

The Economic Impact of Tobacco Use in Indiana

Final Report

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The Economic Impact of Tobacco in Indiana Executive Summary

Every day, 1.2 million Indiana residents purchase and smoke an average of 1.4 packs of cigarettes. That purely private, personal decision has wide ranging impacts on the Indiana economy, both in the private and public sector.

Because there is tobacco use:

- we have a tobacco industry, which employs people in farming, processing, distribution, advertising, and taxation and regulation;
- we have demands on the health care system – which produce employment -- to treat tobacco-attributable disease, borne by smokers and non-smokers (through second-hand smoke) alike, which consumes resources and increases taxes and labor costs;
- businesses pay health care premiums, fire insurance premiums, and losses stemming from higher absenteeism rates and lower productivity that reflect the fact that many of their workers are smokers or use tobacco.

Because Indiana is a relatively high smoking state, these undesirable impacts of tobacco use put businesses here at a competitive disadvantage. In order to more fully understand the manner in which the existence of tobacco affects the performance of the state economy, we have carefully constructed an economic projection that answers a very simple question: what would the Indiana economy look like if tobacco did not exist?

Our overall finding is that tobacco use in Indiana exacts a painful, significant cost on the overall economy. Specifically, we find that in an Indiana economy where tobacco was not used or produced:

- More than 175,000 more jobs would exist;
- Personal income would be \$28.7 billion higher;
- After-tax income would be 7 percent higher;
- Population would be more than half a million people higher;
- Almost half of that population gain, or about 220,000 people, would be migrants from other states;
- More than \$100 billion in cumulative new investment would take place;
- Per capita income would be about \$108 higher.

These changes occur as the different mechanisms that cause smoking behavior to reduce the size of the economic pie are “undone.” Employer non-wage labor costs fall as tobacco induced health care expenditures are eliminated. Workers who would otherwise retire early go on to enjoy normal length working lives. Those who would die – in the status quo economy -- from tobacco-related ailments instead live average length lives, consuming goods and services in a state that is tobacco-free. As a result of these changes, investment, jobs, and migration patterns change significantly to produce a significantly larger, wealthier economy.

The results of this study support a growing body of evidence that suggests that tobacco is more than simply a killer of people. It is also a killer of jobs and wealth. As such, public policies that seek to limit its use have strong justification.

1. Overview and Introduction

The health consequences of tobacco use have been known to the general public for at least forty years. Yet on any given day in Indiana, almost 1.2 million smokers statewide smoke an average of 1.4 packs of cigarettes apiece, while countless others smoke cigars and pipes, and still others use chew. As a public health problem, tobacco use remains one of the largest issues before us. Smoking and other forms of tobacco use are the cause of more preventable health conditions than any other single behavior.

Yet, as an economic issue, the problem is quite different. Because we have smokers, we have a tobacco industry, the stores and trucks that sell and distribute the product, and the tax revenues that are based on sales. Moreover, as smokers contract illnesses that stem from their smoking behavior, they buy other things – medical services, hospital services, and drugs – that provide others with income and jobs. So is smoking a problem for the economy?

That is the fundamental question raised and addressed in the study for the state of Indiana. We find the answer to be a resounding “yes.” Because we are a state with people who smoke, our economy

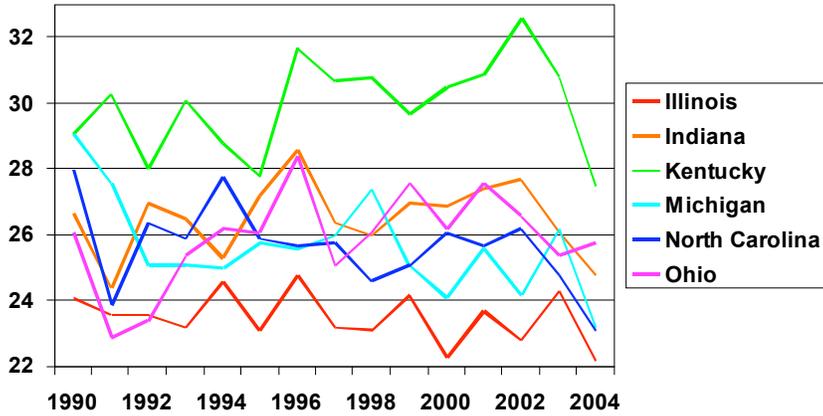
- has 178,000 fewer jobs,
- produces almost \$15 billion less goods and services,
- has about 520,000 fewer people, and
- pays \$25.3 billion less in after-tax income to its workers and residents.

As will be more fully detailed below, these estimates compare the evolution of the Indiana economy as it exists today to one where no tobacco is present. The implication of these results is that the negative economic consequences of tobacco use – the excess morbidity and mortality, the reduction in productivity and investment, to name a few – greatly offset whatever positive economic contribution may be made. The fundamental conclusion is simply this: the continued use and enjoyment of tobacco by Indiana residents is an impediment to economic growth, and thus is a legitimate issue to address in our public policy.

Tobacco Use in Indiana

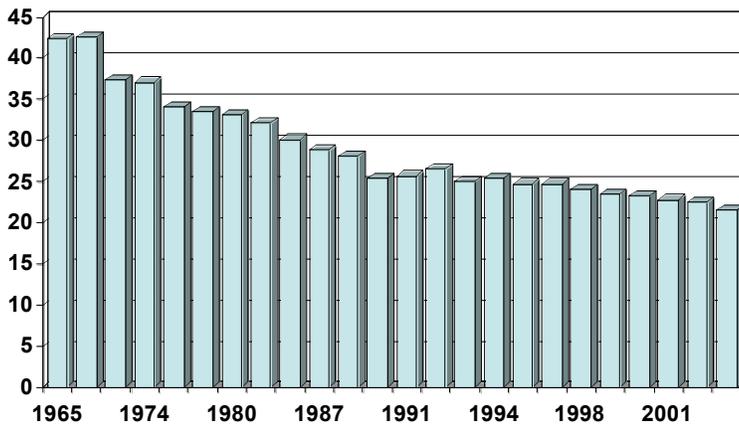
Indiana has enjoyed the rather dubious distinction of being a state of relatively heavy smokers. In 2003, 26.1 percent of the adult population reported that they smoked cigarettes regularly, a fraction that was exceeded by only six other states nationwide. Among our immediate neighbors, only Kentucky to the south has had a consistently higher prevalence of smoking than Indiana, as shown by the results of the CDC’s annual Behavior Risk Factor survey displayed in Figure 2.1.

