Investment under uncertainty and the threat of nationalization

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Motivation

- February 2022: Russian parliament legislation allows the state to nationalize assets of foreign companies.
- e.g. Uniper and Fortum (energy), Danone and Carlsberg (food and beverages), Ariston and BSH Hausgeraete (manufacturing).
- Nationalization is not a recent phenomenon
- Once an investment has been made, a government can implement policies that might diminish an investor's profits.
- Multinational corporations and host countries have mutual interests which frequently result in agreements satisfactory for both parties.

Contribution

- **RQ**: How the threat of nationalization affects the **timing** and **scale** of investments?
- **Findings**: A decrease in the nationalization cost, i) hastens nationalization, ii) favors the choice of a smaller project and iii) (indirectly) an earlier investment.
- **Message**: The presence of investors in high-risk environments should not be treated as evidence of tolerance against political risk. Instead, it might merely suggest investments presenting important scale and time distortions.

The main set up

- **Players**: Multinational corporation (MNC) and host country (HC)
- **Project**: Productive capacity $q(a)$:

$$q(a) = \frac{a^{\gamma}}{\gamma} \text{ and } \gamma \in (0,1), \tag{1}$$

- Sunk investment cost $I(a) = ka$ where $a \geq 0$ is the capital intensity of the project.
- Upon the investment the project starts generating a profit flow π_t per unit of $q(a)$:

$$\frac{d\pi_t}{\pi_t} = \mu dt + \sigma dZ_t \tag{2}$$

where Z_t is a standard Wiener process, μ the drift, σ the volatility and $\pi_0 = \pi$ the starting point of π_t.

The main set up (cont.)

- MNC and HC split the flow of generated profits $q(a)\pi_t$ with MNC cashing a share $\theta \in (0,1)$ and HC cashing the rest.
- The nationalization cost is $N > 0$.
- Nationalization gives access to the entirety of $q(a)\pi_t$ for HC.
- The discount factor is common and equal to $r\,(> \mu)$.
- **Timing of the interaction**: i) MNC and HC agree on $a \geq 0$ via N.B., ii) MNC chooses when to spend $I(a)$ in order to start the flow $q(a)\pi_t$, iii) HC chooses when to incur N in order to nationalize the project.

Nationalization and Investment

- The expected net present value for HC at the generic initial profit level $\pi \leq \pi_I < \pi_N$ is:

$$H(\pi, a) = E_0\left[e^{-rT^I}\right] E\left[\begin{array}{c} \int_{T^I}^{T^N} (1-\theta)\, q(a)\, \pi_t e^{-r\left(t-T^I\right)} dt \\ + \int_{T^N}^{\infty} q(a)\, \pi_t e^{-r\left(t-T^N\right)} dt - N e^{-rT^N} \end{array}\right]$$

- Similarly for MNC:

$$M(\pi, a) = E_0\left[e^{-rT^I}\right] E\left[\int_{T^I}^{T^N} \theta q(a)\, \pi_t e^{-r\left(t-T^I\right)} dt - I(a)\right]$$

where $T^z = \inf\left(t \geq 0 | \pi_t = \pi_z\right)$ for $z \in \{I, N\}$ is the random first time point where the stochastic process π_t hits the investment threshold π_z.

Optimal Nationalization Threshold

- The optimal nationalization threshold is equal to

$$\pi_N(a) = \frac{\beta}{\beta - 1} \frac{r - \mu}{\theta} \frac{N}{q(a)}.$$

  where $\beta > 1$ is the positive root of the characteristic quadratic $\Lambda(b) = \frac{1}{2}\sigma^2 b(b-1) + \mu b - r$.

- The value of the nationalization option is

$$\left(\left(\theta q(a) \frac{\pi_N(a)}{r-\mu} - N \right) \left(\frac{\pi}{\pi_N(a)} \right)^{\beta} + (1-\theta) q(a) \frac{\pi}{r-\mu} \right) \left(\frac{\pi}{\pi_I(a)} \right)^{\beta}$$

  for $\pi < \pi_N(a)$.

Optimal Investment Threshold

- The optimal investment threshold is equal to

$$\pi_I(a) = \frac{\beta}{\beta - 1} \frac{r - \mu}{\theta} \frac{ka}{q(a)}$$

where again $\beta > 1$ is the positive root of the characteristic quadratic $\Lambda(b) = \frac{1}{2}\sigma^2 b(b-1) + \mu b - r$.

- The value of the investment option is

$$\left[\theta\left[q(a)\frac{\pi_I(a)}{r-\mu} - q(a)\frac{\pi_N(a)}{r-\mu}\left(\frac{\pi_I(a)}{\pi_N(a)}\right)^{\beta}\right] - ka\right]\left(\frac{\pi}{\pi_I(a)}\right)^{\beta}$$

for $\pi < \pi_I(a)$.

