DELEGATED INFORMATION CHOICE
ONLINE APPENDIX

KRISTOFFER P. NIMARK AND STEFAN PITSCHNER

This Appendix complements the analysis in our paper *Delegated Information Choice*. It contains 5 sections. In the first section, we report homogeneity measures for alternative LDA specifications with different numbers of topics as well how the average homogeneity depends on the number of topics. Section 2 reports the the highest-frequency words for each topic in a specification with 100 topics. Section 3 reports the text snippets of articles that were assigned the highest probability of belonging to each of the ten topics estimated in the baseline LDA specification. Section 4 contains additional results for the discrete state model for the case when agents have a very strong strategic motive. Section 5 contains additional numerical results from the model with continuous distributions for the case when actions are strategic substitutes.

1. News homogeneity and the number of topics

Figure 1 and 2 plots the time series for the homogeneity measure of news coverage, as defined by Eq (2.5) in the main text, for the two sample periods. Figure 3 illustrates how sample average homogeneity depend on the number of topics.
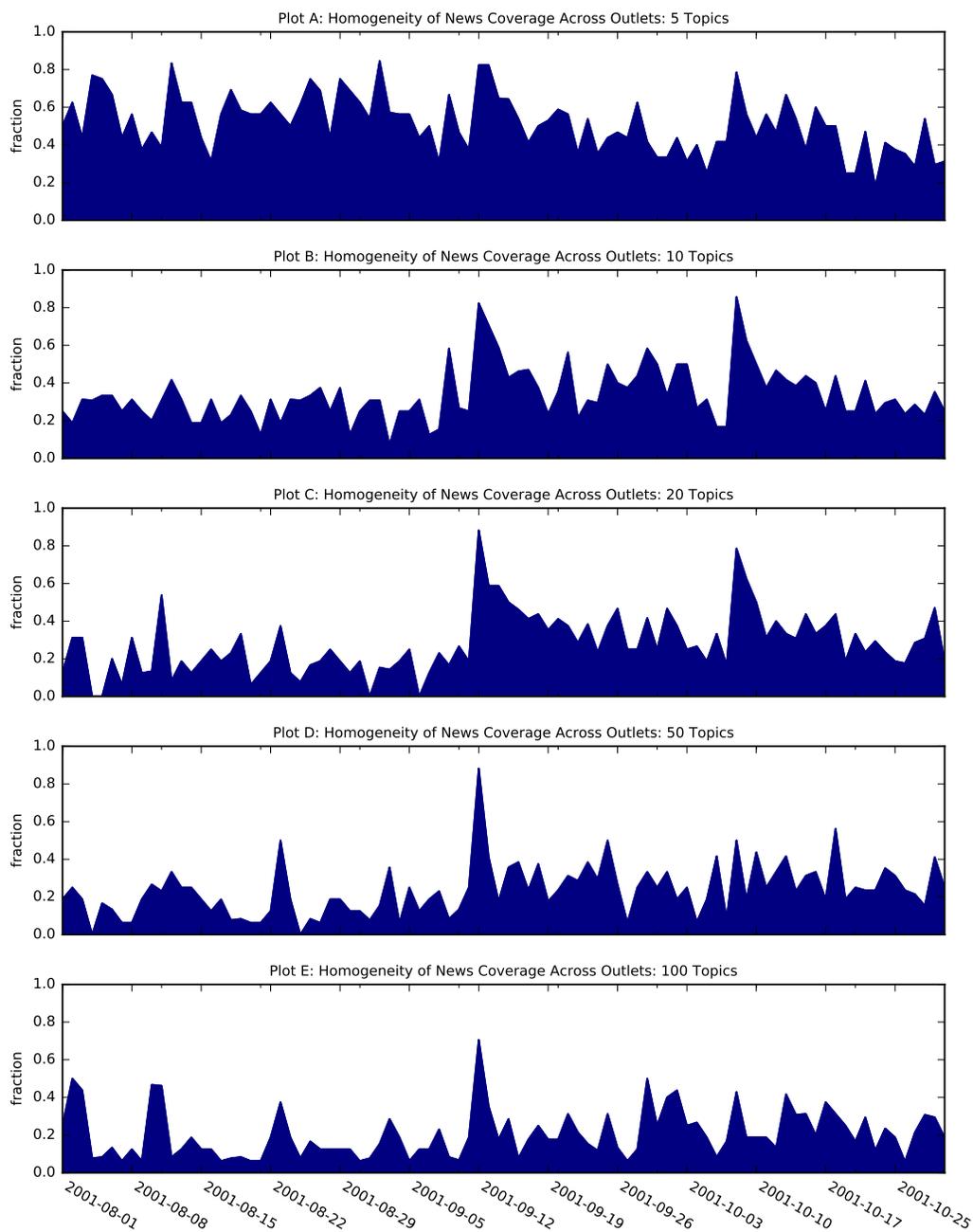

