Online Appendix to Simulating Collusion and Enforcement

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Preliminary Version

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This online appendix contains additional results and figures for our paper "Simulating Collusion and Enforcement".

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A Summary Statistics

Table 1: Summary Statistics Population (Detected and Undetected Cartels) of Model I

	Mean	Median	SD	Min	Max	Skew	N
Start	501.24	502	289.60	1	1000	-0.01	24'374
End	507.27	509	289.56	1	1000	-0.01	24'374
Duration	7.03	3	10.30	1	176	3.85	24'374
Ln(Dur)	1.30	1.10	1.09	0	5.17	0.49	24'374
Detected	0.37	0	0.48	0	1	0.54	24'374
Sample	0.37	0	0.48	0	1	0.54	24'374
TC	6.50	4	6.47	0	39	1.46	24'374
Ln(TC+1)	1.64	1.61	0.90	0	3.69	-0.15	24'374
Rep. Off.	0.77	1	0.42	0	1	-1.28	24'374
κ	0.06	0.07	0.02	0	0.10	-0.40	24'374
Type η	3.06	2.72	1.55	1.10	9.77	1.03	24'374
Ln(η)	0.997	1	0.49	0.10	2.28	0.09	24'374

For Model I, this table presents the following summary statistics of the 24'374 simulated detected and undetected cartels within a total period of 1'000 time units: the exogenous industry characteristics, the start and end date of the cartel, the duration, if it got detected, detected repeatedly, and how often it got detected.

Table 2: Summary Statistics Sample (CA and Leniency Detected Cartels) of Model I

	Mean	Median	SD	Min	Max	Skew	N
Start	494.88	493	289.08	1	1000	0	9'012
End	504.73	504	289.06	1	1000	0	9'012
Duration	10.85	6	13.62	1	176	2.94	9'012
Ln(Dur)	1.76	1.79	1.15	0	5.17	0.07	9'012
Detected	1	1	0	1	1		9'012
Sample	1	1	0	1	1		9'012
TC	9.37	7	7.37	1	39	0.99	9'012
Ln(TC+1)	2.07	2.08	0.77	0.69	3.69	-0.19	9'012
Rep. Off.	0.91	1	0.29	0	1	-2.78	9'012
κ	0.06	0.06	0.02	0	0.10	-0.37	9'012
Type η	2.22	1.83	1.19	1.10	9.75	1.86	9'012
Ln(η)	0.69	0.61	0.45	0.10	2.28	0.77	9'012

For Model I, this table presents the following summary statistics of the 9'012 simulated detected cartels within a total period of 1'000 time units: the exogenous industry characteristics, the start and end date of the cartel, the duration, if it got detected repeatedly, and how often it got detected.

Table 3: Summary Statistics Population (Detected and Undetected Cartels) of Model IIA

	Mean	Median	SD	Min	Max	Skew	N
Start	501.13	502	289.62	1	1000	-0.01	24'301
End	507.15	509	289.59	1	1000	-0.01	24'301
Duration	7.02	3	10.28	1	176	3.85	24'301
Ln(Dur)	1.30	1.10	1.09	0	5.17	0.49	24'301
Detected	0.34	0	0.47	0	1	0.68	24'301
Leniency	0.65	1	0.48	0	1	-0.65	24'301
Sample	0.99	1	0.08	0	1	-12.28	24'301
TC	18.05	16	13	0	69	0.79	24'301
Ln(TC+1)	2.66	2.83	0.83	0	4.25	-0.60	24'301
Rep. Off.	0.96	1	0.19	0	1	-4.77	24'301
κ	0.06	0.07	0.02	0	0.10	-0.40	24'301
Type η	3.05	2.72	1.54	1.10	9.77	1.03	24'301
Ln(η)	0.99	1	0.49	0.10	2.28	0.09	24'301

For Model IIA, this table presents the following summary statistics of the 24'301 simulated detected and undetected cartels within a total period of 1'000 time units: the exogenous industry characteristics, the start and end date of the cartel, the duration, if it got detected, detected repeatedly, and how often it got detected.

