DA4_Tarrifs_China_Project

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Trade war and Tariffs

In 2018, Trump has initiated a trade war with China by implementing tariffs on certain Chinese products voicing concerns over trade imbalance and IP theft. China has mirrored some of these policies. According to the UN Conference on Trade and Development (UNCTAD), the US-China trade war has had negative economic impacts on both countries. the study suggests that U.S. tariffs on China caused a 25% loss of exports - a 35 billion dollar blow to Chinese exports in the U.S. market for tariffed goods in the first half of 2019. Sectors such as office machinery and communication equipment were the hardest hit, with a $15 billion reduction in US imports from China in those sectors, representing an average decline of 55% (UNCTAD, 2019).

In 2023, the U.S.-China trade war still continues and has been suggested to have an impact on global trade by Peterson Insitute for International Economics. The phase one agreement between the Trump administration and China, implemented on February 14, 2020, established new U.S. tariffs on imports from China, with average tariffs remaining high at 19.3%. These tariffs cover 66.4% of U.S. imports from China, or approximately 335 billion dollar of trade. Moreover, Chinese retaliatory tariffs on U.S. exports remain high, averaging 21.1%, covering 58.3% of imports from the U.S., or about $90 billion of trade (Chad P. Bown, Peterson Institute for International Economics, 2023).

This study verifies the effect of tariffs and trade war on the Chinese exports on global level.

Data Source

The data was gathered for 281 countries altough there were many missing values. Thus, about half has been reduced just by removing missing values.

Key variables were provided by Chinese Bureau for statistics including Imports, Exports, and Utilized fdi. Most of the entries were available and there was very low data loss. Using various regressions models, it has been confirmed that the data series of Imports and Exports is highly correlated because of reciprocal trade policies. Thus, only exports were used.

The confounders were provided by World Bank, the list was long and is provided in the data quality assessment. There were many missing values, thus, we have dropped the ones that were mostly missing values.

Model

The dependent variable in our model is “Exports”. The independent is Tarrifs and Trade war (dummy of time = treatment of the US market post start of trade war = since 2018). It is an unbalanced dataset as most of the data are prior to 2018. The rest are confounders. We have utilized both fixed effect panel data and diff-in-diff model. It has been conducted for both levels (absolute) value of Total Value of Exports in dollars but also log value as it is related to money.

Data Cleaning

Convert to long form panel data frame

Example of data

Country	Year	Imports	Exports	Tariffs	fdi	business	ageing	electricity	oil
Afghanistan	1997	NA	NA	NA	NA	NA	105	NA	NA
Afghanistan	1998	21	2417	NA	212	NA	106	NA	NA
Afghanistan	1999	290	1668	NA	NA	NA	107	NA	NA
Afghanistan	2000	540	1989	NA	NA	NA	108	1.6	NA
Afghanistan	2001	16	1726	NA	50	NA	109	4.1	NA
Afghanistan	2002	8	1991	NA	NA	NA	109	9.4	0.029

Data quality

Including missing values if n>7000. I have reviewed it also per country and dropped the variables accordingly.

	vars	n	mean	sd	median	trimmed	mad	min	max	range
Country*	1	7000	140.5	80.8	140.50	140.5	103.78	1.00	280	279
Year*	2	7000	13.0	7.2	13.00	13.0	8.90	1.00	25	24
Imports	3	4906	610718.5	2193733.2	12120.00	116442.3	17966.15	0.00	24981428	24981428
Exports	4	5229	810963.4	3685964.4	36761.00	146520.7	54183.10	0.00	62766802	62766802
Tariffs	5	3377	6.8	10.0	4.73	5.8	4.30	0.00	422	422
fdi	6	2864	83581.2	602748.7	686.50	8367.5	1002.98	-18.00	13175642	13175660
business	7	3196	49.0	104.0	16.65	28.6	21.72	0.00	1540	1540
ageing	8	5775	61.4	18.5	55.45	60.1	15.58	16.17	113	97
electricity	9	5315	80.0	29.5	98.82	85.8	1.75	0.64	100	99
oil	10	5025	3.8	9.4	0.01	1.2	0.01	0.00	67	67
gdp	11	5484	14104.4	22605.0	4502.98	9140.3	5682.06	99.76	234315	234216
savings	12	4049	23.0	15.2	21.74	22.1	9.32	-19.90	373	393
internet	13	5047	30.7	30.2	20.00	27.3	28.02	0.00	100	100
inflation	14	4762	6.8	25.6	3.37	4.1	3.28	-10.07	1058	1068
gender	15	5023	49.8	15.2	51.58	50.6	12.23	5.92	87	81
interest	16	3125	13.8	11.2	11.13	12.0	6.82	0.00	213	213
unemployment	17	3142	8.3	6.2	6.81	7.4	4.40	0.10	57	57
servicesector	18	5013	54.5	12.8	54.14	54.4	12.65	9.69	96	87
ruralpop	19	5725	42.4	24.0	43.11	42.5	29.48	0.00	92	92
literacy	20	1160	80.0	18.6	87.12	82.4	16.32	14.38	100	86
education	21	1952	78.5	7.6	79.67	79.2	5.92	29.63	100	70
slums	22	1178	41.5	23.7	42.55	40.9	28.97	0.79	100	99
publicdebt	23	1429	57.7	36.4	51.18	53.8	31.61	-1.17	252	253
militaryexp	24	4020	2.1	1.9	1.59	1.8	0.93	0.01	34	34
immigration	25	906	11.0	15.8	4.09	7.2	5.31	0.04	88	88

