1 Instrumental Variables: Intro.

- Bias in OLS:

  - Consider a linear model:

$$Y = X\beta + \epsilon$$

  - Suppose that

$$cov\left(X, \epsilon\right) = \rho$$

  - then OLS yields:

$$\begin{aligned} \hat{\beta}_{OLS} &= \left(X'X\right)^{-1} X'Y = \\ & \left(X'X\right)^{-1} X'\left(X\beta + \epsilon\right) \\ \implies & E\hat{\beta}_{OLS} = \beta + \left(X'X\right)\rho \end{aligned}$$

- Two Stage Least Squares
  - One solution to the problem of bias in OLS is to find variables correlated with Y only through their correlation with X and use only the variation in X correlated with these other variables (called instruments) Z. First run:

$$X = Z\gamma + \delta$$

  - From this we get an estimate of γ which we call $\hat{\gamma}$ and a predicted X:

$$Z\left(Z'Z\right)^{-1}Z'X$$

  - then run:

$$\begin{pmatrix} \left[X'Z\left(Z'Z\right)^{-1}Z'Z\left(Z'Z\right)^{-1}Z'X\right]^{-1} \\ X'Z\left(Z'Z\right)^{-1}Z'Y \end{pmatrix}$$

- Three cases:

  1. Under-identified: number of regressors in Z $<$ number of regressors in X

  2. Just Identified: number of regressors in Z $=$ number of regressors in X

  3. Over identified: number of regressors in Z $>$ number of regressors in X

  - In the under-identified case, the model can not be estimated

  - In the just identified case the dimension of $X\prime Z$ is the dimension of $Z\prime Z$ in which case:

$$\left(\begin{array}{c} \left[\left(Z'X\right)^{-1} \left(Z'Z\right) \left(Z'Z\right)^{-1} \left(Z'Z\right) \left(X'Z\right)^{-1} \right] \\ X'Z \left(Z'Z\right)^{-1} Z'Y \end{array} \right)$$

$$= \left(Z'X\right)^{-1} Z'Y$$

- Weak Instruments Problem

  - One problem is that if $Z'X \approx 0 = Z'Y$, then the distribution $(Z'X)^{-1} Z'Y$ is the ratio of two normals with mean zero and is approximated well even in very large samples by a Cauchy Distribution, whose mean and variance do not exist. This can be very problematic.

  - What is?

$$E\left[\left(Z'X\right)^{-1} Z'Y - \beta\right]$$

  - In general, we dont know. However,

$$\begin{aligned} & p\lim\left[\left(Z'X\right)^{-1} Z'Y - \beta\right] \\ = \; & p\lim\left[\left(Z'X\right)^{-1} Z'\left(X\beta + \epsilon\right) - \beta\right] \\ = \; & p\lim\left[\beta + \left(Z'X\right)^{-1} Z'\epsilon - \beta\right] \\ = \; & p\lim\left[\beta - \beta\right] = 0 \end{aligned}$$

- Bias in OLS vs. 2SLS: $\frac{(Z'X)^{-1}Z'\epsilon}{X'\epsilon}$
  - Re-expressed:

$$\frac{\sigma_{Z\epsilon}}{\sigma_{XZ}\sigma_{X\epsilon}}$$

  - Another way to write the 2SLS estimator is:

$$\left(\hat{X}'\hat{X}\right)^{-1}\hat{X}'\epsilon = \frac{\sigma_{\hat{X}\epsilon}}{\sigma^2_{\hat{X}}}$$

  - as opposed to the OLS bias:

$$\left(X'X\right)^{-1}X'\epsilon = \frac{\sigma_{X\epsilon}}{\sigma^2_{X}}$$

  - So the small bias of the 2SLS is in the direction of the OLS estimator.

- Wald Estimator:
  - One special example is the so-called Wald Estimator:

$$\begin{aligned} Y_i &= \alpha_1 + \beta X_i + \epsilon \\ X_i &= \alpha_2 + \gamma D_i + \delta \end{aligned}$$

  - where D_i is a dummy variable taking on the values of $\{0, 1\}$. Then:

$$\hat{\beta}_{WALD} = \frac{\bar{Y}_1 - \bar{Y}_0}{\bar{X}_1 - \bar{X}_0}$$

  - where $\bar{Y}_1, \bar{Y}_0$ are the average Y when $Z = 1, 0$ respectively and $\bar{X}_1, \bar{X}_0$ are the average X when $Z = 1, 0$ respectively.

- Small Sample Bias of 2SLS:
  - Approximate Bias Formula for small samples (derived using power series approximations):

$$\begin{aligned} & \frac{\sigma_{Z,\delta}}{\gamma' Z' Z \gamma}(K-2) \\ = & \frac{\sigma_{Z,\delta}}{\sigma_\delta^2} \frac{\sigma_\delta^2}{\gamma' Z' Z \gamma}(K-2) \end{aligned}$$

  - where K is the number of excluded instruments.

$$\tau^2 = \frac{\sigma_\delta^2}{\gamma' Z' Z \gamma}$$

  - τ^2 is called a concentration parameter and is equal to $\frac{1}{R^2}$ from the first stage regression.
  - Commonly thought that bias is proportional to K. In fact, this is only true in the case where $\sigma_{XZ} = 0$ (or $\sigma_{XZ} \approx 0$). Otherwise $\gamma' Z' Z \gamma$ and thus τ^2 depend upon K.
  - So is adding more instruments a good thing? Depends if they are correlated with LHS variables

conditional on the other instruments. Similar to out of sample prediction... not always a good idea.

– Can you test if instruments are too weak? You can run a joint F-test on the first stage (essentially the concentration parameter). Usually you want at least F-Statistic of 4 or 5 in the literature. Some will want at least 10.