Table 4: Summary Statistics Sample (CA and Leniency Detected Cartels) of Model IIA

	Mean	Median	SD	Min	Max	Skew	N
Start	497.98	498	287.86	1	1000	-0.01	24'143
End	503.97	505	287.77	1	1000	-0.01	24'143
Duration	6.99	3	10.24	1	176	3.87	24'143
Ln(Dur)	1.29	1.10	1.09	0	5.17	0.49	24'143
Detected	0.34	0	0.47	0	1	0.67	24'143
Leniency	0.66	1	0.47	0	1	-0.67	24'143
Sample	1	1	0	1	1		24'143
TC	17.96	15	12.95	1	69	0.79	24'143
Ln(TC+1)	2.65	2.77	0.83	0.69	4.25	-0.60	24'143
Rep. Off.	0.96	1	0.19	0	1	-4.75	24'143
κ	0.06	0.07	0.02	0	0.10	-0.40	24'143
Type η	3.06	2.72	1.54	1.10	9.77	1.03	24'143
Ln(η)	1	1	0.49	0.10	2.28	0.09	24'143

For Model IIA, this table presents the following summary statistics of the 24'143 simulated detected cartels within a total period of 1'000 time units: the exogenous industry characteristics, the start and end date of the cartel, the duration, if it got detected, detected repeatedly, and how often it got detected.

Table 5: Summary Statistics Population (Detected and Undetected Cartels) of Model IIB

	Mean	Median	SD	Min	Max	Skew	N
Start	497.65	498	289.50	1	1000	0	24'148
End	503.68	505	289.58	1	1000	0	24'148
Duration	7.03	3	10.25	1	170	3.95	24'148
Ln(Dur)	1.31	1.10	1.09	0	5.14	0.48	24'148
Detected	0.36	0	0.48	0	1	0.57	24'148
Leniency	0.12	0	0.33	0	1	2.30	24'148
Sample	0.49	0	0.50	0	1	0.06	24'148
TC	8.16	7	6.65	0	40	1.04	24'148
Ln(TC+1)	1.91	2.08	0.84	0	3.71	-0.48	24'148
Rep. Off.	0.86	1	0.35	0	1	-2.07	24'148
κ	0.06	0.07	0.02	0	0.10	-0.39	24'148
Type η	3.04	2.72	1.53	1.10	9.77	1.05	24'148
Ln(η)	0.99	1	0.49	0.10	2.28	0.10	24'148
Pr(Leniency)	0.19	0.17	0.12	0	0.50	0.39	24'148

For Model IIB, this table presents the following summary statistics of the 24'148 simulated detected and undetected cartels within a total period of 1'000 time units: the exogenous industry characteristics, the start and end date of the cartel, the duration, if it got detected, detected repeatedly, and how often it got detected.

Table 6: Summary Statistics Sample (CA and Leniency Detected Cartels) of Model IIB

	Mean	Median	SD	Min	Max	Skew	N
Start	490.58	489	287.32	1	999	0.02	11'742
End	499.08	498	287.42	1	1000	0.02	11'742
Duration	9.49	5	12.59	1	170	3.25	11'742
Ln(Dur)	1.60	1.61	1.15	0	5.14	0.21	11'742
Detected	0.75	1	0.43	0	1	-1.14	11'742
Leniency	0.25	0	0.43	0	1	1.14	11'742
Sample	1	1	0	1	1		11'742
TC	9.64	8	7.09	1	40	0.90	11'742
Ln(TC+1)	2.12	2.20	0.74	0.69	3.71	-0.31	11'742
Rep. Off.	0.92	1	0.27	0	1	-3.13	11'742
κ	0.06	0.06	0.02	0	0.10	-0.21	11'742
Type η	2.56	2.06	1.45	1.10	9.77	1.55	11'742
Ln(η)	0.81	0.72	0.50	0.10	2.28	0.52	11'742
Pr(Leniency)	0.21	0.20	0.12	0	0.50	0.21	11'742

For Model IIB, this table presents the following summary statistics of the 11'742 simulated detected cartels within a total period of 1'000 time units: the exogenous industry characteristics, the start and end date of the cartel, the duration, if it got detected, detected repeatedly, and how often it got detected.

