Structural trends in global gold mining: propositions about diversity and connectivity

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(1) Trends in global gold markets

(2) The globalization of gold mining: drivers and challenges

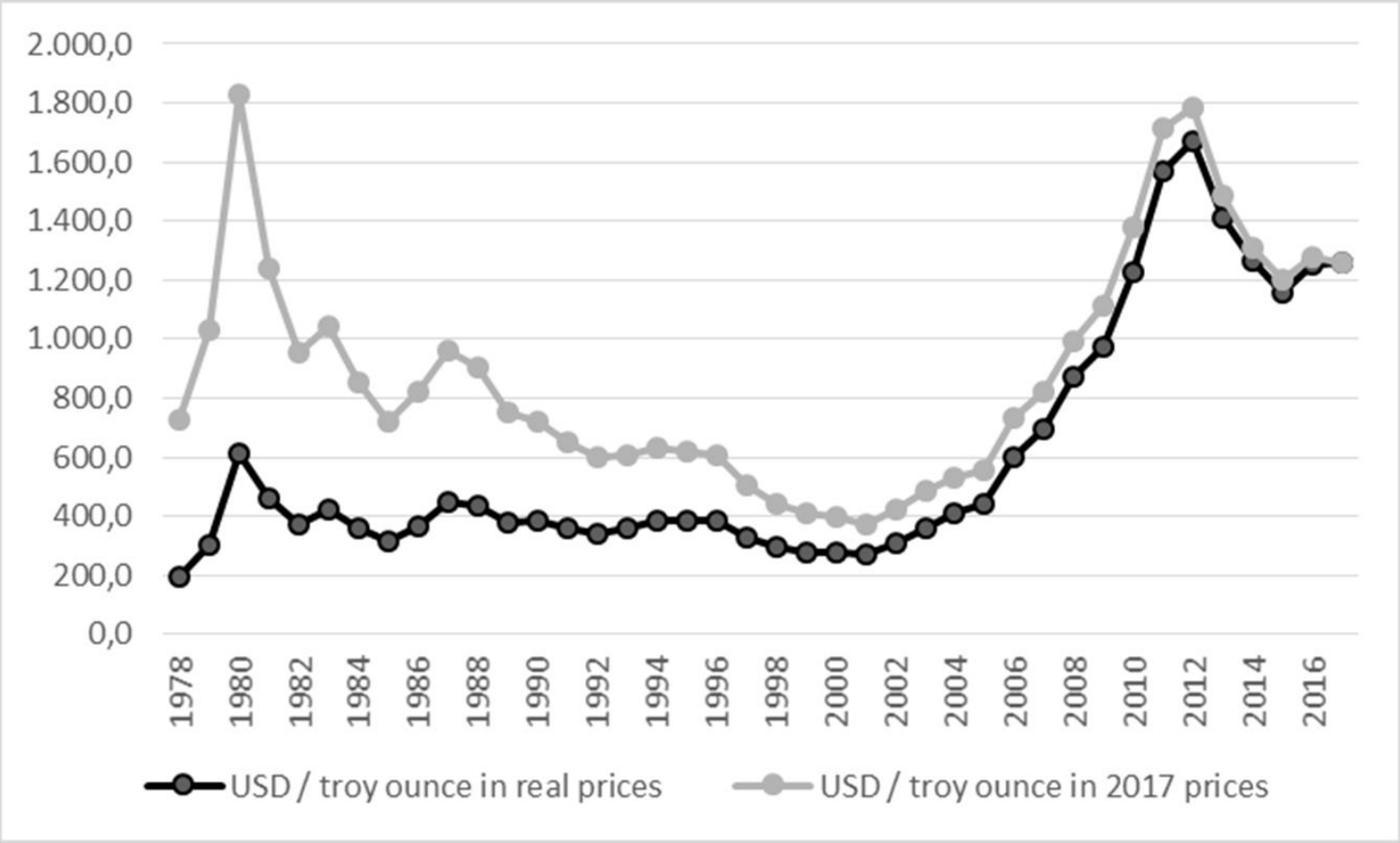
(3) Whither ASGM?

