THE ECONOMIC IMPACTS OF THE TOBACCO SETTLEMENT

by

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Abstract

Recent litigation against major tobacco companies culminated in a "Master Settlement Agreement" (MSA) under which the participating companies agreed to compensate most states for Medicaid expenses. We outline the terms of the settlement and analyze whether it was a move toward economic efficiency using data from Massachusetts. Medicaid spending will fall, but only a modest amount ($0.1 billion). The efficiency issue turns mainly on the treatment of health benefits from reduced smoking induced by the settlement. We conclude that the settlement was a move towards economic efficiency.

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The recent litigation undertaken by the Attorneys General of several states against the major tobacco companies culminated in November 1998 in the well-publicized settlement.[1] The settlement, the terms of which are made explicit in a "Master Settlement Agreement" (the MSA), involves the largest sum of money paid in any civil litigation in American history.[2] While the final amount of the settlement is contingent upon certain future events, especially tobacco sales, the tobacco manufacturers have agreed to pay 46 states about $87 billion (in present value) through 2025 to compensate for health care expenses incurred by the Medicaid program.

In this paper we ask whether the settlement was a move toward economic efficiency. We conclude that it was. We focus our analysis on Massachusetts, the state for which we have particular expertise and data, but we believe our key conclusions will generalize to other states.[3]

The MSA has several components. First, the MSA specifies monetary payments from the tobacco companies to state governments. We estimate the payments to Massachusetts to be $4 billion in present value through 2025.[4] These payments are being financed by higher cigarette prices. Additional revenues to state governments are valuable for those entities, and the citizens they represent. But for the economy as a whole they are simply transfers from one party (future smokers) to another party (all the citizens of the state). Transfers do not by themselves affect economic efficiency.[5]

The increase in cigarette prices to finance the payments, however, will reduce the demand

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[1]   A copy of the settlement can be found at www.naag.org/tobac/index.html. The MSA resolves payments to 46 states. Florida, Minnesota, Mississippi and Texas reached prior settlements with the tobacco manufacturers.

[2]   See http://www.courttv.com/trials/tobacco/national/111698_ctv.html. Although the claim to be the largest settlement is likely based on nominal undiscounted values through 2025, we believe the settlement is the largest sum paid in real terms as well.

[3]   We were retained by the Commonwealth of Massachusetts as experts on Medicaid costs incurred because of smoking (see Cutler et al., 1998a, b, c). Massachusetts has 2.3 percent of the national population and its Medicaid spending is 3.3 percent of the national total. Thus, one can extrapolate our values to the nation as a whole by multiplying the Massachusetts values by a factor of 30 to 40.

[4]   Though the MSA in some cases predicts payments through the year 2548 (for 550 years!), we carry our calculations through the year 2025. Not only are any forecasts beyond the first 10-25 years subject to considerable uncertainty, they will be unimportant at usual discount rates.

[5]   One might contend that the increase in state revenues reduces deadweight loss by lowering revenue needs from other sources, for example the state income tax. But the increase in nominal wages from lower income tax rates is exactly offset by the increase in prices from the implicit cigarette taxes. There is no real wage change from this substitution. The only net effect of changing the mix of taxes is the change in cigarette consumption relative to other consumption, which we address separately. This tax mix point is similar to the 'double dividend' debate in

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for cigarettes. In addition, the MSA prohibits or restricts certain forms of advertising, such as cartoon characters and tobacco company sponsorship of public events. Further, the MSA funds tobacco counter-advertising that may convince people to quit or not begin smoking. We believe the increase in prices and counter-advertising will work to reduce cigarette consumption. We estimate that these provisions will ultimately reduce smoking by 11 to 13 percent of baseline amounts, with 90 percent of this reduction from the price increase and the remaining 10 percent from the counter-advertising campaign.

The reduction in cigarette consumption will affect economic efficiency in two ways. First, reduced cigarette utilization will reduce the external costs associated with cigarettes. Lower rates of smoking in the future will translate into lower Medicaid spending, the savings from which are a direct benefit to taxpayers. Indeed, taxpayers benefit both from the reduced taxes needed to finance Medicaid and the reduced deadweight loss from lower overall tax rates. We calculate the gains of reduced Medicaid spending to be relatively small, however -- about $0.1 billion to Massachusetts in present value from 1999 to 2025. This savings is perhaps one-fourtieth of the direct payments to the state and about less than a tenth of a percent of the present value of future direct spending by the state.[6] Given the size of these numbers, we feel comfortable ignoring other effects on state programs, such as state employee health insurance.

The second, and far larger, effect of reduced cigarette consumption is that people will live longer, healthier lives. An important reason these benefits are larger is that the price and counter-advertising effects apply to all smokers and potential smokers, whereas the Medicaid program effects apply only to Medicaid beneficiaries. We estimate the health benefits to Massachusetts of additional longevity alone (ignoring the benefits from reduced morbidity) at $29-$91 billion (in 1999 dollars) by 2025, with a 'best guess' of perhaps $60 billion.

These health benefits are only a net gain to society if people did not account for them properly in their smoking decisions. In the rational addiction model of smoking (Becker and Murphy, 1988), for example, smokers internalize the health costs of their smoking decision, and thus the internal benefits of reduced smoking are offset by the internal costs of lost cigarette pleasure. If this were not true, people would not smoke in the first place. We consider but reject

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environmental economics (Goulder, 1995).

[6]   It is about half a percent of current annual spending.

this argument. The evidence for the rational addiction model is not persuasive in comparison to other plausible models, particularly those where individuals overly discount current benefits at the expense of future benefits, where peer group interactions influence smoking decisions, and where youths experience regret or have biased expectations regarding addiction.

Still, if one believed part of the rational addiction model and cut our estimates of the health gains by 60 percent, the magnitude of the health benefits remains overwhelmingly large – perhaps $24 billion through 2025. This gain is large absolutely and relative to the payments that Massachusetts will collect. We estimate that for every $1 transferred from tobacco companies to the state, there are $6 of efficiency gains.

