



Financial System in Transition: Challenges and Solutions

Special focus on the role of Central Banks

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The views expressed in this presentation are those of the author and not necessarily the views of the BIS.

Preface: Development institutions as key instruments to (1) address systemic market failures (eg., unpriced negative externalities), (2) enhance coordination-cooperation with other agents, and (3) facilitate Pareto outcomes from public policies.... They contribute

..... (4) overcoming tragedies of the Horizon, of the Commons; (5) investing under uncertainty; but need to (6) contribute keeping macroeconomic and financial stability... Three major concretes cases (under CC+Covid-19):

1. New challenges for stability from Climate Change
2. New financial technologies to reduce Inequality
3. New options for Post-Covid recovery and sustainable growth

1. New challenges for stability from Climate Change

The “Why” the need to help combat Climate Change.. becomes now a “How”

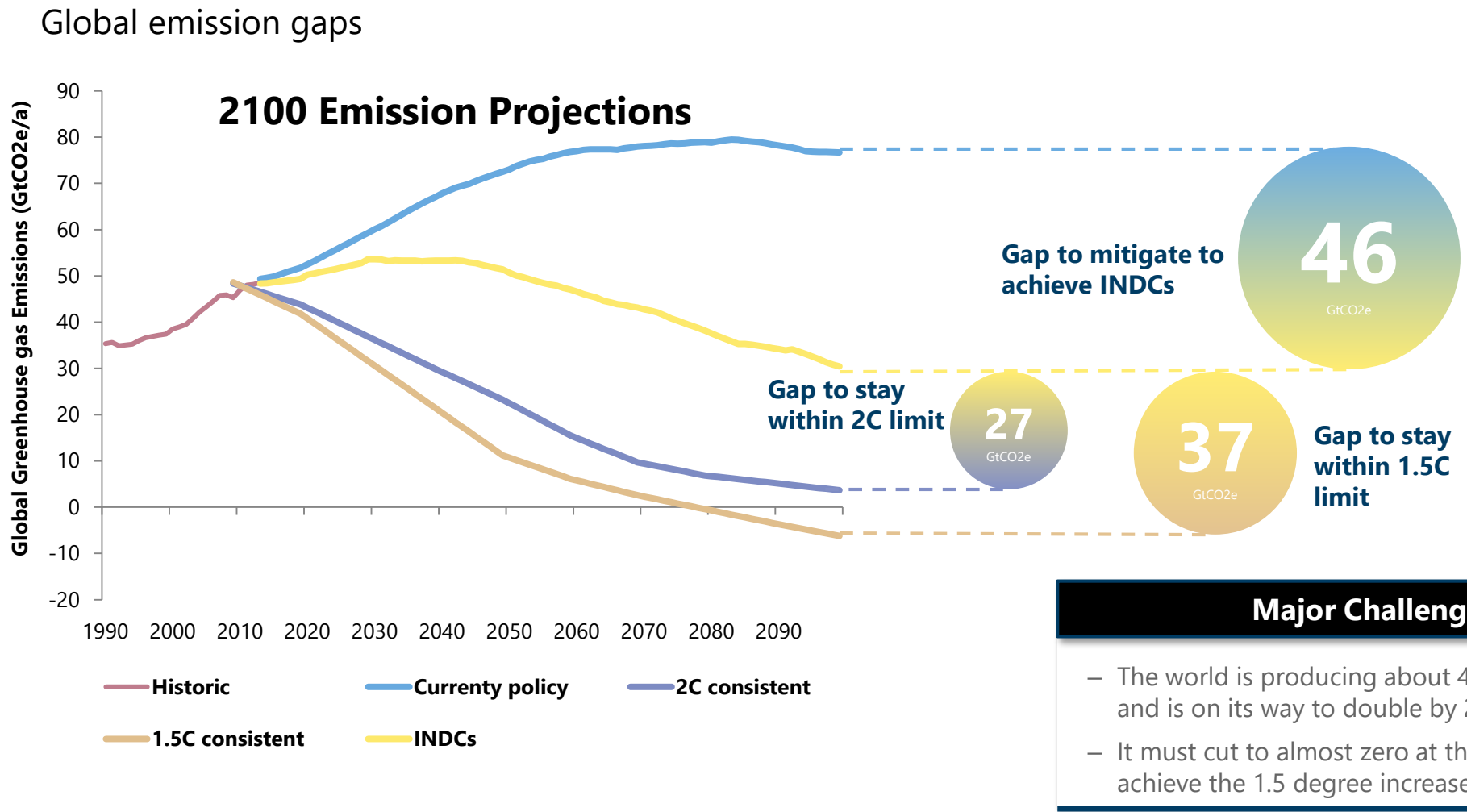
- **Recent positive evolution of mindsets among CB community:** (Carney, NGFS, Stern-Stiglitz, supervisors) overcomes two orthogonal views (a) do nothing (strict independence) or (b) do everything (listen to more vocal parts of civil society); convergence now seems to evolve around:
 - No “silver bullet”, CBs alone cannot mitigate CC, avoid becoming again “only game in town”;
 - Coordination with other actors (eg., Governments, private sector) is key;
 - Address issues of consensus within mandates; communicate more about CC impact.
- **Indeed, within CBs mandates, impact of CC directly undermines fulfilling CBs objectives:**
 - Financial stability: potentially severe negative effects related to CC-risks, physical and transition risks (eg., weather events → massive losses of capital → threat of financial instability)
 - Price and macroeconomic stability: shocks and uncertainty on inflation (eg., heat → food prices → shortages, permanent higher inflation?), sectoral shocks, mass migrations, impacts on r^* and U^* , lower employment → materialization of CC-related risks → real and financial crises).
- **Moreover, other agents moving fast on CC (private real and financial sector, civil society):**
 - Demand for sustainability, transparency and consistency (eg., from investors, consumers)
 - Supply of “green” portfolios, taxonomy and volume (eg., from issuers, AMs)

