

Cambridge Judge Business School

Cambridge Centre for Risk Studies 2017 Risk Summit

ADVANCING THE CITY RISK INDEX

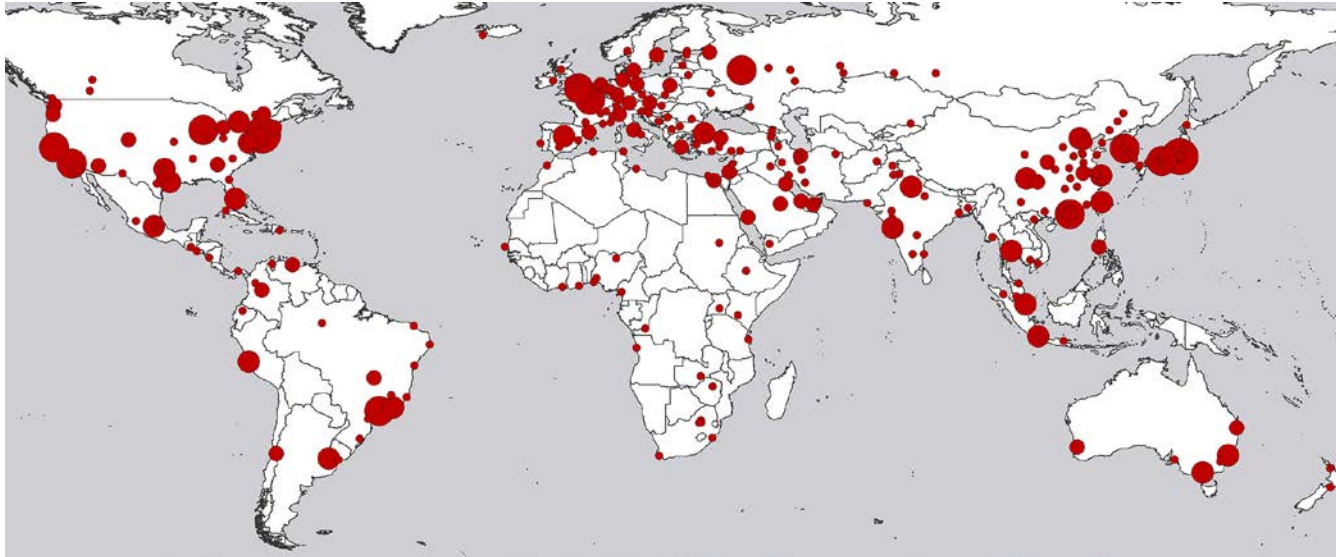
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Cambridge Global Risk Index