(4) Propositions about diversity and connectivity

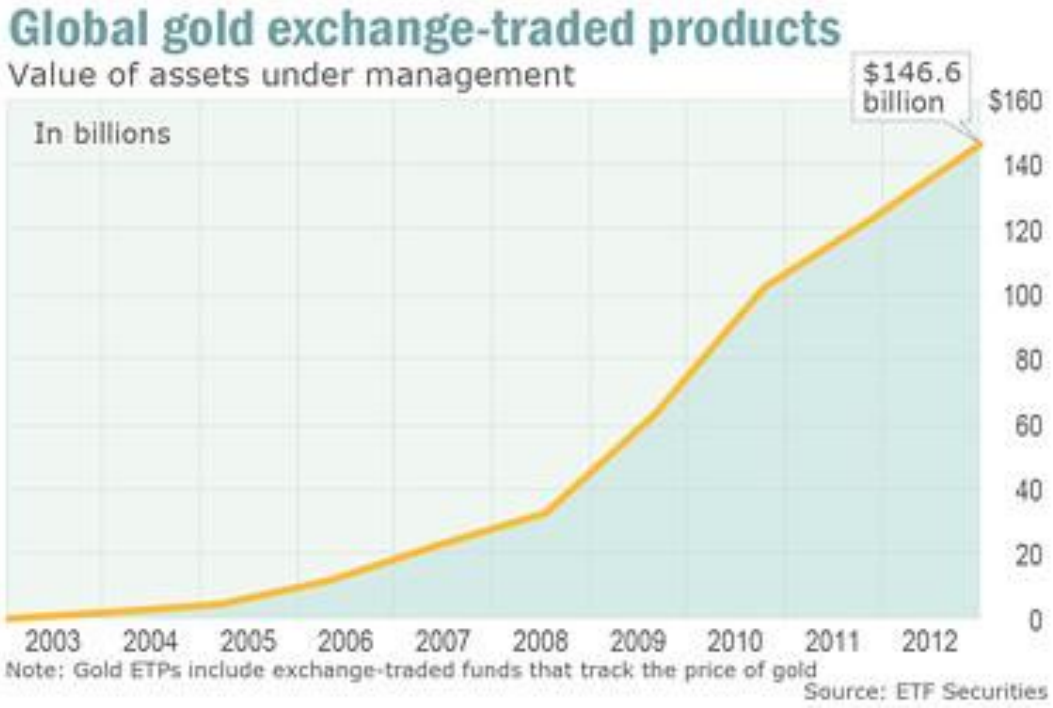
(1) Trends in global gold markets

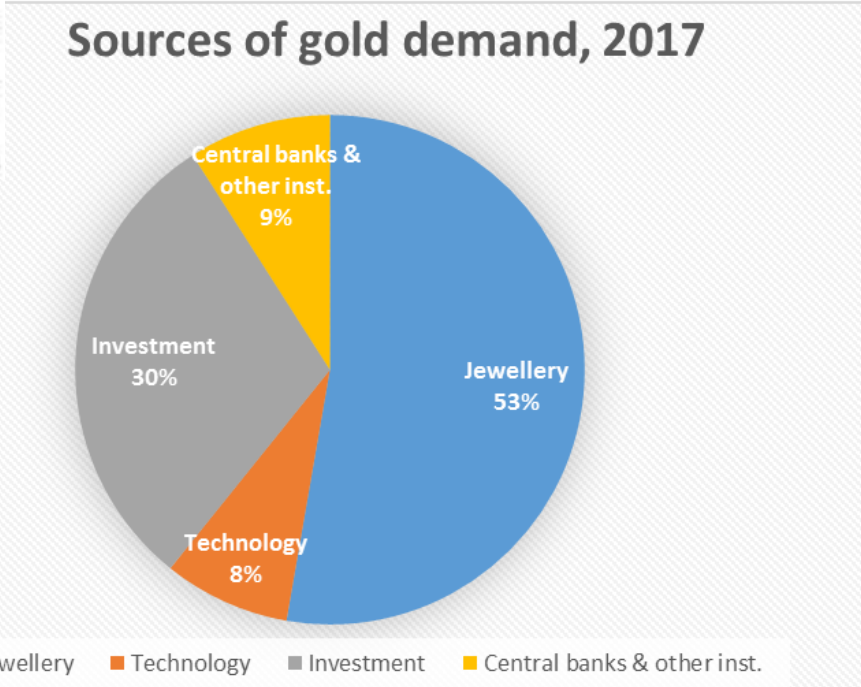
Increased demand, rising prices

- Prior to 1970s: gold markets regulated by gold standards
- After 1970s: gradual liberalization of gold markets
- Demand from <2,000t (1980) to >4,000t (2018)