Interpreting the results - Level Value

Although the coefficients are consistently negative, the tariffs alone may not have a significant impact on decreasing Chinese exports based on p-value (sometimes significant sometimes insignificant).Other factors such as fdi (foreign direct investment) seem to have a significant positive impact on Chinese exports. The treatment used, US post starting the trade war, is insufifficient to capture the downturn caused by the trade war. The model would benefit of using countries as confounders but then there would be just too many variables and there would be a threat of overfitting the model.

I will walk you quickly through the results.

1. Fixed Effects Model - Tariffs and US-tradewar treatment Only:

The fixed effects model with only tariffs as the independent explanatory variable shows that tariffs do not have a statistically significant effect on exports because of high p-value (0.5285>0.05). The treatment variable (US during trade war) is highly significant but rather than trade wars it captures the sheer volume and strengtth of Chinese-US trade between two large market and the coefficient is positive. The R-squared value of 0.236 suggests that the model explains only about 23.6% of the variance in Chinese exports and the performance of the model is relatively low.

2. Fixed Effects Model - Tariffs, treatment and FDI Only:

In the fixed effects model with tariffs, FDI and treatment as explanatory variables, tariffs do not show a statistically significant effect on exports, consistent with the preevious model. The FDI is statistically significant according to a very low p-value indicating a strong positive effect on exports as well as the treatment. The R-squared is higher explaining about 46.4% of the variance of exports.

3. Fixed Effects Model - Tariffs, treatment, FDI, and confounders :

In the fixed effects model enriched with the World Bank confounders, the results show that tariffs and treatment have significant effects on Chinese exports. Tariffs have a negative impact on exports with a coefficient of -110298.098 meaning 1 unit (1%) change in tarrifs leads to -110298098 dollars-worth less exports. The US treatment has a significant positive impact. In addition, several years (2005-2019) also show significant positive effects on exports. Other confounding variables such as FDI, aging population, firms, Internet and gender also have significant effects on exports. FDI and low cost of starting a busines have positive significant effects on exports, while growing age dependency ratio, access to Internet and female participation in labor force have negative significant effects on exports.

The model is relatively a good fit as it captures 68.9% of the variance of exports. To summarise, these results suggest that tariffs, treatment and other confounding factors are important factors affecting exports in this model.

Diff-in-Diff

In Diff-in-Diff, the results are similar. The key difference is that the treatment variable is included as an interaction term with the Year variable. This way, we may see that the tarrifs' effect remains significant across all three models and the R-square is slightly lower as not each year is accounted for, only the treated ones.

Log Export models

1. Fixed Effects Model - Tariffs and US-tradewar treatment Only:

The first model shows that tariffs have a statistically significant negative effect on exports, with an estimated negative coefficient of -0.00244 for each 1% increase in current tarrif rate (1.01*XX% tarrifs). The treatment variable is insignificant due to high p-value. The effect of years is consistent accross countries and significan.

2. Fixed Effects Model - Tariffs, treatment and FDI Only:

Once we introduce FDI and treatment as explanatory variables, tariffs do not show a statistically significant effect on exports. However, FDI is statistically significant with a slightly negative coefficient.This model predominantly captures the growth over time in a form of years. The R-squared value is higher, explaining as much as 46.4% of the variance of exports but still a limited fit.