The reduced consumption of cigarettes will disadvantage some workers in the tobacco industry, and may result in some movement of resources out of tobacco and into other industries. These changes may reduce welfare of workers in the tobacco industry and owners of tobacco farms, but they are not an efficiency loss except perhaps for transitory effects. If the reduction in cigarette consumption is appropriate for external or internal cost reasons, the change in resource distribution that accompanies that demand reduction is an appropriate change socially.

This paper is structured in three parts. The first section estimates the financial payments to states under the MSA, and to Massachusetts in particular. The second and third sections estimate the efficiency consequences of the settlement, focusing on lower Medicaid expenses (the second section) and the value of longer life (the third section). The last section summarizes and concludes.

I.   Financial Payments to the States

We set the stage for our later efficiency analysis of the MSA by first valuing the financial transfers that the MSA specifies. Payments under the MSA are a product of a base amount and adjustments for a series of factors, including inflation and changes in the number of cigarettes sold. In this section we project payments for the nation as a whole and for Massachusetts.

There are six separate payments called for by the MSA, detailed in Table 1. The first is an initial up-front payment. Up-front payments for all 46 settling states total $12.7 billion (in nominal terms) between 1998 and 2003. The second, the heart of the settlement, are annual payments for Medicaid damages. Across all 46 states these payments total $87 billion in present

value between 2000 and 2025, and continue at the amount of $8.6 billion per year (in nominal terms) thereafter. To put these amounts in perspective, in 2000 these two payment streams combined amount to $0.32 per pack of cigarettes sold, and are expected to be $0.37 per pack in 2010.

The third payment is strategic contribution payments of $8.6 billion, to reward states whose litigation efforts contributed to the settlement. There are additional funds for education and public outreach. The settlement creates a National Foundation to Reduce Teen Smoking and Substance Abuse ($250 million) and establishes a National Public Education Fund ($1.45 billion) to sponsor tobacco counter-advertising. Finally, there are payments to the National Association of Attorneys' General for enforcement of the settlement ($51.5 million). We assume these funds are spent by the National Association of Attorneys' General and thus do not allocate them to the states.[7]

Table 1. Total Payments to the States under the MSA

TYPE OF PAYMENT	AMOUNT (NOMINAL DOLLARS)	ADJUSTMENTS
Initial up-front payments	$12.7 billion total from 1999-2003	*Volume* and *non-settling states*
Base payments	$4.5 billion in 2000 up to $9 billion in 2018 and beyond	All.
Strategic contribution payments	$861 million per year, 2008-2017	All except *previously settled states.*
National Foundation to Reduce Teen Smoking and Substance Abuse	$25 million per year, 1999-2008	No adjustments.
Public Education Fund	$1.45 billion over 1999-2003	*Inflation* and *volume*.
National Association of Attorneys' General for enforcement of the settlement	$51.5 million over 1998-2007	No adjustments.

As noted in the right hand column of the table, several adjustments are made to some of these payments. These adjustments are detailed in Table 2. The first adjustment is for inflation. The MSA allows for annual payment increases of 3 percent or the increase in the CPI, whichever is greater; we use the 3 percent figure in our estimates. The most notable adjustment, shown in

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[7]   These payments should in principle be deducted from efficiency gains, but because of their modest size in

the second row, is for volume changes. Payments are reduced by 98 percent of the percentage

decline in cigarette sales. There are smaller adjustments for previously settled states, for non-

setting states, for non-participating manufacturers, for any future federal legislation that might

pre-empt the MSA, and for violation of a litigation release agreement.

In addition to the statutory adjustments, there was initially an issue about whether the

states will keep all of the settlement proceeds, or whether the federal government will reclaim the

federal Medicaid share. This issue has now been resolved, so that all of the money remains with

the states (absent that going to the National Association of Attorneys' General).

Table 2.   Adjustments to Payment Streams

ADJUSTMENT	DESCRIPTION	KEY ASSUMPTIONS INCORPORATED INTO OUR CALCULATIONS
Inflation adjustment	Annual payments increase by 3% or the increase in the CPI, whichever is larger	Assumed inflation 3% or less per year
Volume adjustment:	Payments reduced by 98% of the percentage decline in cigarette sales. Adjustment reduced by 25% of any profit increases.	Annual volume of cigarette sales modeled as a function of secular trend and price elasticity of demand. Assume no increase in profitability of tobacco companies.
Previously settled states adjustment	Accounts for payments already made to MS, FL, TX, and MN.	As directed by MSA, no additional assumptions necessary.
Non-settling states adjustment	Accounts for any states that did not sign the MSA.	All states have signed; no adjustment.
Non-participating manufacturers adjustment	Addresses the possibility that participating manufacturers will lose market share to non-participating manufacturers. States are given incentives to pass laws to tax non-participating firms at same level as MSA.	Incentives are for all states to tax non-participants and therefore for all manufacturers to participate. We assume no adjustment.
Federal tobacco legislation offset adjustment	Reduces obligations of participating manufacturers dollar for dollar for federal legislation passed by 11/30/2002.	Assume no new federal legislation before 11/30/2002; no adjustment.
Litigating releasing parties Offset	Reduces the obligations of the participating manufacturers dollar for dollar for settlements against which they should have been released under	Assume that no such settlements are reached.

relationship to the benefits we have estimated, we ignore them.

the MSA.	

Because the volume adjustment is important to the value of the settlement, and is the factor that is central to the health benefits from the MSA, we model volume changes in some detail.

