SCM and GTAP sim

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Introduction

We further check the potential impact the paid-up capital give to the flow and stock of FDI. We first do Synthetic Control Method (SCM) (Abadie & Gardeazabal, 2003; Abadie, 2021) to see whether the increase in paid-up capital in 2021 and 2013 has significant impact to FDI. We then use the finding to justify the shock in GTAP simulation.

We try varios SCM with the investment data. Data is extracted from UNCTAD to get panel data of countries, various measures of FDI, and we get GDP and Population for control variable. The synthetic countries that we pick are all countries considered developing in the dataset bar unbalanced panel (unfortunately some countries has incomplete series). The result is a set of developing countries that balanced.

The list of countries that serves as control units are as follows

```
 [1] "Brunei"               "Bulgaria"             "Chile"
 [4] "China"                "Colombia"             "Costa Rica"
 [7] "Egypt"                "Hungary"              "Iceland"
[10] "India"                "Indonesia"            "Laos"
[13] "Malaysia"             "Mexico"               "Myanmar"
[16] "Nigeria"              "Peru"                 "Philippines"
[19] "Poland"               "Romania"              "Russia"
[22] "Saudi Arabia"         "South Africa"         "Thailand"
[25] "United Arab Emirates" "Vietnam"
```

Note that Indonesia is in the list because it's part of the dataset.

The treatment is the increase of paid-up capital to 10M IDR in 2021. Data spans from 1990 to 2023. FDI flow is in Million Current USD. For full documentation of the SCM consult to my github repository. We separate the impact into the 2021 paid-up capital and the 2013 paaid-up capital. We first show the 2021 then the 2013.

It should be noted that the stagnant of FDI stock since the year around 2013-2014 looks systematic compared to the synthetic control. Since the synthetic Indonesia is built from other countries, seems to be the case that this problem is quite general. In fact, it has been talked a lot about the stagnant growth of Indonesian investment since this time. It is hard to imagine all of this is caused by the paid-up capital alone.

SCM summary

In general, results from SCM is not conclusive. The synthetic Indonesia for some of the results follow the same pattern. Results from sectoral SCM are mostly inconsistent. We also try various measures of FDI (flow, flow per capita, flow per GDP, flow per GFCF, stock, stock per capita, stock per GDP). The FDI stock seems to be more consistent than the FDI inflow. Sectoral SCM is hard to justify amid lack of sectoral investment data from other countries.

The best results are coming from the FDI stock / GDP. We can see a clear trend down post 2013 vs the Synthetic Indonesia. The 2021 paid-up capital doesn't seem to matter much, however. Indonesia seems to be underwhelming compared to its synthetic counterpart in the 2013 results.

The 2021 cut-off point is hard to be justified because of the pandemic. Omnibus bill and the follow-up regulations (mostly enacted in 2021) covers so much issue in the investment space. Paid-up capital seems to be a less important issue compared to others like Risk-based assessment and nickel import ban (and other hilirisasi-related investment incentives).

The 2013 results are more interesting. While 2013 cut-off point is used, the clear divergence between the real Indonesia vs Synthetic Indonesia seems to happen in 2017. May be amid delay impact but the 2016 drop in FDI inflow seems to be the more important issue. What happened in 2016/2017?

Having said that, the 2013 results are all interesting because all three indicators (FDI stock, FDI stock per capita and FDI stock per GDP) shows consistent results: the synthetic Indonesia still increase its FDI stock while the real Indonesia decrease its FDI stock. Meaning, what was expected happened in Indonesia is a investment inflow was actually a drop in investment. The approximate difference will be used for the GTAP simulation.

The 2021 Paid-up capital

FDI inflow

First we test using FDI Inflow. Unfortunately the synthetic Indonesia produced by the FDI inflow is rather unstable. We try using FDI flow, FDI flow per capita, FDI flow per GDP and FDI flow per GFCF.

