Economic Implications of Cigarette Consumption & Taxation: A Case Study of Indiana

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Roadmap

1. Introduction and Preview of Results
2. Motivation and Framework
3. Optimal Taxation
4. Forecasted Economic Impact
5. Conclusion

Introduction

This project estimates the range of optimal taxes of cigarettes based on

- Externalities: external costs that are indirect costs or benefits to an uninvolved third party that arises as an effect of another party's activity.
- Internalities: internal costs that are the long-term benefit or cost to an individual that they do not consider when deciding to consume a good or service.
- Future Discounting

Then, through the use of REMI, I study the economic forecasts of increasing the tax in the state of Indiana. This work builds off Gruber and Kőszegi (2004), Chaloupka and Tauras (2023), Tauras, Chaloupka, and Esposito (2023a), and Tauras, Chaloupka, and Esposito (2023b).

Preview of Results

This paper finds that

- The externality of cigarettes in Indiana is $1.91/pack.
- The harm induced onto the person who smokes is $52.02/pack.
- When including internalities, the optimal tax ranges from $6.96/pack to $22.12/pack.
- In the simulation, when increasing the tax rate to up to the interval of $1.91 to $6.96, I find that there are positive benefits to Indiana through an increase to total employment, GDP, and personal income by at least 3813 jobs, $314.8 M, and $237 M in first year of implementation, respectively.
- Increasing the tax between $1.91 to $6.96, there are continued benefits to the economy for 20 years.

Assumptions and Limitations

Assumptions

1. Cigarette taxes are in the form of excise taxes.
2. The consumer is fully responsible for the tax.

Limitations

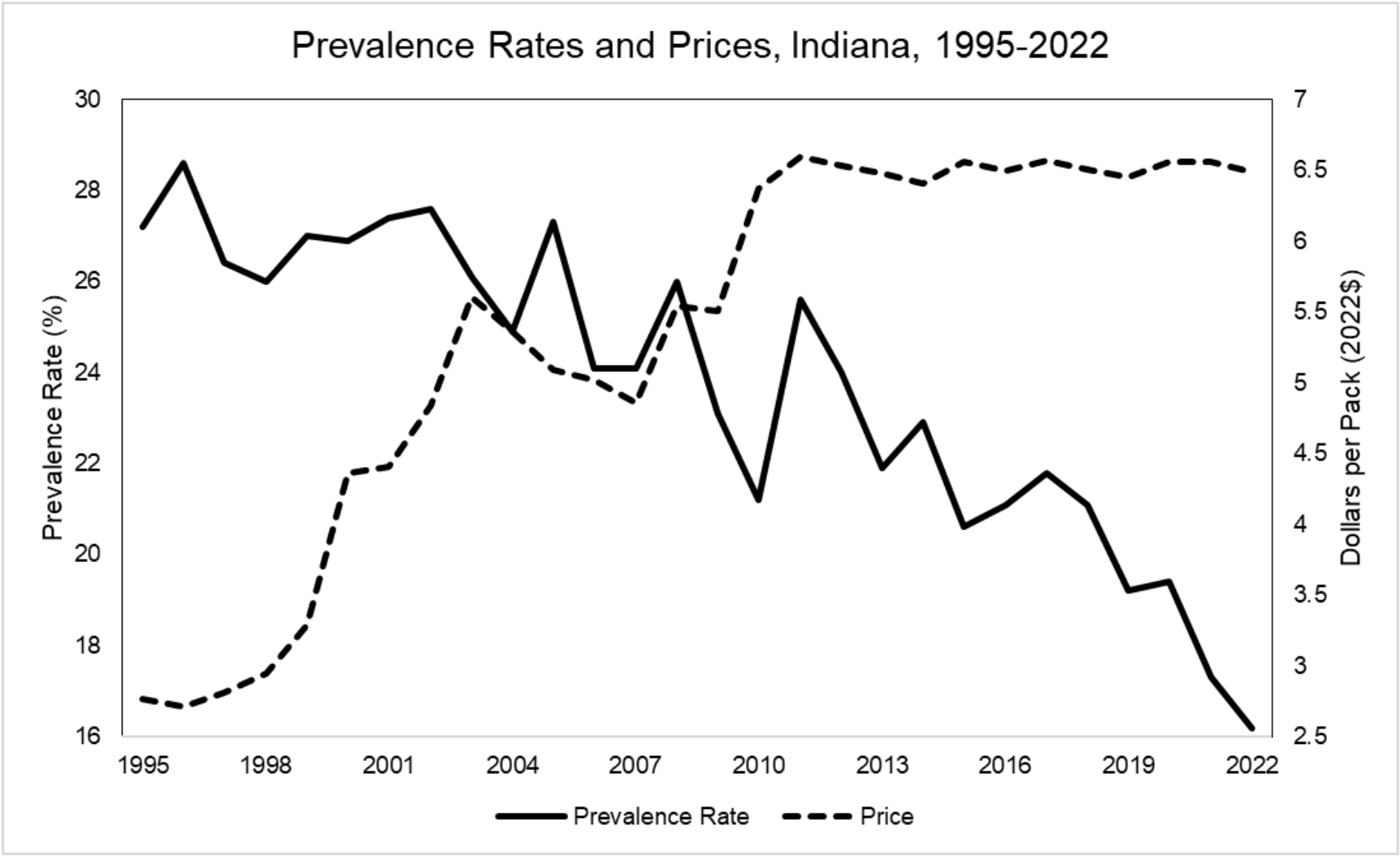
1. No account for the number of people that may purchase their cigarettes outside of Indiana.
2. Estimates from model represent the upper bound.
3. This study does not take into account for the positive impact it would have on reducing healthcare costs.
4. No explanation of tradeoffs between cigarettes and other "bads."