Changes in the Volume of Cigarettes Consumed

The MSA has three factors that might reduce the demand for cigarettes. The first is price increase of 45 cents per pack that the participating manufacturers imposed to finance the costs of the settlement immediately following the settlement in November 1998. Non-participating manufacturers are expected to implement comparable price increases after most states pass the "model legislation" set forth in the MSA, which effectively taxes those manufacturers who do not participate in the settlement.[8]

The ultimate price increase might be higher than the 45 cents previously enacted for two reasons. First, if manufacturers' price increases are marked up by wholesalers and retailers, the price increase faced by consumers would be greater. In fact, however, past empirical studies of the impact of cigarette tax increases on the retail price of cigarettes have uniformly concluded that there is no appreciable additional markup (Barnett, et al., 1995; Merriman, 1994; and Sumner, 1981). This is because wholesalers and retailers generally set their markup as an absolute dollar amount above their costs of business, rather than a percentage, consistent with the competitive nature of the retail industry. Second, states may respond to the settlement by raising their excise taxes in an attempt to partially recoup lost excise tax revenue (as a result of sales reductions). But essentially all of the settlement receipts are passed back to the states themselves, and thus will exceed the lost state excise tax revenues from the decline in cigarette volume. Thus, it is even possible that states could lower excise taxes in response to this inflow. In our analysis we have assumed that the 45-cent price increase is the amount that will prevail.

The extent to which demand will decline as a result of the price increase depends on the

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[8]   As of April 1, 2000, more than half the states had passed such legislation; in the remaining states, the model legislation is pending. All states have an incentive to pass such legislation quickly, so that a similar price increase should occur on all cigarettes in the near future.

elasticity of demand for cigarettes. A substantial literature has looked at this issue. The most recent, and complete, review is by Chaloupka and Warner (2000). They conclude that a consensus estimate of the demand elasticity for cigarettes is –0.4.[9] We use an elasticity of -0.4 for our estimates.

The price increase of 45 cents is a 20 percent increase (using an average of the baseline and final price). Assuming a demand elasticity of –0.4, one would expect a demand reduction of about 8 percent. The 1999 data indicate a reduction in cigarette sales of approximately 6.5 percent, somewhat lower than our model would predict, but clearly other factors may have been at play [Economic Research Service, 2000]. If, however, 6.5 percent is the long-run value of the demand response, our estimates of payments to the state are low; i.e., we may have overadjusted for volume declines. Our estimated health effects, however, used a lower elasticity value; see below. Both these factors make our estimates of the efficiency gain conservative.

The second factor affecting cigarette demand is the restrictions on advertising. The MSA embodies a number of restrictions on industry advertising. In particular, the settlement:

- Prohibits targeting youth in advertising and promotion
- Bans cartoon characters in cigarette ads or packaging
- Restricts tobacco sponsorship of public events
- Bans outdoor and transit advertising of tobacco products
- Bans placement of tobacco products in movies and other entertainment
- Bans sale of apparel and merchandise with brand-name logos
- Bans youth access to free samples
- Bans gifts without proof of age

In evaluating the impact of these advertising bans on cigarette consumption, several points are relevant. First, these limitations are very small relative to total tobacco advertising and promotional expenditures. According to the Federal Trade Commission [1998], outdoor and transit advertising was only 6.3 percent of tobacco industry advertising expenditures in 1996, and public entertainment (which is a restricted and not eliminated category) was only 3.4 percent. There may be some additional reductions in advertising, but the reductions altogether are unlikely to exceed 10 percent of total advertising spending.

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[9]   The -0.4 value is also consistent with the review of the literature by the Congressional Budget Office (1998) and Evans, Ringel and Stech (1998).

Second, there is no restriction on the tobacco industry's increasing advertising expenditures through other venues to compensate for these restrictions. Tobacco advertising is very fluid; in just two years (from 1994-1996), for example, promotional allowances rose from 34.7 percent to 42.1 percent of total spending. Furthermore, outdoor and transit advertising has been in decline; in 1986, these categories were twice as large a share of total advertising dollars. The industry might well substitute for the advertising bans by increasing ads in other areas.

Partly as a result of this, the existing literature does not provide a very strong consensus on the role of cigarette advertising in affecting smoking. Chaloupka and Warner [2000] conclude that aggregate cigarette advertising has a small impact on total cigarette sales, and that previous advertising bans (such as the ban on television advertising did not appreciably affect cigarette smoking. Even a much more favorable review of the advertising literature by Andrews and Franke [1991] estimated an elasticity of smoking with respect to advertising dollars of only 0.06. Hence, a 10 percent reduction in advertising, which is the largest effect that could be envisioned from this settlement, would lower smoking by only 0.6 percent, a very small amount. As a result of this evidence, we assume that there is no impact of advertising restrictions on smoking behavior.

The third part of the MSA that will influence cigarette demand is the funding for smoking counter-advertising and education. Anti-smoking programs will be funded in two ways: the National Foundation to Reduce Teen Smoking and Substance Abuse is funded for $250 million over the next ten years, to study programs to reduce youth smoking and substance abuse; and the National Public Education Fund is funded for $1.45 billion over the next five years to carry out sustained advertising and education programs to counter youth tobacco use and educate consumers about tobacco-related disease.

Current spending on counter-advertising and education in the U.S. is approximately $150 million per year.[10] The Public Education Fund alone would increase counter-advertising and

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[10]   Based on data collected by CDC (private conversation with Jeff McKenna from Office on Smoking and Health, January 14, 1999). This consists of roughly $85 million in counter-advertising and education spending by the states; roughly $12 million of spending by federal agencies (FDA, CDC, and NCI); and roughly $50 million in spending by the federal government on its ASSIST and IMPACT programs that are designed to provide infrastructure for state anti-smoking efforts.

education spending by up to $300 million per year for five years, a 200 percent increase in spending.

