Price Volatility and The Political Economy of the Resource Curse

Thierry Verdier
(PSE and CEPR)
• An old standing question:
  Natural Resources & Economic Performances: blessing or curse?

• Prior to late 80s: conventional wisdom: a blessing!
  Economic historians / Industrial revolution: USA, Britain, Australia
Introduction (I)

• An old standing question:
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• After the 80s: Presumption of a Curse!
Source: Data used in Mehlum et al. (2006).
Introduction (I)

• An old standing question:
  Natural Resources & Economic Performances: blessing or curse?

• Prior to late 80s: conventional wisdom: a blessing!
  Economic historians / Industrial revolution: USA, Britain, Australia

• After the 80s: Presumption of a Curse!
  - Cross country empirical work: Sachs and Warner (1995, 1999),
    Bannon and Collier 2003; Davis et al.2003
    Mehlum, Moene and Torvik (2006),
    Sala-i-Martin and Subramanian (2003), Eifert et al. (2003)
• In fact: great variety of outcomes (even in LDCs):
  Botswana, Chile, Malaysia, Oman and Thailand (Abidin 2001)
  Algeria, Ecuador, Mexico, Nigeria, Trinidad & Tobago, Venezuela, Zambia
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• Skepticism/controversies about existence of Resource Curse
  Pbs of statistical robustness / generalizations / endogeneity:

  Manzano and Rigobon (2001), Ding and Field (2005), Alexeev and Conrad (2009),
  Brunnschweiler and Bulte (2008), van der Ploeg and Poelhekke (2010)

  Collier and Goderis (2007); Butkiewisz and Yanikkaya (2010)
Introduction (III)

- Shifts in literature from « average effects » of resources to:

1) Explaining diversity of outcomes and mechanisms:
«Why some resource-abundant countries succeed while others do not?»
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«Why some resource-abundant countries succeed while others do not? »

role of institutions and policies:

Andersen and Aslaksen (2008): Presidentialism vs Parliamentary democracies
Arezki and van der Ploeg (2007) : Trade policies/openness
• Shifts in literature from «average effects» of resources to:

1) Explaining diversity of outcomes and mechanisms:
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political economy dimensions
2) Volatility curse: volatility of prices/policies

- Volatility and growth:
  - Aizenman and Marion (1991)
  - Ramey and Ramey (1995)
  - Aghion, Angeletos, Banerjee, Manova (2005)
  - Aghion, Bachetta, Rancière and Rogoff (2006)
2) Volatility curse: volatility of prices/policies

- Volatility and growth:
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  - Ramey and Ramey (1995)
  - Aghion, Angeletos, Banerjee, Manova (2005)
  - Aghion, Bachetta, Rancière and Rogoff (2006)

- Volatility curse:
  Haussman and Rigobon (2002): reinforcing effects: specialization in non tradables / financial frictions/ RER volatility
  van der Ploeg and Poelhekke (2010): direct positive effect of resource on growth indirect negative effect through volatility
  Bleaney and Halland (2009): negative effect of resources on growth through fiscal volatility
  Leong and Mohaddes (2011): volatility curse /mitigating role of institutions
In this talk… (I)

- Political economy dimensions / volatility curse
• Political economy dimensions / volatility curse

• Political economy channel:
  - «Bad policy » induced by Resource rents
  - Dysfunctional state behavior \ large public sectors \ Inefficient redistributive policies \ (Gelb (1988), Gavin (1993), Karl (1997), Auty (2001), Ross (2012))
In this talk… (I)

• Political economy dimensions / volatility curse

• Political economy channel for resource curse
  - «Bad policy » induced by Resource rents
  - Dysfunctional state behavior \ large public sectors \ Inefficient redistributive policies \ (Gelb (1988), Gavin (1993), Karl (1997), Auty (2001), Ross (2012))

• How Resource Booms / volatility affect the extent of inefficient redistribution ?

Interactions between political incentives / price shocks volatility
In this talk...(II)

• Political models of resource extraction with price volatility

- Probabilistic voting Model (Lindbeck-Weibull 1993)
  incumbent politician\resource extraction
In this talk… (II)

- Political models of resource extraction with price volatility

  - Probabilistic voting Model (Lindbeck-Weibull 1993)
    incumbent politician\resource extraction

  - Inefficient redistribution : clientelism \ patronage :
    system of political exchange with voters
    Public employment: redistribution of rents (Auty 2001)

    Two sided credibility: patron\voters
    Exclusivity of patron: social network (Robinson and Verdier (2012))
    Way to gain political support
In this talk… (II)

- Political models of resource extraction with price volatility
  - Probabilistic voting Model (Lindbeck-Weibull 1993)
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  - Inefficient redistribution: clientelism \ patronage:
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      Two sided credibility: patron\ voters
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      Way to gain political support

Price shocks \[\rightarrow\] Political support.
Volatility \[\rightarrow\] Incumbent’s incentives \[\rightarrow\] Resource
Public Policies
Curse
Main Insights (I)

Deterministic price shocks (Robinson, Torvik, Verdier 2006)

- Over extraction of natural resources
- Permanent resource boom: improves efficiency of extraction
- Permanent resource boom: increase resource misallocation in the rest of the economy
- Impact of resource boom: depends on nature of political institutions

Resource booms create underdevelopment not because of inefficiency in the rate of resource extraction but because of what politicians do with the resource rents.
## Main Results (II)

Extension to Stochastic Resource Prices and Volatility

Volatility

- Political support / turnover
  (fiscal volatility for risk averse voters)
- Value of staying in power
  (for risk averse politicians)
Main Insights (II)

Extension to Stochastic Resource Prices and Volatility

Volatility

- Political support / turnover (fiscal volatility for risk averse voters)
- Value of staying in power (for risk averse politicians)

• When incumbent’s constituency « more sensitive » to fiscal shocks than rest of population:

<table>
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<th>Higher resource volatility</th>
<th>Inefficient Patronage policies</th>
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<td>Crowding out of public investment</td>
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<td>Magnification of over extraction of natural resources</td>
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<td>More so under « weak » institutions</td>
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Roadmap

1) Political Economy models of the resource curse

2) A simple model of clientelism, price shocks and resource curse

3) Political clientelism under price volatility

4) Political clientelism, public investment and price volatility

5) Resource extraction under price volatility

6) Conclusions
Economic /Political models of the resource curse (I)


