco-wide market shares of American and Wills may not have differed significantly until 1898, American Tobacco enjoyed a highly profitable market position in cigarettes that was difficult to contest, and thus had the luxury of devoting its managerial attention elsewhere. Wills was also profitable in the 1890s, but did not have

⁷ The 1896 Wills study calculated that cigarettes' contribution to profit per pound was about 7 times that of manufactured tobacco. Given American Tobacco's strategy of predatory pricing in manufactured tobacco, cigarettes accounted for most of its profits.

⁸ US Bureau of Corporations (1915, p. 161, 164, 166).

⁹ As I discuss in Zitzewitz (2003), learning-by-doing was important in manufacturing cigarettes; even after the Bonsack patents were invalidated in 1895, the competitive fringe was at a significant experience disadvantage.

the same luxury until the 1902 merger. It was this difference I sought to capture when I treated the U.S. as “monopolized” and the UK as “competitive” from 1890 to 1902.

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