FIGURE 1. Homogeneity measures for model with (top to bottom) 5, 10, 20, 50 and 100 topics in 2001 sample period.
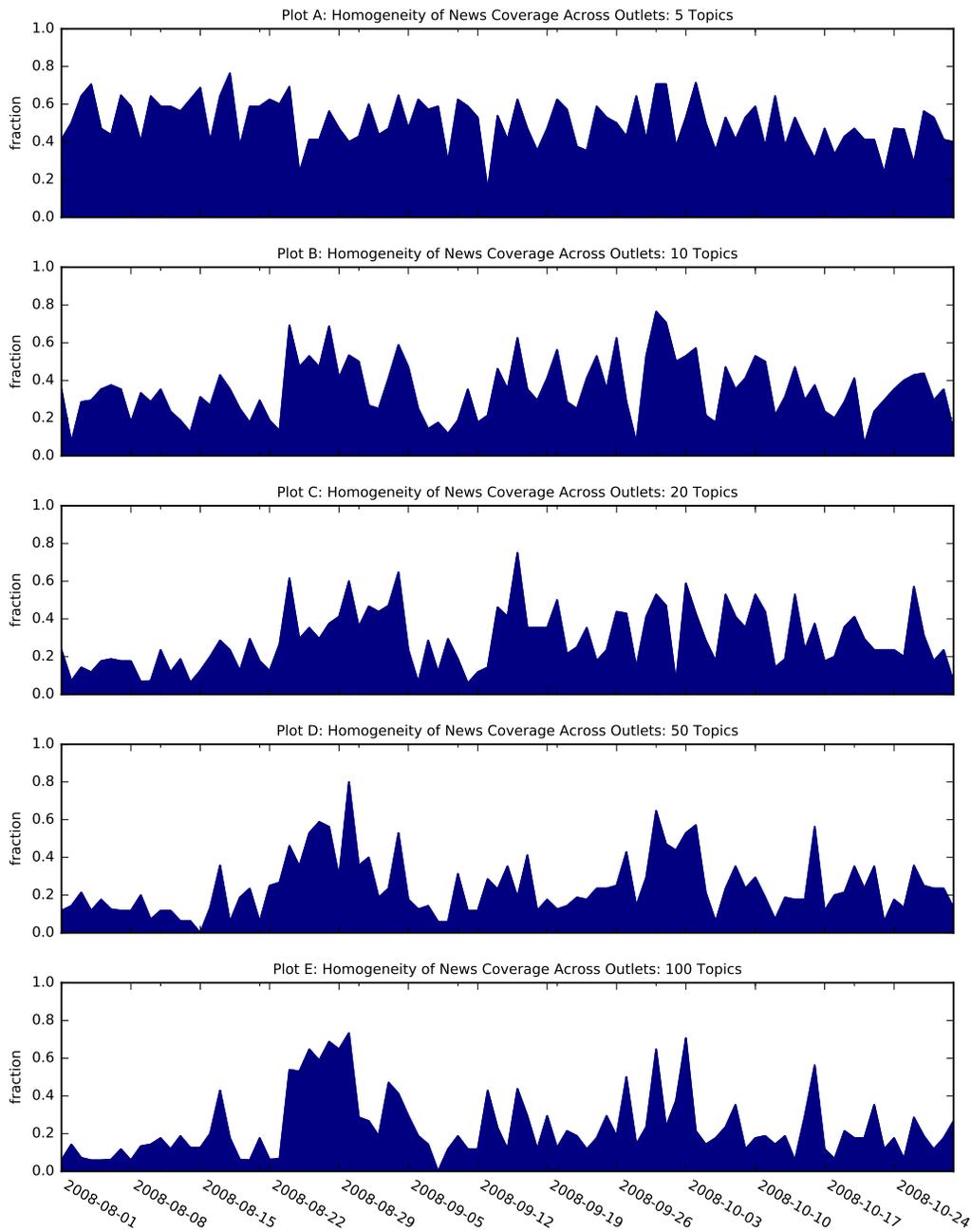
FIGURE 2. Homogeneity measures for model with (top to bottom) 5, 10, 20, 50 and 100 topics in 2008 sample period.
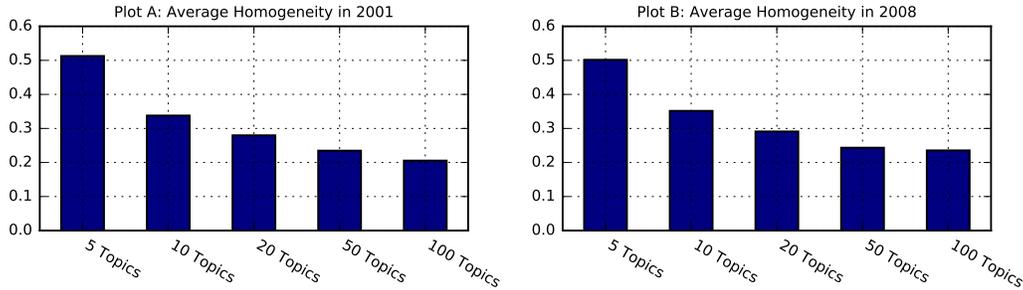
FIGURE 3. Average sample homogeneity for model with 5, 10, 20, 50 and 100 topics.