Motivation

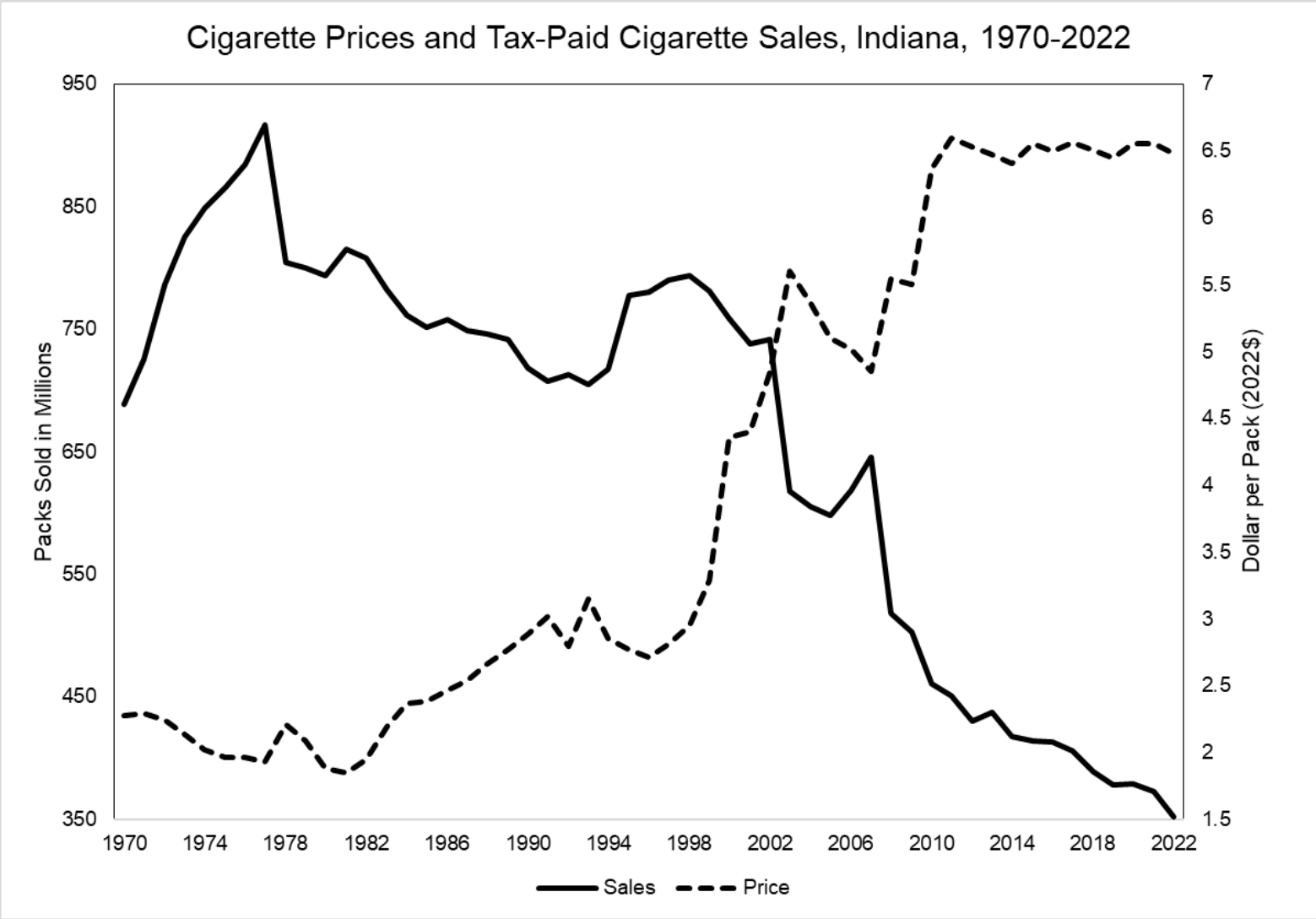
- Indiana has the 11th lowest tax rate in the United States, currently at $0.995, while having the ninth highest smoking prevalence rate in the United States. (CDC, 2023)
- Median tax rate in the U.S. is $1.78 (2022)
- 2022 Productivity loss = $2.3 Billion (Tauras et al., 2023a)
- 2022 Smoking-related health care expenditure = $3.4 billion (Chaloupka and Tauras, 2023)

