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The 1983 Increase in the Federal Cigarette Excise Tax

From 1951 through 1982, the U.S. federal excise tax on cigarettes re-
mained at $0.08 per pack. As part of the Tax Equity and Fiscal Responsi-
bility Act of 1982, the U.S. Congress temporarily increased the tax to
$0.16 per pack, effective January 1, 1983. The statute contained a sunset
clause that provided for resumption of the old $0.08 rate on October 1,
1985. After a half-dozen temporary extensions, Congress made the $0.16
rate permanent in 1986.

In this paper, I take a closeup look at the microeconomics of the recent
federal cigarette tax increase. My main conclusions are as follows:

1. During 1981–1986, the real price of a pack of cigarettes, adjusted for
   general inflation, rose 36 percent.
2. Quantitatively, the main component of rising cigarette prices was *not*
   the increased federal excise tax, but a rapid expansion in the whole-
   sale prices charged by the major U.S. cigarette manufacturers.
3. The pattern of manufacturers' wholesale price increases had many of
   the characteristics of an oligopoly price markup.
4. With the federal tax increase already scheduled, manufacturers' whole-
   sale prices began to increase substantially in the fall of 1982, at least
   three months before the scheduled tax rise. From August 1982 through
   December 1983—as a result of six industry-wide price announce-
   ments—the wholesale prices of branded, nondiscount cigarettes rose

$0.09 per pack, exclusive of the federal excise tax. There is little evidence that such price increases were matched by cost increases.

5. The preannounced, one-time federal tax increase appears to have served as a focal point for coordinating oligopoly price increases by sellers.

6. Accordingly, the full impact of the increase in the federal excise tax may not have been the legislated $0.08 per pack rise in price, but a market-induced jump in price of about $0.16 per pack. Quite contrary to the conventional view of the incidence of excise taxes, the federal excise tax may actually have had a multiplier effect upon price.

7. During 1981–1986, per capita consumption of cigarettes declined 15 percent. The increase in cigarette prices was probably the main cause of the decline.

8. The decline in cigarette use reflected mostly a decrease in the number of cigarette smokers rather than in the amount smoked by continuing users. The evidence supports the hypothesis that price increases do not induce smokers to cut down on the number of cigarettes. Instead, they either induce existing smokers to quit or prevent potential smokers from starting.

9. Even if a rise in the price of cigarettes reduces the number of smokers, there is insufficient evidence to determine whether the effect is reversible. We do not know whether quitters would resume smoking if the price were to fall, or whether more teenagers would start.

10. Who cuts down on cigarettes, who quits, and who fails to start are critical questions in assessing the quantitative effect of a cigarette tax increase on the health of the population. It is likely that, as a result of the price-induced decline in cigarette consumption during 1982–1985, about 100,000 additional persons will survive to age sixty-five.

The cigarette tax has already been studied, argued about, and reviewed. I hardly intend yet another review of the reviews. In particular, I do not inquire about the general role of excise taxes in federal tax policy, nor do I compare cigarette taxes to other federal excise taxes, such as those for the airport and highway trust funds. I do not ask whether increases in federal excise taxes usurp the states' taxing roles. For the year ending June 30, 1986, federal excise tax revenues on cigarettes were an estimated $4.4 billion,[1] constituting 13 percent of total federal excise tax

1. U.S. Department of Agriculture, Economic Research Service. *Tobacco situation and outlook report*. Number TS-195, September 1986, Table 31.

collections and 0.8 percent of total federal on-budget receipts.[2] Federal excise tax collections were about half of combined federal, state, and local governmental excise tax revenues from cigarettes.[3] For calendar 1985, total governmental excise tax collections on cigarettes comprised about 0.4 percent of personal consumption expenditures.[4] Although excise taxes make up less than 1 percent of governmental tax revenues in the United States, the proportion exceeds 5 percent in the United Kingdom and the Federal Republic of Germany (Gray and Walter (1986)).

Moreover, I shall not consider the direct incidence of cigarette excise taxation. Although one repeatedly hears that cigarette taxes are income regressive, it needs to be understood that regressivity is only one dimension of fairness. In a 1980–1981 survey, expenditures on tobacco by consumers in the lowest income quintile constituted 1.2 percent of their total expenditures and 2.9 percent of their income; for the highest income quartile, tobacco made up 0.7 percent of total expenditures and 0.5 percent of income.[5] From a 1978–1980 series, I have computed cigarette excise tax payments to be 0.5 percent of income for adults under age sixty-five, but only 0.3 percent of income for the elderly (Harris (1986)). Although an estimated 31 percent of adults are current smokers,[6] one survey of business executives found that only 14 percent of top managers now smoke cigarettes.[7,8]

1. Price and Consumption in the Modern Cigarette Industry

Figure 1 depicts the relation between consumption and price of cigarettes during the twenty-three year period since the 1964 issuance of the report of the Surgeon General's Advisory Committee on smoking and health. The quantity of cigarettes is the annual consumption per person aged eighteen and over. (It is not consumption per adult smoker, but

2. U.S. Department of Treasury. *U.S. Treasury Bulletin*. 3rd quarter, fiscal 1986. Table FFO-2.
3. U.S. Department of Agriculture, Economic Research Service. *Tobacco situation and outlook report*. Number TS-195, September 1986, Table 31.
4. *Economic report of the president*. February 1986, Table B-14.
5. U.S. Department of Labor, Bureau of Labor Statistics. Consumer expenditure survey: Results from the 1980–81 interview. *News Release*, December 19, 1984, Table 1, reproduced in Toder (1986).
6. U.S. National Center for Health Statistics. Provisional data from the National Health Interview Survey: United States, January–June 1985. *Advance data from vital and health statistics*. Number 119, May 14, 1986.
7. Robert Half International, Inc., New York, 1986.
8. See also Chappell (1985), Shughart and Savarese (1986), Toder (1986), Harris (1982, 1986).

consumption per adult.) The price is given in dollars per pack, converted by the Consumer Price Index to constant 1986 prices.[9]

The price-quantity relation in Figure 1 slopes neither uniformly down-ward like a demand curve nor uniformly upward like a supply curve. What Figure 1 shows is the combined effects of movements in both the supply curve and the demand curve for cigarettes. In general, one can-

