



PAPUA
NEW GUINEA

Economywide Risk Profile

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Overview

All economies face risks

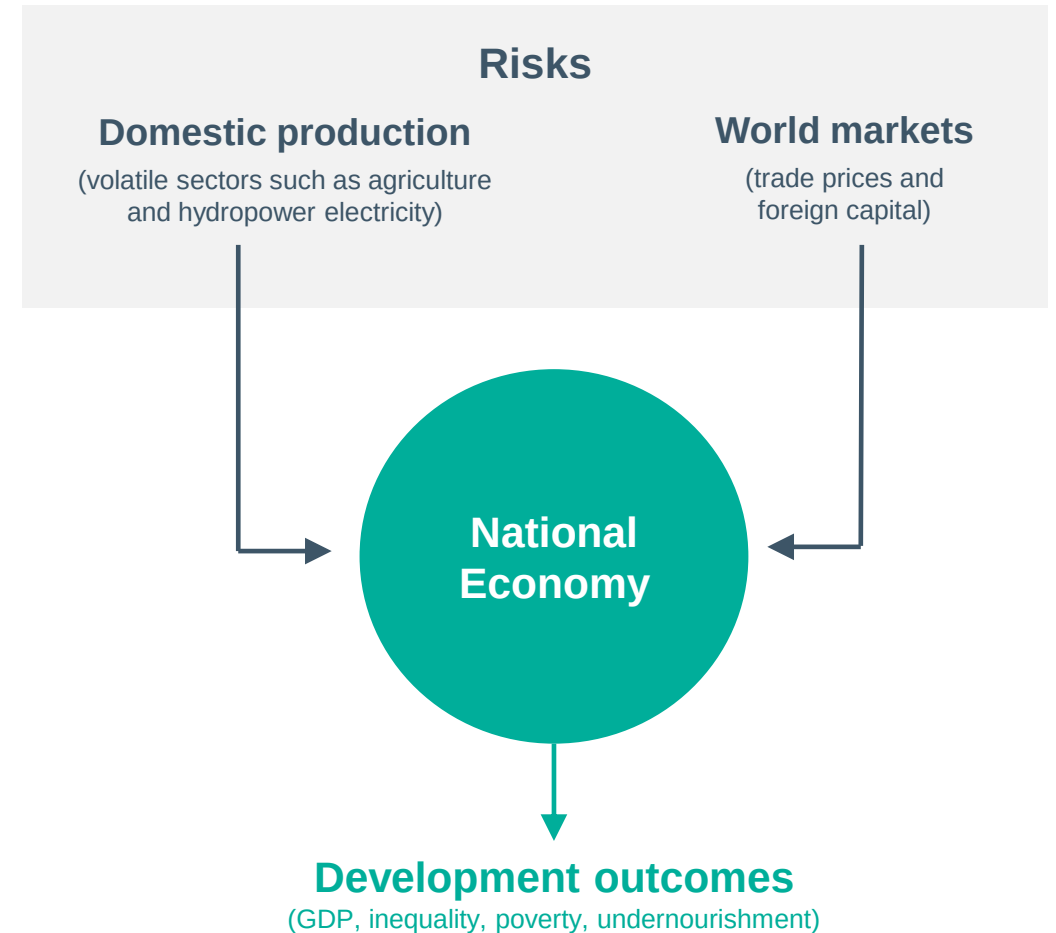
- Domestic production shocks
- World market prices
- Foreign capital flows

Level of economic exposure is country-specific

- Depends on economic structure and nature of risks

Two key questions:

1. How vulnerable is the economy and population to risks?
2. Which risks are most important for development outcomes?

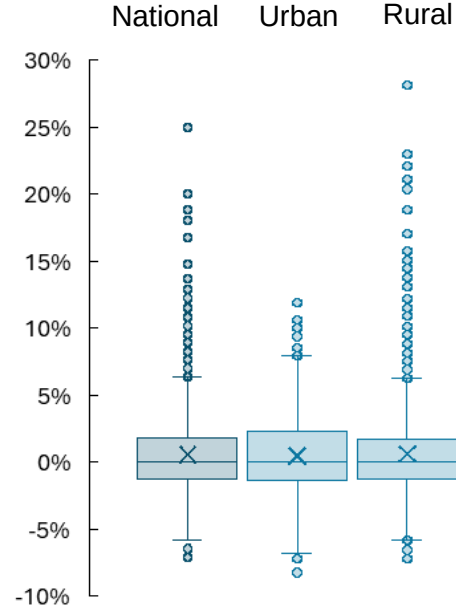


PNG Risk Profile | Headline Findings

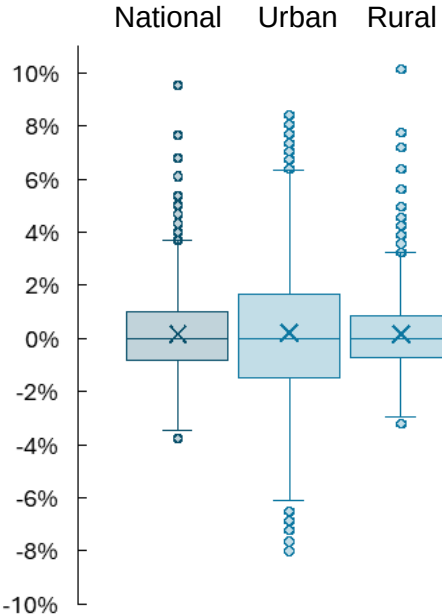
1 How vulnerable is the population to risks?

- **Poverty** rate can fluctuate -7.1 to +25.0 %-points (around baseline 39.9%)
- **Undernourishment** rate fluctuates -3.8 to +9.5 %-points (around baseline 23.1%)

Deviation in poverty rate
(%-point change from base)



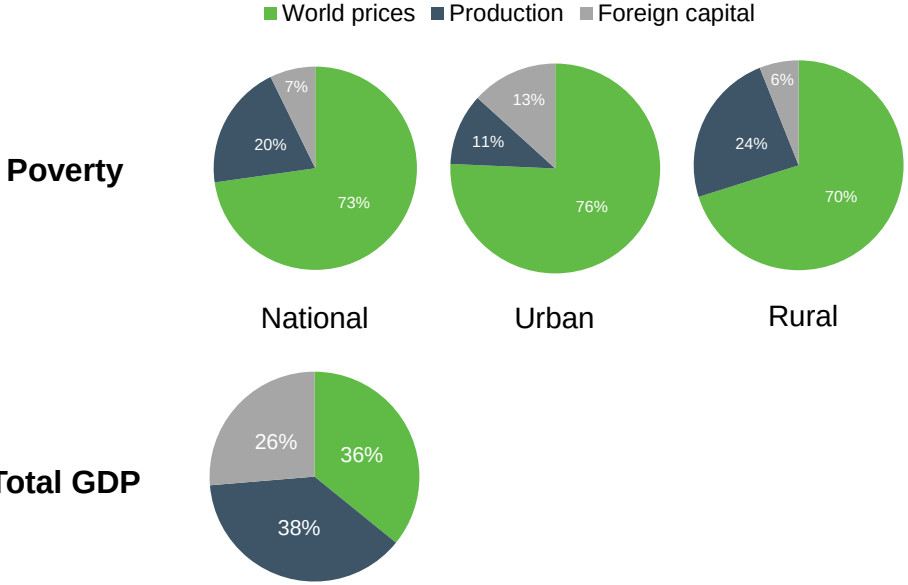
Deviation in undernourishment
(%-point change from base)



