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Abstract

Donald Trump claimed that the Korea-U.S. Free Trade Agreement (KORUS FTA) was a horrible deal, pointing to a significant increase in the U.S. trade deficit with Korea since the agreement went into effect in March 2012. However, during the same period, the U.S. trade balance with many other major trading partners also deteriorated, even though none of them had an FTA with the U.S. This raises questions about whether the KORUS FTA is responsible for the worsened trade imbalance, casting doubt on Trump's claim. We explore this issue by analyzing the causal effects of the KORUS FTA on the trade balance between the U.S. and Korea using a difference-in-differences approach, along with an event study to asset the model's validity. Our empirical findings strongly support Trump's claim, while accounting for business cycle fluctuations over time.

Keywords: KORUS FTA; Trade Deficit; Difference-in-Differences; Causal Effect; Event Study

JEL Classification: F13; F14

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I Introduction

During his 2016 Presidential campaign, Mr. Donald Trump often criticized the Korea-U.S. Free Trade Agreement (KORUS FTA) as a "horrible deal," even threatening to terminate it. His criticisms were primarily based on the claim that the U.S. experienced an increased trade deficit in goods with Korea following the KORUS FTA's enactment in March 2012. While data supports the observation that the U.S. trade deficit with Korea grew post-FTA, this trend was not unique to Korea.[1] The U.S. trade deficit also increased with seven out of eleven major trading partner countries during the same period, none of which had FTAs with the U.S. This raises the question whether the KORUS FTA had a causal effect on the increase in the U.S. trade deficit with Korea during the post-KORUS FTA period.

Although Mr. Trump's criticism likely had political motivations, a proper empirical assessment of his claim can offer informative insights for policymakers. This is particularly relevant considering the heterogeneous effects of FTAs on international trade flows, as highlighted by Baier, Yotov, and Zylkin (2019), who show that trade agreements can lead to significant but highly variable trade gains. A key challenge in evaluating these effects is how to deal with endogeneity bias when estimating the treatment effects of FTAs. Baier and Bergstrand (2007, 2009) suggest employing panel approaches with country-pair fixed effects to control for this issue, while Anderson and Yotov (2016) propose the use of structural gravity models to account for the general equilibrium effects of FTAs on trade.[2] Cho, Choi, and Díaz (2022) implement a generalized difference-in-differences analysis using highly disaggregated product-level data.[3]

This paper examines the causal effects of the KORUS FTA on the U.S. trade balance with Korea.[4] We employ a difference-in-differences approach, using the U.S.'s other major trading partner countries as control groups. In addition to country and time fixed effects, we control for income/absorption effects and

[1] Russ and Swenson (2019) claim the increased U.S. trade deficit with Korea reflects the diverted U.S. import demand away from other trading partners.
[2] Baier and Bergstrand (2007) report substantially positive effects of FTAs on trade flows using a panel approach that controls endogeneity bias. Baier and Bergstrand (2009) confirmed this claim via nonparametric cross-section estimates.
[3] For analyses of the trade effects of the North American Free Trade Agreement (NAFTA), see Burfisher, Robinson, and Thierfelder (2001) and Caliendo and Parro (2015), among others.
[4] The profession has extensively studied the effects of the North American Free Trade Agreement (NAFTA) on trade flows. See among others, Caliendo and Parro (2015), Kehoe and Ruhl (2013), Romalis (2007), and Trefler (2004).

expenditure-switching effects by including the real industrial production ratio and the real exchange rate. To ensure the robustness of our results, we also implemented an event study to test the parallel trends assumption, a key validity condition for our difference-in-differences estimation results.

Our research shows that the increased U.S. trade deficits with the control group countries can be attributed to the stronger performance of the American economy and the real appreciations of the dollar during the post-FTA period. However, the KORUS FTA did contribute to a rise in the U.S. trade deficit with Korea, despite Korea's stronger economic performance relative to the U.S. and the real depreciation of the dollar *vis-à-vis* the Korean won, which would typically promote U.S. exports to Korea. In other words, our findings provide strong empirical support for Trump's claim that the KORUS FTA caused U.S. trade deficit to increase after its enactment.

The remainder of the paper is structured as follows. Section II describes the data employed and provides some useful insights from the data. In Section III, we present and interpret our major findings. Section IV concludes.

