Online Appendix

Examiner and Judge Designs in Economics: A Practitioner's Guide

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Appendix Table A.1: Applications of Examiner Researcher Designs in Economics

Topic	Study	Year	Treatment	Examiner	Outcome(s)
Crime	Kling	2006	Incarceration length	Judge	Employment, earnings
Crime	Abrams	2010	Incarceration Length	Public Defender	Recidivism
Crime	Chen	2010	Sexual Harassment Case Decision	Judge	Gender Inequality
Crime	Green and Winik	2010	Sentence	Judge	Recidivism
Crime	Di Tella and Schargrodsky	2013	Monitoring method	Judge	Recidivism
Crime	Loeffler	2013	Imprisonment	Judge	Recidivism, unemployment
Crime	Aizer and Doyle	2015	Juvenile incarceration	Judge	Educational attainment, adult recidivism
Crime	Andersen and Wildeman	2015	Probation	Parole Officer	Labor Market Outcomes & Recidivism
Crime	Mueller-Smith	2015	Incarceration	Judge	Recidivism, employment outcomes, public assistance
Crime	Roach and Schanzenbach	2015	Additional Prison Time	Judge	Recidivism
Crime	Gupta et al.	2016	Money bail	Bail judge	Conviction, recidivism
Crime	Leslie and Pope	2017	Pretrial detention	Judge	Conviction, recidivism
Crime	Lum et al.	2017	Setting Bail	Judge	Case Outcome
Crime	Arnold et al.	2018	Racial bias	Bail Judge	Misconduct bail rates
Crime	Arteaga	2018	Parental incarceration	Judge	Children's educational attainment
Crime	Bhuller et al.	2018	Parental incarceration	Judge	Criminal justice outcomes, education, employment
Crime	Dobbie et al.	2018	Pretrial detention	Judge	Conviction, recidivism, employment
Crime	Dobbie et al.	2018	Parental incarceration	Judge	Crime, education, employment
Crime	Harding et al.	2018	Imprisonment	Judge	Labor Market Outcomes
Crime	Stevenson	2018	Pretrial detention	Bail magistrates	Conviction
Crime	Cortés et al.	2019	Juvenile Incarceration	Public Attorney	Recidivism
Crime	Harding et al.	2019	Imprisonment	Judge	Violent Crime
Crime	Hjalmarsson and Lindquist	2019	Military Conscription	Officiator	Crime
Crime	Ribeiro and Ferraz	2019	Pretrial detention	Judge	Recidivism
Crime	White	2019	Incarceration	Judge	Voting
Crime	Aneja and Avenancio-León	2020	Incarceration	Judge	Credit Access
Crime	Bhuller et al.	2020	Incarceration	Judge	Recidivism, employment
Crime	Didwania	2020	Pretrial release	Judge	Case outcomes
Crime	Meier et al.	2020	Early Release	Judge	Reincarceration
Crime	Zapryanova	2020	Prison time, parole time	Judge	Recidivism
Crime	Agan et al.	2021	Misdemeanor prosecution	District Attorney	Subsequent Crime involvement, local crime
Crime	Arbour	2021	Reintegration Program	Probation Officer	Recidivism
Crime	Bhuller and Sigstad	2021	Sentence Reversal	Appeal Panel	Judge Behavior
Crime	Bhuller et al.	2021	Incarceration	Judge	Health of prisoners, prisoners' family members
Crime	Eren and Mocan	2021	Juvenile crime punishment	Judge	Adult recidivism, high school completion
Crime	Grau et al.	2021	Pretrial detention	Judge	Post-verdict labor market outcomes
Crime	Klaassen	2021	Fines & Court Fees	Judge	Reoffending
Crime	Norris et al.	2021	Parental/sibling incarceration	Judge	Incarceration, education, teen parenthood, neighborhood
Crime	Alexeev and Weatherburn	2022	Monetary penalty	Judge	Future crime, drug use
Crime	Augustine et al.	2022	Pretrial diversion programs	Judge	Case outcomes, subsequent Crime contact
Crime	Gillooly	2022	Priority 911 Call Classification	911 Call-Takers	Police Perception
Crime	Jordan and Kim	2022	Police Oversight	Supervising Investigator	Officer Behavior
Crime	LaForest	2022	Early Prison Release	Parole Interviewers	Recidivism
Crime	Rateb	2022	Pretrial Detention	Bail Judge	Court & Crime Outcomes

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Appendix Table A.1: Applications of Examiner Researcher Designs in Economics (continued)