Figure 2.1
Smoking Prevalence by State
Pct. Of Adult Pop. Who Smoke



Smoking rates among the adult population have been trending down over the last two decades nationally, as is shown in Figure 2.2 below. But the rate of decline has slowed significantly in the last decade. Moreover, little if any progress has been made in narrowing the difference between the fraction of adults who smoke in Indiana versus the national average. In 2003, that difference amounted to 4.5 percentage points.

Figure 2.2
Smoking Prevalence, U.S.
Percent of Adult Population



Since more people smoke in Indiana than elsewhere, the wasteful spending that results from smoking behavior is accordingly higher here as well. As documented in the 2000 (Barkey) study, both the scope and magnitude of this spending are surprisingly large. Not only does smoking necessitate additional spending for medical treatment of smokers themselves, but also those around them (second-hand smoke), and those who are born from their wombs (low birth weight babies). Their behavior also lowers the productivity of the labor force, both from illness-related absences as well as from their premature death during their most productive years.

The fact that Hoosiers smoke more than average means that these costs are higher than elsewhere as well. The 2000 study speculated on, but did not investigate, the response of the economy, through investment and location decisions of businesses and households. This study is devoted precisely to that question.

The Approach of This Study

Most research on the economic impact of smoking seeks to quantify the costs associated with the undesirable side effects of smoking behavior. Those costs stem largely from the deleterious health consequences, reduced productivity, and early mortality of smokers and those around them. The clear implication is that if smoking were eliminated, the resources used to pay these costs would be freed for other purposes.

But this conclusion rests on a partial analysis. The absence of smoking would change many actions in the decisions in the economy. Patterns of consumer spending would change, as money spent on tobacco and medical care became available for other goods and services. Business costs would change, which would in turn impact investment and productivity. These changes would destroy some jobs, while creating others.

The full impact of smoking behavior can only be assessed by taking all of these reactions into account. That is the approach taken by this study. Following the work of Warner and Fulton, we use a large scale mathematical model of the Indiana economy to produce two projections of economic activity. The first is a status quo projection, using baseline data that include the effects of current smoking behavior. The second is a projection that removes the consumption, production, and distribution of tobacco from the state economy.

In this alternate economy, actors in the economy “respond” to the stimulus presented by the elimination of tobacco. The difference between the two economies represents the impact of tobacco.

In order to simplify the analysis, but also to present a clean, clear portrayal of the impact of smoking behavior, the “no tobacco” scenario of the state economy used in this study is admittedly one that no actual policy could actually produce. We compare the actual economy to one where

- tobacco production, distribution, sale, and consumption is eliminated in Indiana, yet continues unchanged outside the state;
- the health consequences of tobacco use are eliminated, or equivalently, no one in Indiana has ever smoked;
- those who migrate to Indiana from outside the state instantly acquire the “tobacco free” health profile of Hoosiers.

In this artificially created world, the actual situation in the Indiana economy is reversed, and the state becomes a less costly and more desirably place to live and do business in as a result of the elimination of tobacco. Those factors influence investment and migration decisions that ultimately determine economic performance.

Organization of the Report

The remainder of this report is organized as follows. We introduce the primary analytical tool used in this study, the REMI model, in the next section. The REMI model is a highly developed regional economic impact model that has been used in hundreds of policy analysis studies over its twenty year history. Since the inter-relationships between agents in the economy is central to the results that we present, a brief overview of the model’s philosophy is appropriate.

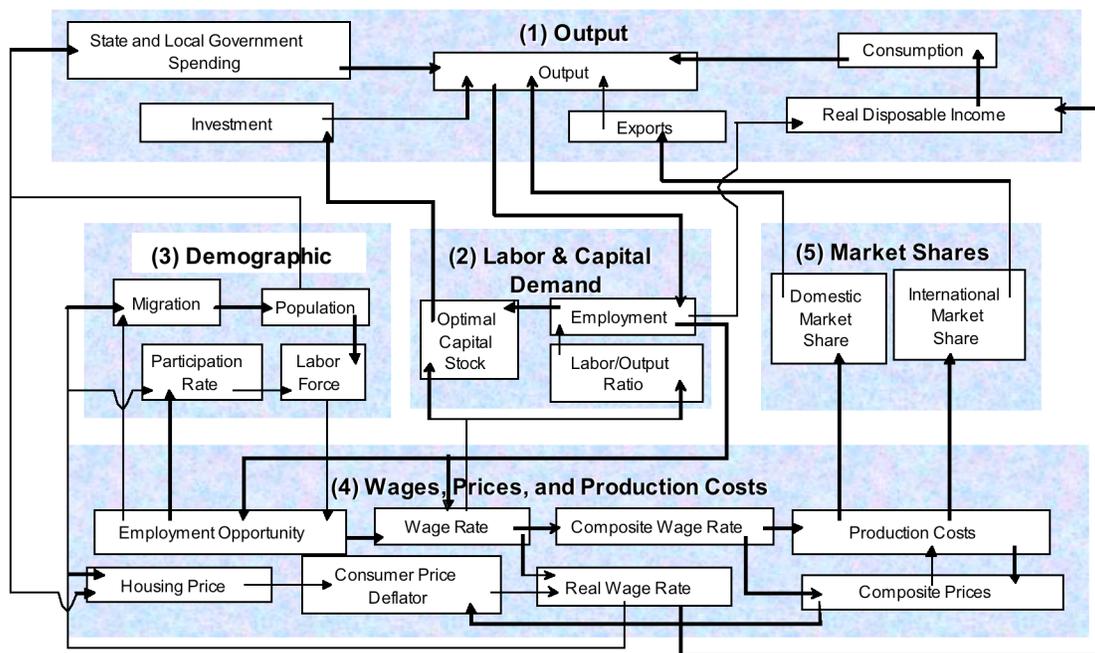
Policy analysis with a tool such as the REMI model requires one to make specific assumptions about the policy under consideration. Our implementation of the “no tobacco” scenario for the Indiana economy is spelled out in section 3. We provide detail in that section on how we adapted existing research on tobacco input to serve as a description of how the elimination of tobacco translates into changes in the parameters guiding business and household economic decisions.

The results are presented in section 4, along with a discussion of their implications.

2. Methodology: The REMI Model

The primary tool for the analysis reported in this study is a dynamic input-output model of the Indiana economy created by Regional Economic Models, Inc. (REMI), of Amherst, Massachusetts. The REMI model is a mathematical representation of the technical, economic and demographic relationships that characterize how the economy of Indiana interacts with itself and the world outside its borders.

