A Critique on “Partisan Pandemic: How partisanship and public health concerns affect individuals’ social mobility during COVID-19”: the Evaluation of Industry Sector as a Potential Omitted Variable

ECON231W Econometrics Final Project

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PART ONE: PAPER SUMMARY

As of January 2020, the coronavirus pandemic COVID-19 is affecting 200 countries and poses a severe threat worldwide. To prevent the spread of the virus, social distancing remains an important strategy to combat the COVID-19 pandemic. Since March 2020, state and local governments in the United States implemented social distancing policies, including "work-from-home policies, school closures, closures of non-essential business and services, limits on social-gathering, and bans on in-restaurant dining".[1] However, due to the two-party system, the nonpartisan coronavirus met with an increasingly partisan response in the United States, especially in terms of the social distancing policies, which is a rare political divide all over the world. Democrats and Republicans disagreed over things about the proper attitudes towards COVID-19, mobility, and social contact, even as the actual impact of the pandemic fell along different fault lines, including race, income, age, location, and household structure. Hence, it's worth investigating the extent to which the partisan differences affect people's concerns about COVID-19 and their mobility behaviors, with fixed demographic covariates (gender, age, race, education, income, population density, and employment status). Besides, we are also interested in how the local COVID-19 severity measured by the number of COVID-19 cases influenced mobility. The effects of partisanship and local incidence of COVID-19 on individuals' social mobility during COVID-19 are explored in this paper written by Clinton, Cohen, Lapinski, and Trussler. They eventually found out that "partisanship is 27 times more important than the local incidence of COVID-19 in explaining mobility" (Clinton et al. 2021).[2] While Ceteris paribus, compared to independents, Republicans are 27.8% more likely to mobile, which is implied by the number of daily activities, while Democrats are 13.1% less likely to mobile.

Methods:

The authors issued questionnaires to 1,135,638 randomly selected respondents from the Survey Monkey platform between April 4, 2020 and September 29, 2020 and collected data about their daily activities, level of worried about COVID-19, partisanship, and media source preferences. The observations were weighted to represent the U.S. adult population. The outcome variable is people's level of activity, which is the total number of activities (going to a restaurant, visiting family or friends, taking a walk, exercising, getting groceries, receiving medical care, and going to work) that they reported participating in during the previous 24 hours. The two major explanatory variables are partisanship and the number of COVID-19 cases in the county. Data of COVID-19 cases in each county comes from the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University.

Apart from the partisanship and local incidence of COVID-19, Clinton and his coworkers hypothesized that the differences in demographic variables (gender, age, race, education, income, population density, and employment status) and state background may lead to differences in mobility patterns. To decompose the two factors—partisanship and change in COVID-19 cases—and better understand each factor's contribution to individuals' mobility, the authors

[1] Gregory A. Wellenius et al, "Impacts of Social Distancing Policies on Mobility and Covid-19 Case Growth in the US," *Nature News*, Nature Publishing Group, May 25, 2021, https://www.nature.com/articles/s41467-021-23404-5.

[2] Joshua Clinton et al. "Partisan pandemic: How partisanship and public health concerns affect individuals' social mobility during COVID-19," *Science Advances* 7, no. 2 (2021): eabd7204.

proposed 4 possible models of daily mobility that controlled demographic variables and state variables and added different combinations of the two explanatory variables. They ran ordinary least squares (OLS) regressions on them. The importance of each factor is evidenced by the coefficients of partial determination, which suggests the extent to which variances in mobility can be explained by partisanship and COVID-19 cases. The conditional marginal effects can be determined from the 4 models as well.

Results:
The first conclusion emerges from the scatterplot overview of the observations. They plotted people's level of worried about COVID-19 categorized by their partisanships and local COVID-19 severity and the reported number of activities categorized by their partisanships and local COVID-19 severity. The plots show that the level of worry about COVID-19 and the number of daily activities do not vary greatly with differences in the local incidence of COVID-19, but display distinct patterns for Democrats, Independents, and Republicans. Besides, Republicans generally have the fewest COVID-19 concerns and mobile most frequently, while Democrats are the opposite.

The results of regression models indicate that for the proportion of variance in mobility unexplained by demographics or state, partisan variation explains increasingly more with a maximum at 7% while the change in country cases explains almost nothing. The analysis of the marginal conditional effect of partisanship and COVID-19 cases with controlled demographics and state effects reveals that Democrats engage in less social activities compared to average, while Republicans are above average and have a maximum gap of 0.93 social activities with Democrats. However, the difference in the number of daily activities for COVID-19 severe and non-severe regions is less than 0.1. To determine the source for the partisan differences in the mobility pattern, the authors examine the partisanship of the governor and the different regulatory environment of each state. The results of marginal conditional effects of partisanship by states show that Democrats and Republicans have a similar level of activities regardless of the state they locate and the partisanship of local governors.

