1 Initial Regression

- Treatment: minimum wage law enacted in New Jersey on April 1992
- Treated group: fast-food restaurants in New Jersey
- Control group: fast-food restaurants in Pennsylvania

Regressing *fte* on *t*, *treated*, and *DiD*, we obtain the following summary statistic:

Table 1: Fast Food Employment in NJ and PA

	Dependent variable:
	fte
t	-2.490^{*}
	(1.472)
treated	-2.944^{**}
	(1.160)
DiD	2.939^{*}
	(1.641)
Constant	20.013^{***}
	(1.041)
Observations	780
R^2	0.008
Adjusted R^2	0.004
Residual Std. Error	9.075 (df = 776)
F Statistic	2.159^{*} (df = 3; 776)
Note:	*p<0.1; **p<0.05; ***p<0.01

We see that the average treatment effect on the treated (ATET), or the coefficient of *DiD* in this case, is 2.939 and is significant at the 10% level. From February 1992 to November 1992 in New Jersey, where the minimum wage law was enacted, we found full-time employment went up on average by 2.939 for fast-food restaurants relative to Pennsylvania, where the minimum wage was not enacted.

2 Non-Regression DiD

We can also compute a simple, non-regression DiD by calculating these four averages:

	Pre-treatment	Post-treatment
Untreated	20.012315	17.523026
Treated	17.069367	17.5183121

Thus, the ATET is simply:

$$\begin{aligned}\text{ATET} &= (\text{Treated Post-treatment} - \text{Untreated Post-treatment}) \\ &\quad - (\text{Treated Pre-treatment} - \text{Untreated Pre-treatment}) \\ &= (17.5183121 - 17.523026) - (17.069367 - 20.012315) \\ &= 2.939176\end{aligned}$$

This is the same coefficient we obtained from our initial regression. The reason is because in the regression, the interaction term *DiD* is doing the same thing as the non-regression method. Since *t* and *treated* are dummy variables, when calculating *DiD* by the interaction of *t* and *treated* ($t \times treated$), we essentially filtered post-treatment New Jersey (the ATET).

3 Burger King Regression

Re-running our regression for only the Burger King stores, we obtain the following summary statistics:

Table 2: Burger King Employment in NJ and PA

	Dependent variable:
	bkfte
bkt	−3.368
	(2.070)
bktreated	−7.005***
	(1.645)
bkdid	4.629**
	(2.326)
Constant	25.654***
	(1.463)
Observations	326
R^2	0.059
Adjusted R^2	0.051
Residual Std. Error	8.533 (df = 322)
F Statistic	6.772*** (df = 3; 322)
Note:	*p<0.1; **p<0.05; ***p<0.01

We can see that the ATET for Burger King stores is higher (at 4.629) compared to the ATET that included every fast food franchise—and this is significant at a 5% level . It follows that the Burger King stores in New Jersey drove up the full-time employment effect in our initial regression under treatment. Under the minimum wage law, the effect may not increase full time employment to the extent that we calculated in our initial regression for the other fast food franchises in New Jersey.

4 R code

```
---
title: "POLS 5385 - Homework 1"
author: "Don Lim"
date: "9/26/2021"
output:
pdf_document:
keep_tex: yes
html_document: default
word_document: default
---

```{r setup, include=FALSE}
knitr::opts_chunk$set(echo = TRUE)
```

```{r}
# Installs necessary packages
library(tidyverse)
library(readxl)
library(haven)
```
```

```r
# Imports data from the website
read_data <- function(df)
{
       full_path <- paste("http://fmwww.bc.edu/repec/bocode/c/",
       df, sep = "")
       df <- read_dta(full_path)
       return(df)
}
CardKrueger1994 <- read_data("cardkrueger1994.dta")
```

```r
# Creates interaction effect, DiD (treated times treatment)
CardKrueger1994$DiD <- CardKrueger1994$t * CardKrueger1994$treated
```

```r
# Regresses fte on treatment, treated, and DiD interaction
model = lm(fte~t+treated+DiD,data=CardKrueger1994)
summary(model)
```

```r
# Creates additional columns to calculate the averages of the diff-in-diff
CardKrueger1994$UntreatedPre <- ifelse(CardKrueger1994$t == 0 &
    CardKrueger1994$treated == 0, CardKrueger1994$fte,NA)
CardKrueger1994$UntreatedPost <- ifelse(CardKrueger1994$t == 1 &
    CardKrueger1994$treated == 0, CardKrueger1994$fte, NA)
CardKrueger1994$TreatedPre <- ifelse(CardKrueger1994$t == 0 &
    CardKrueger1994$treated == 1, CardKrueger1994$fte, NA)
CardKrueger1994$TreatedPost <- ifelse(CardKrueger1994$t == 1 &
    CardKrueger1994$treated == 1, CardKrueger1994$fte, NA)
```

```r
# Basic non-regression diff-in-diff with four averages
UntreatedPre <- mean(CardKrueger1994$UntreatedPre,na.rm=TRUE)
UntreatedPost <- mean(CardKrueger1994$UntreatedPost,na.rm=TRUE)
TreatedPre <- mean(CardKrueger1994$TreatedPre,na.rm=TRUE)
TreatedPost <- mean(CardKrueger1994$TreatedPost,na.rm=TRUE)

# Finds the average treatment effect on the treated
ATET <- (TreatedPost-UntreatedPost)-(TreatedPre-UntreatedPre)
ATET
```

```r
# Create columns for only BK treatment, treated, and FTE
CardKrueger1994$bkt <- ifelse(CardKrueger1994$bk == 1, CardKrueger1994$t, NA)
CardKrueger1994$bktreated <- ifelse(CardKrueger1994$bk == 1,
    CardKrueger1994$treated, NA)
CardKrueger1994$bkfte <- ifelse(CardKrueger1994$bk == 1, CardKrueger1994$fte, NA)

# Create interaction effect for Burger King only (bkt X bktreated)
CardKrueger1994$bkdid <- CardKrueger1994$bkt * CardKrueger1994$bktreated
```

```r
# Regresses BK FTE on BK treated, treatment, and interaction effect
bkmodel = lm(bkfte~bkt+bktreated+bkdid,data=CardKrueger1994)
summary(bkmodel)
```