SMOKING TRENDS | NOMINAL TAX TRENDS | REAL TAX TRENDS

Motivation


Prevalence Rates and Prices, Indiana, 1995-2022
Prevalence Rate (%)
30
28
26
24
22
20
18
16
Dollars per Pack (2022$)
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
1995
1998
2001
2004
2007
2010
2013
2016
2019
2022
Prevalence Rate
Price

Motivation


Cigarette Prices and Tax-Paid Cigarette Sales, Indiana, 1970-2022
Packs Sold in Millions
950
850
750
650
550
450
350
Dollar per Pack (2022$)
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1970
1974
1978
1982
1986
1990
1994
1998
2002
2006
2010
2014
2018
2022
Sales
Price

Motivation

Why tax cigarettes?

- Overconsumption of cigarettes
  - Social Optimal $<$ Market Equilibrium $\Rightarrow$ DWL created
- Taxation is the most effective way to decrease smoking. (Warner, Chaloupka, Cook, Manning, Newhouse, Novotny, Schelling, and Townsend, 1995)

Rectification

- Rational Addiction Model: $\tau^* = f(\text{externalities})$
- Hyperbolic Discounters: $\tau^* = f(\text{externalities},\ \text{internalities})$

Gruber and Kőszegi (2004, 2008)

Given this framework, where individuals are not rationally addicted, Gruber and Koszegi (2008) finds the optimal tax on cigarettes can be represented by

$$\tau^* = \text{Externalities} + (1 - \beta)\delta \times \text{Self Harm} \tag{1}$$

where β and δ are bounded between zero and one and represent the short-run future discount rate and long-run future discount rate, respective. Self Harm is measured through value of statistical life (VSL).

Negative Externalities

Negative externalities from cigarette smoking result in costs to employers in terms of productivity lost and additional healthcare spending.

1. Absenteeism = $280,812,328 (or $0.80/pack)
2. Presenteeism = $280,812,328 (or $0.80/pack)
3. Smoking Breaks = $1.73 billion (or $4.91/pack)
4. Healthcare Costs by Private Employers that Self-Insure = $757,317,372 (or $2.16/pack)

The estimates I show are based on Berman, Crane, Seiber, and Munur (2014) and are estimated at the industry level.

COMPUTATION

Positive Externalities

Since people who smoke die about 10 years earlier than people who do not smoke, the government and employers save money by not having to spend on Social Security, Medicare, and employer-defined benefits.

- Social Security Savings = $984,230,465 (or $2.80/pack)
- Medicare Savings = $1,267,445,414 (or $3.61/pack)
- Employer Defined Benefits Savings = $117,910,339 (or $0.34/pack)

Externalities Summary

Table: Economic Impacts of Cigarette Consumption in Indiana

	Dollar Amount	Dollar per Pack
Negative Externalities		
Absenteeism	$280,812,328	$0.80
Presenteeism	$280,812,328	$0.80
Smoking Breaks	$1,733,409,434	$4.91
Healthcare Costs for Self-Insured Private Employers	$757,317,372	$2.16
Total Negative Externality = $3,040,285,089		
Positive Externalities		
Social Security Savings	$984,230,465	$2.80
Medicare Savings	$1,267,445,414	$3.61
Employer Defined Benefit Savings	$117,910,339	$0.34
Total Positive Externality = $2,369,586,218		

Based on the table below, the net externality of smoking cigarettes is $1.91/pack. Traditionally, under the exponential discounting agent (or rationally addicted), the optimal tax would be a function of the net externality of smoking.