Table 7: Summary Statistics Population (Detected and Undetected Cartels) of Model III

	Mean	Median	SD	Min	Max	Skew	N
Start	499.82	500	290	1	1000	-0.01	23'197
End	507.50	508	290.01	1	1000	-0.01	23'197
Duration	8.67	3	14.79	1	275	4.54	23'197
Ln(Dur)	1.38	1.10	1.18	0	5.62	0.57	23'197
Detected	0.25	0	0.43	0	1	1.14	23'197
Leniency	0.07	0	0.25	0	1	3.44	23'197
Sample	0.32	0	0.47	0	1	0.77	23'197
TC	5.23	4	4.70	0	30	1.27	23'197
Ln(TC+1)	1.53	1.61	0.81	0	3.43	-0.25	23'197
Rep. Off.	0.77	1	0.42	0	1	-1.25	23'197
κ	0.06	0.07	0.02	0	0.10	-0.39	23'197
Type η	3.19	2.85	1.58	1.10	9.97	0.99	23'197
Ln(η)	1.04	1.05	0.49	0.10	2.30	0.04	23'197

For Model III, this table presents the following summary statistics of the 23'197 simulated detected and undetected cartels within a total period of 1'000 time units: the exogenous industry characteristics, the start and end date of the cartel, the duration, if it got detected, detected repeatedly, and how often it got detected.

Table 8: Summary Statistics Sample (CA and Leniency Detected Cartels) of Model III

	Mean	Median	SD	Min	Max	Skew	N
Start	483.24	478	290.17	1	1000	0	7'417
End	496.55	494	290.28	1	1000	-0.01	7'417
Duration	14.31	6	20.95	1	275	3.30	7'417
Ln(Dur)	1.87	1.79	1.28	0	5.62	0.18	7'417
Detected	0.79	1	0.41	0	1	-1.41	7'417
Leniency	0.21	0	0.41	0	1	1.41	7'417
Sample	1	1	0	1	1		7'417
TC	6.97	6	5.20	1	30	0.98	7'417
Ln(TC+1)	1.85	1.95	0.69	0.69	3.43	-0.13	7'417
Rep. Off.	0.88	1	0.32	0	1	-2.37	7'417
κ	0.06	0.06	0.02	0	0.10	-0.35	7'417
Type η	2.44	1.97	1.38	1.10	9.77	1.64	7'417
Ln(η)	0.77	0.68	0.49	0.10	2.28	0.62	7'417

For Model III, this table presents the following summary statistics of the 7'417 simulated detected cartels within a total period of 1'000 time units: the exogenous industry characteristics, the start and end date of the cartel, the duration, if it got detected, detected repeatedly, and how often it got detected.

B Correlation Tables

Table 9: Correlation Table Population Model I

	Ind	Start	End	Dur	Ln(Dur)	D	Sample	TC	Rep	κ	η
Industry	1.00	-0.01	-0.01	0.00	-0.01	-0.01	-0.01	0.01	-0.02	0.03	-0.01
Start	-0.01	1.00	1.00	-0.02	-0.02	-0.02	-0.02	0.54	0.43	-0.01	0.01
End	-0.01	1.00	1.00	0.01	0.01	-0.01	-0.01	0.55	0.44	-0.01	-0.01
Duration	0.00	-0.02	0.01	1.00	0.81	0.28	0.28	0.29	0.17	-0.03	-0.43
Ln(Dur)	-0.01	-0.02	0.01	0.81	1.00	0.32	0.32	0.35	0.24	-0.04	-0.58
Detected	-0.01	-0.02	-0.01	0.28	0.32	1.00	1.00	0.34	0.25	-0.03	-0.41
Sample	-0.01	-0.02	-0.01	0.28	0.32	1.00	1.00	0.34	0.25	-0.03	-0.41
TC	0.01	0.54	0.55	0.29	0.35	0.34	0.34	1.00	0.50	0.26	-0.55
Rep. Off.	-0.02	0.43	0.44	0.17	0.24	0.25	0.25	0.50	1.00	0.15	-0.45
κ	0.03	-0.01	-0.01	-0.03	-0.04	-0.03	-0.03	0.26	0.15	1.00	-0.11
Type η	-0.01	0.01	-0.01	-0.43	-0.58	-0.41	-0.41	-0.55	-0.45	-0.11	1.00

For Model I, this table presents the correlation between all variables shown in the summary statistics in Table 1.

