Problem Set 5 (Question 3)

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Names are listed in alphabetical order

(a) Treatment D: The trade reform of Jordan in 1965.

Jordan opened up in 1965 and adopted a more liberal trade policy since then.

The government has required import licenses since at least 1951. In the 1950s Jordan allowed importing only by registered importers who were allocated foreign exchange based on the government's annual import plan. In the 1960s Jordan introduced a list of prohibited imports, but this included only a few products. By the mid-1960s the IMF reports state that import licenses were granted freely except for items on these lists. The black market premium was also low enough since 1965, indicating that import restrictions did not lead to severe excess demand for foreign exchange.

(b) We choose the following countries as the control group (53 in total):

Algeria, Argentina, Benin, Bolivia, Brazil, Cameroon, Chile, China, Colombia, Costa Rica, Dominican Rep, Ecuador, Egypt, El Salvador, Gambia, Ghana, Guatemala, Honduras, India, Indonesia, Iran, Jamaica, Kenya, Korea, Malawi, Malaysia, Mali, Mexico, Mozambique, Nepal, Nicaragua, Niger, Pakistan, Panama, Paraguay, Peru, Philippines, Romania, Singapore, South Africa, Sri Lanka, Syria, Tanzania, Thailand, Togo, Trinidad Tob, Turkey, Uganda, Uruguay, Venezuela, Zambia, Zimbabwe.

We have two criteria in making this choice. First, this the country should be a developing country with medium to low income outside of Europe; therefore it can have a similar domestic and foreign economic status with Jordan. Second, this country must obtain its independence before 1960; therefore we have complete data for this country during year 1960 to 1980. We choose year 1980 as the end of our study period because Jordan had a macroeconomic crisis later in 1980s and 1990s (debt rescheduling in 1987 and 1992, and external payments arrears in 1993), which can have various reasons beyond its opening up policy. After the first selection, we drop countries that have completely no data on *Educational Attainment* variable because we want to use it as a control, and we will explain the reason in part (c).

Notice: Since we only have data beginning from 1960 and the Jordan reform took place in 1965, it may not comply with the general rule of thumb of having at least ten years of observation before the reform.

(c) One prominent pattern is that the two variables *Educational Attainment* and *School Enrollment* are provided once five years. Therefore for the rest four years their values are missing. We replace missing values with the previous or forthcoming existing values of that country. As explained in part (b), we drop countries that meet the two criteria but has completely no observation on these two variables. Also for many countries the data on Intergenerational Mobility is missing, so we have to drop them in part (e).

In studying the trade reform of Jordan, we think quality of the bureaucracy, corruption and public expenditure can all play a role. Unfortunately, due to the limitation of dataset, they are all missing for those less developed countries in year 1960-1980, so we must drop these control variables. Nevertheless, we think using the outcome variable only to construct the weights of the synthetic control is enough. One thing worth noticing, however, is that we decide to include *Educational Attainment* variable as one of our controls, because Jordan also took an education reform in 1965, and we don't want that reform to bias our result.

So our controls include growth rate from 1960 to 1964 and *Educational Attainment*.

(d) Stata code to produce the result (after dropping non-control countries):

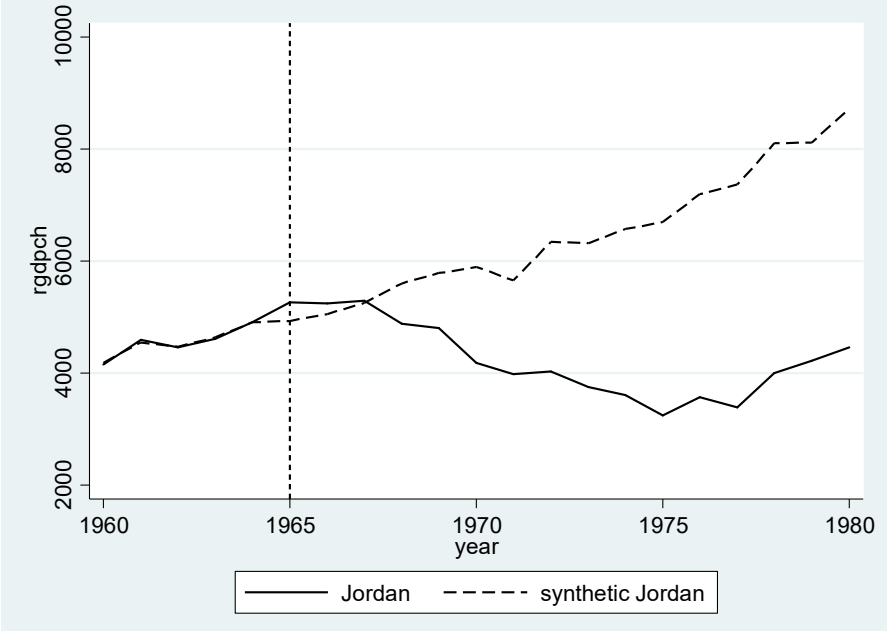
```
#Replace string variables
encode country, gen(country_id)

#Setup data
tsset country_id year

#Generate new variables
gen growth=log(rgdpch)
gen edu= educ_attn

#Replace missing values
carryforward edu, replace

#Construct SCM weights
synth rgdpch rgdpch(1960) rgdpch(1961) rgdpch(1962) rgdpch(1963) rgdpch(1964)
edu, trunit(29) trperiod (1965) nested fig
```