Crime	Williams and Weatherburn	2022	Electronic Monitoring	Judge	Recidivism
Crime	Amaral et al.	2023	Arrest for Domestic Violence	Police Officer	Future Domestic Violence Calls
Crime	Ash and Nix	2023	Asylum	Judge	Failure to appear
Crime	Gonçalves and Mello	2023	Sanctions for speeding	Police officer	Recidivism; speeding offenses
Crime	Helland and Yun	2023	Informal Discovery Conferences	Judge	Number of Discovery Motions
Crime	Humphries et al.	2023	Conviction & Incarceration	Judge	Recidivism
Crime	Jordan et al.	2023	Incarceration, sentencing	Judge	Recidivism
Crime	Lee	2023	Residential Imprisonment	Case Manager	Reincarceration
Crime	Nesbit	2023	Mental Health Treatment	Judge	Recidivism
Crime	Stevenson et al.	2023	Incarceration, convictions	Judge	Recidivism
Crime	Arbour and Marchand	2024	Parole	Parole Board Members	Recidivism
Crime	Axbard	2024	Convicting Corrupt Officials	Judge	Local Government Outcomes
Crime	Wermink et al.	2024	Short-Term Imprisonment	Judge	Recidivism
Finance	Chang and Schoar	2006	Chapter 11 bankruptcy	Judge	Re-filing for bankruptcy
Finance	Munroe and Wilse-Samson	2013	Foreclosure	Chancery-Court Judges	Nearby Foreclosures
Finance	Dobbie and Song	2015	Chapter 13 bankruptcy	Judge	Earnings, mortality, foreclosure rates
Finance	Dobbie et al.	2017	Chapter 13 bankruptcy	Judge	Adverse financial events
Finance	Fraisse	2017	Debt Suspension	Manager	Likelihood to Re-Default
Finance	Bernstein et al.	2019	Firm Liquidation & Reorganization	Judge	Asset Utilization
Finance	Bernstein et al.	2019	Firm Liquidation & Reorganization	Judge	Nearby Employment
Finance	Caskurlu	2019	Strength of Patent Rights	Judges	Acquisition of Substitute Patents & Firm Outcomes
Finance	Rieber and Schechinger	2019	Rating change	Credit rating analyst	Herding behavior
Finance	Dippel and Frye	2020	Allotment of land	US government	Employment, educational attainment, location
Finance	Bamieh et al.	2021	Firing Costs	Judge	Employee Turnover
Finance	Bonfim and Nogueira	2021	Corporate Reorganization and Liquidation	Judge	Reallocation of Labor
Finance	Cespedes et al.	2021	Chapter 13 bankruptcy	Judge	Foreclosure rate, propensity to move, crime rate
Finance	Cheng et al.	2021	Out of court settlement	Judge	financial distress (relative to in-court settlement)
Finance	González-Uribe and Reyes	2021	Alleviating Firm Constraints	Judge	Firm Revenue & Growth
Finance	Grindaker et al.	2021	Bankruptcy	Judge	CEO Career Outcomes
Finance	Honigsberg and Jacob	2021	Expungement	Arbitrators	Future misconduct, long-term career prospects
Finance	Manoel and Augusto Brunassi Silva	2021	Court Delay	Judge	Approval Votes & Plan Approval
Finance	Antill	2022	Firm Liquidation	Bankruptcy Judge	Creditor Recovery
Finance	Beaudry and Willems	2022	Growth Forecast Optimism	IMF Mission Chief	Macroeconomic Outcomes
Finance	Huttunen et al.	2022	Harsher Punishment	Judge	Recidivism for Financial Crimes
Finance	Araujo et al.	2023	Firm Continuation	Judge	Employee Outcomes
Finance	Quignon	2023	Crowd Rating	Evaluator	Funding

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Appendix Table A.1: Applications of Examiner Researcher Designs in Economics (continued)

