We use a gaussian integral around the inner cylinder:

$$\int Eda = 4\pi \int \rho dv \Rightarrow 2\pi r E = 4\pi\sigma_i 2\pi b \Rightarrow E = \frac{4\pi\sigma_i b}{r}$$

The potential difference is given by:

$$U = \int_b^a Edr = 4\pi\sigma_i b \ln a - 4\pi\sigma_i b \ln b$$

Solving for σ_i:

$$\sigma_i = \frac{U}{4\pi b \ln\left(a/b\right)}$$

The potential is given by:

$$\Phi = 4\pi\sigma_i b \ln r$$

So that the charge on the outer cylinder is given by:

$$\sigma_o = -\frac{1}{4\pi}\nabla\Phi\cdot\hat{n} = -\frac{1}{4\pi}\left(\frac{\partial\Phi}{\partial r}\right)_{r=a} = -\frac{\sigma_i b}{a}$$

We can integrate the charge densities to get the total charge:

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<math>Q_{i}=2\pi bl\sigma_{i}=l\frac{U}{2\ln\left(a/b\right)}</math>
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$$Q_o = 2\pi a l \sigma_o = -l\frac{U}{2\ln\left(a/b\right)}$$

And the electric field is given by:

$$\vec{E} = \frac{U}{\ln\left(a/b\right)}\frac{\hat{r}}{r}$$

The Faraday's Law gives:

$$2\pi b\mathbf{E} = -\frac{1}{c}\frac{d}{dt}\int_S \mathbf{B}\cdot\mathbf{n}da$$

So that for the inner cylinder:

$$\mathcal{E}_i = \frac{1}{c}\frac{B_0}{t_0}\frac{b}{2}$$

The torque will be:

$$\dot{L} = r\mathbf{E}Q\hat{z}$$

So that the induced angular momentum will be:

$$L_i = b\mathbf{E}_i Q_i t_0\hat{z} = \frac{1}{c}B_0\frac{b^2}{2}l\frac{U\hat{z}}{2\ln\left(a/b\right)} = \frac{b^2 l B_0 U\hat{z}}{4c\ln\left(a/b\right)}$$

For the outer cylinder:

$$\mathcal{E}_o = \frac{1}{c}\frac{B_0}{t_0}\frac{a}{2}$$

So that:

$$L_o = a\mathbf{E}_o Q_o t_0 \hat{z} = -\frac{1}{c}B_0\frac{a^2}{2}l\frac{U\hat{z}}{2\ln(a/b)} = -\frac{a^2 l B_0 U\hat{z}}{4c\ln(a/b)}$$

And the total angular momentum is:

$$L = L_i + L_o = \frac{lB_0U}{4c\ln(a/b)}\hat{z}\left(b^2 - a^2\right)$$

The field momentum is given by the Poynting Vector:

$$S = \vec{E}\times\vec{B}/4\pi c = \frac{U}{\ln(a/b)}\frac{1}{r}B_0\frac{1}{4\pi c}\hat{\theta}$$

So that its angular momentum is:

$$L = \int r\times S dv = -2\pi l\hat{z}\int_b^a r\frac{U}{\ln(a/b)}\frac{1}{r}B_0\frac{1}{4\pi c}r dr$$

where the integral over z and θ is already done. Integrating over r:

$$L = \frac{lUB_0\hat{z}}{4c\ln(a/b)}\left(b^2 - a^2\right)$$

The momentum would decrease, as the cylinders turn to oppose the change in $\vec{B}$ in the same direction as before. This field would have angular momentum in the same direction, so that the cylinders themselves would have less angular momentum.