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Stranded assets and the financial system

Bank of Greece Seminar Series: Economic Policy–including monetary policy—and climate change

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Outline

- Stranded assets defined
- Two main classes of climate related risks of stranding
- Key research topics
- Risks to financial system and measuring physical and transition risks
- Addressing risks
- Needs to be seen in broader context of sustainability transitions

Stranded assets: definitions

- Accountants: assets that become obsolete or non-performing but must be recorded as loss of profit on balance sheet
- Regulators: ‘stranded costs’ to capture decline in value of electricity-generating assets resulting from restructuring of industry
- Energy economist perspective (IEA): “those investments which have already been made but which, at some time prior to the end of their economic life (as assumed at the investment decision point), are no longer able to earn an economic return”
- Meta-definition: “stranded assets are assets that have suffered from unanticipated or premature write-downs, devaluations, or conversion to liabilities” (Caldecott et al. 2013)

Stranded asset risks related to the environment and climate change

- **Physical** environmental risks: associated with more broadly with change in the environment and impacts that follow
  - Threat to coal-fired power generation by air pollution and water scarcity in China
  - High-efficiency gas plants in Europe stranded by downward pressure on coal prices resulting from US shale gas revolution
- **Societal environment related risks:** risks that result from societal response to environmental change and its impacts
  - Low-carbon transition stranding may not always be associated with fossil fuel industry, e.g., ‘renewables bubble’
  - Environment-related risks in addition to those related to unburnable carbon have a significant impact on assets today and this significance will rise in time
- To the extent that we focus on climate change these two categories become **physical risk** and **transition risk**