Economic /Political models of the resource curse (I)


• «Dutch Disease » literature:  Corden and Neary (1982), van Wijnbergen (1984),
  Krugman (1987), Matsuyama (1992),
  Sachs and Warner (1995), Gylfason et al. (1999),
  Torvik (2001), Matsen and Torvik (2005),
  van der Ploeg and Venables (2011)
  Haussman and Rigobon (2002)

• « Rent-Seeking » Literature : Tornell and Lane (1999): « Voracity Effect »
  Baland and François (2000)  Occupational choices

- Need for some negative multiplier /externality/ increasing returns effect:
  not internalized by political system decentralized

- No explicit role for political/institutional parameters
Political/ Economic models of the resource curse (II)

- Political Economy Models of the resource curse

  - Political theories of the « rentier » state: North and Thomas (1973)
    Karl (1997), Ross (1999, 2001)
Political/ Economic models of the resource curse (II)

- Political Economy Models of the resource curse

  - Political theories of the « rentier » state: North and Thomas (1973)
    Karl (1997), Ross (1999, 2001)

  - Civil conflicts:
    Collier and Hoeffler (2004): Rebels’ incentives and capacity
    Aslaksen and Torvik (2006): violent vs democratic competition

  - Incumbency distortions and lobbying:
    Acemoglu, Robinson and Verdier (2006): Elite’s behavior
    Damania and Bulte (2003): Lobbying incentives
    Caselli and Cunningham (2009): leader’s incentives/ non monotonic effects
    survival function

  - Public sector distortions:
    Robinson, Torvik and Verdier (2006) : public employment /clientelism
    Robinson and Torvik (2005) : « white elephants »
A Simple Political Economy Model (I)

(Robinson, Torvik and Verdier 2006)

• Two-period probabilistic voting model: periods 1 and 2
• Two parties/politicians: incumbent A and challenger B.
• Election is at the end of period 1
• Mass of voters normalized to 1
• Stock of natural resources: prices $p_1, p_2$

• Resource extracted in period 1: $e$
in period 2: $R(e)$
with $R'(e) < 0$ and $R''(e) < 0$
A Simple Political Economy Model (II)

- Resource income can be used in two possible ways:
  - Consumption by the incumbent
  - Distribution as patronage: public jobs / influence election outcome
  - No taxes

- After election, political winner consumes remaining resource rents.
- No commitment to policies

- Incumbent politician: clientelism / offers public jobs: \( L_p < 1 \)
  public wage: \( W > H \)

  \( H \) : productivity in private sector

- Re-election probability: \( \Pi = \Pi(L_p) \) with \( \Pi' > 0 \)
• The incumbent decides policy before the election: Resource extraction $e$ and public sector employment $L_p$

$$\max_{e,L_p} p_1 e - WL_P + \Pi(L_P)[p_2 R(e) - WL_P]$$
The incumbent decides policy before the election: Resource extraction $e$ and public sector employment $L_p$

$$\max_{e,L_P} p_1 e - WL_P + \Pi(L_P)[p_2 R(e) - WL_P]$$

$$p_1 + \Pi(L_P)p_2 R'(e) = 0$$

$$-[1 + \Pi(L_P)]W + \Pi'[p_2 R(e) - WL_P] = 0$$
Equilibrium Policies

\[ e(L_P, p_1, p_2) \]

\[ L_P(e, p_2) \]
A Simple Political Economy Model (III)

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$$\max_{e, L_P} \ p_1 e - WL_P + \Pi(L_P)[p_2 R(e) - WL_P]$$

$$p_1 + \Pi(L_P)p_2 R'(e) = 0$$

$$-[1 + \Pi(L_P)]W + \Pi'[p_2 R(e) - WL_P] = 0$$

- Efficient extraction path: $\max_{e} \ p_1 e + p_2 R(e)$

(F): $p_1 + p_2 R'(e) = 0$ \quad \Rightarrow \quad e > e^f$
Price Shocks and Extractive Efficiency (I)

- Resources are inefficiently over-extracted: $e > e^f$
• Resources are inefficiently over-extracted: \( e > e^f \)

• Comparative statics on price shocks: \( p_1, p_2 \)

i) permanent resource boom: \( \frac{dp_1}{p_1} = \frac{dp_2}{p_2} = \frac{dp}{p} \)
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    - reduces extraction rate and increases efficiency

Intuition:
- value of staying in power: $↑$
- more incentives to bias political competition
- probability of staying in power: $↑$
- politician is less myopic
Permanent resource boom
ii) **temporary resource boom**: \( dp_1 > 0 \ and \ dp_2 = 0 \)

iii) **anticipated future resource boom**: \( dp_1 = 0 \ and \ dp_2 > 0 \)
ii) temporary resource boom: \( dp_1 > 0 \) and \( dp_2 = 0 \)

- increases extraction rate and reduces efficiency if \( R''(e) \geq 0 \)

- equilibrium extraction path change
  Endogenous effect of clientelism: increases myopia

iii) anticipated future resource boom: \( dp_1 = 0 \) and \( dp_2 > 0 \)
Temporary resource boom

\[ \Delta p_1 > 0 \]

\[ e(L_P, p_1, p_2) \]

\[ L_P(e, p_2) \]
ii) temporary resource boom: \( dp_1 > 0 \) and \( dp_2 = 0 \)

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iii) anticipated future resource boom: \( dp_1 = 0 \) and \( dp_2 > 0 \)
ii) temporary resource boom: $dp_1 > 0$ and $dp_2 = 0$

- increases extraction rate and reduces efficiency if $R'''(e) \geq 0$

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iii) anticipated future resource boom: $dp_1 = 0$ and $dp_2 > 0$

- reduces extraction rate and increases efficiency if $R'''(e) \geq 0$

- equilibrium extraction path change
  endogenous effect of clientelism: decreases myopia
Future anticipated resource boom

\[ \Delta p_2 > 0 \]

\[ e(L_P, p_1, p_2) \]

\[ L_P(e, p_2) \]
Resource booms and resource allocation (I)

permanent resource boom:
- public sector employment ↑
- Private sector employment ↓

\[
\frac{d p_1}{p_1} = \frac{d p_2}{p_2} = \frac{d p}{p}
\]
Resource booms and resource allocation (I)

permanent resource boom: \( \frac{dp_1}{p_1} = \frac{dp_2}{p_2} = \frac{dp}{p} \)

