Optimal macro-policy and the resource project cycle: how should Papua New Guinea set policy for Papua LNG?

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What are we doing?

- Basic set-up: ‘giant’ resource projects (large relative to size of economy)
  - movement between project phases causes macroeconomic instability
    - project phases are a source of instability (new work)
    - instability via commodity resource price shocks, output shocks
    - macroeconomic instability (via RER) bad for growth – resource curse
  - relevant to recent experience (PNG LNG) and future (Papua LNG, P’nyang etc)
- Lifecycle problem
  - we all face it
  - desire to smooth consumption over lifetime
    - borrow / save to achieve
    - not good for us to starve at any point or to die in debt (for our progeny)
- Simple story complicated by an uncertain world
  - shocks to resource prices (positive and negative) (PNG in 2014)
  - project not as productive as expected
  - desire to optimally allocate resource wealth over time in the face of risks
    - uncertainty in the future – save more now (precautionary savings)
  - PNG gov’t credit constrained
- Governments borrowing / saving across phases to smooth consumption for HHs
  - HHs can’t do this for themselves: can’t borrow/save

Structural Model of Small Open Economy

- 4 period macro model incorporating lifecycle of resource projects: 4 phases
- Three production sectors
  - Traded (T) goods sector: agriculture, manufactures, some services
  - Non-traded (N) goods sector: services
  - Resource sector: oil, gas, minerals: produced using foreign factors

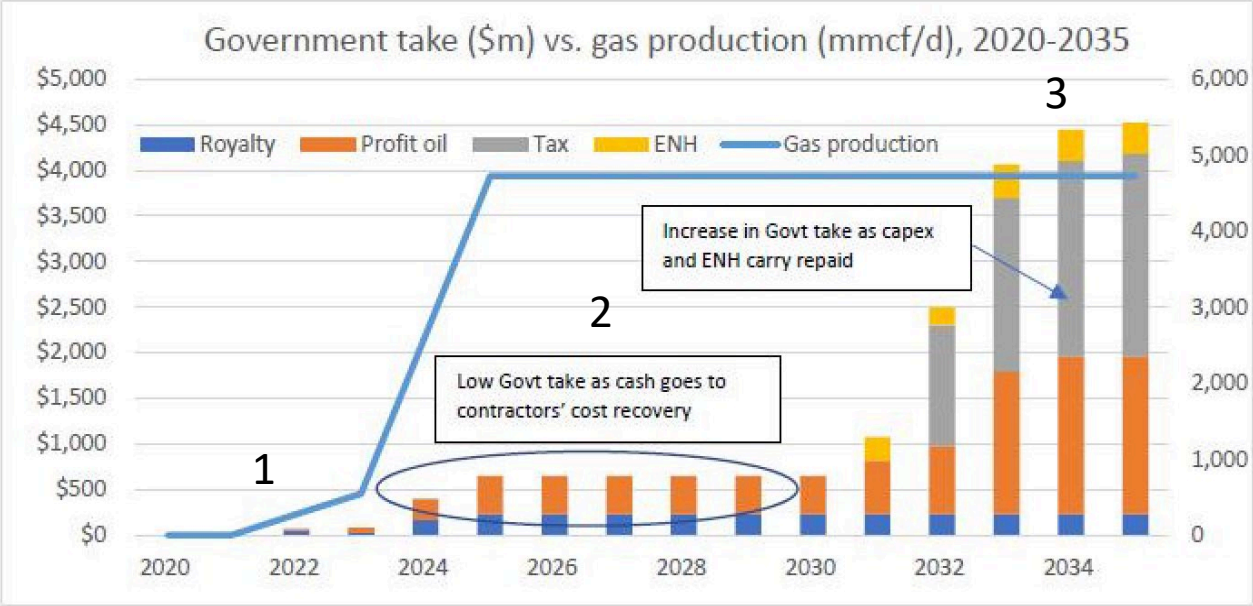
- Three groups of agents
  - Households consume *T* and *N* goods and provide labour (*L)*for production
    - maximize utility
  - Firms: produce *T* and *N* goods
    - maximize profit
  - Government: reallocates spending over time through taxes and spending
    - reallocate spending over time to maximize household welfare