Figure 2.1
REMI Model Linkages



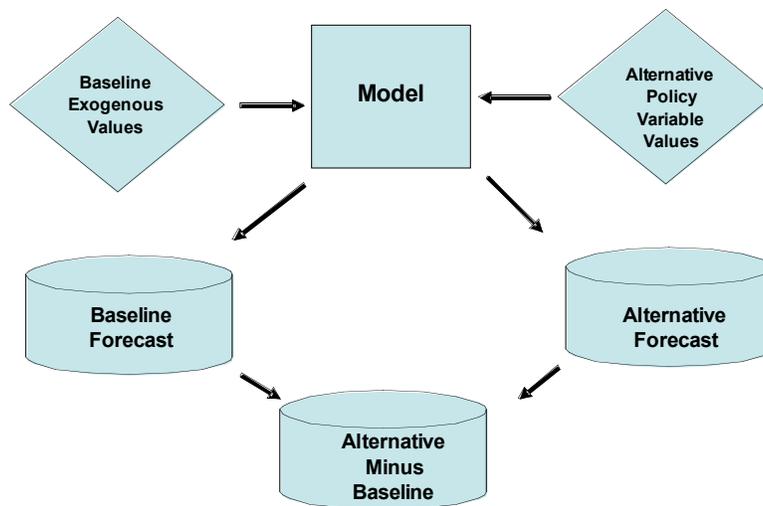
At the heart of the model is a 70-sector input-output matrix that describes the production relationships between industries in the economy. This matrix, which is based on the input-output matrix maintained by the U.S. Bureau of Economic Analysis, estimates how an expansion in one sector of the economy impacts other industries. These “input requirements” induced on all other industries when, say, an industry expands or a new investment is made, represent a major mechanism through which changes in policy or the external environment reverberate throughout the economy.

All of these mechanisms are shown graphically in Figure 2.1. Although the relationships and feedbacks in the model are numerous, they fall roughly into three categories: technical, economic, and demographic. The technical relationships are largely those involving the input-output relationship described above. The economic relationships essentially comprise the short run adjustments in prices, wages, and capital investment as

policy changes occur. For example, an expansion in a high tech industry output would drive up wages in that industry in the short run as job opportunities increase relative to the workforce.

A third category of relationships in REMI with particular relevance for the Indiana economy is demographic in nature. Since younger aged workers are more likely to migrate in and out of the state as opportunities change, taking their current or future children with them, changes in economic opportunities can have significant longer term impacts.

Figure 2.2
The Economic Impact of Tobacco in Indiana
Policy Analysis With REMI



This model will be used to analyze the impact of tobacco as illustrated in Figure 2.2. First, a baseline projection of the economy is made. This projection assumes no change to the status quo, and thus includes the production, sale, and use of tobacco. An alternate projection is then made of the economy which

- removes the spending of consumers on tobacco and reallocates it to other items;
- ceases the production and sale of tobacco and releases the resources for other purposes;
- eliminates the excessive tobacco-induced spending on medical services and other items and releases the resources to other purposes;
- increases the productivity of the Indiana workforce.

The ultimate impact of tobacco on the state economy is the difference in economic activity between the baseline and alternate scenarios.

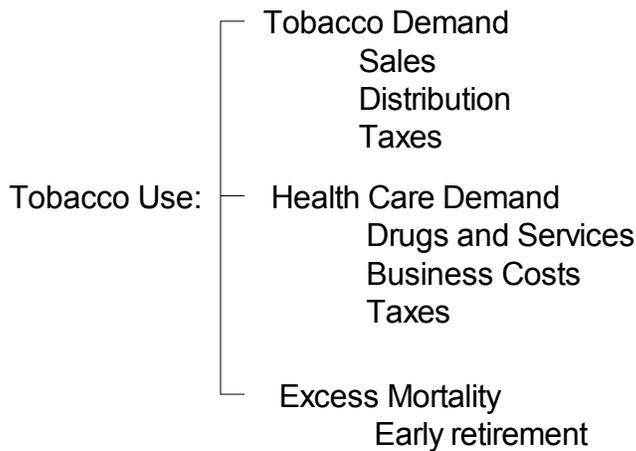
The REMI model is specifically designed to analyze how changes in the economic environment bring out different economic outcomes. It is the only policy analysis model commercially available that embodies a population cohort-survival model, in addition to an input-output module and a dynamic econometric model. It has been used in hundreds of published impact studies and continues to be the one of the most highly respected and admired frameworks for policy analysis.

3. Methodology: Input Assumptions

Removing tobacco from the Indiana economy would mean that the spending on tobacco, and on the wide-ranging consequences of tobacco consumption, would no longer be present. To project how the economy would ultimately respond, we must first quantify the “stimulus” in the experiment, namely, the direct spending in the state economy that is attributable to tobacco.

In the terminology of this study, the direct spending on tobacco consumption, production, distribution, and the health/safety consequences thereof are “inputs” to the analysis of economic impact. We shall present how the economy ultimately responds to these changes in the next section.

Figure 3.1
Tobacco Use and the Economy



The use of tobacco is linked to economic activity in Indiana in three fundamental ways, as illustrated in Figure 3.1. The first connection is to the tobacco industry, broadly defined as the growers, processors, wholesalers, and retailers of tobacco products. Because more than \$2 billion a year is spent on tobacco products in Indiana, some of the productive capacity of the economy is devoted to servicing that demand.

This is the same as would occur for any privately consumed good or service. Tobacco differs from ordinary goods, however, because its consumption causes unwanted side effects, for both smokers and non-smokers. Thus a second link exists between tobacco use and the health care industry. Because of smoking, we have smoking-related illnesses, which create demand for drugs and medical services. Meeting that demand consumes resources, but also creates jobs and income.

A third basic linkage is closely related – the morbidity and mortality attributable to tobacco use. Tobacco use produces in earlier retirement and earlier death in the

population than would occur otherwise. A tobacco-free population is larger, older, and works longer. This impacts spending and production across the entire spectrum of goods and industries, as well as the age-structure of the population.

Now we turn to the estimation of each of these relationships.

Tobacco Consumption and Distribution

In the fiscal year 2003, the state of Indiana collected \$352.4 million in excise taxes on cigarettes (Indiana Department of Revenue, 2004). Based on a statutory tax rate of \$.555 per pack, this corresponds to about 635 million packs sold in the twelve months period. At a retail price of \$3.72 per pack, this means that about \$2.36 billion was spent on cigarettes in the state for the year.