- public sector employment ↑
- Private sector employment ↓

Resource Booms lead to politically motivated expansions of the public sector:

- Auty (1999): Trinidad and Tobago
- Gelb (1988): Ecuador and Venezuela
**Resource curse? (I)**

- Opposite extraction path effect and labor misallocation effect:
- ex: permanent boom: - efficiency of extraction rate increases
  - more labor in public sector
- Impact of resource booms on total income: ambiguous

\[ Y = 2(1 - L_P)H + p_1 e + p_2 R(e) \]
Resource curse? (I)

- Opposite extraction path effect and labor misallocation effect:
- Ex: permanent boom: - efficiency of extraction rate increases
  - more labor in public sector
- Impact of resource booms on total income: ambiguous

\[ Y = 2(1 - L_P)H + p_1 e + p_2 R(e) \]

\[ \frac{dY}{dp/p} = p_1 e + p_2 R + (p_1 + p_2 R') \frac{de}{dp/p} - 2H \frac{dL_P}{dp/p} \]

+ Resource value increase
- Positive extraction path effect
  + Negative reallocation effect
Resource booms and resource allocation (II)

- Negative reallocation effect stronger on public sector when politician has more ability to influence political process through « patronage » redistribution
Resource booms and resource allocation (II)

• Negative reallocation effect stronger on public sector when politician has more ability to influence political process through « patronage » redistribution

• Importance of institutions for resource curse:
Resource booms and resource allocation (II)

- Negative reallocation effect stronger on public sector when politician has more ability to influence political process through « patronage » redistribution

- Importance of institutions for resource curse:
  
  - Weak institutions: (subject to clientelism) → Resource curse
  
  - Strong institutions → No resource curse

Consistent with Mehlum et al. (2006), Iimi (2007), Kolstad (2009):
Positive effects of Resources on growth when institutions are good
Price Volatility and Political Economy (I)

- Exogenous natural resource endowment: $Z$
- Intertemporal path of prices $(p_1, p_2)$:
  \[
  p_1 = \bar{p}_1 > 0 \quad \text{(deterministic)}
  \]
  \[
  p_2 = \bar{p}_2 + \varepsilon \quad \text{(stochastic)} \quad \bar{p}_2 > 0
  \]
  \[
  \varepsilon: \text{ random variable defined on } [-a,a]
  \quad E(\varepsilon) = 0 \quad \text{var}(\varepsilon) = \sigma^2
  \]

- Microfoundations of political competition (probabilistic voting):
  2 groups of individuals A and B: size 1/2.
  2 politicians: incumbent from group A / challenger from group B
  - Different preferences: private good/ group specific public good
voters of type $A$ : \[ u^A(C_t, G_t) = C_t - \gamma^A \frac{(\bar{G} - G_t)^2}{2} \quad \bar{G} > 0 \]

voters of type $B$ : \[ u^B(C_t) = C_t \]

- concave public good utility: risk aversion for fiscal volatility
- group specific public good: fiscal volatility affects political turnover
- quadratic specification: “certainty equivalent” forms

• Each politician cares about his own utility:

\[ V^A_t = R^A_t - \gamma^A \frac{(\bar{G} - G_t)^2}{2} \]
\[ V^B_t = R^B_t \]

$R^i_t$: politician's private good consumption
• Productivity in private sector: H
• Productivity in public sector: 0, wage W

• $L_P$: public sector workers decided by incumbent in period 1
credible commitment for incumbent in period 2
(political patronage / clientelistic social networks)
No commitment for challenger (Robinson and Verdier 2012)

• Per-period Gvt budget constraints (no taxes):

$$G_1 + R_1^A = p_1 Z - WL_P$$
$$G_2(A) + R_2^B = p_2 Z - WL_P$$
$$G_2(B) + R_2^B = p_2 Z$$
• Probabilistic voting model: \( U_t^i (A) + \sigma^i + \theta > U_t^i (B) \)

\( \sigma^i \): « idiosyncratic component » uniformly distributed on \( [-\frac{1}{2s}, \frac{1}{2s}] \)

\( \theta \): incumbent specific popularity uniformly distributed on \( [-\frac{1}{2h}, \frac{1}{2h}] \)
**Price Volatility and Political Economy (IV)**

- Probabilistic voting model: $U_t^i (A) + \sigma^i + \theta > U_t^i (B)$
  
  $\sigma^i$ : uniformly distributed on $\left[ -\frac{1}{2s}, \frac{1}{2s} \right]$ 
  
  $\theta$ : uniformly distributed on $\left[ -\frac{1}{2h}, \frac{1}{2h} \right]$ 

- Timing: 
  - period 1: - Incumbent chooses: $(L_P, G_1, R_{1A})$ 
    - production, consumption 
  - period 2: - political competition: $(G_2(A), R_{2A})$ 
    - winner implements ex post optimal rent $R_2$ 
    - realization of the price shock $\varepsilon$ 
    - production, consumption and public good provision
Equilibrium Policies in period 2 (I)

- Credible policies: backward induction

  Period 2:
  - If politician of type B is elected: $G_2(B) = 0$
    No public jobs
    consume all the rent $p_2Z$
Equilibrium Policies in period 2 (I)

- Credible policies: backward induction

Period 2:
- If politician of type B is elected: \( G_2(B) = 0 \)
  
  No public jobs consume all the rent \( p_2Z \)

- For incumbent of type A:
  
  \[
  G_2(A) = \max[p_2Z - R_2^A - WLP; 0]
  \]

  Public jobs: \( L_P \)
  
  Choice of \( R_2^A \):
  
  \[
  \max_{R_2^A} R_2^A - \gamma^A E\left[ \frac{(G_2 - G_2(A))^2}{2} \right]
  \]

  We will consider only regimes where \( G_2(A) > 0 \) for all realizations of \( p_2 \)
Equilibrium Policies in period 2 (II)