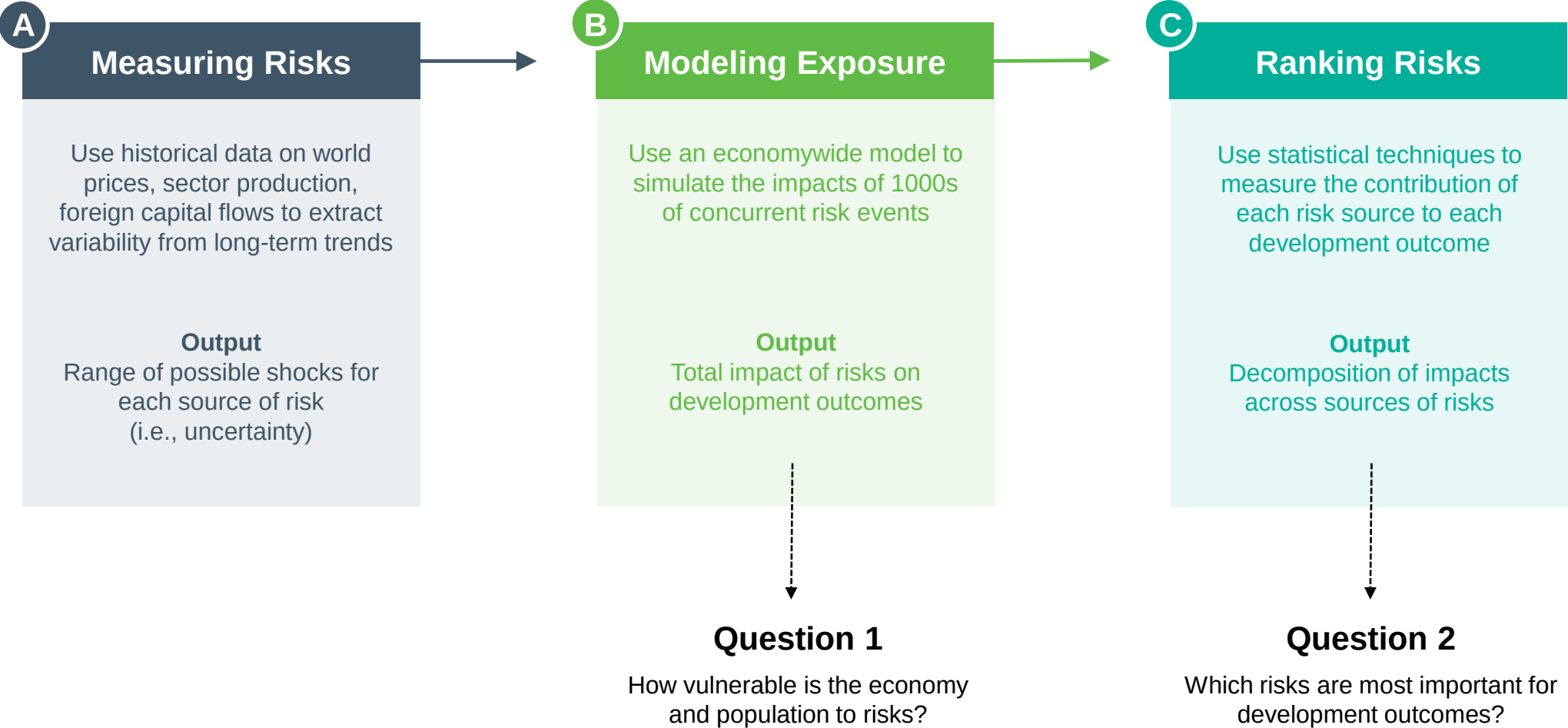
2 Which risks are most important?

- Economy (GDP) is equally exposed to production, world price, and foreign capital risk
- Population is more exposed to **external risks** (esp. world prices) than to domestic production risks
- World **energy and metal prices** are key risks

Contributions of different sources of risk
(% share of total variation in poverty or undernourishment rates)



Generating a Risk Profile



Step A | Measuring Risks

28 different sources of shocks:

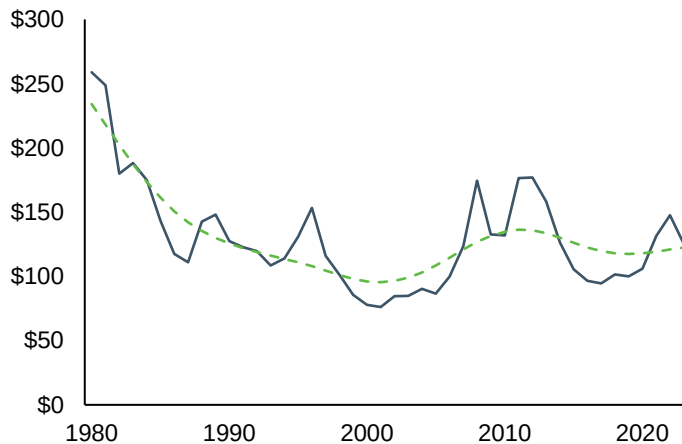
- 13 production sectors with high volatility (e.g., grains, metals, etc.)
- 14 world market prices (e.g., grains, energy, manufacturing, etc.)
- Foreign capital flows (e.g., FDI, loans, etc.)

Data processing:

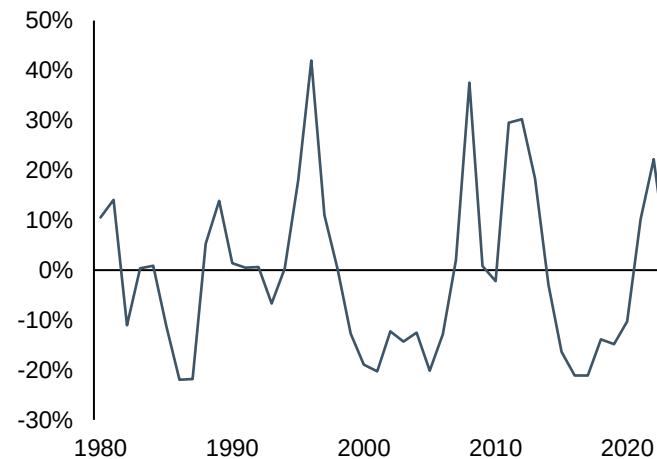
1. Estimate historical trends (using Hodrick-Prescott filter)
2. Calculate annual deviations from trend line (i.e., observed but unexplained year-on-year variability)
3. Generate distribution for risk source (i.e., by production sector, world commodity, etc.)