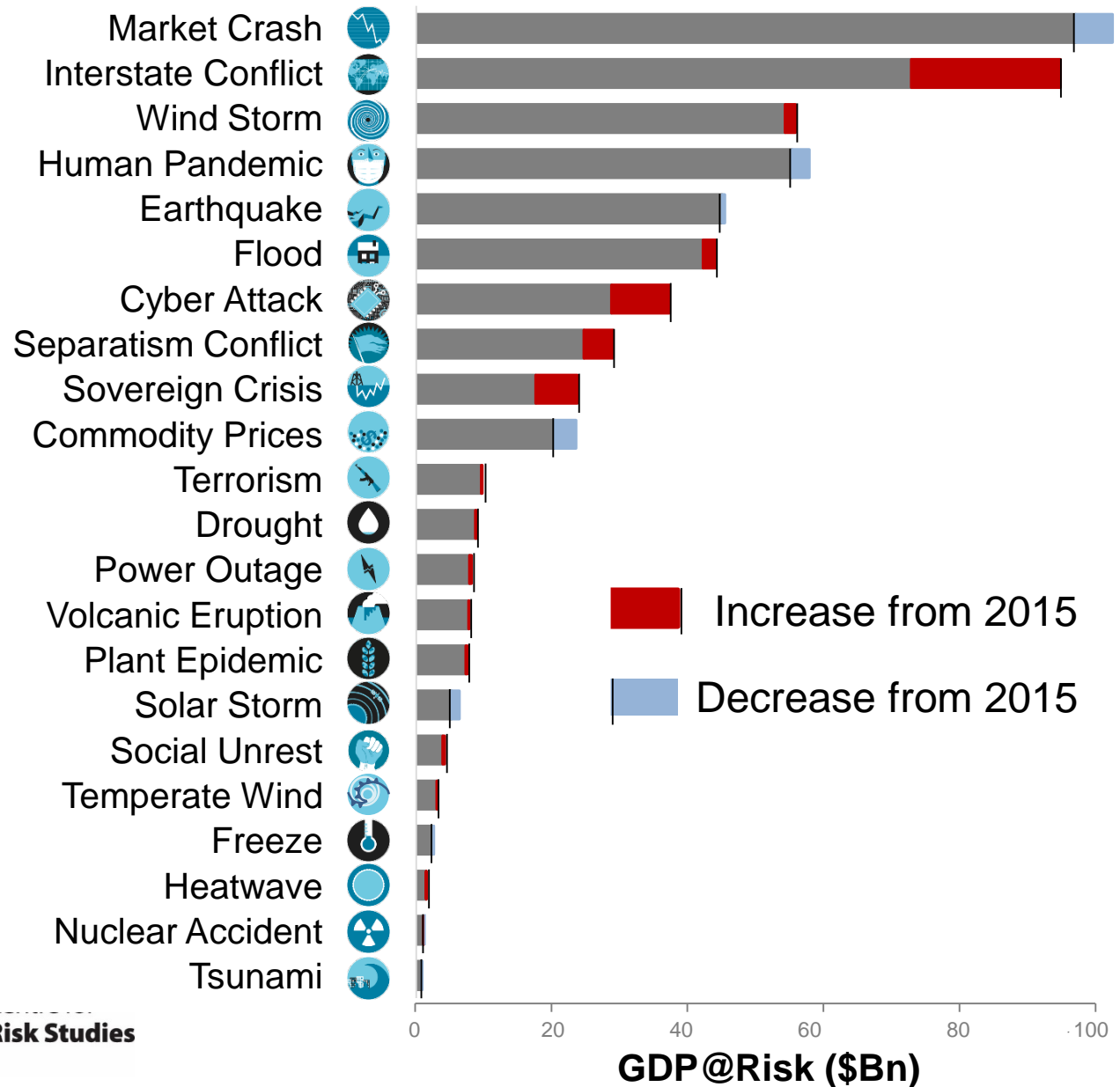


300 Cities

22 Threats

\$1.17 Trillion of GDP@Risk a year

2017 Risk Index: Update by Threat



What's New on the Risk Landscape?

Financial, Economic & Trade Risks



Market
Crash

Banking Crisis Risk

- Basel III progress – close to TLAC
 - TLAC (Total Loss Absorbing Capacity) of G-SIBs is near completion
- Italian banking crisis
- Central banks less likely to bail out

Asset Bubble Risk

- Property bubbles continue to build
- Global debt explodes at 'eye-watering' pace to hit £170 trillion
- Zero Interest Rate Policy: 'Everything' Bubble



Sovereign
Crisis

Sovereign Crisis Risk

- BREXIT UK Rating Downgrade
- Continuing Eurozone strain
- A Chinese Sovereign Debt Default?