• Incumbent of type A maximizes expected utility:

\[
\max_{R^A_2} R^A_2 - \gamma^A \left( \frac{(G - E[G^A_2])}{2} \right)^2 - \gamma^A \frac{\sigma^2}{2} Z^2
\]

with \( E[G^A_2(A)] = \bar{p}_2 Z - R^A_2 - WL_P \)
Equilibrium Policies in period 2 (II)

- Incumbent of type A maximizes expected utility:

$$\max_{R^A_2} R^A_2 - \gamma^A (\overline{G} - E[G_2(A)])^2 - \gamma^A \frac{\sigma^2}{2} Z^2$$

with \( E[G_2^A(A)] = \overline{p_2}Z - R^A_2 - WL_P \)

- Optimal level of incumbent's rent:\n\( R^A_2 = \overline{p_2}Z - WL_P + \frac{1}{\gamma^A} - \overline{G} \)

- Provision of the public good A:\n\( G_2(A) = [p_2 - \overline{p_2}]Z + \overline{G} - \frac{1}{\gamma^A} \)
Equilibrium Policies in period 2 (II)

• For incumbent of type A:

\[
\max_{R_2^A} R_2^A - \gamma^A \left( \frac{\bar{G} - E[G_2(A)]}{2} \right)^2 - \gamma^A \frac{\sigma^2}{2} Z^2
\]

with \( E[G_2^A(A)] = \bar{p}_2 Z - R_2^A - WL_P \)

- Optimal level of incumbent's rent: \( R_2^A = \bar{p}_2 Z - WL_P + \frac{1}{\gamma^A} - \bar{G} \)

- Provision of the public good A: \( G_2(A) = [p_2 - \bar{p}_2]Z + \bar{G} - \frac{1}{\gamma^A} \)

• Assumptions for an interior solution: \( R_2^A > 0 \) and \( 0 < G_2(A) < \bar{G} \)

\[
\begin{align*}
\bar{p}_2 Z - \frac{W}{2} &> \bar{G} - \frac{1}{\gamma^A} &\quad \rightarrow & R_2^A > 0 \\
aZ &< \min \left\{ \frac{1}{\gamma^A} ; \bar{G} - \frac{1}{\gamma^A} \right\} &\quad \rightarrow & 0 < G_2(A) < \bar{G}
\end{align*}
\]
Equilibrium Voters Utilities (I)

- Period 2 expected utility of private sector voters:

\[ U_2^A(A) = H - \frac{1}{2\gamma^A} - \frac{\gamma^A \sigma^2}{2} Z^2 \]  and \[ U_2^A(B) = H - \frac{\gamma^A}{2} (\overline{G})^2 \]

\[ U_2^B(B) = U_2^B(A) = H \]

- Voters of type A:  - Utility benefit of average public good provision

\[ \frac{\gamma^A}{2} (\overline{G})^2 - \frac{1}{2\gamma^A} > 0 \]

- Fiscal volatility cost related to fluctuations of resource income \( p_2 Z \)

\[ - \frac{\gamma^A \sigma^2}{2} Z^2 \]

- Assume volatility not too high:  \[ U_2^A(A) > U_2^A(B) \]
• Expected utility for public employees in group A:

\[
U^L_2(A) = W - \frac{1}{2\gamma^A} - \frac{\gamma^A \sigma^2}{2} Z^2 \quad \text{and} \quad U^L_2(B) = H - \frac{\gamma^A}{2} (\overline{G})^2
\]

• Again when volatility not too high: \( U^L_2(A) > U^L_2(B) \)
Election probability (I)

- group B voters:
  - Post-election income independent of election outcome:
    - Support incumbent A: $\sigma^i + \theta > 0$
    $$N_B = \frac{1}{2} \left( \frac{1}{2} + s\theta \right)$$
Election probability (I)

• group B voters:
  - Post-election income independent of election outcome:
    - Support incumbent A: \( \sigma^i + \theta > 0 \)
      \[
      N_B = \frac{1}{2} \left( \frac{1}{2} + s \theta \right)
      \]

• Group A voters:
  - private employees: \( U^A_2(A) + s^i + \theta > U^A_2(B) \)
    \[
    N^H_A = (1 - L_p) \left( \frac{1}{2} + s \left( \theta + [U^A_2(A) - U^A_2(B)] \right) \right)
    \]
  - public workers:
    \[
    N^P_A = L_p \left( \frac{1}{2} + s \left( \theta + [U^L_2(A) - U^L_2(B)] \right) \right)
    \]
Election probability (II)

- Election probability of incumbent: \( \Pi = \Pr \left\{ N_B + N_A^P + N_A^L \geq \frac{1}{2} \right\} \)

\[
\Pi \rightarrow \Pi = \Pr \left[ \theta + \frac{\gamma^4}{2} \left[ \bar{G}^2 - \frac{1}{(\gamma^4)^2} - \sigma^2 Z^2 \right] + (W - H)L_P \geq 0 \right]
\]

\[
\Pi(L_P, \sigma^2) = \frac{1}{2} + h \left\{ \frac{\gamma^4}{4} \left[ \bar{G}^2 - \frac{1}{(\gamma^4)^2} - \sigma^2 Z^2 \right] + (W - H)L_P \right\}
\]
Election probability (III)

- Election probability of incumbent: \( \Pi = \text{Pr}\left\{ N_B + N_A^P + N_A^L \geq \frac{1}{2} \right\} \)

\[
\Pi = \text{Pr}\left[ \theta + \frac{\gamma^4}{2} \left[ \bar{G}^2 - \frac{1}{\langle \gamma^4 \rangle^2} - \sigma^2 Z^2 \right] + (W - H)L_P \geq 0 \right]
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\[
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\]

- Depends positively on public employment \( L_P \)

Clientelism influences probability to stay in power
Reelection probability of incumbent: \( \Pi = \Pr \left\{ N_B + N_A^P + N_A^L \geq \frac{1}{2} \right\} \)

\[
\Pi = \Pr \left[ \theta + \frac{\gamma^A}{2} \left( \bar{G}^2 - \frac{1}{(\gamma^A)^2} - \sigma^2 Z^2 \right) + (W - H) L_P \geq 0 \right]
\]

\[
\Pi(L_P, \sigma^2) = \frac{1}{2} + h \left\{ \frac{\gamma^A}{4} \left[ \bar{G}^2 - \frac{1}{(\gamma^A)^2} - \sigma^2 Z^2 \right] + (W - H) L_P \right\}
\]