- Limited Information Maximum Likelihood

  – Can also estimate with Limited Information Maximum Likelihood. It turns out that though the asymptotic distribution of the 2SLS estimator and the LIML estimator are the same, the small sample distributions can be quite different in overidentified models. In particular, with LIML, the parameter being estimated is close to its population median rather than mean. The formula for LIML is:

$$L(\beta, \pi, \Omega) = \sum_{n=1}^{N} \begin{pmatrix} -\frac{1}{2}|\Omega| - \frac{1}{2}\binom{Y_i - \beta\gamma Z_i}{X_i - \gamma Z_i}' \\ \Omega^{-1}\binom{Y_i - \beta\gamma Z_i}{X_i - \gamma Z_i} \end{pmatrix}$$

  – Example with real and random instruments:

	Single Instr.	500 Instr. 2SLS
Real	0.089 (0.011)	0.073 (0.008)***
Random	−1.958 (18.116)	0.059 (0.085)

	500 Instr. LIML
Real	0.095 (0.017)***
Random	−0.330 (0.1001)***

- 2SLS Inference:
  - Suppose you run 2SLS in two stages. Then you compute SEs as:

$$\left(\hat{X}'\hat{X}\right)^{-1}\hat{\sigma}^2$$

  - Instead you should take the assymptotic variance of:

$$\left(\begin{array}{c}\left[(Z'X)^{-1}(Z'Z)(Z'Z)^{-1}(Z'Z)(X'Z)^{-1}\right]\\ X'Z(Z'Z)^{-1}Z'Y\end{array}\right)$$

  - In which case you get:

$$\left(X'Z\right)\left(Z'Z\right)^{-1}\left(Z'X\right)^{-1}\hat{\sigma}^2$$

  - You can show that the true SEs are large than the second stage OLS because they include the variation from the first stage which the second stage OLS standard errors do not.

2 Average Treatment Effects

- Setup: Binary Instrument and Binary Endogenous RHS Variable.
  - Note, according to Angrist (Journal of Econometrics, 1991): Grouped-data estimation and testing in simple labor-supply models, continuous IV models can be reduced to binary IV models.

- Define Four Types of Reactions to Instrument:

	$D_i(0) = 0$	$D_i(0) = 1$
$D_i(1) = 0$	Never-Taker	Defier
$D_i(1) = 1$	Complier	Always-Taker

- Then if we see the following combinations of instrument and RHS variable, we know that:

	$Z_i = 0$	$Z_i = 1$
$D_i = 0$	Complier/Never-Taker	Never-Taker/Defier
$D_i = 1$	Always-Taker/Defier	Complier/Always-Taker

- Assuming monotonicity ($D_i(1) \geq D_i(0) \ \forall i$), we can eliminate defiers. Then from combinations of instrument and RHS variable, we can figure out:

	$Z_i = 0$	$Z_i = 1$
$D_i = 0$	Complier/Never-Taker	Never-Taker
$D_i = 1$	Always-Taker	Complier/Always-Taker

- So we define fraction complier $= \alpha_C$, fraction Never-Taker $= \alpha_N$ and fraction Always-Taker $= \alpha_A$

  – Then $\alpha_C + \alpha_N + \alpha_A = 1$

  – Morever we get that $P(D_i = 1 | Z_i = 0) = \alpha_A$ and $P(D_i = 1 | Z_i = 0) = \alpha_N$ and finally $\alpha_C = 1 - \alpha_N - \alpha_A$

  – So, under the assumption that there are no defiers, we can recover, α_C, α_N, and α_A

- With one regressor:

$$\begin{aligned}
& \left(Z'D\right)^{-1} Z'Y \\
= \; & \left(Z'D\right)^{-1} \left(Z'Z\right) \left(Z'Z\right)^{-1} \left(Z'Y\right) \\
= \; & \left(\left(Z'Z\right)^{-1}\right)^{-1} \left(Z'D\right)^{-1} \left(Z'Z\right)^{-1} \left(Z'Y\right) \\
= \; & \frac{(Z'Z)^{-1} (Z'Y)}{(Z'Z)^{-1} (Z'D)}
\end{aligned}$$

  In other words, we can interpret the IV coefficient as the ratio of the regression coefficient of the outcome variable on the instrument to the regression coefficient of the endogenous explanatory variable on the instrument.

- Now look at the numerator of this formula:

$$E\left(Y|Z=1\right) - E\left(Y|Z=0\right)$$

  - We can break it up into the expectation conditional on $Z = 0$ and the expectation conditional on $Z = 1$. Starting with $Z = 0$:

$$\begin{aligned} E(Y|Z=0) &= \\ & E(Y|Z=0,C)\,P(C|Z=0) + \\ & E(Y|Z=0,N)\,P(N|Z=0) + \\ & E(Y|Z=0,A)\,P(A|Z=0) \end{aligned}$$

– And now turning to $Z = 1$:

$$\begin{aligned} E(Y|Z=1) &= \\ & E(Y|Z=1,C)\,P(C|Z=1) + \\ & E(Y|Z=1,N)\,P(N|Z=1) + \\ & E(Y|Z=1,A)\,P(A|Z=1) \end{aligned}$$

- Note that Always-Takers and Never-Takers are not affected by the instrument:

$$E(Y|Z=1,N) = E(Y|Z=0,N)$$

$$E(Y|Z=1,A) = E(Y|Z=0,A)$$

- Also since Z is randomized, probabilities of getting assigned the instrument are independent of type:

$$\begin{aligned} P(A|Z=1) &= P(A|Z=0) \\ P(N|Z=1) &= P(N|Z=1) \\ P(C|Z=1) &= P(C|Z=0) \end{aligned}$$

- Now we can compute the numerator conditioning on type:

$$\left(Z'Z\right)^{-1}\left(Z'Y\right) =$$

$$\begin{aligned} &E(Y|Z=1,C)\,P(C|Z=1) + \\ &E(Y|Z=1,N)\,P(N|Z=1) + \\ &E(Y|Z=1,A)\,P(A|Z=1) - \\ &E(Y|Z=0,C)\,P(C|Z=0) - \\ &E(Y|Z=0,N)\,P(N|Z=0) - \\ &E(Y|Z=0,A)\,P(A|Z=0) \end{aligned}$$

- But the conditional expectations and probabilities for the Never-Takers and Always-Takers second two terms are the same (the always and never takers are not affected by the instrument) and they thus cancel out, leaving:

$$
\begin{aligned}
& \left(Z'Z\right)^{-1}\left(Z'Y\right) \\
= \; & \left[E\left(Y|Z=1,C\right)-E\left(Y|Z=0,C\right)\right]\alpha_C
\end{aligned}
$$

- Similarly (without showing computations) for the denominator:

$$
\begin{aligned}
\left(Z'Z\right)^{-1}\left(Z'D\right) &= \\
\left[\begin{array}{c} P\left(C\right)1+P\left(A\right)1+P\left(N\right)0 \\ -P\left(A\right)1-P\left(C\right)0-P\left(N\right)0 \end{array}\right] &= \\
\alpha_C+\alpha_A-\alpha_A &= \alpha_C
\end{aligned}
$$

- Finally, we get our expression:

$$
\begin{aligned}
\beta_{IV} &= \left(Z'D\right)^{-1}Z'Y = \\
& \frac{\left[E\left(Y|Z=1,C\right)-E\left(Y|Z=0,C\right)\right]\alpha_C}{\alpha_C} \\
&= E\left(Y|Z=1,C\right)-E\left(Y|Z=0,C\right)
\end{aligned}
$$

or in other words, the IV instrument gives the local average treatment effect for the compliers to the instrument (and thus since different instruments will have different sets of compliers, different instruments may yield different IV estimates).