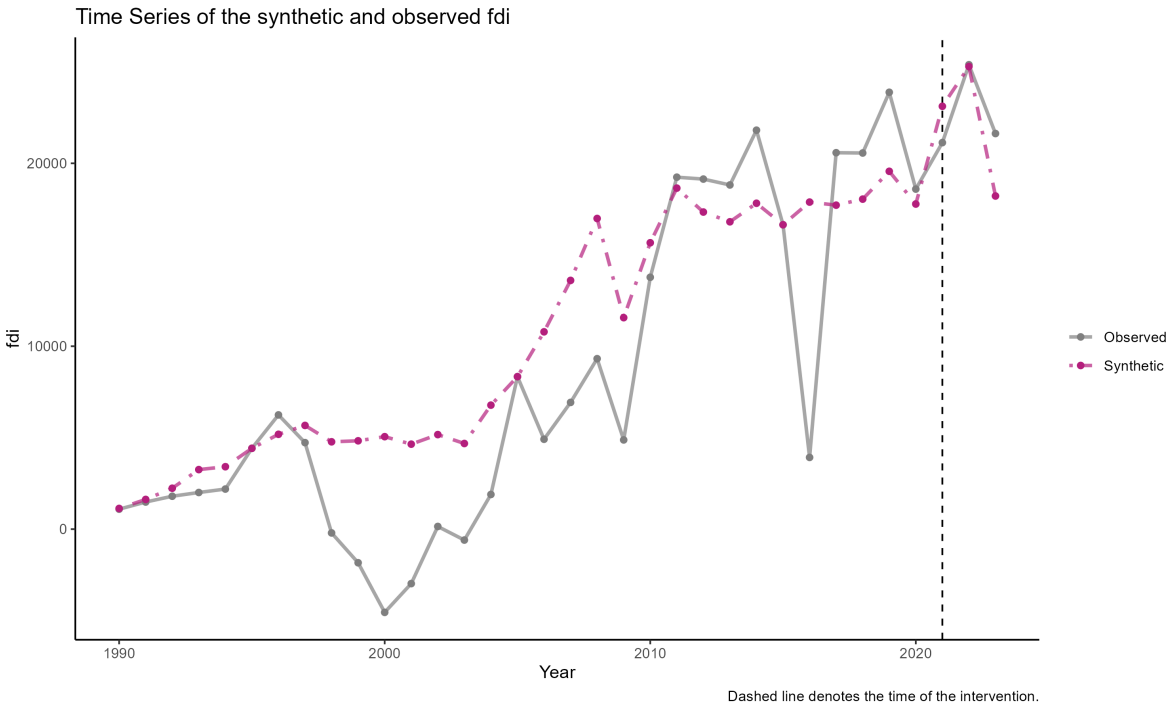


Figure 1: SCM results for FDI inflow

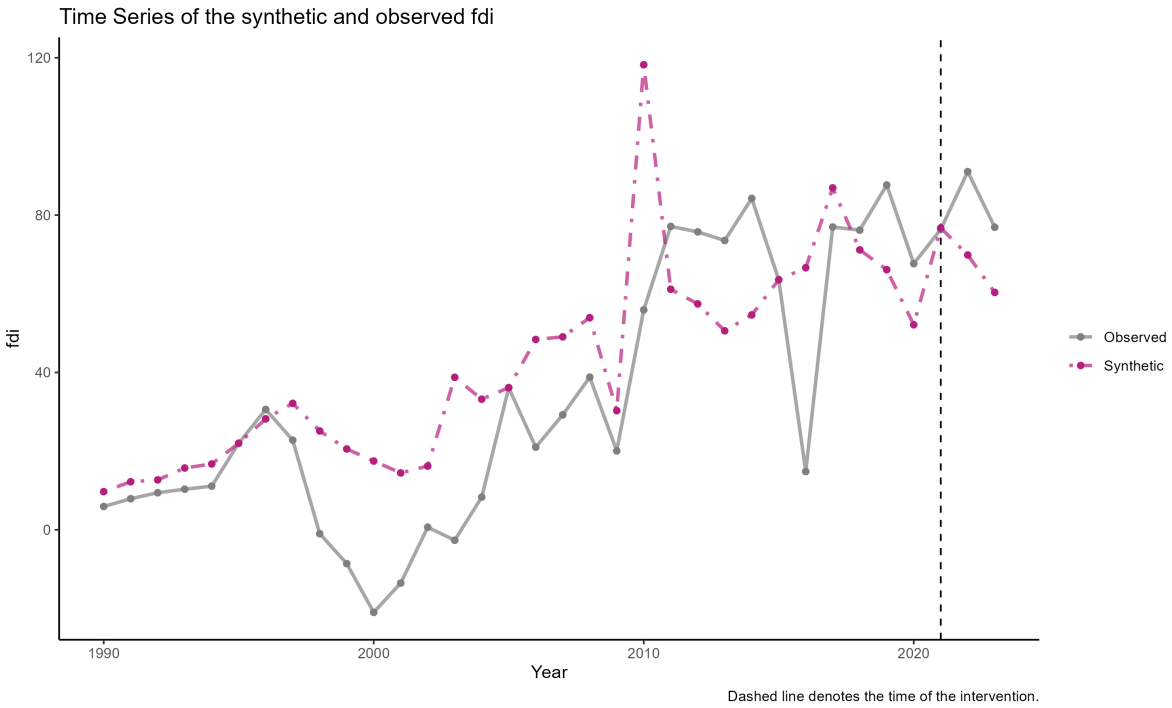


Figure 2: SCM results for FDI inflow per capita

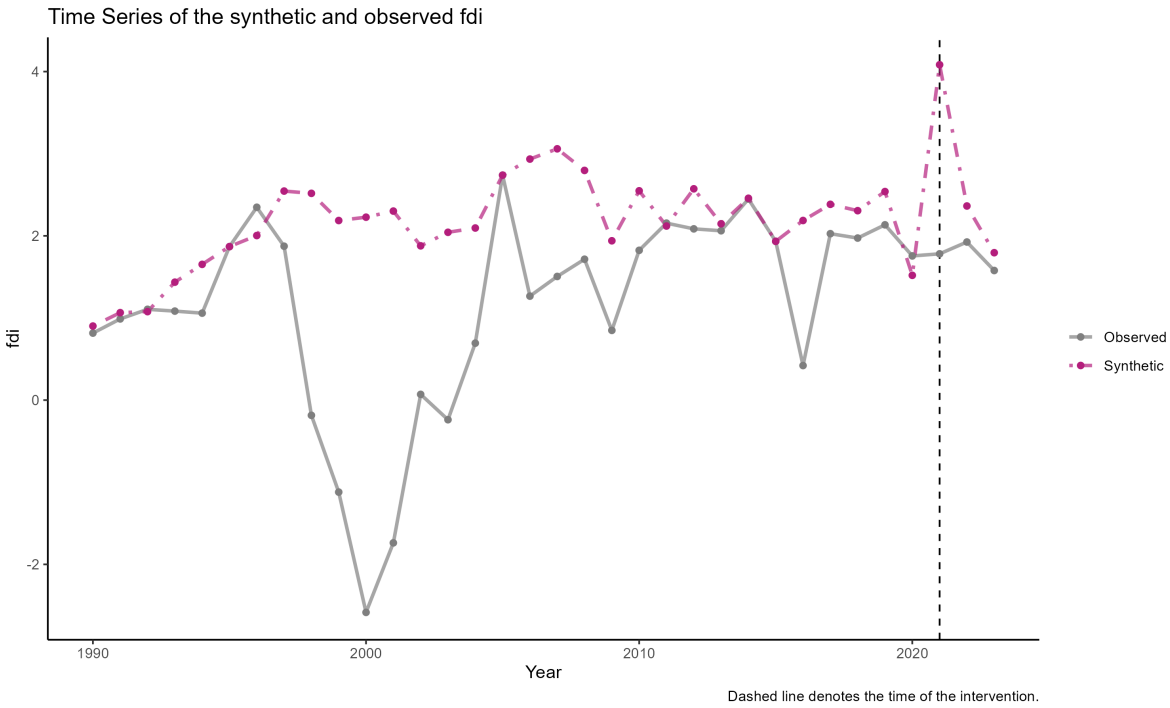


Figure 3: SCM results for FDI inflow per GDP

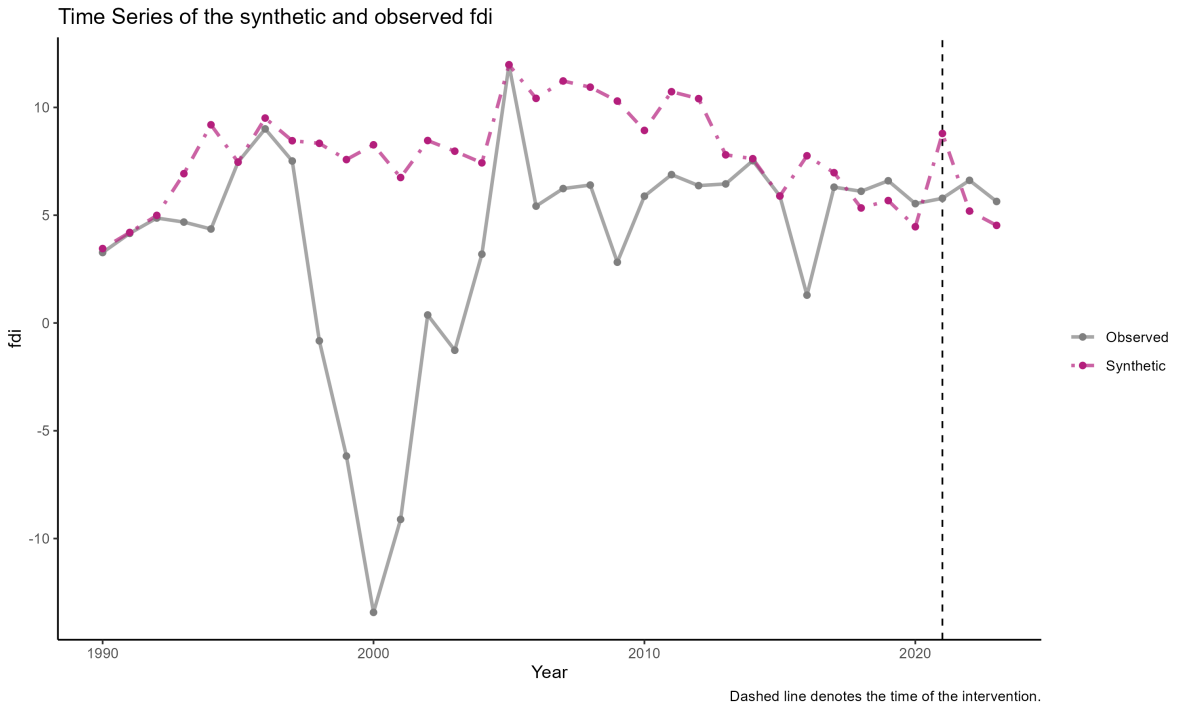


Figure 4: SCM results for FDI inflow per GFCF

We also try running the SCM using sectoral FDI vis-a-vis national FDI. The sectoral FDI is obtained through CEIC. It consists of ISIC rev.4 2 digit category and then aggregated into five different sectoral categories: extractive, manufacturing capital intensive, manufacturing labor intensive, services capital intensive and services labor intensive. We unfortunately have to use the same control unit (i.e., national FDI inflow by countries) because we cannot obtain sectoral FDI from our original control unit.