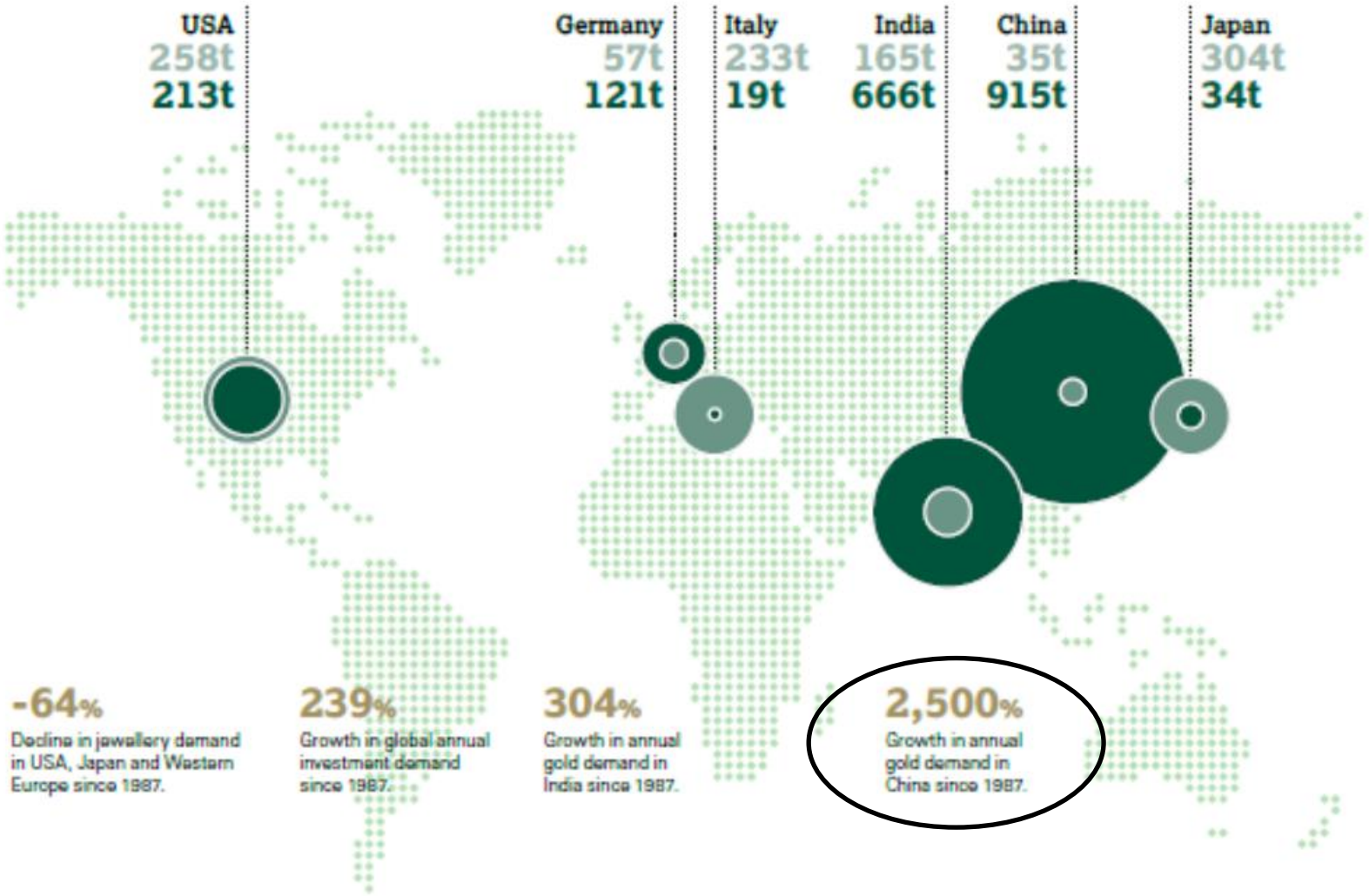


Increased investor demand





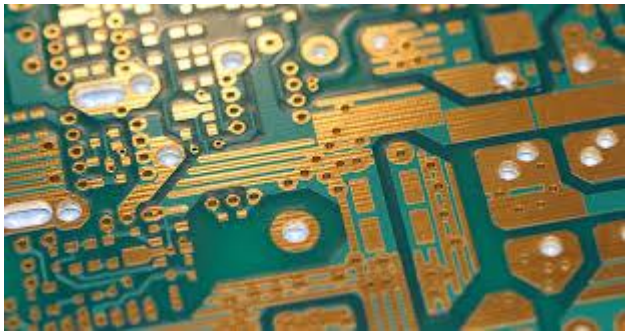
Demand shifts to the East



(2) The globalization of gold mining: drivers and challenges

Above-ground vs below-ground stocks

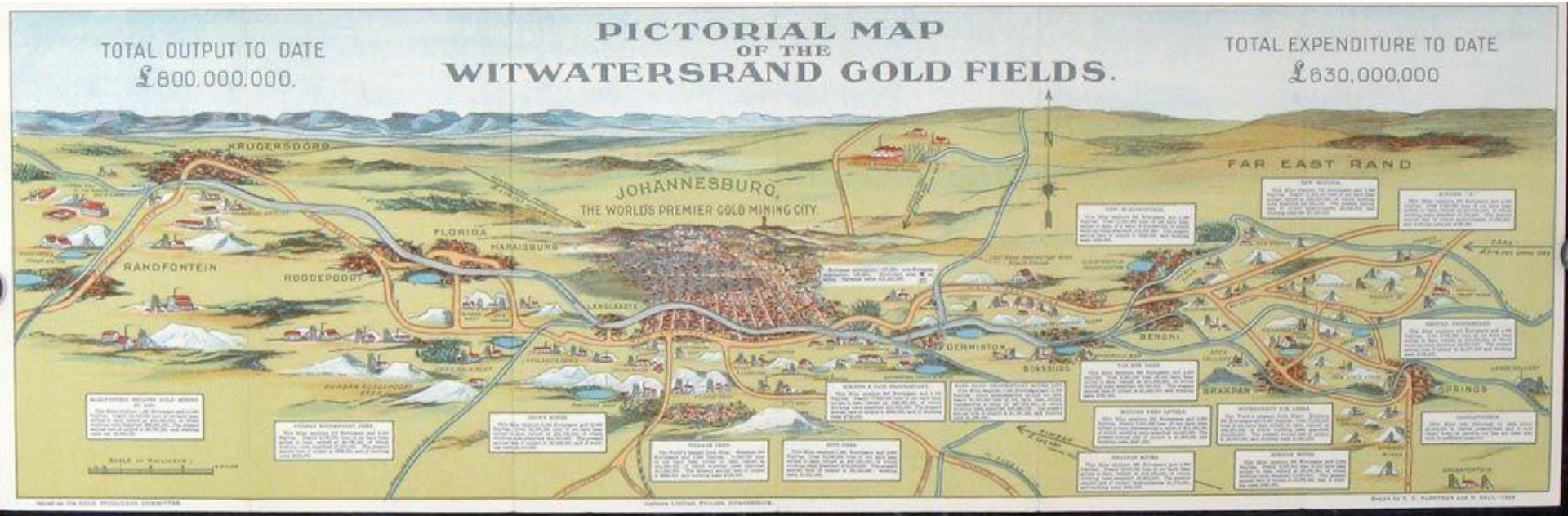
- Above-ground = recycled gold (scrap supply)



- Supply from above-ground stocks typically accounts for 1/5th to 1/4th of gold supply
  - Sensitive to change in gold price