3. Fixed Effects Model - Tariffs, treatment, FDI, and confounders:

This model displays the highest R-square explaining as much as 72.6% of the variation. The results show that tariffs and treatment have significant effects on Chinese exports. Tariffs have a negative impact on exports, with a coefficient of -0.014 meaning that a 1% change in tariffs leads to a decrease in exports worth $14. The US treatment has a significant positive impact. Other confounding variables such as FDI, aging population, firms, Internet and gender also have significant effects on exports. FDI and low cost of starting a busines have positive significant effects on exports, while growing age dependency ratio, access to Internet and female participation in labor force have negative significant effects on exports.

Diff-in-Diff

In Diff-in-Diff, the results are similar. Tarrifs have a consistent significant negative effect on the exports. The key difference is that the treatment variable is included as an interaction term with the Year variable. This way, we may see that the tarrifs' effect remains significant across all three models and the R-square is slightly lower as not each year is accounted for, only the treated ones.

Summary

The best fitting models do suggest that tariffs do have some significant negative impact on export volumes in dollars around the world even when controlling for the US post-trade war. Nonetheless, the picture is much more complex. Imports and FDI are highly correlated with exports as it is a political decision (parallel trend) rather than a natural causal relationship like physics. Nonetheless, country marketing, trade, and subsequent exports could be arguably boosted by FDI. China prefers to export to countries with low cost of starting a business, younger population and little female equality (emerging markets?), and tarriffs are a factor but Chinese products do manage to remain competitive even after tariffs (UNCATD, 2019).

The best performing model is able to capture 72.6% of variation It includes most of the variables but not all as 50% of filtered out because of missing values. The model is based on log-exports which is common in economics among datasetss that deal with money.

Apendix

Levels Exports

Fixed Effects Model

Tarrifs only

```
Oneway (individual) effect Within Model

Call:
plm(formula = Exports ~ Tariffs + treatment + Year, data = panel_data,
    na.action = na.exclude, effect = "individual", model = "within",
    fixed = TRUE)

Unbalanced Panel: n = 164, T = 1-23, N = 2850

Residuals:
     Min.   1st Qu.    Median   3rd Qu.      Max.
-17588515   -464604    -62386    438054  19631236

Coefficients:
          Estimate Std. Error t-value             Pr(>|t|)
Tariffs       2253       3574    0.63                0.5285
treatment 21694918    1054844   20.57 < 0.0000000000000002 ***
Year1999     16697     269596    0.06                0.9506
Year2000    207195     262400    0.79                0.4298
Year2001    398435     250583    1.59                0.1119
Year2002    467541     248446    1.88                0.0600 .
Year2003    528022     251683    2.10                0.0360 *
Year2004    645782     252803    2.55                0.0107 *
Year2005    776180     249764    3.11                0.0019 **
Year2006    988091     246002    4.02   0.0000606790869325 ***
Year2007   1144734     245968    4.65   0.0000034150872317 ***
Year2008   1294672     244490    5.30   0.0000001284465706 ***
Year2009   1140799     246238    4.63   0.0000037789871437 ***
Year2010   1398710     245451    5.70   0.0000000134111311 ***
Year2011   1623299     244641    6.64   0.0000000000390571 ***
Year2012   1716583     245602    6.99   0.0000000000034791 ***
Year2013   1849589     246697    7.50   0.0000000000000881 ***
Year2014   1987501     253449    7.84   0.0000000000000064 ***
Year2015   1859961     246049    7.56   0.0000000000000554 ***
Year2016   1787671     249877    7.15   0.0000000000010831 ***
Year2017   1961742     256083    7.66   0.0000000000000257 ***
Year2018   1917316     252993    7.58   0.0000000000000479 ***
Year2019   1819571     251595    7.23   0.0000000000006186 ***
Year2020   1890237     246279    7.68   0.0000000000000230 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    10000000000000000
Residual Sum of Squares: 7660000000000000
R-Squared:      0.236
Adj. R-Squared: 0.182
F-statistic: 34.2169 on 24 and 2662 DF, p-value: <0.0000000000000002
```