The literature suggests that counter-advertising deters smoking. The Fairness Doctrine, which was in place from 1967 until 1971, mandated counter-advertising in proportion to direct cigarette advertising on television. Smoking fell by an estimated 5 percent in those years (Warner, 1977). Indeed, some have claimed that the net impact of the subsequent ban on television advertising of cigarettes was to raise consumption, because it also eliminated the counter-advertising (Chaloupka and Warner, 2000). A study of California's substantial counter-advertising initiative that began in the late 1980s estimated an elasticity of smoking with respect to counter-advertising of -0.05 (Hu, *et. al*., 1994, 1995). This study is hampered by the fact that it has time series evidence for only one state, California, in a period shortly after a substantial price increase. Thus, it is difficult to separate long-run price effects from the effects of the counter-advertising. Still, if we take the Hu, *et. al.* elasticity at face value, the 200 percent increase in spending induced by the MSA will lead to a 10 percent decline in smoking.

We make a relatively conservative assumption – that the increase in counter-advertising and education will have roughly the same effect as the Fairness Doctrine, a 5 percent decline in smoking, phased in at 1 percent per year for the five years that the public education fund is spending.

The decline in smoking from the price increase, the advertising restrictions, and the counter-advertising campaign comes on top of a substantial trend over time of lower cigarette consumption. Over the past 20 years, cigarette usage has declined by about 1.2 percent per year. Since 1994, however, cigarette smoking has remained roughly constant.[11] In the analyses here, we assume that the decline in smoking will resume, but at half the previous rate, or 0.6 percent per year.

Figure 1 shows our estimate of the volume of cigarettes consumed nationally under the pre-MSA baseline and with the provisions of the MSA.[12] We estimate that the settlement will

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[11]   Tobacco Institute [1998].

[12]   Baseline price and consumption data come from an analysis by Gary Black of Sanford Bernstein Company (December 15, 1998). Cigarette prices in 1998 averaged $1.97 per pack, with 23.8 billion packs sold. There is a federal tax increase scheduled of 10 cents in 2000 and 5 more cents in 2002 that is built into the baseline. For our Massachusetts-specific analysis, we use price data specific to that state. In 1998, cigarettes prices averaged $2.79 per

lower smoking by about 11 percent by 2003, relative to the non-settlement baseline. In later years, the percentage decline relative to the baseline is slightly larger (13 percent in 2025), as baseline smoking declines.

Estimated Payments

We combine the payment and adjustment assumptions to estimate total payments under the MSA to Massachusetts. Massachusetts has 2.3 percent of the nation's population and 3.3 percent of its Medicaid spending. As of now, Massachusetts' share of Foundation spending and Public Education Fund spending is not clearly delineated. We therefore make the most conservative assumption, assuming the state receives no payments from these two sources. Because these payments are small, our calculations are not substantially affected by how we treat them. In forming present values throughout the paper, we use a nominal discount rate of 7 percent per year, or 4 percent in real terms. This was a consensus discount rate of investment bankers in their proposals to securitize the financial payment streams to the plaintiff's attorneys. Thus, it incorporates factors such as the risk of default by the tobacco companies.

Table 3 shows the present value of payments to states as a whole, and to Massachusetts in particular, beginning in 1999 and continuing through either 2010 or 2025. We estimate that states as a whole will receive $58.8 billion in present value through 2010, and $104.7 billion through 2025. Massachusetts will receive $2.3 billion through 2010 and $4.2 billion through the year 2025.[13] These amounts represent roughly 2 percent of state tax receipts.

Table 3: Estimated Payments Under the MSA
NPV in 1999 dollars – billions

	Through Period	
Group	2010	2025

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pack in Massachusetts, well above the national average.
[13]   For comparison, under the same assumptions but absent the volume adjustment, the payments to the Commonwealth would be $2.6 and 4.8 billion through 2010 and 2025, respectively.

"Nation" (46 states)[14]	$58.8	$104.7
Massachusetts	2.3	4.2

These payments by themselves have no efficiency consequences. They are merely transfers from one set of people (future cigarette smokers) to another (all future taxpayers). If this were the entire effect of the settlement, economic efficiency would be unchanged.

But the effects do not end here. The increased price of cigarettes and other provisions of the settlement will result in substantial reductions in cigarette consumption. This consumption decline will influence economic efficiency in two ways: by reducing the external costs of smoking; and by helping smokers to better internalize the costs of smoking. We quantify these effects in the next two sections.

II. Reduced Medicaid Spending

The first effect of the MSA on efficiency is through reduced spending by Medicaid. By reducing smoking prevalence, the MSA will reduce the cost of the smoking-related illnesses.[15] This is entirely an efficiency gain. In addition, there is the added effect of reducing deadweight loss from financing this spending. We have estimated the savings to Medicaid from the MSA at some length in our earlier research (Cutler, et. al*., 1998a, b, c, 1999).   In this section we summarize these findings.

We divide Medicaid spending into spending for adult inpatient care, adult outpatient care, long-term care, and care for low-birthweight infants. We project these values to 2025 assuming that expenditures will grow at a nominal rate of 6 percent for each age and gender group.[16]

To calculate the proportion of the Medicaid expenditures attributable to smoking, we multiply Medicaid spending by a Smoking Attributable Fraction (SAF) of expenses. For adult

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[14]   The 46 states comprising the settlement have 85 percent of the national population.
[15]   Because we analyze annual spending, rather than lifetime spending we may overestimate long-run cost savings to Medicaid. Savings based on lifetime spending may be less, because increased longevity is likely to entail additional health costs, but these will be heavily discounted at usual discount rates.
[16]   This growth rate reflects the following assumptions: inflation of 3%, real growth in services per capita of 2% and population growth of 1%.

inpatient and outpatient care, we estimate the SAF using regression models relating health care use at the individual level to indicators for whether the individual was a current, former, or never smoker, controlling for other individual covariates. The smoking coefficients, when weighted by the share of current and former smokers in the population, indicate the share of medical spending attributable to smoking. For long-term care and low-birthweight babies, we used published data on relative risks of particular diseases for smokers, in combination with data on smoking rates by these populations. Overall we estimate that about 7 percent of adult Medicaid spending is attributable to smoking for the period 1992-1998, although in 1998 the percentage had fallen to 5 percent.