1. Historical world grain prices

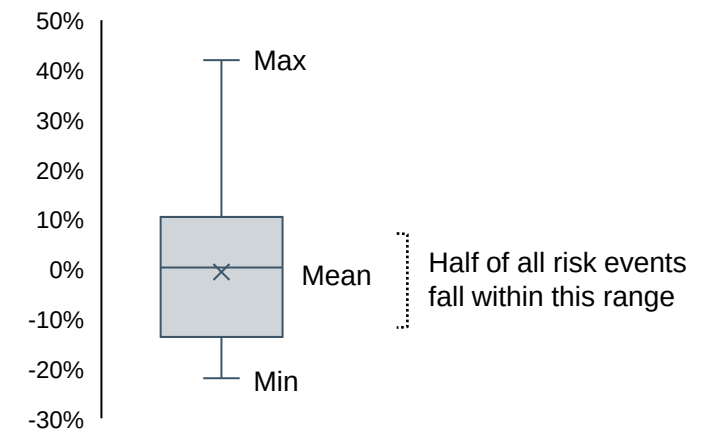
(real 2019 US\$ | trend line in dashed blue)



2. Deviations from trend



3. Risk distribution



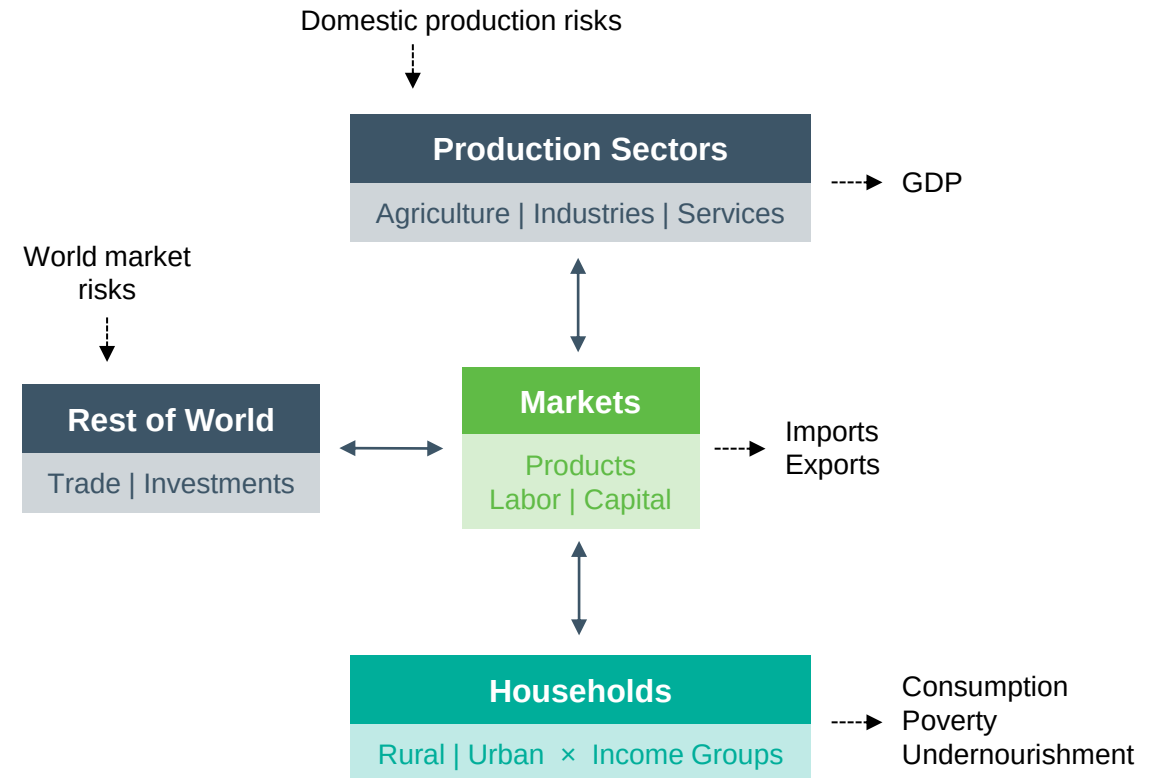
Step B | Modeling Exposure

Economywide modeling system

- Captures all sectors and households
- Links sector production to household incomes

Run 10,000 simulations

- Captures all possible combinations of production and world market shocks
- Preserve historical covariance



Step C | Ranking Risks

Calculate contribution of each source of risk to total outcome variation

What determines contribution?

