**Referee Report**

In America, a person's 21st birthday is an important milestone because this is when they can drink legally. The article titled "The Effects of Alcohol on the Consumption of Hard Drugs: Regression Discontinuity Evidence from the 1997 National Longitudinal Study of Youth" by Monica Deza employs a regression discontinuity (RD) design framework to analyze the impact of an increase in alcohol consumption as the result of the minimum legal drinking age on using hard drugs. The dataset utilized in the paper comes from the 1997 National Longitudinal Survey of Youth (NLSY97), which consists of 8,984 male and female participants in 13 waves between 1997 and 2009. For the analysis, the periods are restricted to periods when young adults are between 19 and 23.

The paper's main findings reveal that the minimum legal drinking age exerted a positive impact on all alcohol usage measures but resulted in the opposite effect on hard drug consumption. Overall, the study results revealed that the number of people who use hard drugs decreased discontinuously at 21 by approximately 1.5 to 2 percentage points and was robust across specifications. Likewise, the probability of being introduced to drug usage dropped by one percentage point at age 21, while intensity did not change. All of the estimates turned out to be robust in response to several specifications and different subsamples.

The paper sets itself apart from the literature by emphasizing three aspects of hard drug consumption and how they are influenced by alcohol consumption. The literature has analyzed alcohol's impact on a wide range of topics such as vehicle accident fatalities, arrests, and mortality. Still, more focus has been devoted to study the effects of alcohol on marijuana and tobacco usage. This paper contributes to the literature by focusing more on the connection between alcohol and hard drugs. The paper zeros in on three different degrees of hard drug consumption, such as whether they are used or not, how often they are used, and if they are just being introduced.

Overall, the paper did an excellent job of discussing the relevance and importance of the research question, including covariates, different model specifications, and laying the foundation for future research possibilities. First off, the article raises awareness to policymakers, and the public of the influence alcohol holds among the nation's youth, representing future generations. Deza accounts for various time-varying covariates to improve accuracy of the results, such as two or four-year college enrollment, work status, the highest level of educational attainment, and demographics. The paper's inclusion of three different model specifications considers non-linear relationships using first, second, and third-order polynomials. Lastly, even though the study is not free of shortcomings, it lays the foundation for future researchers to improve the study's accuracy by addressing the setbacks such as acquiring a dataset that includes the exact date of drug usage and birth date of participants (Deza, 2015).

Several caveats present in the study need to be addressed to improve the paper's accuracy. The first problem is that the survey data utilized in the study is self-reported, which can result in measurement error. In other words, the participants may or may not be truthful about their drug or alcohol consumption. Those who use hard drugs such as cocaine are less incentivized to report it because it is illegal. The next issue is connected to the previous one since participants were more likely to report alcohol consumption as soon as they turn 21 because that’s the legal drinking age. Thus, those who drank alcohol at an earlier age were less likely to report because it is illegal.

Other limitations included in the study put its generalizability and accuracy into question. The findings are not generalizable to different age groups since Deza examines the impacts of alcohol at 21. Another limitation is that the actual date states comply with the minimum legal drinking age is potentially nonrandom since they all accepted 21 as the minimum legal drinking age in 1988. Unfortunately, even though the dataset is still valuable, it did not include the exact birthdate or date participants had used hard drugs. An ideal dataset would consist of the exact dates, which could open the door for future research and perhaps conduct the study in a more natural setting. Another setback is that people who turn 21 are more likely to consume alcohol in public places, which means it is much more costly to consume hard drugs out in the open, thereby biasing the estimates. A final aspect that is questionable is that Deza does not account for participants' income. It is hard to imagine those under 21 or precisely at the age of 21, having large amounts of income to purchase alcoholic beverages in the first place.

The identification strategy that the paper used is the minimum legal drinking age law to analyze the relationship between alcohol and hard drugs while applying a sharp RD design framework. The two following conditions must hold to employ a successful RD design model. First, there cannot be perfect manipulation of the running variable, and nothing else must change at the cutoff. The running variable in this study is age, while the treatment is the ability to drink legally. As for the initial condition, it is highly unlikely that ethical researchers would manipulate the participants' results through the self-reported survey. All states adopted the minimum legal drinking age simultaneously in 1988, which satisfies the second assumption underlying the RD design framework. As a result, the difference in expected outcomes when crossing the cutoff are attributable to the treatment itself and not any other outcomes. Employing a sharp RD design makes sense since participants can either legally drink or not as determined by the treatment. A final note is that the different model specifications that account for non-linearity using different order polynomials and inclusion of possible covariates that could potentially influence the relationship of interest are beneficial in building an effective identification strategy.

As far as mechanisms are concerned, the reason the results turned out the way they did makes sense intuitively. For instance, the reported use of alcohol across different alcohol consumption measures experienced a discontinuous increase at 21 because it is the legal drinking age. Therefore, one would expect an increase in peoples' drinking habits to be slightly above the 21 age cutoff point. A discontinuous decrease in the consumption of hard drugs before and after 21 makes sense since the workforce doesn't allow employees to consume hard drugs and requires employees to take drug tests, which is a different setting compared to a college one. Drug use initiation decreased at 21 and occurred for the same reason. All of the estimates were robust across different specifications and subsamples, indicating a relationship between alcohol and hard drug consumption resulting from the minimum legal drinking age (Deza, 2015).

Two minor suggestions on how Deza could improve her paper are related to clarification and typo issues. There are several instances in Deza's article in which definitions should be provided for unfamiliar terminology. For example, Deza does not explain what the word attrition means, which causes those who are not familiar with the word to use an outside source, such as an online dictionary, to uncover its meaning. Another aspect of the paper that needs additional clarification is that Deza mentions how the survey gathered 13 waves but did not specify how many months or years distinguish a wave from another. Deza would make her study much more understandable and convenient for readers if she included definitions of uncommon terminology and filled in clarification gaps.

The next minor error that needs fixing is typo mistakes, which creates confusion among readers. For example, in one part of the paper, instead of putting 2009, 1009 was used. Similarly, the study mistakenly refers to a panel C in two of the tables instead of panel B. These two minor mistakes create confusion among readers and injure the study's credibility. Fixing these two errors are simple and will improve the paper's credibility and eliminate confusion (Deza, 2015).

Despite the weaknesses present in Deza's paper, it raises awareness of the question and contributes to the literature revolving around the topic. Deza employed an effective identification strategy, and the mechanisms present in the paper make sense. This research illustrates that no economic research study is free of errors, nor is perfect. Regardless of its limitations, Deza's study provides future research possibilities to expand and improve on.

**Reference**

Deza, M. (2015). The effects of alcohol on the consumption of hard drugs: regression discontinuity evidence from the National Longitudinal Study of Youth, 1997. *Health economics*, *24*(4), 419-438.