  - 2017: 1,167t vs 3,305t
- This project: supply from below-ground stocks

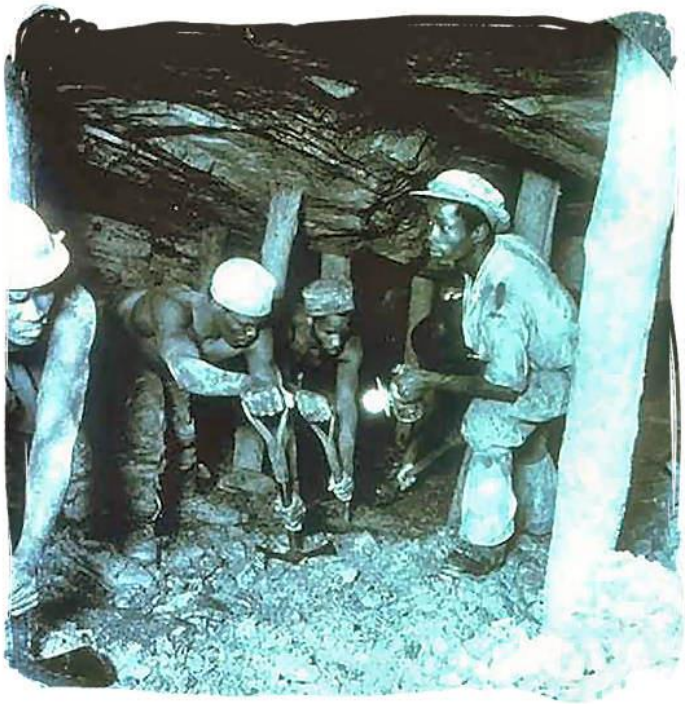
The rise and decline of South Africa

- 19th century: Australasian and North American gold rushes
- 1886: discovery of Witwatersrand gold fields
- 1890s: Introduction of cyanidation
- South African becomes 'gold factory' of the world (Lynch, 2004)
- Reliance on labor-intensive underground mining → depends on availability of skilled workforce