Finance	Bonfim and Nogueira	2024	Firm Reorganization	Judge	Employee Labor Outcomes
Finance	Ivanov and Wang	2024	Firm Supervision	Bank Examiner	Corporate Lending
Health	Abaluck et al.	2016	Anticoagulation Prescription	Physician	Having a Stoke
Health	Chan et al.	2019	Pneumonia diagnosis	Radiologist	Patient health
Health	Doyle et al.	2019	Hospital quality	Ambulance company	Patient health outcomes
Health	Bakx et al.	2020	Nursing home eligibility	Nursing home assessor	Health, Healthcare spending
Health	Blæhr and Søgaard	2021	Psychotherapy	Hospital departments	Suicide attempts; Health and economic outcomes
Health	Bos et al.	2021	Mental-illness diagnosis	Doctor	Health, labor market, wealth, family outcomes
Health	Berggren	2022	Obtaining an Antibiotic Prescription	General Practitioner	Child Health Outcomes
Health	Cooper et al.	2022	Hospital Prices	Ambulance Company	Mortality
Health	Eichmeyer and Zhang	2022	Medical care	Physician	Opiod use, fentanyl use
Health	Mullainathan and Obermeyer	2022	Mental-illness diagnosis	Doctor	Health, labor market, wealth, family outcomes
Health	Silver and Zhang	2022	Benefit Generosity	Medical Examiner	Health and Well-Being
Health	Bos et al.	2023	Mental Illness Diagnosis	Doctor	Health and Employment Outcomes
Health	Chan et al.	2023	VA Care	Ambulance Company	Mortality, Patient Spending
Health	Eichmeyer and Zhang	2023	Opioid Prescription	Provider	Opioid Dependency & Patient Health Outcomes
Health	Grimon	2023	Child Welfare Intervention	Investigators	Mother's Enrollment in Mental Health and Substance Abuse Treatment Services
Health	Helénsdotter	2023	Removal of Child From Home	Judge	Child's Health
Health	Ofek-Shanny et al.	2023	Long-Term Care Subsidy	Evaluators	Health & Labor Outcomes of Children
Health	Huynh and Chan	2024	Disability Claims	Caseworkers & Physicians	Health Outcomes
Patents	Galasso and Schankerman	2015	Removing patent rights	Judge	Subsequent research related to focal patent
Patents	Sampat and Williams	2015	Patent	Investors	Subsequent research and commercial investment
Patent	Farre-Mensa et al.	2016	Patent	Patent Examiner	Subsequent employment growth, sales, innovation
Patents	Galasso and Schankerman	2018	Patent invalidation	Judge	Subsequent innovation and exit by patent holders
Patents	Gaule	2018	Patent Acquisition	Patent Examiner	Firm Outcomes
Patent	Dyevre	2023	R&D Funding Source	Patent Examiner	Aggregate Productivity Growth
Patent	Gupta	2023	Patent Acquisition	Patent Examiner	Monopoly Life
Public	Doyle	2007	Foster care	Child protection worker	Juvenile delinquency, teen motherhood, employment
Public	Doyle	2008	Foster care	Child protection worker	Adult crime
Public	Famulari	2012	Remedial Writing	Grader	Academic Performance
Public	Doyle Jr	2013	Foster care	Child protection worker	Delinquency, health
Public	Maestas et al.	2013	Disability benefits	Disability examiner	Labor supply
Public	Dahl et al.	2014	Receipt of a welfare	Judge	Participation in the next generation
Public	French and Song	2014	Disability benefits	Judge	Labor supply
Public	Autor et al.	2017	Disability benefits	Judge	Household income, consumption, labor supply
Public	Black et al.	2018	Disability benefits	Judge	Mortality
Public	Hyman	2018	Trade Adjustment Assistance	Case investigator	Labor market outcomes
Public	Okudaira	2018	Worker Court Victory	Judge	Job Creation & Destruction

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Appendix Table A.1: Applications of Examiner Researcher Designs in Economics (continued)

Public	Arni and Schiprowski	2019	Job Search Requirements	Case Worker	Effort and Labor Market Outcomes
Public	Galletta et al.	2019	Judge Sentiments in Court Decisions	Judge	Social Attitudes
Public	Hjalmarsson and Lindquist	2019	Mandatory military service	Draft officiator	Criminal behavior, post-service labor market outcomes
Public	Humphries et al.	2019	Eviction	Judge	Financial distress, residential mobility, neighborhood
Public	Baron and Gross	2020	Foster care	Child protection worker	Children's safety and educational outcomes
Public	Diamond et al.	2020	Foreclosure	Judge	Housing stability, homeownership, financial stress
Public	Bald et al.	2022	Foster care	Child protection worker	Child test scores, grade repetition
Public	Baron and Gross	2022	Foster care	Child protection worker	Adult arrests, convictions, incarceration; child safety
Public	Cohen	2022	Housing assistance	Case manager	Homelessness, crime, income, employment
Public	Collinson et al.	2022	Evictions	Judge	Homelessness, earnings, access to credit
Public	van der Klaauw and Vethaak	2022	Broader Job Search Requirements	Case Worker	Job Finding
Public	De Souza	2023	Disabled Worker Quota	Inspector	Labor Market & Welfare
Public	Herbst	2023	IDR Enrollment	Servicing Agent	Student Borrower Outcomes
Public	Jeremy	2023	Vacancy Referrals	Caseworker	Job Interview & Offers
Public	Lee	2023	Residential housing	Case manager	Reincarceration
Public	Moscona	2023	Management of Development Aid	Project Leader	Violent Conflict in Africa
Public	Silver and Zhang	2023	Monthly cash benefits	Mental disorder examiner	Food security, homelessness, debt, health, mortality
Public	Yin et al.	2023	Vocational Rehabilitation Services	Vocational Rehabilitation Counselors	Employment Outcomes

Notes: This table provides a survey of 136 studies in economics that have used examiner tendency research designs.