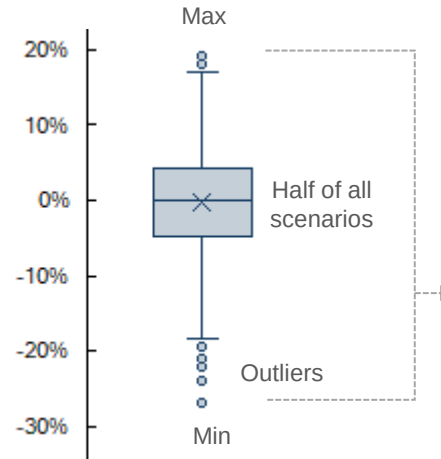
- **Risk:** how variable is risk?
- **Exposure:** how big is the sector, or how important is the traded product?
- **Linkages:** how crucial is the sector or product for other supply chains?

Two methods used:

- Relative importance regression analysis
- Random Forest (machine learning)

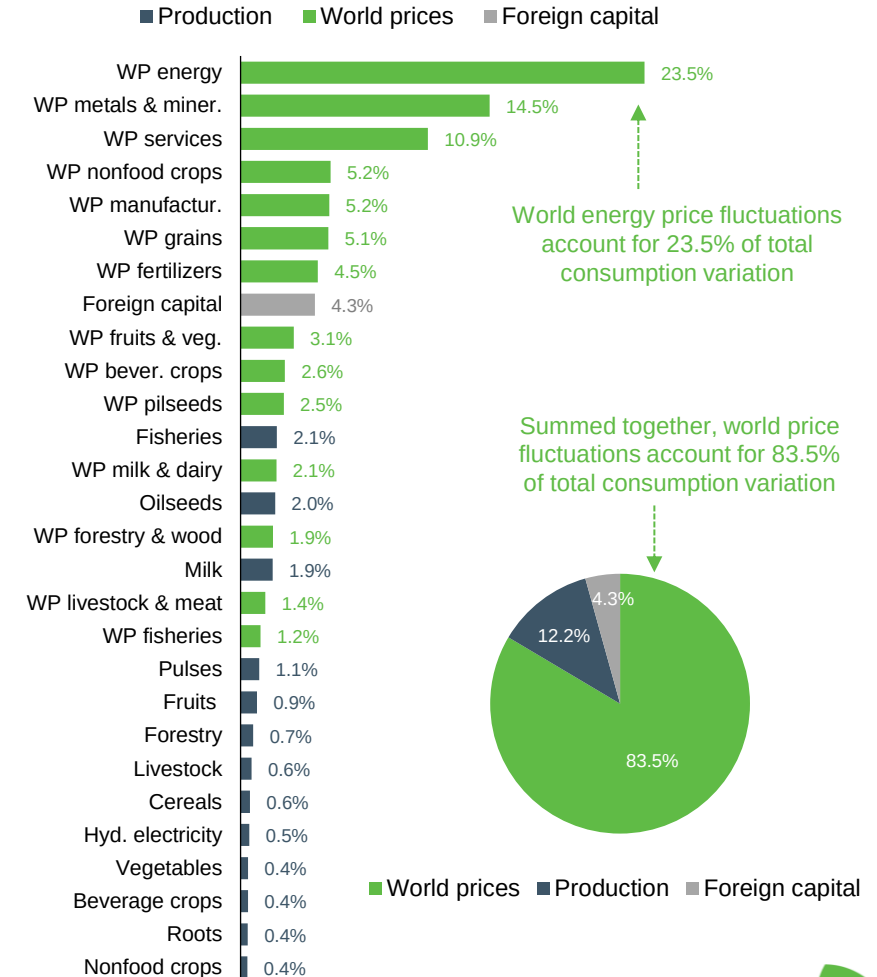
Step B estimates total variation

Consumption variation
(% deviation from base)