II Data Description and Some Insights from the Data

1. Data Description

The United States and the Republic of Korea signed the KORUS FTA on June 30, 2007, and it came into effect on March 15, 2012. Following his inauguration as the 45th President of the United States on January 20, 2017, Mr. Trump began renegotiating the agreement. Based on this timeline, the post-treatment (KORUS FTA) period spans the 58 months from March 2012, when the agreement first went into effect, to December 2016, the last month before Trump's presidency began. Consequently, the pre-treatment sample period consists of the 58 months prior to the KORUS FTA, from May 2007 to February 2012.

We obtained U.S. trade data for goods with the top 15 trading partner countries, covering the period from May 2007 to December 2016, from the United States Census Bureau. The data were seasonally

adjusted using the X12-ARIMA procedure. Vietnam was excluded due to a lack of available control variable data. Additionally, Canada and Mexico were excluded because of their participation in the North American Free Trade Agreement (NAFTA) with the U.S., which was enacted in 1994, prior to the KORUS FTA, and later replaced by the U.S.-Mexico-Canada Agreement (USMCA) on July 1, 2020.[5] Consequently, South Korea is the treatment country, while the remaining 11 countries serve as the control group countries.[6]

We define the deficit ratio as the U.S. trade deficit (imports minus exports) divided by the trade volume (imports plus exports) with the partner country. To measure the income/absorption effect on the trade deficit, we employ the industrial production (IP) ratio, calculated as U.S. real IP divided by the real IP of the partner country. Real IP is derived by deflating nominal IP with the respective consumer price index (CPI). All IP and CPI data are seasonally adjusted and were obtained from the Federal Reserve Economic Data (FRED), except for Taiwan's data, which was acquired from Taiwan's National Statistics. Nominal bilateral foreign exchange rates (FXR) relative to the U.S. dollar, also obtained from the FRED, were converted into CPI-based real exchange rates and log-transformed.

2. Useful Insights from Key Trade-Related Data

Table 1 reports the average values of the key variables of interest: deficit ratios, IP ratios, and real exchange rates during the pre-FTA period (May 2007 to February 2012) and the post-FTA period (March 2012 to December 2016, Treatment). We divided the control group countries in two categories: Euro Zone and Non-Euro Zone Countries.[7] Bold numbers indicate that the average value in the post-FTA period exceeds the pre-FTA average.

[5] The USMCA was initially signed on November 30, 2018. A revised version of the agreement was signed on December 10, 2019.
[6] These countries include China, Japan, Germany, the U.K., France, India, Taiwan, the Netherlands, Brazil, Ireland, and Italy.
[7] The Euro-Zone includes France, Germany, Ireland, Italy, and the Netherlands, while the Non-Euro Zone Countries includes Brazil, China, India, Japan, Taiwan and the UK.

We note that South Korea was not the only trading partner with an increased deficit ratio after the KORUS FTA came into effect. Seven out of eleven other major trading partners also experienced greater trade surpluses (bold numbers) with the U.S. during the same period, even though none had an FTA with the U.S. As shown in Figure 1, the U.S. experienced similar deficit dynamics Germany, India, and Italy as it did with Korea.