Capital intensity

- Assuming that MNC and HC engage in Nash bargaining at T_I the solution a^* maximizes the following objective function

$$\ln H(\pi_I, a)^p + \ln M(\pi_I, a)^q$$

where $p \in (0,1)$ and $q = 1 - p$ represent the bargaining power of HC and MNC respectively.

- Nash bargaining results in capital intensity of size

$$a^* = \omega^*(\beta, \eta, \theta)^{\frac{1}{\beta-1}} \frac{N}{k},$$

where $\eta = p/q$ and $\omega^*(\beta, \eta, \theta)$ a constant.

The effect of N

- a^* is linearly increasing in the ratio N/k.
- Also, given a^*:

$$\pi_N(a^*) = \frac{\beta}{\beta - 1} \frac{r - \mu}{\theta} N^{1-\gamma} k^{\gamma} \gamma \omega^* (\beta, \eta, \theta)^{-\frac{\gamma}{\beta - 1}},$$

and

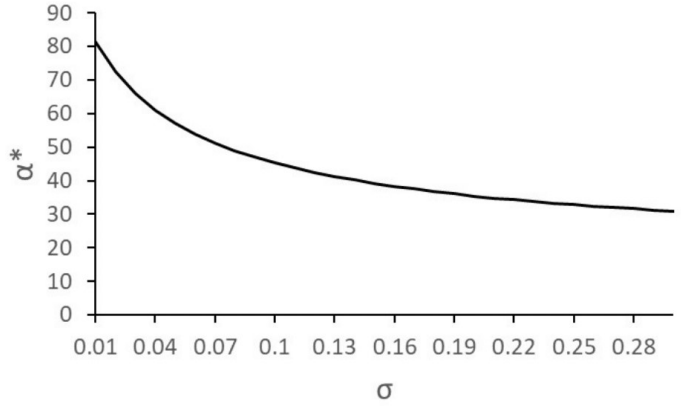
$$\pi_I(a^*) = \frac{\beta}{\beta - 1} \frac{r - \mu}{\theta} N^{1-\gamma} k^{\gamma} \gamma \omega^* (\beta, \eta, \theta)^{\frac{1-\gamma}{\beta - 1}},$$

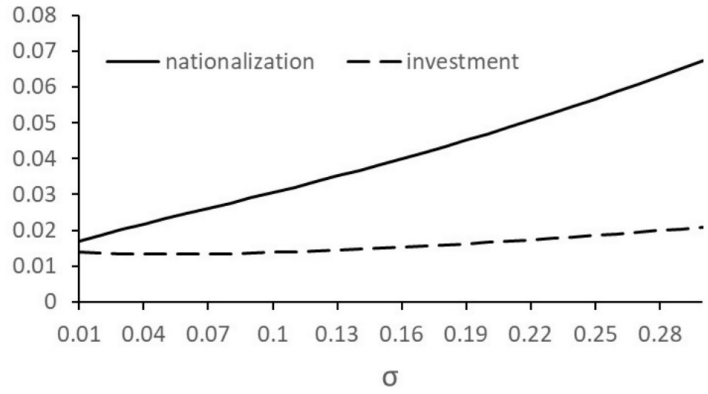
- While changes in N do not affect π_I directly, there exists a positive indirect effect passing through a^*.

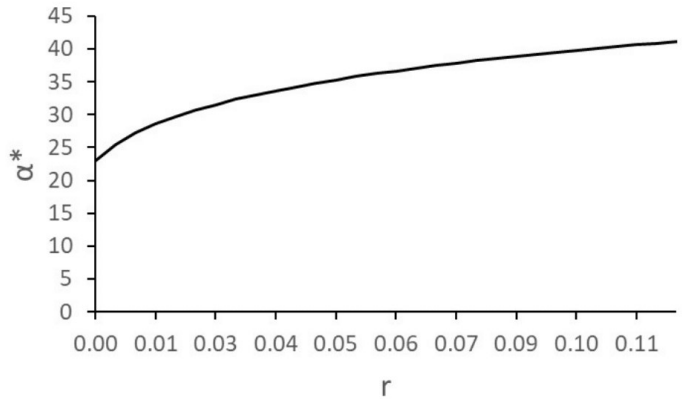
The effect of N (cont.)

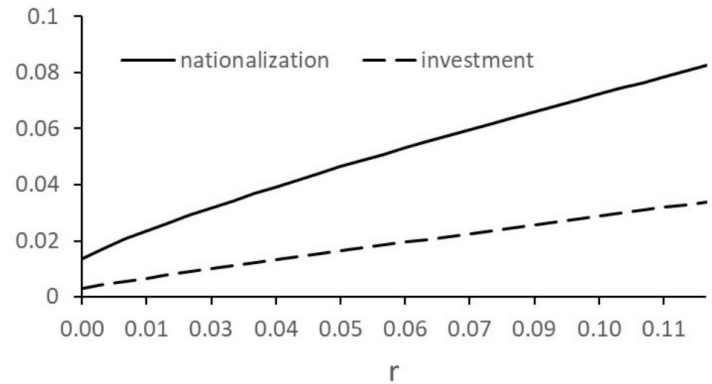
- An increase in the nationalization cost is reflected in a higher nationalization threshold.
- Hence MNC benefits from the project for a longer period of time and is willing to push for a larger a^*.
- However a larger project is more expensive to invest in so it requires more opportune market conditions, i.e., an investment that takes place later in expected terms.
- **NB**: If the nationalization threat is significant (low N), then the investment option will be exercised, in expected terms, earlier!