Green Swan (new systemic risk concept) contribution to debate:

- “Green Swan” book message: move CC from “**ethical equity** issue” to “**risk** approach” (Covid illustrated “global sudden stop” accelerated version of gradual cumulative CC risks).
- Best science today says CC calls for **epistemological break in risk models**, break away from: (a) Gaussian distributions of risk (with fat tails or not), (b) linearity of transmissions of CC risks, (c) usual extrapolation of consequences using historical data.
- Best science warns of (a) **quasi-certainty** of occurrence of CC-related catastrophic material and human losses; (b) irreversible “**tipping points**” if we emit GHGs beyond 420Gt (1.5 C) CO2 budget (IPCC); our usual “*wait-and-see*” attitude is *very risky*.
- Need to act under **radical uncertainty** and **asymmetric risk** (future huge losses vs “small” cost of mitigation insurance today): better prevent, build buffers even without optimal carbon pricing, perfect models and ideal understanding of CC.



GHGs behind Global Warming pose challenge of irreversible tipping point if CO2 maximum budget 420 Gt CO2 is reached

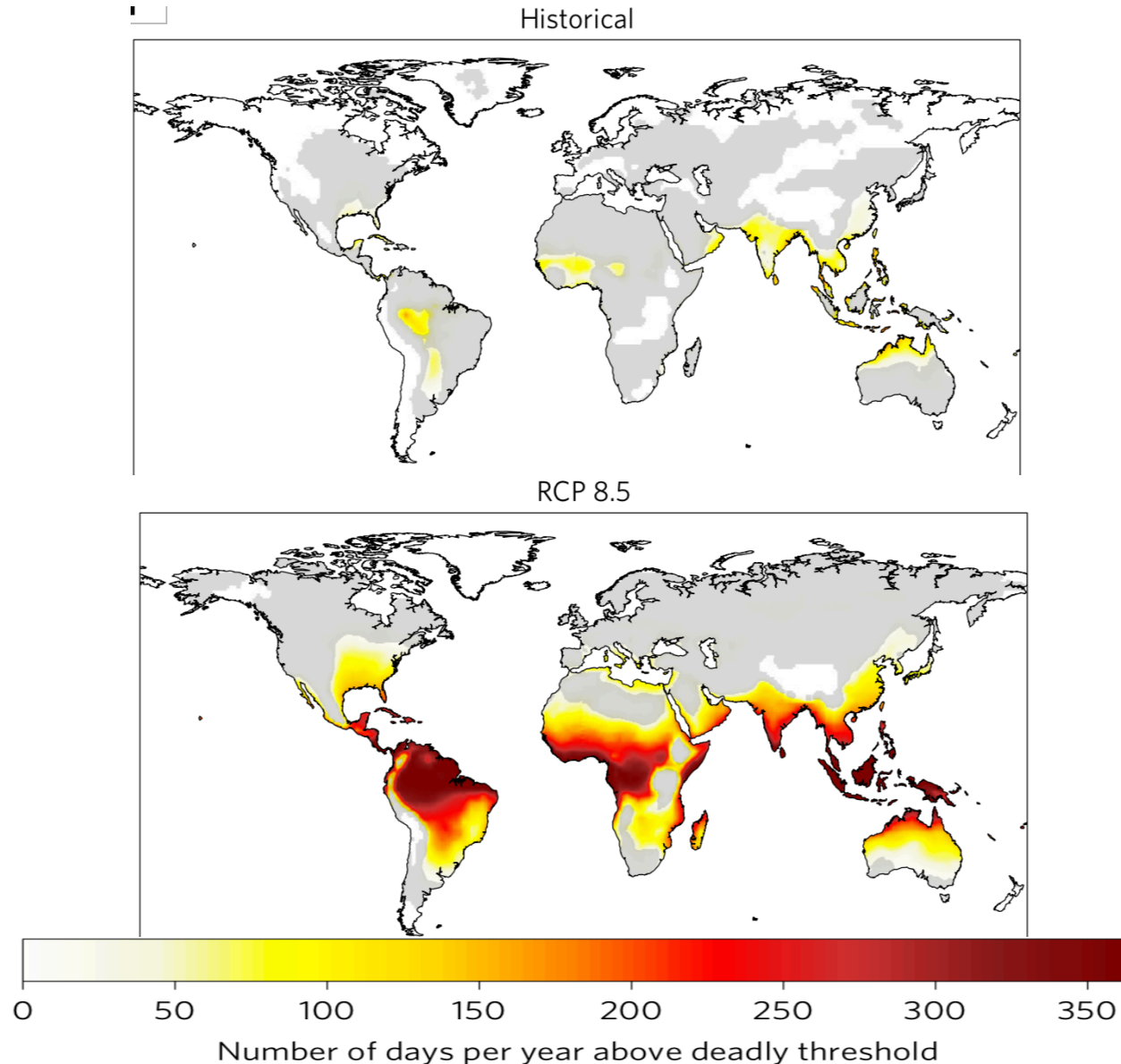


Major Challenge

- The world is producing about 40 GtCO₂/year and is on its way to double by 2050
- It must cut to almost zero at this time to achieve the 1.5 degree increase objective

Source: Climate Action Tracker Database, Global emissions time series, updated November 2017. Time series data for INDCs, 2C consistent, 1.5C consistent time series are computed as medians of highest and lowest potential global emission level results.

