

Supplementary Materials

Table S1. Related parameters used in practical case study for solving the extended CPEP game.

Chemical Plant	Penalty for Defender	Reward for Attacker
<i>chemical plant a</i>	−368	854
<i>chemical plant b</i>	−361	887
<i>chemical plant c</i>	−353	826
<i>chemical plant d</i>	−351	832
<i>chemical plant e</i>	−391	812
<i>chemical plant f</i>	−393	894
<i>chemical plant g</i>	−365	865
<i>chemical plant h</i>	−396	848
<i>chemical plant i</i>	−374	864
<i>chemical plant j</i>	−373	855
<i>chemical plant k</i>	−357	865
<i>chemical plant l</i>	−376	854
<i>chemical plant m</i>	−380	872
<i>chemical plant n</i>	−366	852
<i>chemical plant o</i>	−363	900
<i>chemical plant p</i>	−374	822
<i>chemical plant q</i>	−383	810
<i>chemical plant r</i>	−393	811
<i>chemical plant s</i>	−371	806
<i>chemical plant t</i>	−387	840
<i>chemical plant u</i>	−398	845
<i>chemical plant v</i>	−362	836
<i>chemical plant w</i>	−388	877
<i>deliberate employee</i>	−400	900

Table S2. Prior probabilities of different chemical plants.

Chemical Plant	Prior Probability	Infraction Number
<i>chemical plant a</i>	0.0303	106
<i>chemical plant b</i>	0.0645	136
<i>chemical plant c</i>	0.0323	68
<i>chemical plant d</i>	0.0517	109
<i>chemical plant e</i>	0.0342	72
<i>chemical plant f</i>	0.0517	109
<i>chemical plant g</i>	0.0527	111
<i>chemical plant h</i>	0.0243	51
<i>chemical plant i</i>	0.0327	69
<i>chemical plant j</i>	0.0313	66
<i>chemical plant k</i>	0.0517	109
<i>chemical plant l</i>	0.0598	126
<i>chemical plant m</i>	0.0371	78
<i>chemical plant n</i>	0.0565	119
<i>chemical plant o</i>	0.0517	109
<i>chemical plant p</i>	0.0214	45
<i>chemical plant q</i>	0.0484	102
<i>chemical plant r</i>	0.0389	82
<i>chemical plant s</i>	0.0626	132
<i>chemical plant t</i>	0.0214	45
<i>chemical plant u</i>	0.0422	89
<i>chemical plant v</i>	0.0404	85
<i>chemical plant w</i>	0.0422	89
<i>deliberate employee</i>	0.02	42

Table S3. Attacker results of extended CPEP game under a learning curve of the piecewise function.

Learning Curve: Piecewise Function											
$m = 1$		$m = 2$		$m = 3$		$m = 4$		$m = 5$		$m = 6$	
Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P
$q_1 = 1$	235.6	$q_1 = 1$	202.152	$q_1 = 1$	109.808	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	281.8	$q_1 = 1$	247.956	$q_1 = 1$	154.424	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	196.4	$q_1 = 1$	163.288	$q_1 = 1$	71.952	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	204.8	$q_1 = 1$	171.616	$q_1 = 1$	80.064	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	176.8	$q_1 = 1$	143.856	$q_1 = 1$	53.024	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	291.6	$q_1 = 1$	257.672	$q_1 = 1$	163.888	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	251	$q_1 = 1$	217.42	$q_1 = 1$	124.68	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	227.2	$q_1 = 1$	193.824	$q_1 = 1$	101.696	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	249.6	$q_1 = 1$	216.032	$q_1 = 1$	123.328	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	237	$q_1 = 1$	203.54	$q_1 = 1$	111.16	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	251	$q_1 = 1$	217.42	$q_1 = 1$	124.68	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	235.6	$q_1 = 1$	202.152	$q_1 = 1$	109.808	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	260.8	$q_1 = 1$	227.136	$q_1 = 1$	134.144	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	232.8	$q_1 = 1$	199.376	$q_1 = 1$	107.104	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	300	$q_1 = 1$	266	$q_1 = 1$	172	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	190.8	$q_1 = 1$	157.736	$q_1 = 1$	66.544	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	174	$q_1 = 1$	141.08	$q_1 = 1$	50.32	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	175.4	$q_1 = 1$	142.468	$q_1 = 1$	51.672	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	168.4	$q_1 = 1$	135.528	$q_1 = 1$	44.912	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	216	$q_1 = 1$	182.72	$q_1 = 1$	90.88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	223	$q_1 = 1$	189.66	$q_1 = 1$	97.64	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	210.4	$q_1 = 1$	177.168	$q_1 = 1$	85.472	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	267.8	$q_1 = 1$	234.076	$q_1 = 1$	140.904	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	300	$q_1 = 1$	266	$q_1 = 1$	172	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100

Table S4. Attacker results of extended CPEP game under a learning curve of the exponential fall function.

Learning Curve: Exponential Fall Function											
$m = 1$		$m = 2$		$m = 3$		$m = 4$		$m = 5$		$m = 6$	
Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P
$q_1 = 1$	235.6	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	281.8	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	196.4	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	204.8	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	176.8	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	291.6	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	251	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	227.2	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	249.6	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	237	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	251	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	235.6	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	260.8	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100

$q_1 = 1$	232.8	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	300	$q_1 = 1$	-79	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	190.8	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	174	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	175.4	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	168.4	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	216	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	223	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	210.4	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	267.8	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	300	$q_1 = 1$	-79	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100

Table S5. Attacker results of extended CPEP game under a learning curve of the power law function.