The first two columns of Table 4 show estimates of Medicaid spending attributable to smoking. We forecast that absent the MSA, the present value of Medicaid spending in Massachusetts on smoking-related diseases would be $3.4 billion through 2010, and $7.2 billion through 2025. This is larger than, but of the same order of magnitude as, the financial payments to the state. Indeed, in our earlier work (Cutler et al., 2000), we estimated that in the first years of the settlement, the financial payments under the MSA about equal the damages from smoking. Over time, the settlement covers less of the costs of smoking because the increase in medical costs forecast in our baseline is greater than the increase in payments provided for under the MSA.

We then estimate how these amounts will change with the change in smoking prevalence. We note that such estimates may understate, perhaps substantially, the savings to Medicaid from the MSA. The sample of former smokers in survey data includes a number of individuals who stopped smoking because they were being treated for active disease. Not surprisingly, those former smokers have very high Medicaid expenses. Those who quit because of the MSA, in contrast, will have disproportionately quit for non-health reasons and thus are not likely to spend as much. In effect, because we attribute the spending habits of past quitters to future quitters, we underestimate the effects of quitting smoking on medical spending. We are not able to produce better effects with existing data, however.

The second columns of Table 4 show the expected reductions in Medicaid spending because of the MSA.[17] We expect that as a result of the MSA, Massachusetts will save $29 to $65

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[17] These savings are calculated based on the change in the number of smokers, not the total number of cigarette packs sold. We discuss the methodology for estimating changes in the number of smokers in the next section.

million over this time period. These savings amount to about 1 percent of the costs attributable to smoking, which in turn are 0.08 percent of total forecast Medicaid spending.

In addition to these savings, there are reduced deadweight costs because governments do not need to raise as much money. Standard estimates in the economics literature suggest that the marginal deadweight loss from the existing tax system is about 30 cents per dollar raised (Ballard, Fullerton, Shoven, and Whalley, 1984). The savings in deadweight loss are therefore $9 million to $20 million. The net savings are therefore $38 million through 2010 and $85 million through 2025. The overall effect of the MSA on Medicaid costs are very small.

Table 4:
Forecasts of Medicaid Spending Attributable to Smoking and Savings Under the MSA
Net Present Value in 1999 dollars -- millions

	Baseline Spending Through		Savings from MSA Through	
	2010	**2025**	**2010**	**2025**
Expenses for:				
Adult Acute Care	$2,256	$4,550	$6	$29
Long Term Care[18]	1,143	2,581	22	32
LBW Babies	27	61	1	3
Total	$3,427	$7,192	$29	$65
Reduced Deadweight Loss			9	20

There will be other effects on state budgets that we have not tried to estimate. Spending for state employee health insurance and direct delivery systems of health care such as city hospitals will fall, and for defined benefit pension plans for state employees will rise. Medicaid, however, is a large program in the state budget, and the modest effect on Medicaid gives us confidence that ignoring these other programs will not cause a large error.[19]

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[18]   To give some idea of the importance of increased life span for computing Medicaid cost savings we recomputed our results assuming that the long-term care population grows at a rate that is 10% above the baseline (1% per year), beginning in the first year of the MSA. Under this scenario, the present value of total Medicaid savings fall to $22.7 million and $30.0 million in 2010 and 2025, respectively.

[19]   Spending on the Medicaid program is on the order of 15 percent of direct state spending (excluding transfers to local government) and about 12 percent of spending accounting for transfers to local government. Spending on public welfare, education, and highways account for about 70 percent of direct state spending

III. The Value of Lives Saved and Health Improved by the Settlement

Smoking is the leading preventable cause of death in the United States (McGinnis and Foege, 1993). Reductions in smoking therefore translate into substantial gains in life expectancy. In this section, we estimate the health impacts of the MSA.

We value the health effects of the MSA as resulting from reduced numbers of smokers only – quitters and people who never begin. Although there are health benefits from continuing smokers' consuming fewer packs, data limitations make estimating these benefits more difficult. Moreover, in some of our calculations, we rely on published disease-specific relative risks, which are available only as a function of whether a person smokes and not as a function of the number of cigarettes smoked. Ignoring the reductions in amounts smoked among smokers, of course, makes our estimates of health benefits conservative.[20]

Changes in the Number of Smokers

We estimate the impact of the MSA on the number of smokers using a methodology similar to that developed above. We assume the same 45 cent increase in prices in Massachusetts as elsewhere in the nation. Because baseline cigarette prices are higher in Massachusetts than elsewhere (see footnote 12), the percentage increase in prices is smaller, only 15 percent.[21]

The smoking participation elasticity is generally smaller than the elasticity of total packs of cigarettes consumed, because some of the response to higher prices is among existing smokers' consuming fewer packs. We draw estimates of participation elasticities from the literature. For adult smokers, we use a participation elasticity of –0.25, based on research by Evans, Ringel, and Stech (1998).[22] Essentially all of the response for adults will be increased quitting, as opposed to reduced initiation because few adults initiate smoking. Among

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(Statistical Abstract, 1999, page 328).
[20] Potentially offsetting this conservative bias is the fact that we do not account for possible selection of who quits smoking. If individuals who quit (or never start) smoking are (or would have been) relatively light smokers, there is a bias in the other direction.
[21] This is calculated using the midpoint of the prior 2.79 price and the assumed price increase of 45 cents.

individuals who have ever smoked daily, 77 percent began smoking daily before age 20, and 91 percent first tried a cigarette by that age (U.S. Department of Health and Human Services [1994]).