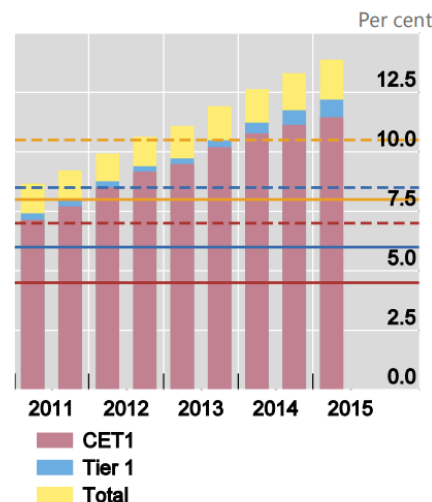


Commodity
Prices

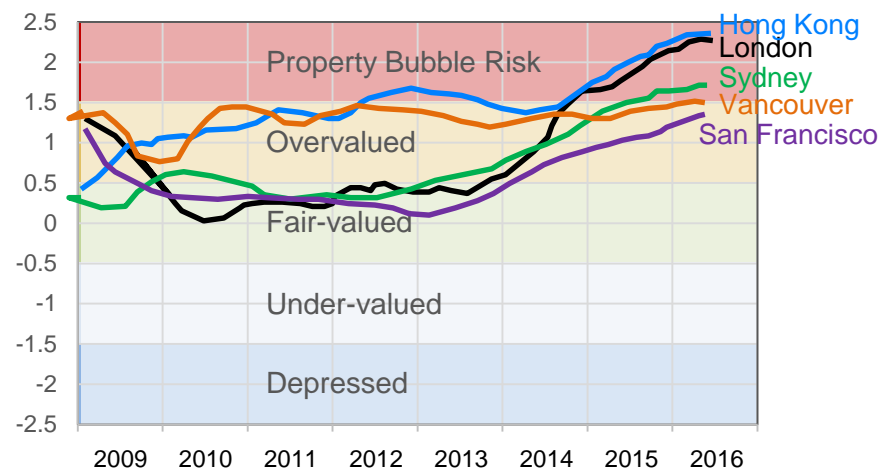
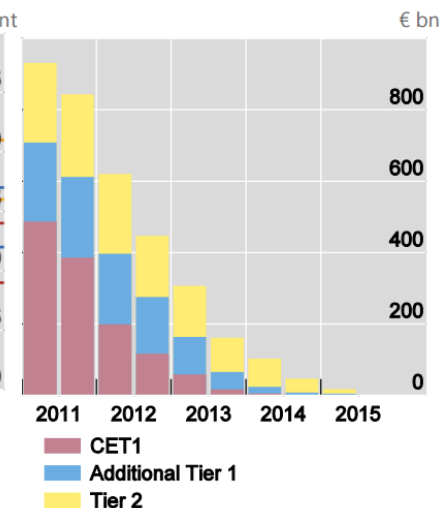
Price Shock Risk

- China slump
- Oil price collapse
- Commodity pricing slump
- Food price volatility

Capital ratio²



Capital shortfall at the target level³



Source: Basel Committee on Banking Supervision:
Implementation of Basel standards August 2016

What's New on the Risk Landscape?

Geopolitical & Security Risks



Interstate
Conflict



Terrorism



Separatism
Conflict



Social
Unrest

- Saudi Arabia and six other nations cut ties with Qatar
- Terrorism activity in mainland Europe
 - Paris and London Attacks
 - Increased activity but micro attacks
 - Potential for much larger attacks
- Tensions in the East China Sea
- Taliban in Afghanistan
- Civil War in Syria
- Territorial Disputes in the South China Sea
- North Korea Crisis
- War Against Islamic State in Iraq
- Civil War in Libya



What's New on the Risk Landscape? Technology & Space



Cyber attack

- Cyber attack severities are increasing
- Major recent cyber hacks have consistently broken previous records
 - WannaCry ransomware attack: World's biggest cyberattack sends countries into 'disaster recovery mode'
 - Largest ever data exfiltration attacks (Yahoo 500m records and Mossack Fonseca 2.6 Tbytes)
 - Largest known attempted cyber bank theft (Lazarus SWIFT \$1Bn attempt)
 - Largest Denial of Service attacks: 1,000 Gbps



Solar storm

- 2016 saw a cyber attack on Ukrainian power grid cause outage to 225,000
- Cyber security is also increasing in response



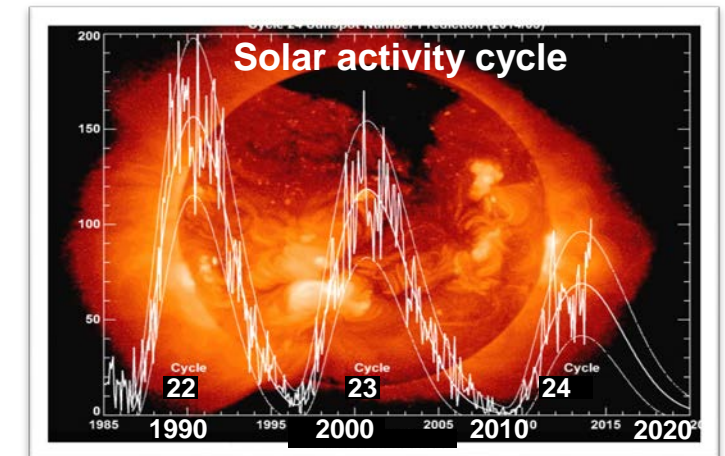
Power outage

- Worldwide spending on cybersecurity products and services projected to exceed \$1 trillion over next 5 yrs
- Solar storm has been a major subject of CCRS study in 2015/16 with the release of Helios Solar Storm report
 - Solar cycle may not be a good indicator of threat of CME but we are currently in declining phase of cycle 24 of solar activity