- Depends negatively on volatility of the resource price
- Type A voters suffer from fiscal volatility when incumbent reelected
- Reduces political support of these voters.
- Economic volatility translates into political instability
- (asymmetry between incumbent/challenger is crucial)
• Period 1 problem of the incumbent:

\[
\begin{align*}
\max_{R_1^A, G_1, L_P} & \quad R_1^A - \gamma^A \left( \overline{G} - G_1 \right)^2 + \Pi(L_P, \sigma^2) \left[ \frac{1}{2} p_2 Z - WLP + \frac{1}{2} \gamma^A - \overline{G} - \frac{\gamma^A \sigma^2}{2} Z^2 \right] \\
& + (1 - \Pi(L_P, \sigma^2)) \left[ -\frac{\gamma^A}{2} \left( \overline{G} \right)^2 \right]
\end{align*}
\]

under budget constraint: \( G_1 + R_1^A = p_1 Z - WLP \)
Equilibrium patronage and Price Volatility (I)

• Period 1 problem of the incumbent:

$$\max_{A, G_1, LP} R_1^A - \gamma^A \frac{(G - G_1)^2}{2} + \Pi(L_P, \sigma^2) \left[ \bar{p}_2 Z - WLP + \frac{1}{2\gamma^A} - \bar{G} - \frac{\gamma^A \sigma^2}{2} Z^2 \right] + (1 - \Pi(L_P, \sigma^2)) \left[ -\frac{\gamma^A}{2} (\bar{G})^2 \right]$$

under budget constraint: \( G_1 + R_1^A = p_1 Z - WLP \)

\[ \Rightarrow \]

Equilibrium level of public employment (patronage):

$$\Pi'_L \left[ \bar{p}_2 Z - WLP + \frac{1}{2\gamma^A} - \bar{G} - \frac{\gamma^A \sigma^2}{2} Z^2 + \frac{\gamma^A}{2} (\bar{G})^2 \right] - W[1 + \Pi] = 0$$

Marginal benefit of patronage

Marginal cost of patronage
Equilibrium patronage and Price Volatility (II)

- Effect of price volatility on patronage:
Equilibrium patronage and Price Volatility (II)

- Effect of price volatility on patronage:
  - in general: ambiguous

- Volatility reduces value to stay in power (marginal benefit):

\[ V_{\text{power}} = \bar{p}_2 Z - WL_P + \frac{1}{2\gamma^A} - \bar{G} - \frac{\gamma^A \sigma^2}{2} Z^2 + \frac{\gamma^A}{2} \left( \bar{G} \right)^2 \]

\[ \Rightarrow \text{Reduces political patronage } L_P \]
Equilibrium patronage and Price Volatility (II)

- Effect of price volatility on patronage:
  - in general: ambiguous
- Volatility reduces value to stay in power (marginal benefit):
  \[ V_{\text{power}} = \bar{p}_2 Z - WL_P + \frac{1}{2\gamma^A} - \bar{G} - \frac{\gamma^A \sigma^2}{2} Z^2 + \frac{\gamma^A}{2} (\bar{G})^2 \]
  \[ \rightarrow \]
  Reduces political patronage \( L_P \)

- Volatility reduces proba of reelection / expected cost of public jobs
  \[ \rightarrow \]
  Increases political patronage \( L_P \)
Equilibrium patronage and Price Volatility (II)

- Effect of price volatility:
  - in general: ambiguous

• Volatility reduces value to stay in power (marginal benefit):

\[ V_{\text{power}} = \overline{p} Z - WL_P + \frac{1}{2\gamma^A} - \bar{G} - \frac{\gamma^A \sigma^2}{2} Z^2 + \frac{\gamma^A}{2} \left( \frac{\sigma G}{\gamma^A} \right)^2 \]

→ Reduces political patronage \( L_P \)

• Volatility reduces proba of reelection / expected cost of public jobs

→ Increases political patronage \( L_P \)

• For our parametric specification: \( L_P \) \( \uparrow \) with volatility \( \sigma^2 \)
  when public wages are not too high (ie. \( W/H < 2 \))
  / Politician not too risk averse
Resource Curse and Volatility (I)

• Total expected wealth:

\[ Y = 2H + p_1Z + \overline{p}_2Z - (1 + \Pi(L_P))L_PH \]

Expected resource cost of political patronage
Resource Curse and Volatility (I)

- Total expected wealth:

\[ Y = 2H + p_1Z + \bar{p}_2Z - (1 + \Pi(L_P))L_PH \]

Expected resource cost of political patronage

\[ \text{Price volatility leads to a resource curse when political patronage increases} \]

\[ \text{Moreover when average resource income } \bar{p}_2Z \text{ is large enough, Negative effect is stronger, the weaker the institutions (ie. } \Pi'_L \uparrow \text{)} \]
• Extend the model to public investment/growth

- Curse not only through clientelistic policies but also through crowding out of public investments (infrastructures/education) (Caselli (2006), Caselli and Cuningham 2010).

• Productivity of private sector: \( H_1 = H \); \( H_2(I) = H + \delta I \)

\( \delta > 0 \)

• Government can tax private sector at the tax rate \( \tau > 0 \)
Public Investment and Political Patronage (II)

• Prb of reelection:

\[
\Pi(L_P, I) = \min \left[ \frac{1}{2} + h \left\{ \frac{\gamma^4}{4} \left[ \bar{G}^2 - \frac{1}{(\gamma^4)^2} - \sigma^2 Z^2 \right] + [W - H_2(I)(1 - \tau)]L_P \right\}; 1 \right]
\]

Rent depends negatively on I

\[
\frac{\partial^2 \Pi}{\partial L_P \partial I} < 0
\]