9. The horizontal axis in Figure 1 represents total U.S. consumption per person aged eigh-teen and over, as reported by the U.S. Department of Agriculture. The vertical axis rep-resents the real mean domestic price per pack in constant 1986 dollars. To obtain current mean prices, I divided consumer expenditures for cigarettes (compiled from reports of the U.S. Department of Commerce, Bureau of Economic Analysis) by total U.S. con-sumption exclusive of overseas forces (as estimated by the U.S. Department of Agricul-ture, Economic Research Service). The 1986 data are provisional. See U.S. Department of Agriculture. *Tobacco situation and outlook reports*, various issues.
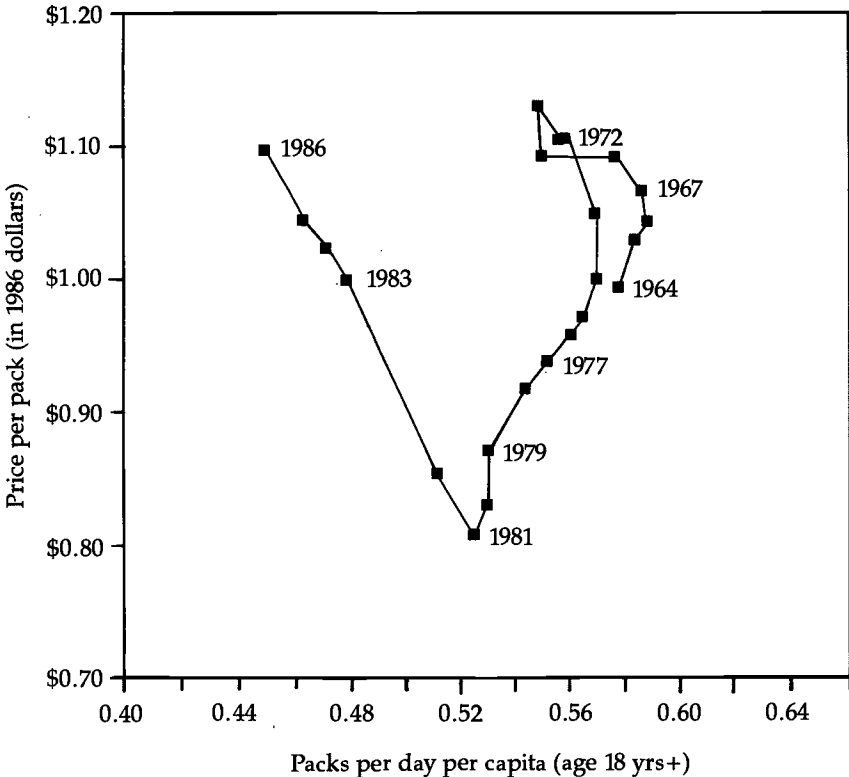

Figure 1 PRICE AND CONSUMPTION OF CIGARETTES, UNITED STATES, 1964–1966

not sort out these separate supply and demand effects merely from the type of data given in the figure. However, with additional information about market conditions, one could reconstruct a meaningful story of the separate influences of supply and demand in the modern American cigarette market.

It is useful to divide Figure 1 into three historical phases according to the movement of real prices: an initial period of price increases (1964–1971); a subsequent period of price declines (1971–1981); and a most recent period of renewed price increases (1981–1986).

1964–1971 The first phase was dominated by two main influences: actions by public and private organizations to publicize the health hazards of cigarette smoking; and increases in state and local cigarette excise taxes.

Thus, following the 1964 Surgeon General's report, the first required health warning on cigarette advertising and packages became law in July 1966.[10] In November 1967, the Federal Trade Commission issued its first periodic report on "tar" and nicotine contents of various brands. In March 1969, the Federal Communications Commission, applying the Fairness Doctrine, ruled that television stations must present a significant number of antismoking messages during prime-time viewing hours when cigarette commercials were presented. In April 1970,[11] Congress strengthened the required health warning and banned the broadcast of cigarette advertising starting January 2, 1971. (See Harris (1979)).

Concomitantly, during 1964–1971, the nominal price of cigarettes increased by about $0.13 per pack, about half of which represented increases in state and local excise taxes. Had there been no changes in state and local taxes during that period, the real price of cigarettes would have changed very little.

Much econometric sweat has poured forth in assigning the relative influence of health information and state taxes in the 1964–1971 phase, particularly in the drop in consumption during 1967–1970.[12] All of these efforts point to the same conclusion: increases in excise taxes pushed the supply curve upward, and emerging health information pushed the demand curve back.

1971–1981 The second phase has been somewhat more resistant to simple interpretation. Cigarette demand, according to some observers,

10. Federal Cigarette Labelling and Advertising Act (Public Law 89–92).
11. Public Health Cigarette Smoking Act (Public Law 91–222).
12. See, for example, Hamilton (1974), Schneider, Klein, and Murphy (1981), Porter (1985), Bishop and Yoo (1985), and Baltagi and Levin (1986).

rebounded after the 1971 ban on cigarette advertising and the concomitant removal of antismoking messages from the prime-time viewing hours (e.g., Hamilton (1974)). Others note that cigarette advertising expenditures, though declining in real terms for a few years after the ban, rebounded as the manufacturers intensified their promotional events and expenditures on nonelectronic media (U.S. Federal Trade Commission (1984)). On the supply side, the growth of state and local excise taxes slowed considerably: the absolute increase in nominal excise taxes per pack during 1971–1981 was less than half of the rise for 1964–1971.

Moreover, the average cigarette was being produced at progressively lower cost. These declines in unit cost appear to have resulted mainly from product changes as opposed to pure improvements in technical efficiency. Thus, from 1971 to 1981, the domestic market share of "low tar" cigarettes increased from 4 to 56 percent (U.S. Federal Trade Commission (1984)). Concomitantly, the average quantity of tobacco per cigarette fell by 16 percent.[13]

Accordingly, diminishing real excise taxes and absolutely declining production costs pushed the supply curve for cigarettes back downward during the 1970s. The demand curve probably continued to shift back as well. The net effect was a marked decline in price with relatively unchanged consumption.

1981–1986 During the third and most recent period, the real price of cigarettes rebounded almost to its peak of 1970. The biggest jump was from 1982 to 1983, the latter being the year of the federal tax increase.

Table 1 shows the separate components of the retail price of cigarettes from 1978 through 1985. The total price is broken down into four parts: the federal cigarette excise tax; the average state and local excise tax; the wholesale price quoted by cigarette manufacturers (exclusive of excise taxes); and the remaining retail trade markup. In contrast to Figure 1, the table shows the nominal prices in each year, uncorrected for general price inflation.