Resource Project Cycle: 4 phases

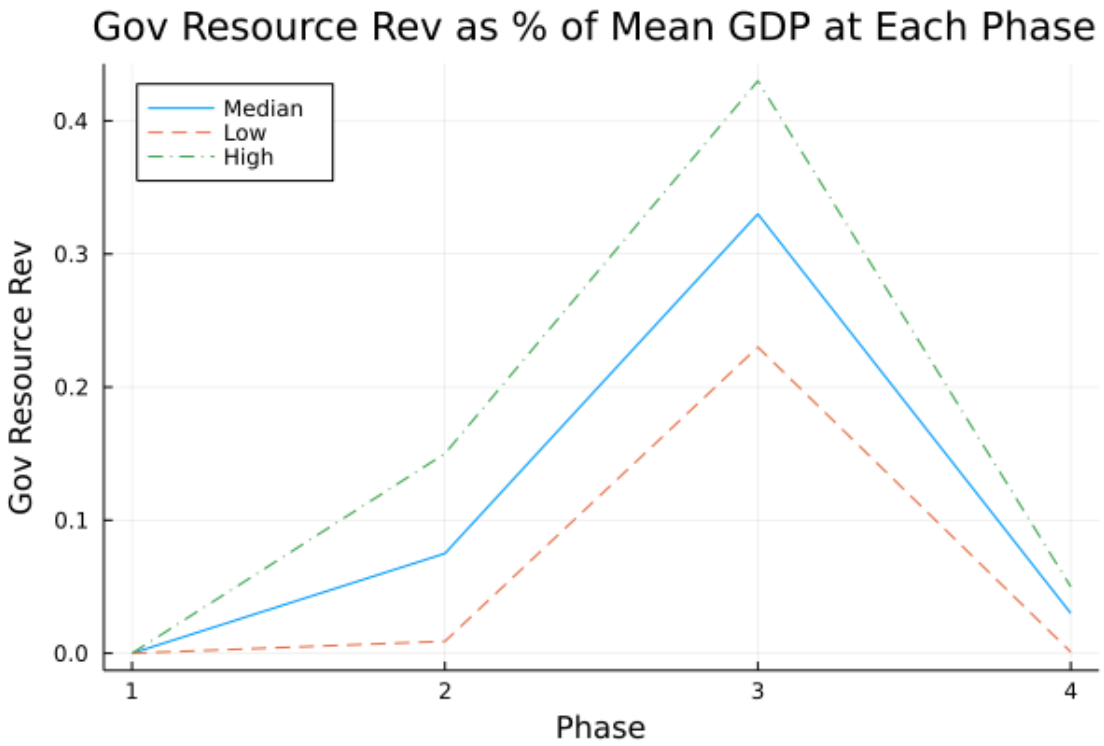
- P1: investment phase
  - physical capital and infrastructure investments
    - build capacity for the production phases
    - high demand local resources
      - positive shock to economy (appreciates RER)
    - PNG LNG construction phase 2010-2013
- P2: high production, low government take
  - Project partners use rents from production to recoup costs
    - tax revenues low: incentives to MNE that backload resource revenues: tax concessions etc
    - PNG LNG current phase
- P3: high production, high government take
  - significant increase in gov't take (tax receipts high)
    - project investment costs recouped
      - tax exemptions/deferments expire
    - PNG LNG 2026? (IMF Article IV 2022)
- P4: falling production yields – revenues falling
  - as resource exhausted, production yields fall
  - tax revenues (and gov't take) trend downward.