3 Control Function Approach

- Equivalence of controlling for first stage residuals and standard 2SLS approach of putting in fitted values from first stage. Assume model:

$$\begin{aligned} Y &= X\beta + \gamma W + \epsilon \\ W &= X\beta + \mu Z + \nu \end{aligned}$$

  - We are interested in γ; X is a set of controls, W is an endogenous variable, Z is a valid instrument

$$\begin{aligned} cov\left(W, \epsilon\right) &\neq 0 \\ cov\left(Z, \epsilon\right) &\neq 0 \\ cov\left(Z, \nu\right) &= 0 \end{aligned}$$

  - 1st stage: regress

$$W = X\beta + \mu Z + \nu$$

  - Obtain first stage residuals $\hat{\nu}$

- 2nd stage: plug in residuals into first equation. Regress:

$$Y = X\beta + \gamma W + \phi\hat{\nu} + \epsilon$$

- Then

$$\hat{\gamma} = \gamma_{2SLS}$$

- The coefficient matrix $[\gamma|\beta]$ can be obtained using the Frisch-Waugh-Lovell Theorem:

$$[\gamma|\beta] = \left[V'\left(I - P\right)V\right]^{-1} V'\left[I - P\right]Y$$

where

- Note that the coefficient on γ using this method is not just assymptotically equivalent to γ_{2SLS}, it is identical. Therefore:

$$V = [W|X]$$

$$Q = [Z|X]$$

$$P = \left[I - Q\left(Q'Q\right)^{-1}Q'\right]Q$$

* The standard errors on γ will be identical to the γ_{2SLS} standard errors and

* The second stage OLS standard errors will not be equal to the true standard errors.

3.1 Random Coefficients

- Now we relax that coefficients on the impact of W are the same for the entire population. First we assume that

$$\begin{aligned} Y &= X\beta + \gamma W + \epsilon \\ W &= X\beta + \mu Z + \nu \end{aligned}$$

$$\gamma = \bar{\gamma} + \delta$$

$$cov\left(\delta, W\right) = 0$$

In this case, the 2SLS estimator consistently estimates the average effect of W:

$$\text{plim}\left(\hat{\gamma}_{2SLS}\right) = \bar{\gamma}$$

- However, often times the impact of W may be different for different values of W :

$$cov\left(\delta, W\right) \neq 0$$

  - In this case, $\hat{\gamma}_{2SLS}$ does not estimate an average treatment effect but rather a weighted average of treatment effects (weighted by W).

  - In this case, we can still estimate (with a linearity assumption) a control function:

$$\begin{aligned} Y &= X\beta + \gamma W + \rho\hat{\nu} + \eta\hat{\nu}W + \theta \\ W &= X\beta + \mu Z + \nu \end{aligned}$$

- ρ captures endogeneity bias

- η captures selectivity (a positive η means that those likely to select into higher W are more likely to have higher residual Y; a negative η means that those likely to select into lower W are more likely to have higher residual Y)

- Note that only in the case of $cov(\delta, W) = 0$ is δ (as the population average of consistently estimated with normal IV.

- Also, note that this is a more general model (assymptotically). Anytime that $\hat{\gamma}_{2SLS}$ consistently estimates the true $\bar{\gamma}$, then so does $\hat{\gamma}_{CF}$ (the control function $\hat{\gamma}$). However, if $cov(\delta, W) \neq 0$, $\hat{\gamma}_{CF}$ still consistently estimates $\bar{\gamma}$ but $\hat{\gamma}_{2SLS}$ does not.

6 News Droughts, News Floods and US Disaster Relief: (Eisensee / Stromberg)

6.1 Main Specifications

- What is the impact of news coverage on disaster relief provision?

$$relief_i = \alpha_1 news_i + \alpha' \theta_i + \alpha_2 reliefworthy + \epsilon_i$$

- variable $reliefworthy$ is unobserved but is correlated with news so that we get contamination:

$$\hat{\alpha}_1 = \alpha_1 + \frac{cov\left(news, reliefworthy\right)}{v\left(news\right)}$$

- most likely $\frac{cov(news, reliefworthiness)}{v(news)} > 0$ so that $\hat{\alpha}_1 > \alpha_1$ ($\hat{\alpha}_1$ overestimates the true effect)

- Eisensee/Stromberg instrument $news_i$ with measures of news pressure. In their full IV specification they run

$$\begin{aligned} relief_i &= \alpha_1 \widehat{news}_i + \alpha' \theta_i + \beta_1 reliefworthy + \epsilon_i \\ news_i &= \beta_1 newspressure_i + \beta_2 Olymp_i + \beta' \theta_i + \omega_i \end{aligned}$$

  θ is a vector including year, month, country and disaster-type fixed effects. Imputed values of killed and affected also include fixed effects for the interaction of missing values and disaster type.

- In other words, Eisensee/Stromberg look at the impact of news on relief for news that reported because it wasnt crowded out by more "important" news stories

- Simplest examples: Olympics, World Series, Super Bowl

- Also construct a more general news pressure variable which they include as separate regressor in the first stage of their main IV specifications

- News pressure: percent of half hour tv news covered by top 3 stories in 40 days following event

- Robustness Specifications:

  1. All days with positive reporting of a disaster are removed from that disaster's 40 day window of average time spent on top 3 stories

  2. Redefine news pressure to equal top 3 stories plus time spent on the disaster itself

  3. Take a 20 day average rather than 40 for news pressure

  4. Include countries which never received US relief

  5. Exclude observations which fall within top 1/3 of news pressure

6.2 Data

- Disaster Data: CRED (Centre for Research on the Epidemiology of Disasters).
  - Disaster is an event which satisfies at least one of:
    * 10 or more people killed
    * 100 or more people affected (people requiring immediate assistance during a period of emergency for basic survival), injured and/or made homeless
    * A state of emergency has been declared
    * There has been a call for international assistance
  - Intensity of disaster measured as:
    * number *killed*

    * number *affected* (injured + homeless + affected)

- Eisensee/Stromberg drop:

    * Non-natural disasters (exlcudes disasters such as war which may be covered and also make relief difficult to implement as in Somalia)

    * 40 disasters from before August 5, 1968 when the media data is first available

    * 408 disasters where only the year of the disaster was recorded

    * Use country fixed effects. Also, only use countries which have received OFDA (Office of Foreign Disaster Assistance) money (US govt.) at least once. Therefore, they effectively trhow out 1,104 observations.