Data based on tax records do not distinguish between purchases by Indiana residents and others. But there are at least two reasons to expect that the tax revenue-based consumption data underestimate consumption by Hoosier smokers. The first is our close geographic proximity to Kentucky, whose excise tax was much lower than Indiana in FY 2003. It is reasonable, if undocumented, to presume that some consumption here is connected with purchases from vendors located in the Bluegrass state.

That presumption is also supported by a second piece of evidence – the steep decline in consumption implied by tax collections between FY 2002 and 2003, when the tax rate in Indiana jumped from \$.155 to \$.555 per pack. In this interval, the revenue-based consumption fell by 20 percent. This unusually large drop suggests some tax avoidance on the part of smokers, which in turn suggests that the spending figure of \$2.36 billion on cigarettes in Indiana in FY 2003 understates actual consumption.

When tobacco demand is eliminated from the economy, consumers have money available for other goods and services. Following Warner and Fulton (1995) we have made the neutral assumption that consumers distribute this new spending on all consumption categories in the proportion that they show up in their overall budget.

In the REMI model, tobacco consumption appears in the Other Non-Durables goods category. The \$2.36 billion of spending on tobacco products represents about 22 percent of spending in that sub-category, and about 1.8 percent of total consumption. Thus we added 1.8 percent of spending to every consumption category except Other Non-Durables, which was reduced by 22 percent. The overall change in spending is zero – the stimulus simply represents shifting spending away from tobacco towards other products, with total spending remaining intact.

Because the REMI model contains linkages between consumption of the final tobacco product and the wide range of inputs to its production, the impact on the state's retailers, wholesalers, and transportation industries from the elimination of tobacco sales is already taken into account.

There is a small amount of acreage in Indiana that produces tobacco leaf. In 2003 those 4,200 acres produced about 8.4 million pounds, or about \$16.5 million worth, of crop. Since that same acreage would have only produced about \$1.1 million if it were instead planted with soybeans, we reduced aggregate farm income by the difference -- \$15.4 million -- to account for the elimination of tobacco.

Summary of Likely Impacts

Although we do not report any partial results in this report, some discussion of the individual contributions of each group of inputs to the final outcome is useful to illustrate and clarify the interrelationships that ultimately determine the outcome.

We expect the shift of spending on tobacco goods to other products to have a mild positive impact on the overall economy of Indiana, similar to what was found by Warner and Fulton. This is because tobacco products are almost exclusively produced outside of the state. Shifting consumption away from a good whose value added is largely produced elsewhere, and towards a market basket of other goods can only add to sales of state companies.

Health Goods and Services

The use of tobacco spawns a demand for medical goods and services, both by smokers themselves and those who are exposed to its effects. In a tobacco-free economy, these demands are no longer present, and the spending that would have taken place is available for other kinds of consumption. This subsection details the procedure and assumptions used to estimate this stimulus to the economy.

Since tobacco-induced medical spending is not directly observable, we must depend on the results of previous research to assess its magnitude. Moreover, a sizable percentage of medical goods and services are paid for by employers and government, we must take greater care in properly accounting for what kinds of spending, if any, can be said to increase when tobacco-related spending is eliminated.

The best state-specific estimates of tobacco-induced spending for medical care remain those published by Miller, Zhang, et. al. (1994). As updated by Barkey (2000), these estimates imply that about \$1.75 billion is spent treating smoking related illness each year in Indiana. Of that total, about \$210 million represents spending on drugs, with the remainder for hospital services, ambulatory care, nursing home care, and home health care.

To this spending we must add the cost of medical care and treatment for the effects of the transmission of second-hand smoke to non-smokers, and also the additional spending necessitated by the low-birth weight of babies born to women who smoke during pregnancy.

We used the Zolinger et. al. (2005) study of second hand smoke (SHS) in Marion County, Indiana, to derive an estimate of statewide spending for treating the illness in non-smokers attributable to their exposure to SHS. We accomplished this by applying that study's estimates of expenditures on children and adults per capita to the state population. We estimate spending for those affected (of all ages) to be approximately \$105 million per year.

For the additional spending to care for low-birth weight babies, we relied on national estimates published in Summers (1998) and adapted by Barkey (2000) in Indiana. Using national incidence rates and cost per capita, we estimate the medical spending necessitated by the smoking behavior of pregnant mothers to be approximately \$96 million per year in Indiana.

From all three sources – treating smokers, those exposed to SHS, and treating low-birth weight babies born to smoking mothers – the total annual spending amounts to just less than \$2 billion annually.

In order to adapt this information to serve as an input to the policy analysis we perform with the REMI model, we must analyze two additional issues.

The first is the distribution of medical spending between drugs and medical services. These two types of spending have different impacts on the economy, since the local content as well as the nature of the product delivered differ substantially. The Miller (1994) study estimates that approximately 10.5 percent of tobacco-induced medical spending for smokers is for drugs. The Zollinger (2005) and Summers (1998) estimates give no detail on this question for SHS-induced spending and spending to care for low-birth weight babies, respectively. We have applied the 10.5 percent fraction to the results of the latter two studies as well.

Thus in the tobacco-free scenario for the Indiana economy, there is \$205 million less demand for drugs, and about \$1.74 billion less in demand for health care services than in the status quo economy.

A second question has to do with the resources released for other purposes when the need for treatment of tobacco-related illness is eliminated. Unlike the buying and selling of tobacco, medical care is only partially paid for by those who consume it. The CDC (2000) estimates that approximately one third of health care expenditures are paid out of pocket by consumers. Using the \$2 billion in tobacco-induced health care spending as a base, this gives about \$640 million back to consumers to spend on other goods and services when tobacco is eliminated. We spread this new spending across the entire range of goods and services, exactly as outlined for tobacco spending above.

Approximately 31 percent of health care expenditures are paid for by businesses. Thus the elimination of tobacco from the economy lowers employers labor costs. Thus we lowered the non-wage labor costs for all industries in the REMI model, by the

appropriate percentage, to reflect the savings of about \$600 million realized annually from the elimination of tobacco.

The remainder of health care spending is paid for by governments. About 19 percent, or \$368 million of the tobacco-induced total, is paid for by the Federal government. Since Indiana is such a small share of the national economy, and that, by assumption, tobacco use continues as before in every other state, Indiana's transformation to a non-smoking state will have a negligible impact on federal tobacco-related liabilities. Thus we have assumed that this Federal spending is simply lost to the state's health care providers.

The elimination of the state and local government share of tobacco-induced health care spending, on the other hand, does free up public revenues for other purposes. This could either take the form of increased spending on other public goods, or lower tax rates for individuals and/or businesses. We have made the assumption that the \$329 million in savings to state and local businesses is matched by a slight reduction in personal income tax rates, leaving other public spending unchanged.