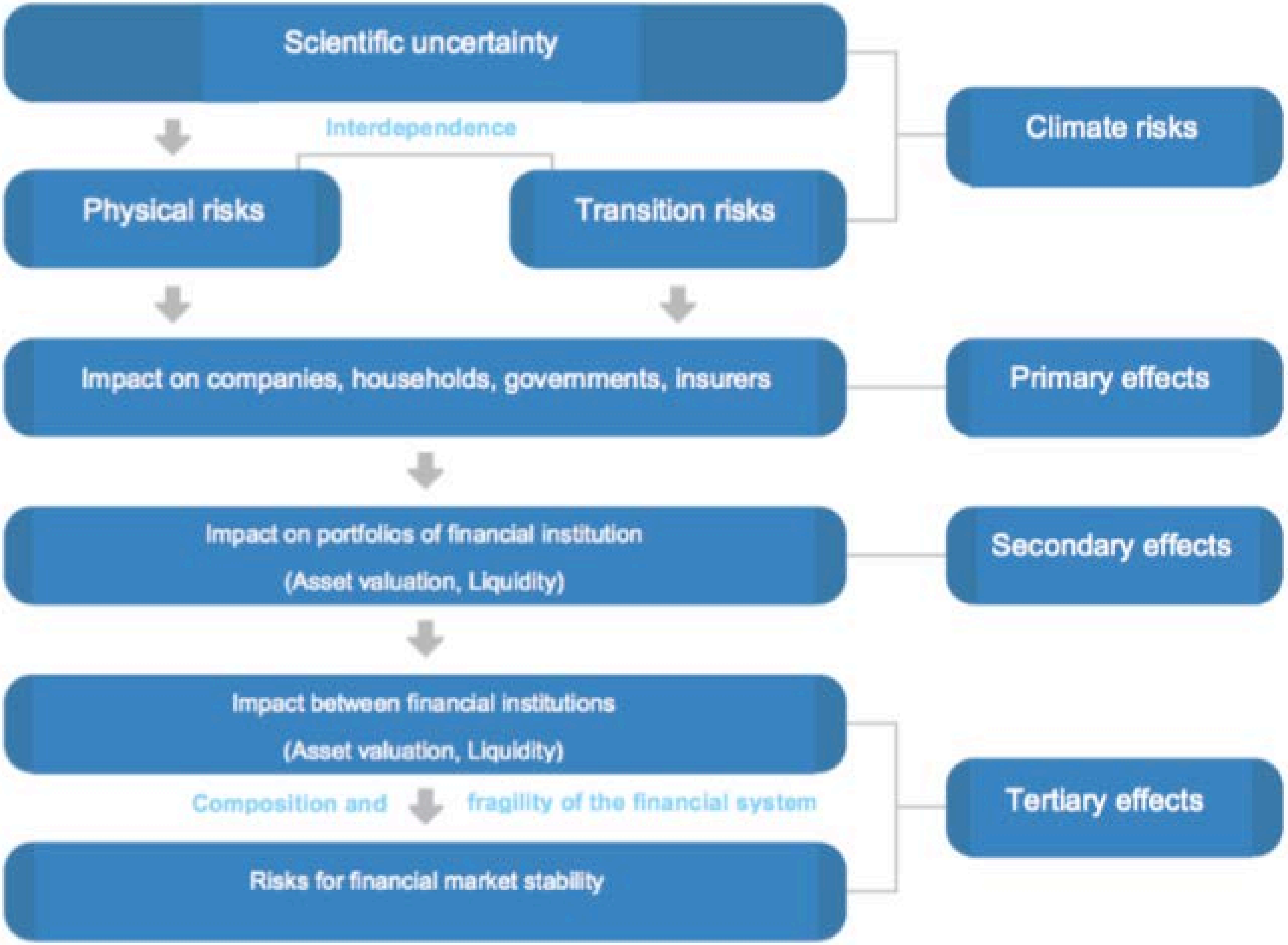
Physical environmental risks			
Risks	Issues	Consequences	Examples
Environmental change	Climate change	Increased extreme weather events, such as: droughts, floods, and heat waves	A temperature increase of 2.5ºC above pre-industrial levels by 2100 could result in annual damages of 1-2% of world GDP[16]
		Sea level rise	By 2050, US$66-106bn worth of existing coastal property will likely be below sea level in the US[17]
	Biodiversity and habitat loss	Loss and degradation of ecosystem services such as water retention, and soil formation and protection	Goods and services provided by ecosystems are estimated to amount some US$33 trillion per year[18]
	Land degradation and desertification	Deforestation and forest degradation	From 2000 to 2012, the world lost over 2.3 million km^2 (230 million hectares) of forest[19]
		Loss of agricultural areas	52% of the land used for agriculture is moderately or severely affected by soil degradation worldwide[20]
	Water pollution (biological or chemical)	Decreased water availability Health hazards	In a recent paper, 53% of the companies surveyed on the FTSE Global 500 Index reported that they had suffered water-related business impacts in the past five years[21]
	Air pollution	Decreased air quality, leading to health problems	In 2012, around seven million premature deaths resulted from air pollution, more than double previous estimates[22]
Resource landscape	Availability of natural resources	Depletion of non-renewable resources	Long-term exhaustion of phosphorus reserves[23]
		Reduced natural flows of renewable resources	Water scarcity for agriculture[24]
	Price changes of natural resources	Impacts on business value	Farmland value reduction in Iowa caused by crop price falls in 2014[25]