To interpret the evidence in Table 1, we need some institutional details. Cigarette manufacturers sell their products to regional distributors. Upon transit from the manufacturers to the distributors' warehouses, the federal excise tax is paid. (Some cigarette shipments, such as to the military and Indian reservations, are federal tax exempt. There are also inventory or "floor stock" taxes, to which I shall return). By convention,

13. Calculated from U.S. Department of Agriculture, Economic Research Service, *Tobacco situation and outlook report*, Number TS-175, March 1981, Table 2 and Number TS-196, September 1986. I computed the average weight of tobacco per cigarette to be 998 mg in 1964, 840 mg in 1971, 707 mg in 1981, and 621 mg per cigarette in 1986.

the manufacturers' prices are quoted inclusive of the federal tax. Such prices, typically per 1,000 cigarettes, may differ by brand category (non-filter, king size, 100 mm, etc.). When the cigarettes enter specific states for retail sale, the state tax, as applicable, is to be paid. Regional distributors, wholesalers, and retailers (vending machine operators, supermarkets, etc.) attach further markups, some of which are governed by fair trade laws in the respective states. What Table 1 shows is each of these effects as well as their total.

Superficially, Table 1 shows that the main source of the 1982–1983 price rise was the increase in the federal excise tax. However, for the entire period 1981–1985, the main source of increased prices is the manufacturers' wholesale price of cigarettes, and not rising excise taxes. For example, during 1981–1985, the average retail price of cigarettes rose from $0.67 to $1.03 per pack. Of this nominal price rise of $0.36 per pack, $0.08 was due to the federal excise tax; $0.03 to rising state and local taxes; $0.08 to retail trade markups; and the remaining $0.17 to manufacturers.[14]

Put differently, the 1981–1985 period represented a 30 percent increase in the real price of a pack of cigarettes. If the federal excise tax had not been increased during 1981–1985, but all other components of price remained as in Table 1, then the real price of cigarettes would still have increased 20 percent.

Figure 2 reinterprets the data in Table 1. In contrast to the table, the time periods are fiscal years ending June 30. During fiscal year 1983, the

14. As a check on the accuracy of the estimated manufacturers' wholesale prices, I performed the following alternative computations for a single domestic cigarette manufacturer—Lorillard, Inc.

Year	Cigarette revenues ($ billion)	Federal excise taxes paid ($ billion)	Estimated wholesale price per pack ($)
1978	0.813	0.218	0.22
1979	0.951	0.235	0.24
1980	1.053	0.239	0.27
1981	1.109	0.228	0.31
1982	1.173	0.213	0.36
1983	1.490	0.429	0.40
1984	1.431	0.383	0.44
1985	1.501	0.378	0.48

Total cigarette revenues and total federal excise taxes paid were derived from the annual reports of Loews Corporation, of which Lorillard is a subsidiary. The estimated wholesale price per pack is computed from the formula $t(R - T)/T$, where R is total cigarette revenues, T is total federal excise tax payments, and t is the federal excise tax rate per pack ($0.08 in 1978–1982, $0.16 in 1983–1985).

Table 1   CHANGES IN CIGARETTE PRICES, BY COMPONENT
UNITED STATES, 1978–1985

	Mean retail price	Federal excise tax	State & local tax	Manufact. wholesale price	Other retail markups
1978	0.55	0.08	0.12	0.22	0.12
1979	0.58	0.08	0.13	0.24	0.13
1980	0.63	0.08	0.13	0.27	0.14
1981	0.67	0.08	0.13	0.31	0.15
1982	0.75	0.08	0.13	0.37	0.17
1983	0.91	0.16	0.15	0.40	0.19
1984	0.97	0.16	0.15	0.44	0.22
1985	1.03	0.16	0.16	0.48	0.23

All prices and components in current dollars per pack. State and local tax equals state and local tax revenues divided by domestic consumption. The manufacturers' wholesale price equals the weighted average of wholesale prices (exclusive of federal excise tax), where the weights reflect the proportion of the year that each quoted price was in effect; the proportion of output for each brand (standard, king size 85mm, filter 80mm, 100mm, and 120mm); and the market share of the manufacturer. Computation of the mean wholesale prices includes generic and discount brands, whose market shares were 0.9 percent in 1982, 3.3 percent in 1983, 5.5 percent in 1984, and 7.3 percent in 1985. Other retail markups are computed as residuals.
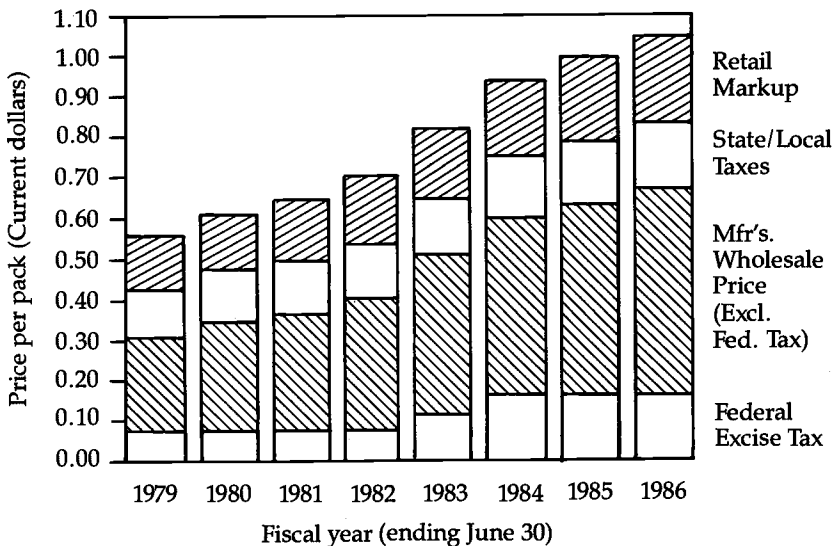

Figure 2 CIGARETTE PRICES BY COMPONENT, FISCAL YEARS 1979–1986

manufacturers' wholesale price increased by $0.07 per pack. By contrast, the federal excise tax (in effect only for half of the fiscal year) increased by about $0.04 per pack. During fiscal 1982 through fiscal 1984, increases in manufacturers' wholesale prices constituted about half of the retail price increase.