- On average natural disasters per year taking 63,000 lives and affecting 125 million people. Average disaster: 590 deaths and affected 1.2 million people

    * Floods: 32%
    * Storms: 23%
    * Epidemics 14%
    * Droughts most casualties; fires/landslides least.

- Disaster Relief
  - Data taken from OFDA, an office within USAID (United States Agency for International Development)
  - US provides approximately 1/3 of OECD-provided total emergency aid to developing countries
  - In sample, OFDA responded to 19% of disasters in sample or 28 disasters per year. Disaster responded to if

    - US Ambassador or Chief of US Mission to the country declares a disaster (Chief of Mission declaration allows for allocation of $25K up to 2002 and $50K after 2001)
    - US Assistant Secretary of State can declare a disaster
    - After disaster declaration, amounts are determined jointly between USAID and local mission.

- News Coverage
  - From Vanderbilt Television News Archive (VTNA)
    - More than 700,000 news stories
    - Over 30,000 individual network evening news broadcasts
    - Four major news networks (ABC, CBS, NBC, CNN)

  * Since August 5, 1968

- Disaster recorded in the news if both:
  * Type of disaster (i.e. earthquake, flood, hurricane) mentioned and
  * Country mentioned
  * In a window of (-2,+40) days of the disaster recorded by CRED. Why -2?
- Network news covered approximately 10% of disasters in the sample

TABLE I
SUMMARY STATISTICS

Variable	Observations	Mean	Std. Dev.	Min	Max
relief	5 212	0.19	0.39	0	1
news	5 212	0.12	0.32	0	1
killed	3 714	590	9 143	1	300 000
affected	4 004	1 092 508	9 858 292	1	300 000 000
news pressure	5 212	7.73	1.22	4.56	14.32
Olympics	5 212	0.02	0.09	0	0.77
world series	5 212	0.01	0.05	0	0.56
US ally	5 212	0.32	0.47	0	1

TABLE II
SUMMARY STATISTICS FOR DISASTERS

Disaster type	Number of disasters	Share of disasters	Killed per disaster	Affected per disaster	Share receiving OFDA relief
Flood	1 675	0.32	170	1 724 851	0.22
Storm	1 175	0.23	646	601 490	0.17
Epidemic	737	0.14	249	27 528	0.12
Earthquake	559	0.11	1 522	173 015	0.21
Drought	326	0.06	18 657	5 740 623	0.30
Landslide	310	0.06	84	38 789	0.06
Fire	129	0.02	19	69 552	0.13
Cold wave	114	0.02	103	46 656	0.01
Volcano	102	0.02	853	39 008	0.27
Infestation	47	0.01	na	1 100	0.68
Food shortage	38	0.01	4 293	734 630	0.13
Total	5 212	1.00	590	1 166 505	0.19

TABLE III

DATES OF TWO LARGEST *daily news pressure* AND MAIN STORY, BY YEAR

Year	Date	Main News Story
2003	14 Aug	*New York City Blackout*
	22 Mar	*Invasion of Iraq: Day 3*
2002	11 Sep	*9/11 Commemoration*
	24 Oct	*Sniper Shooting in Washington: Arrest of Suspects*
2001	13 Sep	*9/11 Attack on America: Day 3*
	12 Sep	*9/11 Attack on America: Day 2*
2000	26 Nov	*Gore vs. Bush: Florida Recount - Certification by Katherine Harris*
	8 Dec	*Gore vs. Bush: Florida Recount - Supreme Court Ruling*
1999	1 Apr	*Kosovo Crisis: U.S. Soldiers Captured*
	18 Jul	*Crash of Plane Carrying John F. Kennedy, Junior*
1998	16 Dec	*U.S. Missile Attack on Iraq*
	18 Dec	*Clinton Impeachment*
1997	23 Dec	*Oklahoma City Bombing: Trial*
	31 Aug	*Princess Diana's Death*
1996	18 Jul	*TWA Flight 800 Explosion*
	27 Jul	*Olympic Games Bombing in Atlanta*
1995	3 Oct	*O.J. Simpson Trial: The Verdict*
	22 Apr	*Oklahoma City Bombing*
1994	17 Jan	*California Earthquake*
	18 Jun	*O.J. Simpson Arrested*
1993	17 Jan	*U.S. Missile Attack on Iraq*
	20 Apr	*Waco, Texas: Cult Standoff Ends in Fire*
1992	16 Jul	*Perot Quits 1992 Presidential Campaign*
	1 May	*Los Angeles Riots*
1991	27 Feb	*Gulf War: President Bush Declares Kuwait Liberated*
	17 Jan	*Gulf War: Operation Dessert Storm Launched*
1990	4 Aug	*Iraq Invasion of Kuwait: Day 4*
	8 Aug	*Iraq Invasion of Kuwait: Mobilisation of U.S. Troops*
1989	9 Mar	*Senate Rejection of Tower Appointment to Secretary of Defence*
	23 Dec	*Romania Revolution*
1988	22 Dec	*Pan Am Plane Crash*
	14 Dec	*Arafat Condemns Terrorism and Accept Israel's Right to Exist*
1987	26 Feb	*Iran Arms Scandal: Tower Commission Report*
	18 May	*USS Stark Attack in Persian Gulf*
1986	29 Jan	*Challenger Explosion*
	15 Apr	*U.S. Attack on Libya*
1985	30 Jun	*TWA Flight 847 Hijacking: Release of Hostages*
	29 Jun	*TWA Flight 847 Hijacking: Release of Hostages*