Nuclear accident

- Nuclear risk diminishing as 3 nuclear plants decommissioned last year



2017 City Rankings – Total GDP@Risk

2017 Rank	City Name	GDP@Risk (\$US Bn)	Change in Rank from Baseline	Change in GDP@Risk from Baseline
1	Taipei	20.57	0 -	0.4%
2	Tokyo	20.44	0 -	24.4%
3	Seoul	13.76	0 -	▲ 2.0%
4	Manila	13.10	0 -	▲ 1.6%
5	Istanbul	12.06	0 -	▲ 19.5%
6	Tehran	10.66	0 -	▲ 6.9%
7	Osaka	10.02	7	▲ 20.6%
8	Mumbai	9.72	▲ 0 -	▲ 5.4%
9	New York	9.23	-2	▲ -1.1%
10	Delhi	9.22	▼ 0 -	▼ 5.2%
11	Shanghai	8.75	0 -	▲ 0.5%
12	Los Angeles	8.73	-3	-0.8%
13	Lima	8.65	▼ -1	0.8%
14	Hong Kong	8.57	▼ -1	0.1%
15	Buenos Aires	7.70	▼ 0 -	7.4%
16	Moscow	7.25	5	▲ 34.0%
17	Sao Paulo	7.09	▲ -1	▲ 2.8%
18	Mexico City	6.19	▼ -1	▲ 1.5%
19	Kuwait City	5.89	▼ -1	▲ 2.0%
20	Khartoum	5.86	▼ 4	▲ 11.2%
21	Baghdad	5.72	▲ 5	▲ 10.0%
22	Karachi	5.68	▲ 3	▲ 8.4%
23	Jakarta	5.57	▲ -1	▲ 3.4%
24	Beijing	5.47	▼ -4	▲ 0.5%
25	London	5.46	▼ -6	-0.9%
26	Paris	5.22	▼ -3	-1.1%
27	Tianjin	5.02	▼ 0 -	▼ 0.3%
28	Tel Aviv	4.94	5	5.0%
29	Guangzhou	4.91	▲ -1	▲ 0.4%
30	Chengtu	4.87	▼ -1	0.5%

3yr Risk Outlook



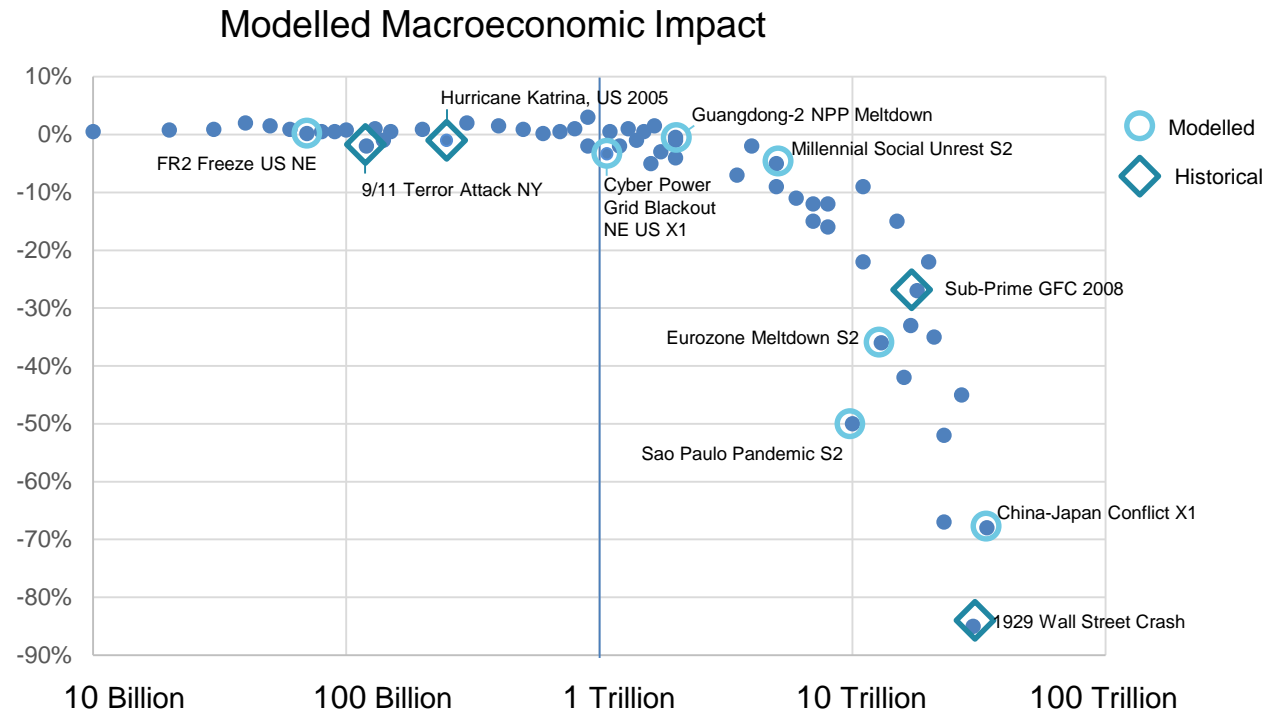
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Defining ALL the Trillion Dollar Event Scenarios