Public investment reduces the effectiveness of political clientelism

Political patronage increases the cost of public investment on re-election proba
• First period problem of the incumbent:

\[
\max_{R_1^A, G_1, L_P, I} \quad R_1^A - \gamma^A \frac{(\bar{G} - G_1)^2}{2}
\]

\[
+ \Pi(L_P, I) \left[ \tau H_2(I)(1 - L_P) + \bar{p}_2 Z - W_{LP} + \frac{1}{\gamma^A} - \bar{G} - \frac{\gamma^A \sigma^2}{2} Z^2 \right]
\]

\[
+ (1 - \Pi(L_P, I)) \left[ -\frac{\gamma^A}{2} (\bar{G})^2 \right]
\]

under the constraint: \( G_1 + R_1^A = \tau H_1(1 - L_P) + p_1 Z - W_{LP} - I \)
• First period problem of the incumbent:

$$\max_{R_1^A, G_1, L_P, I} R_1^A - \gamma^A \left( \overline{G} - G_1 \right)^2$$

$$+ \Pi(L_P, I) \left[ \tau H_2(I)(1 - L_P) + \overline{p} Z - WL_P + \frac{1}{\gamma^A} - \overline{G} - \frac{\gamma^A \sigma^2}{2} Z^2 \right]$$

$$+ (1 - \Pi(L_P, I)) \left[ -\frac{\gamma^A}{2} \left( \overline{G} \right)^2 \right]$$

under the constraint: $G_1 + R_1^A = \tau H_1(1 - L_P) + p_1 Z - WL_P - 1$
Public Investment and Political Patronage (IV)

\[-(W + \tau H_1) - \Pi(W + \tau H_2) + \Pi'_L[V_{\text{power}}] = 0 \quad \text{\rightarrow} \quad L_P(I)\]

\[-1 + \Pi'_L[V_{\text{power}}] + \Pi\tau\delta(1 - L_P) = 0 \quad \text{\rightarrow} \quad I(L_P)\]

Where:

\[V_{\text{power}} = \tau H_2(1 - L_P) + p_2Z - WL_P + \frac{1}{\gamma^A} - \bar{G} - \frac{\gamma^A\sigma^2}{2}Z^2 + \frac{\gamma^A}{2}(\bar{G})^2\]

value to stay in power
Public Investment and Political Patronage (V)

- How is patronage affected by public investment?

![Marginal cost and benefit diagram]

\[-(W + \tau H_1) - \Pi(W + \tau H_2) + \Pi'_L[V_{power}] = 0\]

\[L_P(I)\]
Public Investment and Political Patronage (V)

- How is patronage affected by public investment?

\[ -(W + \tau H_1) - \Pi(W + \tau H_2) + \Pi'_L[V_{\text{power}}] = 0 \]

\[ L_P(I) \]

Marginal cost \hspace{2cm} Marginal benefit

\[ I \uparrow \]

\[ - \downarrow \hspace{2cm} + \downarrow \]

\[ L_P \uparrow \hspace{2cm} L_P \downarrow \]
Public Investment and Political Patronage (V)

• How is patronage affected by public investment?

\[ -(W + \tau H_1) - \Pi (W + \tau H_2) + \Pi'_L[V_{\text{power}}] = 0 \]

• Large enough value of resource income \( \bar{p}_2 Z \) \( \rightarrow \) \( L_P(I) \)

• Patronage and public investment are strategic substitutes
Public Investment and Political Patronage (VI)

- How is public investment affected by patronage?

\[
\text{Marginal cost} \quad \text{Marginal benefit}
\]

\[
-1 + \Pi'_{f}[V_{\text{power}}] + \Pi_{f} \tau \delta (1 - L_P) = 0 \quad \rightarrow \quad I(L_P)
\]

- Large enough value of resource income \( \bar{p}_2 Z \) \( \rightarrow \) \( I(L_P) \)

- How is public investment affected by patronage?
Public Investment and Political Patronage

$I$ vs $L_P$

$LP(I)$

$I(L_P)$

$E$
Public Investment and Political Patronage (VII)

- Effect of price volatility: $\sigma^2 \uparrow$
Public Investment and Political Patronage (VII)

• Effect of price volatility : $\sigma^2 \uparrow$

- Political patronage $L_P(I)$

1) Political turnover $\uparrow$ Expected cost of public jobs $\downarrow$ $L_P \uparrow$

2) Fiscal volatility $\uparrow$ Value to stay in power $\downarrow$ $L_P \downarrow$
• Effect of price volatility: $\sigma^2 \uparrow$

- Political patronage $L_P(I)$

  1) Political turnover $\uparrow$ Expected cost of public jobs $\downarrow$ $L_P \uparrow$

  2) Fiscal volatility $\uparrow$ Value to stay in power $\downarrow$ $L_P \downarrow$

- Public investment $I(L_P)$

  1) Political turnover $\uparrow$ horizon for public Investment $\downarrow$ $I \downarrow$

  2) Fiscal volatility $\uparrow$ cost on expected gains to stay in power $\downarrow$ $I \uparrow$
Public Investment, Political patronage
And the resource curse

• When public wage/sector not too large / politician not too risk averse
  
  political turnover effect dominates

\[ I(L_P) \] decreases with price volatility
\[ L_P(I) \] increases with price volatility

• Volatility leads to resource curse:
  magnification effects of interaction between public investment and patronage
Public Investment, Political Patronage and Price Volatility

\[ L_P(I) \]

\[ I(L_P) \]

\[ \Delta \sigma^2 > 0 \]

\[ \Delta \sigma^2 > 0 \]
Rent extraction, Politics and Price volatility (I)

- Extension with rent extraction: \( Z_1 = e \), \( Z_2 = R(e) \)
  \[ R' < 0 \text{ and } R'' < 0 \]

- No public investment I: \( H_1 = H_2 = H \)

- No taxation \( \tau = 0 \)
Rent extraction, Politics and Price volatility (I)

- Extension with rent extraction: \( Z_1 = e \quad Z_2 = R(e) \)
  
  \[ R' < 0 \text{ and } R'' < 0 \]

- No public investment I: \( H_1 = H_2 = H \)

- No taxation \( \tau = 0 \)

- Proba of incumbent’s election:

  \[
  \Pi(L_P, e) = \frac{1}{2} + h \left\{ \frac{\gamma^A}{4} \left[ \bar{G}^2 - \frac{1}{(\gamma^A)^2} - \sigma^2 R(e)^2 \right] + [W - H]L_P \right\}
  \]

- Proba of reelection increases with extraction rate \( e \):
  