Table 10: Correlation Table Population Model IIA

	Ind	Start	End	Dur	Ln(Dur)	D	Len	Sample	TC	Rep	κ	η
Industry	1.00	-0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	0.02	0.00	0.03	-0.01
Start	-0.01	1.00	1.00	-0.02	-0.02	-0.02	-0.01	-0.13	0.76	0.30	-0.01	0.01
End	-0.01	1.00	1.00	0.01	0.01	-0.01	-0.02	-0.14	0.76	0.30	-0.01	-0.01
Duration	0.00	-0.02	0.01	1.00	0.81	0.30	-0.31	-0.04	-0.05	0.00	-0.03	-0.43
Ln(Dur)	-0.01	-0.02	0.01	0.81	1.00	0.34	-0.35	-0.04	-0.01	0.02	-0.04	-0.58
Detected	0.00	-0.02	-0.01	0.30	0.34	1.00	-0.99	0.06	-0.05	-0.01	-0.03	-0.44
Leniency	0.00	-0.01	-0.02	-0.31	-0.35	-0.99	1.00	0.11	0.03	0.00	0.03	0.45
Sample	0.00	-0.13	-0.14	-0.04	-0.04	0.06	0.11	1.00	-0.09	-0.01	0.00	0.05
TC	0.02	0.76	0.76	-0.05	-0.01	-0.05	0.03	-0.09	1.00	0.26	0.42	-0.16
Rep. Off.	0.00	0.30	0.30	0.00	0.02	-0.01	0.00	-0.01	0.26	1.00	0.11	-0.07
κ	0.03	-0.01	-0.01	-0.03	-0.04	-0.03	0.03	0.00	0.42	0.11	1.00	-0.11
Type η	-0.01	0.01	-0.01	-0.43	-0.58	-0.44	0.45	0.05	-0.16	-0.07	-0.11	1.00

For Model IIA, this table presents the correlation between all variables shown in the summary statistics in Table 3.

Table 11: Correlation Table Population Model IIB

	Ind	Start	End	Dur	Ln(Dur)	D	Len	Sample	TC	Rep	κ	η	$Pr(Len)$
Industry	1.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.00	0.01	0.01	0.02	-0.01	-0.02
Start	0.00	1.00	1.00	-0.01	-0.01	-0.02	0.00	-0.02	0.67	0.45	-0.01	0.01	0.01
End	0.00	1.00	1.00	0.03	0.02	-0.01	-0.01	-0.02	0.68	0.45	-0.01	-0.01	0.01
Duration	0.00	-0.01	0.03	1.00	0.81	0.29	-0.07	0.23	0.25	0.11	-0.03	-0.43	0.03
Ln(Dur)	0.01	-0.01	0.02	0.81	1.00	0.33	-0.08	0.26	0.30	0.16	-0.04	-0.57	0.04
Detected	0.00	-0.02	-0.01	0.29	0.33	1.00	-0.28	0.78	0.27	0.16	-0.02	-0.42	0.02
Leniency	-0.01	0.00	-0.01	-0.07	-0.08	-0.28	1.00	0.38	-0.07	0.03	-0.24	0.16	0.24
Sample	0.00	-0.02	-0.02	0.23	0.26	0.78	0.38	1.00	0.22	0.17	-0.17	-0.30	0.17
TC	0.01	0.67	0.68	0.25	0.30	0.27	-0.07	0.22	1.00	0.46	0.17	-0.49	-0.17
Rep	0.01	0.45	0.45	0.11	0.16	0.16	0.03	0.17	0.46	1.00	0.02	-0.31	-0.02
κ	0.02	-0.01	-0.01	-0.03	-0.04	-0.02	-0.24	-0.17	0.17	0.02	1.00	-0.12	-1.00
Type η	-0.01	0.01	-0.01	-0.43	-0.57	-0.42	0.16	-0.30	-0.49	-0.31	-0.12	1.00	0.12
Pr(Len)	-0.02	0.01	0.01	0.03	0.04	0.02	0.24	0.17	-0.17	-0.02	-1.00	0.12	1.00

For Model IIB, this table presents the correlation between all variables shown in the summary statistics in Table 5.

Table 12: Correlation Table Population Model III

	Ind	Start	End	Dur	Ln(Dur)	D	Len	Sample	TC	Rep	κ	η
Industry	1.00	-0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	0.02	0.00	0.03	-0.01
Start	-0.01	1.00	1.00	-0.02	-0.02	-0.03	-0.03	-0.04	0.58	0.44	-0.01	0.01
End	-0.01	1.00	1.00	0.03	0.02	-0.01	-0.03	-0.03	0.59	0.45	-0.01	-0.01
Duration	0.00	-0.02	0.03	1.00	0.78	0.31	-0.05	0.26	0.24	0.13	-0.05	-0.42
Ln(Dur)	-0.01	-0.02	0.02	0.78	1.00	0.34	-0.06	0.28	0.31	0.19	-0.06	-0.61
Detected	0.00	-0.03	-0.01	0.31	0.34	1.00	-0.16	0.85	0.28	0.19	-0.04	-0.38
Leniency	0.00	-0.03	-0.03	-0.05	-0.06	-0.16	1.00	0.39	-0.01	0.03	0.00	0.07
Sample	0.00	-0.04	-0.03	0.26	0.28	0.85	0.39	1.00	0.25	0.19	-0.03	-0.32
TC	0.02	0.58	0.59	0.24	0.31	0.28	-0.01	0.25	1.00	0.55	0.29	-0.49
Rep. Off.	0.00	0.44	0.45	0.13	0.19	0.19	0.03	0.19	0.55	1.00	0.20	-0.37
κ	0.03	-0.01	-0.01	-0.05	-0.06	-0.04	0.00	-0.03	0.29	0.20	1.00	-0.10
Type η	-0.01	0.01	-0.01	-0.42	-0.61	-0.38	0.07	-0.32	-0.49	-0.37	-0.10	1.00

For Model III, this table presents the correlation between all variables shown in the summary statistics in Table 7.

C Regression Tables

Table 13: Hazard Rate Regression for Cartel Duration (Model I)

	Cartel Death		
	HRSample	HRUndetect	HRCartels
Ln(TC+1)	0.016	0.004	0.006
	(0.017)	(0.012)	(0.009)
κ	4.716***	8.166***	6.792***
	(0.457)	(0.350)	(0.276)
Ln(η)	1.958***	2.228***	2.122***
	(0.032)	(0.027)	(0.020)
Observations	9'012	15'362	24'374
Log Likelihood	−28'313.62	−34'466.92	−62'858.26

This table shows the estimation results of a Weibull Hazard Model to explain cartel death at the industry level, for data simulated for Model I. We estimate HR coefficients on the sample of detected cartels, the group of undetected cartels and the population of all cartels. The estimated HR coefficients show the change of risk for cartel breakdown if the covariate increases by 1 unit, keeping all others fixed. Standard errors are in parentheses. We estimate the Weibull regression:
$Survival(Duration, Death) = \beta_0 + \beta_1 Ln(TC + 1) + \beta_2 \kappa + \beta_3 Ln(\eta) + \epsilon$.

Table 14: Hazard Rate Regression for Cartel Duration (Model IIA)

	Cartel Death			
	CA Detected	Leniency	Sample	Cartels
Ln(TC+1)	0.015	0.058***	0.044***	0.034***
	(0.015)	(0.011)	(0.009)	(0.008)
κ	4.439***	7.479***	6.286***	6.401***
	(0.494)	(0.360)	(0.291)	(0.290)
Ln(η)	1.930***	2.225***	2.105***	2.101***
	(0.031)	(0.024)	(0.019)	(0.019)
Leniency			0.035**	0.058***
			(0.016)	(0.016)
Observations	8'237	15'906	24'143	24'301
Log Likelihood	−26'488.69	−35'855.72	−62'462.72	−62'614.75

This table shows the estimation results of a Weibull Hazard Model to explain cartel death at the industry level, for data simulated for Model IIA. We estimate HR coefficients on the group of CA detected cartels, the group of cartels detected due to leniency application, sample of all detected cartels and the population of all cartels. For Model IIA, we leave the group of undetected cartels out of hazard rate estimation, as all undetected cartels are still active (alive) at the end of the simulation. The estimated HR coefficients show the change of risk for cartel breakdown if the covariate increases by 1 unit, keeping all others fixed. Standard errors are in parentheses. We estimate the Weibull regression:
$Survival(Duration, Death) = \beta_0 + \beta_1 Ln(TC + 1) + \beta_2 \kappa + \beta_3 Ln(\eta) + \beta_4 Leniency + \epsilon$.

Table 15: Hazard Rate Regression for Cartel Duration (Model IIB)

	Cartel Death				
	CA Detected	Leniency	Sample	Undetected	Cartels
Ln(TC+1)	−0.002	0.044	0.008	0.006	0.002
	(0.016)	(0.031)	(0.014)	(0.012)	(0.009)
κ	5.277***	7.616***	5.774***	7.947***	6.942***
	(0.454)	(0.862)	(0.402)	(0.401)	(0.280)
Ln(η)	1.935***	2.160***	1.977***	2.254***	2.125***
	(0.031)	(0.056)	(0.027)	(0.030)	(0.019)
Leniency			0.023		0.001
			(0.025)		(0.021)
Observations	8'782	2'960	11'742	12'406	24'148
Log Likelihood	−27'808.33	−6'833.12	−34'686.70	−27'640.48	−62'385.75

This table shows the estimation results of a Weibull Hazard Model to explain cartel death at the industry level, for data simulated for Model IIB. We estimate HR coefficients on the group of CA detected cartels, the group of cartels detected due to leniency application, sample of all detected cartels, the group of undetected cartels, and the population of all cartels. The estimated HR coefficients show the change of risk for cartel breakdown if the covariate increases by 1 unit, keeping all others fixed. Standard errors are in parentheses. We estimate the Weibull regression:
$Survival(Duration, Death) = \beta_0 + \beta_1 Ln(TC + 1) + \beta_2 \kappa + \beta_3 Ln(\eta) + \beta_4 Leniency + \epsilon$.