- The economy is relatively robust to minor and localized shocks
- A shock that destroys **a trillion dollars or more** of economic output is sufficiently large to trigger significant stockmarket equity devaluations
 - It becomes systemic and impacts connections and wider scale relationships
- Our objective to define all the likely causes of trillion dollar shocks to the global economy in a scenario event set

Stockmarket Shock
Reduction of S&P500 Index in One Quarter



GDP@Risk
\$ Economic Output Loss from Event

A Scenario is Defined By...

Interstate Conflict Scenario: IC04

Name: Saudi Arabia & Iran

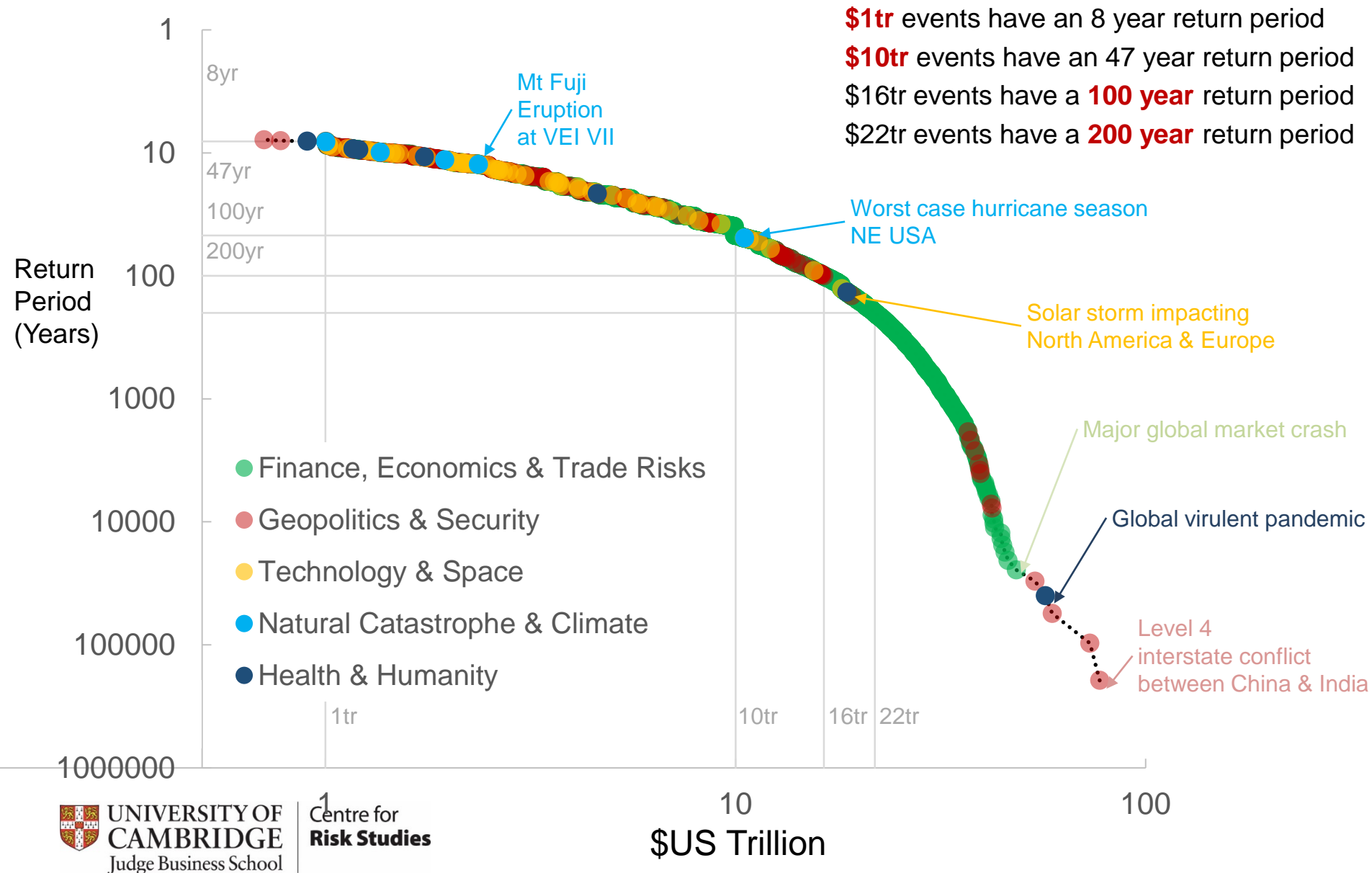
Description: Bilateral border conflict between two medium powers