Summary of Likely Impacts

Tracing how the elimination of tobacco-related spending on medical care affects spending flows in the economy is similar to the analysis for tobacco consumption spending outlined above. In both cases, reduced spending on some categories of consumption (drugs and medical services) is offset by increased spending on others. In the case of medical care, however, both the nature of the products involved, and the sources of spending are different, which complicates the analysis.

Since the locally produced fraction of medical services is relatively high, compared to other goods and services in the economy, shifting some spending away from health care, towards other consumption categories, will likely have a slight negative impact on the state economy. Moreover, the loss of Federal government spending on the care of tobacco-related illnesses in a tobacco-free economy also produces a slight contractionary outcome. On the other hand, the reduction in business non-wage costs, as well as the slight reduction in tax rates work in the other direction, to expand the economic base.

The likely impact of all these changes is at best neutral, or, more likely, slightly contractionary, for the overall economy.

Tobacco-Induced Mortality

One of the most tragic effects of smoking behavior is the premature loss of life that can occur as tobacco-related illness takes its toll. The mechanisms through which early retirement and death impact the economy are varied.

On the production side of the economy, health-induced early retirement from the labor force impacts productivity, costs, and competitiveness. The job- and firm-specific human capital embodied in an experienced worker is lost when that worker leaves the work

force, requiring employers to either hire and train new employees, or maintain more workers than needed, as a result. Either scenario results in higher labor costs, and reduced productivity and competitiveness.

Early death also has an important impact on the demand side of the economy as well. Consumers who die prematurely no longer purchase goods and services that are, at least partially, produced by the state economy. Since the cumulative impact of lower survival rates for smokers on the overall population level is sizable, this mechanism promises to exert a powerful negative force on the overall size of the economy.

The REMI model is able to represent both of these forces through the interrelationships embodied in its structure. Specifically, by altering the survival rates specified in its demographic module, one can depict the aggregate stimulus caused by the removal of tobacco use as a factor in causing excess mortality.

We used the estimates of the impact of smoking behavior on age-specific survival rates published by Manning, et. al. (1991). These impacts were carefully constructed to isolate smoking behavior's independent effect on survival by comparing the mortality of smokers to so-called "non-smoking smokers." The latter group is statistically constructed to resemble the risky behavior of the smoking population in every regard, save for the absence of smoking.

Weighted by the incidence of smoking in the overall Indiana population, by sex, as obtained from the BFRSS survey conducted by the CDC, we adjusted the age-specific survival rates of the status quo economy slightly upwards for the tobacco-free scenario, reflecting the absence of premature death from smoking illness. The results of those calculations, displayed in Table 2.1, show the increased impact of smoking on survival for the older population cohorts.

Summary of Likely Impacts

The cumulative impact of higher survival rates in the Indiana population promises to have a sizable positive impact on the economy, supporting higher output, productivity, and demand. Since higher survival rates impact the population only very slowly, there will be considerable time lag that ensues before the full impact of this mechanism is manifested in economic activity.

Other Factors

There are other ways in which smoking can impact the economy beyond what has been discussed thus far. We have collected the discussion of how these impacts were modeled in the analysis, if at all, in this last subsection.

As a hypothetical "tobacco-free" state, we can expect that Indiana will become a more attractive place to live. In the artificial scenario we have constructed, those who move to Indiana instantly acquire the health status of "never smoked" non-smokers. This

assumption serves to simplify the analysis of tobacco-induced health spending, and was not allowed to influence the decision by those outside the state (especially smokers) to migrate here.

On the other hand, the absence of second-hand tobacco smoke in Indiana can be reasonably thought to increase the attractiveness of Indiana as a place to live. We have recognized this in the analysis by adding an “amenity value” to the wage rates paid in Indiana, which reflect the value to workers of reducing the probability that they will die of a disease transmitted by second hand smoke to zero.

Another aspect of tobacco’s relationship with the economy is the loss of life and property damage caused by fires caused by careless smoking. We have incorporated those impacts as affecting property ownership costs as well as the amenity value reflecting lower chance of loss of life as with SHS.

Summary and Conclusions

This section has presented a summary of the assumptions and calculations used to produce a “tobacco free” scenario for the Indiana economy. Our purpose here has been to represent the stimulus that the elimination of tobacco from the Indiana economy would produce. The ultimate impact of that stimulus on employment, income, production and population in the state economy will be presented in the next section.

The major inputs to the analysis of tobacco’s impact on the economy are (i) tobacco consumption, distribution and production, (ii) tobacco-induced health care expenditures, and (iii) excess mortality caused by tobacco use. Spending in the in the status quo economy due to tobacco use has been shifted to other goods and services, when appropriate. We have used results of previous research to derive these estimates, which will be used as inputs in the construction of a “tobacco free” Indiana economy, using the REMI model.

It should be apparent from this discussion that we have made no effort to make any adjustment or formal recognition of the different quality of life Indiana residents may enjoy in a tobacco free economy. (A minor exception to this is in the second hand smoke impact, which was allowed to impact the amenity factor used in the model). If individuals receive private enjoyment from smoking, we do not incorporate the loss of that enjoyment as a stimulus to the aggregate economy.

On the other hand, the freedom of using one’s money to purchase discretionary goods and services, instead of directing that spending to pay for medical care as a result of smoking-related illness, is presumably also of substantial benefit. And, of course, beyond the spending flows, the enjoyment of life when one has improved health is also of substantial benefit. We do not include that benefit as a driver of economic activity tracked by our analysis.

The emphasis of this study is on the impact of smoking behavior in Indiana on the state's economic performance. To understand this, we must examine how businesses and individuals collective choices about spending and investment react to the stimulus presented by tobacco use. We turn to that topic in the next section.

4. Results and Discussion

This study has carefully constructed a detailed accounting of how the parameters that would govern a tobacco-free Indiana economy would differ from the status quo. The fundamental premise of this report is that actors in this alternate, counter-factual economy will alter patterns of consumption, investment, and migration in ways that will make the overall economic pie grow larger.

As discussed in the last section, the mechanisms through which tobacco use affects economic decisions and outcomes are numerous and varied. We have represented tobacco's impact as the outcome of all of these separate stimuli jointly, with no effort made to isolate or identify the impact any one effect – such as, say, the effect of second-hand smoke – might produce in the economy by itself. Thus we have one set of results, which represents our best effort to assess the impact of tobacco use on economic activity in the state of Indiana.

