## A primer

study the effects of right-to-carry laws

legalized prostitution

immigration policy

Taxation

minimum wages

aim to estimate the effects of aggregate interventions (interventions that are implemented at an aggregate level affecting a small number of large units)

the terms “treated” and “untreated” will refer to units exposed and not exposed to the event or intervention of interest

However, the use of time-series techniques to estimate medium and long-term effects of policy intervention is complicated by the presence of shocks to the outcome of interest

A drawback of comparative case studies of this type is that the selection of the comparison units is not formalized and often relies on informal statements of af\*nity between the units affected by the event or intervention of interest and a set of comparison units. Moreover, when the units of observation are a small number of aggregate entities, like countries or regions, no single unit alone may provide a good comparison for the unit affected by the intervention.

combination of unaffected units often provides a more appropriate comparison than any single unaffected unit alone. The synthetic control methodology formalizes the selection of the comparison units using a data driven procedure

## Formal aspects

The “donor pool,” that is, the set of potential comparisons

will define Yjt N to be the potential response without intervention

Y1t I to be the potential response under the intervention

τ1t = Y1t I − Y1t N

Because unit “one” is exposed to the intervention after period T0, it follows that for t > T0 we have Y1t = Y1t I .

Simply put, for the unit affected by the intervention and a post-intervention period we observe the potential outcome under the intervention

how the outcome of interest would have evolved for the affected unit in the absence of the intervention. This is a counterfactual outcome, as the affected unit was, by de\*nition, exposed to the intervention of interest after t = T0

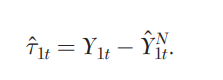
### Estimation

Comparative case studies aim to reproduce value of the outcome variable that would have been observed for the affected unit in the absence of the intervention—using one unaffected unit or a small number of unaffected units that have similar characteristics as the affected unit at the time of the intervention.

synthetic control is de\*ned as a weighted average of the units in the donor pool.

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Automatisch generierte Beschreibung



To avoid extrapolation, the weights are restricted to be nonnegative and to sum to one, so synthetic controls are weighted averages of the units in the donor pool

weights that are typically sparse (see section 4). That is, only a small number of units in the donor pool contribute

Weights can be chosen differently: uniform, nearest-neighbor, …

propose to choose w2,…, wJ+1 so that the resulting synthetic control best resembles the pre-intervention values for the treated unit of predictors of the outcome variable

choose V, such that the synthetic control W(V) minimizes the mean squared prediction error (MSPE) of this synthetic control with respect to Y1t N:

The goal of the synthetic control is to approximate the trajectory that would have been observed for Y1t and t > T0 in the absence of the intervention

set of weights W such that the resulting synthetic control resembles the affected unit before the intervention along the values of the variables X11,…, Xk1.

choosing V = (v1,…, vk) boils down to assessing the relative importance of each of X11,…, Xk1 as a predictor of Y1t N: