

**Problem: Player 1 about to win. Players 2 or 3 could spend a resource to delay win.**

**Symmetric Case:**

P3\P2 [1]	Pay	Don't Pay
Pay	a,a [2]	b,c
Don't Pay	c,b	0,0

**Restrictions**

$c > a > b$
$2a - b - c < 0$

**Reasoning**

Spending less resources is preferable  
 $1-(c+b) < 1-(2a)$ .  $\rightarrow 2a - b - c < 0$ . This is because Player 1 should be better off if "a" happens since both opponents spent one resource

$p = b/(c-a+b)$

a	0.2000
b	0.1500
c	0.3000
p	0.6000

Check

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**Definitions**

p The probability of each player choosing "Pay"

**General Case**

P3\P2	Pay	Don't Pay
Pay	a3,a2	b3,c2
Don't Pay	c3,b2	0,0

**Restrictions**

$c3 > a3 > b3$
$c2 > a2 > a3$
$a2 + a3 - b3 - c2 < 0$
$a2 + a3 - b2 - c3 < 0$

**Reasoning**

Spending less resources is preferable  
 Spending less resources is preferable  
 $1-(c2+b3) < 1-(a2+a3)$  &  $1-(c3+b2) < 1-(a2+a3)$ . This is because Player 1 should be better off if "a" happens since both opponents spent one resource

$p2 = b3/(c3-a3+b3)$

$p3 = b2/(c2-a2+b2)$

a2	0.2000
b2	0.1500
c2	0.2600
a3	0.3330
b3	0.3110
c3	0.3990
p2	0.8249
p3	0.7143

-0.0380  
 -0.0160

Check:

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**Definitions**

p2 The probability of Player 2 choosing "Pay"  
 p3 The probability of Player 3 choosing "Pay"

<b>Symmetric Cases</b>							
<b>Resource Very Scarce</b>		<b>Resource Scarce</b>		<b>Resource Common</b>		<b>Resource Very Common</b>	
a	0.2000	a	0.2800	a	0.2400	a	0.2700
b	0.1000	b	0.2000	b	0.2000	b	0.2500
c	0.4500	c	0.4000	c	0.3000	c	0.3000
p	0.2857	p	0.6250	p	0.7692	p	0.8929
prob(end)	0.5102	prob(end)	0.1406	prob(end)	0.0533	prob(end)	0.0115
<b>Asymmetric Cases</b>							
<b>Resource Very Scarce</b>		<b>Resource Scarce</b>		<b>Resource Common</b>		<b>Resource Very Common</b>	
a2	0.1000	a2	0.1500	a2	0.1900	a2	0.2100
b2	0.0500	b2	0.1000	b2	0.1400	b2	0.1800
c2	0.2500	c2	0.2500	c2	0.2500	c2	0.2500
a3	0.2000	a3	0.2800	a3	0.3000	a3	0.3400
b3	0.1000	b3	0.2000	b3	0.2500	b3	0.3100
c3	0.4500	c3	0.4000	c3	0.4000	c3	0.4000
p2	0.2857	p2	0.6250	p2	0.7143	p2	0.8378
p3	0.2500	p3	0.5000	p3	0.7000	p3	0.8182
prob(end)	0.5357	prob(end)	0.1875	prob(end)	0.0857	prob(end)	0.0295

[1] Actions in rows are Player 3,  
Actions in columns are Player 2

[2] All of the payoffs are read as:

"Player 3 Payoff, Player 2 Payoff"