  Utility cost for voters of type A of price volatility is reduced with lower stock of the resource in period 2.
• The effect of $e$ on $\Pi$ stronger when volatility parameter $\sigma^2$ larger:

$$\Pi''_{e\sigma^2} = -h \frac{\gamma A}{2} R(e)R'(e) > 0$$
Rent extraction, Politics and Price volatility (II)

- The effect of $e$ on $\Pi$ stronger when volatility parameter $\sigma^2$ larger: $\Pi''_{e\sigma^2} = -h \frac{\gamma A}{2} R(e)R'(e) > 0$

- period 1 problem of incumbent:

$$\max_{R_A, \gamma A, L_P, e} R_A^1 - \gamma A \left( \bar{G} - G_1^A \right)^2 + \Pi(L_P, e) \left[ \bar{p}_2R(e) - WL_P + \frac{1}{2\gamma A} - \bar{G} - \frac{\gamma A \sigma^2}{2} R(e)^2 \right] + (1 - \Pi(L_P, e) \left[ -\frac{\gamma A}{2} \left( \bar{G} \right)^2 \right]$$

- Equilibrium extraction in case without patronage (ie. $L_P=0$):

$$p_1 + \Pi \bar{p}_2 R'(e) + \Pi_e (V_{\text{power}}(e, L_P)) - \Pi \gamma A \sigma^2 R(e)R'(e) = 0$$
Rent extraction, Politics and Price volatility (II)

- The effect of $e$ on $\Pi$ stronger when volatility parameter $\sigma^2$ larger:
  \[ \Pi_{e\sigma^2} = -h \frac{\gamma^A}{2} R(e)R'(e) > 0 \]

- Period 1 problem of incumbent:
  \[
  \max_{R_1^A, G_1^A, L_P, e} \left[ R_1^A - \gamma^A \frac{(\bar{G} - G_1^A)^2}{2} + \Pi(L_P, e) \left[ \bar{p}_2R(e) - WL_P + \frac{1}{2\gamma^A} - \bar{G} - \frac{\gamma^A \sigma^2}{2}R(e)^2 \right] \right] \\
  + (1 - \Pi(L_P, e)) \left[ -\frac{\gamma^A}{2} \left( \bar{G} \right)^2 \right]
  \]

- Equilibrium extraction in case without patronage (ie. $L_P=0$):
  \[ p_1 + \Pi \bar{p}_2 R'(e) + \Pi \varepsilon(V_{power}(e, L_P)) - \Pi \gamma^A \sigma^2 R(e)R'(e) = 0 \]
  - Average price effects
  - Political turnover effect
  - Fiscal volatility effect
• Comparative statics on extraction rate $e$:

$$\frac{\partial e^*}{\partial p_1} > 0$$
Rent extraction, Politics and Price Volatility (III)

- Comparative statics on extraction rate \( e \):
  \[
  \frac{\partial e^*}{\partial p_1} > 0 \\
  \frac{\partial e^*}{\partial p_2} < 0
  \]
  (when price volatility not too high)
Rent extraction, Politics and Price Volatility (III)

• Comparative statics on extraction rate $e$:
  \[
  \frac{\partial e^*}{\partial p_1} > 0
  \]
  \[
  \frac{\partial e^*}{\partial p_2} < 0 \quad \text{(when price volatility not too high)}
  \]

• Effect of $\sigma^2$ :
  \[
  p_1 + \Pi\bar{p}_2R'(e) + \Pi_e(V_{\text{power}}(e, L_P)) - \Pi\gamma^A\sigma^2R(e)R'(e) = 0
  \]
Rent extraction, Politics and Price Volatility (III)

- Comparative statics on extraction rate \( e \):
  
  \[
  \frac{\partial e^*}{\partial p_1} > 0
  \]

  \[
  \frac{\partial e^*}{\partial p_2} < 0 
  \]
  (when price volatility not too high)

- Effect of \( \sigma^2 \):
  
  \[
  p_1 + \Pi \overline{p_2 R'(e)} + \Pi_e (V_{power}(e, L_P)) - \Pi \gamma^A \sigma^2 R(e) R'(e) = 0
  \]

  1) Increased political myopia \( \rightarrow e^* \)
• Comparative statics on extraction rate $e$:

\[
\frac{\partial e^*}{\partial p_1} > 0
\]

\[
\frac{\partial e^*}{\partial p_2} < 0 \quad \text{(when price volatility not too high)}
\]

• Effect of $\sigma^2$:

\[
p_1 + \Pi \bar{p}_2 R'(e) + \Pi e(V_{\text{power}}(e, L_P)) - \Pi \gamma^A \sigma^2 R(e) R'(e) = 0
\]

2) Increased political turnover effect  \rightarrow e^*
• Comparative statics on extraction rate $e$:

$$\frac{\partial e^*}{\partial p_1} > 0$$

$$\frac{\partial e^*}{\partial p_2} < 0$$  (when price volatility not too high)

• Effect of $\sigma^2$:

$$p_1 + \Pi \bar{p}_2 R'(e) + \Pi_e (V_{\text{power}}(e, L_P)) - \Pi \gamma^A \sigma^2 R(e)R'(e) = 0$$

3) Reduced value to stay in power $e^*$
Rent extraction, Politics and Price Volatility (III)

- Comparative statics on extraction rate $e$:
  \[ \frac{\partial e^*}{\partial p_1} > 0 \]
  \[ \frac{\partial e^*}{\partial p_2} < 0 \] (when price volatility not too high)

- Effect of $\sigma^2$:
  \[ p_1 + \Pi \bar{p}_2 R'(e) + \Pi_e (V_{\text{power}}(e, L_P)) - \Pi \gamma^A \sigma^2 R(e) R'(e) = 0 \]

4) Increased fiscal volatility $e^*$ effect
Rent extraction, Politics and Price Volatility (III)

- Comparative statics on extraction rate $e$:
  
  \[
  \frac{\partial e^*}{\partial p_1} > 0 \\
  \frac{\partial e^*}{\partial p_2} < 0 
  \]
  (when price volatility not too high)

- Effect of $\sigma^2$:
  
  \[
  p_1 + \Pi \bar{p}_2 R'(e) + \Pi_e (V_{\text{power}}(e, L_P)) - \Pi \gamma^A \sigma^2 R(e)R'(e) = 0
  \]