2. MOST FREQUENT WORDS IN THE 100 TOPIC LDA MODEL

Table 1: Estimated LDA Topics: High Probability Words
(100 Topics)

Topic	Words with the highest assigned probabilities (in descending order)
1	hurrican storm resid coast peopl sunday area night near power
2	death man charg accus counti woman drug kill polic say
3	day worker union labor summer job work went allow contract
4	today aug begin end month armi set year head leav
5	today sept said oct expect announc return appear news atlanta
6	democrat obama parti barack sen clinton convent denver senat nation
7	new york citi mayor train respons turn led week oper
8	page report stori number news sunday said main inform list
9	main portland south want saturday center town friday southern commun
10	park peopl live lot line dozen area near site got
11	militari air forc defens washington pentagon afghanistan base american oper
12	west virginia state offici say charleston joe resid design commiss
13	price ga oil fall rise economi drop industri expect high
14	worcest yesterday citi massachusett boston author resid central manag servic
15	hous right washington senat legisl pass vote wednesday repres approv
16	palestinian isra bank west today kill aug forc leader oct
17	men young town women small home live children life boy
18	bush presid administr washington polici congress promis plan action defens
19	percent year increas juli rate sale number expect accord month
20	accord feder govern report state new agenc depart fail help
21	like way look make chang peopl say just summer littl
22	million group money american rais intern collect support fund effort
23	citi council member monday board approv propos night mayor vote
24	school student high univers colleg class senior test law studi
25	said night tuesday wednesday close thursday told friday late watch
26	war terror world american fight nation long america act battl