A Examples with monotonicity violations

When treatment effects are heterogeneous and examiners differ in how they rank subjects for treatment, our main text highlights that 2SLS identifies a proper weighted average of treatment effects if an average monotonicity condition holds. This section provides stylized examples of cases in which average monotonicity may *or* may not hold in the presence of violations of pairwise monotonicity.

To begin, consider a setting in which bail judges assign defendants to pretrial detention or pretrial release. Each judge observes two characteristics for the defendant: (i) whether the defendant has a criminal history and (ii) whether they belong to a majority racial group. Let c_i and r_i be indicators for having a criminal history or being a majority racial group member, respectively. Each judge j decides whether to detain defendant i by evaluating whether the defendant's probability of misconduct exceeds a judge-specific threshold $\tau_j(r_i)$. Judges may set different thresholds based on racial group status due to taste-based discrimination. Let $D_i(j)$ be a dummy variable indicating whether person i would be assigned to pretrial detention by judge j. The fraction of the population assigned to pretrial detention by judge j is measured by p_j.

In this setting, we specify that the probability of misconduct depends only on criminal history. Specifically, we assume that 50 percent of defendants with a criminal history and 30 percent of those without a criminal history will engage in pretrial misconduct if released. Race could be indirectly informative about misconduct if rates of criminal histories vary across demographic groups (although we do not impose that condition in our examples below). We formalize taste-based discrimination as instances in which judges apply a lower threshold for pretrial detention to defendants in the minority group given a probability of pretrial misconduct. Specifically, their threshold for individuals in the minority group is 0.4 lower than their threshold for people in the majority group. For some possible judges, this setup can lead to patterns that are consistent with average monotonicity but not pairwise monotonicity. It can also lead to violations of average monotonicity. To illustrate the possible monotonicity violations, consider the following scenarios:

Case 1: Average monotonicity holds; pairwise monotonicity is violated. In the population, suppose the following: 45% do not have a criminal record and belong to the majority group; 5% do not have a criminal record and belong to minority group; 45% have a criminal record and belong to the majority group, and 5% have a criminal record and belong to the minority group. In other words, 50% of those in the majority and 50% of those in the minority groups have criminal records. There are four judges, and we assume that judges 1 and 3 discriminate against members of the minority group by having 0.4 lower thresholds for detention.

Appendix Table A.2 (below) summarizes treatment outcomes for defendants assuming that each judge has an equal caseload. Each labelled column reports the potential treatment outcomes for each of the four types of defendants defined by the two observed characteristics. For example, column 1 shows that no judge assigns defendants who are majority group members without a criminal record to treatment. This is because the probability of misconduct is 30% for individuals without a criminal record and this falls below all judges' thresholds for the majority group.

In this example, pairwise monotonicity does not hold because judge 2, whose propensity to treat is 0.5, assigns people in the minority group without a criminal record to pretrial release, while judge 3, whose propensity to treat is 0.1, assigns them to pretrial detention. However, average monotonicity holds because the covariance between potential treatment status and judge propensity to treat is nonnegative for all types of defendants.

Appendix Table A.2: Pairwise Monotonicity is Violated and Average Monotonicity Holds

				Potential Treatment Status, $D_i(j)$ by Defendant Type				
				(1)	(2)	(3)	(4)	
		τ_j		No criminal history		Criminal history		
Judge	Discriminator?	Majority	Minority	Majority	Minority	Majority	Minority	p_j
1	Yes	0.4	0.0	0	1	1	1	0.55
2	No	0.5	0.5	0	0	1	1	0.50
3	Yes	0.6	0.2	0	1	0	1	0.10
4	No	0.7	0.7	0	0	0	0	0.00
Covariance of $D_i(j)$ and p_j for defendant type				0	0.019	0.119	0.072	

Notes: This table is an example in which judge behavior violates pairwise monotonicity while average monotonicity holds. The four columns labelled to the right indicate the potential treatment status $D_i(j)$ for defendants defined by whether (i) they have observabled criminal backgrounds and (ii) whether they are members of a minority or majority group. The four rows of the table list each judge j, where two of the judges discriminate against members of a minority group by imposing a lower threshold (τ_j). Each row (final column at right) reports the population weighted likelihood of treatment for each judge (p_j). The bottom row of the table reports the covariance of potential treatment status and judge-specific treatment probability across the four judges, conditional on the type of defendant.