Table 16: Hazard Rate Regression for Cartel Duration (Model III)

			Cartel Death		
	CA Detected	Leniency	Sample	Undetected	Cartels
Ln(TC+1)	0.060***	0.042	0.057***	0.019	0.030***
	(0.022)	(0.047)	(0.020)	(0.012)	(0.010)
κ	5.094***	10.279***	6.108***	8.484***	7.707***
	(0.559)	(1.121)	(0.499)	(0.348)	(0.284)
Ln(η)	2.301***	2.344***	2.297***	2.458***	2.423***
	(0.040)	(0.079)	(0.036)	(0.026)	(0.020)
Leniency			0.023		0.020
			(0.032)		(0.026)
Observations	5'843	1'574	7'417	15'780	23'197
Log Likelihood	−20'397.88	−3'777.98	−24'215.46	−37'704.22	−61'971.88

This table shows the estimation results of a Weibull Hazard Model to explain cartel death at the industry level, for data simulated for Model III. We estimate HR coefficients on the group of CA detected cartels, the group of cartels detected due to leniency application, sample of all detected cartels, the group of undetected cartels, and the population of all cartels. The estimated HR coefficients show the change of risk for cartel breakdown if the covariate increases by 1 unit, keeping all others fixed. Standard errors are in parentheses. We estimate the Weibull regression:
$Survival(Duration, Death) = \beta_0 + \beta_1 Ln(TC+1) + \beta_2 \kappa + \beta_3 Ln(\eta) + \beta_4 Leniency + \epsilon$.

Table 17: Duration Hazard Rate Regression and Lasso CV (Model IIA)

	Sample	Cartels	Sample Lasso	Cartels Lasso
Ln(TC+1)	0.044***	0.034***	−0.014	−0.036*
	(0.009)	(0.008)	(0.018)	(0.018)
κ	6.286***	6.401***	6.296***	6.408***
	(0.291)	(0.290)	(0.291)	(0.290)
Ln(η)	2.105***	2.101***	2.008***	1.975***
	(0.019)	(0.019)	(0.049)	(0.049)
Leniency	0.035**	0.058***	0.073**	0.094***
	(0.016)	(0.016)	(0.031)	(0.031)
$Ln(\eta) \cdot Leniency$			−0.050	−0.049
			(0.032)	(0.032)
$Ln(\eta) \cdot Ln(TC+1)$			0.055***	0.067***
			(0.016)	(0.016)
Observations	24'143	24'301	24'143	24'301
Log Likelihood	−62'462.72	−62'614.75	−62'431.11	−62'604.24

This table shows the estimation results of a Weibull Hazard Model to explain cartel death at the industry level, for data simulated for Model IIA, comparing the results of the linear model to the extension with Lasso CV selected nonlinear coefficients. We estimate HR coefficients on the sample of all detected cartels and the population of all cartels. The estimated HR coefficients show the change of risk for cartel breakdown if the covariate increases by 1 unit, keeping all others fixed. Standard errors are in parentheses. For Lasso CV, we estimate the Weibull regression:
$Survival(Duration, Death) = \beta_0 + \beta_1 Ln(TC+1) + \beta_2 \kappa + \beta_3 Ln(\eta) + \beta_4 Leniency + \beta_5 Ln(\eta) \cdot Leniency + \beta_6 Ln(\eta) \cdot Ln(TC+1) + \epsilon$.