Numerical findings









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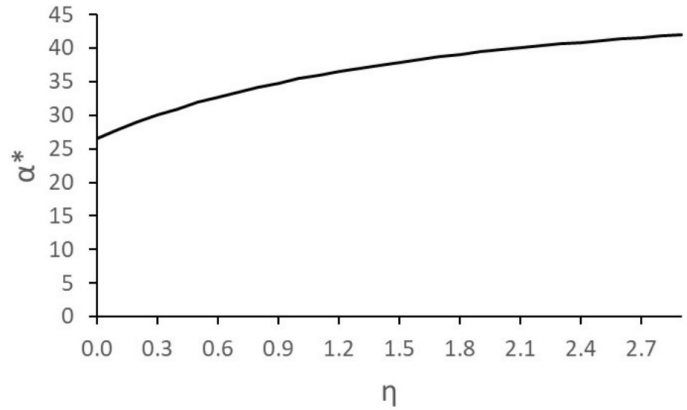

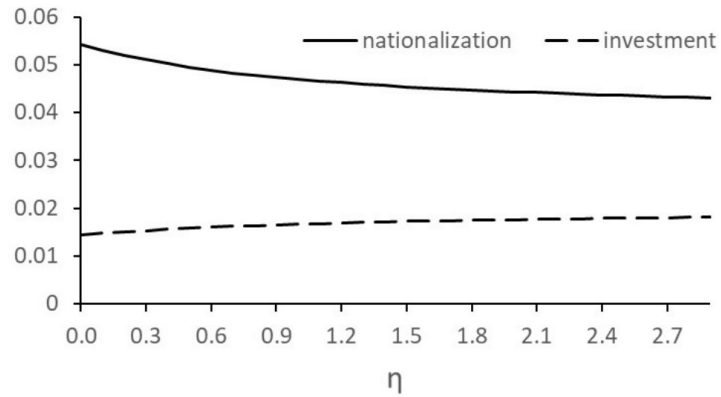

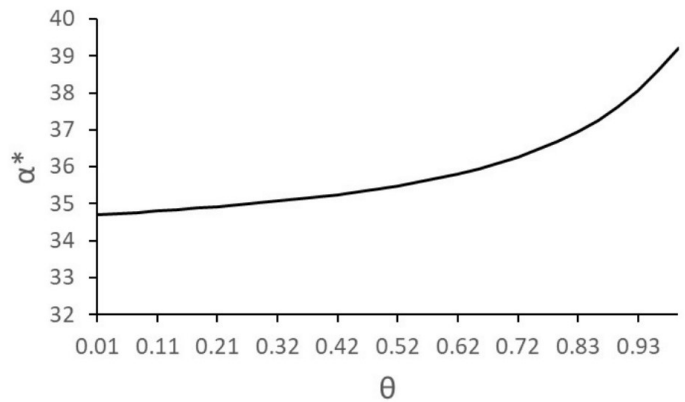

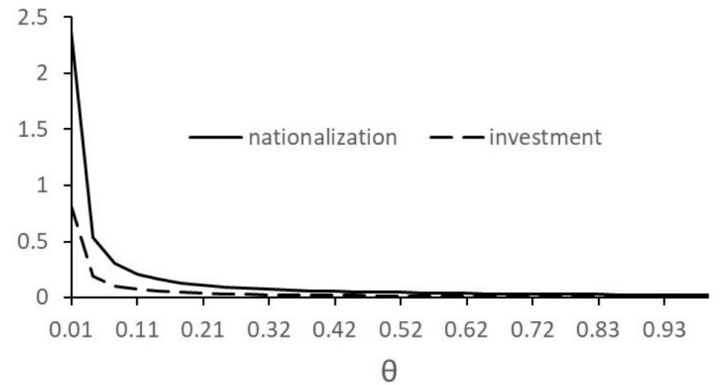

Conclusions

- **RQ**: How does the threat of nationalization affect i) the timing and ii) scale of an investment?
- We show that higher nationalization risk results in underinvestment in terms of timing and scale.
- Originality: explicit consideration of scale as the negotiation variable[1]
- Also in the paper: i) creeping expropriation, ii) a more general nationalization cost function.
- Future work: i) accounting for CS, ii) inability of HC to operate the plant.

[1] Di Corato, L. (2013). Profit sharing under the threat of nationalization. Resource and Energy Economics, 35, 295–315.

Thank you!

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