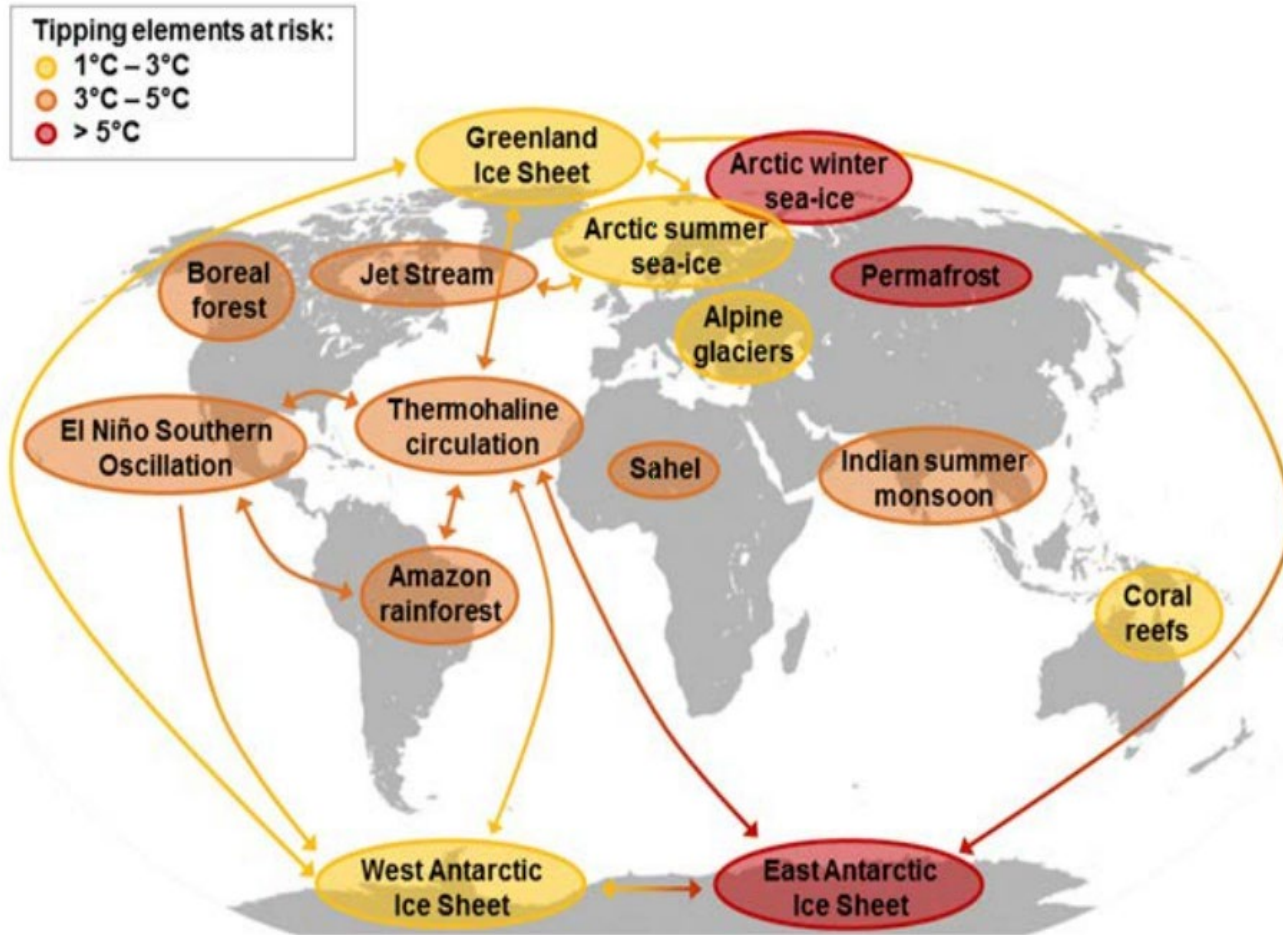
GHG emissions impact temperatures on where we could live → trigger complex new risks



- **Human beings must regulate their internal heat, and so they are exposed to the mix of :**
 - External temperatures and
 - Humidity
- **In 2000*, this was already a severe risk:**
 - 13.2% of the planet's land area where 30.6% of the population resides...
 - was exposed to 20 or more days when temperatures and humidity surpassed the threshold beyond which such conditions become deadly.
- **By the end of the century, in a BAU scenario, entire regions of the world would be inhabitable.**

* Source: Mora et al, "Global Risk of Deadly Heat", *Nature Climate Change*, vol 7, issue 7, June 2017

Quantifying these physical and transition global risks is complex..... Mis-pricing is linked to ramifications of radical uncertainty



The individual tipping elements are colour-coded according to estimated thresholds in global average surface temperature. Arrows show the potential interactions among the tipping elements that could generate cascades, based on expert elicitation.

Source: Steffen et al. (2018)

Impacts on socioeconomic systems are difficult:

- Tipping points are complex, trigger irreversible consequences with nonlinearity, cascading effects...
- Add global inequality effects, migrations, conflicts, etc...

Example: ramifications of “Melting of Polar Ice Sheets”?

What can central banks do and are actually doing?

(1) Provide more and better information on CC-related risks.

Beyond awareness and building consensus, CBs are providing guiding frameworks for public and private financial sector, civil society. **The NGFS has been instrumental offering such public goods**

- Continue improving **analytical tools to assess CC-risk and resilience of economy and financial sectors**
 - New macro models -beyond IAMs or DSGEs-, CC-risk metrics, CC-related stress tests
 - CC-scenarios for 1.5 with sustainable growth and contributions by agent (real & financial sectors)
- Continue discussing scope and role of **macropru** (BCBS working group) and **monetary policies** (collateral, APP); not a trivial issue ("market neutrality" vs shadow-asset pricing)
- **Disclosure and accounting standards** (FSB-TCFD, IFRS sustainability reporting) → better identify risk
- Consistent **taxonomy on green investment** products, for investors and civil society (comparable ESG criteria, PRI, Green bonds standards, construction of 1.5 portfolio, etc)
- Seek "**greening**" **own assets** (eg reserves, pension funds); offer investment options for CBs (BIS-green fund); favoring new "green finance" approaches and instruments

What can central banks do and are actually doing?