Key variables provided by Chinese Bureau for statistics

```
Oneway (individual) effect Within Model

Call:
plm(formula = Exports ~ Tariffs + fdi + treatment + Year, data = panel_data,
    na.action = na.exclude, effect = "individual", model = "within",
    fixed = TRUE)

Unbalanced Panel: n = 124, T = 1-23, N = 1882

Residuals:
     Min.   1st Qu.    Median   3rd Qu.      Max.
-17506738   -524576    -76510    505492  19617260

Coefficients:
              Estimate   Std. Error t-value             Pr(>|t|)
Tariffs      10158.071    13389.207    0.76                0.4481
fdi              2.796        0.116   24.17 < 0.0000000000000002 ***
treatment 21604158.838  1099223.421   19.65 < 0.0000000000000002 ***
Year1999    108538.963   327463.765    0.33                0.7403
Year2000    266125.182   324263.340    0.82                0.4119
Year2001    385439.217   312808.866    1.23                0.2180
Year2002    473457.148   313969.336    1.51                0.1317
Year2003    612644.713   312447.519    1.96                0.0501 .
Year2004    801750.365   312817.405    2.56                0.0105 *
Year2005    977407.492   311916.895    3.13                0.0018 **
Year2006   1263134.472   307614.873    4.11   0.0000420904608612 ***
Year2007   1464991.834   308510.171    4.75   0.0000022168333298 ***
Year2008   1629383.185   310704.116    5.24   0.0000001762540450 ***
Year2009   1405543.286   312563.634    4.50   0.0000073552220921 ***
Year2010   1680029.142   307901.965    5.46   0.0000000556087978 ***
Year2011   2000536.291   309529.207    6.46   0.0000000001329254 ***
Year2012   2231739.664   317772.303    7.02   0.0000000000031056 ***
Year2013   2342952.556   315147.351    7.43   0.0000000000001642 ***
Year2014   2591499.584   328591.421    7.89   0.0000000000000054 ***
Year2015   2399873.605   323357.365    7.42   0.0000000000001802 ***
Year2016   2242186.452   324199.637    6.92   0.0000000000065082 ***
Year2017   2418126.570   327966.713    7.37   0.0000000000002570 ***
Year2018   2425981.873   331327.791    7.32   0.0000000000003723 ***
Year2019   2307498.010   331702.594    6.96   0.0000000000049261 ***
Year2020   2473636.057   330563.715    7.48   0.0000000000001148 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    10000000000000000
Residual Sum of Squares: 5360000000000000
R-Squared:      0.464
Adj. R-Squared: 0.418
F-statistic: 59.9411 on 25 and 1733 DF, p-value: <0.0000000000000002
```

Enriched with World Bank confounders

```
Oneway (individual) effect Within Model

Call:
plm(formula = Exports ~ Tariffs + treatment + Year + fdi + electricity +
    ageing + business + gdp + savings + internet + inflation +
    gender + interest + unemployment + oil, data = panel_data,
    na.action = na.exclude, effect = "individual", model = "within",
    fixed = TRUE)

Unbalanced Panel: n = 73, T = 1-17, N = 621

Residuals:
    Min.  1st Qu.   Median  3rd Qu.     Max.
-6025188  -348954   -32056   326646 10118466

Coefficients:
               Estimate  Std. Error t-value             Pr(>|t|)
Tariffs      -110298.098   38964.916   -2.83              0.00483 **
treatment    5317185.750  946265.608    5.62        0.00000003138 ***
Year2004      320874.043  279637.860    1.15              0.25172
Year2005      599480.984  285308.952    2.10              0.03611 *
Year2006      903599.873  298124.982    3.03              0.00256 **
Year2007     1189199.408  320020.481    3.72              0.00022 ***
Year2008     1447789.190  355642.157    4.07        0.00005414735 ***
Year2009     1201853.220  345254.170    3.48              0.00054 ***
Year2010     1586008.626  363452.523    4.36        0.00001543934 ***
Year2011     2070592.851  400204.638    5.17        0.00000032845 ***
Year2012     2387405.922  423628.939    5.64        0.00000002868 ***
Year2013     2617656.176  426901.025    6.13        0.00000000173 ***
Year2014     2901349.009  463564.096    6.26        0.00000000081 ***
Year2015     2688281.557  471542.856    5.70        0.00000002002 ***
Year2016     2511756.035  492000.024    5.11        0.00000046493 ***
Year2017     2804648.760  513820.663    5.46        0.00000007461 ***
Year2018     3314175.740  557163.722    5.95        0.00000000499 ***
Year2019     3213479.587  581561.912    5.53        0.00000005208 ***
fdi                2.502       0.101   24.77 < 0.0000000000000002 ***
electricity   -26445.517   18899.538   -1.40              0.16233
ageing        -61848.503   22253.398   -2.78              0.00565 **
business       14974.407    4598.267    3.26              0.00120 **
gdp               21.222      12.531    1.69              0.09096 .
savings        -1946.705   15107.485   -0.13              0.89752
internet      -23485.199    8460.728   -2.78              0.00571 **
inflation      -2211.492   17273.444   -0.13              0.89818
gender        -65511.781   30353.249   -2.16              0.03136 *
interest       24259.827   19981.698    1.21              0.22526
unemployment   -4092.074   31596.070   -0.13              0.89700
oil           -54239.437   31443.655   -1.72              0.08513 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    1910000000000000
Residual Sum of Squares: 595000000000000
```

```
R-Squared:      0.689
Adj. R-Squared: 0.628
F-statistic: 38.2557 on 30 and 518 DF, p-value: <0.0000000000000002
```

