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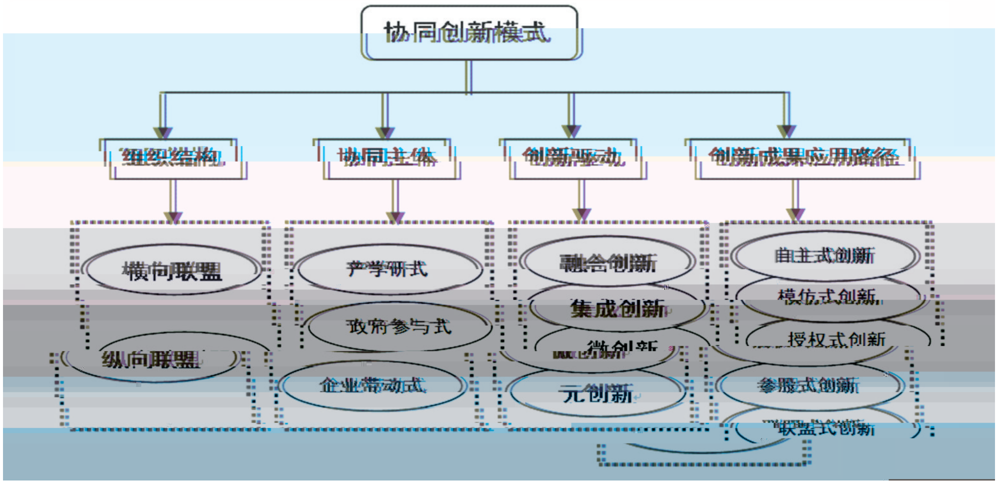

协同创新模式
组织结构
协同主体
创新驱动
创新成果应用路径
横向联盟
纵向联盟
产学研式
政府参与式
企业带动式
融合创新
集成创新
微创新
元创新
自主式创新
模仿式创新
授权式创新
参股式创新
联盟式创新

67% 40%

30%

1.

A B

A B

0

A B

x_a x_b

y_a, y_b

δ_a, δ_b

$0<\delta_a<1$ $0<\delta_b<1$ A

1 (0,0) (0,1) (1,0) (1,1) $(p^* \ q^*)$

(5) $0<\delta_a<1$ $0<\delta_b<1$ p=0,1 $q^* = \frac{1-\delta_a}{1+\gamma_a-\delta_a}$ A B q=0,1 $p^* = \frac{1-\delta_b}{1+\gamma_b-\delta_b}$ B

ESS

Friedman Jacobian

ESS (5) Jacobian

$$J=\begin{bmatrix}\frac{\partial\dot{p}}{\partial p} & \frac{\partial\dot{p}}{\partial p}\\ \frac{\partial\dot{q}}{\partial p} & \frac{\partial\dot{q}}{\partial p}\end{bmatrix}=\begin{bmatrix}(1-2p)x_a[q(\delta_a-\gamma_a-1)+1-\delta_a] & p(1-p)x_a(\delta_a-\gamma_a-1)\\ q(1-q)x_b(\delta_b-\gamma_b-1) & (1-2q)x_b[p(\delta_b-\gamma_b-1)+1-\delta_b]\end{bmatrix} \tag{6}$$

(6) 1

5

2 ESS (0,1) (1,0) A B

(0,0) $\det J=x_ax_b(1-\delta_a)(1-\delta_b)>0$ $trJ=x_a(1-\delta_a)+x_b(1-\delta_b)>0$ (0,0)

(0,1) $\det J=x_ax_b\gamma_a(1-\delta_b)>0$ $trJ=-x_a\gamma_a-x_b(1-\delta_b)<0$ (0,1) ESS

(1,0) $\det J=x_ax_b\gamma_b(1-\delta_a)>0$ $trJ=-x_b\gamma_b-x_a(1-\delta_a)<0$ (1,0) ESS

(1,1) $\det J=x_ax_b\gamma_a\gamma_b>0$ $trJ=x_a\gamma_a+x_b\gamma_b>0$ (1,1)

$(p^* \ q^*)$ $\det J=-x_ax_b\gamma_a\gamma_b\frac{1-\delta_a}{1+\gamma_a-\delta_a}\frac{1-\delta_b}{1+\gamma_b-\delta_b}<0$ $trJ=0$ $(p^* \ q^*)$ **

