Effects of policies on changes in smoking prevalence

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Introduction

Smoking has been one of the most serious health problems in the world. Various policies against smoking have been enforced by the governments all over the world. Effective policies for reduction in smoking are required to be reinforced.

Questions explored:

- Q1: What continent had the most decline in smoking population percentage?
- Q2: How strong is the association (if any) between various policies against smoking and smoking rate decline?

Methodology

- Time frame considered: 2010 – 2018
- Data collected for 193 countries under UN. [1]
- Policies investigated: Bans on advertisement, Tax on tobacco products and Support to quit.
- The quantitative response to model: Change in Percentage point of smoking prevalence rate.
- Covariates used: Policies enforced at the start of 2010 and change in policies in the duration considered.
- Model used for analysis:

$$Y = X\beta + \epsilon\,, \qquad \epsilon \sim N(0, \sigma^2)$$

where X is the design matrix for the policies, β is the matrix of coefficients and ϵ is the error term.

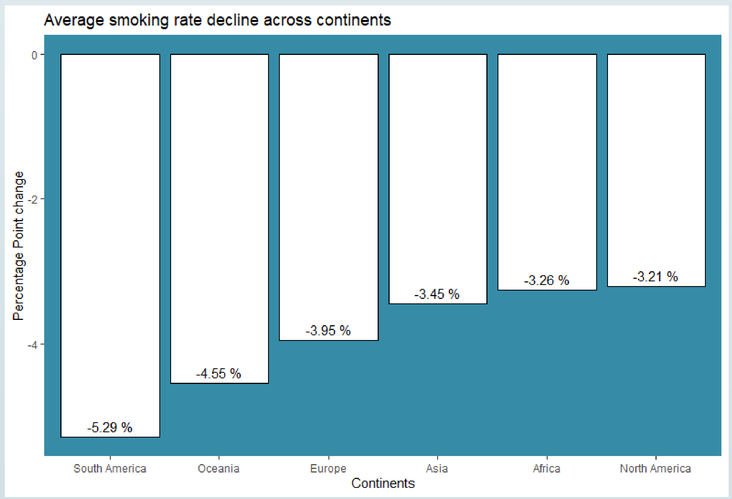

Figure-1: Bar-chart of average percentage point change for all continents

Results

- The regression model with tax policies as explanatory variables complied with all the assumptions.

  prevalence rate change ~ tax policy change + initial tax policy

- No association was found between tax policy changes and smoking prevalence decline at 5% significance level

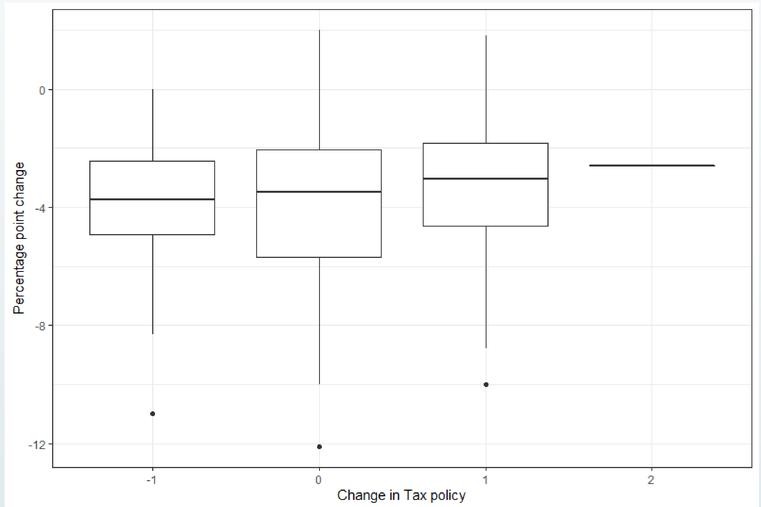

Figure-2: Boxplot of change in smoking prevalence across all changes in tax policies. (value of 1 means country enforced stricter tax policy after 2010 and vice-versa.)

- A crude graphical display of the result is depicted by the boxplot. (Figure-2)
- There is considerable overlap between values of countries with no change i.e. countries with 0 in tax policy change and countries with some change in their policies
- Evidence against or in favor of other policies could not be confirmed by the standards of multiple linear regression.
- But figure-3 gives an estimate of the effect of support policies on the smoking prevalence rate.

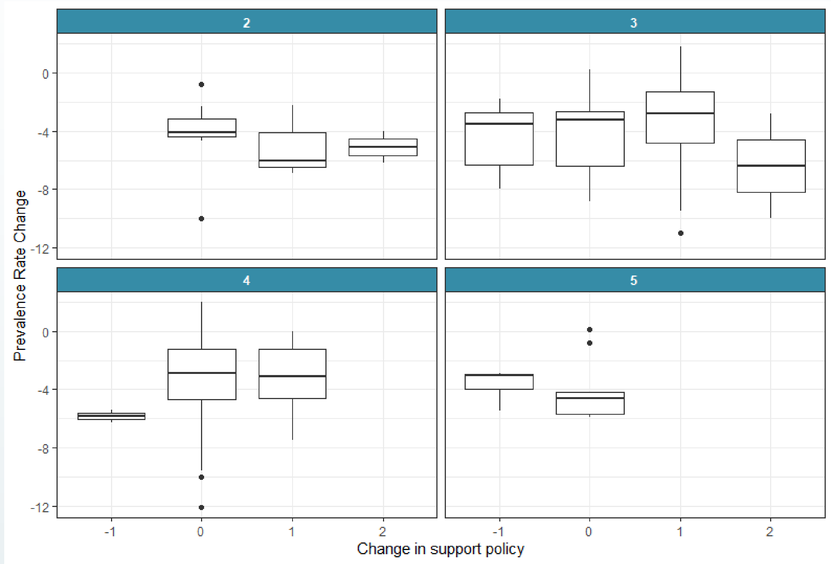

Figure-3: Boxplots of smoking prevalence across all changes 'Support to quit' policies faceted w.r.t initial policy value.

- Within group differences can be seen in case of support policy.
- Confirming or disproving the effects of these policies on prevalence rate change, by standards of some other appropriate model is an interesting starting point of further analysis

Conclusion

- No statistically significant evidence was found for association between change in tax policies and decline in smoking rates.
- Countries relying only on increasing taxes to decline smoking prevalence won't get much benefit.
- Rather, focus should be on policies that give statistical evidence of benefits.

References

[1] Data collected from https://ourworldindata.org/