Table 1. Summary Statistics of Major Trading Partners

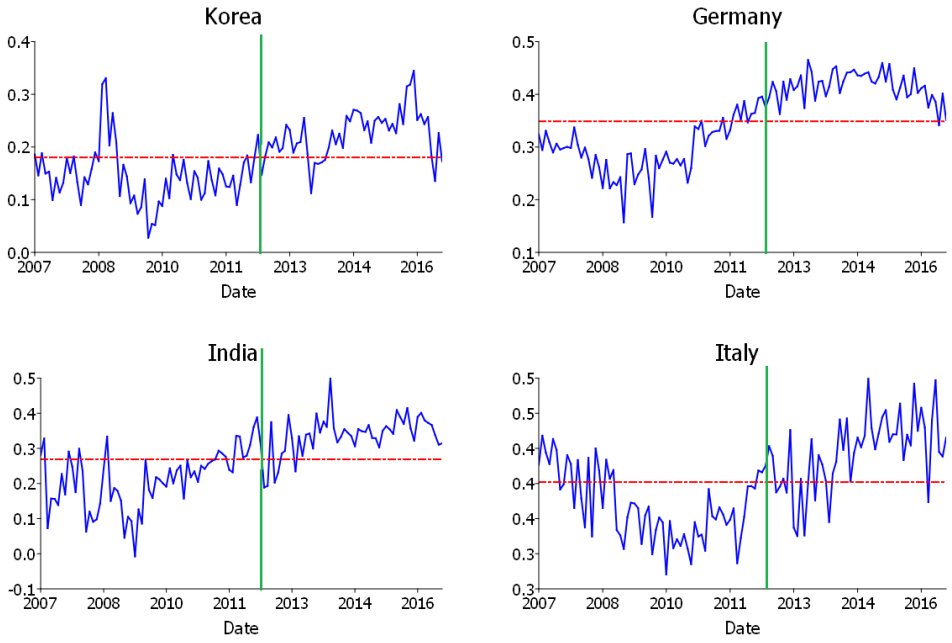
	Deficit Ratio		***IP Ratio***		***Real FXR***	
Countries	Pre-FTA	Post-FTA	Pre-FTA	Post-FTA	Pre-FTA	Post-FTA
			Treatment Country			
Korea	0.142	**0.219**	0.464	0.431	7.910	7.879
			Control Group I: Euro-Zone Countries			
France	0.179	**0.193**	0.406	**0.436**	0.507	**0.657**
Germany	0.286	**0.411**	0.449	0.438	0.520	**0.661**
Ireland	0.621	**0.637**	0.699	0.580	0.469	**0.653**
Italy	0.372	**0.431**	0.367	**0.434**	0.526	**0.657**
Netherlands	-0.296	-0.373	0.391	**0.423**	0.542	**0.664**
			Control Group II: Non-Euro-Zone Countries			
Brazil	-0.105	-0.143	0.286	**0.396**	1.729	**1.882**
China	0.622	0.591	0.338	**0.398**	2.844	2.714
India	0.202	**0.336**	0.328	**0.420**	5.069	5.031
Japan	0.341	**0.351**	0.421	**0.429**	5.341	**5.502**
Taiwan	0.199	**0.213**	0.532	0.448	4.291	**4.296**
UK	0.016	0.016	0.380	**0.435**	0.369	**0.429**

Note: *Deficit Ratio* denotes the difference between U.S. imports and exports, divided by the total trade volume (imports plus exports) with the partner country. *IP Ratio* is defined as U.S. real industrial production divided by the real industrial production of the partner country. *Real FXR* refers to the nominal foreign exchange rate, adjusted by the consumer price index ratio. The pre-FTA denotes the sample period from May 2007 to February 2012, while the post-FTA is the period from March 2012 to December 2016, covering the time when the KORUS FTA was in effect. Bold numbers indicate cases where the average value in the post-FTA period exceeds that of the pre-FTA, suggesting the potential for increasing U.S. deficits through income/absorption effects and expenditure-switching effects.

Additionally, these seven countries with higher deficits also experienced either a higher average IP ratio, a higher average real FXR, or both, during the post-FTA era. Since the IP ratio is defined as $IP_{US,t}/IP_{j,t}$, a higher IP ratio indicates stronger U.S. economic performance relative to the partner country. This suggests that the U.S. economy was likely importing more from these countries, resulting in increased deficits in the post-FTA period.

Similarly, a higher Real FXR for the U.S. dollar implies that the U.S. trade deficit likely grew due to the expenditure-switching effect. That is, the rising U.S. trade deficits with these control group countries during the post-FTA period may have been driven by either stronger U.S. economic performance or the real appreciation of the U.S. dollar.

Figure 1. U.S. Trade Deficit Ratios: Selective Trading Partners



Note: We report the deficit ratio, which represents the difference between U.S. imports and exports, divided by the total trade volume (imports plus exports) with the partner country over the pre-KORUS FTA and the post-KORUS FTA periods. The vertical line marks March 2012, the date when the KORUS FTA came into effect. The horizontal line represents the average deficit ratio for the entire sample period.

On the other hand, Korea experienced none of these, implying that the business cycle conditions during the post-FTA period could have been consistent with a lower, rather than higher, U.S. trade deficit with Korea. This implies a strong possibility that the KORUS FTA might have been driving the observed increase in the U.S. trade deficit with Korea.

In the following sections, we employ formal econometric tests using a difference-in-differences approach, accompanied by an event study, to statistically test this hypothesis.

III Econometric Test Results

1. Difference-in-Differences Estimation and Interpretation of the Results

This section assesses the causal effect of the KORUS FTA on the U.S. trade deficit with South Korea using the difference-in-differences (diff-in-diff) estimator (Card and Krueger, 1994). We propose the following regression equation.

$$USDef_{i,t} = \alpha + \beta_1 treated_{i,t} + \beta_2 post_{i,t} + \beta_3 treated_{i,t} \times post_{i,t} \quad (1)$$
$$+\beta_4 ipratio_{i,t} + \beta_5 rfxr_{i,t} + \alpha_t + \gamma_i + \varepsilon_{i,t},$$

where $USDef_{i,t}$ is the US deficit ratio with country i at time t, $treated_{i,t}$ is a dummy variable that takes the value of 1 for Korea (treatment) and 0 for control group countries. $post_{i,t}$ is a dummy variable that takes the value of 1 for the post-KORUS FTA period (treatment period, March 2012 to December 2016) and 0 for the pre-KORUS FTA period. β_3 is the difference-in-differences coefficient, which is crucial for our study.