THE 1982 PRICE INCREASE

The key datum, it appears, is the behavior of manufacturers' wholesale price in the second half of calendar 1982, before the federal tax increase was to take effect.

Table 2 sets forth such information in detail. The table gives the behavior of manufacturers' wholesale prices for their higher-priced 100 mm brands, inclusive of federal excise taxes, from September 29, 1982, through June 27, 1985. The table indicates the dates of announcement of price increases; which firms announced the price increases on the first day of the announcement period (the "leading firms(s)"); which firms followed suit with price increases ("responding firms(s)"); and the list prices, net of the announced price increases, for each of the six major firms that comprise the domestic cigarette market. (The price increases announced during December 10–17, 1982, were effective January 3, 1983. Otherwise, all announcements were effective immediately or within a few days.)

Prior to 1982, manufacturers had typically announced coincident wholesale price increases twice annually. From 1975 to 1982, such prices were essentially uniform across manufacturers. The situation changed in 1982. In February 1982 (not shown in Table 2), all manufacturers' list prices increased uniformly by $1.00 to $21.70 per 1,000. Again, during August–September 1982 (also not shown in Table 2), manufacturers increased their list prices, but for the first time by differing amounts: Philip Morris by $1.40 to $23.10; the other five firms by $2.00 to $23.70.[15]

All firms again increased prices during September 29 through October 2, 1982, again by differing amounts. Concurrently, manufacturers announced "tax assistance plans" to ease the transition through the scheduled January 1 tax increase.[16] Such plans offered limited, tempo-

15. As of this writing, I have not located the individual manufacturers' telegrams announcing the February 1982 and August–September 1982 wholesale price increases; hence, they do not appear in Table 2. Data on median increases in wholesale price are given in U.S. Department of Agriculture. *Tobacco situation and outlook report.* Number TS-196, September 1986, Table 5. See also Number TS-177, September 1981.

16. R. J. Reynolds announced its Federal Excise Tax Assistance Plan (FETAP) on October 2, 1982: "In view of the impending federal excise tax increase on cigarettes, we have developed a program to help offset the impact of the increase for direct accounts and retailers and reduce the impact of higher prices on consumers. RJR's programs will

Table 2   PATTERN OF MANUFACTURERS' WHOLESALE PRICE INCREASES FOR 100MM BRANDS
SEPTEMBER 29, 1982 THROUGH JUNE 27, 1985

Announcement period		Leading Firm(s)	Responding Firm(s)	Post-increase price ($ per 1000)					
From	To			AM	BW	LM	LO	PM	RJ
29 Sep 82	06 Oct 82	LO	All	25.70	25.20	25.70	25.20	25.20	25.70
11 Nov 82	16 Nov 82	BW	Not RJ	27.20	26.20	27.20	27.20	27.20	25.70
10 Dec 82	17 Dec 82	PM, RJ	All	27.90	27.90	27.90	27.90	28.90	27.90
17 Jun 83	22 Jun 83	RJ	All	29.40	29.40	29.40	29.40	29.40	29.40
16 Dec 83	19 Dec 83	5 firms	All	30.15	30.15	30.15	30.15	30.15	30.15
01 Jun 84	06 Jun 84	PM	All	31.15	31.15	31.15	31.15	31.15	31.15
14 Dec 84	17 Dec 84	PM, RJ	All	32.40	32.40	32.40	32.40	32.15	32.40
29 Jan 85	29 Jan 85	PM	None	32.40	32.40	32.40	32.40	32.40	32.40
13 Jun 85	14 Jun 85	PM, RJ	All	33.40	33.40	33.40	33.40	33.05	33.40
27 Jun 85	27 Jun 85	PM	None	33.40	33.40	33.40	33.40	33.40	33.40

Source: Telegrams by manufacturers to wholesalers.
Note: Prices include applicable federal excise tax. Federal excise tax increased from $4.00 to $8.00 per 1000 cigarettes effective January 1, 1983. AM = American Tobacco Co.; BW = Brown & Williamson Tobacco Corp.; LM = Liggett & Myers Tobacco Co.; LO = Lorillard Inc.; PM = Philip Morris USA; RJ = R. J. Reynolds Tobacco Co.

rary bonus payments for accelerated purchases, as well as discounts to offset federal taxes on year-end inventories.[17] Moreover, several firms began to introduce generic and discounted brands.[18] Still, the net effect was to raise prices in 1982, not 1983. By the end of 1982, through five successive increases in list prices ($0.02 per pack in February, $0.04 per pack in August, $0.04 per pack in October, $0.03 per pack in November, and $0.014 per pack in December), the $0.08 per-pack tax increase had been almost twice recovered.

By June 1983, interfirm divergences in wholesale price had been virtually eliminated. In December 1984 and June 1985, Philip Morris's initial price increase fell short of that announced by R. J. Reynolds, which the remaining four firms followed. In both instances, Philip Morris acted within two weeks to match the others' price.

However, as the excise tax approached sunset on October 1, 1985, a new phase was entered. On September 13, 1985, Philip Morris announced a program to rebate taxes due on floor stocks should the federal tax expire as scheduled and should no provision be made for a floor stock tax refund. On September 19, American Tobacco Company offered to rebate the differential on one week's average supply should the tax expire and "the federal government does not provide for a floor stock tax refund to manufacturers and wholesalers. . . ." On September 18 and 20, R. J. Reynolds offered a similar one-week refund (its Federal Excise Tax Reduction Protection Plan) if "the federal government does not provide a tax refund to wholesalers or manufacturers. . . ." On September 19, 1985, Lorillard announced an "inventory protection" plan to take effect if the federal excise tax should expire as scheduled and if "the Bu-

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generate funds for direct accounts to assist in offsetting the year end floor tax and higher 1983 capital requirements. Retailers and consumers will benefit from unprecedented promotion programs throughout the remainder of 1982." Thereafter, the circular explained that a $2.00 increase would go into effect immediately, representing one half of the anticipated $4.00 increase. R. J. Reynolds's next price increase, announced December 10, 1982, which, it explained, constituted $2.00 as the second half of the $4.00 tax increase and $0.20 for "the costs associated with increased working capital and the 3¼% discount related to the higher federal excise tax." The October 1, 1982 increase of $2.00, R. J. Reynolds stated, was "an effort to minimize the impact to customers of doubling the federal excise tax by recovering the higher tax in two steps."

