In[∘]:= $\text{Solve}\left[\frac{-2\beta}{3\lambda+\phi_1-\phi_2}\left(\frac{-\phi_2{}^2+\phi_1\left(3\lambda-\phi_1\right)+\phi_2\left(3\lambda+2\phi_1\right)}{6\lambda}-\left(\pi_a-\frac{c\left(3\lambda+\phi_2-\phi_1\right)}{6\lambda}\right)\right)+\left(1-\beta\right)\left(\frac{1}{2}+\frac{\phi_1-\phi_2}{3\lambda}-\pi_b-\frac{c}{6\lambda}\right)==0,\ \phi_2\right]$

Out[∘]= $\Big\{\Big\{\phi_2\to\frac{1}{4}\Big(-c+3c\beta+9\lambda-3\beta\lambda-6\lambda\pi_b+6\beta\lambda\pi_b+4\phi_1-\sqrt{\left(\left(c-3c\beta-9\lambda+3\beta\lambda+6\lambda\pi_b-6\beta\lambda\pi_b-4\phi_1\right)^2-8\left(-3c\lambda-3c\beta\lambda+9\lambda^2-9\beta\lambda^2+12\beta\lambda\pi_a-18\lambda^2\pi_b+18\beta\lambda^2\pi_b-c\phi_1+3c\beta\phi_1+9\lambda\phi_1-15\beta\lambda\phi_1-6\lambda\pi_b\phi_1+6\beta\lambda\pi_b\phi_1+2\phi_1^2\right)\right)}\Big)\Big\},$

$\Big\{\phi_2\to\frac{1}{4}\Big(-c+3c\beta+9\lambda-3\beta\lambda-6\lambda\pi_b+6\beta\lambda\pi_b+4\phi_1+\sqrt{\left(\left(c-3c\beta-9\lambda+3\beta\lambda+6\lambda\pi_b-6\beta\lambda\pi_b-4\phi_1\right)^2-8\left(-3c\lambda-3c\beta\lambda+9\lambda^2-9\beta\lambda^2+12\beta\lambda\pi_a-18\lambda^2\pi_b+18\beta\lambda^2\pi_b-c\phi_1+3c\beta\phi_1+9\lambda\phi_1-15\beta\lambda\phi_1-6\lambda\pi_b\phi_1+6\beta\lambda\pi_b\phi_1+2\phi_1^2\right)\right)}\Big)\Big\}\Big\}$

In[∘]:=

(*In the above, pi_a is pi_h(Gsetminusi=2) and pi_b is the partial derivative of it with respect to phi2. Obviously this isn't a very nice expression. A general closed form solution may be difficult. I'll instead proceed by virtue of substituting functional forms for pi_a and pi_b.*)
(*First, I consider the active beliefs setting. The active beliefs setting reduces things significantly,
since pi_a becomes (v-\lambda)/2 and pi_b is zero. Further, I substitute \beta=1/2. *)

$\text{Solve}\left[\frac{1}{2}\left(\frac{-2}{3\lambda+\phi_1-\phi_2}\right)\left(\frac{1}{6\lambda}\left(-\phi_2{}^2+\phi_1\left(3\lambda-\phi_1\right)+\phi_2\left(3\lambda+2\phi_1\right)\right)-\frac{(v-\lambda)}{2}\right)+\left(\frac{1}{2}\right)\left(\frac{1}{2}+\frac{(\phi_1-\phi_2)}{3\lambda}-0\right)==0,\ \phi_2\right]$

Out[∘]= $\left\{\left\{\phi_2\to\frac{1}{8}\left(15\lambda+8\phi_1-\sqrt{3}\sqrt{-32v\lambda+59\lambda^2+64\lambda\phi_1}\right)\right\},\left\{\phi_2\to\frac{1}{8}\left(15\lambda+8\phi_1+\sqrt{3}\sqrt{-32v\lambda+59\lambda^2+64\lambda\phi_1}\right)\right\}\right\}$

In[∘]:= $\left\{\left\{\phi_2\to\frac{1}{8}\left(15\lambda+8\phi_1-\sqrt{3}\sqrt{-32v\lambda+59\lambda^2+64\lambda\phi_1}\right)\right\},\left\{\phi_2\to\frac{1}{8}\left(15\lambda+8\phi_1+\sqrt{3}\sqrt{-32v\lambda+59\lambda^2+64\lambda\phi_1}\right)\right\}\right\}$

(*The above then characterize the functional form of Phi_2 in terms of Phi_1 for the active beliefs case. We then want to know how this behaves: namely, what is the derivative of this function with respect to Phi_1. This tells us whether or not there exists a second mover's advantage. The above solution varies significantly from the case Eric described, however. *)

$\text{D}\left[\frac{1}{8}\left(15\lambda+8\phi_1-\sqrt{3}\sqrt{-32v\lambda+59\lambda^2+64\lambda\phi_1}\right),\ \phi_1\right]$

Out[∘]= $\left\{\left\{\phi_2\to\frac{1}{8}\left(15\lambda+8\phi_1-\sqrt{3}\sqrt{-32v\lambda+59\lambda^2+64\lambda\phi_1}\right)\right\},\left\{\phi_2\to\frac{1}{8}\left(15\lambda+8\phi_1+\sqrt{3}\sqrt{-32v\lambda+59\lambda^2+64\lambda\phi_1}\right)\right\}\right\}$

Out[∘]= $\frac{1}{8}\left(8 - \frac{32\sqrt{3}\,\lambda}{\sqrt{-32\,v\,\lambda + 59\,\lambda^2 + 64\,\lambda\,\phi_1}}\right)$

In[∘]:= $D\left[\frac{1}{8}\left(15\,\lambda + 8\,\phi_1 + \sqrt{3}\,\sqrt{-32\,v\,\lambda + 59\,\lambda^2 + 64\,\lambda\,\phi_1}\right), \phi_1\right]$

In[∘]:= $\frac{1}{8}\left(8 + \frac{32\sqrt{3}\,\lambda}{\sqrt{-32\,v\,\lambda + 59\,\lambda^2 + 64\,\lambda\,\phi_1}}\right)$

```
(*Whether or not there is a second-mover's advantage then depends on
  the behavior of the above expression in response to Lambda and v. *)
```

$\frac{1}{8}\left(8 + \frac{32\sqrt{3}\,(5)}{\sqrt{-32\,(25)\,(5) + 59\,(5)^2 + 64\,(5)\,(19.25)}}\right)$

Out[∘]= $\frac{1}{8}\left(8 + \frac{32\sqrt{3}\,\lambda}{\sqrt{-32\,v\,\lambda + 59\,\lambda^2 + 64\,\lambda\,\phi_1}}\right)$

Out[∘]= 1.57456

In[∘]:= `(*Plugging in numerical values*)`

$\frac{1}{8}\left(15\,(5) + 8\,(19.375) + \sqrt{3}\,\sqrt{-32\,(25)\,(5) + 59\,(5)^2 + 64\,(5)\,(19.375)}\right)$

In[∘]:= 41.875`

$\frac{1}{8}\left(15\,(5) + 8\,(19.375) - \sqrt{3}\,\sqrt{-32\,(25)\,(5) + 59\,(5)^2 + 64\,(5)\,(19.375)}\right)$

Out[∘]= 41.875

15.625000000000002`

```
(*NIIIIIIIIIIIIIIIIIIIIIIIICE - the (-) equation works/is
  consistent with Table 6 for the active beliefs sequential case.*)
```

■