Two control variables, $ipratio_{i,t}$ and $rfxr_{i,t}$, are added to the regression equation to control for possible business cycle effects: income/absorption effects and expenditure-switching effects, respectively. In addition to the time fixed effects (α_t), we also include the country fixed effects (γ_i) when there are multiple control countries. Since our regression equation utilizes time series variables with 116 monthly

observations, we employ the Newey-West HAC (Heteroskedasticity and Autocorrelation Consistent) standard error to address serial correlations in the data.[8][9]

Table 2 reports estimation results with all 11 control group countries among major trading partners. In all four specifications, we obtained significantly positive estimates $\hat{\beta}_3$ at the 1% level, indicating a positive causal effect of the KORUS FTA on the U.S. trade deficit with South Korea. The coefficient estimates for control variables have correct signs, that is, positive $\hat{\beta}_4$ and $\hat{\beta}_5$, although they may not be always significant.

Table 2. Diff-in-Diff Estimation: U.S. Deficit with all Control Group Countries

	US Deficit Ratio			
	(1)	(2)	(3)	(4)
$treated_{i,t}$ (β_1)	0.276‡	0.269‡	-0.051	-0.093
	(0.017)	(0.017)	(0.205)	(0.200)
$post_{i,t}$ (β_2)	-0.034	-0.033	-0.043*	-0.043*
	(0.024)	(0.025)	(0.025)	(0.025)
$\boldsymbol{treated_{i,t} \times post_{i,t}}$ $\boldsymbol{(\beta_3)}$	**0.056**‡	**0.059**‡	**0.062**‡	**0.067**‡
	(0.014)	(0.014)	(0.014)	(0.014)
$ipratio_{i,t}$ (β_4)		0.054		0.066
		(0.059)		(0.057)
$rfxr_{i,t}$ (β_5)			0.053	0.059*
			(0.033)	(0.033)
Country FEs	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes
Observations	1392	1392	1392	1392

Note: β_3 is the difference-in-differences coefficient. Superscripts ‡, †, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. Newey-West HAC standard errors are in parenthesis.

We implemented similar estimations with more disaggregated data. In Table 3, we report estimation results with two different control groups: Euro-Zone countries in Panel A and non-Euro-Zone countries in

[8] We implemented the regression with 3-month bandwidth selections for the Bartlett kernel for the NW estimator. Results with 6- and 9-month bandwidths are qualitatively similar and available upon request.
[9] See Bertrand, Duflo, and Mullainathan (2004) for the implication of the bias of diff-in-diff estimation for serially correlated variables.

Panel B. The former includes France, Germany, Ireland, Italy, and the Netherlands, while the latter includes the remaining six partner countries. We also report the results for individual countries.

Again, we obtained significantly positive diff-in-diff estimates of $\hat{\beta}_3$ in all cases at the 5% level, with two exceptions, Germany and Italy. The coefficients of $ipratio_t$ and $rfxr_t$ have the correct signs whenever they are statistically significant, except for Taiwan for $rfxr_t$.

It is interesting to observe that $\hat{\beta}_3$ is not statistically significant for Germany and Italy. Recall that these countries exhibited strikingly similar dynamics of the U.S. trade surplus as Korea (see Figure 1). Therefore, the insignificant $\hat{\beta}_3$ estimates for these two countries seem to result from a lack of sufficient variations in the data.

Putting it all together, we conclude that our analysis provides strong evidence of a positive causal effect of the KORUS FTA on Korea's trade account balance with the U.S.

2. Validating Parallel Trends: An Event-Study Approach

The results of our diff-in-diff estimates rely on the assumption of *parallel trends*, meaning that we require the control group to satisfy this assumption in relation to the treated group.[10] The parallel trends assumption implies that, if the KORUS FTA had not occurred, the difference between the US deficit ratio with Korea (the treated group) and with control group countries would have remained constant in the post-KORUS FTA period, just as it was in the pre-KORUS FTA period.