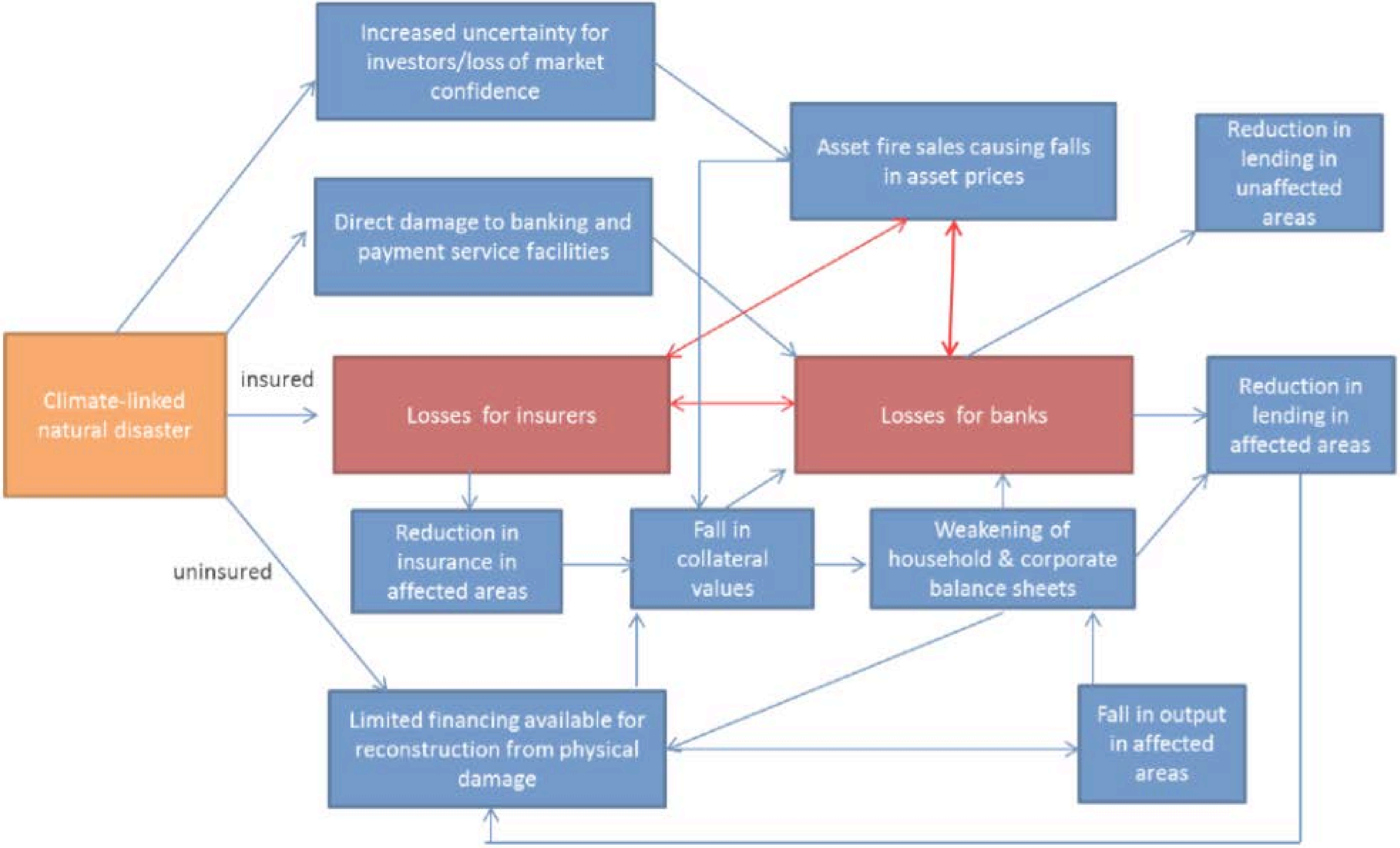
Societal environment related risks

Societal environment related risks			
Risks	Effect	Response	Result
Government regulations	Climate change	Limit increase in global average temperatures to 2ºC	Reduction of global emissions, fossil fuel reserves could remain unburned
	Stratospheric ozone layer loss	Prohibition of substances that deplete the ozone layer	Reduction of the ozone layer, factories of CFCs closed
Technological change	Climate change	Development of electric cars	Combustion engine infrastructure could be left unusable
	Air pollution	Elimination of leaded petrol	Lead production infrastructure affected
Societal norms change	Climate change	Divestment from fossil fuels	Reduction of investment in the fossil fuel industry
	GMOs	Product labelling	Changes in consumer preferences and behaviour
Litigation and statutory interpretation	Pollution	International lawsuit against Chevron-Texaco by Amazon communities	Potential judicial rule against the company. Payment of compensation for damages
	Climate Change	EU greenhouse gases emission for international air travel	Interference to free trade. Positive discrimination for low-carbon products

Key research topics in literature to date

- Measuring and managing exposure of investments to environment-related risks across sectors, geographies and asset classes so that financial institutions can avoid stranded assets
- Financial stability implications and what this means for macro and microprudential regulation and financial conduct
- Reducing negative consequences of stranded assets as societies transition to sustainability (addressing unemployment, lost profits, reduced tax income)
- Internalising risk of stranded assets in corporate strategy and decision making (especially in carbon intensive sectors)
- Role of decarbonization campaigns
- Understanding how emission commitments translate into decarbonization plans