Diff-in-Diff Model

Tarrifs only

```
Oneway (individual) effect Within Model

Call:
plm(formula = Exports ~ Tariffs + treatment:Year, data = panel_data,
    na.action = na.exclude, effect = "individual", model = "within")

Unbalanced Panel: n = 164, T = 1-23, N = 2850

Residuals:
     Min.   1st Qu.    Median   3rd Qu.      Max.
-18665571    -76975     -3027     65783  20501286

Coefficients:
                   Estimate Std. Error t-value            Pr(>|t|)
Tariffs               -7982       3724   -2.14               0.032 *
treatment:Year2018 25367270    1842652   13.77 <0.0000000000000002 ***
treatment:Year2019 19491400    1843186   10.57 <0.0000000000000002 ***
treatment:Year2020 22700034    1842652   12.32 <0.0000000000000002 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    10000000000000000
Residual Sum of Squares: 8670000000000000
R-Squared:      0.135
Adj. R-Squared: 0.081
F-statistic: 104.539 on 4 and 2682 DF, p-value: <0.0000000000000002
```

Key variables provided by Chinese Bureau for statistics

```
Oneway (individual) effect Within Model

Call:
plm(formula = Exports ~ Tariffs + fdi + treatment:Year, data = panel_data,
    na.action = na.exclude, effect = "individual", model = "within")

Unbalanced Panel: n = 124, T = 1-23, N = 1882

Residuals:
     Min.   1st Qu.    Median   3rd Qu.      Max.
-18777725   -196124    -12776    182577  20668780

Coefficients:
                       Estimate   Std. Error t-value             Pr(>|t|)
Tariffs              -80533.512    13001.802   -6.19        0.00000000073 ***
fdi                       3.069        0.123   24.87 < 0.0000000000000002 ***
treatment:Year2018 25517330.939  1942166.504   13.14 < 0.0000000000000002 ***
treatment:Year2019 20526760.566  1948336.790   10.54 < 0.0000000000000002 ***
treatment:Year2020 22963098.080  1942190.882   11.82 < 0.0000000000000002 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    10000000000000000
Residual Sum of Squares: 6300000000000000
R-Squared:      0.37
Adj. R-Squared: 0.324
F-statistic: 206.017 on 5 and 1753 DF, p-value: <0.0000000000000002
```

Enriched with World Bank confounders

```
Oneway (individual) effect Within Model

Call:
plm(formula = Exports ~ Tariffs + fdi + electricity + ageing +
    business + gdp + savings + internet + inflation + gender +
    interest + unemployment + oil + treatment:Year, data = panel_data,
    na.action = na.exclude, effect = "individual", model = "within")

Unbalanced Panel: n = 73, T = 1-17, N = 621

Residuals:
    Min.  1st Qu.   Median     Mean  3rd Qu.     Max.
-6173319  -325765    -4977        0   293364 10595086

Coefficients:
                      Estimate  Std. Error t-value             Pr(>|t|)
Tariffs             -104584.383   40041.893   -2.61               0.0093 **
fdi                      2.552       0.103   24.81 < 0.0000000000000002 ***
electricity           5880.093   18110.756    0.32               0.7456
ageing              -62051.677   21313.917   -2.91               0.0037 **
business              7362.177    4493.615    1.64               0.1019
gdp                     57.966      11.629    4.98        0.00000084055 ***
savings              -1291.086   15077.360   -0.09               0.9318
internet             19422.063    4797.172    4.05        0.00005915658 ***
inflation             6883.597   16627.383    0.41               0.6790
gender              -31761.468   30378.394   -1.05               0.2963
interest             -4585.969   20018.300   -0.23               0.8189
unemployment         15570.978   31441.360    0.50               0.6206
oil                 -44128.308   30924.496   -1.43               0.1542
treatment:Year2018 7569030.237 1211403.245    6.25        0.00000000085 ***
treatment:Year2019 2773361.451 1305964.653    2.12               0.0342 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    1910000000000000
Residual Sum of Squares: 648000000000000
R-Squared:      0.661
Adj. R-Squared: 0.606
F-statistic: 69.3528 on 15 and 533 DF, p-value: <0.0000000000000002
```