PART TWO: CRITIQUE
Overall, the dataset, methodology, and results of the research have strong logicality and robustness, and the authors themselves also rule out many plausible imperfections. For example, Clinton and his coworkers include alternative measures of public health/local COVID-19 severity such as change in county deaths/1000, absolute county cases/1000, and change in state cases/1000 to replace the original COVID-19 measure calculated by change in county cases/1000. They also try to use a dataset composed of anonymized cell phone data about the change in how long individuals are at various locations from Google as an alternative to the original self-reported dataset. The regression model already includes many possible covariates of daily mobility. The results generated with these changes reach an accord with the original ones, which means that the measurement error of public health, response bias of daily activity, and omitted variable bias of the existing demographic and state variables may not occur in the research. The omitted variable is perhaps one of the few weaknesses of the proposed model, and it is the essence of the problem of endogeneity, which will cause the OLS estimator to be biased. The paper has included gender, age, race, education, income, population density, and employment status as the demographic covariates in the regression model. However, the industry

sector that the respondent works in may affect mobility during the COVID-19 pandemic as well, while it is not included as a controlled variable in the OLS regression model.

The industry is classified into four major sectors, including primary, secondary, tertiary, and quaternary sectors, which represent various business types and goods they produce and sell. The primary sector makes direct use of natural resources and includes businesses such as agriculture, forestry, mining, and extraction of oil. The secondary sector is comprised of the manufacturing industries that transform intermediate materials into goods, as in steel into cars and textiles into clothing. The tertiary sector produces services and covers a wide range of activities from market services (i.e. financial operations and food services) to non-market services (i.e. education and health system).[3] The newly emerged quaternary sector is a knowledge sector and involves research and high-tech jobs. Each person is in one sector given he is employed.

The reason for introducing the industry sectors is that different kinds of jobs have different work modes and thus require different mobility patterns. As mentioned in "Partisan pandemic: How partisanship and public health concerns affect individuals' social mobility during COVID-19", many states implemented stay-at-home and work-from-home policies. However, these policies cannot be uniformly implemented. The tertiary sectors that should provide comfortable and enthusiastic services require employees to be in a specific location or in proximity to consumers. Despite some work arrangements and state regulations, work-from-home is a luxury for some workers. For example, grocery workers need to stay at the store and provide in-person help to customers. As long as the companies of the tertiary sector continue to operate and provide services, their employees cannot easily stay at home and work from home. However, remote working is feasible and beneficial for tech workers in the quaternary sector. Statistics have shown that 74% of workers in information technology and 62% of workers in biotech and pharmaceuticals, two representative jobs in the quaternary sector, reported access to work-from-home benefits in terms of convenience and productivity, while only 11% of restaurant and food services workers and 29% of transportation workers indicate such benefits.[4] The activity index in Clinton's model is calculated by the sum of the mobility for work, grocery shopping, exercise, take-a-walk, visiting friends, eating outside, and getting medical care. Therefore, Moreover, primary and secondary sectors have some relationship with people's mobility behaviors as well. Pasaribu, Pane, and Suwarna utilize the province-level Google mobility data and national labor force statistics and argue that regions with primary and secondary sectoral employment structures have different mobility changes while Ceteris paribus.[5] Primary sector-dominated regions tend to have their mobility unchanged when the COVID-19 broke out and social distancing policies were introduced and slightly decreased in the later periods compared to the pre-COVID-19 mobility. Regions with a large share of secondary-sector workers, however, did

[3] Michael E. Carpenter, "What are Primary, Secondary & Tertiary Economic Sectors," *Bizfluent*, November 21, 2018, https://bizfluent.com/info-8564100-primary-secondary-tertiary-sectors.html.
[4] Daniel Zhao, "Work From Home: Has the Future of Work Arrived," *Glassdoor*, March 18, 2020, https://www.glassdoor.com/research/working-from-home/.
[5] Donny Pasaribu, Pane Deasy, and Suwarna Yudi, "How Do Sectoral Employment Structures Affect Mobility during the COVID-19 Pandemic," 2021.

not change their mobility at all during the observed period. Therefore, the industry sector is associated with mobility behaviors.

The industry sector is associated with the political party as well. There are partisan preferences in the career choice, which means that some jobs are "Democratic jobs", and some are "Republican jobs". Many analyses[6][7][8] on the campaign contribution data from FEC about the job distribution over a political party. For example, according to Morris's data, the software developer is a very "Democrat job" with a percent of 83.9% Democrat workers, while the construction manager is "Republican" with a percent of 71.7% Republican workers. Though the analyses may vary on the specific ratio of Democrats versus Republicans in each job, they are consistent on the big picture. In general, the quaternary sector jobs such as programmers, data scientists, and environmental scientists have more Democrat workers, while the primary, secondary, and tertiary sector jobs such as oil workers, wholesalers, and truck drivers have more Republican workers. This partisan division in industry sectors may be due to geographic reasons. Democrats tend to live in urban areas where tech companies locate, while Republicans are likely to live in more rural regions where natural resources are abundant and manufacturing skills are necessary.[9] Hence, the industry sector is useful in explaining the treatment variable (Partisanship) in Clinton's model.