17. Philip Morris USA appears to have instituted a "Floor Tax Protection Plan" in October, 1982. Brown & Williamson established an "Excise Tax Protection Plan," along with assumption of the floor tax, in December 1982.

18. On October 6, 1982, Liggett & Myers announced a price increase on all regular brands, but exclusive of private label and generic brands marketed by Gary Tobacco Company, a subsidiary of Liggett. In a mailing two days later, Liggett asked wholesalers to advertise Gary brands aggressively.

reau of Alcohol, Tobacco and Firearms does not allow a rebate of the [federal excise tax] reduction on manufacturers' and wholesalers' inventory on hand. . . ." Subsequently, the Congress extended the excise tax temporarily to November 15, 1985. And likewise, between October 31 and November 9, firms announced similar tax protection plans.

These nearly simultaneous announcements may be more salient for what they did not say. None of the announcements mentioned the possibility of a permanent price decrease should the federal tax sunset. They may have been intended to indicate that no such decrease was contemplated.

COSTS AND PROFITS

Why did wholesale prices increase? There is little if any evidence of comparably increased costs. During the 1980s, the average quantity of tobacco per cigarette continued to decline. Moreover, imported tobacco became an increasingly significant portion of all tobacco used in American cigarettes. Such imported tobacco, mostly Oriental leaf, cost considerably less than domestic tobacco even with ocean freight and import duties, in part because of domestic price supports and in part because the entire Oriental leaf is usable without stemming.

To be sure, advertising and promotional expenditures of tobacco manufacturers rose from $1.55 billion to $2.10 billion during 1981–1984 (U.S. Federal Trade Commission (1986)). However, this cost increase, equaling $0.55 billion in aggregate, amounted to only $0.022 per pack. During the same period, manufacturers' wholesale price (exclusive of the excise tax) rose by about $0.13 per pack (Table 1).

American cigarette manufacturers are conglomerate, multinational firms. Accordingly, data on aggregate profits by company, or even profits by tobacco line of business (combined domestic and international) may not be indicative of profits solely from domestic cigarette sales. Moreover, reports of accounting profits for particular lines of business can be affected by methods of allocating corporatewide expenses. Still, the data that are available do not support the view that manufacturers' wholesale price increases reflected a comparable rise in the costs of operation.

Thus, for 1981 to 1985, the combined operating profits of Philip Morris, R. J. Reynolds, American Brands, and Loews Corporation from their tobacco lines of business (domestic and international) rose from $2.98 billion to $4.77 billion (annual reports of respective companies). These four companies held a combined domestic market share in excess of 80 percent during this period.

Similarly, from 1980 to 1985, Philip Morris USA, the domestic tobacco subsidiary of Philip Morris Companies, Inc. and the largest domestic

manufacturer, achieved the following unit sales and operating income:[19]

	Unit Sales (billions of packs)	Operating income ($ billion)	Operating income per pack ($)
1980	9.56	0.79	.082
1981	9.97	0.91	.091
1982	10.22	1.10	.108
1983	10.23	1.34	.131
1984	10.58	1.75	.165
1985	10.68	2.05	.192

Thus, for Philip Morris USA during 1980–1985, operating income increased by $0.11 per pack. During the same period, manufacturers' wholesale prices (including discounts and generic cigarettes, but excluding excise taxes) rose by an estimated $0.21 per pack (Table 1). These data suggest that about one half of the manufacturers' price increase during 1980–1985 can be accounted for by increased unit costs.

The evidence thus indicates that during 1981–1985, American cigarette manufacturers raised wholesale prices—exclusive of excise tax payments—by $0.17 per pack. Such a price increase was coincident with a one-time increase of $0.08 per pack in the federal excise tax, announced in 1982 and effective beginning in 1983. A key question is whether the preannounced federal tax increase served, at least in part, as a means to effectuate the rise in wholesale price.

EXCISE TAXES AND OLIGOPOLY BEHAVIOR

The cigarette industry has been repeatedly cited as an example of an imperfectly competitive industry. In the famous Tobacco Case of 1946, the major cigarette manufacturers were convicted of operating an illegal cartel in the 1930s (Nicholls (1949)). Although manufacturers were convicted, the consensus has been that company behavior was not changed by the verdict. Today, the American cigarette market remains a six-firm oligopoly. In 1982, the top four firms held a combined market share of 87 percent; the Herfindahl Index was 2543 (Porter (1986)).

How would the imposition of an excise tax affect the retail price of a

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19. See Philip Morris Companies, Inc. *1985 Annual report*. See also Moody's Investor's Service, *Moody's industrial manual*, 1982, p. 3246; 1983, p. 3261; 1984, p. 3272; 1986, p. 3351. Operating income equals operating revenues net of excise taxes, cost of sales, and depreciation. It does not include deductions for income taxes, interest expense, corporate expense, and other nonoperating income and deductions.

product sold in an oligopoly market? In general, there are two basic approaches to answering this question.

The first approach is to specify the rules of interaction among the sellers and then to analyze the effect of the tax *given* such rules. Thus, we determine the effect of a tax increase if the oligopoly operated as a cartel; alternatively, we assess the effect of the same tax increase if the firms showed no collusive or interdependent behavior; and finally, we assess the same effect if the member firms displayed partial interdependence. Each set of rules would give a different result. For example, for a competitive industry with perfectly elastic supply, all of the tax would be passed on to consumers. The logical inverse of this approach is that if we have already observed the response of an industry to an excise tax increase, then we could work backward to infer the degree of interdependence among the sellers. With such an approach in mind, some economists have studied how retail cigarette prices vary in relation to excise taxes across states (Sumner (1981), Bulow and Pfleiderer (1983), Sullivan (1985), Barzel (1976)).

The second approach does not take the rules of firm interaction as given. Instead, the idea is that the imposition of the excise tax may actually change the rules. That is, the tax increase could allow firms to act more like a cartel; alternatively, it could be the event that disrupts a collusive arrangement.

Within this second approach, there are two lines of reasoning. The first focuses on the incentives of would-be cartel members to cheat. The idea is that the imposition of an excise tax threatens profit margins in the same way as an increase in production costs. In turn, the profit situation in the industry affects the stability of any collusive or partially collusive arrangement. Although economists have long held that shrinking profit margins threaten such collusive arrangements, there is now some evidence to the contrary (Rotemberg and Saloner (1986)). Smaller profits, it appears, reduce the reward to recalcitrant behavior, and thus firms stick together.