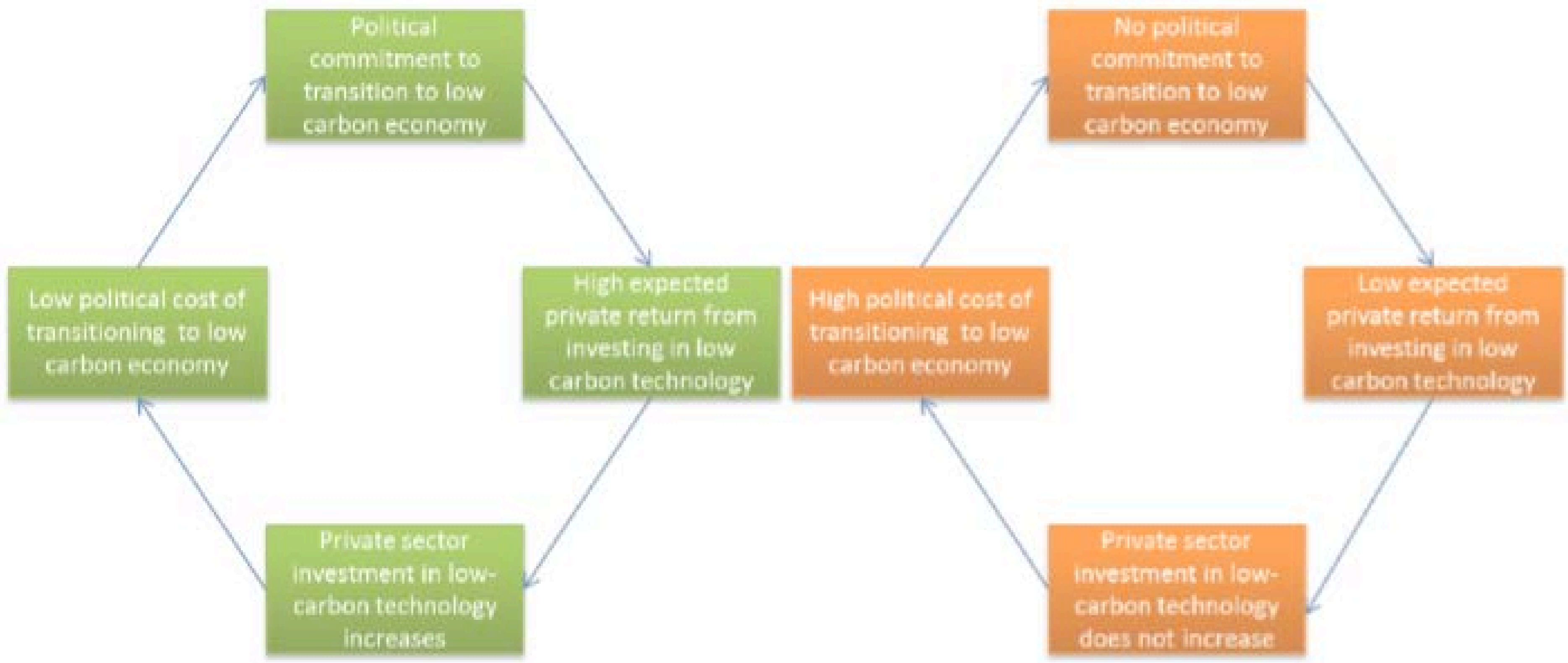

Scientific uncertainty
Interdependence
Physical risks
Transition risks
Climate risks
Impact on companies, households, governments, insurers
Primary effects
Impact on portfolios of financial institution
(Asset valuation, Liquidity)
Secondary effects
Impact between financial institutions
(Asset valuation, Liquidity)
Composition and
fragility of the financial system
Tertiary effects
Risks for financial market stability