What's more, the existing independent variables in Clinton's model cannot predict the industry sector that the respondent works in. Take two observations with the same political preference, local COVID-19 severity, demographic and state effects, but different job types as an instance. One is in a tertiary sector, and the other one is a quaternary sector. They probably would not have the same level of mobility, as the person engaged in a quaternary sector can work from home and probably decrease his mobility. However, the tertiary sector worker needs to work in person and maintain a high level of mobility. To supplement this, the single independent variable in the model cannot perfectly predict the industry sector of the individual. According to the U.S. Bureau of Labor Statistics[10][11][12], the four industry sectors have the roughly same age, race, unemployment, and gender distribution patterns, despite slight differences for different

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[6] Kathy Morris, "Democratic vs. Republican Jobs: Is your Job Red or Blue," *Zippia*, November 2, 2020, https://www.zippia.com/advice/democratic-vs-republican-jobs/

[7] Verdant Labs, "Democratic vs. Republican Occupations," http://verdantlabs.com/politics_of_professions/

[8] Philip Bump, "How Democratic or Republican is your job? This Tool Tells You," *The Washington Post*, June 3, 2015, https://www.washingtonpost.com/news/the-fix/wp/2015/06/03/how-democratic-or-republican-is-your-job-this-tool-tells-you/

[9] Markus Jokela, "Urban-Rural Residential Mobility Associated with Political Party Affiliation: The U.S. National Longitudinal Surveys of Youth and Young Adults," *Social Psychological and Personality Science* (2021): 1948550621994000.

[10] The U.S. Bureau of Labor Statistics, "The Employment Situation—November 2021," December 3, 2021, https://www.bls.gov/news.release/pdf/empsit.pdf

[11] The U.S. Bureau of Labor Statistics, "Labor Force Statistics from the Current Population Survey 11b," January 22, 2021, https://www.bls.gov/cps/cpsaat11b.htm

[12] The U.S. Bureau of Labor Statistics, "Labor Force Statistics from the Current Population Survey 18b," January 22, 2021, https://www.bls.gov/cps/cpsaat18b.htm

occupations. As a result, we conclude that the industry sector of the respondent is not a redundant variable or fully represented by other covariates in Clinton's model.

Based on the model $Last24_i = \alpha_j + \gamma Democrat_i + \zeta Republican_i + \eta County\ Change\ in\ COVID\ Cases_i + \beta K_i + \epsilon_{ij}$,[13] we may form a new model by adding the industry sector factor as four dummy variables: $Last24_i = \alpha_j + \gamma Democrat_i + \zeta Republican_i + \eta County\ Change\ in\ COVID\ Cases_i + \beta K_i + \omega Primary + \varphi Secondary + \rho Tertiary + \mu Quaternary + \epsilon_{ij}$, where $Primary = 1$ means the respondent works in the primary sector and $Primary = 0$ means the respondent does not work in the primary sector. $Primary + Secondary + Teritary + Quarernary = 1$ for employed people (only count the single full-time job if people have many jobs) while $Primary + Secondary + Teritary + Quarernary = 0$ for unemployed people. However, we cannot use the omitted variable bias formulas which are $\widehat{\beta_1} \approx \beta_1 + \widehat{\beta_w}\widehat{\theta_1}$ and $\widehat{\beta_1} \approx \beta_1 + \widehat{\beta_{w1}}\widehat{\theta_{11}} + \widehat{\beta_{w2}}\widehat{\theta_{12}}$ as the omitted variables as multiple dummy variables. Thus, it's not possible to provide a specific bias via the bias formulas. We may need more data related to the industry sector to find out the bias. If the data show that Republicans who work in the quaternary sector have a similar active mobility pattern, or Democrats who work in the tertiary sector have a similar conservative mobility pattern, we may underestimate the effect of partisanship on mobility. Otherwise, we may overestimate it.

In conclusion, the industry sector that respondent works in is an omitted variable from Clinton's model, as it is associated with daily mobility and partisanship, not fully represented by other covariates. Unfortunately, the direction of the omitted variable bias is unknown and requires more information to explore. The consequences of overlooking the variable are significant. Obviously, when the local governments regulate the mobility and social distancing of their citizens, they probably will not impose supplementary policies that help people who work in the sectors with high demand for mobility and close contact to find alternative and flexible methods. The result would either be a detriment to the economy or the ineffectiveness of the social distancing policies.

[13] lbid.

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