Log Exports

Fixed Effects Model

Tarrifs only

```
Oneway (individual) effect Within Model

Call:
plm(formula = log(Exports) ~ Tariffs + treatment + Year, data = panel_data,
    na.action = na.exclude, effect = "individual", model = "within",
    fixed = TRUE)

Unbalanced Panel: n = 164, T = 1-23, N = 2850

Residuals:
     Min.   1st Qu.    Median   3rd Qu.      Max.
-7.261221 -0.232166 -0.000236  0.244756  2.310959

Coefficients:
          Estimate Std. Error t-value             Pr(>|t|)
Tariffs   -0.00244    0.00101   -2.42                0.015 *
treatment -0.35258    0.29692   -1.19                0.235
Year1999   0.02556    0.07589    0.34                0.736
Year2000   0.31003    0.07386    4.20      0.0000278603798 ***
Year2001   0.32185    0.07053    4.56      0.0000052711380 ***
Year2002   0.49831    0.06993    7.13      0.0000000000013 ***
Year2003   0.84686    0.07084   11.95 < 0.0000000000000002 ***
Year2004   1.23846    0.07116   17.40 < 0.0000000000000002 ***
Year2005   1.52222    0.07030   21.65 < 0.0000000000000002 ***
Year2006   1.85748    0.06924   26.83 < 0.0000000000000002 ***
Year2007   2.20329    0.06923   31.82 < 0.0000000000000002 ***
Year2008   2.48343    0.06882   36.09 < 0.0000000000000002 ***
Year2009   2.29583    0.06931   33.12 < 0.0000000000000002 ***
Year2010   2.57866    0.06909   37.32 < 0.0000000000000002 ***
Year2011   2.79670    0.06886   40.61 < 0.0000000000000002 ***
Year2012   2.91564    0.06913   42.18 < 0.0000000000000002 ***
Year2013   2.97339    0.06944   42.82 < 0.0000000000000002 ***
Year2014   3.08336    0.07134   43.22 < 0.0000000000000002 ***
Year2015   3.04552    0.06926   43.97 < 0.0000000000000002 ***
Year2016   2.96112    0.07033   42.10 < 0.0000000000000002 ***
Year2017   2.96854    0.07208   41.18 < 0.0000000000000002 ***
Year2018   3.14942    0.07121   44.23 < 0.0000000000000002 ***
Year2019   3.18268    0.07082   44.94 < 0.0000000000000002 ***
Year2020   3.17437    0.06932   45.79 < 0.0000000000000002 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    3650
Residual Sum of Squares: 607
R-Squared:      0.834
Adj. R-Squared: 0.822
F-statistic: 555.871 on 24 and 2662 DF, p-value: <0.0000000000000002
```

Key variables provided by Chinese Bureau for statistics

```
Oneway (individual) effect Within Model

Call:
plm(formula = log(Exports) ~ Tariffs + fdi + treatment + Year,
    data = panel_data, na.action = na.exclude, effect = "individual",
    model = "within", fixed = TRUE)

Unbalanced Panel: n = 124, T = 1-23, N = 1882

Residuals:
    Min.  1st Qu.   Median  3rd Qu.     Max.
-6.68522 -0.19527 -0.00683  0.18883  1.78999

Coefficients:
               Estimate    Std. Error t-value             Pr(>|t|)
Tariffs   -0.0277611683  0.0029891449   -9.29 < 0.0000000000000002 ***
fdi       -0.0000000799  0.0000000258   -3.10               0.0020 **
treatment -0.1069971364  0.2454019944   -0.44               0.6629
Year1999  -0.0404058026  0.0731063946   -0.55               0.5805
Year2000   0.2232256929  0.0723918984    3.08               0.0021 **
Year2001   0.2976997557  0.0698346835    4.26       0.000021263190 ***
Year2002   0.4627722083  0.0700937586    6.60       0.000000000054 ***
Year2003   0.8059471652  0.0697540126   11.55 < 0.0000000000000002 ***
Year2004   1.1166912929  0.0698365898   15.99 < 0.0000000000000002 ***
Year2005   1.3843854141  0.0696355505   19.88 < 0.0000000000000002 ***
Year2006   1.7063552974  0.0686751228   24.85 < 0.0000000000000002 ***
Year2007   2.0041827177  0.0688749983   29.10 < 0.0000000000000002 ***
Year2008   2.2508834352  0.0693647972   32.45 < 0.0000000000000002 ***
Year2009   1.9863777625  0.0697799352   28.47 < 0.0000000000000002 ***
Year2010   2.3480252163  0.0687392161   34.16 < 0.0000000000000002 ***
Year2011   2.5818017870  0.0691024984   37.36 < 0.0000000000000002 ***
Year2012   2.6258461559  0.0709427724   37.01 < 0.0000000000000002 ***
Year2013   2.6852128330  0.0703567510   38.17 < 0.0000000000000002 ***
Year2014   2.7307670275  0.0733581441   37.23 < 0.0000000000000002 ***
Year2015   2.6887996694  0.0721896393   37.25 < 0.0000000000000002 ***
Year2016   2.6114141237  0.0723776769   36.08 < 0.0000000000000002 ***
Year2017   2.6401077364  0.0732186777   36.06 < 0.0000000000000002 ***
Year2018   2.7688694939  0.0739690395   37.43 < 0.0000000000000002 ***
Year2019   2.8900658410  0.0740527145   39.03 < 0.0000000000000002 ***
Year2020   2.8085492187  0.0737984593   38.06 < 0.0000000000000002 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    2010
Residual Sum of Squares: 267
R-Squared:      0.867
Adj. R-Squared: 0.855
F-statistic: 451.303 on 25 and 1733 DF, p-value: <0.0000000000000002
```