Again, we get inconsistent synthetic sectors. See below.

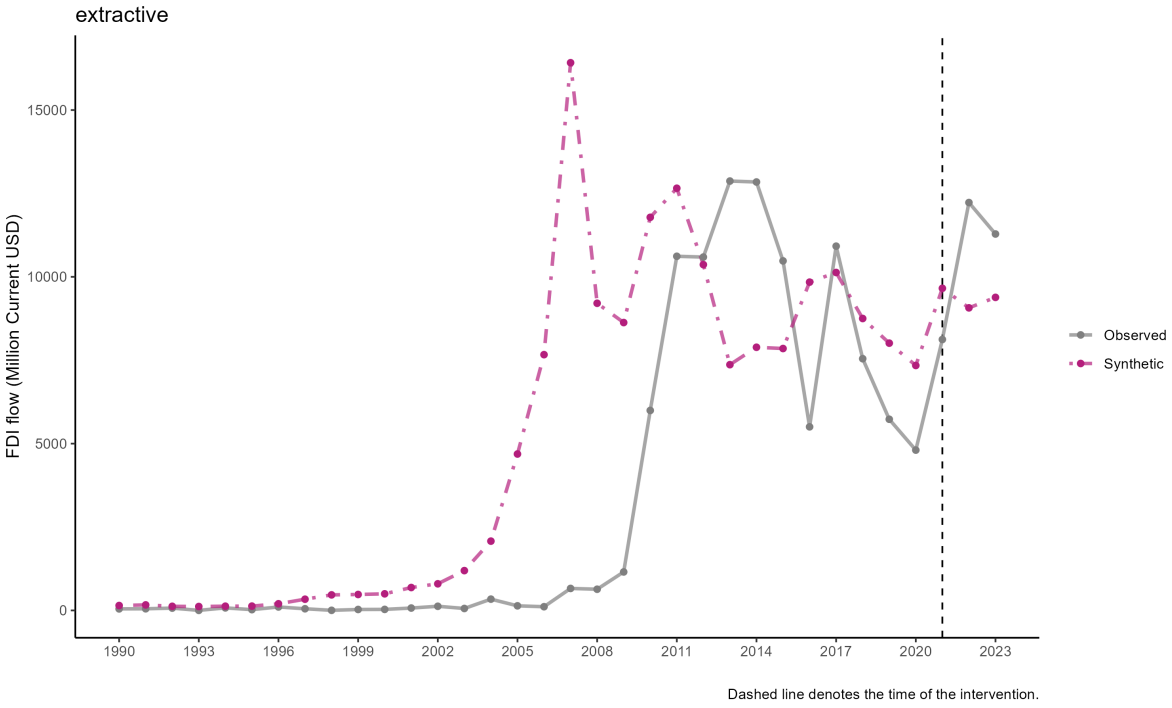


Figure 5: SCM result for exctractive

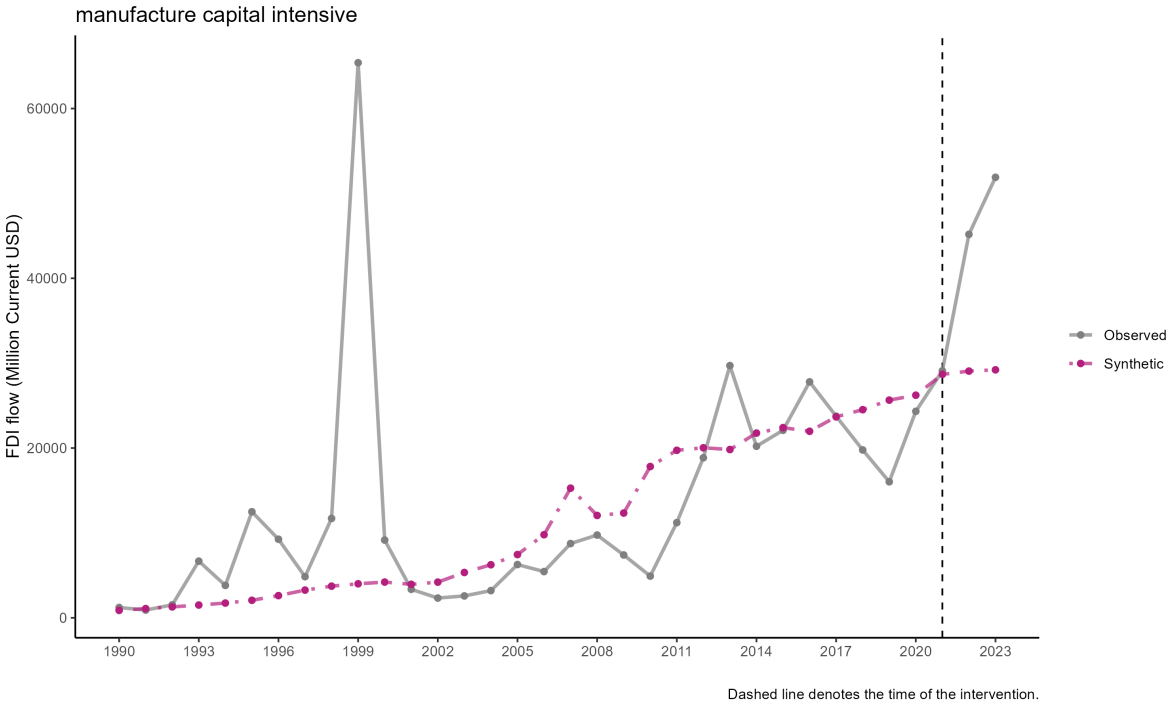


Figure 6: SCM result for manufacturing capital intensive

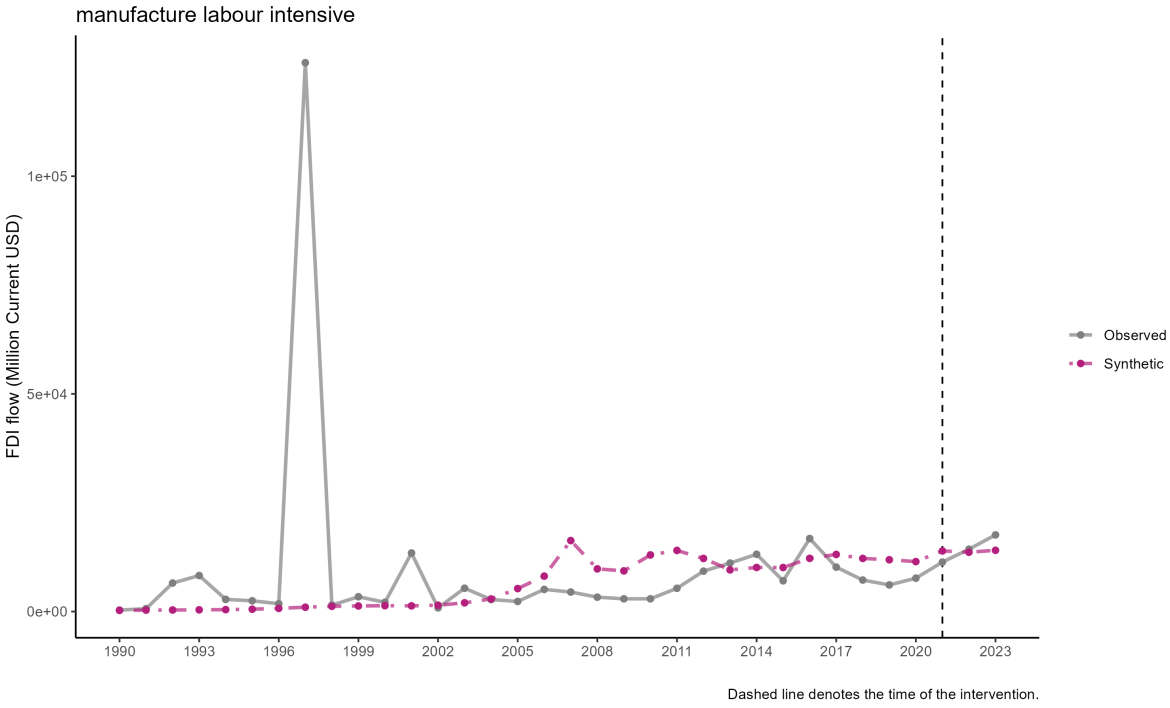


Figure 7: SCM result of manufacturing labor intensive

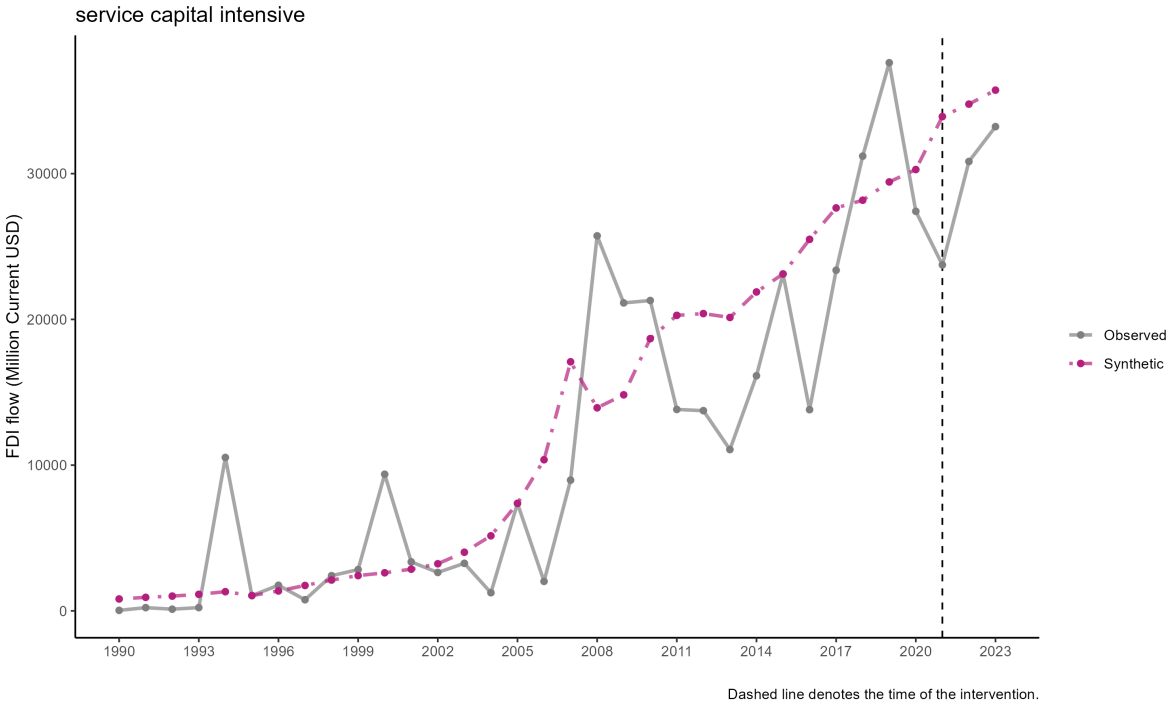


Figure 8: SCM results of services capital intensive