Table 18: Duration Hazard Rate Regression and Lasso CV (Model IIB)

	Sample	Cartels	Sample Lasso	Cartels Lasso
Ln(TC+1)	0.008	0.002	-0.090^{***}	-0.123^{***}
	(0.014)	(0.009)	(0.024)	(0.018)
κ	5.774^{***}	6.942^{***}	5.872^{***}	7.057^{***}
	(0.402)	(0.280)	(0.403)	(0.280)
Ln(η)	1.977^{***}	2.125^{***}	1.755^{***}	1.917^{***}
	(0.027)	(0.019)	(0.061)	(0.034)
Leniency	0.023	0.001	0.092	0.123^{**}
	(0.025)	(0.021)	(0.058)	(0.055)
$Ln(\eta) \cdot Leniency$			-0.063	-0.111^{***}
			(0.049)	(0.043)
$Ln(\eta) \cdot Ln(TC+1)$			0.131^{***}	0.126^{***}
			(0.027)	(0.015)
Observations	11'742	24'148	11'742	24'148
Log Likelihood	-34'686.70	-62'385.75	-34'649.96	-62'346.44

This table shows the estimation results of a Weibull Hazard Model to explain cartel death at the industry level, for data simulated for Model IIB, comparing the results of the linear model to the extension with Lasso CV selected nonlinear coefficients. We estimate HR coefficients on the sample of all detected cartels and the population of all cartels. The estimated HR coefficients show the change of risk for cartel breakdown if the covariate increases by 1 unit, keeping all others fixed. Standard errors are in parentheses. For Lasso CV, we estimate the Weibull regression: $Survival(Duration, Death) = \beta_0 + \beta_1 Ln(TC+1) + \beta_2 \kappa + \beta_3 Ln(\eta) + \beta_4 Leniency + \beta_5 Ln(\eta) \cdot Leniency + \beta_6 Ln(\eta) \cdot Ln(TC+1) + \epsilon$.

Table 19: Duration Hazard Rate Regression and Lasso CV (Model III)

	Sample	Cartels	Sample Lasso	Cartels Lasso
Ln(TC+1)	0.057^{***}	0.030^{***}	-0.057^{*}	-0.155^{***}
	(0.020)	(0.010)	(0.031)	(0.019)
κ	6.108^{***}	7.707^{***}	5.931^{***}	7.562^{***}
	(0.499)	(0.284)	(0.500)	(0.284)
Ln(η)	2.297^{***}	2.423^{***}	2.090^{***}	2.180^{***}
	(0.036)	(0.020)	(0.072)	(0.030)
Leniency	0.023	0.020	0.286^{***}	0.257^{***}
	(0.032)	(0.026)	(0.076)	(0.071)
$Ln(\eta) \cdot Leniency$			-0.244^{***}	-0.219^{***}
			(0.065)	(0.057)
$Ln(\eta) \cdot Ln(TC+1)$			0.173^{***}	0.187^{***}
			(0.038)	(0.016)
Observations	7'417	23'197	7'417	23'197
Log Likelihood	-24'215.46	-61'971.88	-24'166.47	-61'894.36

This table shows the estimation results of a Weibull Hazard Model to explain cartel death at the industry level, for data simulated for Model III, comparing the results of the linear model to the extension with Lasso CV selected nonlinear coefficients. We estimate HR coefficients on the sample of all detected cartels and the population of all cartels. The estimated HR coefficients show the change of risk for cartel breakdown if the covariate increases by 1 unit, keeping all others fixed. Standard errors are in parentheses. For Lasso CV, we estimate the Weibull regression: $Survival(Duration, Death) = \beta_0 + \beta_1 Ln(TC+1) + \beta_2 \kappa + \beta_3 Ln(\eta) + \beta_4 Leniency + \beta_5 Ln(\eta) \cdot Leniency + \beta_6 Ln(\eta) \cdot Ln(TC+1) + \epsilon$.

Table 20: Duration Linear Regression and Lasso CV (Model I)

	Sample	Cartels	Sample Lasso	Cartels Lasso
Ln(TC+1)	−0.012	−0.015*	−0.012	−0.015*
	(0.016)	(0.008)	(0.016)	(0.008)
κ	−3.536***	−4.388***	−3.536***	−4.388***
	(0.430)	(0.233)	(0.430)	(0.233)
Ln(η)	−1.460***	−1.408***	−1.460***	−1.408***
	(0.026)	(0.014)	(0.026)	(0.014)
Constant	3.004***	3.001***	3.004***	3.001***
	(0.047)	(0.027)	(0.047)	(0.027)
Observations	9'012	24'374	9'012	24'374
R^2	0.314	0.393	0.314	0.393
Adjusted R^2	0.314	0.393	0.314	0.393

This table shows the estimation results of linear cross-sectional and Lasso CV regressions to explain cartel duration at the industry level, for data simulated for Model I, on the sample of detected cartels, the group of undetected cartels and the population of all cartels. Standard errors are in parentheses.