27   state unit offici say includ develop recent countri tri local
28   hous white black washington insid red recent room larg away
29   famili like work friend watch home place didnt son know
30   morn day earli start televis monday hour news arriv sunday
31   gener attorney offici said state yesterday john say depart investig
32   financi billion crisi plan rescu washington bailout market econom govern
33   servic commun church local organ nation provid support come list
34   democrat race elect republican district candid senat polit seat rep
35   review journal la tuesday friday local citi monday wednesday southern
36   street wall financi crisi main credit firm fail market invest
37   month comput year time turn leav end wait minut work
38   stock market industri point day investor loss sell monday drop
39   new york week open hope bring time base far ground
40   school student high teacher counti educ district parent children year
41   game tri play mountain weekend turn head week set win
42   court judg feder rule case order law monday file hear
43   bush presid administr support yesterday washington effort georg leader said
44   build water river use home near street site search develop
45   state unit nation washington secretari sept meet world south tonight
46   leader washington reach senat major hous yesterday agreement hill capitol
47   offici remain say local yesterday warn region despit carri emerg
48   palin sarah presidenti republican vice john gov run mccain candid
49   year past decad prison life nearli time releas month number
50   said offici help hope tri aid protect nation tuesday friday
51   year ago week time nearli histori decad began final record
52   georgia russia russian forc south north troop atlanta war sign
53   attack terrorist sept washington respons america tuesday week terror victim
54   bin laden osama afghanistan terrorist taliban pakistan terror suspect attack
55   time littl second good sign like seri come right continu
56   attack author washington terrorist investig feder fbi suspect yesterday peopl
57   american associ press aug nation lead receiv say countri major
58   citi yesterday said mayor week mr run mark term michael
59   world center trade attack pentagon terrorist sept yesterday crash plane
60   job employe busi compani work cut worker said cost forc
61   presid bush washington american georg war nation urg militari warn
62   afghanistan taliban pakistan afghan bomb forc northern oct militari american
63   store away big open peopl far place look food turn
64   research cell human feder use scientist fund line institut announc
65   airport secur intern nation air airlin travel feder measur flight
66   yesterday pittsburgh north state pennsylvania univers mark make continu month
67   hour just walk mile night half did week minut work
68   execut said chief director busi board counti oper offic author
69   face issu question time histori second nation american econom long
70   state law public new gov agenc offic secur protect pennsylvania

71   year ago old month seven just time did retir good
72   bloomington normal friday illinoi america wednesday thursday morn central center
73   home head photo week came thursday visit went famili insid
74   day open just hand left like monday look held sunday
75   anthrax letter test offici washington said investig posit mail yesterday
76   mccain john obama barack presidenti campaign sen republican democrat debat
77   million dollar pay project year thousand agre hundr compani sell
78   st paul loui nation john convent republican wednesday night mccain
79   polic offic man charg depart chief said citi charleston investig
80   public plan work includ member safeti share hear famili commiss
81   new way start money phone commun busi effort want fund
82   elect vote voter counti earli florida day month final week
83   say use help number grow drug free make privat countri
84   economi rate feder reserv consum cut yesterday continu point half
85   power plan compani propos plant new energi creat develop build
86   want need come did know make week help say thing
87   campaign polit fall launch week yesterday begin start return battl
88   counti kanawha depart charleston month offici commiss file owner wednesday
89   bank billion corp financi deal feder govern compani agre invest
90   govern yesterday nation step said offici took control tuesday group
91   mail daili staff report charleston capitol counti kanawha say today
92   state gov budget cut tax governor legisl plan million propos
93   tax washington congress budget economi secur cut billion econom social
94   year old mother man boy son kill woman home death
95   health medic insur hospit care center doctor state patient emerg
96   car road drive line hard hit long outsid day home
97   airlin hijack flight sept american unit passeng crash jet plane
98   peopl kill said left thousand sunday dead truck die hundr
99   today oct meet leader aug govern nation minist talk countri
100   day end week long east middl hope appear come began

3. Highest-probability articles in the 10-topic LDA model

Table 2: Highest-Probability Articles in the 10-Topic LDA Specification

Topic	Text Snippet of Highest-Probability Article	Newspaper	Date	Probability
1	Afghanistans Taliban government yesterday rebuffed a demand by Pakistan that it immediately surrender Osama bin Laden to the United States to head off a military showdown, but set a high-level meeting for today to make a final ..."	Pittsburgh Post-Gazette	2001/09/18	95.7%
2	Claiming her historic spot on the Republican ticket, vice presidential candidate Sarah Palin uncorked a slashing attack on Barack Obama on Wednesday night and vowed to help John McCain bring real change to Washington ..."	The Evansville Courier	2008/09/04	95.7%
3	Kanawha County teachers, principals and other employees face random drug tests for the first time if school board members approve a policy new at a meeting Wednesday - and some school board members think they will ..."	Charleston Gazette	2008/10/14	95.7%
4	The search for Kimberly Szumski, the mother of two who disappeared from her Cinnaminson home three months ago, appeared to come to a dramatic end yesterday afternoon in the basement of a Society Hill apartment building ..."	The Philadelphia Inquirer	2001/08/17	93.1%
5	Congressional budget analysts warned in a report made public yesterday that the economic downturn and President Bushs tax-cut package would force the federal government to spend 9 billion from the Social Security surplus this year ..."	Pittsburgh Post-Gazette	2001/08/28	95.7%
6	State officials are planning to build a five-story building on the East End as a temporary home for state workers now housed in an outdated Capitol office building Building 3, which houses offices of the Division of ..."	Charleston Gazette	2001/08/27	95.9%