Phases of Resource Project

Figure: Projected fiscal resource revenue, Mozambique LNG projects, 2020–2035



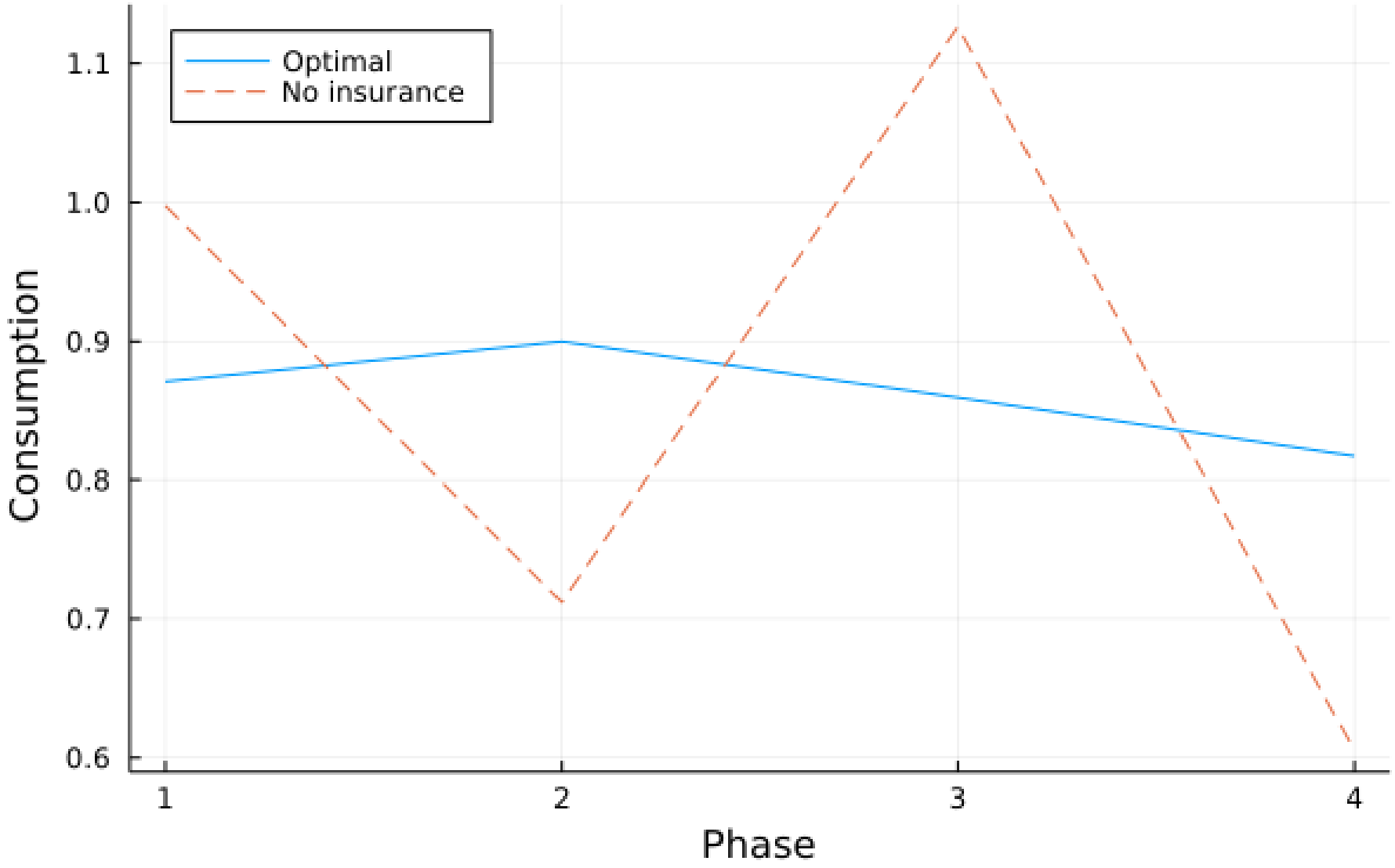
Source: Akap Energy



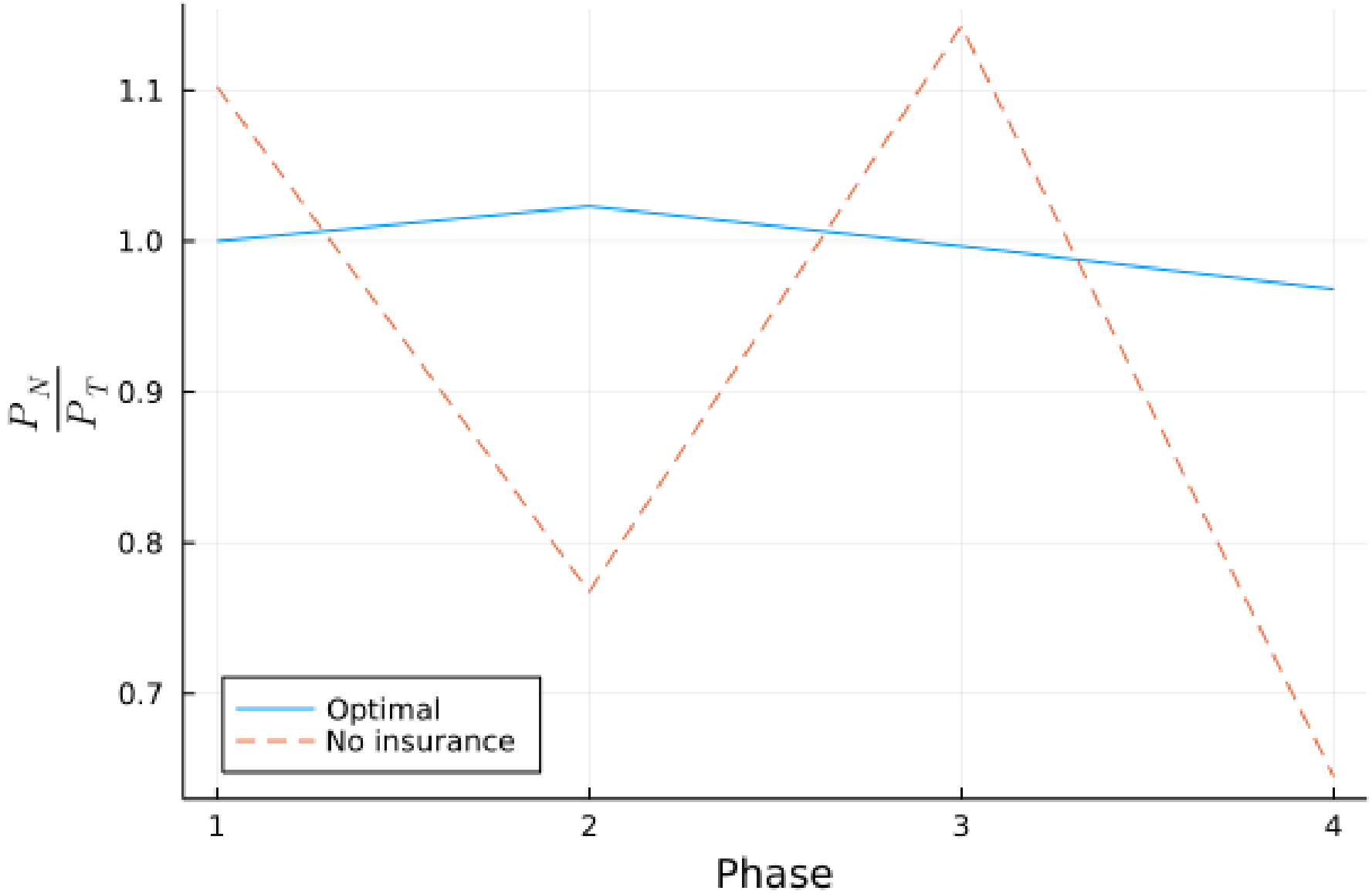
How should Papua New Guinea set policy for Papua LNG?

- P1: Investment
  - Boom: resource sector hires local worker for construction
  - Policy
    - save now for future periods
      - Positive net spending detrimental as further appreciate RER (PNG gov't in 2012)
- P2: high production, low revenue
  - Policy
    - borrow against future revenues: smooth consumption
  - Risks
    - resource price collapses (PNG in 2014)
    - project not as productive as expected – resolved in P2
- P3: high production, high revenue
  - Policy
    - save – times are good
    - payback borrowing from P2, save for P4
  - Challenges
    - saving in P3 is tough
      - just been handed keys to Ferrari
    - politically difficult to do these two things (save, depreciate)
    - risk: if don't do the right thing, suffer in P4 (nothing to eat when you retire)
- P4: falling production, falling revenues
  - Policy
    - spend savings from P3
    - e.g. Timor in P4: drawing down SWF