Internalities

To account for the internalities of smoking, I use the value for statistical life (VSL). It accounts for lost earnings:

- Smokers may have reduced lifetime earnings due to premature death, illness, or disability caused by smoking-related diseases.

Based on the value of statistical life being about $10 million and smokers, on average, living 10 less years, I find the average harm is **$52.08 per pack**.

- Based on the CPS Tobacco Use Supplement 2022
- Assume that average damage equals to the marginal damage of consuming an additional cigarette.

Optimal Tax

Suppose β (short-term discount factor) and δ (long-term discount factor) vary based on how individuals value the future. I let $\delta = 0.97$ and vary $\beta \in (0.6, 1)$ to be consistent with the literature.

Table: Optimal Taxation for Cigarettes in Indiana

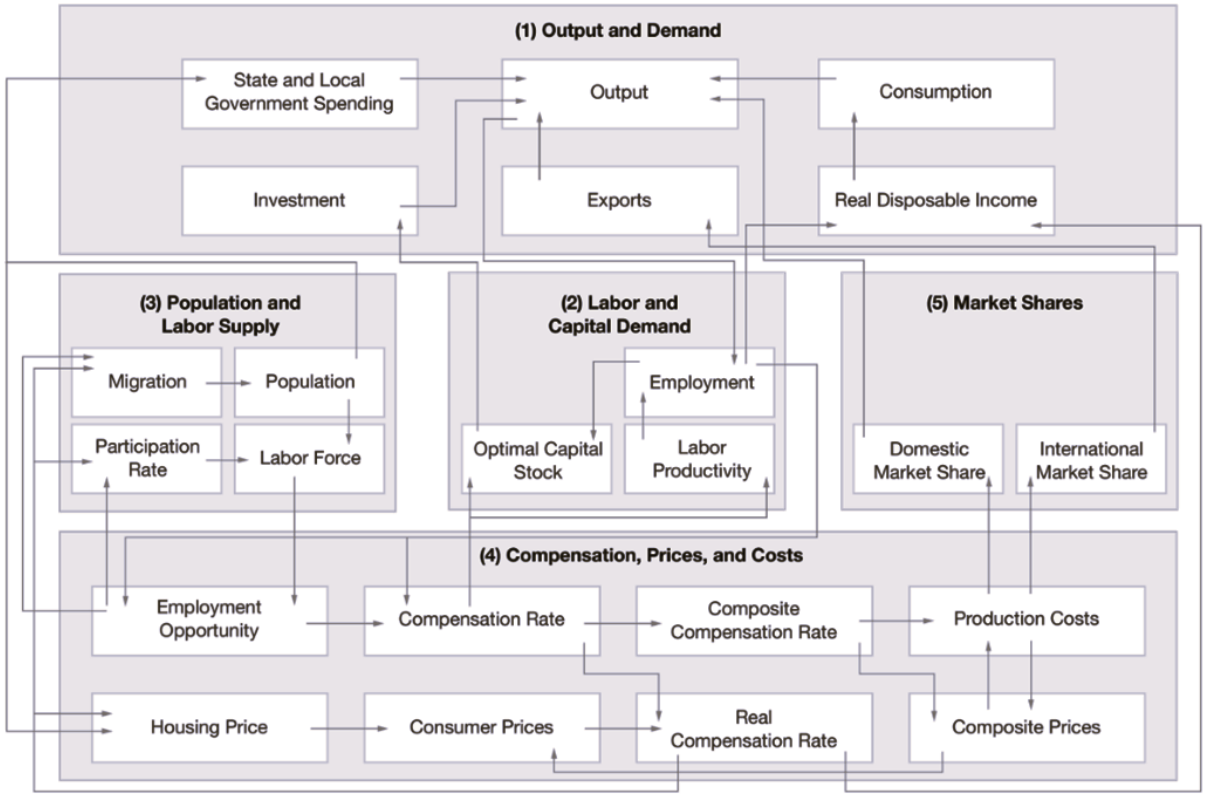
Discount Factor β	1.0	0.9	0.8	0.6
Optimal Tax τ^*	\$ 1.91	\$ 6.69	\$ 12.01	\$ 22.12

Note: This assumes that $\delta = 0.97$.