Traditional estimates of the elasticity of youth initiation rates are higher, around -0.7 (Chaloupka and Warner, 2000). But these studies generally do not control for omitted state characteristics that might be correlated with both taxes and smoking rates. Evans and Huang (1998) control for these factors and estimate a youth participation elasticity of -0.5, which we use in our estimates.[23] Because of the uncertainty in the literature about this value, we experiment with elasticities of one-half of our baseline value (-0.25) and zero.

We again assume that restrictions on tobacco company marketing will not affect smoking prevalence. Counter-advertising, however, will affect smoking habits. Prior to the MSA, Massachusetts already had a significant amount of tobacco counter-advertising: $13 million of the $150 million spent nationally. Hence, if we assume that the $300 million in the Public Education Fund is allocated to each state in rough proportion to that state's population, Massachusetts' share ($6.6 million) is only a 51 percent increase over current levels, compared to the 200 percent nationwide increase. Thus, instead of assuming a cumulative 5 percent impact on smoking rates from counter-advertising (1 percent per year for five years) as we did nationally, we assume a cumulative 1.28 percent impact in Massachusetts (0.255 percent per year for five years).

Finally, we differentiate the secular time trend in smoking rates into quitting rates, cutbacks among existing smokers, and reduced initiations. According to the Centers for Disease Control and Prevention, about 70 percent of the trend decline in smoking is a result of fewer numbers of smokers, while 30 percent is a result of fewer cigarettes per active smoker (Centers for Disease Control and Prevention, 1998.) We therefore assume the baseline reduction in smoking rates among adults is 0.42 percent per year (70 percent of the 0.6 percent per year decline). Forecasting the time trend in youth smoking is more difficult. Youth smoking declined

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[22]   This compares to their total elasticity estimate of –0.41.

[23]   Other recent work (DeCicca, *et. al.*, [1998]) has claimed that the elasticity of participation is much smaller, but this work has been effectively refuted by the observations of Dee and Evans [1998]. In addition, recent work by Sherry Glied [1999] has indicated that price changes may only delay smoking participation in youth rather than prevent such behavior. These findings suggest that the long-run elasticity may be considerably lower, perhaps zero.

substantially in the late 1970s, was relatively flat in the 1980s, and rose precipitously in the 1990s. In Massachusetts, the trend in youth smoking has been flat in recent years (Abt Associates, 1997). In the absence of a good model of youth smoking initiation, we assume no secular trend in smoking initiation by youths.

Using these assumptions, we estimate a decline in the number of adult smokers resulting from the MSA (increased number of quitters) of 45,000, or 5 percent. For youths, assuming a price elasticity of –0.5, we estimate a decline in the number of smokers (increased number of never smokers) of 13,000, or 8 percent. Approximately 1,400 of these never smokers are replaced each year by a new cohort. [24] With the lower elasticity estimate of –0.25 for youths, youth never-smokers rise only 7,800 (5 percent), with a new cohort of approximately 990 each year. With the elasticity of zero, the only changes in youth smoking occur in the first five years, due to the counter-advertising measures. Under this zero elasticity assumption, youth smoking is reduced by 2,100 persons (1.8 percent) by 2004.

As mentioned above, the actual decline in cigarette sales in 1999 was 6.5 percent. Although we do not know the distribution of this decline and therefore how health might have been affected, the elasticities we are using to estimate health benefits appear if anything to be low. Thus, the health benefits we estimate may be somewhat low.

Longevity Benefits from Reduced Smoking

To compute the number of life-years saved by the MSA, we use estimates of difference in life expectancy for smokers compared to non-smokers taken from the simulation model developed for the Healthier People Network.[25] This projects life expectancy using a probabilistic model of disease and survival and assumed values of demographic characteristics (current age, sex, height, weight, smoking status). We ran simulations for men and women separately for

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[24]   The number of "new" children who become smokers each year under current law is derived from CDC data that report that 3,000 children in the U.S. start smoking every day. Multiplying by 365 and taking the Massachusetts share of youth (~2%), yields an annual estimate of new youth smokers in Massachusetts of 21,882.

[25]   HPN Health Risk Appraisal V6.0, The Healthier People Network, Decatur, Georgia, 1997. The model also incorporates CDC life-table data: National Center for Health Statistics. Vital Statistics of the United States, 1995, preprint of vol. II, mortality, part A sec 6 lifetables. Hyattsville, MD. 1998. This model has been independently validated. See, for example, Foxman and Edington (1987) and Gazmarian, et al., (1991).

youth "never starters" (assumed to be age 20) and adult quitters (assumed to be age 40).[26]
Characteristics of these representative individuals were set equal to the mean values for smokers
of their age and sex from the National Health Interview Survey.

Table 5 shows the change in longevity expected for people who quit or never start
smoking. Life expectancy increases by 5.1 to 6.5 years. The increase is greater for men than for
women and is greater for never starters than for quitters.

Table 5: Life Expectancy in Years for Smokers, Quitters and Never Starters

	Men	Women
"Never Starter"		
Life expectancy at age 20 if never smoker	55.5	61.5
Life expectancy at age 20 if smoker	49.0	55.8
Difference in years	**6.5**	**5.7**
"Quitter"		
Life expectancy at age 40 if quitter	37.2	41.9
Life expectancy at age 40 if remain smoker	31.2	36.8
Difference in years	**6.0**	**5.1**

Aggregate life-years saved per year by the MSA are the product of the reduced number of
smokers and the increase in life-years expected for people who quit or never begin smoking. The
first row of Table 6 shows the number of life-years saved in Massachusetts. We estimate about
500,000 additional years of life lived by people alive by 2025.

To monetize these health benefits, a value per life-year must be applied to the gains in life
expectancy.[27] The estimates in the literature range from $70,000 to $175,000 in 1990 dollars,

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[26] Although this method is not exact because of the non-linear effect of smoking on mortality, our purpose is
to demonstrate that the effect size is large relative to the monetary settlement. The approximation should be good
enough for that purpose.