Local Impact Severities (\$US bn)

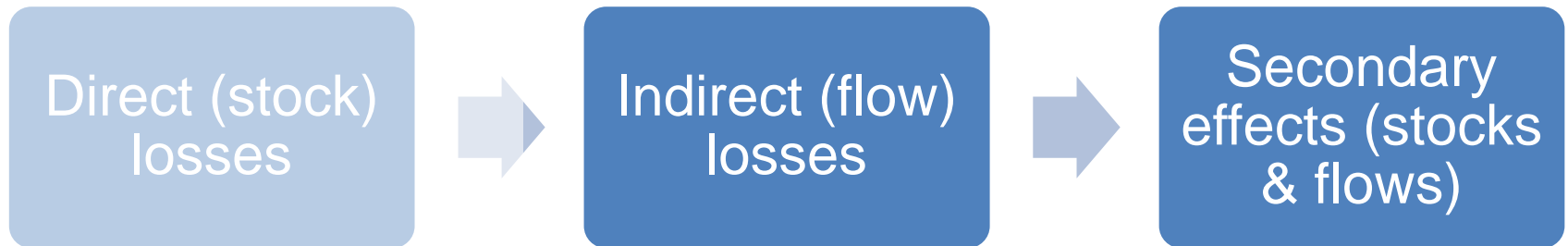
		IC1 (small) City mobilized for war, but not attacked; mobilization switches civilian commerce to military production; population gripped by fear, consumer demand drops, parts of population flees. Investor confidence is affected; Conflict lasts a year.	IC2 (medium) City suffers sporadic attack from occasional missiles or aerial bombardment, possible damage to city infrastructure from military cyber attack; City is mobilized for war; significant emigration of population from city. Investors withdraw	IC3 (large) City is the target of strategic bombing by enemy forces, destroying industrial and commercial output and military facilities in the city; Major emigration by population. Possible rebuilding afterwards by major injection of capital. Conflict lasts 3 years.
CRS City ID	City Name			
SAU_ARI	Riyadh	43.6	224.6	391.8
SAU_JED	Jeddah	42.4	218.6	381.0
IRN_TER	Tehran	29.2	167.4	296.4
IRN_KHR	Mashhad	9.3	53.8	95.0
IRN_ISF	Isfahan	6.2	35.9	63.4
IRN_34807	Karaj	5.4	31.4	55.4
IRN_AEK	Tabriz	5.4	31.2	55.0
IRN_FAR	Shiraz	4.7	27.4	48.3
IRN_KHZ	Ahvaz	3.8	21.8	38.4
IRN_QOM	Qom	3.7	21.5	37.8
IRN_38338	Kermanshah	3.0	17.6	31.0
		Total GDP@Risk (\$US bn)		1,009
		Estimated Return Period		600



Global Catastrophe Exceedance Probability Curve



A Typology of Disaster Impacts



■ Flow Losses (**GDP**)