1984	12 Jul	*Ferraro as Vice President Candidate*
	16 Aug	*Delorean Verdict*
1983	25 Oct	*U.S. Invasion of Grenada: Day 1*
	3 Sep	*USSR Downing of Korean Commercial Flight*
1982	4 Aug	*Israel Invasion of Lebanon*
	2 Jan	*Poland: Martial Law*
1981	30 Mar	*Ronald Reagan Assassination Attempt*
	13 Dec	*Poland: Martial Law Declared by Wojchiech Jaruzelski*
1980	10 Aug	*Hurricane Allen in Texas*
	26 Dec	*Iran Hostage Crisis: Iran Release Film of Hostages*
1979	31 Mar	*Three Mile Island Nuclear Accident*
	15 Dec	*Iran Hostage Crisis: Departure of Shah from U.S. Announced*
1978	19 Nov	*Guyana Incident: Sect Mass Suicide*
	6 Aug	*Death of Pope Paul VI*
1977	14 Jul	*New York City Blackout*
	11 Aug	*Serial Killer David Berkowitz Arrested*
1976	13 Jul	*Democratic Convention*
	9 Jun	*Jimmy Carter Wins in Primaries*
1975	3 Nov	*Nelson Rockefeller Decides Not to Run for Vice President*
	14 May	*Mayaguez Incident: U.S. Attacks*
1974	1 Mar	*Watergate Indictments Announced*
	21 Jul	*Turkey Invades Cyprus*
1973	12 Feb	*Vietnam War: U.S. Prisoners of War Released*
	24 Jan	*Vietnam War: Cease-Fire Agreement Reached*
1972	9 Jan	*Howard Hughes Telephone Conference*
	28 May	*Nixon Visit in USSR: SALT I signed*
1971	16 Jul	*Nixon Announces Trip to China*
	16 Aug	*Nixon Suspends Convertibility from Dollars to Gold*
1970	28 Sep	*Gamal Abdel Nasser Dead*
	7 Sep	*Dawson's Field Hijackings: Blow Up of Planes*
1969	15 Oct	*Vietnam Anti-War Demonstration (Moratorium)*
	28 Mar	*Eisenhower Dead*
1968	22 Aug	*USSR Invades Czechoslovakia: Day 2*
	1 Nov	*October Surprise: Vietnam Bombing Halt*