Summary of Key Findings

Our overall finding is that tobacco use in Indiana exacts a painful, significant cost on the overall economy. Specifically, we find that in an Indiana economy where tobacco was not used or produced:

- More than 175,000 more jobs would exist;
- Personal income would be \$28.7 billion higher;
- After-tax income would be 7 percent higher;
- Population would be more than half a million people higher;
- Almost half of that population gain, or about 220,000 people, would be migrants from other states;
- More than \$100 billion in cumulative new investment would take place;
- Per capita income would be about \$108 higher.

These changes occur as the different mechanisms that cause smoking behavior to reduce the size of the economic pie are “undone.” Employer non-wage labor costs fall as tobacco induced health care expenditures are eliminated. Workers who would otherwise retire early go on to enjoy normal length working lives. Those who would die – in the status quo economy -- from tobacco-related ailments instead live average length lives, consuming goods and services in a state that is tobacco-free. As a result of these changes, investment, jobs, and migration patterns change significantly to produce this result.

The impacts summarized above do not occur instantly, even in the hypothetical scenario where tobacco use and the effects of past tobacco use are instantly eliminated. The adjustments of the economy, through new investment and the migration of workers toward better job opportunities, take five or more years to react. More importantly, it takes several decades for the impact of higher survival rates in the population – a consequence of tobacco cessation – to manifest themselves in population levels.

As a consequence, the aggregate impacts we present in this section exhibit a pronounced pattern of growth over the simulation period. The full effect of tobacco use on the economy is embodied in the effects that occur at the end of the simulation.

Table 4.1						
Economic Impact of Tobacco in Indiana						
Summary Table						
Variable	Year					
	2005	2010	2020	2030	2040	2050
Total Employment (Thous)	18.0	50.7	97.0	132.2	159.4	178.2
Percent Share of US Employment	0.011	0.028	0.050	0.065	0.073	0.077
Private Non-Farm Employment (Thous)	12.7	39.8	78.0	108.5	132.4	149.8
Percent Share of US Employment	0.009	0.026	0.048	0.063	0.072	0.075
Gross State Product (\$ bill.)	0.781	2.655	5.955	9.284	12.824	16.581
Personal Income (\$ bill.)	1.220	3.637	8.618	14.355	21.031	28.688
Percent Share of US Pers Income	0.012	0.031	0.058	0.077	0.090	0.098
Disposable Personal Income (\$ bill.)	1.438	3.709	8.398	13.809	20.140	27.440
Price Index (2005=100)	-0.341	-0.400	-0.496	-0.590	-0.659	-0.756
Disp Pers Income Per Capita (\$ thous.)	-0.074	-0.152	-0.211	-0.147	-0.035	0.108
Population (Thous)	86.6	175.3	304.8	394.5	464.3	520.7
Percent Share of US Population	0.029	0.056	0.088	0.104	0.113	0.118

The growth in most impacts is seen readily from the summary of aggregate impacts displayed in Table 4.1. Each of the figures in this table reflect the difference between the no-tobacco and the baseline scenario for the future. All dollar amounts in this and subsequent tables have been inflation-adjusted to reflect purchasing power in the year 2005.

Gross State Product, which represents the total output of the state economy, is about \$781 million higher than the baseline in the first year of the state’s tobacco-free existence. As

new investment patterns begin to take hold, the impact on output of eliminating tobacco grows, reaching about \$6.0 billion, or just under 1 percent of total output, after an interval of 15 years. As the impact of higher survival rates builds up the total population over the next decades, GSP in the tobacco-free economy continues to grow more quickly than the baseline, so that by the year 2050 the total impact become about \$16.5 billion, or about 2.5 percent of total state output.

The impact of tobacco on personal income, also shown in Table 4.1, is even greater than the increase in economic output. The impact on income to individuals grows by \$26.8 billion by the end of the simulation. This seeming paradox is explained by the large increase in transfer payments, which are not counted as output. This occurs as increased survival rates increase the average age of the overall population, as we explain in more detail below.

The ultimate impact on population is quite substantial. By the year 2050, increased survival rates and in-migration have increased the state's population by more than a half million, or 6.7 percent. This increase boosts the state's share of national population by about a tenth of a percentage point, as shown in the last line of the table.

Key Findings: Employment Impacts

A tobacco-free economy has substantially higher output, so we should not be surprised to find that employment is higher as well. The detailed impacts shown in Table 4.2 confirm that this is indeed the case. By the end of the simulation period, the number of jobs in the tobacco-free economy has grown to a figure that is about 178,000, or 4.1 percent, higher than the status quo baseline.

The breakdown of employment impacts by industry in the table give some insights into the different mechanisms producing the ultimate results. Note that the initial employment impacts on retail trade and health services industry employment are negative. This reflects the first round impact of the cessation of tobacco distribution, in the case of retail trade, and tobacco-induced health care, for health services. With passage of time these employment cuts become smaller and then turn positive as investment and population growth grow the overall economy.

Even with the job declines in those two industries in the very short run, the overall impact on employment in the first year of the simulation is positive. This is because every other industry shows some job gain, reflecting the shifting pattern of consumer spending in the tobacco-free economy, as well as the lower business costs that obtain when tobacco-related health care costs are eliminated.

As we go deeper into the simulation period, the impacts on all industries grow strongly positive. Particularly strong, on a percentage basis, are the impacts on state and local government, retail trade, and the food services industries. All of these categories of employment are closely linked to population.

Table 4.2						
Economic Impact of Tobacco in Indiana						
Employment Impacts by Industry						
(Thousands)						
Industry	Year					
	2005	2010	2020	2030	2040	2050
Mining	0.0	0.0	0.1	0.1	0.1	0.1
Utilities	0.2	0.3	0.4	0.5	0.5	0.6
Construction	2.2	5.3	8.8	10.6	11.4	11.5
Manufacturing	2.2	4.7	7.0	8.3	9.2	9.9
Trade	-3.4	1.2	8.1	13.3	16.9	19.2
Wholesale Trade	0.0	0.7	1.5	1.9	2.0	2.1
Retail Trade	-3.4	0.5	6.7	11.4	14.9	17.1
Transportation, Warehousing	0.4	0.9	1.6	2.1	2.6	2.9
Information	0.1	0.6	1.0	1.3	1.5	1.8
Finance, Insurance	2.3	3.8	5.3	6.1	6.5	6.7
Real Estate, Rental, Leasing	2.2	3.3	4.6	5.2	5.5	5.5
Professional, Tech Services	1.1	2.3	3.9	5.2	6.5	7.7
Management of Companies	0.1	0.2	0.4	0.5	0.5	0.6
Administration, Waste Services	0.8	2.4	4.7	6.4	7.8	8.9
Educational Services	1.2	1.8	2.9	3.9	4.9	5.8
Health Care, Social Asst	-9.6	-5.7	2.8	13.3	23.8	33.2
Arts, Entertain & Rec Services	1.1	1.7	2.5	2.9	3.2	3.2
Accommodation, Food Services	6.6	9.4	13.3	15.7	17.1	17.4
Other Services (excl Gov)	5.1	7.4	10.7	12.8	14.2	14.8
Government	5.3	10.9	19.0	23.7	27.0	28.5
Total	18.0	50.7	97.0	132.2	159.4	178.2

But lower employment costs help to boost employment in export industries as well. Manufacturing employment is boosted by 1.8 percent, or about 9,900 jobs, relative to the status quo economy. Construction employment, not surprisingly, responds to the faster growth of the economy, employing 11,500 more people when tobacco is eliminated from the state economy.