To test the parallel trends assumption in diff-in-diff estimation, we conduct an event study analysis to test for prior trends, using the following regression:

$$USDef_{i,t} = \alpha + \beta_1 treated_{i,t} + \beta_2 post_{i,t} + \sum_{t=0}^{116} \beta_3 \left(treated_{i,t} \times 1[time_{i,t} = t]\right) \quad (2)$$
$$+\beta_4 ipratio_{i,t} + \beta_5 rfxr_{i,t} + \alpha_t + \gamma_i + \varepsilon_{i,t},$$

[10] See Abadie (2005) for a detailed discussion on the importance of parallel trends in diff-in-diff estimations.

where $1[time_{i,t} = t]$ are dummies for the 58 months before and after the KORUS FTA. To avoid perfect multicollinearity, we omit February 2012, the month prior to the month KORUS FTA went into effect.

Table 3. Diff-in-Diff Estimation: U.S. Deficit Ratio with Individual Trading Partners

Panel A	**Euro Zone**	France	Germany	Ireland	Italy	Netherlands
$treated_{i,t}$ (β_1)	-1.862†	-1.683†	-1.863†	-2.468‡	-1.445†	0.782
	(0.797)	(0.784)	(0.842)	(0.755)	(0.626)	(1.307)
$post_{i,t}$ (β_2)	-0.107†	-0.168‡	0.013	-0.006	-0.050	-0.098
	(0.043)	(0.051)	(0.036)	(0.085)	(0.040)	(0.066)
$\boldsymbol{treated_{i,t} \times post_{i,t}}$ **($\boldsymbol{\beta_3}$)**	**0.093‡**	**0.124‡**	0.008	**0.092‡**	0.037	**0.185‡**
	(0.022)	(0.028)	(0.023)	(0.027)	(0.025)	(0.045)
$ipratio_{i,t}$ (β_4)	0.010	0.343	0.744‡	0.338‡	-0.062	0.616
	(0.073)	(0.256)	(0.237)	(0.085)	(0.152)	(0.499)
$rfxr_{i,t}$ (β_5)	0.247†	0.220†	0.231†	0.278‡	0.165*	-0.053
	(0.108)	(0.106)	(0.114)	(0.102)	(0.085)	(0.178)
Country FEs	Yes	No	No	No	No	No
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	696	232	232	232	232	232

Panel B	**Non-EZ**	Brazil	China	Japan	India	Taiwan	UK
$treated_{i,t}$ (β_1)	0.147	-1.524‡	-1.297‡	-0.334	-0.930†	0.801†	-1.639†
	(0.215)	(0.560)	(0.223)	(0.277)	(0.361)	(0.313)	(0.808)
$post_{i,t}$ (β_2)	-0.047	-0.190†	-0.095‡	-0.080†	-0.019	-0.040	-0.121†
	(0.030)	(0.078)	(0.030)	(0.040)	(0.037)	(0.035)	(0.050)
$\boldsymbol{treated_{i,t} \times post_{i,t}}$ **($\boldsymbol{\beta_3}$)**	**0.075‡**	**0.170‡**	**0.091‡**	**0.068†**	**0.081‡**	**0.058‡**	**0.076†**
	(0.015)	(0.037)	(0.016)	(0.033)	(0.030)	(0.018)	(0.031)
$ipratio_{i,t}$ (β_4)	0.170*	0.020	-0.006	-0.228	1.123‡	-0.083	-0.253
	(0.094)	(0.198)	(0.152)	(0.392)	(0.235)	(0.193)	(0.263)
$rfxr_{i,t}$ (β_5)	0.017	0.286‡	0.161‡	0.056	0.253†	-0.239‡	0.237†
	(0.036)	(0.091)	(0.042)	(0.106)	(0.119)	(0.089)	(0.108)
Country FEs	Yes	No	No	No	No	No	No
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	812	232	232	232	232	232	232

Note: We report the results using two sets of control group countries: Eurozone and non-Eurozone groups, along with individual trading partner countries. β_3 is the difference-in-differences coefficient. Superscripts ‡, †, and * denote statistical significance at the 1%, 5%, and 10% level, respectively. Newey-West HAC standard errors are in parenthesis.

For the parallel trends assumption to hold in this regression, the estimates of the main coefficient of interest, β_3, should generally be insignificant for most months prior to the KORUS FTA event. This would indicate that before the event, both the treatment country (Korea) and the control countries followed the same trend.