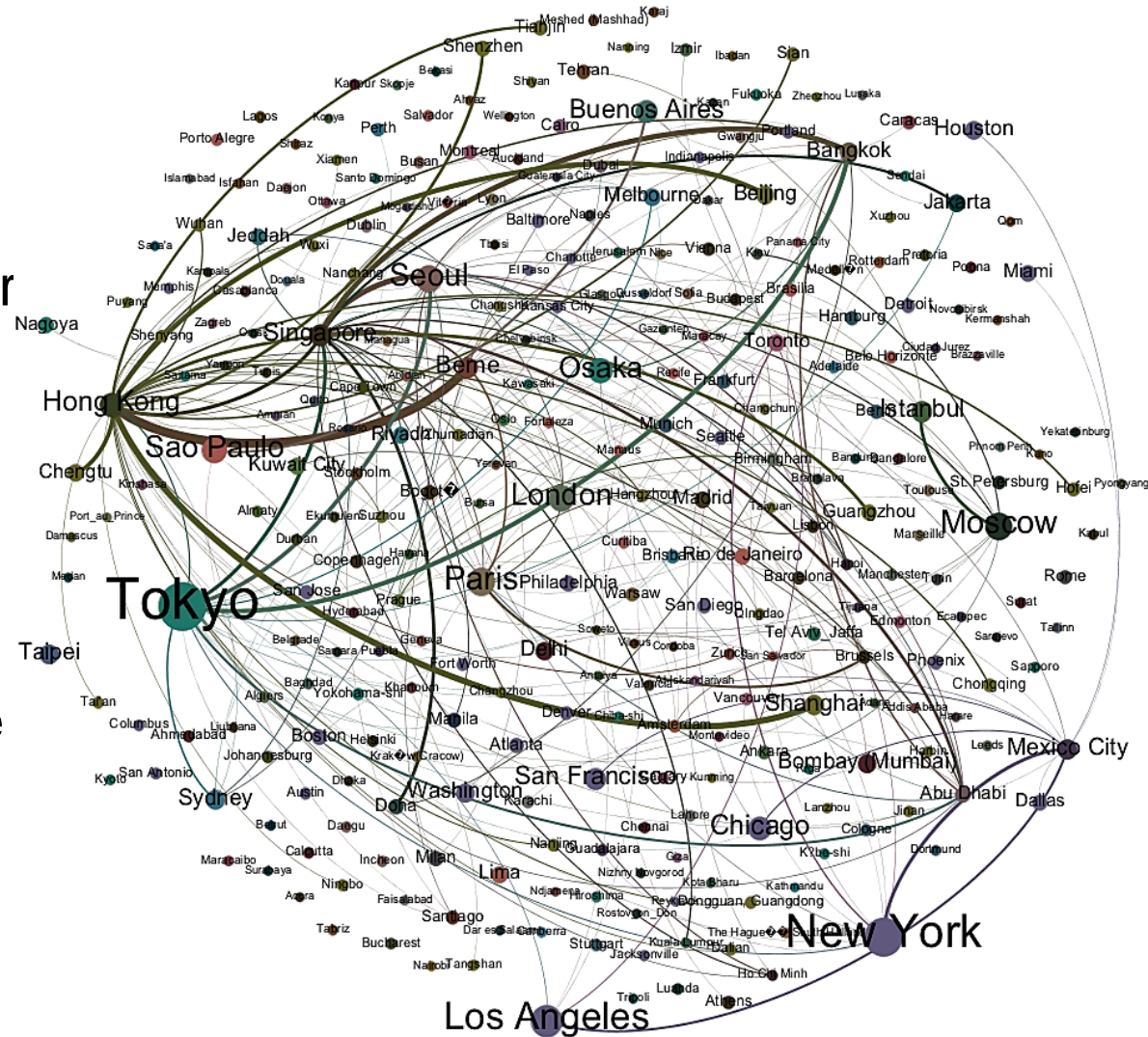
- **Direct damage & disruption** to productive assets, inventories, infrastructure and markets
- **Disrupted labour supply**
 - Death, illness, injury
 - Infrastructure disruption
- **Supply chain disruptions**
- **Reduced consumer demand**
 - Confidence
 - Loss of income