The health care industry, after the first few years, becomes larger, as measured by employment, in a tobacco-free economy. This expansion follows from the increase in population, particularly for the older age cohorts. While this result does not definitely answer the much narrower question of whether the habit of smoking adds, or reduces, one's expected lifetime health care costs, it does yield this valuable insight – in a tobacco-free economy, higher health care spending may occur, but the capacity to pay those costs is higher as well.

It is clear from Table 4.2 that the elimination of tobacco from the state economy does much more than simply help people live longer. The enhanced competitive position of employers in the state causes them to increase their capacity, produce more, and add to their payrolls. This is an important result that adds weight to the notion that smoking is a problem for the economy, not just for smokers.

Key Findings: Impacts on Income

The impact of tobacco on income follows two slightly different patterns. The impact on the wages and salaries component of income very closely resembles the pattern of employment by industry discussed above. We find that a tobacco free economy would have about \$7.4 billion more paid to workers statewide than occur in the status quo economy.

A second force propelling income growth is even stronger. That is the non-wage income accruing to older Hoosiers, who are more numerous in a tobacco-free economy. Although wages make up more than three quarters of total personal income, they only comprise a 25 percent share of the additional income that accrues to the state economy due to the elimination of tobacco, as can be seen from Table 4.3 below.

Table 4.3						
Economic Impact of Tobacco in Indiana						
Impacts on Income						
(Millions of 2005\$)						
	Year					
Income	2005	2010	2020	2030	2040	2050
Wage & Salary Disbursements	10.5	732.6	2135.4	3745.0	5568.1	7395.1
Proprietor & Other Labor Income	139.4	427.1	995.4	1630.8	2285.2	2947.8
Tot Labor & Proprietor Income	149.8	1159.3	3131.5	5375.2	7855.7	10344.4
Social Insurance Contribution	0.8	59.5	184.9	345.3	546.6	771.9
Net Residential Adjustment	-6.8	-50.5	-135.4	-231.1	-335.7	-439.8
Dividends & Interest & Rent	498.2	1153.9	2329.2	3439.5	4470.5	5444.6
Transfer Payments	579.2	1433.2	3480.2	6116.9	9588.4	14107.1
Personal Income	1220.0	3636.8	8618.0	14354.7	21031.2	28688.0
Personal Taxes	-218.0	-71.8	223.7	543.0	890.7	1244.9
Disposable Personal Income	1438.0	3708.7	8397.8	13809.5	20140.5	27440.4
Disposable Pers Inc per Capita (thous)	-0.074	-0.152	-0.211	-0.147	-0.035	0.108

By far the largest and most significant component of the long range income impact is the \$14.1 billion in increased transfer payments. Accounting for almost half of the total impact on income, this category makes up only about 15 percent of income in the overall economy. This outcome reflects the larger number of older Hoosiers in the population of the tobacco free economy, and the importance of transfer payments in their income. The

impact on dividends and rental income is also much larger than its proportionate share of the overall income pool in the overall economy, for largely the same reasons.

Personal taxes are slightly lower in the beginning of the simulation, largely due our assumption that government savings from the elimination of its share of tobacco-induced health care spending would be returned to taxpayers in lower tax rates.

Industry	Year					
	2005	2010	2020	2030	2040	2050
Utilities	19.5	32.3	56.9	81.5	104.2	123.2
Construction	80.5	224.8	445.1	635.1	800.7	931.4
Manufacturing	32.5	121.8	256.6	394.9	547.6	701.6
Wholesale Trade	-12.0	12.2	57.0	97.9	134.1	161.7
Retail Trade	-88.8	-23.9	125.8	296.6	476.6	649.9
Transportation, Warehousing	6.0	16.0	36.2	60.7	90.8	121.7
Information	2.4	20.1	46.0	72.7	103.9	138.7
Finance, Insurance	89.6	159.8	266.7	364.0	455.8	538.1
Real Estate, Rental, Leasing	34.4	57.8	98.2	135.2	169.6	201.0
Professional, Technical Services	41.4	91.5	187.8	303.0	442.9	605.7
Management of Companies	2.0	13.6	30.4	45.1	58.8	70.5
Adminstration, Waste Services	13.4	47.7	114.2	189.4	272.3	357.4
Educational Services	25.9	40.8	74.5	119.0	174.8	237.3
Health Care, Social Asst	-495.2	-415.4	-119.6	460.8	1236.8	2140.0
Arts, Entertainment, Recreation	32.6	53.3	90.7	127.8	162.7	192.2
Accomodation, Food Services	91.9	141.4	235.2	329.5	418.7	492.0
Other Services (excl Government)	84.7	134.9	227.1	319.3	408.8	486.0
Government	191.6	436.9	911.7	1352.2	1801.4	2196.0
Total	152.4	1165.5	3140.5	5384.8	7860.5	10344.6

The impact of tobacco on earnings and proprietors income by industry, reported in Table 4.4 above, largely follow the same pattern as employment reported above. The strongest proportionate impacts are felt in the food services, state and local government, and retail trade industries, although the ultimate impacts on all major industries are positive. Earnings and proprietor impacts income negatively by almost a half billion dollars in the health care industry in the very short run, as tobacco-induced demand disappears in the tobacco free economy, only to swing significantly positive later in the simulation.

Taken as a whole, the elimination of tobacco in the Indiana economy would add more than \$28 billion to personal income statewide, a 6.9 percent increase. This increase is

sufficiently large that even with more than 500,000 additional residents in the state, per capita after tax income still manages to grow by about \$108.

Key Findings: Population Impacts

A major impact of the elimination of tobacco in the state economy is on the state's population. Not only does the absence of tobacco use result in fewer deaths, but the improved economic climate that results from lower costs encourages investment, growth, and in-migration. The result is a significant rise in state residents.