7	One of the authors of the states health care law says a decision by Gov Deval L Patrick to cut more than one third of the funding for a new council to control the rising costs of health care will cripple the independent ..."	Telegram & Gazette Worcester	2008/10/23	95.3%
8	An NBC News employee in New York has tested positive for anthrax in tests done after the company received suspicious mail, the network said today The anthrax was not the inhaled form of the disease, which killed a Florida man a ..."	Charleston Gazette	2001/10/12	95.5%
9	Two jets that left Bostons Logan International Airport this morning - American Airlines Flight 11, with 92 people aboard, and United Airlines Flight 175, carrying 65 people - were hijacked, and airline officials said both planes had ..."	The Boston Globe	2001/09/11	95.7%
10	Israeli forces killed eight Palestinians in the West Bank town of Nablus yesterday, in a strike aimed at top officials in the Islamic militant group Hamas The move raised the levels of violence in the area to its ..."	The Boston Globe	2001/08/01	94.7%

4. Discrete states, strong complementarities

In this section we discuss how the equilibrium news selection functions change when agents have a strong strategic motive. When $\lambda > \widehat{\lambda} \approx 0.55$ the equilibrium news selection functions are given by

$$\mathcal{S}_i = \begin{cases} |1 - \mathcal{S}_j| & \text{if } x_i = -x_j \\ 0 & \text{if } x_i = 0 \text{ and } x_j \in \{-1, 1\} \\ 1 & \text{otherwise} \end{cases} \tag{4.1}$$

Relative to the case with intermediate degrees of strategic complementarities, it is no longer necessarily an equilibrium for Paper A to report X_a whenever $x_a \neq 0$. To see why, note that when λ is large so that Alice cares a lot about Bob's action, she really wants to avoid taking a positive action when Bob takes a negative action, and vice versa. Therefore, when $x_a = -x_b$ and complementarities are strong enough, Alice prefers to read about X_b. However, because of the symmetry in utility functions, in the same states of the world, Bob would prefer to read about X_a if Alice does, in order to avoid taking a negative action when Alice takes a positive action. We then have multiple equilibria described by the condition that $\mathcal{S}_i = |1 - \mathcal{S}_j|$ i.e. so that $\mathcal{S}_a = 0$ if $\mathcal{S}_b = 1$. Whenever $x_a = -x_b$, it is an equilibrium for both papers to report either X_a or X_b as long as they coordinate on the reporting the same variable.

To break the tie, below we analyze one particular equilibrium where the newspapers coordinate on bad news, i.e. both papers will report the variable that had a negative realization whenever $x_a = -x_b$. In states of the world in which it is an equilibrium if both papers either report X_a or X_b, i.e. in states where $x_a = -x_b$, both papers will then report the story that had a negative realization.

News selection functions

Paper A				**Paper B**			
Strong complementarities, negative news coordination							
	$X_a = -1$	$X_a = 0$	$X_a = 1$		$X_a = -1$	$X_a = 0$	$X_a = 1$
$X_b = -1$	A	B	B	$X_b = -1$	B	B	B
$X_b = 0$	A	A	A	$X_b = 0$	A	B	A
$X_b = 1$	A	B	A	$X_b = 1$	A	B	B

Conditional on Alice observing $x_a = 1$ she can infer that $x_b \neq -1$ since with negative news coordination, paper A would have reported x_b if that was the case. If $x_b = 1$, paper B will report X_b which happens with conditional probability $\frac{1}{3}$. The remaining possibility is that $x_b = 0$ so that paper B will report that $x_a = 1$. Alice's optimal action is then given by

$$y_a(x_a = 1) = (1 - \lambda) + \lambda \frac{1}{3} y_b(x_b = 1) + \lambda \frac{2}{3} y_a(x_a = 1). \tag{4.2}$$