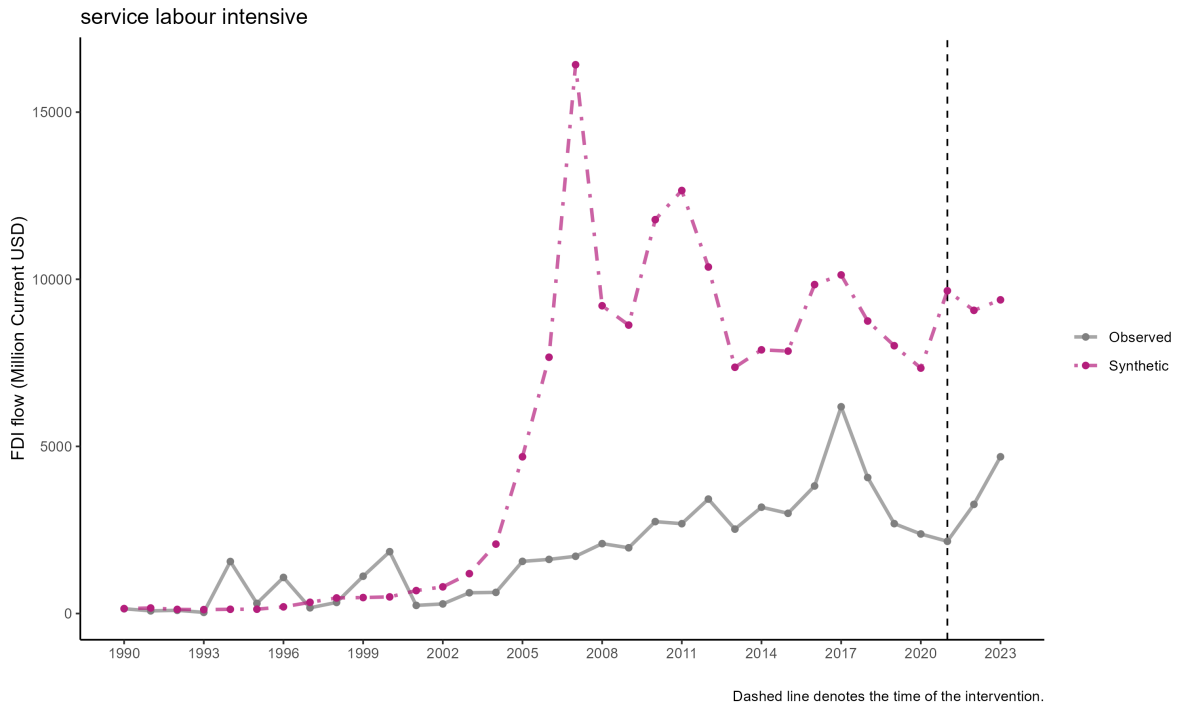


Figure 9: SCM result of services labor intensive

FDI Stock

FDI stock have a more consistent results, however. Like above, we use the some country, but different variable i.e., FDI stock in million current USD. Unfortunately we cannot get sectoral FDI stock since the data, to our knowledge, doesn't exist. Results of the FDI stock below.