Case 2: Average monotonicity is violated. Consider Case 1 while removing judge 1 from the example. Appendix Table A.3 shows that both average monotonicity and pairwise monotonicity are violated in this scenario. This case with the three remaining judges illustrates that the satisfaction of monotonicity conditions can be sensitive to which judges are included in the sample. This is not specific to average monotonicity; if we start with Case 1 and remove judge 3, then pairwise monotonicity (and, therefore, average monotonicity) would hold.

Appendix Table A.3: Both Pairwise Monotonicity and Average Monotonicity Violated

				Potential Treatment Status, $D_i(j)$ by Defendant Type				
				(1)	(2)	(3)	(4)	
		τ_j		No criminal history		Criminal history		
Judge	Discriminator?	Majority	Minority	Majority	Minority	Majority	Minority	p_j
2	No	0.5	0.5	0	0	1	1	0.50
3	Yes	0.6	0.2	0	1	0	1	0.10
4	No	0.7	0.7	0	0	0	0	0.00
Covariance of $D_i(j)$ and p_j for defendant type				0	-0.033	0.100	0.067	

Notes: This table is a stylized example in which judge behavior violates both pairwise and average monotonicity. See Appendix Table A.2 for detailed notes.

B Detailed discussion of multiple treatments frameworks

Bhuller and Sigstad (2023) and Humphries et al. (2023) provide frameworks in which 2SLS can identify positively weighted averages of the effects of multiple treatments in examiner tendency designs. Specifically, Bhuller and Sigstad (2022) show when linear 2SLS with multiple endogenous treatments using examiner propensities for each treatment as excluded instruments identifies proper weighted causal effects. By contrast, Humphries et al. (2023a) shows when 2SLS controlling for non-focal propensities identifies proper weighted average effects of a focal treatment. This appendix describes the conditions in each framework in turn, and then develops an important special case in which they are equivalent: that of three mutually exclusive treatments and three examiners.

First, we establish notation in the case of three mutually exclusive treatment categories and three examiners that will be useful for both frameworks. For individual i, we index the treatment categories by $D_i \in \{0,1,2\}$ and the three possible examiners by $J_i \in \{0,1,2\}$.[1] Let $D_{si} := 1(D_i = s)$ be an indicator for actually receiving treatment s, and $p_s(J_i) = E[D_{si}|J_i]$ be the propensity of the examiner to assign individuals to treatment s. Denote potential treatment status as $D_{si}(j)$ which is an indicator for receipt of treatment s if the individual is assigned to examiner j. There are several "margins" of treatment effects given the multiple treatments in this context. The natural treatment effects of interest compare potential outcomes under treatment s to a reference treatment which is designated by zero: $\delta_i^{0\to s} := Y_i(s) - Y_i(0)$, where $Y_i(s)$ is individual i's potential outcome under treatment s. The goal in the Bhuller and Sigstad (2022) framework is to identify proper weighted averages of $\delta_{1i}^{0\to 1}$ and $\delta_i^{0\to 2}$ as coefficients on the indicators D_{1i} and D_{2i} from 2SLS estimation of the equation:

$$Y_i = \alpha + \delta_1 D_{1i} + \delta_2 D_{2i} + \varepsilon_i,$$

where $p_1(J_i)$ and $p_2(J_i)$ are the excluded instruments. In the Humphries et al. (2023a) framework the goal similar: identify proper weighted averages of a focal treatment, controlling (perhaps linearly) for non-focal propensities:

$$Y_i = \alpha + \delta_1 D_{1i} + \pi p_2(J_i) + \varepsilon_i.$$

In what follows below, we adapt the identifying assumptions from Bhuller and Sigstad (2022) and Humphries et al. (2023a) to this setting. Throughout, we assume that examiners are assigned randomly, vary sufficiently in their propensities (i.e., they satisfy the instrument rank condition), and only influence outcomes through D_i. Note that some of the conditions below invoke the concept of *partial correlation*. The partial correlation between random variables A and B given C is equal to the usual (Pearson) correlation between the residuals from a linear regression of A on C and the residuals from a linear regression of B on C.

[1] The index notation that we chose is intentional. As discussed below, the Bhuller and Sigstad conditions imply a mapping between examiners and treatments.

B.1 Bhuller and Sigstad (2023) Assumptions

In the following assumptions, consider J_i (individual i's examiner assignment) to be a random variable for each individual i, whose distribution is determined by the mechanism assigning examiners to individuals. Therefore, $D_{1i}(J_i)$, $D_{2i}(J_i)$, $p_1(J_i)$, and $p_2(J_i)$ are also random variables for each individual i. The following conditions govern the relationships among these random variables for each individual i.