REMI Model

REMI is a macroeconomic model created by the Regional Economics Model, Inc. It is similar to the IO model used by BEA.

Figure: REMI Model Linkages



REMI Model

Tauras et al. (2023b) use it study the impact tobacco consumption has on Indiana's economy.

- They find that employment, population, and income would increase if tobacco did not exist.

I focus my analysis on employment, GDP, and income. The results for increasing the tax past $6.96/pack showed results that did not align with theory and other research, so I focus on increasing the tax up to $6.96/pack.

REMI Model

Implementing the model, I assume that

1. Tobacco products cannot be factored out so I increase all tobacco products by their overall price increase. Excise taxes cannot be adjusted by purely inputting the rate.
2. People will quit at a drastic rate when the tax is implemented, then adjust to a 2% decline afterward.
   - PED is -0.4
3. Money not spent on cigarettes from the shock of the tax will be redistributed to all other aspects of consumer spending.
4. To account for how much money the government makes from the tax increase, I will allow the government to increase their spending in the model since the model does not show the increase in government tax revenue.

EXAMPLE

Results from increasing the tax rate to $1.91/pack

Table: Economic Impact Summary of a $1.91 Tax on Cigarettes

	1 Year	5 Years	10 Years	15 Years	20 Years
Total Employment	3812.736	3143.029	2439.892	1824.3	1342.756
Gross Domestic Product	314.843	265.579	209.921	160.857	120.483
Personal Income	237.012	264.985	241.529	197.44	151.805
Disposable Personal Income	166.56	184.16	169.473	138.303	105.388
Disposable Personal Income per Capita	0.02	0.014	0.011	0.01	0.012

- Total Employment is measured in individual jobs.
- GDP is measured in millions of 2022$.
- Personal Income is measured in millions of 2022$.
- Disposable Personal Income is measured in millions of 2012$.
- Disposable Personal Income per Capita is measured in 1000s of 2012$.

Results from increasing the tax rate to $6.96/pack

Table: Economic Impact Summary of a $6.96 Tax on Cigarettes

	1 Year	5 Years	10 Years	15 Years	20 Years
Total Employment	17512.86	14159.53	11087.51	8313.955	6005.764
Gross Domestic Product	1.417	1.154	0.916	0.694	0.502
Personal Income	1.098	1.197	1.091	0.889	0.662
Disposable Personal Income	0.772	0.831	0.764	0.621	0.457
Disposable Personal Income per Capita	0.096	0.067	0.057	0.056	0.062

- Total Employment is measured in individual jobs.
- GDP is measured in billions of 2022$.
- Personal Income is measured in billions of 2022$.
- Disposable Personal Income is measured in billions of 2012$.
- Disposable Personal Income per Capita is measured in 1000s of 2012$.

Results

These increases are being driven by

- Majors increases in (1) state government, (2) health care and social assistance sector, and (3) construction.
- Consumption and Government spending increase [*caveat*]
- Net earnings increases

Conclusions

The major take-aways from this project are

1. Taxes on cigarettes in Indiana are too low; if people are hyperbolic discounters, then the tax can be raised to about $20/pack.
2. Evidence supports that raising the tax to about $7/pack has positive economic implications for Indiana through increased employment, GDP, and personal income.