Step C decomposes total variation across risk sources

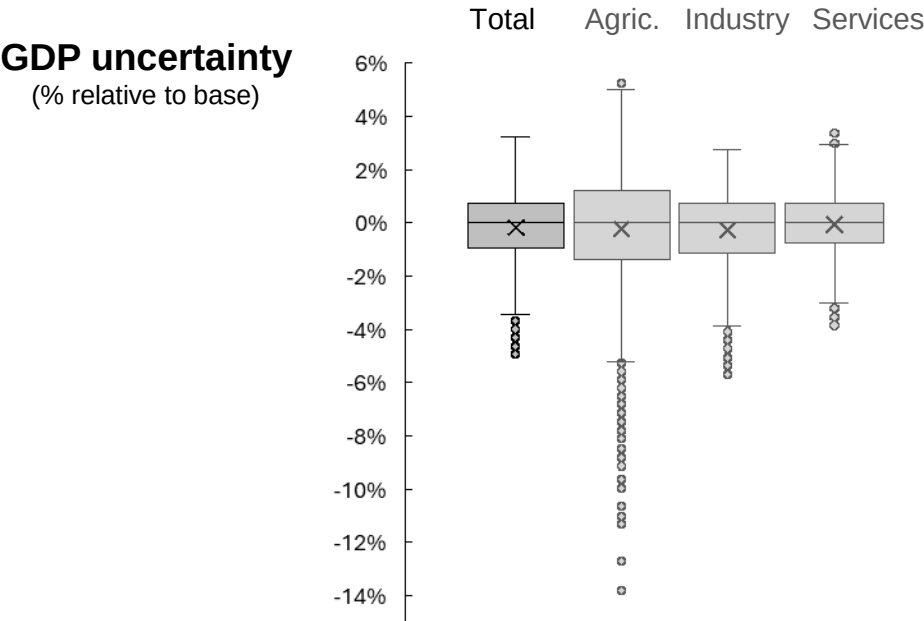
Risk importance decomposition
(sums to 100%)



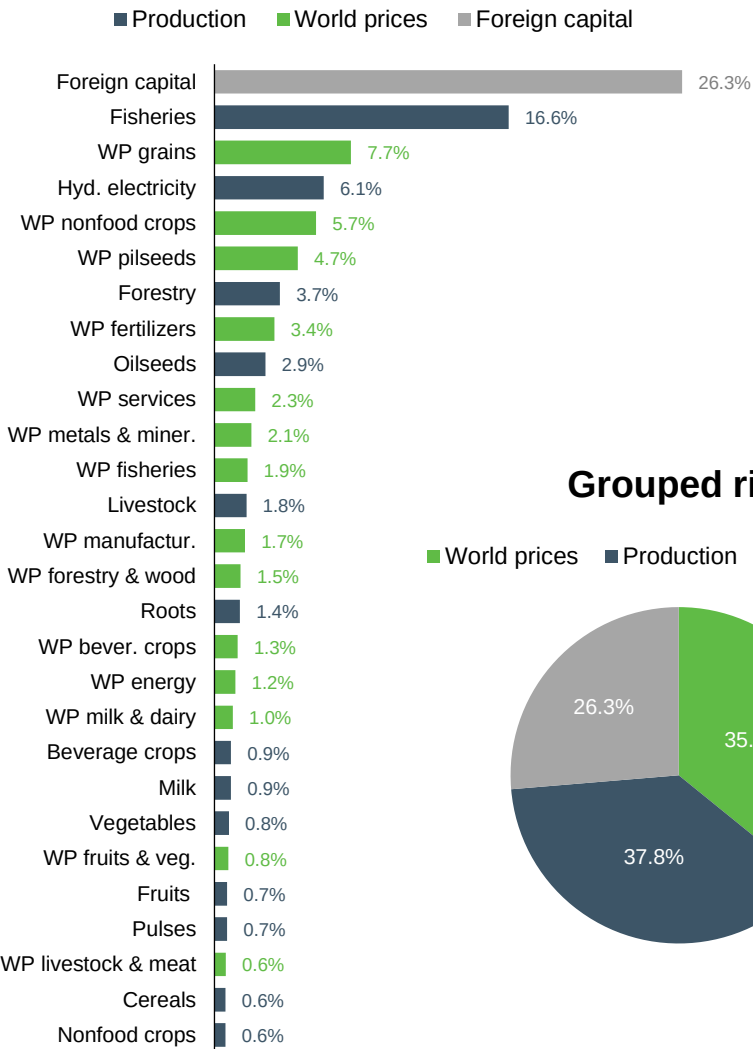
Total GDP | Which Risks Are Most Important?