Alternatively, the tax increase serves as a "focal point" or "coordinating device." The idea is that in a world where explicit, written contracts to fix prices are illegal, sellers will seek other bases for implicit agreement. The classic example is the phases of the moon, used by one cartel to determine whose turn it was to win in a series of supposedly sealed-bid auctions. Member firms used such an external event to coordinate behavior without explicitly communicating with each other.

A pending excise tax increase, which is scheduled to go into effect in a national market at a fixed rate on a fixed date, could in principle serve as such a coordinating device. Firms would announce a price increase in

anticipation of the pending tax hike. Because the pending tax increase is fixed and predictable, such firms would have good reason to anticipate that other industry members will respond likewise. An ideal but subtle strategy would be to implement the price increases in successive increments, each time assessing whether other firms will match the price rise. So long as prices were not already at fully collusive levels, member firms could push prices well beyond the magnitude of the tax increase.

The tax increase would act as a cover for the price increases. That is, during the period surrounding the tax increases, consumers may have difficulty discerning what proportion of the ultimate retail price increase was due to the tax. Such an effect would be enhanced if the industry operated through complex lines of distribution, involving multiple wholesalers and retailers, all of whom append their own markups to the ultimate price.

The behavior of the American cigarette industry during the period surrounding the federal excise tax increase is consistent with the hypothesis that the tax increase served as a focal point for an oligopolistic price increase. Prices increased in late 1982, the period prior to the effective date of the tax. Sellers justified such premature increases as smoothing the transition for wholesalers and ultimate consumers. The price increases occurred by a sequence of increments (August 1982, September 1982, October 1982, December 1982, etc.), in which an announcement by one firm would trigger responses by others. Although there were price differences for a few months before and after January 1, 1983, the date that the tax went into effect, such price differences were virtually eliminated by June 1983. Most of the price increases were initiated by Philip Morris and R. J. Reynolds, the two largest firms in the industry. During December 1984 and June 1985, when an initial increase announced by Philip Morris was more than matched by other firms, Philip Morris soon brought its price in line. During the period when the excise tax was pending expiration, firms made a sequence of announcements that failed to suggest any possibility that after-tax prices to wholesalers might fall. The pending sunset of the tax appears to have served as a focal point to communicate to other firms that prices would not be cut.

MULTIPLIER EFFECTS OF THE FEDERAL EXCISE TAX INCREASE

There is now an ambiguity about the impact of the federal excise tax on prices, which will necessarily carry over to its impact on consumption and, in fact, on health. The evidence indicates that an oligopoly price increase occurred. If the oligopoly price increase would have occurred in the absence of a federal tax hike, then the increase in the federal excise tax may conceivably have had a negligible effect on price. That is, manu-

facturers would have raised wholesale prices to the point where retail prices are exactly as they are now. Alternatively, if the tax was a critical focal point for coordinating an oligopoly price increase, than the increase in the federal tax had a multiplier effect on price.

The value of this multiplier effect could not be computed precisely from the data on hand. We would need to know how much sellers would have increased price without the tax. We would also have to determine what would have happened to retail markups. From the available evidence, the multiplier effect could be as large as twofold. That is, an $0.08 increase in the federal excise tax actually led to about $0.16 increase in retail price.

2. Taxes and Cigarette Consumption

During 1981–1986, as shown in Figure 1, the real price of cigarettes increased by 36 percent. Concomitantly, per capita consumption declined by 15 percent.

Was the decline in consumption simply a response to the rise in price, or were there other superimposed trends in demand? Put differently, does the downward-sloping portion of the price-quantity diagram in Figure 1 (that is, from 1986 to 1981) represent a piece of the current market demand curve?

One crude test is to compute the demand price elasticity from the putative segment of a demand curve in Figure 1 and compare it to other estimates in the literature. From Figure 1, we obtain that every 1 percent increase in the real price results in about a 42 percent decline in consumption (that is, $15/36$). Although estimates of price elasticity have varied from 20 to 120 percent, the above value of 42 percent falls pretty much in the consensus range of 40–70 percent (Toder (1986)).

The difficulty with simple computations based upon the price elasticity is that other economic variables have changed since 1981. During 1981–1984, for example, per capita consumption declined 10 percent while the real price of cigarettes increased by 27 percent. Concomitantly, cigarette manufacturers' advertising and promotional expenditures rose in real terms by 18 percent, and real disposable personal income rose by 10 percent. A more sophisticated test of the effect of price increases on demand would take account of these additional factors.

Such a test is performed in Table 3. The first row shows the actual percentage decline in per capita consumption during 1981–1984 (that is, from 0.525 to 0.472 packs per day per capita). The remaining rows in the table show what each of six different econometric analyses of the de-

mand curve for cigarettes would have predicted for 1984. For each model, two predictions are given: the percentage decline during 1981–1984 if only price had changed; and the corresponding percentage decline in consumption, taking into account such additional factors as income and advertising.[20]

With the exception of the Lewit–Coate model, the predicted overall declines in cigarette consumption were less than the "price effect only"

20. Let C denote per capita consumption of cigarettes; P, the real price per pack; Y, real per capita disposable income; A, real advertising and promotional expenditures of cigarette manufacturers; S, the stock of "advertising capital," a time series in which past contributions to the stock depreciate at a rate of one third per year; L, the fraction of cigarettes consumed with FTC tar rating below 15 mg; T, average tobacco per cigarette; C_{-1}, one-year lagged consumption per capita; POP, the total adult population eighteen and over; and YR, the calendar year.

The prediction equations were as follows. For Schneider et al. (1981, equation (8)): $\log(C) = \text{constant} - 1.218 \log(P) + 0.462 \log(Y) + 0.046 \log(S) - 0.235L - 1.386 \log(T)$. For Porter (1986, Table 6, equation (4)): $\log(C) = \text{constant} - 0.290 \log(P) - 0.130 \log(Y) + 0.0909 \log(S) - 0.390L - 0.319 \log(T)$. For Baltagi and Levin (1986, Table 1, OLS): $\log C = \text{constant} - 0.225 \log(P) + 0.004 \log(Y) + 0.038 \log(A) + 0.927 \log(C_{-1})$. For Ippolito et al. (1979, Table 1, equation (1)): $\log(C) = \text{constant} - 0.811 \log(P) + 0.735 \log(Y) - 0.014\text{YR}$. For Bishop and Yoo (1985, Table I, 3SLS): $\log(C \cdot \text{POP}) = \text{constant} - 0.454 \cdot \log(P) + 0.919 \cdot \log(Y) + 0.095 \cdot \log(A)$. For Lewit and Coate (1982, Table 2 Restricted Sample): $C = 0.779 - 0.315P$.

