PROBLEM SET 4  
**Due on Tuesday April 25, 2023, 10:00 am**

I - INSTRUCTIONS

To successfully complete this problem set, please follow these steps:

1. Download this Word document file into your computer and download the datasets into a data subfolder in your problem set-specific RStudio Project directory.
2. Insert your answers into this document and organize your code in a R script. You can also insert non-Word objects such as handwritten work or screenshots in your answers.
3. Once your document is complete, please save it as a PDF.
4. Please submit an electronic copy of the **PDF** and your **replicable R script** to the Canvas assignment page.

II - IDENTIFICATION

1. Your information

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| Your Last Name: |  |
| Your First Name: |  |

(2) Group Members (please list the classmates you worked with on this problem set):

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1. Compliance with Harvard Kennedy School Academic Code[[1]](#footnote-1) (mark with an X below)

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| |  |  |  | | --- | --- | --- | |  | **Yes** | **No** | | I certify that my work in this problem set complies with the Harvard Kennedy School Academic Code |  |  | |

For this problem set, we will be examining the following paper:

Stevenson, Betsey, and Justin Wolfers. 2006. "Bargaining in the Shadow of the Law: Divorce Laws and Family Distress," *Quarterly Journal of Economics,* 121 (1): 267-88.

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| **Tips:** Forthis problem set, you may find it more efficient to go back and forth between the conceptual and data analysis questions, as many questions are paired.  **Instructions:** Please keep your answers *concise*. Most subquestions can be answered in 1-2 sentences. Bolding or italicizing keywords also help grading. |

# Conceptual Questions

1. Read the paper.
   1. Clearly state the primary research question that the authors are trying to answer. (1 point)

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* 1. In 2-3 sentences, explain the main finding of the paper using non-technical jargon, as if you were writing a brief policy memo. (2 points)

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* 1. What are the two mechanisms that the authors discuss by which unilateral divorce laws may have reduced suicide rates among married women? (1 point)

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# Data Analysis

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| For this problem set, you can rely on a two-part demo: [constructing variables for DID](https://vimeo.com/409267138), and [estimating DID coefficients](https://vimeo.com/409267190) with the two-way fixed effects estimator. That said, the techniques involved (e.g. fixed effects) are not new. A data appendix at the end describes the dataset and the key variables. |

In this section, we will estimate the effect of unilateral divorce laws on female suicide. In the problem set link, we have provided a lightly cleaned version of their main analysis files: stevenson\_wolfers\_210.dta. The data we are using is available from [Justin Wolfers’ website](http://users.nber.org/~jwolfers/).

1. We will begin by estimating a simple 2x2 difference-in-differences regression.
   1. The year in which the greatest number of states passed unilateral divorce laws was 1973. Using data on states that passed unilateral divorce laws in 1973 and those that never passed unilateral divorce laws, run a simple 2x2 DID regression to estimate the effect of unilateral divorce laws on ln(suiciderate\_jag) for women, clustering standard errors at the state level. Report the estimated effect and the standard error below. (2 points)

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* 1. Interpret the point estimate. Explain which treatment/control groups are being compared and how the effect is estimated so that someone without statistical training could understand. (2 points)

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* 1. Are the results significant? Can you rule out substantively meaningful effect sizes? (1 point)

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1. Now we will assess whether the parallel trends assumption is reasonable in this setting by estimating an event study, pooling data from all the states.  
   1. Consider the following event study regression specification:

Interpret the coefficients. (2 points)

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* 1. Plot the event study, being sure to include confidence bands as well as point estimates (Hint: Follow Andrew Goodman-Bacon’s mini-guide [here](https://twitter.com/agoodmanbacon/status/1165643395844493313)). (3 points)

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* 1. Interpret the figure. Does it support the parallel trends assumption? How do the effects of the reform appear to unfold over time? (2 points)

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* 1. Read the abstract and introduction of Rambachan and Roth (2023), “A More Credible Approach to Parallel Trends.” Explain the potential concerns with using the above event study regression estimates to assess the parallel trends assumptions. (2 points)  
       
     Bonus: Read the introduction of Sun and Abraham (2020) and explain the concern with event studies when there is staggered timing in treatment adoption.

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1. Now estimate the pooled DID effect using a two-way fixed-effect regression specification.
   1. Report the coefficient and standard error clustered at the state level. How does the point estimate compare to the simple 2x2 estimate from question 13? How do the standard errors compare? (3 points)

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* 1. How should we think about the two-way fixed-effects estimate? What comparisons are being made? How many are there? Categorize these comparisons into four distinct groups (Hint: See Goodman-Bacon (2021) )(2 points)

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* 1. Given the event study you estimated in question 14, what concerns might you have about some of these comparisons? Do you think the two-way fixed-effects estimate may be biased? If so, in what direction? (2 points)

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# DIDs in Your Own Work (8 points)

1. Drawing from your own experience and interests, suggest a question that you might try to answer using a difference-in-differences model. As you think through what this would entail, explain the following aspects of your proposed analysis:
   1. Propose a specific policy question. Explain why you think this is an interesting and important policy question. Provide evidence that there is ***not*** already a conclusive answer to this question. (1 point)

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* 1. Describe your treatment group. (1 point)

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* 1. Propose a comparison group and explain why you chose that group. In your answer, make sure to explain what the parallel trends assumption would mean for your analysis and whether you think that assumption will be satisfied. (1 point)

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* 1. Describe the fixed effects that you would use in your difference-in-differences specification. (1 point)

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* 1. Describe how you would cluster your standard errors, if at all. (1 point)

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* 1. Provide three examples of confounding issues that would be addressed by using the fixed effects that you include. (1.5 points)

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* 1. Provide three examples of additional issues that might still bias your estimates despite using a difference in differences specification. How might you consider addressing those issues? (1.5 points)

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**Reminder: please include your replicable script separately in your submission.**

# Appendix for Data Analysis

The data for this problem set is a state-by-year panel. Observations are uniquely identified by state, year, and sex. The data has the following key variables:

* st and year are the state and year variables.
* sex indicates whether the outcome is observed for males or females. It is coded as 1 for males and 2 for females.
* divyear is the year of unilateral divorce reform.
* unilateral indicates whether unilateral divorce is legal.
* suiciderate\_jag is the suicide rate.

1. We abide by the Harvard Kennedy School Academic [code](https://www.hks.harvard.edu/educational-programs/academic-calendars-policies/student-handbook/general-regulations-and-1) for all aspects of the course. In terms of problem sets, unless explicitly written otherwise, the norms are the following: You are free (and encouraged) to discuss problem sets with your classmates. However, you must hand in your own unique written work and code in all cases. Any copy/paste of another’s work is plagiarism. In other words, you can work with your classmate(s), sitting side-by-side and going through the problem set question-by-question, but you must each type your own answers and your own code. For more details, please see syllabus. [↑](#footnote-ref-1)