■ Secondary Effects

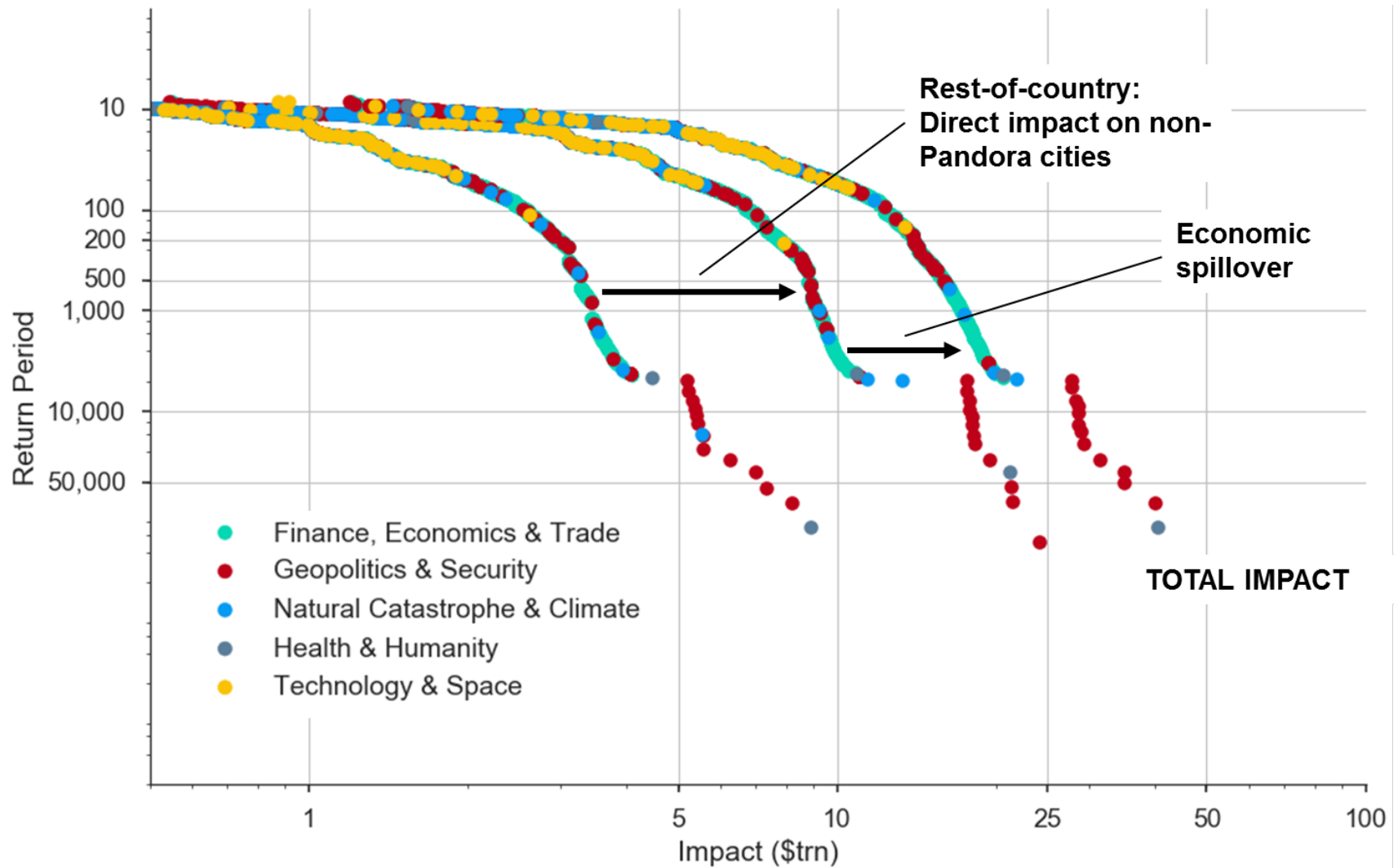
- Lost jobs leading to **lower consumer demand**
- Lost tax revenues and emergency budgets leading to **lower public demand**
- Major planned **investments delayed** or cancelled
- Consecutive natural disasters may cause **uncertainty** that discourages potential investors
- International **spill overs**

Pandora Economic Spillover Model

- Footprints of threat scenarios are used to quantify international and domestic spillover
- The global bilateral trade data is used to estimate Pandora cities trade network
- The reconstructed network is a complete city to city trade flow representation



Global EP Curve – Accounting for the ‘Rest’



Cambridge Risk Index 2018

- We provide an objective, quantified index of risk for threats
- The index provides useful relativities between
 - Locations: “Where might my business operations suffer disruptions?”
 - Threats: “What should I be most concerned to protect against?”
 - Timelines: “How might my business plan be impacted?”
- Threat model updates
 - Probability assessments
 - City economic characteristics
 - City resilience assessment
- Methodology Updates
 - Validation of regional result aggregations
- Analytics dashboard
- Launch early 2018



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