When paper A reports that $x_a = -1$ Alice knows that paper B will report x_a if $x_b \in \{0, 1\}$ and report $x_b = -1$ otherwise and her optimal action is then given by

$$y_a(x_a = -1) = -(1 - \lambda) + \lambda \frac{3}{4} y_b(x_a = -1) + \lambda \frac{1}{4} y_b(x_b = -1). \tag{4.3}$$

As always, Alice knows that if she observes X_b then so does Bob. If she observes that $x_b = 1$ she can infer with certainty that $x_a = 0$ and her optimal action is given by

$$y_a(x_b = 1) = \lambda y_j(x_j = 1). \tag{4.4}$$

If Alice observes $x_b = 1$ she can still be sure that Bob also observes the same event. However, because of the negative news coordination, it is now possible that she observes $x_b = -1$ when $x_a = 1$. Alice's action is then given by

$$y_a(x_b = -1) = \frac{1}{3}(1 - \lambda) + \lambda y_b(x_b = -1) \tag{4.5}$$

where $\frac{1}{3}(1 - \lambda)$ is her conditional expectation of x_a. That is, Alice understands the negativity bias in the news reporting but, because the bias is probabilistic, it is discounted by the probability.

Alice and Bob's actions in each state of the world can be found by solving the system of equations implied by (4.2) - (4.5).

Equilibrium Actions w/ Strong Complementarities

	Alice				Bob		
	Negative news coordination						
	$X_a = -1$	$X_a = 0$	$X_a = 1$		$X_a = -1$	$X_a = 0$	$X_a = 1$
$X_b = -1$	$-\frac{4-\lambda}{3\lambda+4}$	$-\frac{13\lambda-4}{9\lambda+12}$	$-\frac{13\lambda-4}{9\lambda+12}$	$X_b = -1$	$-\frac{4-\lambda}{3\lambda+4}$	$-\frac{4-\lambda}{3\lambda+4}$	$-\frac{4-\lambda}{3\lambda+4}$
$X_b = 0$	$-\frac{4-\lambda}{3\lambda+4}$	0	$\frac{3}{2\lambda+3}$	$X_b = 0$	$-\frac{13\lambda-4}{9\lambda+12}$	0	$\frac{3\lambda}{2\lambda+3}$
$X_b = 1$	$-\frac{4-\lambda}{3\lambda+4}$	$\frac{3\lambda}{2\lambda+3}$	$\frac{3}{2\lambda+3}$	$X_b = 1$	$-\frac{13\lambda-4}{9\lambda+12}$	$\frac{3}{2\lambda+3}$	$\frac{3}{2\lambda+3}$

With negative news coordination, Alice and Bob's actions are symmetric. As in the case with moderate strategic complementarities, whenever Alice or Bob observe a zero realization of an event, the state $(0,0)$ is common knowledge and both agents take a zero action. However, Alice's action when $x_a = 1$ is stronger than in the benchmark model since Alice can be sure that $x_b \neq -1$ since Paper A would then have reported about X_b. Alice's action when she observes $x_a = -1$ is also stronger, i.e. more negative, than in the benchmark case since she knows that Bob then either observes $x_a = -1$ or $x_b = -1$. Negative news coordination thus makes agents responses to a given event stronger.