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Motivation

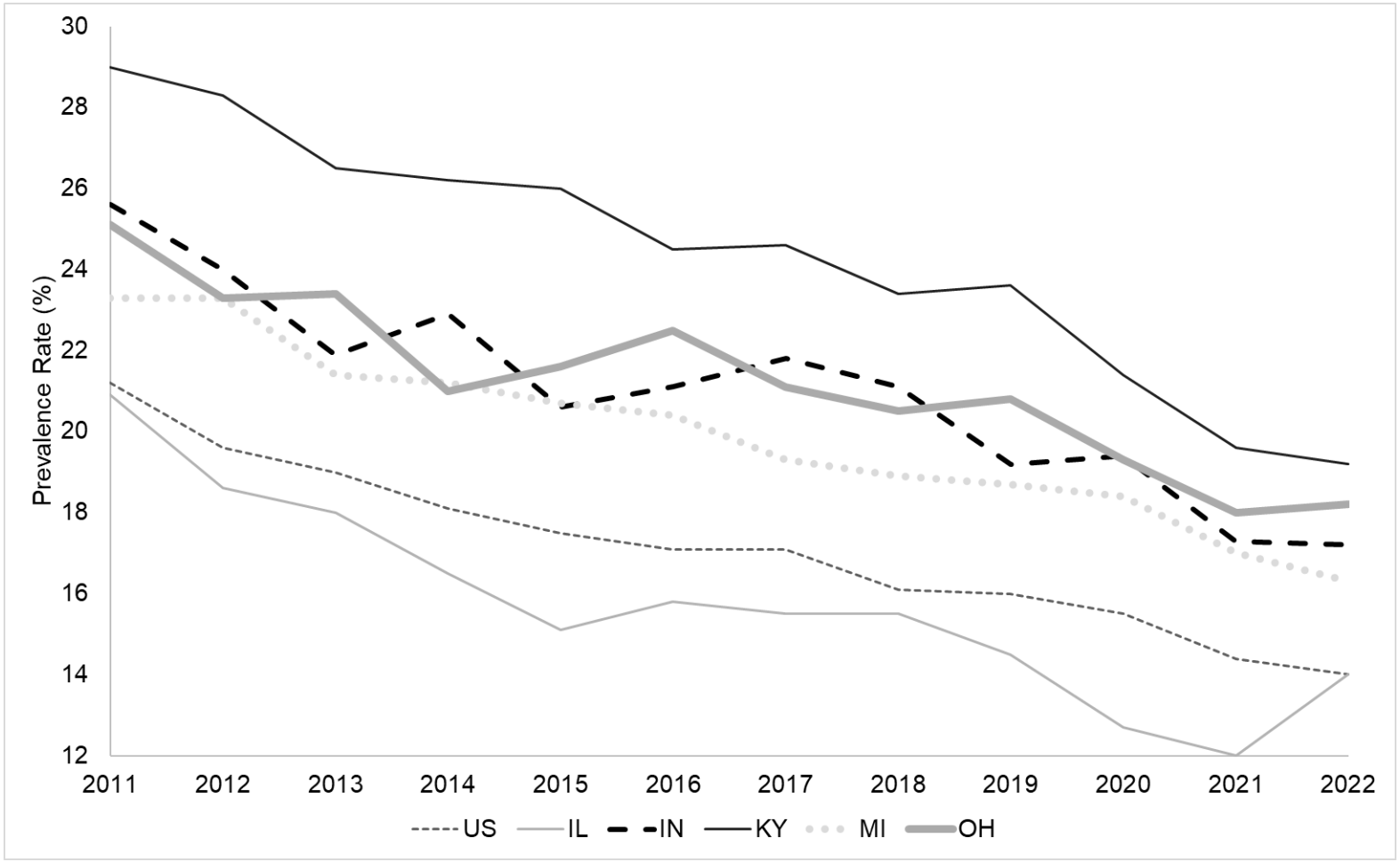

Figure: Prevalence Rates in the Midwest

BACK

Motivation

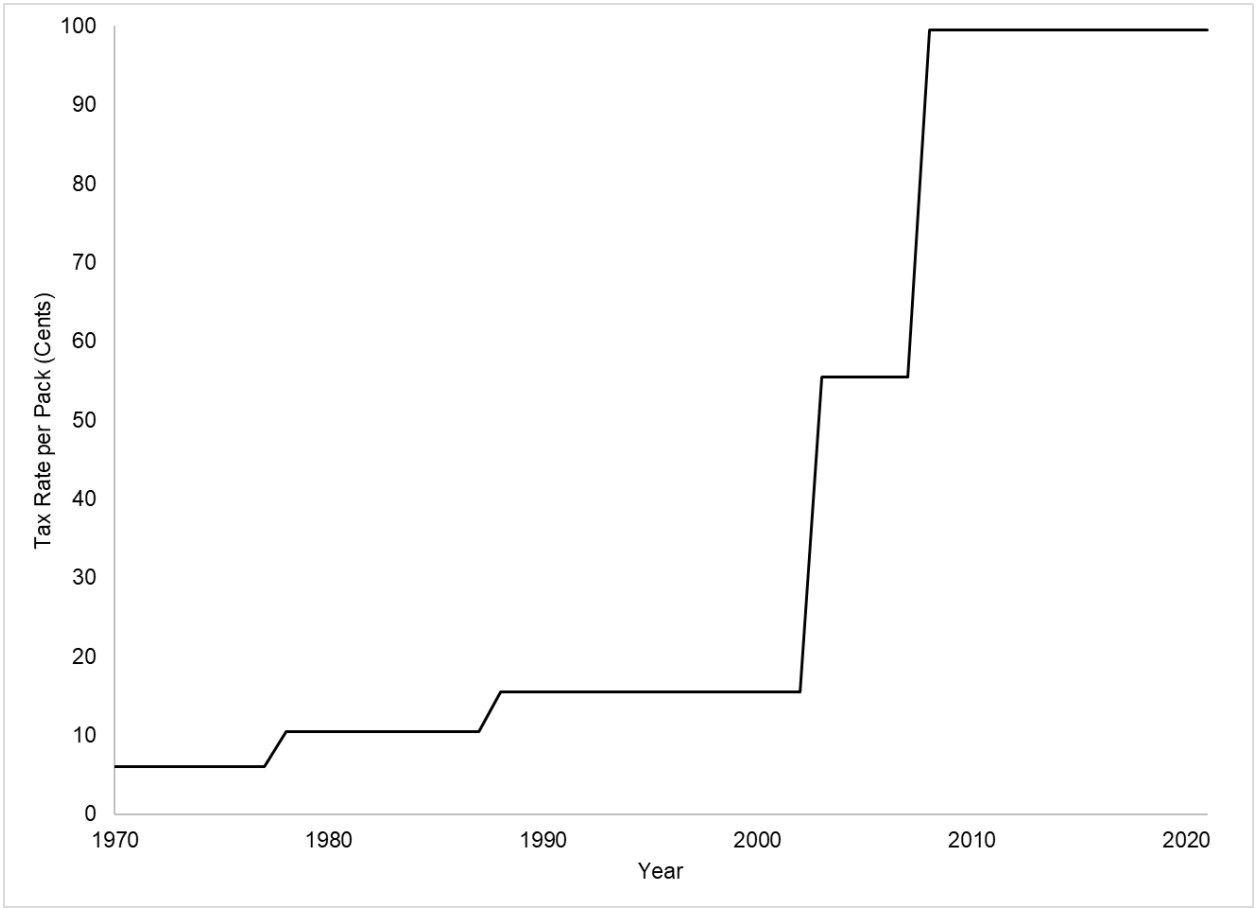

Figure: Tax Rate in Indiana

BACK

Motivation

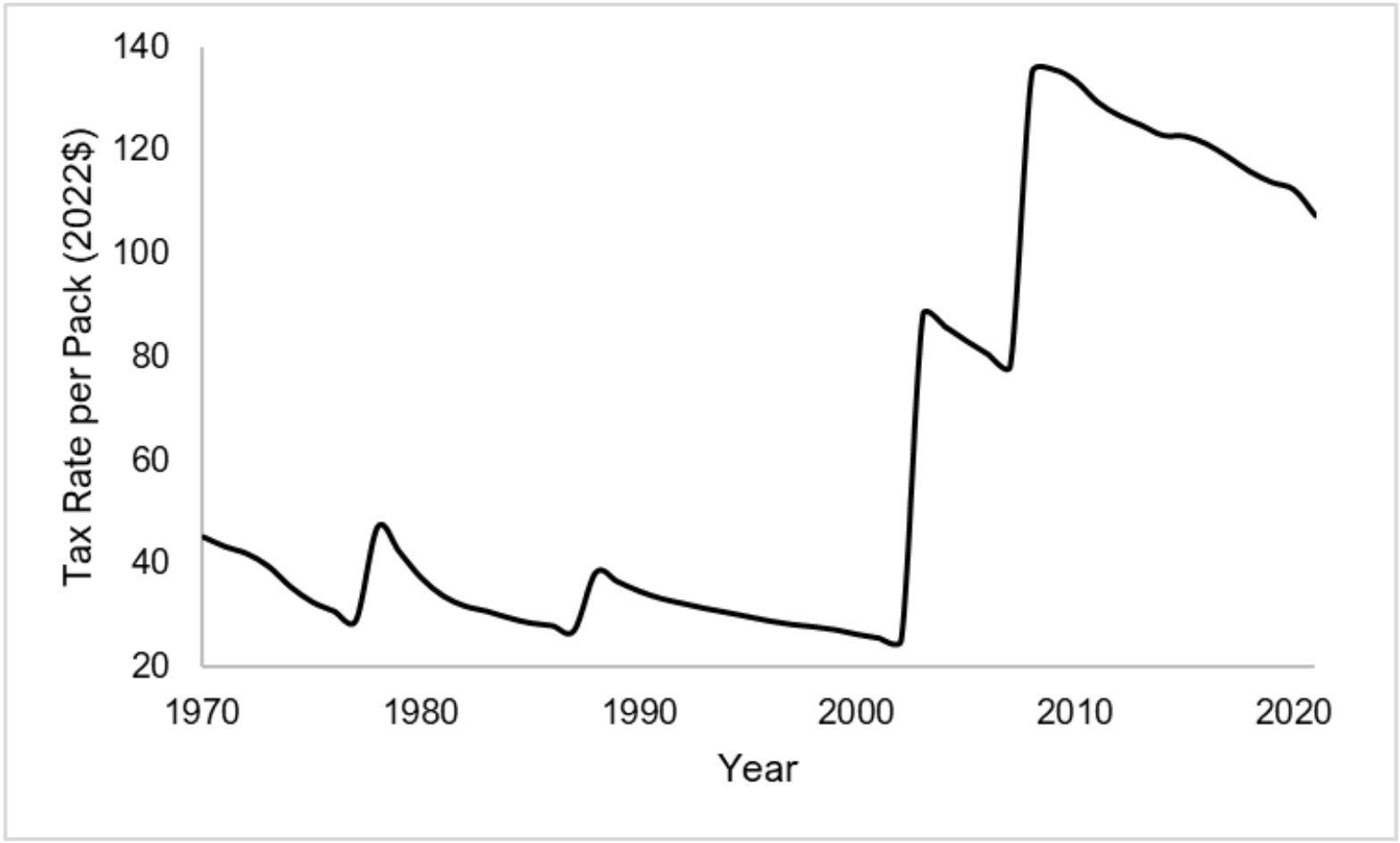

Figure: Real Tax Rate in Indiana

BACK

Absenteeism

Absenteeism is the additional time off a person does not work due to their smoking behavior.

$$\text{Absenteeism} = \text{Days Lost} \times \text{Hours Worked} \times \text{Compensation Costs}$$

where

- Hours Worked (Daily) = 8.1 (BLS, 2023)
- Days Worked Weekly = 5 (BLS, 2023)
- Absenteeism Days (Days Lost) = 2.6 (Berman et al., 2014)

Absenteeism in Indiana 2022 was $280,812,328 (or $0.80/pack).

Presenteeism

Presenteeism is when an employee is physically present at work but is unable to perform their duties due the need to smoke cigarettes.

