Economics and Human Biology 30 (2018) 37–47

Contents lists available at ScienceDirect

Economics and Human Biology

journal homepage: www.elsevier.com/locate/ehb

Smoking ban and health at birth: Evidence from Hungary

Tamás Hajdu[a,*], Gábor Hajdu[b,c]

[a] Institute of Economics, Centre for Economic and Regional Studies, Hungarian Academy of Sciences, Tóth Kálmán u. 4., 1097 Budapest, Hungary
[b] Institute for Sociology, Centre for Social Sciences, Hungarian Academy of Sciences, Tóth Kálmán u. 4., 1097 Budapest, Hungary
[c] MTA-ELTE Peripato Comparative Social Dynamics Research Group, Pázmány Péter sétány 1/A, 1117 Budapest, Hungary

ARTICLE INFO

Article history:
Received 19 January 2018
Received in revised form 20 April 2018
Accepted 31 May 2018
Available online xxx

JEL classification:
I18
J13

Keywords:
Smoking ban
Health at birth
Policy evaluation

ABSTRACT

In 2012, smoking restrictions were extended to hospitality venues in Hungary. Women working in bars and restaurants were primarily affected by the intervention. In this research, we analyze the effect of this smoking ban on the outcomes of their pregnancies. Using individual live birth, fetal loss, and infant mortality registry data, we examine the probability of live birth, indicators of health at birth, and the probability of death in the first year of life. We apply a difference-in-differences framework and show that the smoking ban has improved health at birth. We observed birth weight to increase by 56 g (95% CI: 4.2 to 106.8) and gestation length by 0.19 weeks (95% CI: 0.02 to 0.36). Due to the ban, the probability of being born with very low and low birth weight has decreased by 1.2 and 2.2 percentage points, respectively (95% CI: −0.2 to −2.2 and 0.06 to −4.4), and we see a 0.9 percentage points reduction in the chance of being born very preterm (95% CI: −0.03 to −1.9). We also observe a decrease in the probability of being born with a low Ponderal index (decrease of 4.1 percentage points, 95% CI: −0.7 to −7.5). Performing a series of robustness and placebo tests, we provide evidence that supports the causal interpretation of our results. We also show that the ban was more beneficial for newborns of parents with low educational attainment and at the bottom of the fetal health endowment distribution.

1. Introduction

There is vast evidence on the harmful effects of smoking and secondhand smoke exposure; therefore, governments try to reduce smoking prevalence and smoke exposure by enacting tobacco control policies. Tobacco control interventions can take many forms, from cessation support to tax policy to prohibiting smoking in certain places. The evaluations of such interventions are indispensable for planning future policies and for enhancing the well-being of the society.

In this paper, we focus on smoking bans and birth-related outcomes. The vast majority of the studies that evaluated the effect of policies prohibiting smoking in public places, workplaces, or hospitality venues on birth outcomes used data that covered the entire population. Many of them applied interrupted time-series (ITS) analysis (Been et al., 2015; Cox et al., 2013; Kabir et al., 2013; Mackay et al., 2012; McKinnon et al., 2015; Peelen et al., 2016; Simón et al., 2017; Vicedo-Cabrera et al., 2016). A meta-analysis of the papers using the ITS design found mixed results. A smoking ban in workplaces or public places is associated with a reduction in preterm births, but it does not influence low birth weight (Been et al., 2014); however, recent studies reported more significant impacts. Other papers used the panel data of countries, US states/counties, or other geographical units. They exploited geographical differences and variations in the timing of smoking bans to estimate their effect on infants' health or on the prevalence of sudden infant death syndrome (Bartholomew and Abouk, 2016; Gao and Baughman, 2017; Hawkins et al., 2014; King et al., 2015; Markowitz, 2008; Markowitz et al., 2013; Page et al., 2012). Most of these studies concluded that smoking bans have limited effects.[1]

One of the major methodological issues of the ITS estimation strategy is to appropriately model the pre-intervention (or in other words the counterfactual post-intervention) time trend (Huesch et al., 2012; Lagarde, 2012). Another difficulty arises from the studies using data covering the entire population as follows. The (treatment on the treated) effect of workplace smoking bans might be underestimated, since many workplaces are smoke-free before the intervention (Been et al., 2015; Peelen et al., 2016). The higher the

* Corresponding author.
E-mail addresses: hajdu.tamas@krtk.mta.hu (T. Hajdu), hajdu.gabor@tk.mta.hu (G. Hajdu).

[1] A recent meta-analysis found that smoke-free legislation is associated with a reduction of pre-term birth and low birth weight, and with an increase in birth weight (Faber et al., 2017).

https://doi.org/10.1016/j.ehb.2018.05.003
1570-677X/

proportion of workplaces being smoke-free prior to the ban, the higher the probability that an intervention appears to be ineffective, even if it has a significant impact on certain groups of people.

Studies that are able to identify a subset of the population where pre-intervention exposure is more common, and that can follow a difference-in-differences strategy, might be more successful in estimating a causal effect that is closer to a treatment on the treated estimates. Such a rare example is the paper of Bharadwaj et al. (2014), which analyzed a 2004 law change in Norway that restricted smoking in bars and restaurants. Applying a standard difference-in-differences approach, it found that the children of female restaurant and bar workers are less likely to be born pre-term and with very low birth weight after the ban. However, there was no significant effect on birth weight, low birth weight, APGAR score and birth defect.