GDP fluctuates +3.2% (best) to -4.9% (worst)

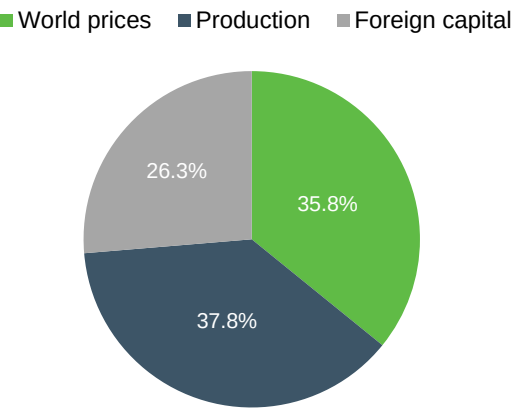
- **Domestic production** shocks account for 37.8% of total uncertainty (fishery production volatility is largest risk)
- **Foreign capital** flows explain 26.3% of GDP uncertainty (due to impacts on investment demand and exchange rates)
- **World prices** account for remaining 35.8%



Risk importance decomposition (sums to 100%)



Grouped risks

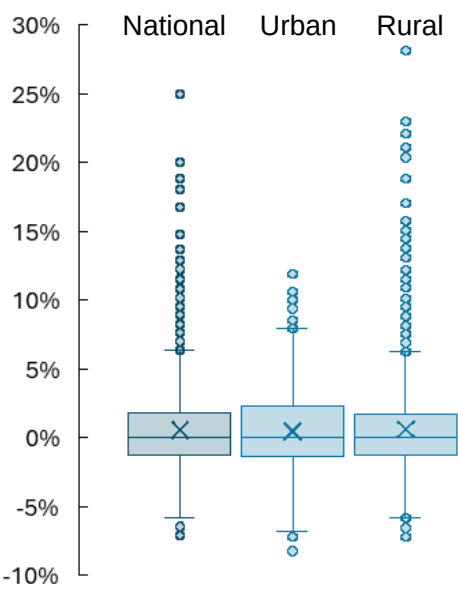


Poverty | Which Risks Are Most Important?

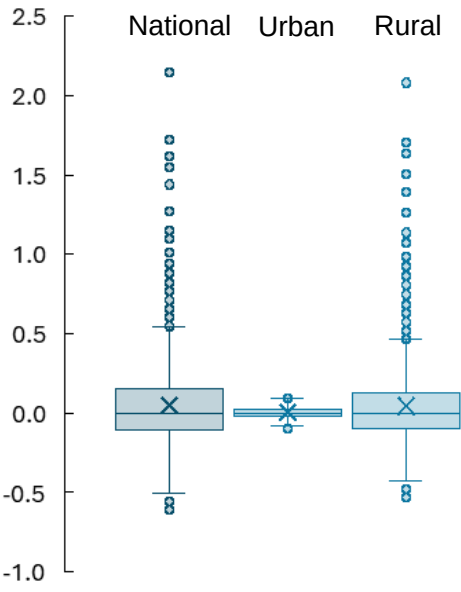
Poverty rate fluctuates from -7.1% to +25.0 %-points

- **Poor population** ranges +2.1 million to -0.6 million people (largest important on rural population)
- **World prices** explain 72.8% of poverty rate variation
- **Domestic production** risks are dominated by fisheries

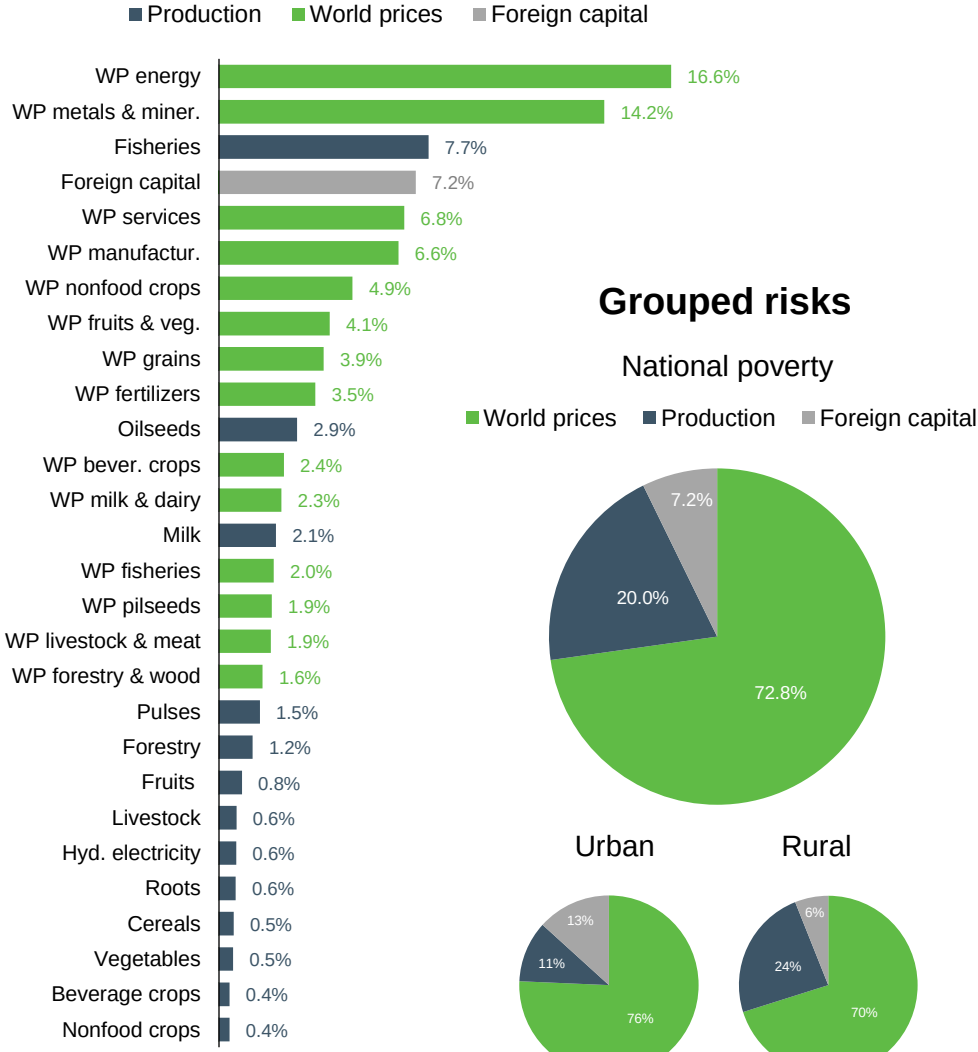
Poverty rate uncertainty
(%-point change from base)