Enriched with World Bank confounders

```
Oneway (individual) effect Within Model

Call:
plm(formula = log(Exports) ~ Tariffs + fdi + treatment + Year +
    electricity + ageing + business + gdp + savings + internet +
    inflation + gender + interest + unemployment + oil, data = panel_data,
    na.action = na.exclude, effect = "individual", model = "within",
    fixed = TRUE)

Unbalanced Panel: n = 73, T = 1-17, N = 621

Residuals:
    Min.  1st Qu.   Median  3rd Qu.     Max.
-6.67219 -0.10092 -0.00339  0.10922  1.17121

Coefficients:
                  Estimate    Std. Error t-value             Pr(>|t|)
Tariffs      -0.0143811262  0.0137531335   -1.05              0.29620
fdi          -0.0000000500  0.0000000357   -1.40              0.16112
treatment     0.0286683442  0.3339957768    0.09              0.93163
Year2004      0.3018940624  0.0987015309    3.06              0.00234 **
Year2005      0.5307907053  0.1007032108    5.27   0.0000001996618219 ***
Year2006      0.8010872261  0.1052267819    7.61   0.0000000000001278 ***
Year2007      0.9590080203  0.1129550605    8.49 < 0.0000000000000002 ***
Year2008      1.1864745304  0.1255281578    9.45 < 0.0000000000000002 ***
Year2009      0.7168857980  0.1218615934    5.88   0.0000000072444801 ***
Year2010      1.1683168125  0.1282849200    9.11 < 0.0000000000000002 ***
Year2011      1.4371284960  0.1412570188   10.17 < 0.0000000000000002 ***
Year2012      1.4252194975  0.1495249064    9.53 < 0.0000000000000002 ***
Year2013      1.5301952603  0.1506798285   10.16 < 0.0000000000000002 ***
Year2014      1.5356091188  0.1636204985    9.39 < 0.0000000000000002 ***
Year2015      1.5094786077  0.1664366973    9.07 < 0.0000000000000002 ***
Year2016      1.4277170649  0.1736572996    8.22   0.0000000000000016 ***
Year2017      1.4804614091  0.1813591555    8.16   0.0000000000000025 ***
Year2018      1.5790068536  0.1966576070    8.03   0.0000000000000066 ***
Year2019      1.6478731510  0.2052692403    8.03   0.0000000000000067 ***
electricity   0.0088217327  0.0066708181    1.32              0.18661
ageing       -0.0338167459  0.0078546033   -4.31   0.0000199453500801 ***
business     -0.0037677394  0.0016230134   -2.32              0.02065 *
gdp           0.0000011129  0.0000044230    0.25              0.80144
savings      -0.0074071519  0.0053323678   -1.39              0.16540
internet      0.0040403706  0.0029863154    1.35              0.17666
inflation    -0.0022498636  0.0060968690   -0.37              0.71226
gender       -0.0001975321  0.0107135427   -0.02              0.98530
interest     -0.0037630887  0.0070527795   -0.53              0.59387
unemployment -0.0409684222  0.0111522114   -3.67              0.00026 ***
oil          -0.0065739126  0.0110984145   -0.59              0.55389
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    271
Residual Sum of Squares: 74.1
```

```
R-Squared:      0.726
Adj. R-Squared: 0.673
F-statistic: 45.8453 on 30 and 518 DF, p-value: <0.0000000000000002
```