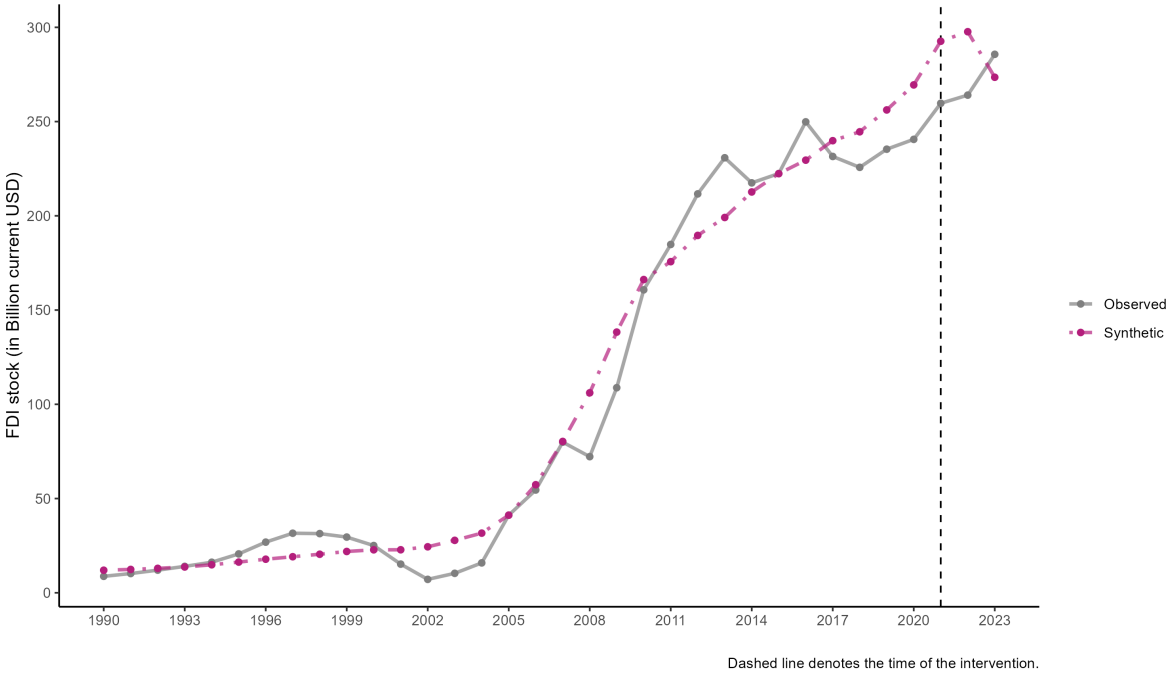


Figure 10: SCM results for FDI stock

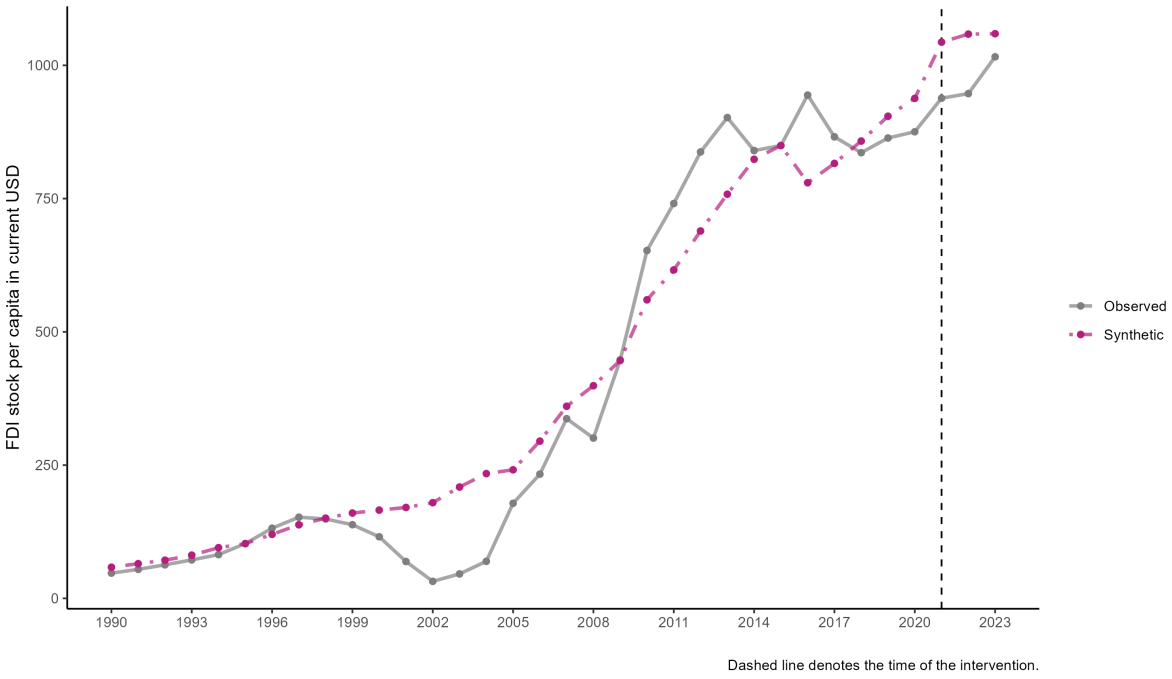


Figure 11: SCM results for FDI stock per capita

Figure 12: SCM results for FDI stock per GDP

All shows consistent dynamics: the synthetic Indonesia is consistent with the trend but smoother. The Indonesia current under performance in 2017 onwards is interesting. More importantly, the 2021 time doesn't seem to matter too much, and Indonesia seems to be outperform its synthetic counterpart in 2023. We are not sure whether the paid capital causes this.

The 2013 paid-up capital

FDI Stock

Like the 2021 version, SCM for FDI stock provides more consistent results, however. Like above, we use the some country, but different variable i.e., FDI stock in million current USD. Unfortunately we cannot get sectoral FDI stock since the data, to our knowledge, doesn't exist. Results of the FDI stock below.