1) Increased political myopia  
2) Increased political turnover effect  
3) Reduced value to stay in power  
4) Increased fiscal volatility effect

Price volatility not too strong

\[
\begin{align*}
\text{e}^* & \quad \text{not too strong} \\
\end{align*}
\]
Rent extraction, Politics and Price Volatility (IV)

• More aggressive extraction in context of price volatility

Van der Ploeg (2010) : social planner’s context / modified optimal Hotelling rule
Social optimum extraction path brought forward by future price volatility
• More aggressive extraction in context of price volatility

Van der Ploeg (2010): social planner’s context / modified optimal Hotelling rule
Social optimum extraction path brought forward by future price volatility

• Here social utilitarian optimum:

\[
\begin{align*}
\max S &= X_1 + \frac{1}{2} u^A(C_1^A, G_1^A) + \frac{1}{2} u^B(C_1^B) \\
&\quad + E\left[ X_2 + \frac{1}{2} u^A(C_2^A, G_2^A) + \frac{1}{2} u^B(C_2^B) \right] \\
X_1 + G_1^A &= p_1 e \quad X_2 + G_2^A = p_2 R(e)
\end{align*}
\]

\[ p_1 + p_2 R'(e) - \frac{\gamma^A}{2} \sigma^2 R(e) R'(e) = 0 \]

Optimum extraction brought forward by price volatility
Rent extraction, Politics and Price Volatility (V)

\[ p_1 + \overline{p}_2 R'(e) - \frac{\gamma^4}{2} \sigma^2 R(e) R'(e) = 0 \]  
(social optimum)

\[ p_1 + \Pi \overline{p}_2 R'(e) + \Pi_e (V_{\text{power}}(e, L_P)) - \Pi \gamma^4 \sigma^2 R(e) R'(e) = 0 \]  
(political eq.)
Rent extraction, Politics and Price Volatility (V)

\[ p_1 + \bar{p}_2 R'(e) - \frac{\gamma^A}{2} \sigma^2 R(e) R'(e) = 0 \]  
(social optimum)

\[ p_1 + \Pi \bar{p}_2 R'(e) + \Pi_e (V_{\text{power}}(e, L_P)) - \Pi \gamma^A \sigma^2 R(e) R'(e) = 0 \]  
(political eq.)

Political turnover effect
Fiscal volatility effect
Rent extraction, Politics and Price Volatility (V)

\[ p_1 + \bar{p}_2 R'(e) - \frac{\gamma^4}{2} \sigma^2 R(e)R'(e) = 0 \]  
(social optimum)

\[ p_1 + \Pi \bar{p}_2 R'(e) + \Pi(e(V_{\text{power}}(e, L_P))) - \Pi \gamma^4 \sigma^2 R(e)R'(e) = 0 \]  
(political eq.)

Political turnover effect  
Fiscal volatility effect

Over extraction of the resource under price volatility  
Inefficiency likely to increase with \(\sigma^2\)

Expected total wealth: \[ Y = 2H + p_1 e + \bar{p}_2 R(e) \]

Resource curse associated to higher \(\sigma^2\)
Rent extraction, Politics and Price Volatility (VI)

- Analysis can be extended to positive political patronage (ie. $L_P > 0$)

\[-(1 + \Pi)W + \Pi'_L[V_{\text{power}}] = 0 \quad \longrightarrow \quad L_P(e)\]

\[p_1 + \Pi e[V_{\text{power}}] + \Pi[p_2 - \gamma^A \sigma^2 R(e)]R'(e) = 0 \quad \longrightarrow \quad e(L_P)\]

With: $V_{\text{power}} = p_2 R(e) - W L_P + \frac{1}{2\gamma^A} - \bar{G} - \frac{\gamma^A \sigma^2}{2} R(e)^2 + \frac{\gamma^A}{2} \bar{G}$
Rent extraction, Politics and Price Volatility

\[ L_P(e) \]

\[ e(L_P) \]
Rent extraction, Politics and Price Volatility (VI)

- Effect of volatility: $L_P(e)$ shifted up with $\sigma^2$

\[ e(L_P) \]
Rent extraction, Politics and Price Volatility

\[ L_P(e) \]

\[ \Delta \sigma^2 > 0 \]

\[ \Delta \sigma^2 > 0 \]

\[ e(L_P) \]
Rent extraction, Politics and Price Volatility (VII)

- Effect of volatility: \[ L_P(e) \]
  - shifted up with \( \sigma^2 \)

- At least one of the two policy variables: \( e^* ; L^*_P \)
  - with price volatility

- Negative impact of price/fiscal volatility on income
  - when both variables increase:
  - over extraction / inefficient public employment
Conclusions (I)

• Political-economy models of the resource curse: How political incentives interact with price shocks/volatility

• Incumbent’s asymmetric capacity:
  - Clientelism: inefficient redistribution through public jobs tool for influencing people's political behavior.

• Resource booms create underdevelopment not because of inefficiency in rate of resource extraction but because of political redistribution of the rents.
• Political-economy models of the resource curse:
  How political incentives interact with price shocks/volatility

• Incumbent’s asymmetric capacity:
  - Clientelism: inefficient redistribution through public jobs tool for influencing people's political behavior.

• Resource booms create underdevelopment not because of inefficiency in rate of resource extraction But because of political redistribution of the rents.

• Resource volatility → Public policy volatility voters’ perceptions political turnover → Incumbent’s Public policies
  → Resource allocation Redistribution
Conclusions (II)

- Limited public instruments: risk shifting to voters
- Asymmetric effects on constituencies between incumbent/challenger
Conclusions (II)

- Limited public instruments: risk shifting to voters
- Asymmetric effects on constituencies between incumbent/challenger

\[
\text{volatility} \quad \rightarrow \quad \text{「bad」 incumbent’s policies}
\]
\[
\text{political channel for volatility curse}
\]
Conclusions (II)

- Limited public instruments: risk shifting to voters
- Asymmetric effects on constituencies between incumbent/challenger

\[ \text{volatility} \longrightarrow \text{« bad » incumbent’s policies} \]
\[ \text{political channel for volatility curse} \]

• Extensions: - The role of Liquidity constraints/Financial frictions
  - Debt policy
  - Other public policies
  - Nontraded/traded goods: «Political» Dutch disease?