Except for the linear model of Lewit–Coate, the econometric analyses predicted the logarithm of consumption. Accordingly, it is more appropriate to assess the proportional change in consumption during 1981–1984, as is done in Table 3. For the Lewit–Coate model, I adjusted the "constant" term in the model so that, at a real price of $0.807 in 1981, the observed consumption of 0.525 packs/day per capita would be predicted.

Table 3   ACTUAL VERSUS PREDICTED DECLINE IN PER CAPITA CONSUMPTION, 1981–1984: SIX ECONOMETRIC MODELS

	Percent decline in per capita consumption, 1981–1984	
	Price effect only	Overall effect
Actual decline		10
Predicted decline		
Bishop and Yoo (1985)	10	5
Porter (1986)	7	5
Baltagi and Levin (1986)	11	10
Lewit and Coate (1982)	13	13
Ippolito et al. (1979)	18	16
Schneider et al. (1981)	25	21

The methods of calculation are given in footnote 20.

estimates. That is, such factors as rising incomes and advertising were expected to counteract the demand-depressing effect of price increases. For the three models that included more recent data (Bishop and Yoo (1985), Porter (1986), Baltagi and Levin (1986)), I find that the "price only" predictions show a consumption decline ranging from 7 to 11 percent, whereas the overall predictions show a decline ranging from 5 to 10 percent.

I thus conclude that most of the decline during 1981–1984 could be explained on the basis of price increases alone. However, unmeasured trends in cigarette consumption could also be important. From the Bishop–Yoo results, I decompose the observed 10 percent decline in consumption into three counteracting effects: a 10 percent decline due to price increases; an additional 5 percent decline due to secular trends in consumption; and an offsetting 5 percent increase due to rising incomes and increased cigarette advertising and promotion.

The unit for measuring demand in Figure 1 is consumption per capita, not consumption per smoker. Accordingly, changes in per capita consumption could reflect changes in either the average number smoked by current smokers or the proportion of smokers in the adult population.

Recent econometric studies of cigarette smoking in relation to local price levels (Lewit, Coate, and Grossman (1981), Lewit and Coate (1982)) have suggested that increases in price actually affect the proportion of smokers more than they affect the number smoked by continuing smokers. For adults, the demand price elasticity for the proportion of smokers was estimated to be 26 percent out of a total price elasticity of

Table 4   CIGARETTE USE IN RELATION TO PRICE FOR SELECTED YEARS, UNITED STATES, 1965–1985

Year	Price per pack ($1986)	Proportion of adults smoking cigarettes (%)	Average number of cigarettes per day per adult smoker
1965	1.03	42	28
1967	1.06	40	29
1970	1.14	37	30
1976	0.96	37	31
1978	0.92	33	33
1980	0.83	34	31
1983	1.00	32	30
1985	1.05	31	30

Sources: U.S. Department of Health and Human Services (1984); U.S. National Center for Health Statistics (1985, 1986); Harris (1980b).

42 percent. This estimated effect was found to be particularly striking among teenagers: the demand price elasticity for the proportion of smokers was 120 percent out of a total price elasticity of 140 percent.

Table 4 examines the national data on the proportion of smokers. For selected years, I have juxtaposed the price data of Figure 1 against survey-derived estimates of the proportion of adults who currently smoke cigarettes. I derived the rightmost column—the average daily consumption among adult current users—by dividing cigarette consumption per capita (as in Figure 1) by the proportion of current cigarette smokers given in the table. (Numerical adjustments to take teenage smoking into account lead to only minor changes in the rightmost column that do not alter the main conclusions.)

The patterns displayed in Table 4 show a reasonable but imperfect parallel to the aggregate per capita data in Figure 1. The prevalence of cigarette smoking fell during the late 1960s. (The decline was mostly from quitting smoking, though there may have been a reduction in the rate at which teenagers started to smoke. See Harris (1979, 1980b, 1983).) During the 1970s, the proportion of smokers declined less consistently. Moreover, as the market share of "low tar" cigarettes increased, the average daily smoking frequency showed a compensatory increase. During the 1980s, the prevalence of smoking declined in about the same proportion as per capita consumption. Accordingly, if the decline in consumption observed during the 1980s was caused mostly by price increases, then it was indeed an effect of price on the percentage of smokers.

How could price increases affect individual smoking in an all-or-none way? It is likely to be an interaction between prices and other influences on cigarette use. Surveys indicate that substantial proportions of cigarette smokers report recurrent unsuccessful attempts to quit smoking—sometimes five or more annually—in the face of an acknowledged desire to stop. Such attempts, which are typically very short-lived, are triggered no doubt by a variety of stimuli. Perhaps price increases trigger new attempts or improve the success rate of such attempts.

Given the data on cigarette prices, the price elasticity of demand for cigarettes, and the prevalence of smoking, one could estimate an independent quantitative effect of an $0.08-per-pack price increase (Harris (1982), Warner (1986)). As already noted, however, there is a conceptual question as to whether $0.08 is the correct quantity. If the change in the federal excise tax actually induced a full $0.16-per-pack increase in the nominal price of cigarettes, then I compute that, as a result of the federal excise tax increase and the resultant oligopoly response, about 2 million adults stopped smoking and 600,000 teenagers (aged 12–17) did not start.

3. Health Consequences

What will be the health consequences of the price-induced decline in smoking? Any attempt at a full response would require a separate paper. Instead, I shall offer the following points.

Cigarette smoke is a complex mixture of chemicals consumed at diverse stages of life. A reduction in smoking will have different effects on a woman of childbearing age, a young man trying to improve his exercise tolerance, a women in her thirties who takes oral contraceptives, a man who has worked for years with asbestos, or a man who already has poor circulation in his legs. These effects are qualitatively and quantitatively very different.

Moreover, responsiveness to price may vary considerably across smokers. To assess the health consequences of price increases, one therefore needs to know not merely the average price responsiveness of the smoking population, but whether price sensitivity is correlated with health effects (Harris (1980a)). We thus need to determine whether a newly pregnant smoking woman is more or less responsive to price increases than a smoker who, say, already has irreversible, terminal cancer.