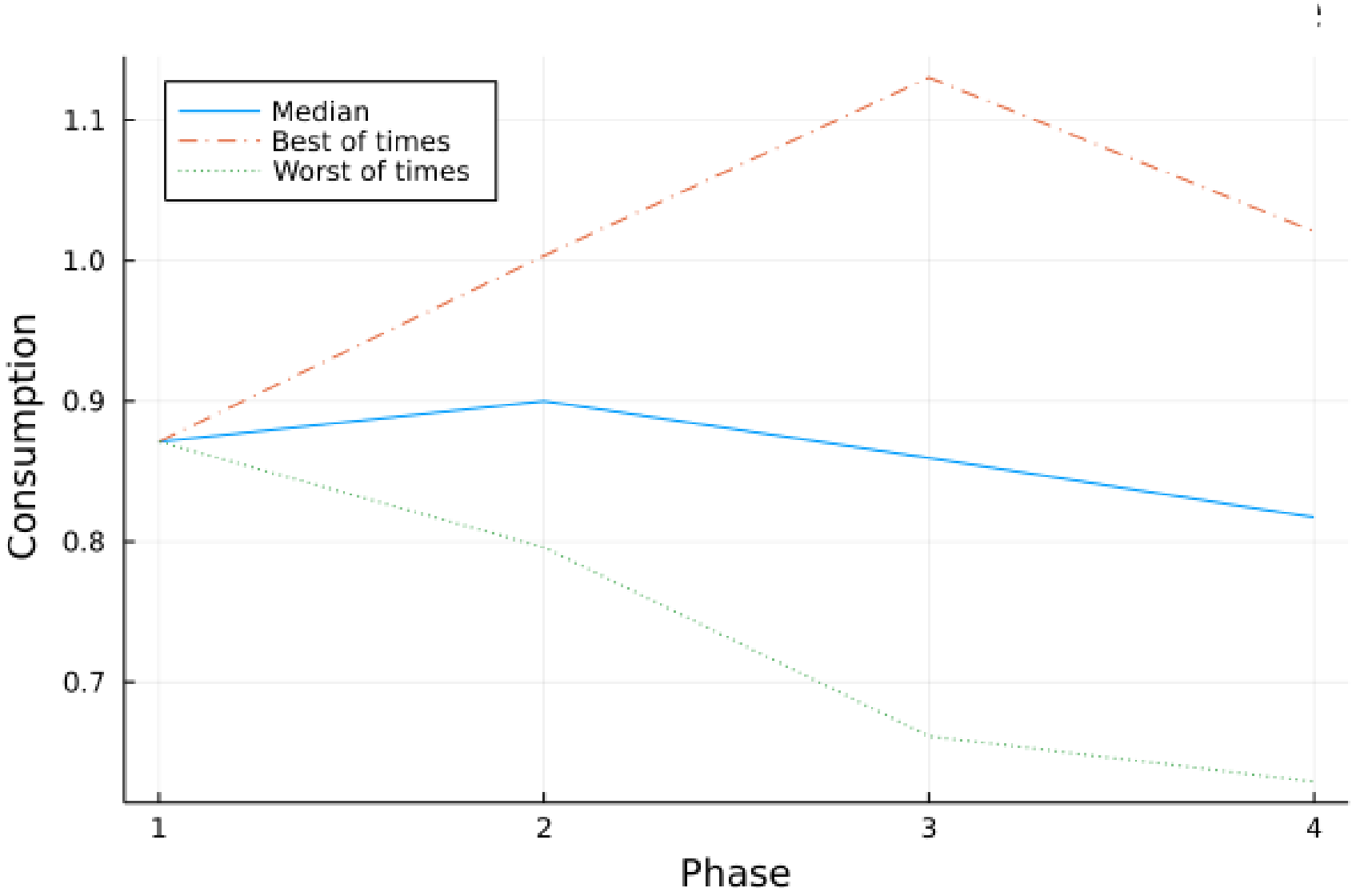
Consumption: no-insurance vs optimal consumption