In this paper, we estimate the impact of the 2012 amendment to the Act on the protection of nonsmokers on several outcomes of pregnancies of mothers working in bars and restaurants in Hungary. The law change strengthened the existing anti-smoking legislation and had the strongest effect on women working in bars and restaurants, as in most bars/pubs and in many restaurants smoking was allowed before 2012. We use individual live birth, fetal loss (miscarriage or stillbirth), and infant mortality registry data, and we examine the probability of live birth, various health at birth indicators of the newborns, and mortality in the first year of life. We apply a difference-in-differences framework with continuous treatment intensity and estimate intention to treat effects. Our results show that the smoking ban (law change) has significantly improved the health of newborns of the bar worker mothers and has reduced infant mortality among those newborns. We also show that the ban was more beneficial for the children of parents with low educational attainment and for newborns at the bottom of the birth weight and Ponderal index distribution might benefit more from the smoking restrictions.

Performing a series of robustness and placebo tests we can rule out (among others) the concern about selection on unobservables and model misspecification. A main concern is that women who would in any case have better pregnancy outcomes might have started to work in bars after the ban, or more careful bar worker women have decided to postpone their pregnancies until their workplaces became smoke-free. To rule out this potential bias, we run placebo regressions using outcome variables (the health indicators of the older siblings) that could not have been affected by the ban, but should have been influenced by the unobserved, time-invariant "quality" of the mothers. Since we observe not only statistically insignificant, but zero or very weak associations, this exercise suggest that change in the composition of the bar worker mothers is unlikely to be a major problem in our estimations.

In an additional placebo reform test we assumed that the smoking ban was not introduced in 2012, but on other random dates several years before, and then we re-estimated our model using these dates as the start of the ban. The effects of the random bans are much closer to zero than the effect of the 2012 law change. We also show that even if we relax the parallel trend assumption of the difference-in-differences estimation by introducing a bar worker-specific linear time trend, our results hold.

The most similar paper to our work is Bharadwaj et al. (2014). Unlike the other studies in the literature, it applies a difference-in-differences framework and focuses on a subset of the population with high level of workplace exposure to tobacco smoke. However, there are several features of our work that adds to not only the literature, but even to the paper of Bharadwaj et al. (2014). First of all, we study the effect of a smoking ban in a country with high smoking prevalence in Europe. In 2003, one year before the Norwegian smoking ban, the proportion of daily smokers was around the European average in Norway (26%), whereas it was significantly higher in Hungary (30%) (OECD, 2017). Although the smoking prevalence decreased slightly in Hungary for the early 2010 s (26%), it was still one of the highest rate in Europe. In addition, the daily cigarette consumption was 20–25% higher and consumption of tobacco item in grams was 30–60% higher in Hungary during the 2000 s than in Norway (OECD, 2017).

Another important feature of our work is that we analyze a two-year-long period, by which we are able to control for seasonality. Unlike to our paper, Bharadwaj et al. (2014) used 10 months of observations (5 months before and after the ban) and excluded some intermediary period. Since we use a continuous treatment intensity variable (exposure to the law change) we can include those pregnancies that started before but ended after the law change.

Studying the heterogeneity by fetal health endowment we are able to evaluate the impact of the smoking ban on the entire health at birth distribution. Although the previous literature (including Bharadwaj et al. (2014) studied the effects on low birth weight and pre-term birth, they provide an incomplete picture. For example, we do not know whether a shift in the probability of being born with low birth weight (or being premature) is the result of a shift of the entire distribution or only the lower tail. Applying a quantile regression approach, we can advance our knowledge on this issue.

Finally, compared to Bharadwaj et al. (2014) we also get some novel results. Most importantly, we show that the ban had a significant effect not only on low birth weight and pre-term birth, but also on average birth weight and gestational age.

2. The Hungarian smoking ban in 2012

On April 26, 2011, an amendment to the Act on the protection of nonsmokers (Act XLII of 1999) was adopted by the Hungarian Parliament, which strengthened the existing Hungarian anti-smoking legislation. This law, which went into effect January 1, 2012, bans smoking in public-education institutions, in enclosed workplace areas, on public transport, in childcare and healthcare institutions, and in hospitality venues (including pubs, bars, and restaurants). In workplaces and most public places, smoking was allowed only in designated smoking areas even before 2012, which means that hospitals, educational facilities, and many other workplaces were already smoke-free prior to the amendment. However, the amendment had a substantial effect on bars and most restaurants where smoking was previously permitted.[2] The ban took full effect on April 1, 2012. Previously, during the first three months, the consequences of noncompliance resulted in warnings only.[3]

Before 2012, exposure to cigarette smoke was intense in Hungarian bars and restaurants. According to the Eurobarometer survey conducted in 2009,[4] 78% of the Hungarian adult population experienced smoking inside bars (drinking establishments), and 43% experienced smoking inside restaurants (eating establishments). After the ban, air quality in bars and restaurants substantially improved. In 2014, only 9% and 4% of people reported that people were allowed to smoke inside bars or restaurants, respectively.[5] A study that measured the level of indoor air pollution in 42 public locations in 2008 in Hungary reported that

[2] After the law change, smoking was completely banned in bars and restaurants, that is, no indoor designated smoking areas were allowed.

[3] Not only smoke exposure was high in the hospitality sector, but smoking prevalence, too. The prevalence of smoking was 40% among women working in the hospitality sector in 2009, whereas the national average was 26% (Demjén et al., 2011).

[4] Eurobarometer 72.3 (2009). GESIS Data Archive, Cologne. ZA4977, https://doi.org/doi:10.4232/1.11140.

[5] Eurobarometer 82.4 (2014). GESIS Data Archive, Cologne. ZA5933, https://doi.org/doi:10.4232/1.12265.