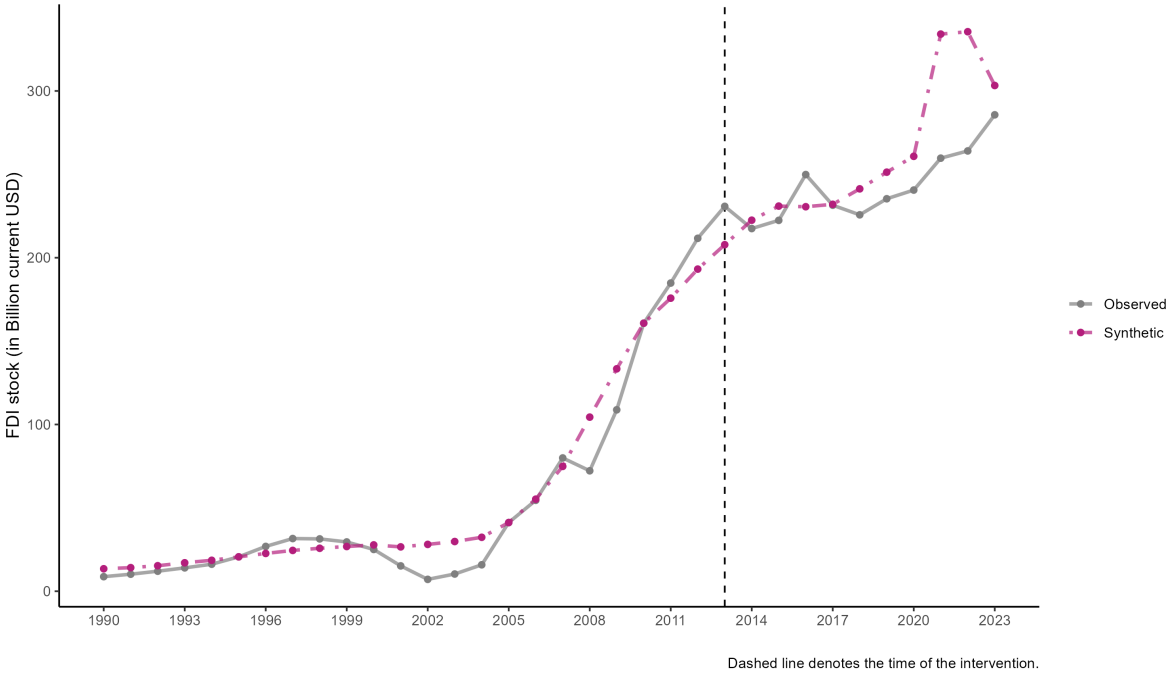


Figure 13: SCM results for FDI stock

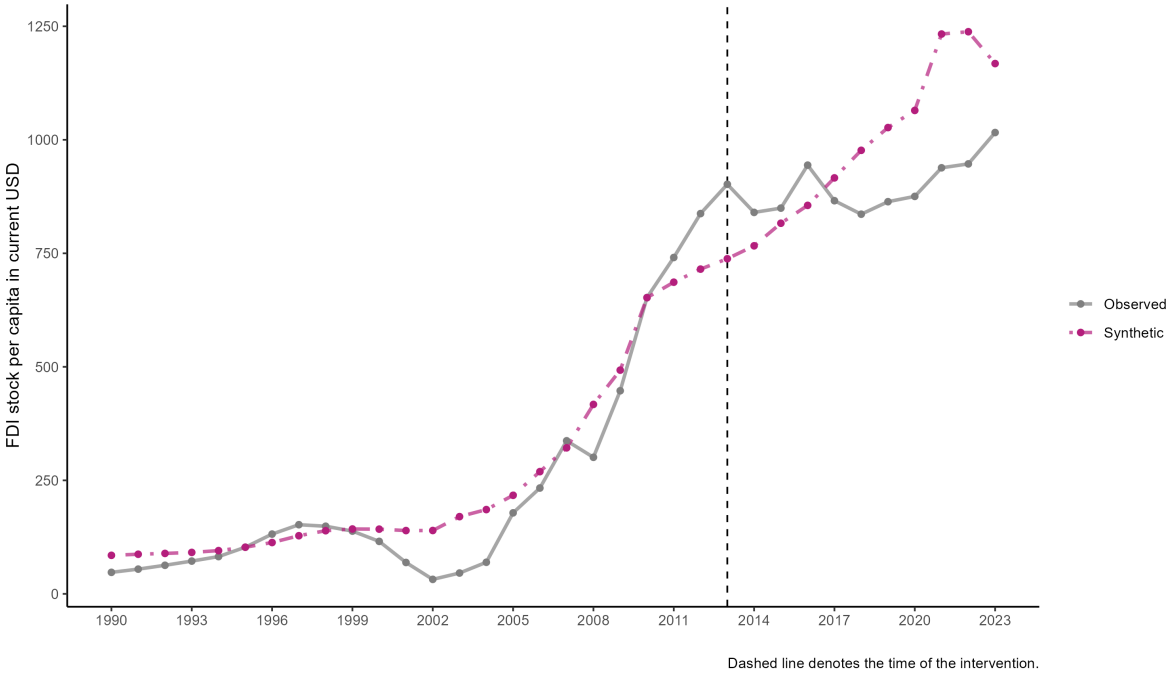
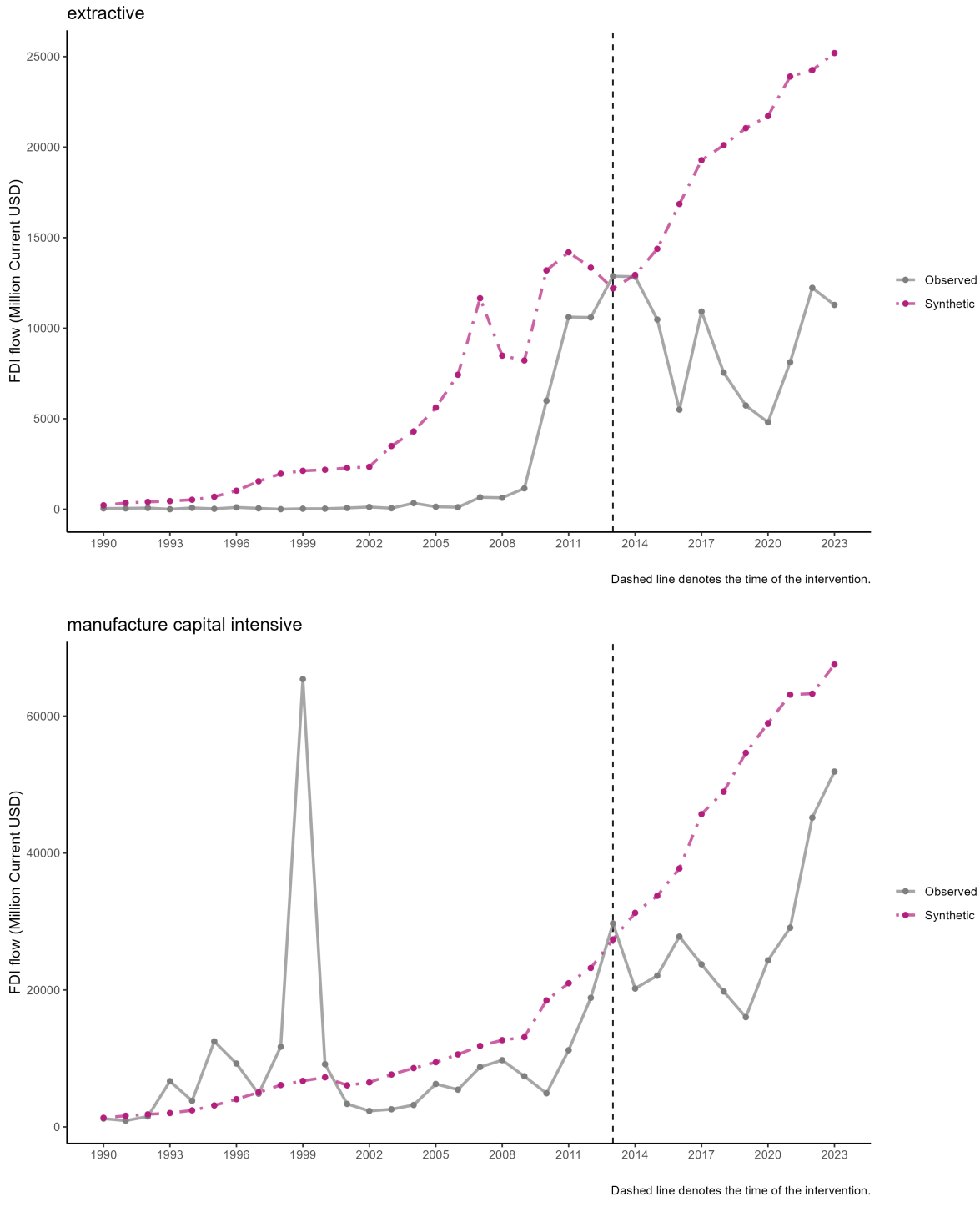