Diff-in-Diff Model

Tarrifs only

```
Oneway (individual) effect Within Model

Call:
plm(formula = log(Exports) ~ Tariffs + treatment:Year, data = panel_data,
    na.action = na.exclude, effect = "individual", model = "within")

Unbalanced Panel: n = 164, T = 1-23, N = 2850

Residuals:
   Min. 1st Qu.  Median 3rd Qu.    Max.
 -7.019  -0.755   0.268   0.825   7.505

Coefficients:
                   Estimate Std. Error t-value            Pr(>|t|)
Tariffs            -0.01996    0.00238   -8.37 <0.0000000000000002 ***
treatment:Year2018  1.01896    1.17955    0.86                0.39
treatment:Year2019  1.12888    1.17989    0.96                0.34
treatment:Year2020  0.96020    1.17955    0.81                0.42
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    3650
Residual Sum of Squares: 3550
R-Squared:      0.0261
Adj. R-Squared: -0.0345
F-statistic: 17.9778 on 4 and 2682 DF, p-value: 0.000000000000014
```

Key variables provided by Chinese Bureau for statistics

```
Oneway (individual) effect Within Model

Call:
plm(formula = log(Exports) ~ Tariffs + fdi + treatment:Year,
    data = panel_data, na.action = na.exclude, effect = "individual",
    model = "within")

Unbalanced Panel: n = 124, T = 1-23, N = 1882

Residuals:
   Min. 1st Qu.  Median 3rd Qu.    Max.
 -6.372  -0.605   0.181   0.650   9.619

Coefficients:
                       Estimate    Std. Error t-value             Pr(>|t|)
Tariffs            -0.1408323237  0.0064930963  -21.69 < 0.0000000000000002 ***
fdi                 0.0000002254  0.0000000616    3.66              0.00026 ***
treatment:Year2018  0.9989572917  0.9699173991    1.03              0.30318
treatment:Year2019  2.5823998032  0.9729988385    2.65              0.00802 **
treatment:Year2020  0.9404175554  0.9699295737    0.97              0.33239
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    2010
Residual Sum of Squares: 1570
R-Squared:      0.217
Adj. R-Squared: 0.16
F-statistic: 97.4221 on 5 and 1753 DF, p-value: <0.0000000000000002
```

Enriched with World Bank confounders

```
Oneway (individual) effect Within Model

Call:
plm(formula = log(Exports) ~ Tariffs + fdi + electricity + ageing +
    business + gdp + savings + internet + inflation + gender +
    interest + unemployment + oil + treatment:Year, data = panel_data,
    na.action = na.exclude, effect = "individual", model = "within")

Unbalanced Panel: n = 73, T = 1-17, N = 621

Residuals:
                Min.              1st Qu.               Median
-7.01107102956756023 -0.14683381084464034 -0.00000000000000068
             3rd Qu.                 Max.
 0.18387959502438384  1.19455788248088246

Coefficients:
                       Estimate    Std. Error t-value             Pr(>|t|)
Tariffs            -0.0384134071  0.0155769387   -2.47                0.0140 *
fdi                -0.0000000281  0.0000000400   -0.70                0.4820
electricity         0.0192586173  0.0070453745    2.73                0.0065 **
ageing             -0.0470113397  0.0082914556   -5.67          0.000000023 ***
business           -0.0081616157  0.0017480884   -4.67          0.000003837 ***
gdp                 0.0000222493  0.0000045238    4.92          0.000001165 ***
savings            -0.0024242552  0.0058653351   -0.41                0.6795
internet            0.0217670398  0.0018661767   11.66 < 0.0000000000000002 ***
inflation           0.0104142766  0.0064683186    1.61                0.1080
gender              0.0097635762  0.0118176826    0.83                0.4091
interest           -0.0185426465  0.0077874398   -2.38                0.0176 *
unemployment       -0.0360668019  0.0122311935   -2.95                0.0033 **
oil                 0.0052922543  0.0120301252    0.44                0.6602
treatment:Year2018 -0.1634618965  0.4712552986   -0.35                0.7288
treatment:Year2019  0.1257308115  0.5080412035    0.25                0.8046
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Total Sum of Squares:    271
Residual Sum of Squares: 98
R-Squared:      0.638
Adj. R-Squared: 0.579
F-statistic: 62.6148 on 15 and 533 DF, p-value: <0.0000000000000002
```