Increased uncertainty for investors/loss of market confidence
Asset fire sales causing falls in asset prices
Reduction in lending in unaffected areas
Direct damage to banking and payment service facilities
Climate-linked natural disaster
insured
Losses for insurers
Losses for banks
Reduction in lending in affected areas
uninsured
Reduction in insurance in affected areas
Fall in collateral values
Weakening of household & corporate balance sheets
Limited financing available for reconstruction from physical damage
Fall in output in affected areas

Global measures of physical risks to the financial system

- Little research to date on potential impact of climate change to financial sector
- Integrated Assessment Models can be used to compute value at risk (VaR) associated with climate shocks (Dietz et al. 2016)
  - Under certain assumptions corporate earnings should grow roughly at same rate as economy
  - IAM forecast future global GDP growth with and without climate change providing an approximation of VaR of financial assets
  - An extended version of Nordhaus's DICE model allows for a portion of the damages of CC to fall directly on the capital stock in addition to impacts on existing capital stock and labor inputs (productivity)
- Expected 'climate value at risk" of global financial assets today along a bau is 1.8% (US$2.5 trillion)
- This rises to 16.9% or (US$24.2 trillion) at the 99th percentile of VaR
- Putting in perspective the stock market capitalization of fossil-fuel companies has been estimated at US$5 trillion

Transition risk: Low and high equilibria



Measuring the impact of stranded assets from a transition to a low-carbon economy

- IEA/IRENA (2017) report distinguishes between
- Taking current reported fuel reserves and burning them would lead to three times more CO_2 emissions than would be allowed by the 66% 2°C Scenario (880Gt)
- More relevant is outlook per fossil fuel
  - a 65% drop in coal consumption between 2014 and 2050
  - 55% drop for oil and less than 20% for gas
  - the breakdown for unburnable fuels based on cumulative fossil fuel production would be around 40% of gas, 50% of oil and over 80% of coal
- Fossil fuel power plants that would need to be retired (stranded) prior to recovering capital investment would amount to a total USD 320 billion worldwide over the period to 2050.
- Key message is that a ‘disjointed transition’ (delayed climate action and sudden reversal) would be hugely disruptive (oil and gas stranded assets would increase dramatically)

Market failure and the risk of stranded assets

- Why individuals operating in the financial industry may overlook or under-price low carbon transition risks
  - Social norms and educational background may prevent assessment of climate risk and low-carbon investment potential
  - asset managers' performance is evaluated on basis of short-term risk-adjusted returns as compared to their peers so they stick close to established index and may be averse to dropping potentially stranded assets that are relevant to indices (and have been relatively risk free historically)
- Broader rationality discussion relevant:
  - evidence from behavioral and experimental economics, e.g., people follow simple rules of thumb when faced by complexity potentially leading to systematic errors, bias to status quo, confirmation bias
  - Fat tails may be underweighted by financial markets (investors appear risk-averse for small losses but less impacted by large losses)
- Empirical attempts to gauge climate risk sensitivity of investors (events, loan conditions)

Addressing climate-related risks to assets: Responses by investors and central banks

- Investors
  - Several new stock indexes, funds and bond ratings are being designed to help investors buy into low-carbon opportunities
  - Measuring stranded asset risk by foot printing or carbon intensity of capital as proxy, requiring disclosure, research on identifying environmental risk associated with assets owned by companies
  - Decarbonizing of investment portfolios and divesting
  - Green bonds
- Central banks
  - Climate stress tests
  - Macroprudential regulation both for protecting from climate-related risk and to help sustainability transition, e.g., different reserve ratio requirements
  - Green quantitative easing and reserve management (incorporate ESG criteria in risk assessment of risk-weighted capital requirements)

Sustainability transitions and crises

- Many of the major technological transitions or revolutions have been associated with major upheaval and crises
- Some stranding may be inevitable (creative destruction) but the sustainability transition is different (potential abruptness)
- Hope that (a) climate change policy could give clear and consistent signals, (b) the technological and societal transition will be smooth and fast enough, (c) the financial community will find means of handling the several novel risks associated with the sustainability transition
- The nature of deep uncertainty inherent in the sustainability transition and in climate change itself will heighten the need for vigilance against physical and transition risks and for better understanding these as well as finding the means of response at various levels of governance.