At least for a number of chronic illnesses, the reversibility of smoking-induced danger depends on the duration of prior cigarette use. We thus need to know whether older persons who have smoked for several decades are more or less price sensitive than younger smokers. Further, there is evidence that for lung cancer the carcinogenic effect of the second pack of cigarettes per day may exceed that of the first pack (Doll and Peto (1978)). In that case, a heavy smoker's cutting down on a consumption might avert more damage than a moderate smoker's quitting. On the other hand, there may be illnesses for which the first cigarette of the day is more damaging than the last one.

Even if cigarette use responds relatively quickly to price increases, some of the health consequences of the resulting changes in smoking could take decades to be manifest. Thus, one's excess risk of lung cancer may not return to that of the nonsmoker for more than a decade. Abnormalities in the small airways of the lung, detectable in many of the youngest initiates to smoking, may indeed be rapidly reversible. But once chronic lung obstruction sets in, reversal of breathing impairment is much slower. By contrast, the effects of quitting smoking during pregnancy may be more immediate.

Moreover, predicting the future health consequences of current changes in smoking is hardly as easy as measuring the current health consequences of past changes in smoking. The median age of a person now dying from a disease caused by his cigarette smoking is about sev-

enty years. Such an individual, roughly speaking, started to smoke in the early 1930s, may have switched to filtertip cigarettes in the 1950s and 1960s, and may have quit smoking in the past couple of years. Epidemiological and biomedical investigations have yielded substantial quantitative information about the health risks of cigarettes among such past users. In particular, such investigations have indicated that smokers of exclusively filtertip cigarettes of the type available during the 1960s incurred lower risks of lung cancer (and possibly other cancers) than smokers of nonfilter cigarettes. By contrast, the evidence that the 1960s filtertip cigarettes conferred any protection against coronary heart disease (or other adverse health consequences of smoking) remains equivocal.

Filtertip cigarettes, however, have evolved further since the 1960s and early 1970s. Current cigarettes are diluted by porous materials and perforations in the filters. Smokers compensate for the air dilution by smoking each cigarette more intensively and, possibly, by blocking the perforations. Moreover, the newest cigarettes contain additives, such as artificial tobacco substitutes and flavoring extracts, whose identity, chemical composition, and health effects are as yet unknown.

Accordingly, who cuts down on cigarettes, who quits, and who fails to start are critical questions in assessing the quantitative effect of a cigarette tax increase on the health of the population. That an increase in price appears to reduce the proportion of smokers is likely to figure prominently in such an analysis.

Based upon the findings of epidemiological studies conducted during the 1950s, 1960s, and 1970s, I estimate that out of a cohort of 100 males who become regular cigarette smokers in their teens, about 11 will not survive to age sixty-five because of their cigarette smoking. For a comparable cohort of 100 women, about 7 will die before age sixty-five, who would have otherwise survived to that age. For males and females combined, about 9 percent will not survive to age sixty-five because of their smoking. If these estimates apply to current smokers, and if increased taxes prevented 600,000 teenagers from starting to smoke, then 54,000 additional teenagers will reach age sixty-five. Computation of the mortality consequences for regular smokers who quit smoking will depend upon the age distribution of those who quit. Roughly speaking, even if the effect of quitting were only one fourth that of not smoking at all, then I obtain an additional 45,000 survivors to age sixty-five years. Altogether, this would imply that about 100,000 additional persons will live to age sixty-five as a result of price-induced declines in cigarette use.

Although there was indeed a period when the real price of cigarettes fell (Figure 1), we have no clear evidence that the hypothesized effect of a price increase is reversible. Thus, although prices fell during 1971–1981,

the proportion of cigarette smokers did not rise (Table 4). It is conceivable that, if real price had not fallen, the declines in the prevalence of cigarette use might have accelerated during 1971–1981. Still, if increased prices were sustained for a sufficiently long period, and if one effect of such price increases were to deter teenagers from smoking, then a subsequent fall in price may not induce them to start smoking. The great fraction of persons now starting to smoke cigarettes do so while teenagers. Sustained, irreversible declines in cigarette use would have very different health consequences than temporary changes due to short-term price fluctuations.

4. Unanswered Questions

This paper has left unanswered a number of questions that merit further research.

My conclusion that manufacturers' price increases were not matched by cost increases is based on incomplete data. It would be appropriate to assess more carefully manufacturers' profit margins by domestic tobacco lines of business. It would be further desirable to ascertain whether the gains from cigarette price increases figured in other nontobacco corporate acquisitions made by the manufacturers.

I noted that manufacturers began to introduce generic and discount cigarettes in substantial numbers beginning in 1982. Although I attempted to take account of the presence of such discount brands in my computations of manufacturers' wholesale prices, I said nothing about their role in corporate pricing strategy. With respect to the analysis of variations in price sensitivity across consumers, it would be interesting to ascertain what types of consumers demand such brands.

I mentioned that changes in the type of cigarette consumed may affect the costs of production. I also discussed how future changes in cigarette composition may affect the health consequences of current price changes. However, I said little about who consumes such cigarettes. Nor did I ask whether the introduction of "low tar" brands has affected consumers' sensitivity to price.

I did not ask how long manufacturers' price increases might persist. If the increase in the federal excise tax had been originally enacted as permanent, then I speculate that most of the price increase would have been realized by the end of 1984. However, the fact that the tax was supposed to sunset in October 1985 may have moved manufacturers to persist in price increases. I examined data on wholesale prices only up to June 1986. One wonders what will be the pattern of manufacturers' prices now that the tax increase has been made permanent.

I focused on manufacturers' price increases, but I sidestepped the fact that wholesalers' and retailers' markups also increased. I am not sure whether such intermediate sellers also took advantage of the confusion surrounding the tax increase, or whether their markups are determined by other rules, such as state fair-trade laws.

I concluded that rising prices were probably responsible for most of the decline in cigarette consumption during the 1980s. Such a finding does not by itself imply that public and private sector education has had no effect. One can only conclude that the net effects of such informational efforts may be canceled by other factors, including promotional activities of manufacturers.

If increases in cigarette prices deter teenagers from starting, then the current period of sustained real price increases may have substantial long-term effects on the population of cigarette smokers. It would be of interest to know whether American cigarette manufacturers, in opting for such price increases, considered a balancing of these potential long-term losses against short-run profit gains. That would, of course, require predictions about the future path of the American cigarette industry, which I shall resist.

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