[27] The monetary value of a life-year is frequently estimated by studying individuals' willingness to pay to
reduce specific risks of mortality. The valuation of risk reduction is then extrapolated to compute the value of a
"statistical" life, from which the value of a single life-year is computed. There are a number of alternative
approaches to measuring the value of reductions in mortality caused by illness. A method using quality-adjusted life-
years is one commonly used alternative. This method accounts not only for the shortened life span of smokers but
also for the pain and suffering caused by the fatal illness and its treatment. A study by Jones-Lee, Hammerton, and
Philips [1985] indicates that preventing death from cancer or heart disease (the primary intermediate causes of death
from smoking) should be valued at two to three times instant death. Our approach is both simpler and more
conservative in that it ignores these quality of life factors.

which is roughly $100,000 to $200,000 in 1999 dollars (Tolley, Kenkel, and Fabian, 1994).[28] We consider a benchmark value of $150,000 per year, with alternatives of $100,000 per year and $200,000 per year.

The bottom rows of Table 6 present our estimates of the cumulative net present value of gains in life expectancy induced by the MSA in Massachusetts. Our benchmark estimate is a value of $56 billion through 2010 and $65 billion through 2025. The lower and higher valuations of a year of life change this range accordingly.

Table 6: Valuation of Increased Life Expectancy in Massachusetts

	Through 2010	**Through 2025**
Life-years saved	424,000	552,000

Present discounted value of increased life expectancy ($ billion) assuming:

	Through 2010	Through 2025
Medium value per life-year = $150,000	$56.2	$65.0
Low value per life-year = $100,000	37.5	43.3
High value per life-year = $200,000	74.9	86.7

Because of the uncertainty surrounding the point estimate of the youth price elasticity, we examined the sensitivity of our estimates of the value of lives saved by the MSA assuming the elasticity was –0.25 and zero, respectively. With a youth price elasticity of –0.25, we found that the MSA saved 369,000 life-years through 2010. Assuming no response to price by teen smokers, the MSA saved 267,000 life-years through 2010. At the medium value of a life-year of $150,000, the net present value of these gains in life expectancy is $49 billion and $37 billion, respectively.

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[28] As above, we assume a 3% rate of inflation in the value of a life-year after 1999 and discount all measures at 4% real and 7% nominal rates.

Morbidity Benefits from Reduced Smoking

Although morbidity is a much more common outcome of smoking than is mortality, it is more challenging to value the reduced level of illness. The problem of identifying incident (new) cases of disease is significant, and the willingness-to-pay of individuals to avoid sickness is less well understood than willingness-to-pay to avoid mortality.

An illustrative calculation using a single disease category, chronic bronchitis, indicates the potential magnitude of the value of morbidity reductions induced by the MSA. Because smokers are nearly ten times more likely to contract chronic bronchitis than non-smokers, about 90-95 percent of chronic bronchitis is a result of smoking. Using data on current prevalence rates and our estimates of changes in smoking, we calculate that 696 cases of chronic bronchitis in Massachusetts will be prevented by the MSA (8 percent of the baseline number).

How much will people value the reduction in bronchitis? The literature provides two pieces of evidence. First, people are willing to pay about $100 to avoid a single day of coughing spells (Tolley, Kenkel, and Fabian, [1994]). So even if each case of bronchitis involved only 50 day of coughing per year, the value *for a single year* for Massachusetts would be $3.5 million. Second, it has been estimated that to avoid chronic bronchitis altogether, people are willing to pay between $600,000 and $800,000 in 1999 dollars (Viscusi, Magat, and Huber, 1991). The *cumulative* value of the benefits of the MSA, by this metric, are about $500 million.

Clearly, if we extend such calculations to the morbidity induced by other smoking-related diseases, the measured financial benefits of the settlement could substantially increase.

Should Benefits to the Smoker be Netted Out?

In conventional welfare economics any benefits of smoking to the smoker would be netted out from the value of the health benefits we have estimated here. Indeed, the presumption would be that such benefits exceed even these very large health benefits or the individual would not have smoked. Thus, for example, the well known rational addiction model argues that far from being a welfare gain, the price increase induced by the settlement would cause a net loss of welfare (Becker and Murphy [1988]; Becker, Grossman, and Murphy [1991, 1994]).[29]

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[29] This statement does not consider any deadweight losses from taxes or premiums to finance medical care or

We have not adopted this position for several reasons. First, most of the evidence in the literature supporting forward-looking behavior by consumers is also consistent with the theory that firms rather than consumers are forward looking. The evidence supporting rational addiction comes from studies demonstrating that when price increases in the future are learned about today, consumption declines today, as smokers anticipate the declining value of consumption in the future. As Showalter (1999) has pointed out, in the case of an addictive good, the response may be on the part of firms. Firms that can price discriminate should subsidize initial consumption and charge a markup on later consumption. Forward-looking behavior by firms is consistent with the industry's targeting of promotional materials to adolescents and children (Arnett and Terhanian, [1998], DiFranza, et al., [1991], Fischer, et al. [1991]).

Moreover, as already noted, most smokers begin to smoke and presumably become physiologically addicted in adolescence. Given the *de jure* prohibition against sales to those under 18, it is not clear that consumer sovereignty with respect to smoking decisions should carry the usual weight.

Moreover, adolescents seem overly optimistic about their ability to quit subsequently. In a 1991 survey of high school seniors who smoked, 56 percent said they would not be smoking in five years, but in fact only 31 percent had quit by 5 years later (US Department of Health and Human Services, 1994). Excessively optimistic forecasts of one's ability to quit further undercut the case for respecting consumer sovereignty with respect to adolescent decisions to smoke.[30]

Even more importantly, the rational addiction model assumes time-consistent discount rates, but the implied discount rates in the prominent estimates of the rational addiction model are exorbitantly high, suggesting that the discount rate current smokers apply to the future costs of smoking may be around 90 percent per year. One would expect a discount rate the same as for other consumption, presumably in the single digit percentages (Laux [2000]). With such a high discount rate for the costs of smoking, Laux estimates that smokers may underestimate the future costs that they themselves bear, primarily reductions in health, by approximately 40 percent.