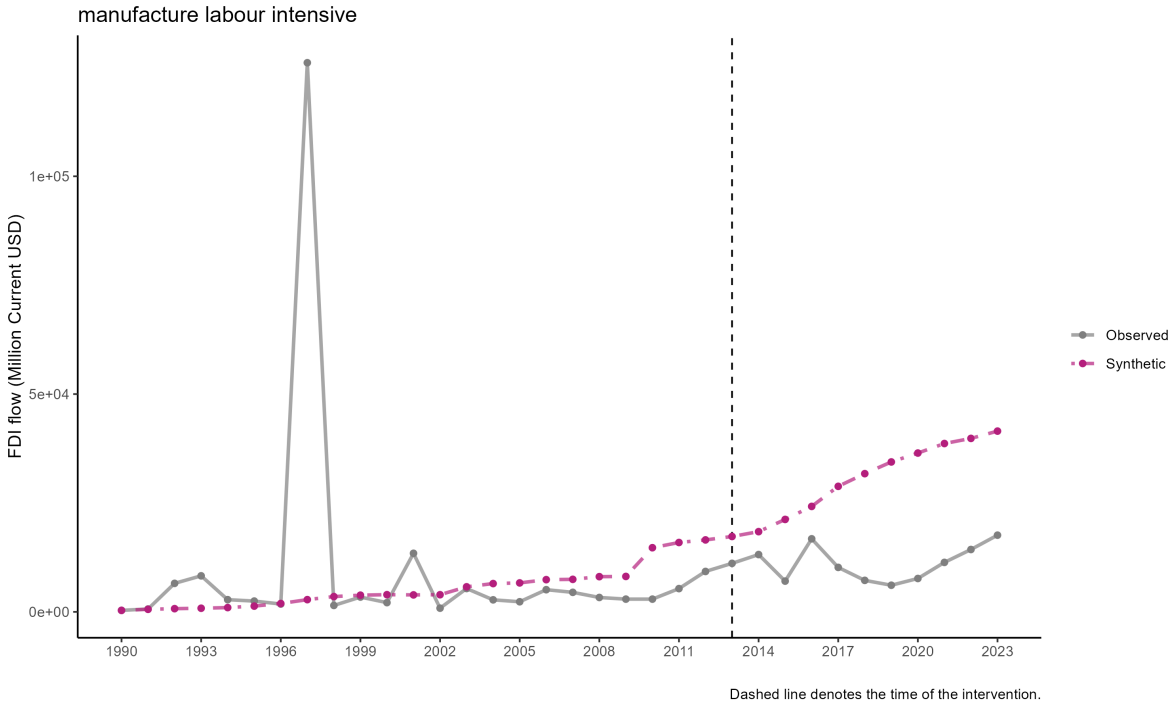
Figure 14: SCM results for FDI stock per capita

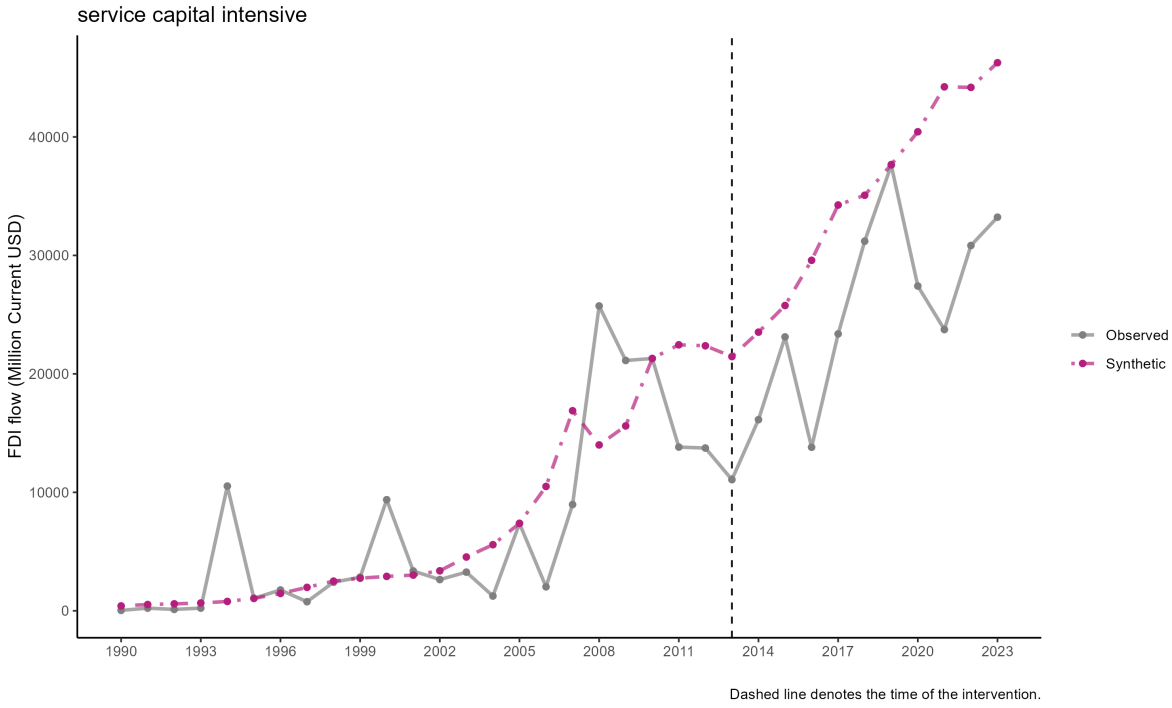
Figure 15: SCM results for FDI stock per GDP

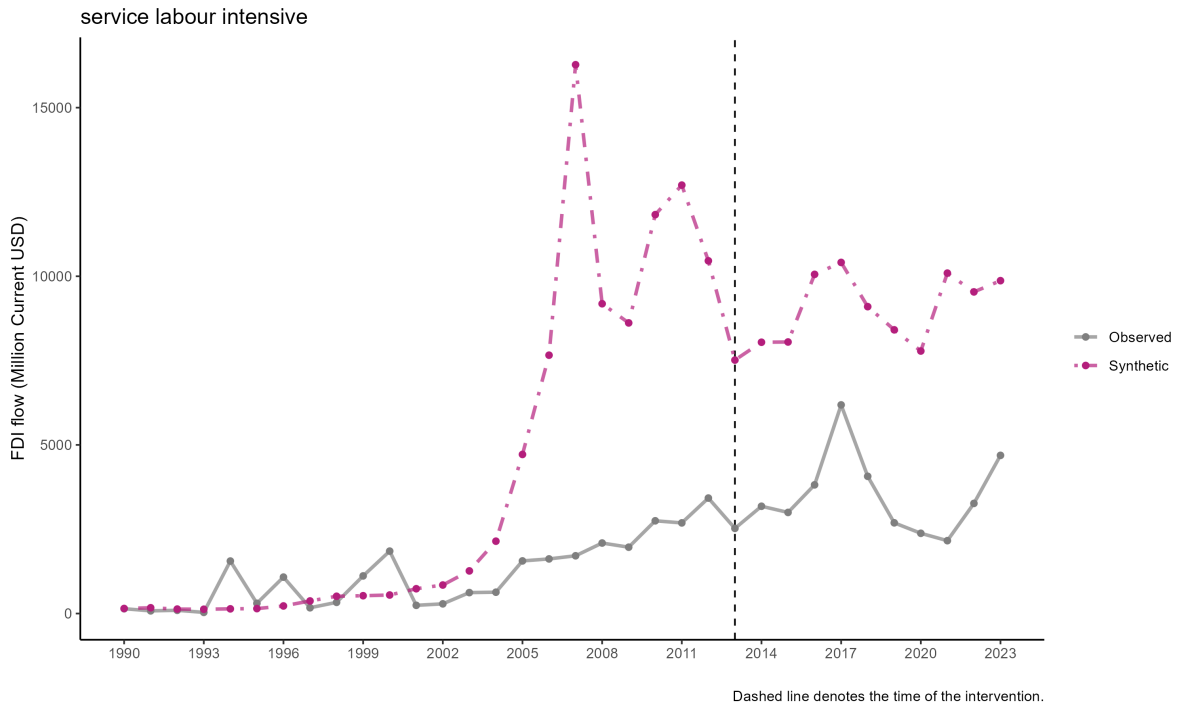
All shows consistent dynamics: the synthetic Indonesia is consistent with the trend but smoother. The Indonesia current under performance in 2017 onwards is interesting. More importantly, the 2021 time doesn't seem to matter too much, and Indonesia seems to be outperform its synthetic counterpart in 2023. We are not sure whether the paid capital causes this.