- *Average conditional monotonicity (ACM).* ACM is defined for each specific treatment given another. ACM of treatment 1 given $p_2(J_i)$, denoted ACM(1|2), requires that, for every individual i, the partial correlation between $p_1(J_i)$ and $D_{1i}(J_i)$ given $p_2(J_i)$ be nonnegative. In other words, a hypothetical examiner-level linear regression of $D_{1i}(J_i)$ on $p_1(J_i)$ and $p_2(J_i)$ yields a positive coefficient on $p_1(J_i)$ for each individual i. ACM of treatment 2 given $p_1(J_i)$ is defined similarly.

- *No cross effects (NC).* NC is also defined specifically for each treatment. The NC condition for treatment 1 given $p_2(J_i)$, denoted NC(1|2), says that, for every individual i, the partial correlation between $p_1(J_i)$ and $D_{2i}(J_i)$ is zero. The NC condition for treatment 2 is defined similarly.

Intuitively, assumptions ACM(1|2) and NC(1|2) together ensure that increasing $p_1(J_i)$, controlling linearly for $p_2(J_i)$, on average increases $D_{1i}(J_i)$ and on average has zero effect on $D_{2i}(J_i)$. The key consequence is that the 2SLS coefficient on D_{1i} in a model with D_{1i} and D_{2i} as endogenous regressors and $p_1(J_i)$ and $p_2(J_i)$ as excluded instruments identifies a proper weighted average of $\delta_i^{0\to1}$. Similarly, ACM(2|1) and NC(2|1) imply that the coefficient on D_{2i} identifies a proper weighed average of $\delta_i^{0\to2}$.

B.2 Humphries et al. (2023) Assumptions

The conditions in Humphries et al. (2023a) consider variation in treatment assignment holding the examiner propensity for one of the treatments fixed. In the case of three examiners, this means considering how treatment status would change if an individual were switched between two examiners who have the same propensity for one of the treatments. To make the condition below concrete, suppose examiner $J_i = 1$ has higher propensity for treatment 1 than examiner $J_i = 0$, but they have equal propensities for treatment 2 (i.e., $p_1(1) > p_1(0)$ and $p_2(0) = p_2(1)$). Similarly, suppose that examiner $J_i = 2$ has higher propensity for treatment 2 than examiner 0, but they have equal propensities for treatment 1 (i.e., $p_2(2) > p_2(0)$ and $p_1(0) = p_1(2)$). Humphries et al. (2023a) provide the following condition under which the coefficient on D_{1i} in an IV procedure that employs $p_1(J_i)$ as the excluded instrument and conditions (perhaps nonparametrically) on $p_2(J_i)$ will recover a proper weighted average of $\delta_i^{0\to1}$.

- *Unordered partial monotonicity (UPM).* UPM of treatment 1 given treatment 2, denoted UPM$(1|2)$ means the following hold for all i:

    1. $D_{1i}(1) \geq D_{1i}(0)$
    2. $D_{0i}(1) \leq D_{0i}(0)$

3. $D_{2i}(1) = D_{2i}(0)$

UPM$(1|2)$ implies that, if an individual were to switch from examiner 0 to examiner 1 (which increases $p_1(J_i)$ holding $p_2(J_i)$ fixed), that individual might switch into treatment 1, but would never switch out. The second inequality means the individual might switch out of treatment 0, but would never switch in. The equality means no individual's treatment 2 status would change when switching from examiner 0 to examiner 1.[2] In other words, the only change that could happen if an individual were to switch from examiner 0 to examiner 1 is a switch from treatment 0 to treatment 1. Similarly, UPM$(2|1)$ means that the only change that could happen if an individual were to switch from examiner 0 to examiner 2 (which increases $p_2(J_i)$ holding $p_1(J_i)$ constant) is a switch from treatment 0 to treatment 2.

In the current special case where examiners 0 and 1 have identical propensities for treatment 2 and examiners 0 and 2 have identical propensities for treatment 1, the assumption UPM(1l2) implies that the 2SLS coefficient on D_{1i}, with $p_1(J_i)$ as the excluded instrument and conditioning on $p_2(J_i)$, identifies a proper weighted average of $\delta_i^{0\to 1}$.

Here "conditioning on $p_2(J_i)$" is equivalent to including it as a linear control because $p_2(J_i)$ takes on only two values. Beyond this special case, however, conditioning on $p_2(J_i)$ would either require nonparametrically controlling for $p_2(J_i)$, or assuming additionally that $E[p_{1i}(J_i)|p_2(J_i)]$ is linear in $p_2(J_i)$.

Identifying proper weighted averages of $\delta_i^{0\to 2}$ requires the analogous assumption UPM$(2|1)$. If both UPM$(1|2)$ and UPM$(2|1)$ hold, then 2SLS estimation with both D_{1i} and D_{2i} as endogenous regressors and $p_1(J_i)$ and $p_2(J_i)$ as excluded instruments identifies effects of both treatments.