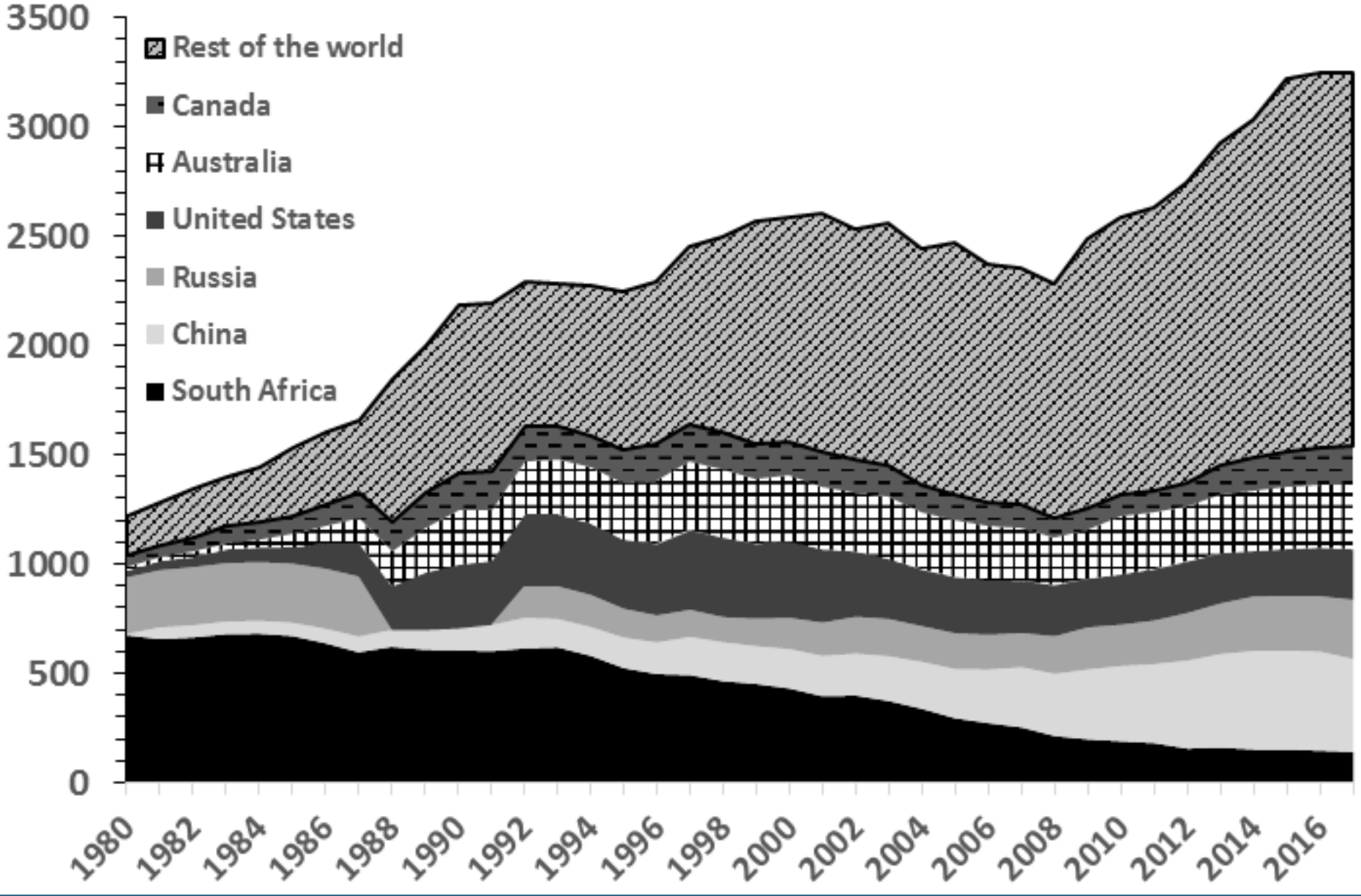


The rise and decline of South Africa

- **Early 1970s:** >1000t (80% of global mine production)
- **Post-1980s** decline due to:
  - End of apartheid and coercive regime of labor control
  - Depletion of reserves and limitations of underground mining
  - Labor unrest and wage increases
- **2017:** 140t (4% of global mine production)