5. CONTINUOUS STATES AND STRATEGIC COMPLEMENTS

Here we replicate the plots of Section 5 of the main paper for the case with strategic substitutability of actions.
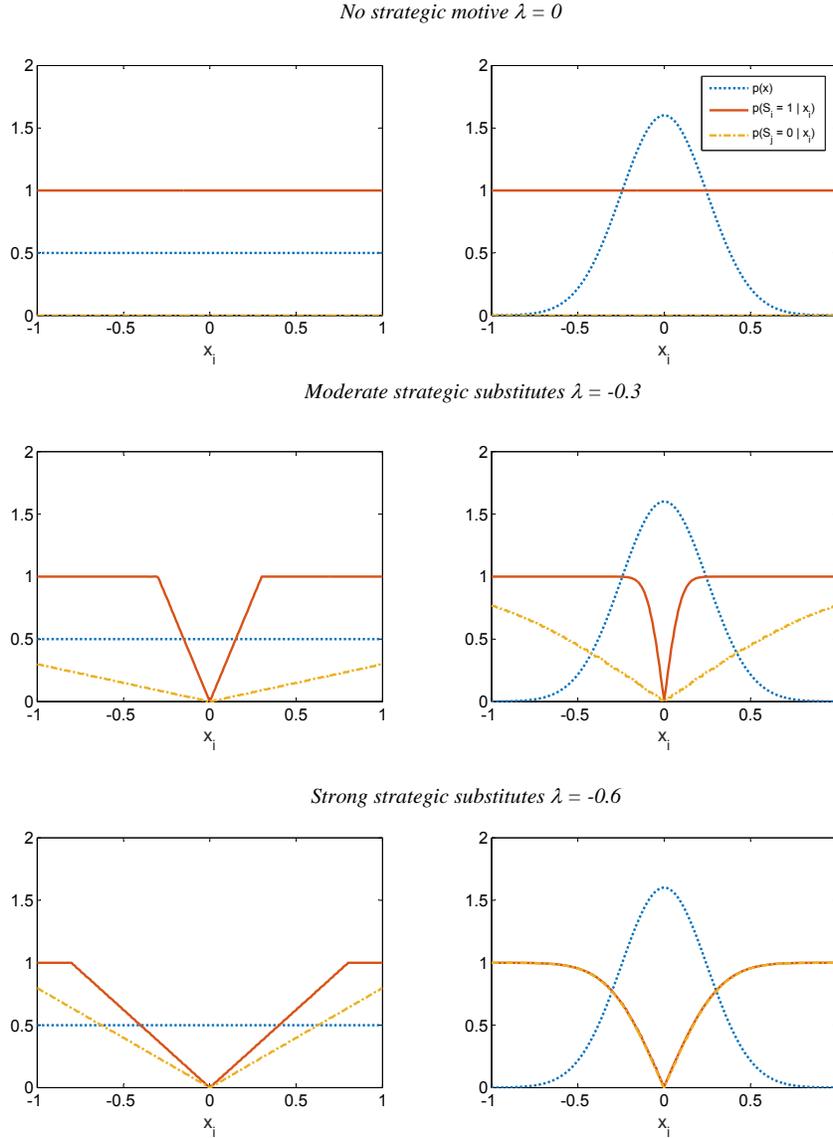

FIGURE 4. The probability that the agent i (solid red) and agent j (yellow dashed) observe x_i conditional on x_i with X_i and X_j distributed as $U(-1, 1)$ (left column) and $N(0, 1/3)$ (right column). Top row is model without strategic motive ($\lambda = 0$), middle row with moderate strategic substitutability ($\lambda = -0.3$) and bottom row with strong strategic substitutability ($\lambda = -0.6$).
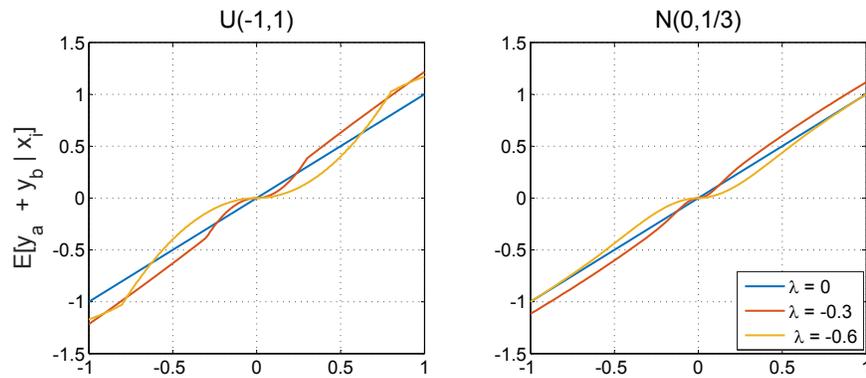
FIGURE 5. Expected aggregate response conditional on x_i with $U(-1,1)$ (left panel) and $N(0, \frac{1}{3})$ (right panel) distributions of X_i and X_j.