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other collectively financed goods.
[30]   Orphanides and Zervos (1995) suggest a rational addiction model in which adolescents sample cigarettes but are uncertain whether they will become addicted. Some then do become addicted. Orphanides and Zervos, however, assume that adolescents are unbiased in their forecasts of their ability to quit, an assumption the data do not seem to support.

Gruber and Köszegi (2000) have recently put forward a similar argument; they point out that there is a strong case for hyperbolic discounting in smoking – discount rates that value today too much over tomorrow, but annual discount rates after today at the expected rate (Laibson, 1997). There is substantial psychological evidence that individuals apply a higher discount rate to decisions involving shorter time horizons (Laux, 2000). If hyperbolic rather than conventional discount rates are used, a large portion of the costs borne by the smoker would be relevant to welfare calculations.

Finally, Laux (2000) notes that smoking may involve peer group effects. Smoking participation rates, for example, are higher among white adolescents than African-American adolescents, and rates are differential by sex in several countries. Peer group effects may imply an externality, such that there may be a welfare gain from additional taxes or regulations.[31]

None of the foregoing arguments, of course, implies that no benefits accrue to the smoker nor that any such benefits should not be netted out from the health gains that we estimate. Nonetheless, if Laux's estimate that smokers may misestimate internal costs by 40 percent or so is approximately correct, the welfare gain from the MSA just to Massachusetts will be very large indeed – perhaps $24 billion.

IV.   Summary and Conclusions

We have identified two aspects of the MSA that we believe will increase economic efficiency and have tried to estimate their magnitude. These effects, and their magnitudes, are shown in Table 7. First, there are modest benefits from reduced Medicaid spending brought about by lower smoking, and the lower deadweight loss from lower required tax collections. These benefits total about $100 million in present value through 2025. That they are so small relative to the other items suggests to us that ignoring effects on other state programs is a reasonable approximation.

The second, and far larger source of gain is the health benefits of reduced smoking. We conservatively estimate the value to Massachusetts of the reductions in mortality induced by the

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[31]   With peer group effects, individual demand curves shift with overall market demand. The welfare gain assumes the individual demand curve post-tax or post-regulation is the relevant demand curve. If individuals do not

Settlement to be in excess of $28 billion in net present value (1999 dollars) by 2025. A higher end –
but not upper bound – estimate is $91 billion. How much of this gain should be counted as a gain
in efficiency is uncertain, but we have argued that 40 percent of it might be relevant. Even if the
correct figure is substantially lower, however, the resulting number would obviously be large.

Table 7: Summary Impacts of MSA Effects on Economic Efficiency in Massachusetts
NPV -- $1999 Million

	Estimates Through	
	2010	**2025**
Reduced Medicaid spending	$0.0	$0.1
40 percent of reduced mortality*	$9.8 - $30.0	$9.8 - $34.7
Total	$12.1 - $32.3	$14.1 - $39.0

* The ranges reflects the lowest and highest values for the youth price elasticity of demand (0.0, -0.5) and
the value of a life-year ($100,000, $200,000.)

In short, we estimate a gain in efficiency of $14 to $39 billion for Massachusetts through
2025, with a best estimate of around $24 billion, using our middle estimate of the value of a life-
year. Gains for the nation may be some 30 to 40 times this amount.

To put this in perspective, we estimate that the settlement will transfer $4 billion from
cigarette companies to Massachusetts. Thus, for every dollar of transfer, we estimate efficiency
gains of $6.

Against this must be laid the transactions costs of achieving the settlement. The settlement
calls for payments to all plaintiffs' attorneys nationally of $500 million per year for 25 years, the
present value of which is $5.8 billion. We do not know the costs of the defense attorneys, although

choose their peer group, this change would be an external effect. See Laux (2000).

it was surely much less than $5 billion (given that it should not continue into the future). If we take as a rough figure the Massachusetts share of this as 3 percent or $150 million, the costs are clearly modest compared to the gains.

The key issue in assessing whether the MSA was a move toward economic efficiency is whether the pleasures of smoking outweigh these benefits in the eyes of the smoker. Iin other words, the key issue is whether consumer sovereignty should simply be honored so that the health benefits, which largely affect the smoker, are irrelevant because they are assumed to be outweighed by the unmeasured benefits of smoking. We have presented a number of reasons why the conventional welfare economics argument does not apply to cigarette smoking and therefore why the MSA was a move toward economic efficiency.

To be sure, the transactions costs of the litigation were on their face much higher than simply legislating a tax increase, which would have had much the same effect. Any legislative action, however, also carries transactions costs in the form of lobbying expenses, though presumably not on the same scale as the costs of litigation. Moreover, increased federal taxes on cigarettes were not likely in the near term, and increased state taxes bring with them the problem of bootlegging or smuggling from other states.

Our estimates of health benefits are not complete. For example, we did not consider the health consequences of second-hand smoke, nor did we include comprehensive estimates of morbidity. In addition, we did not take up more global effects on the policy environment. For example, the success of the Attorneys General against the tobacco companies is likely to have been a motivating factor in the recent lawsuits brought against the gun manufacturers, which in turn may force improvements in gun safety. Quantifying the full range of effects of the MSA and similar litigation, such as the suit against the gun manufacturers, is an important area for future research. We believe, however, that such research will only serve to reinforce our main finding: that the MSA represents a substantial increase in economic efficiency, of which the financial flows are but a small fraction.

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Figure 1. Cigarette Consumption With and Without Provisions of the MSA, 1998-2025