Note: Ordered by *daily news pressure.*

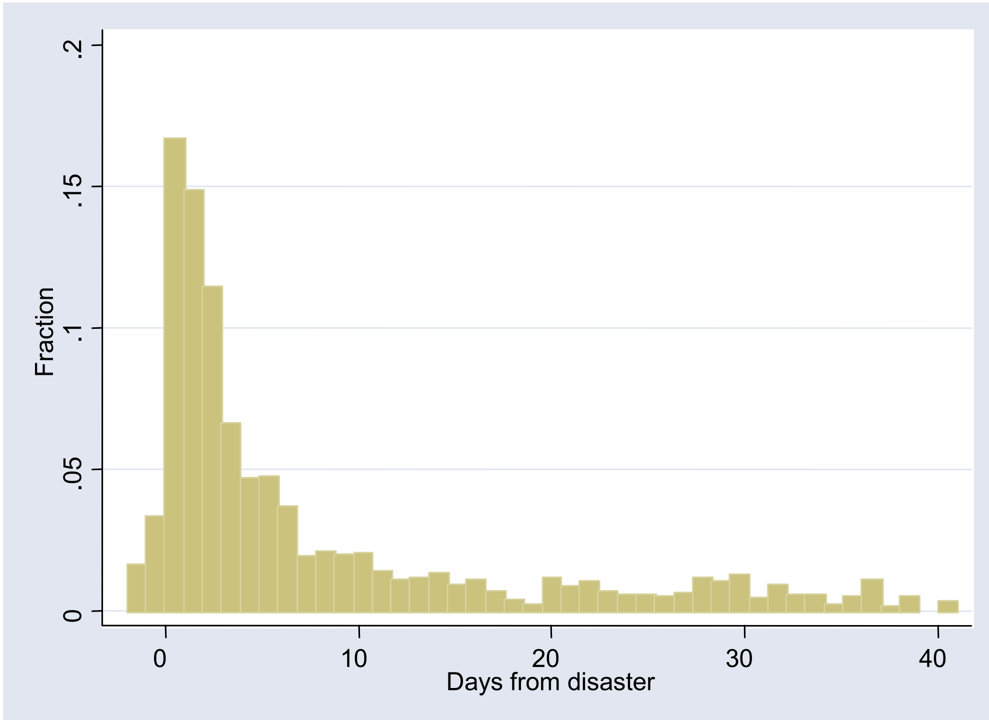

FIGURE I
News Stories on Disasters, by Days from the Disaster

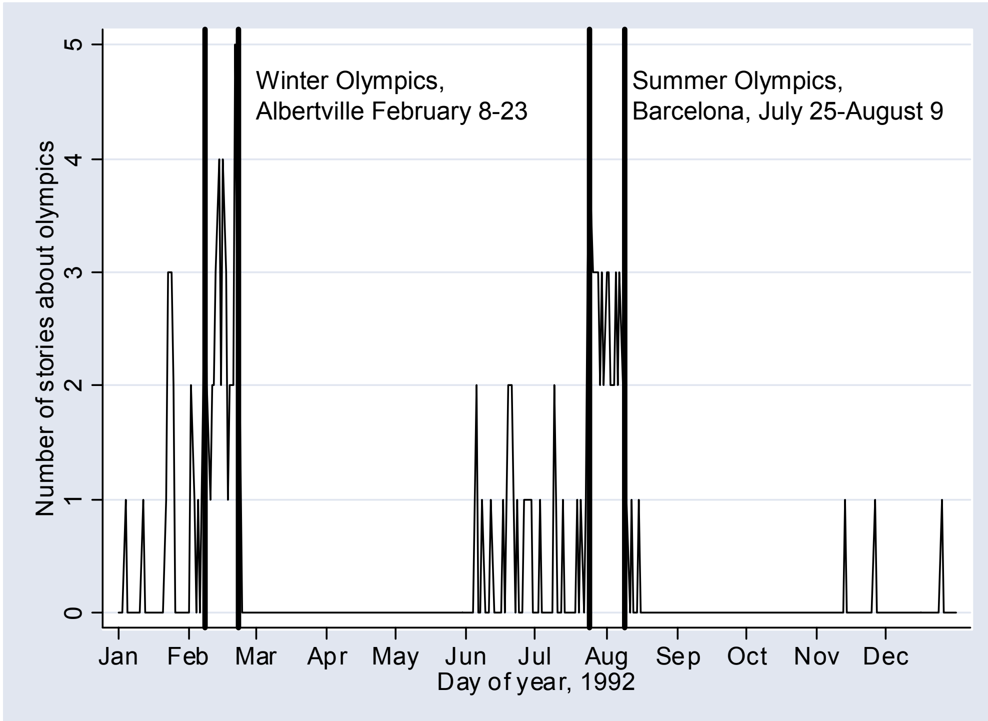

FIGURE II

Daily Number of News Stories about Olympic Games, 1992

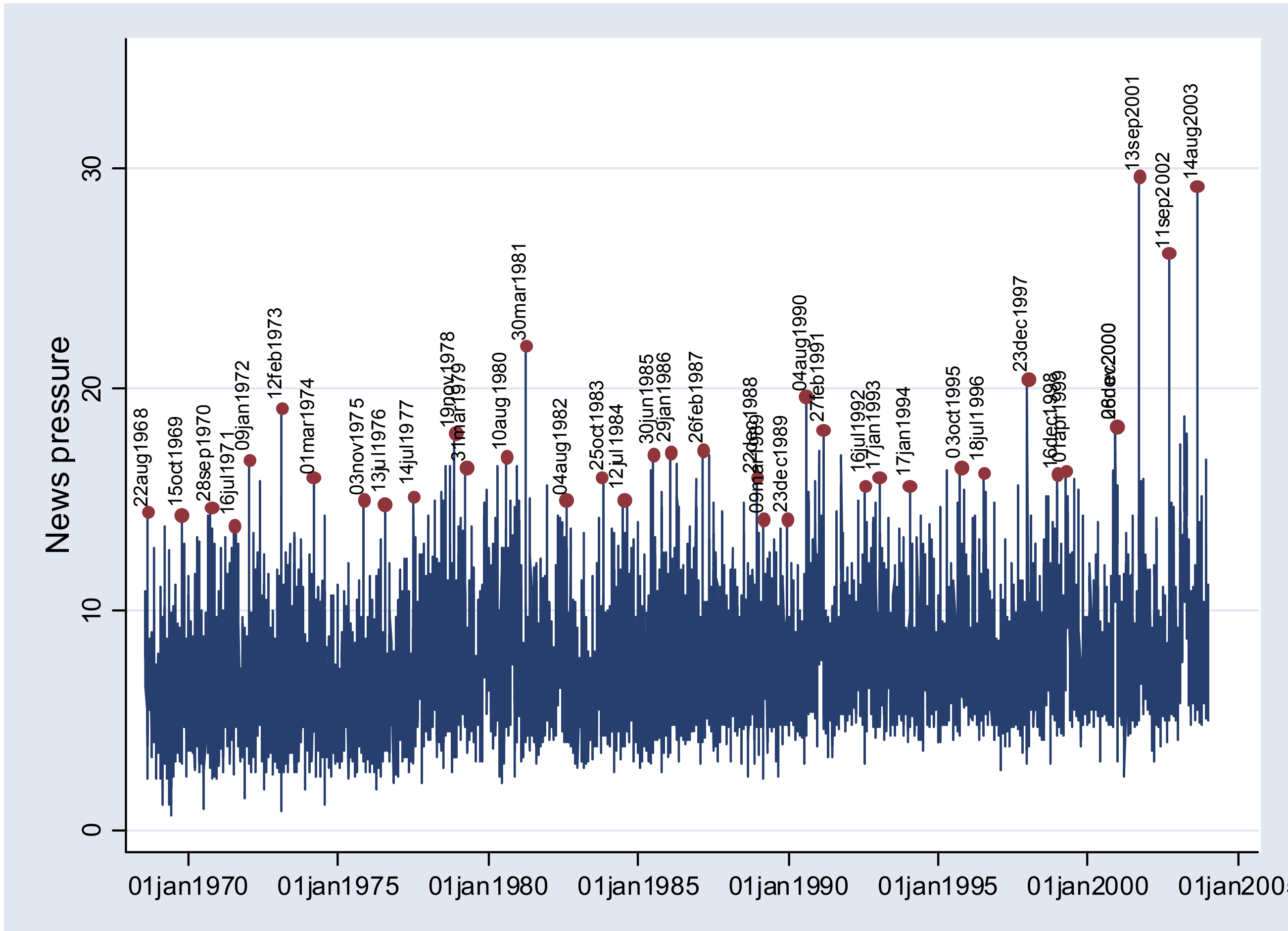

FIGURE III
Daily News Pressure (Minutes), by Day

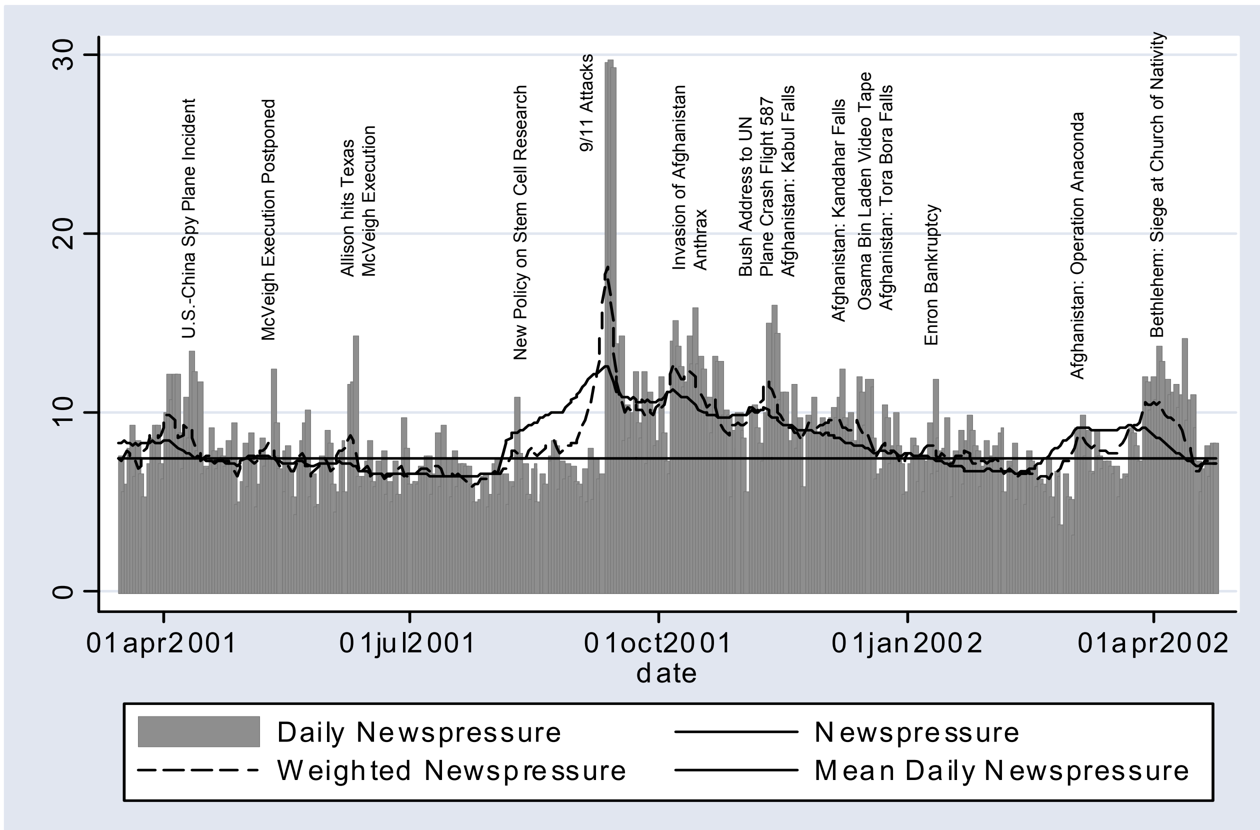

FIGURE IV
News Pressure (Minutes) during 405 Days, 15 March 2001 – 23 Apr 2002, by Day

TABLE IV

EFFECT OF THE PRESSURE FOR NEWS TIME ON DISASTER *News* AND *Relief*

	Dependent variable: *News*				Dependent variable: *Relief*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
News Pressure	-0.0162	-0.0163	-0.0177	-0.0142	-0.0117	-0.0119	-0.0094	-0.0078
	(0.0041)***	(0.0041)***	(0.0057)***	(0.0037)***	(0.0045)***	(0.0045)***	(0.0058)	(0.0040)**
Olympics	-0.1078	-0.1079	-0.0871	-0.111	-0.1231	-0.1232	-0.1071	-0.1098
	(0.0470)**	(0.0470)**	(-0.0628)	(0.0413)***	(0.0521)**	(0.0521)**	(0.0763)	(0.0479)**
World Series	-0.1133				-0.1324			
	(-0.1065)				(0.1031)			
log Killed			0.0605				0.0582	
			(0.0040)***				(0.0044)***	
log Affected			0.0123				0.0376	
			(0.0024)***				(0.0024)***	
imputed log Killed				0.0491				0.0442
				(0.0034)***				(0.0037)***
imputed log Affected				0.0151				0.0394
				(0.0020)***				(0.0020)***
Observations	5212	5212	2926	5212	5212	5212	2926	5212
R-squared	0.1799	0.1797	0.3624	0.2875	0.1991	0.1989	0.4115	0.3726