B.3 Equivalence of Results

In this just identified example, the Bhuller and Sigstad (2022) conditions are equivalent to the Humphries et al. (2023a) conditions. That is, ACM$(1|2)$, ACM$(2|1)$, NC$(1|2)$, and NC$(2|1)$ imply UPM$(1|2)$ and UPM$(2|1)$ and vice versa. To see this, note that these conditions restrict only how individuals' treatment status responds to examiner assignment. The two sets of conditions are equivalent if they allow the same responses of individual treatment status to examiner assignment.

There are 27 possible ways that the three examiners can allocate a defendant to one of three treatments. Appendix Table A.4 below lists all the possible treatment permutations. We'll refer to each treatment permutation as a "response type." Each response type is defined by its potential treatment states as a function of examiner assignment: $(D_i(0), D_i(1), D_i(2)) \in \{0,1,2\}^3$. For example, the response type "always 0" is allocated to treatment 0 by all three examiners, and so has potential treatment states $(0,0,0)$.

The second column of the table shows that the Bhuller and Sigstad (2022) assumptions, ACM$(1|2)$, ACM$(2|1)$, NC$(1|2)$, and NC$(2|1)$, allow only six response types:

- $(0,0,0)$
- $(1,1,1)$

[2] In Humphries et al. (2023a), the equality is expressed as a weak inequality, but in our three-examiner, three-treatment scenario here where examiners 0 and 1 share the same propensity for treatment 2, the weak inequality must be satisfied with equality.

- $(2, 2, 2)$
- $(0, 1, 0)$
- $(0, 0, 2)$
- $(0, 1, 2)$.

The third column shows that the Humphries et al. (2023a) assumptions, UPM$(1|2)$ and UPM$(2|1)$, allow the same six response types. It also shows how each of the prohibited response types violates those conditions.

The two sets of assumptions make identical restrictions on how individual treatment status responds to examiner assignment, and therefore are equivalent in this special case.

The argument above establishes via brute force that the two assumptions are equivalent. Further intuition is provided in Figure A.1 which illustrates the pattern of treatment assignment that must occur in this setting. The rows represent each of the three judges while the columns represent the six allowed response types. The pattern in each cell of the figure indicates whether defendants of a given response type would be assigned to treatment 0 (dots), 1 (crosshatch dots) or 2 (crosshatch) when they are assigned to a specific examiner.

Appendix Figure A.1 below illustrates three response types that we might describe as "always-takers" of one of the three treatments. Defendants whose potential treatment status is defined by the vector (0,0,0) always receive treatment 0. Similarly, response types (1,1,1), and (2,2,2) receive the same treatment regardless of examiner assignment. For the remaining three response types, treatment status varies with examiner assignment. All of them will be assigned to treatment 0 if assigned to examiner 0. Examiner 1 moves some of them into treatment 1, and examiner 2 moves some of them into treatment 2.

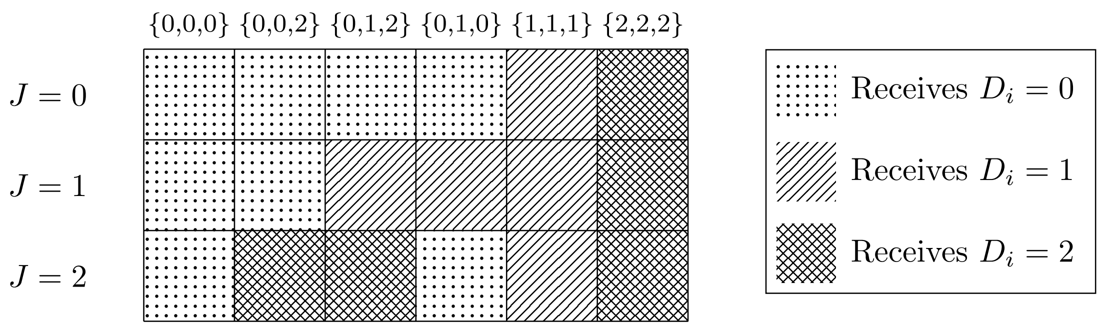
The figure demonstrates that not only do the allowable response types imply the existence of a reference treatment, they also imply the existence of a reference examiner. Identification of the average effects $\bar{\delta}_1$ and $\bar{\delta}_2$ effects is possible because a comparison between those assigned to examiners 1 and 0 isolates the impact of receiving treatment 1 relative to treatment 0. Similarly, the comparison between those assigned to examiners 2 and 0 isolates the impact of receiving treatment 2 relative to treatment 0. For a researcher to argue that only the six allowed response types will exist in their setting, they must be willing to argue that there is a labeling of examiners such that one is the reference examiner, while the other examiners only move people across exactly one treatment margin relative to the reference examiner.