	Year						
	2002	2005	2010	2020	2030	2040	2050
Starting Population	0	66.39	159.1	294	386.7	457.8	515.7
Births	0.2797	1.464	2.729	3.326	3.916	4.671	5.099
Deaths	-5.714	-5.47	-5.141	-4.436	-2.528	0.3174	1.758
Natural Growth	5.993	6.933	7.87	7.762	6.444	4.354	3.341
Population Before Migrants	5.993	73.32	167	301.7	393.1	462.2	519
Total Migrants	17.49	13.22	8.303	3.042	1.367	2.124	1.708
Total Population	23.48	86.55	175.3	304.8	394.5	464.3	520.7

In the immediate aftermath of tobacco's elimination, the population increase experienced in the state is primarily due to in-migration, as shown from the summary in Table 4.5 above. Out of about 23,500 additional new residents in the first year, all but 6,000 are workers who have moved to the state in response to improved employment opportunities. The other contributions come from the children borne to new residents, and the reduction in deaths due to higher survival rates in a tobacco-free economy.

As we move further into the simulation period, the cumulative impacts of both of these forces begin to spawn their own impacts on the population and its age structure. Eventually the impact on deaths in the overall population falls back towards zero, and eventually turns positive, as the age structure of the population stabilizes and the increased total size of the population is manifested.

The number of births rises along with overall population growth, especially from the children born to families of those who migrate to the state. This is because migrating families tend to be younger, and more likely to include women of child-bearing age. Economic migration each year, on the other hand, tends to decline as the labor supply expands, tending to reduce the wage and job opportunities that sparked migration in the first place.

Note that with the exception of the first and last lines of Table 4.5, all of the figures it contains are annual flows. Thus, for example, even though only about 1,700 more people migrate into Indiana at the end of the simulation in a tobacco free economy relative to the

status quo, the number of migrants in the overall population is much larger. Indeed, over the entire simulation period, more than 216,000 people have moved to Indiana from other regions (not all of whom survive until year 2050, however).

Further insight on the nature of the population impacts from tobacco can be found in the detailed impacts for specific age cohorts in the population shown in Table 4.6 below. From the first column of the table, it is seen that the biggest impact is on the late 20's cohort of the population, whose 9,500 increase makes up more than 10 percent of the overall population impact for the first year shown. This increase is nearly matched by the youngest cohort. This represents economic migrants and their young children.

Table 4.6
The Economic Impact of Tobacco in Indiana
Population Impacts by Age (thousands)

	2005	2010	2020	2030	2040	2050
Ages 0-4	7.417	14.11	17.37	19.14	23.27	25.6
Ages 5-9	5.121	11.8	18.54	18.41	22.11	25.56
Ages 10-14	4.115	8.682	18.12	18.92	20.52	24.99
Ages 15-19	3.512	7.074	15.09	19.81	19.56	23.53
Ages 20-24	7.981	9.639	12.81	19.75	20.66	22.48
Ages 25-29	9.503	16.09	13.95	17.81	22.46	22.75
Ages 30-34	7.378	15.97	17.2	15.91	22.49	24.08
Ages 35-39	5.63	12.34	22.13	16.79	20.3	25.47
Ages 40-44	5.23	10.2	21.14	20.1	18.67	25.54
Ages 45-49	4.8	9.82	17.67	25.26	20.36	23.97
Ages 50-54	4.36	9.353	16.07	24.82	24.45	23.25
Ages 55-59	4.211	9.115	17.29	22.59	29.87	26.44
Ages 60-64	4.648	9.863	19.28	23.54	31.04	32.55
Ages 65-69	4.187	10.31	21.6	29.69	31.98	38.89
Ages 70-74	3.871	8.796	22.18	33.54	35.07	40.32
Ages 75-79	3.13	6.865	17.77	30.85	39.05	38.68
Ages 80-84	1.452	4.246	10.44	22.15	32.34	33.08
85 and over	0	0.9954	6.143	15.4	30.08	43.57

In the next 15 years of the simulation, the cumulative impacts of higher survival rates in the population in the tobacco free economy begins to show up in the older cohorts of the population, along with the aging of those who migrated to the state in the earlier years. By the time we get to the end of the simulation period, the oldest cohorts exhibit the largest growth. The four oldest cohorts have between 12 and 16 percent more people in a no-tobacco economy than they do in the status quo projection.

Because of the higher smoking incidence of men, the population impacts tend to be more pronounced on men than women. Of the 520,000 new residents of Indiana in the tobacco-free economy relative to the status quo, approximately 285,000, or 54 percent, are males.

Discussion

This has been a detailed examination of the outcomes that would occur in an Indiana economy where tobacco ceases to exist. In examining the difference between these outcomes and those that can be expected to occur with consumption and production of tobacco intact, we can hope to learn the full impact of tobacco on the state economy.

Our findings leave little doubt but that tobacco is a significant killer, not only of people, but also of jobs and wealth. Every result presented in this section paints a picture of a larger and more prosperous economy in the absence of tobacco. The removal of tobacco ultimately produces more than 178,000 additional jobs, more than \$28 billion in personal income, and more than 520,000 more people in the state's economy. Those are significant impacts, and should alert policymakers of the importance of tobacco cessation as a legitimate public policy goal.

In the long list of factors bringing about these results, two stand out larger than the rest. The first is the premature death caused by tobacco-related illness. The cumulative impact of restoring those who would otherwise have been lost has an enormous impact on economic output and demand. That can easily be seen from the behavior of impacts over time in the tables we have presented.

The second major factor is the reduction in the costs of living and operating a business in Indiana. Lifting the burden of financing tobacco-induced health care costs from businesses, consumers, and governments lowers costs and increases the after tax rate of return on new investment in the state economy. The response of the economy is seen in these results.

The question asked and answered in this study – the impact on the economy from the elimination of tobacco – is not one that can be achieved in all practicality. It is hard to conceive of circumstances that would cut Indiana's smoking incidence to zero while leaving other state's unchanged, certainly, just as it is impossible to wipe clean the health consequences of a legacy of smoking behavior. We have made these assumptions not only to simplify the analysis, but also to underscore that in an economy where states and regions compete for investment and jobs, tobacco-related costs do matter.

Although the analysis would be more complicated, the force of these arguments applies to efforts to bring down, rather than completely eliminate, the presence of tobacco in the state's economy as well. Simply put, any change which turns our state's use of tobacco into a competitive advantage, instead of the disadvantage it is today, can be expected to work its way through the economy precisely as these results describe.

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