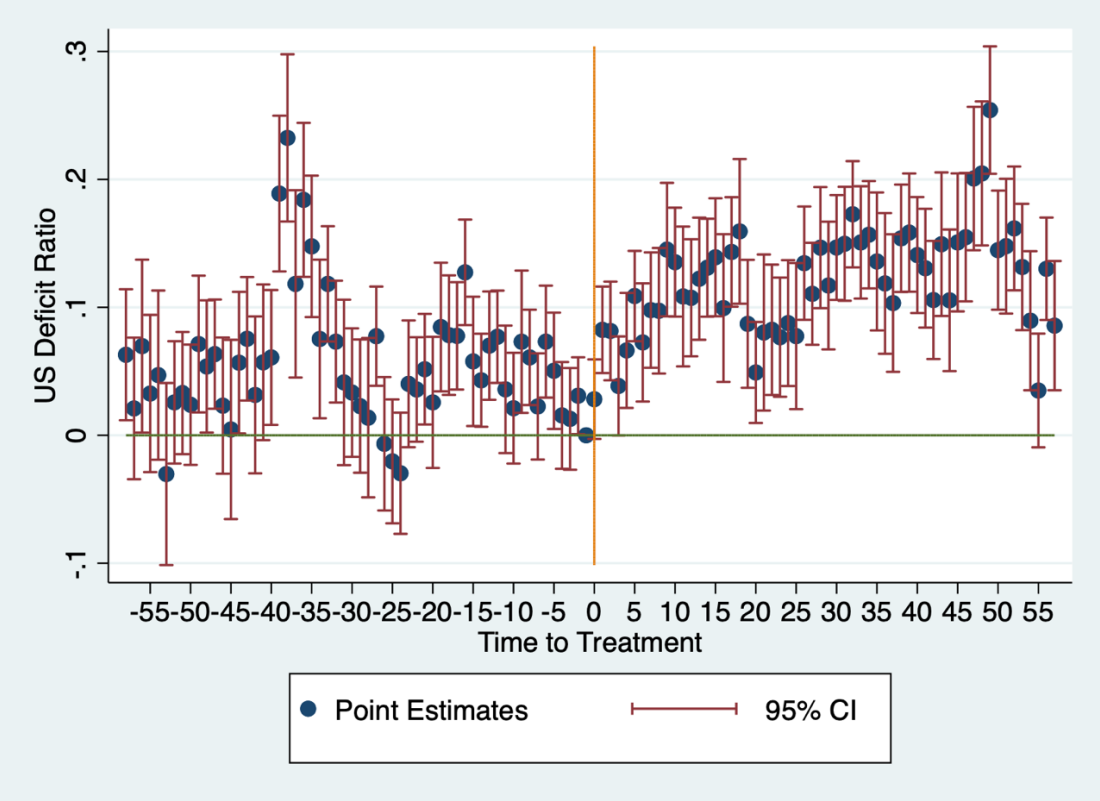
Figure 2 illustrates this by estimating equation (2) and plotting the estimates for the interaction term between the treated dummy and the month-year indicators for each month and year, along with their 95% confidence intervals. The insignificant point estimates for the U.S. deficit ratio in the figure clearly demonstrates that there is no difference between the U.S. deficit ratio with Korea and the control group countries in the months prior to the event. However, after the KORUS FTA event, these estimates become highly and positively significant, providing further evidence of the absence of pre-trends in the U.S. deficit ratio between Korea and control countries.

V Concluding Remarks

Mr. Trump criticized the KORUS FTA as a job-killing trade deal, citing the rising U.S. trade deficit with Korea after the agreement came into effect in March 2012. However, 7 out of 11 major U.S. trading partners also experienced similar increases in their trade surpluses with the U.S. during the same period, despite not having an FTA with the U.S. This complicates the evaluation of the causal effects of the KORUS FTA on the trade balance with Korea.

Employing a difference-in-differences approach, we found strong empirical support for Trump's assertion. Our findings demonstrate that rising American trade deficits with other trading partner countries were primarily driven by the stronger performance of the U.S. economy or the real appreciation of the U.S. dollar. In contrast, business cycle conditions in Korea were the opposite, and our analysis concludes that the KORUS FTA did cause the larger U.S. trade deficit with Korea after its enactment.

Figure 2. Event Study Analysis for U.S. Deficit Ratio



Note: Point estimates are displayed along with their 95% confidence intervals as described in equation (2). The horizontal axis labels denote the number of months before or after the event, for e.g. -30 refers to 30 months (Sept. 2009) before the KORUS FTA went into effect (March 2012). The baseline (omitted) base period is one month prior to the KORUS FTA's implementation.

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