

Impact of Tariffs on Chinese Exports

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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 Institute 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 although 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 Tariffs 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 insufficient 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-trade war 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 strength of Chinese-US trade between two large markets 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 previous 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 tariffs 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 business 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 tariffs' 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-trade war 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 tariff rate (1.01*XX% tariffs). The treatment variable is insignificant due to high p-value. The effect of years is consistent across countries and significant.

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 business 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. Tariffs 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 tariffs' 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 tariffs 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 datasets that deal with money.

Appendix

Levels Exports

Fixed Effects Model

Tariffs 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	0.00000000000006186 ***
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	0.00000000000065082 ***
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	0.00000000000049261 ***
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

Tariffs 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: 191000000000000

Residual Sum of Squares: 64800000000000

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

Tariffs 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	< 0.000000000000002 ***
Year2004	1.23846	0.07116	17.40	< 0.000000000000002 ***
Year2005	1.52222	0.07030	21.65	< 0.000000000000002 ***
Year2006	1.85748	0.06924	26.83	< 0.000000000000002 ***
Year2007	2.20329	0.06923	31.82	< 0.000000000000002 ***
Year2008	2.48343	0.06882	36.09	< 0.000000000000002 ***
Year2009	2.29583	0.06931	33.12	< 0.000000000000002 ***
Year2010	2.57866	0.06909	37.32	< 0.000000000000002 ***
Year2011	2.79670	0.06886	40.61	< 0.000000000000002 ***
Year2012	2.91564	0.06913	42.18	< 0.000000000000002 ***
Year2013	2.97339	0.06944	42.82	< 0.000000000000002 ***
Year2014	3.08336	0.07134	43.22	< 0.000000000000002 ***
Year2015	3.04552	0.06926	43.97	< 0.000000000000002 ***
Year2016	2.96112	0.07033	42.10	< 0.000000000000002 ***
Year2017	2.96854	0.07208	41.18	< 0.000000000000002 ***
Year2018	3.14942	0.07121	44.23	< 0.000000000000002 ***
Year2019	3.18268	0.07082	44.94	< 0.000000000000002 ***
Year2020	3.17437	0.06932	45.79	< 0.000000000000002 ***

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: <0.000000000000002

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	0.0000000000054 ***
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	0.00000000000001278 ***
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

Tariffs 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