Learning curve: exponential fall function											
$m = 1$		$m = 2$		$m = 3$		$m = 4$		$m = 5$		$m = 6$	
Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P
$q_1 = 1$	235.6	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	281.8	$q_1 = 1$	-79	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	196.4	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	204.8	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	176.8	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	291.6	$q_1 = 1$	-70.204	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	251	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	227.2	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	249.6	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	237	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	251	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	235.6	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	260.8	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	232.8	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	300	$q_1 = 1$	-62.665	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	190.8	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	174	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	175.4	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	168.4	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	216	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	223	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	210.4	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	267.8	$q_4 = 1$	-84	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100
$q_1 = 1$	300	$q_1 = 1$	-62.665	$q_4 = 1$	-88	$q_4 = 1$	-92	$q_4 = 1$	-96	$q_4 = 1$	-100

Table S6. Attacker results computed by COBRA under different rationality levels of attackers.

$\varepsilon = 0.5$		$\varepsilon = 1$		$\varepsilon = 1.5$		$\varepsilon = 2$		$\varepsilon = 2.5$		$\varepsilon = 5$		$\varepsilon = 7.5$		$\varepsilon = 10$	
Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P	Att_Str	Att_P
$q_1 = 1$	-84.45	$q_1 = 1$	-83.45	$q_1 = 1$	-82.45	$q_1 = 1$	-81.45	$q_1 = 1$	-80.45	$q_1 = 1$	-75.34	$q_1 = 1$	-68.99	$q_1 = 1$	-65.44
$q_1 = 1$	-42.45	$q_1 = 1$	-41.44	$q_1 = 1$	-40.42	$q_1 = 1$	-39.41	$q_1 = 1$	-38.39	$q_1 = 1$	-33.21	$q_1 = 1$	-26.78	$q_1 = 1$	-23.18
$q_4 = 1$	-88	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00
$q_4 = 1$	-88	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00
$q_4 = 1$	-88	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00
$q_1 = 1$	-33.54	$q_1 = 1$	-32.52	$q_1 = 1$	-31.51	$q_1 = 1$	-30.49	$q_1 = 1$	-29.47	$q_1 = 1$	-24.28	$q_1 = 1$	-17.82	$q_1 = 1$	-14.22
$q_1 = 1$	-70.45	$q_1 = 1$	-69.45	$q_1 = 1$	-68.44	$q_1 = 1$	-67.44	$q_1 = 1$	-66.43	$q_1 = 1$	-61.30	$q_1 = 1$	-54.92	$q_1 = 1$	-51.35
$q_4 = 1$	-88	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_1 = 1$	-83.00	$q_1 = 1$	-76.66	$q_1 = 1$	-73.12
$q_1 = 1$	-71.73	$q_1 = 1$	-70.72	$q_1 = 1$	-69.72	$q_1 = 1$	-68.71	$q_1 = 1$	-67.71	$q_1 = 1$	-62.58	$q_1 = 1$	-56.20	$q_1 = 1$	-52.63
$q_1 = 1$	-83.18	$q_1 = 1$	-82.18	$q_1 = 1$	-81.18	$q_1 = 1$	-80.18	$q_1 = 1$	-79.18	$q_1 = 1$	-74.06	$q_1 = 1$	-67.71	$q_1 = 1$	-64.16
$q_1 = 1$	-70.45	$q_1 = 1$	-69.45	$q_1 = 1$	-68.44	$q_1 = 1$	-67.44	$q_1 = 1$	-66.43	$q_1 = 1$	-61.30	$q_1 = 1$	-54.92	$q_1 = 1$	-51.35
$q_1 = 1$	-84.45	$q_1 = 1$	-83.45	$q_1 = 1$	-82.45	$q_1 = 1$	-81.45	$q_1 = 1$	-80.45	$q_1 = 1$	-75.34	$q_1 = 1$	-68.99	$q_1 = 1$	-65.44
$q_1 = 1$	-61.54	$q_1 = 1$	-60.54	$q_1 = 1$	-59.53	$q_1 = 1$	-58.52	$q_1 = 1$	-57.51	$q_1 = 1$	-52.36	$q_1 = 1$	-45.96	$q_1 = 1$	-42.39
$q_1 = 1$	-87	$q_1 = 1$	-86.00	$q_1 = 1$	-85.00	$q_1 = 1$	-84.00	$q_1 = 1$	-83.00	$q_1 = 1$	-77.89	$q_1 = 1$	-71.55	$q_1 = 1$	-68.00
$q_1 = 1$	-25.90	$q_1 = 1$	-24.88	$q_1 = 1$	-23.86	$q_1 = 1$	-22.85	$q_1 = 1$	-21.83	$q_1 = 1$	-16.62	$q_1 = 1$	-10.15	$q_1 = 1$	-6.53
$q_4 = 1$	-88	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_1 = 1$	-87.21
$q_4 = 1$	-88	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00
$q_4 = 1$	-88	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00
$q_4 = 1$	-88	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00
$q_4 = 1$	-88	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_1 = 1$	-86.90	$q_1 = 1$	-83.37
$q_4 = 1$	-88	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_1 = 1$	-86.83	$q_1 = 1$	-80.50	$q_1 = 1$	-76.96
$q_4 = 1$	-88	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00	$q_4 = 1$	-88.00
$q_1 = 1$	-55.18	$q_1 = 1$	-54.17	$q_1 = 1$	-53.16	$q_1 = 1$	-52.15	$q_1 = 1$	-51.14	$q_1 = 1$	-45.98	$q_1 = 1$	-39.57	$q_1 = 1$	-35.99
$q_1 = 1$	-25.90	$q_1 = 1$	-24.88	$q_1 = 1$	-23.86	$q_1 = 1$	-22.85	$q_1 = 1$	-21.83	$q_1 = 1$	-16.62	$q_1 = 1$	-10.15	$q_1 = 1$	-6.53