A B 2

(0,0)	+	+	
(0,1)	+	−	ESS
(1,0)	+	−	ESS
(1,1)	+	+	
(p^*,q^*)	−		

E E>0 P P>0

E P

A B

ESS

A B

3

3 A B

		B	
		q	$1-q$
A	p	π_{1a} π_{1b}	π_{2a} π_{2b}
	$1-p$	π_{3a} π_{3b}	π_{4a} π_{4b}

$$D_a=\begin{bmatrix} x_a+E & (1-\delta_a)x_a \\ (1+\gamma_a)x_a-P & 0 \end{bmatrix}\quad D_b=\begin{bmatrix} x_b+E & (1+\gamma_b)x_b-P \\ (1-\delta_b)x_b & 0 \end{bmatrix}$$

Malthusian A B

$$\dot{p}=p(1-p)[q(\pi_{1a}-\pi_{3a})+(1-q)(\pi_{2a}-\pi_{4a})] \tag{7}$$

$$\dot{q}=q(1-q)[p(\pi_{1b}-\pi_{2b})+(1-p)(\pi_{3b}-\pi_{4b})] \tag{8}$$

$$\begin{cases} \dot{p}=p(1-p)x_a[q(\delta_a-\gamma_a-1)+1-\delta_a]+p(1-p)q(E+P) \\ \dot{q}=q(1-q)x_b[p(\delta_b-\gamma_b-1)+1-\delta_b]+q(1-q)p(E+P) \end{cases} \tag{9}$$

(9) Jacobian

$$J=\begin{bmatrix} (1-2p)x_a[q(\delta a-\gamma_a-1)+1-\delta_a]+(1-2p)q(E+P) & p(1-p)x_a(\delta_a-\gamma_a-1)+p(1-p)(E+P) \\ q(1-q)x_b(\delta_b-\gamma_b-1)+q(1-q)(E+P) & (1-2q)x_b[p(\delta_b-\gamma_b-1)+1-\delta_b]+(1-2q)p(E+P) \end{bmatrix} \tag{10}$$

(0,0) (0,1) (1,0) (1,1)

A B

A p B q (1,1) (9)

ESS

3 $E+P>\max(x_a\gamma_a\ x_b\gamma_b)$ ESS (1,1)

(1,1) (9) ESS

(0,0) $\det J=x_ax_b(1-\delta_a)(1-\delta_b)>0$ $\mathrm{tr}J=x_a(1-\delta_a)+x_b(1-\delta_b)>0$ (0,0)

(0,1) $\det J=x_b(1-\delta b)(x_a\gamma_a-E-P)$ $\mathrm{tr}J=-x_a\gamma_a+E+P-x_b(1-\delta_b)$ $0<\delta_b<1$ (0,1) ESS $x_a\gamma_a-E-P<0$ $E+P>x_a\gamma_a$

(1,0) $\det J=x_a(1-\delta_a)(x_b\gamma_b-E-P)$ $\mathrm{tr}J=-x_b\gamma_b+E+P-x_a(1-\delta_a)$ (1,0) ESS $x_b\gamma_b-E-P<0$ $E+P>x_b\gamma_b$

(1,1) $\det J=(x_a\gamma_a-E-P)(x_b\gamma_b-E-P)$ $\mathrm{tr}J=x_a\gamma_a+x_b\gamma_b-2(E+P)$ $E+P>x_a\gamma_a$ $E+P>x_b\gamma_b$ (1,1) ESS

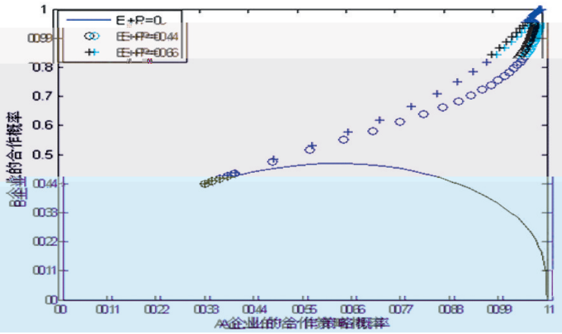
(0,0)	+	+	
(0,1)	−		
(1,0)	−		
(1,1)	+	−	ESS

$E+P>\max(x_a\gamma_a\ x_b\gamma_b)$ A B

4

$$\begin{cases} x_a=2 \\ x_b=1 \end{cases}\quad \begin{cases} \delta_a=0.5 \\ \delta_b=0.6 \end{cases}\quad \begin{cases} \gamma_a=0.2 \\ \gamma_b=0.3 \end{cases}$$

$x_a\gamma_a=0.4$ $x_b\gamma_b=0.3$ 0.3,0.4 E+P 0,0.4 0.6 (9) 2 3



A B

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5. 2013 18

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