The globalization of gold mining



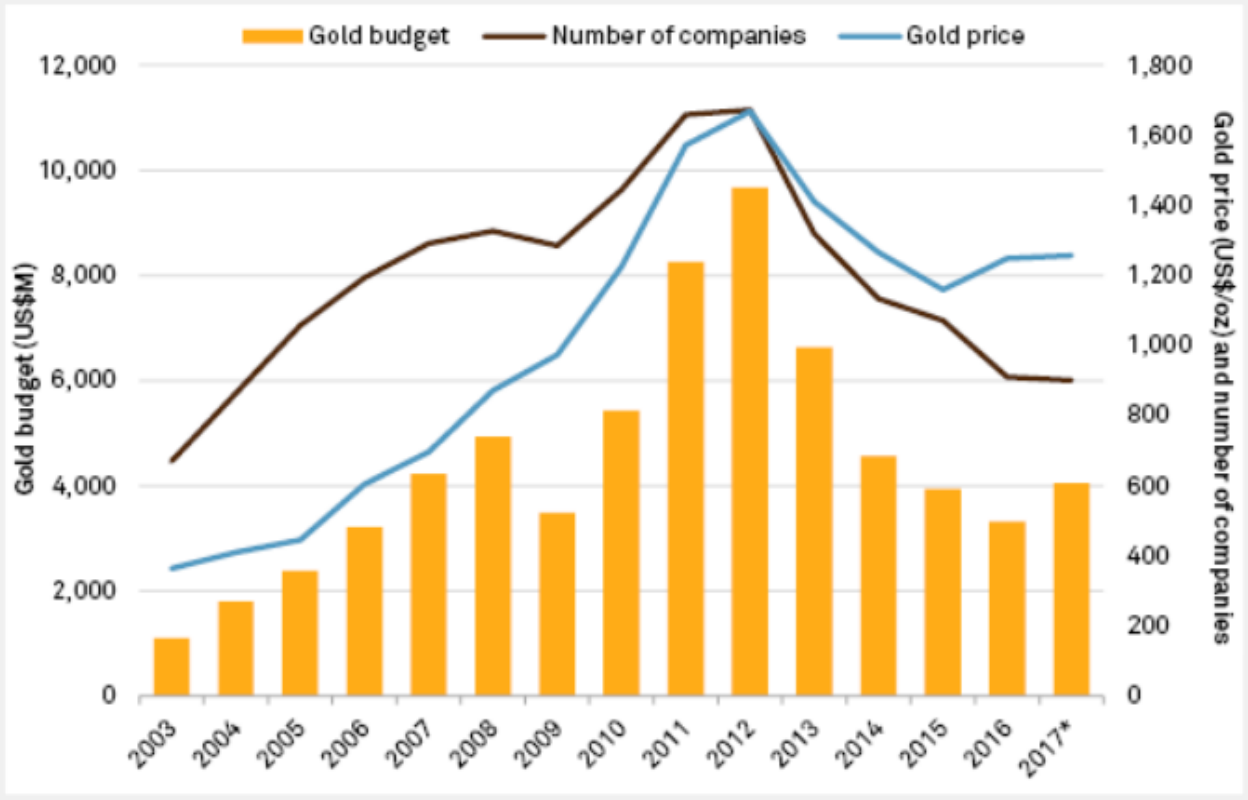
New gold mining destinations

(production figures for 2017; source: Thomson Reuters)

China	426.1t	Kazakhstan	55.1t
Australia	295t	Mali	52.2t
Russia	270.7t	Colombia	50.6t
United States	230t	Tanzania	49.1t
Canada	175.8t	Burkina Faso	49.1t
Peru	162.3t	Philippines	47.9t
Indonesia	154.3t	Chile	35.9t
South Africa	139.9t	Dominican Republic	35.3t
Mexico	130.5t	Suriname	33.4t
Ghana	101.7t	Turkey	26.1t
Uzbekistan	84.9t	Venezuela	25.4t
Brazil	79.9t	Zimbabwe	23.3t
Papua New Guinea	61.9t	Côte d'Ivoire	22.7t
Argentina	61t	Guinea	22.4t
Dem. Rep. of the Congo	60.1t	Guyana	20.4t

The globalization of gold mining: drivers

- **Increased demand and rising prices**
- **Increased (speculative) investment in gold mining** and the role of junior mining companies



The globalization of gold mining: drivers

Regulatory change

- In new mining destinations: liberalization of mining
- Home countries: support for outward expansion e.g. Canada's "mineral resource protection network" (Dougherty, 2016), China's "belt and road initiative"

The globalization of gold mining: drivers

Technological change

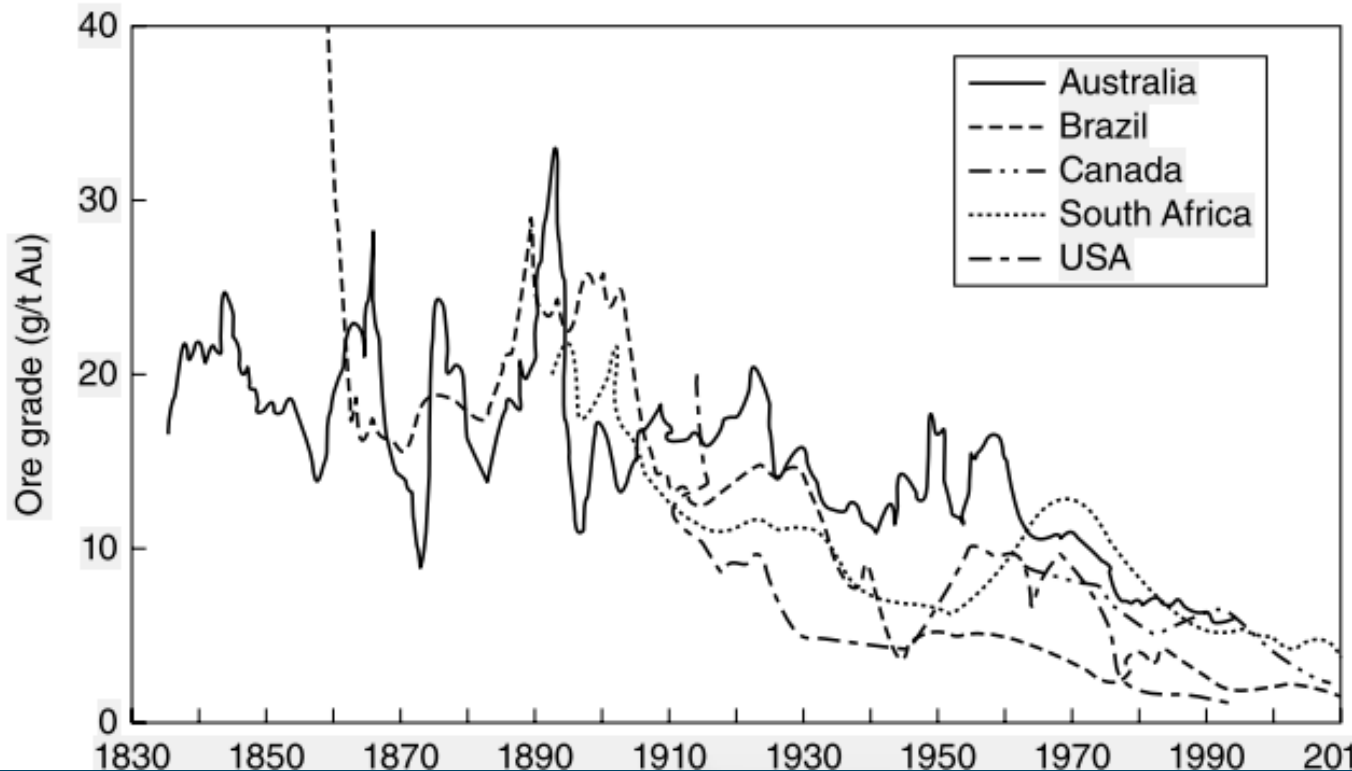
- Improved exploration methods
- Bigger and better mining equipment
- Improved processing methods (cyanidation)
- Increased value-to-volume ratios → trend towards large open-pit mining
- Now: towards the ‘digital mine’?