Linear probability OLS regressions. All regressions include year, month, country and disaster type fixed effects. Regressions with imputed values ((4) and (8)) also include fixed effects for the interaction of missing values and disaster type. Robust standard errors in parentheses:* significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE VI

DEPENDENT VARIABLE: *Relief*

	OLS					IV		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
News	0.2886	0.158	0.1309	0.2323	0.2611	0.8237	0.6341	0.6769
	(0.0200)***	(0.0232)***	(0.0178)***	(0.0328)***	(0.0569)***	(0.2528)***	(0.3341)*	(0.2554)***
News*abs(Pr(news)-0.5)				-0.4922	-0.302			
				(0.1059)***	(0.0840)***			
abs(Pr(news)-0.5)				0.5374	0.2959			
				(0.0943)***	(0.0831)***			
log Killed		0.0486					0.0198	
		(0.0046)***					-0.0208	
log Affected		0.0358					0.0299	
		(0.0024)***					(0.0048)***	
imputed log Killed			0.0378	0.0546	0.0307			0.0109
			(0.0038)***	(0.0049)***	(0.0046)***			-0.0132
imputed log Affected			0.0375	0.0445	0.0345			0.0292
			(0.0020)***	(0.0023)***	(0.0026)***			(0.0045)***
F-stat, instruments, 1st stage						11.0	6.1	11.1
Over-id restrictions, χ^2_{df} (p-value)						0.51_1(0.47)		0.64_1 (0.42)
Observations	5212	2926	5212	5212	5027	5212	2926	5212
R-squared	0.2443	0.4225	0.3800	0.3860				

All regressions include year, month, country, and disaster type fixed effects. Regressions with imputed values ((3), (4) and (5)) also include fixed effects for the interaction of missing values and disaster type. Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%.