Predictor Balance:

	Treated	Synthetic
rgdpch(1960)	4151.359	4183.31
rgdpch(1961)	4591.262	4547.317
rgdpch(1962)	4454.219	4470.015
rgdpch(1963)	4609.741	4636.184
rgdpch(1964)	4911.749	4904.154
edu	2.33	3.64865

As can be seen from the graph, before the trade reform, GDP per capita was increasing. Also the Jordan and synthetic Jordan match quite well before the reform, which can also be confirmed by the predictor balance table. Therefore we think the algorithm work correctly.

As for the unit weight, most countries carry a weight of 0, which is quite surprising, and the country that carries the biggest weight is Trinidad Tob. In summary,

$$\textit{synthetic Jordan} = \textit{Algeria} * 0.021 + \textit{Egypt} * 0.073 + \textit{Trinidad Tob} * 0.591 + \textit{Zambia} * 0.316$$

According to our estimation, the trade reform has a negative treatment effect on GDP per capita. For the statistical significance, we instead use a placebo test on several other countries, assuming they took a trade reform in 1965 as well, but the result shows that the synthetic GDP per capita of those countries are not different from their true values. Therefore we think the result of Jordan is statistically significant. This result is also economically significant, because in the counterfactual setting, Jordan would double its GDP per capita within 15 years, increasing from 4000 to 8000, which is a great deal.

(e) Since the outcome variable is present only every decade, and we don't want to reshape our dataset to ten-year period (in that case we don't have enough observations before the reform), we decide to regard, for example, the inter-generational mobility data between 1961-1969, as missing values and treat them in another way. Instead of replacing the missing values with the previous or forthcoming existing values of that country, we try to smooth the change between 1960 and 1970 through years. For example, the data in 1961 is calculated as

$$x1961 = x1960 - (x1960 - x1970) / 10$$

We know this smoothing treatment can reply on quite strong assumptions, but this is the best way we can think of to ensure enough years of observation before the reform. One thing worth noticing is that since we smooth the changes, we won't identify a policy impact right at 1965; this change rather happens after 1970.

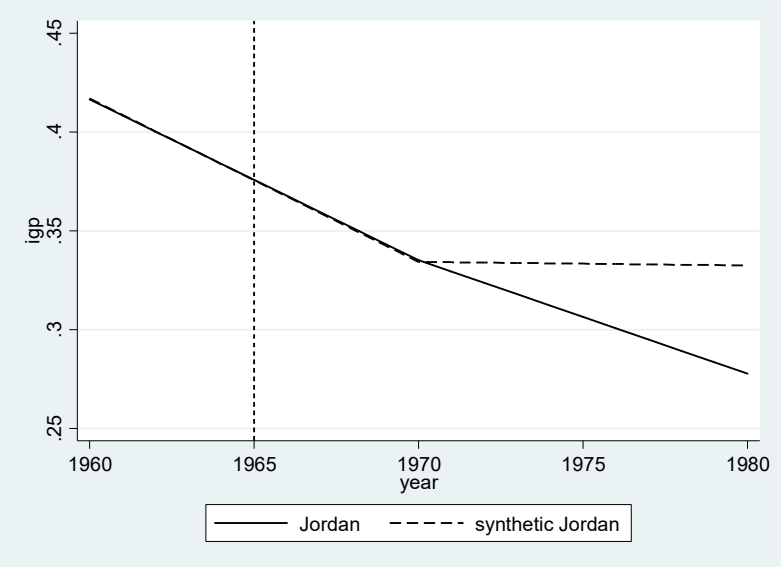
For this analysis, we use these controls: *Inter-generation persistence* (outcome variable) in 1960, *GDP per capita*, *Przeworski index of Democracy augmented with Boix/Rosato*, *Augmented Freedom House political rights index*, and *Educational Attainment*.

We choose the following countries as the control group (31 in total, the dropped ones have no data on inter-generation mobility):

Bolivia, Brazil, Cameroon, Chile, China, Colombia, Ecuador, Ghana, Guatemala, India, Indonesia, Kenya, Malawi, Malaysia, Mali, Mexico, Mozambique, Nepal, Niger, Pakistan, Panama, Peru, Philippines, Romania, South Africa, Sri Lanka, Tanzania, Thailand, Togo, Turkey, Uganda, Zambia

Predictor Balance:

	Treated	Synthetic
igp(1960)	.416638	.4169216
rgdpch	4543.666	3513.466
przdemaug	0	.149
fhpolrigaug	.32	.72837
edu	2.33	3.22096



As for the unit weight, most countries carry a weight of 0, and the country that carries the biggest weight is Kenya. In summary,

*synthetic Jordan = Chile * 0.149 + Kenya * 0.437 + South Africa * 0.414*

According to our estimation, the trade reform in Jordan has a negative treatment effect on inter-generation persistence, thus positive effect on inter-generation mobility. This result is not very economically significant, because the reform allows only 5% of people to change their social status quantiles, which is not a large number.

References

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