Table 21: Duration Linear Regression and Lasso CV (Model IIA)

	Sample	Cartels	Sample Lasso	Cartels Lasso
Ln(TC+1)	−0.039***	−0.038***	0.007	0.008
	(0.007)	(0.007)	(0.016)	(0.016)
κ	−3.969***	−3.974***	−4.011***	−4.018***
	(0.245)	(0.244)	(0.245)	(0.244)
Ln(η)	−1.376***	−1.378***	−1.371***	−1.372***
	(0.013)	(0.013)	(0.041)	(0.041)
$Ln(\eta) \cdot Leniency$			0.142***	0.144***
			(0.028)	(0.028)
$Ln(\eta) \cdot Ln(TC+1)$			−0.040***	−0.041***
			(0.014)	(0.014)
Leniency	−0.048***	−0.048***	−0.164***	−0.166***
	(0.014)	(0.014)	(0.027)	(0.027)
Constant	3.048***	3.050***	2.996***	2.996***
	(0.024)	(0.024)	(0.044)	(0.044)
Observations	24'143	24'301	24'143	24'301
R^2	0.394	0.394	0.395	0.395
Adjusted R^2	0.394	0.394	0.395	0.395

This table shows the estimation results of linear cross-sectional and Lasso CV regressions to explain cartel duration at the industry level, for data simulated for Model IIA, on the sample of CA detected, leniency detected and all detected cartels, the group of undetected cartels and the population of all cartels. Standard errors are in parentheses.

Table 22: Duration Linear Regression and Lasso CV (Model IIB)

	Sample	Cartels	Sample Lasso	Cartels Lasso
Ln(TC+1)	−0.003	−0.009	0.081***	0.101***
	(0.013)	(0.008)	(0.022)	(0.015)
κ	−3.779***	−4.329***	−3.838***	−4.422***
	(0.365)	(0.234)	(0.365)	(0.234)
Ln(η)	−1.401***	−1.389***	−1.219***	−1.201***
	(0.021)	(0.013)	(0.055)	(0.027)
$Ln(\eta) \cdot Leniency$			0.118**	0.107***
			(0.047)	(0.038)
$Ln(\eta) \cdot Ln(TC+1)$			−0.114***	−0.112***
			(0.025)	(0.013)
Leniency	−0.010	0.005	−0.136**	−0.111**
	(0.023)	(0.018)	(0.055)	(0.048)
Constant	2.962***	2.971***	2.813***	2.768***
	(0.041)	(0.028)	(0.056)	(0.038)
Observations	11'742	24'148	11'742	24'148
R^2	0.353	0.384	0.355	0.386
Adjusted R^2	0.353	0.384	0.354	0.386

This table shows the estimation results of linear cross-sectional and Lasso CV regressions to explain cartel duration at the industry level, for data simulated for Model IIB, on the sample of CA detected, leniency detected and all detected cartels, the group of undetected cartels and the population of all cartels. Standard errors are in parentheses.

Table 23: Duration Linear Regression and Lasso CV (Model III)

	Sample	Cartels	Sample Lasso	Cartels Lasso
Ln(TC+1)	−0.034*	−0.029***	0.068**	0.144***
	(0.019)	(0.009)	(0.031)	(0.017)
κ	−4.708***	−5.196***	−4.516***	−5.047***
	(0.480)	(0.246)	(0.479)	(0.246)
Ln(η)	−1.725***	−1.644***	−1.538***	−1.408***
	(0.028)	(0.014)	(0.070)	(0.025)
$Ln(\eta) \cdot Leniency$			0.275***	0.205***
			(0.066)	(0.052)
$Ln(\eta) \cdot Ln(TC+1)$			−0.154***	−0.174***
			(0.037)	(0.014)
Leniency	−0.029	−0.019	−0.324***	−0.239***
	(0.031)	(0.023)	(0.077)	(0.065)
Constant	3.548***	3.464***	3.393***	3.184***
	(0.051)	(0.026)	(0.070)	(0.036)
Observations	7'417	23'197	7'417	23'197
R^2	0.425	0.450	0.429	0.454
Adjusted R^2	0.425	0.450	0.428	0.454

This table shows the estimation results of linear cross-sectional and Lasso CV regressions to explain cartel duration at the industry level, for data simulated for Model III, on the sample of CA detected, leniency detected and all detected cartels, the group of undetected cartels and the population of all cartels. Standard errors are in parentheses.