Poor population uncertainty
(change from base in millions of people)



Risk importance decomposition (sums to 100%)



Summary

PNG's economy is highly exposed to risks

- **GDP:** -5 to +3 %
- **Consumption:** -27 to +20 %
- **Poverty rate:** -7 to +25 %-points
- **Hunger rate:** -4 to +10 %-points

Most exposed to world market risks

- Energy and metals prices are important risks (i.e., major export commodities)

Production risks are also important

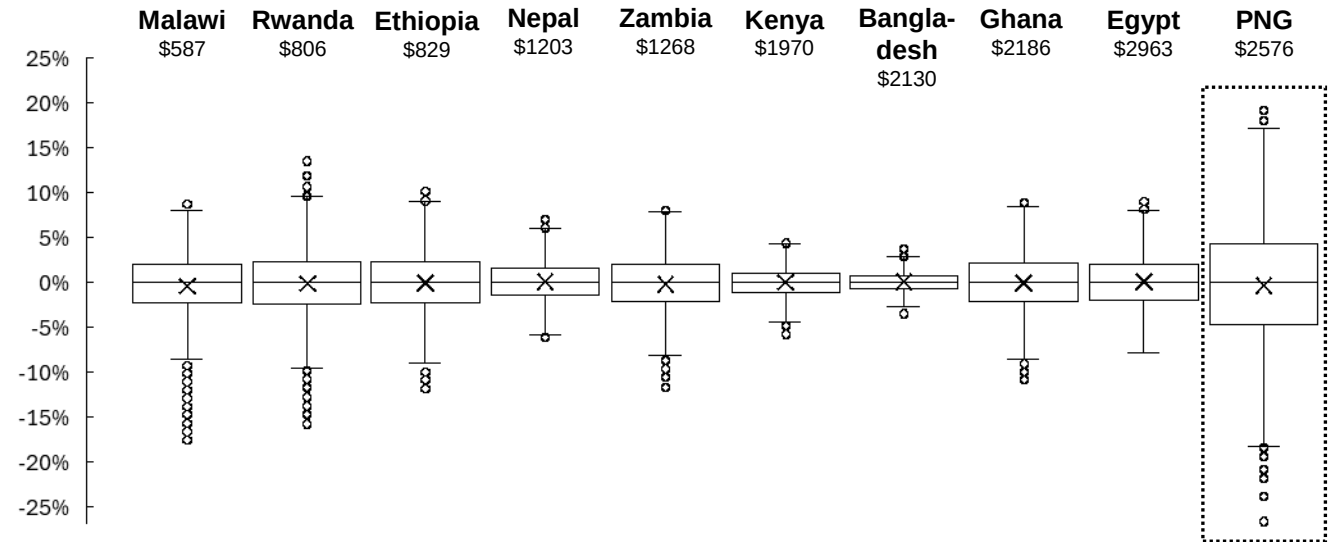
- Fisheries is a major risk factor for rural poverty

Export diversification and import substitution could mitigate some risks

- Reduce dependence on energy and metals exports and on imported foods

Private consumption variations (risk)

(% relative to baseline)



Factors explaining consumption risk

(% share of total variation)

World prices Foreign capital Production