The globalization of gold mining: challenges

Scarcity:

- Declining ore grade and –quality
- While exploration budgets have increased, rate of new discoveries has decreased + No more world class discoveries
- ‘Peak gold’

Source: Mooiman et al., 2016



The globalization of gold mining: challenges

Cost pressures

- Rising energy costs
- Declining ore grades and ore quality
- Higher-than-inflation wage increases
- ‘Regulatory costs’ related to CSR and local content requirements
- Fall-out of mining boom: risky/costly greenfield operations

→ 200 US$/ounce in 2003 → 1,000 US$/ounce in 2013 (O’Connor et al., 2016)

The globalization of gold mining: challenges

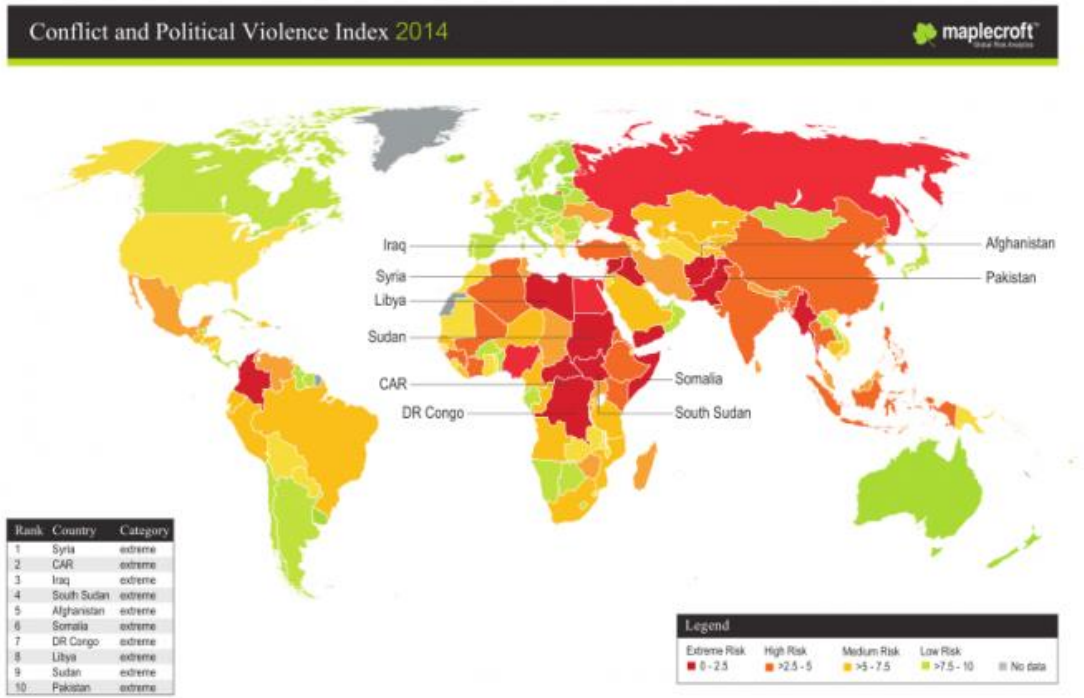
Cost pressures → rationalization since 2012

- Decreasing budgets for exploration
- Renewed focus on brownfield operations
- Automation / digitalization (but slow adopter)
- Closing or selling off peripheral activities
- Cost-cutting measures: efforts to reduce labor costs

The globalization of gold mining: challenges

Political risk

- Related to fixity of mineral deposits
- Regulatory uncertainty; resource nationalism
- Resistance to mining
- Political instability and conflict



Rank	Country	Category
1	Syria	extreme
2	CAR	extreme
3	Iraq	extreme
4	South Sudan	extreme
5	Afghanistan	extreme
6	Somalia	extreme
7	DR Congo	extreme
8	Libya	extreme
9	Sudan	extreme
10	Pakistan	extreme

Whither ASGM?