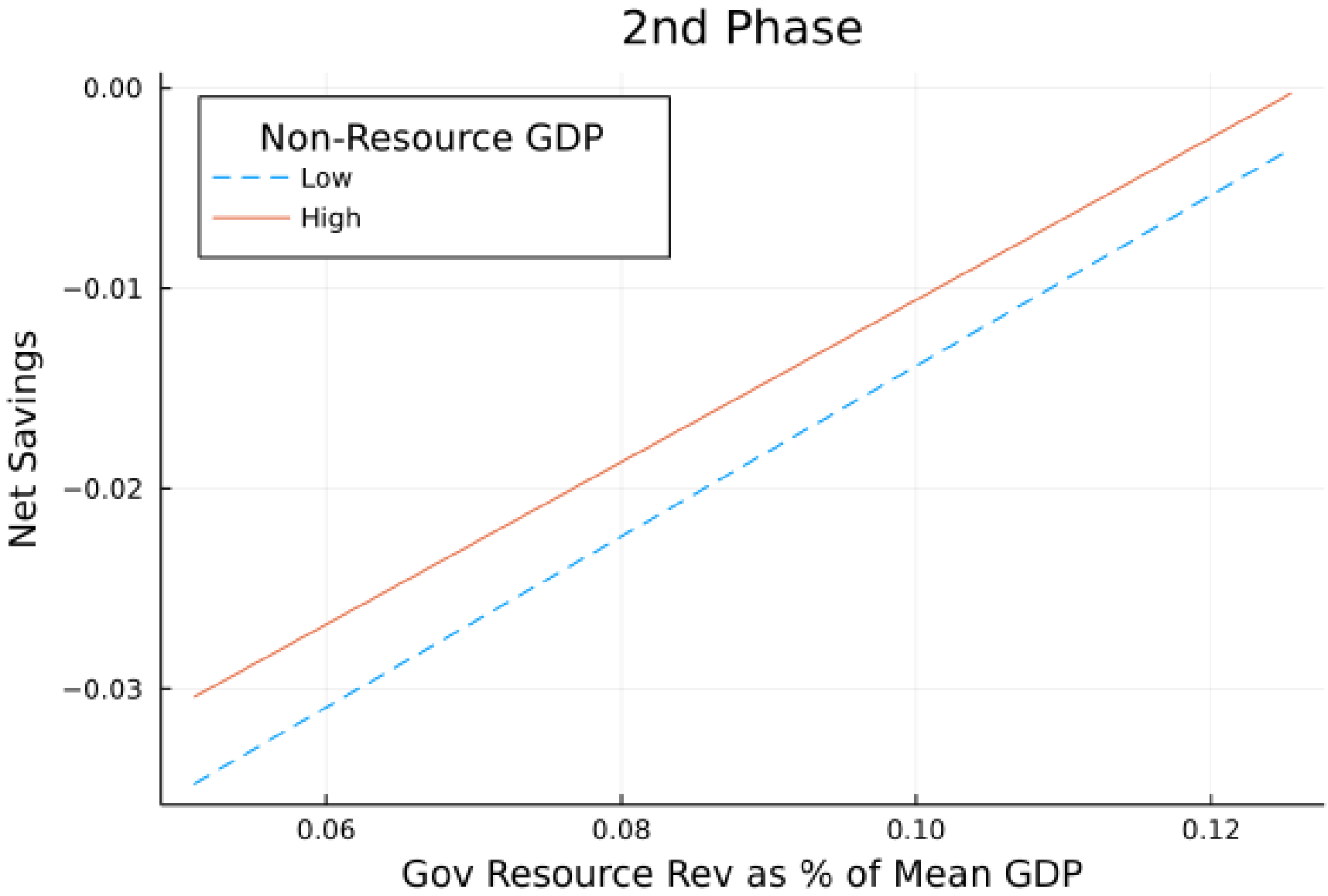
Exchange rate: no-insurance vs optimal policy



Optimal policy: best case and worst case



Policy function: 2nd phase



Lessons and discussion

- Lesson:
  - P1: restrain spending (didn’t happen with PNG LNG)
  - P2: Take more revenue upfront (Davies and Schroder (2022), IMF Article IV (2022))
    - e.g. royalties, ad valorem revenue
      - don’t have to borrow as much in P2
  - P3:
    - saving is very important
      - payback borrowing in P2 and to spend in P4
- Breaking the ring-fence
  - repayment of investment costs of Papua LNG applied against revenue from PNG LNG
    - holds PNG LNG in P2 for longer, shortens P2 for Papua LNG
      - both projects: simultaneous emergence to P3
    - smoother revenue streams are preferred
      - PNG cannot easily access global capital markets
- Multiple large projects in different phases
  - calibrate policy with this analysis in mind

PNG LNG: what has happened?

- PNG LNG
  - P1: investment phase, 2010-2013
    - construction: LNG partners hire PNG labor and capital, wages bid up
    - Kina appreciates, RER appreciates
    - Gov’t spending increased (in advance of windfall) – (hold recommendation)
  - P2: production starts: mid-2014, take low (zero)
    - Energy prices halved (bad shock)
    - Government spending increased (right direction, but too much)
    - RER depreciated but adjustment resisted by BPNG (forex rationing and import compression)
  - P3: sometime soon? (IMF Article IV (2022), 2026 onwards)
    - gov’t will want to spend but must save!