TABLE VII
ROBUSTNESS

	Reference	Changes in independent variables					Different samples			Probit	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Reduced form regressions. Dependent variable: *News*											
News Pressure	-0.0163	-0.0157	-0.0124	-0.0133	-0.0155	-0.0143	-0.0193	-0.0137	-0.0242	-0.0156	-0.0984
	(0.0041)***	(0.0040)***	(0.0042)***	(0.0033)***	(0.0036)***	(0.0038)***	(0.0052)***	(0.0039)***	(0.0118)**	(.0041)***	(0.0273)***
Olympics	-0.1079	-0.1085	-0.1114	-0.1125	-0.1156	-0.1090	-0.1008	-0.1199	-0.1320	-0.1206	-0.5902
	(0.0470)**	(0.0469)**	(0.0470)**	(0.0470)**	(0.0470)**	(0.0460)**	(0.0572)*	(0.0451)***	(0.0864)	(0.0428)***	(0.3084)*
Observations	5212	5212	5212	5212	5212	5212	3950	6303	3473	5209	4266
R-squared	0.1797	0.1789	0.1779	0.1789	0.1795	0.2969	0.1862	0.1887	0.2072		
F-test (instr.)	11.05	10.5	7.4	11.19	12.3	10.0	8.6	10.33	3.4		
Reduced form regressions. Dependent variable: *Relief*											
News Pressure	-0.0119	-0.0116	-0.0104	-0.0092	-0.0085	-0.0082	-0.0126	-0.0105	-0.0125		-0.0611
	(0.0045)***	(0.0045)***	(0.0046)**	(0.0038)**	(0.0041)**	(0.0040)**	(0.0054)**	(0.0038)***	(0.0142)		(0.0233)***
Olympics	-0.1232	-0.1235	-0.1250	-0.1266	-0.1290	-0.1182	-0.1338	-0.0984	-0.1767		-0.6471
	(0.0521)**	(0.0521)**	(0.0520)**	(0.0521)**	(0.0521)**	(0.0515)**	(0.0583)**	(0.0421)**	(0.0893)**		(0.3200)**
Observations	5212	5212	5212	5212	5212	5212	3950	6303	3473		5209
R-squared	0.1989	0.1989	0.1986	0.1987	0.1985	0.3851	0.1835	0.2208	0.2271		
IV-regressions. Dependent variable: *Relief*										IV-Probit	Bi-Probit
News	0.8237	0.8351	0.9391	0.8012	0.6726	0.7124	0.7561	0.7846	0.8505	3.1735	1.9463
	(0.2528)***	(0.2595)***	(0.3225)***	(0.2561)***	(0.2341)***	(0.2637)***	(0.2581)***	(0.2366)***	(0.4597)*	(0 .4417)***	(0.2246)***
Observations	5212	5212	5212	5212	5212	5212	3910	6303	3446	5209	5212
Over-id test	0.51_1(0.47)	0.47_1 (0.49)	0.20_1 (0.66)	0.61_1 (0.43)	1.27_1 (0.26)	0.75_1 (0.39)	1.10_1 (0.30)	0.01_1(0.92)	0.85_1 (0.36)		

Robust standard errors in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions include year, month, country and disaster-type fixed-effects. Column (1) reports the results from an OLS regression. In column (2) all days with news about disasters has been removed before computing the average *news pressure*. In column (3) an extreme bias has been intentionally induced in *news pressure*. In column (4) *news pressure* is the 20-day average of *daily news pressure*, and in column (5) it is the average using the weights reported in Figure I. The regression in column (6) contains controls for whether the country was a US Ally, week fixed effects, imputed log Killed and imputed log Affected, dummy variables for the interaction of disaster type and missing data, as well as two sets of dummy variables indicating whether *Killed* and *Affected* lie in the percentile regions 0^{th}-25^{th}, 25^{th}-50^{th}, 50^{th} -75^{th}, 75^{th}-95^{th} percentiles respectively (omitted category is killed above 95^{th} percentile). Column (7) contains a sub sample with only earth-quakes, floods, fires landslides, storms and volcano eruptions. Column (8) excludes observations where *News Pressure* was in the highest third each year. Column (9) includes observations from countries that never received U.S. relief. The IV-estimate in column (10) shows the result from ML estimation of a model where the first stage is linear and the second stage is a probit. The "reduced form" regression on news shows the result from the first stage of this regression. The IV-estimate in column (11) shows the result from a ML estimation of a bivariate probit model with an endogenous binary variable. The "reduced form" regressions of this column show the results from single equation probit estimation of *news* and *relief* on the exogenous variables.

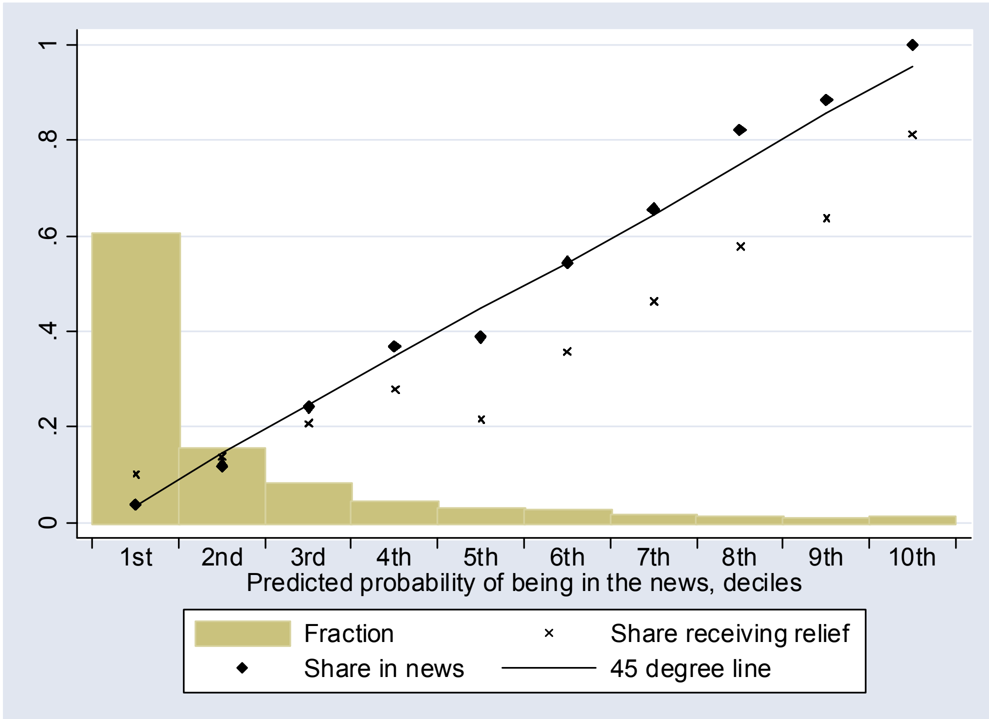

FIGURE V
Predicted Probability of a Disaster Being in the
News and Actual Shares of Disasters Receiving Relief

6.3 Problems

- Identification
  - What if over time there is a movement towards less news pressure and less intense disasters (due to development)?
  - How can we distinguish distraction of government from the impact of news?
  - Could disasters affected by the instrument (low news pressure) be at times when the propensity to give is high (for example, holidays)?

- Standard Errors: F-Statistics are around 11. Do we really know that this is a good guide since we can not solve for the finite-sample distribution of IV estimators? Wouldnt it be better to plot the residuals and make sure they are normal or develop a non-parametric test for IV?

- Is using robust standard errors valid?
  - Consistent estimation of VCV matrix
  - Cosnsistent/Unbiased estimation of coefficients: OLS vs. GLS
- Can we interpret as a heterogeneous treatment effect? Do we believe the functional form assumption of the heterogeneity?
- Is this what we want to know for policy? For example, suppose network news was required to cover more international news?