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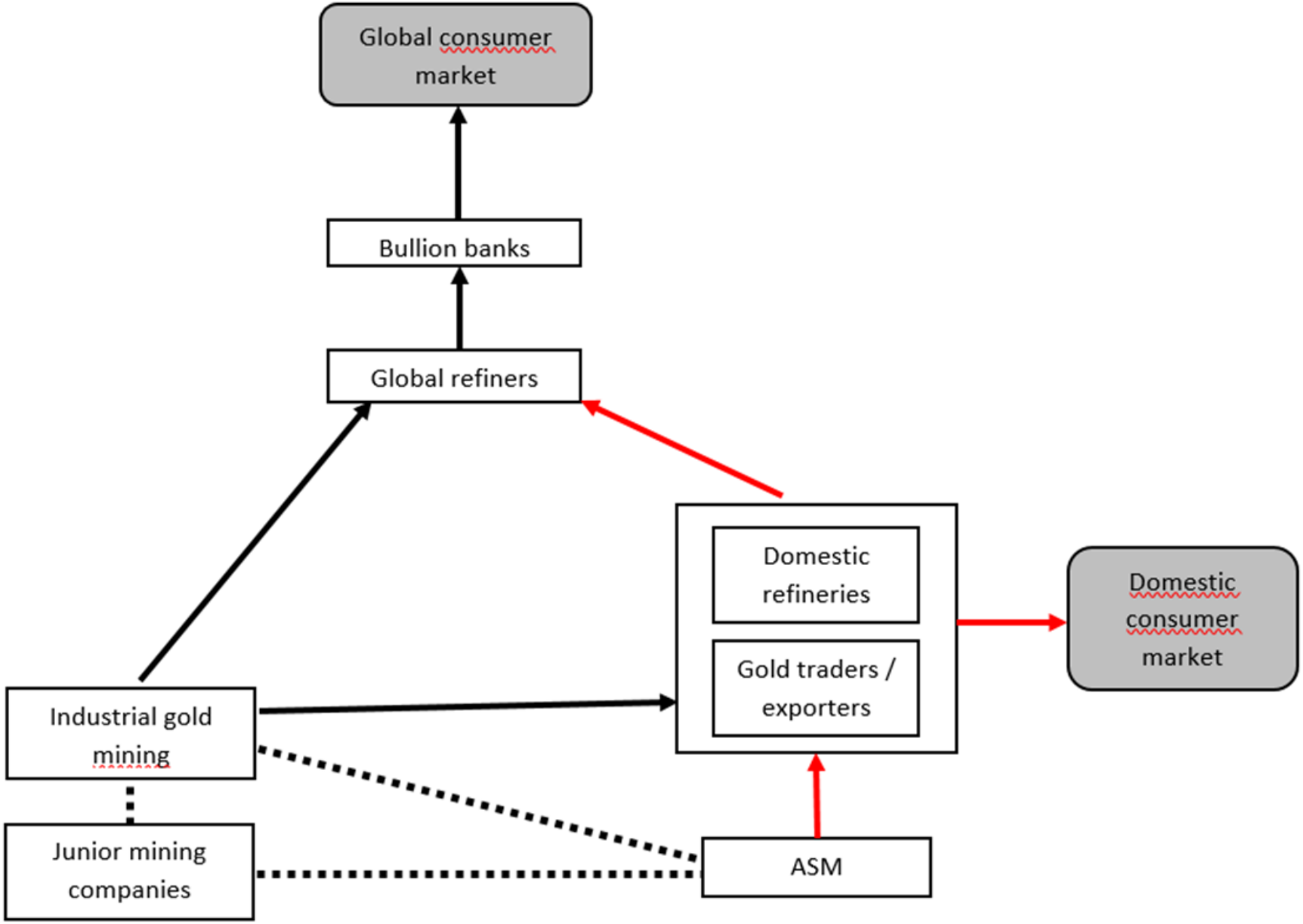
Global consumer market
Bullion banks
Global refiners
Domestic refineries
Gold traders / exporters
Domestic consumer market
Industrial gold mining
Junior mining companies
ASM

Propositions about diversity and connectivity

Proposition 1: ASGM-expansion offers a response to several challenges facing global gold mining

- **Scarcity** → target smaller and diffuse gold deposits
- **Cost pressures** → rely on cheap and flexible informal labor
- **Political risk** → regulatory inertia and local legitimacy

Proposition 2: Alongside a trend towards bigger and more efficient mines, we are witnessing a partial and geographically unequal informalization of gold mining

- Expansion of small-scale and flexible forms of gold mining (ASGM) that rely on cheap informal labour
- Increased reliance on outsourcing and subcontracting in corporate gold mining

Proposition 3: Globalization and informalization intersect with (sub-)national processes of political-economic transformation, producing particular gold mining constellations