2013 by industry




manufacture labour intensive
FDI flow (Million Current USD)
1e+05
5e+04
0e+00
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
2020
2023
Observed
Synthetic
Dashed line denotes the time of the intervention.


service capital intensive
FDI flow (Million Current USD)
40000
30000
20000
10000
0
1990
1993
1996
1999
2002
2005
2008
2011
2014
2017
2020
2023
Observed
Synthetic
Dashed line denotes the time of the intervention.



GTAP results

This is the GTAP results. We simulatae the potential improvement in the Indonesian economy supposed the relaxation of the paid-up capital improves Indonesia's FDI situation. It is assumed that the FDI inflow approximately increased by 1%.

I use GTAP11 database for the database. As for the model, the Standard GTAP model version 7 is used.

```
Warning: package 'tidyverse' was built under R version 4.4.3
```

```
Warning: package 'ggplot2' was built under R version 4.4.3
```

```
Warning: package 'tibble' was built under R version 4.4.3
```

```
Warning: package 'tidyr' was built under R version 4.4.3
```

```
Warning: package 'readr' was built under R version 4.4.3
```

```
Warning: package 'purrr' was built under R version 4.4.3
```

```
Warning: package 'dplyr' was built under R version 4.4.3

Warning: package 'stringr' was built under R version 4.4.3

Warning: package 'forcats' was built under R version 4.4.3

Warning: package 'lubridate' was built under R version 4.4.3

-- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
v dplyr     1.1.4     v readr     2.1.5
v forcats   1.0.0     v stringr   1.5.1
v ggplot2   3.5.2     v tibble    3.3.0
v lubridate 1.9.4     v tidyr     1.3.1
v purrr     1.0.4
-- Conflicts ------------------------------------------ tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x dplyr::lag()    masks stats::lag()
i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to beco

Warning: package 'readxl' was built under R version 4.4.3

Warning: package 'flextable' was built under R version 4.4.3


Attaching package: 'flextable'

The following object is masked from 'package:purrr':

    compose
```

Table 1: GTAP results: macroeconomic indicators

variabel	capital2
PDB Indonesia	0.2087496
Inflasi Indonesia	0.8664402
Konsumsi Indonesia	0.3691528
Belanja Pemerintah Indonesia	0.3979056

variabel	capital2
Trade Balance Indonesia	-9,474.0527000
Ekspor Indonesia	-3.9275358
Impor Indonesia	1.5164201
Rate of return Indonesia	0.4553712
Employment unskilled Indonesia	0.5468689
Employment skilled Indonesia	0.4971084

Table 1 shows what happens to the FDI increase. The increase of FDI by 1% would accompanied by a GDP increase by around 0.21%. Inflation would go up by around 0.86% and consumption by about 0.37%. Jobs would increase by around 0.5%, slightly more for workers without tertiery degrees.

It is important to note that the increase in FDI means a positive capital inflow. The flipside is a current account deficit: an increase of current account deficit will be around 1% of GDP. Exports will go down amid large increase in domestic demands fueled by a booming investment. Import goes up thanks to the economy's need to build up capital goods. This is a natural process and attempts to reduce current account deficit will only leads to an inefficient capital accumulation.

Table 2: GTAP Results: Sectoral output

variabel	capital2
Constructions	2.89641640
Forestry	1.62850560
Non-metalic minerals	1.31216920
Fabricated metal	0.61727029
Land transport	0.51038694
Retail and trade	0.49784005
Other services	0.43583521
Recreations	0.38518256
Health	0.36640567
Dwelling	0.31967944

variabel	capital2
Other mining	0.28181148
Bovine animals	0.25973174
Other biz services	0.24870382
Education	0.23568715
Wool, silk	0.19407420
Processed rice	0.17487651
Other financial	0.17325102
IT	0.17289265
Other animals	0.14721891
Insurance	0.14475718
Water supply	0.13754120
Air transport	0.13035715
Warehousing	0.08535110
beverages, tobacco	0.06563773
Vegetables, fruits, nuts	0.06344088
paddy rice	0.05111563
Raw milk	0.01158366
Fishing, hunting	-0.02103924
Wood products	-0.04619547
Real estate	-0.04826909
Other meat	-0.05887500
Accomodation	-0.10926071
Petroleum, coke	-0.16698572
other grains	-0.17059667
Cattle meat	-0.23924965
Paper	-0.37677294
Other food	-0.43569207

variabel	capital2
Water transport	-0.45562035
Electricity	-0.46104538
Coal	-0.47526985
Dairy	-0.50138938
Other crops	-0.56137025
Sugar crops	-0.56997955
Oil and gas	-0.58488089
Sugar, molasses	-0.59564710
Gas	-0.71430117
wheat	-1.02994240
Oil seeds	-1.47527060
Pharmaceuticals	-1.51967540
Other transport eq	-1.98887860
Motor vehicles	-2.00055500
Iron, steel	-2.13351700
Fibres crops	-2.16794400
Vegetable oils	-2.31524990
Machineries	-2.78146790
Rubber, plastics	-2.81251360
Apparels	-3.77756500
Chemicals	-3.79163460
Textiles	-3.85390810
Other manufactures	-4.07259370
Electronics, optics	-4.83727170
Electrical equipments	-5.09965520
Non-ferrous metal	-5.59014230
Leather, footwear	-5.88248160

Table 2 shows the change in sectoral outputs. An investment-driven growth would see a booming in constructions and its inputs, namely non-metalic minerals and fabricated metals. Additionally, capital-intensive sectors will benefit amid more abundant capital. These sectors will absorb factor of production from other sectors, namely the tradable sectors that now can rely on imports.

Conclusion

All in all, it is hard to show with certainty the impact of paid-up capital using SCM because there are just so much thing happens during the post-pandemic investment climate. The Omnibus Law is indeed important and there are various other policies that potentially are important than paid-up capital. The SCM results are also sensitive to the variable used. FDI stock seems to be more consistent than FDI inflow, and sectoral FDI is hard to be used because of data limitation.

We can see from the sectoral results that almost all sectors experience increase in FDI post 2021. Hard to say the paid-up capital causes this since there is no theory that can explain this. More plausible explanation is that there're other phenomena at play. e.g.. Omnibus bill introduces many many other investment-related policies that are more important than increased pain-up capital. Probably the most important are the Risk Based Assessment and Nickel export ban.

This SCM exercise at least show that the paid-up capital doesn't seem to significantly change Indonesian FDI. It is also show interesting underperformance post 2017 albeit unrelated with the 2021 paid-up capital. The results from Hasran's FDI/project may be more important to show its importance. However, a shock in GTAP can still be done to investment, its just we cannot use the finding in this SCM exercise as the justification for the shock.

The GTAP exercise is conducted by shocking investment. This lead to an increase of FDI by around 1% to Indonesia. The results are that capital-producing sectors are growing, as well as the more capital-intensive sectors. Meanwhile, tradables, especially the more labor-intensive sector ones, are growing. It should be noted that the current account deficit will go up, which is natural since capital inflow goes up. An attempt to discourage current account deficit e.g., trade would lead to a less efficient capital accumulation.

References

Abadie, A., & Gardeazabal, J. (2003). The Economic Costs of Conflict: A Case Study of the Basque Country. The American Economic Review, 93(1), 113–132. http://www.jstor.org/stable/3132164

Abadie, Alberto. 2021. "Using Synthetic Controls: Feasibility, Data Requirements, and Methodological Aspects." Journal of Economic Literature 59 (2): 391–425.