Appendix Table A.4: Response types allowed under ACM, NC, and UPM Assumptions

(1) Response type: $(\mathbf{D(0)}, \mathbf{D(1)}, \mathbf{D(2)})$	(2) **Satisfies ACM and NC conditions?**	(3) **Satisfies UPM inequalities?**
$(\mathbf{0}, \mathbf{0}, \mathbf{0})$	**Yes**	**Yes**
$(0, 0, 1)$	No	Violates UPM$(2\|1)$ #3
$(\mathbf{0}, \mathbf{0}, \mathbf{2})$	**Yes**	**Yes**
$(\mathbf{0}, \mathbf{1}, \mathbf{0})$	**Yes**	**Yes**
$(0, 1, 1)$	No	Violates UPM$(2\|1)$ #3
$(\mathbf{0}, \mathbf{1}, \mathbf{2})$	**Yes**	**Yes**
$(0, 2, 0)$	No	Violates UPM$(1\|2)$ #3
$(0, 2, 1)$	No	Violates UPM$(1\|2)$ #3 and UPM$(2\|1)$ #3
$(0, 2, 2)$	No	Violates UPM$(1\|2)$ #3
$(1, 0, 0)$	No	Violates UPM$(1\|2)$ #1 & #2 and UPM$(2\|1)$ #2 & #3
$(1, 0, 1)$	No	Violates UPM$(1\|2)$ #1 & #2
$(1, 0, 2)$	No	Violates UPM$(1\|2)$ #1 & #2 and UPM$(2\|1)$ #3
$(1, 1, 0)$	No	Violates UPM$(2\|1)$ #2 & #3
$(\mathbf{1}, \mathbf{1}, \mathbf{1})$	**Yes**	**Yes**
$(1, 1, 2)$	No	Violates UPM$(2\|1)$ #3
$(1, 2, 0)$	No	Violates UPM$(1\|2)$ #1 & #3 and UPM$(2\|1)$ #2 & #3
$(1, 2, 1)$	No	Violates UPM$(1\|2)$ #1 & #3
$(1, 2, 2)$	No	Violates UPM$(1\|2)$ #1 & #3 and UPM$(2\|1)$ #3
$(2, 0, 0)$	No	Violates UPM$(1\|2)$ #2 & #3 and UPM$(2\|1)$ #1 & #2
$(2, 0, 1)$	No	Violates UPM$(1\|2)$ #2 & #3 and UPM$(2\|1)$ #1 & #3
$(2, 0, 2)$	No	Violates UPM$(1\|2)$ #2 & #3
$(2, 1, 0)$	No	Violates UPM$(1\|2)$ #3 and UPM$(2\|1)$ #1 & #2
$(2, 1, 1)$	No	Violates UPM$(1\|2)$ #3 and UPM$(2\|1)$ #1 & #3
$(2, 1, 2)$	No	Violates UPM$(1\|2)$ #3
$(2, 2, 0)$	No	Violates UPM$(2\|1)$ #1 & #2
$(2, 2, 1)$	No	Violates UPM$(2\|1)$ #1 & #3
$(\mathbf{2}, \mathbf{2}, \mathbf{2})$	**Yes**	**Yes**

Notes: This table demonstrates the equivalence of the assumptions proposed in Bhuller and Sigstad (2022) and Humphries et al. (2023a) in a setting with three distinct treatments and three judges. Each row is one of the 27 possible treatment permutations for the three judges. We refer to each row as a "response type" which is defined by potential treatment states as a function of examiner assignment. For example, the first row is the response type for "always 0" which is the type of defendant who is allocated to treatment 0 by all examiners. In this setting, there are a total of four ACM and NC conditions from Bhuller and Sigstad (2022). Column 2 shows that only six response types are possible when these four conditions hold. In the framework from Humphries et al. (2023a), there are two UPM conditions that have associated inequality conditions. Column 3 shows that the associated UPM inequalities hold for the six response types that are possible when the ACM and NC conditions hold.

Appendix Figure A.1: Six Potential Treatment Response Types and Treatment Assignment



Notes: This figure illustrates the pattern of treatment assignment that must hold to satisfy the conditions in Bhuller and Sigstad (2022) and Humphries et al. (2023a) in a three examiner and three treatment setting. The rows represent examiners while the columns represent the six response types (i.e., the potential treatment status for a group of defendants) that are permitted. The pattern in each cell indicates whether a defendant of a given response type would be assigned to treatment 0 (dots), 1 (crosshatch dots) or 2 (crosshatch) when they are assigned to a specific examiner.

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