$$\begin{aligned}\text{Presenteeism} = \text{Excess Presenteeism Rate} \times \text{Compensation Cost} \\ \times \text{Hours Worked} \times \text{Days Worked}\end{aligned}$$

where

- EPR = 1% (Berman et al., 2014)
- 260 Days worked a year
- Compensation is derived from BLS by industry

Presenteeism in Indiana 2022 was $280,812,328 (or $0.80/pack).

Smoking Breaks

Smoking breaks tend to be much higher since it requires the employee to physically be away from their work place to smoke.

$$\text{SB} = \text{Cigs/Day} \times \text{Break Time} \times \text{Compensation} \times \text{Days Worked}$$

where

- $\approx$ 2 cigarettes/day
- 15 minutes on break

Smoking breaks in Indiana 2022 was \$1.72 million (or \$4.91/pack).

Private Employer HC costs

The extra healthcare costs private employers are responsible for can be calculated by

$$\text{Cost} = \frac{\text{EHE} \times \text{Adjusted SA \%}}{\text{Smoking Private EE}}$$

where

- SA% $\approx$ 8% (smoking attributable fraction of healthcare expenses)

Tauras et al. (2023a) find that it is $757,317,372 (or $2.16/pack)

BACK

REMI Model

Here is an example of the computation. Consider increasing the excise tax rate from $0.995 to $1.91 per pack.

- The overall price increase from the old tax to the new tax is expected to be 14%.
- Based on PED = -0.4, the first year it is expected that about 20 million packs will not be sold, however the government will receive an increase in the tax revenue collected from cigarettes to be $283 million.
- After the intial shock, the number of packs are expected to decline by 2%. This has been the average decline of cigarette packs sold.

BACK