(2) Foster global & local coordination with “all hands on deck” and action

- **CC requires global and local coordination between local and global agents:** to avoid free riding, collective action pbs, to favor cooperation over Nash, find fair burden sharing, Ostrom, Olson).
 - Coordination with *Governments*, Treasuries and fiscal policy (Pigovian carbon taxes, trading and pricing emissions) over Net Zero policies.
 - Coordination with *international institutions*, **development banks** to leverage financing costs of transition and mitigation.
 - Coordination with *real sector firms*, banks, insurance cies., regulators, standard-setters, ratings agencies to ensure consistency with Governments Net Zero commitments.
- **CC calls for immediate action from a risk not a moral perspective**, perhaps without full understanding of its effects and dynamics.
 - Covid-19 might have triggered **behavioural change**: overwhelming evidence of huge costs of **Green Swans**, convincing societies, policy-makers, private sector of asymmetric risks-returns and **need for immediate action**.

2. New financial technologies to reduce Inequality

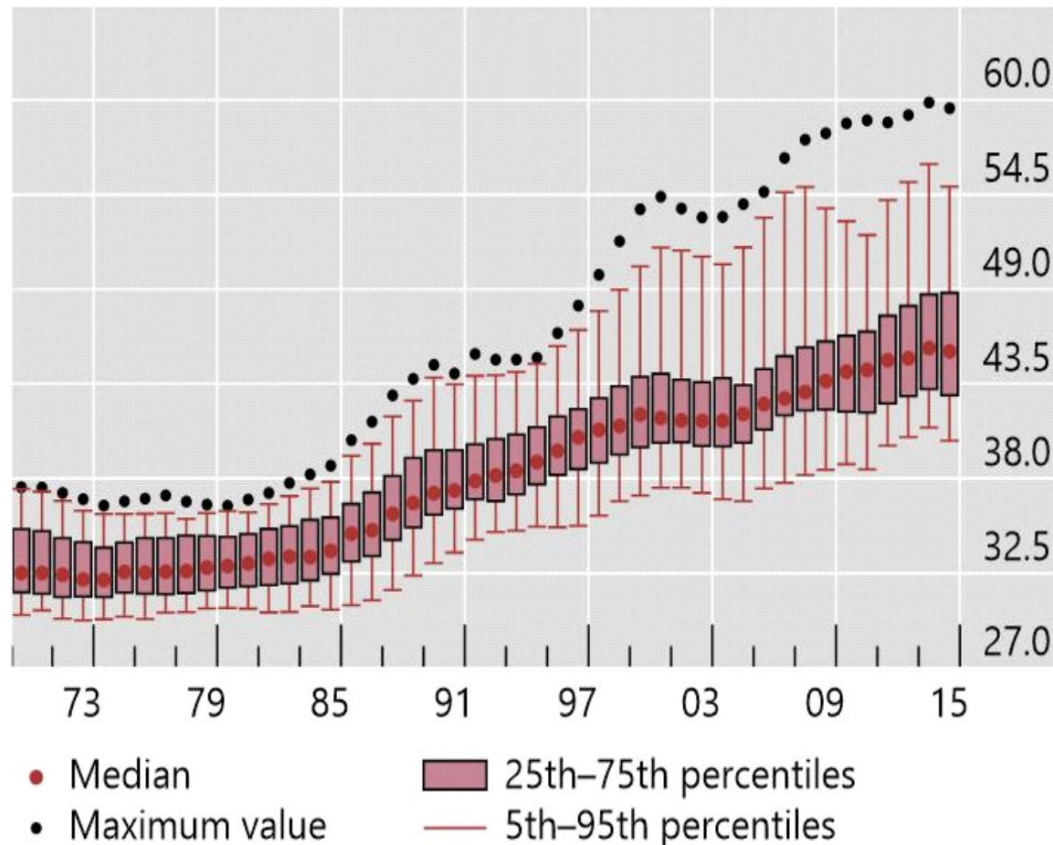
New financial technologies bring more inclusion and change policy design

- **Fintech, faster payments at lower cost** and through different instruments (smartphones) are contributing to increase financial inclusion
- **Digital identity, big data, AI** can change policy design (speed, accuracy of targeting) at low cost, for many programs that reduce poverty and inequality; new role for public agents (eg., development banks, IFIs, etc)
- Other risks need to be monitored (eg., digital discrimination from algorithms, “coded” bias, etc)

A cost of rising inequality in the US: deeper recessions under the GFC

Income inequality across US states

(percent income share of the top decile of the distribution)

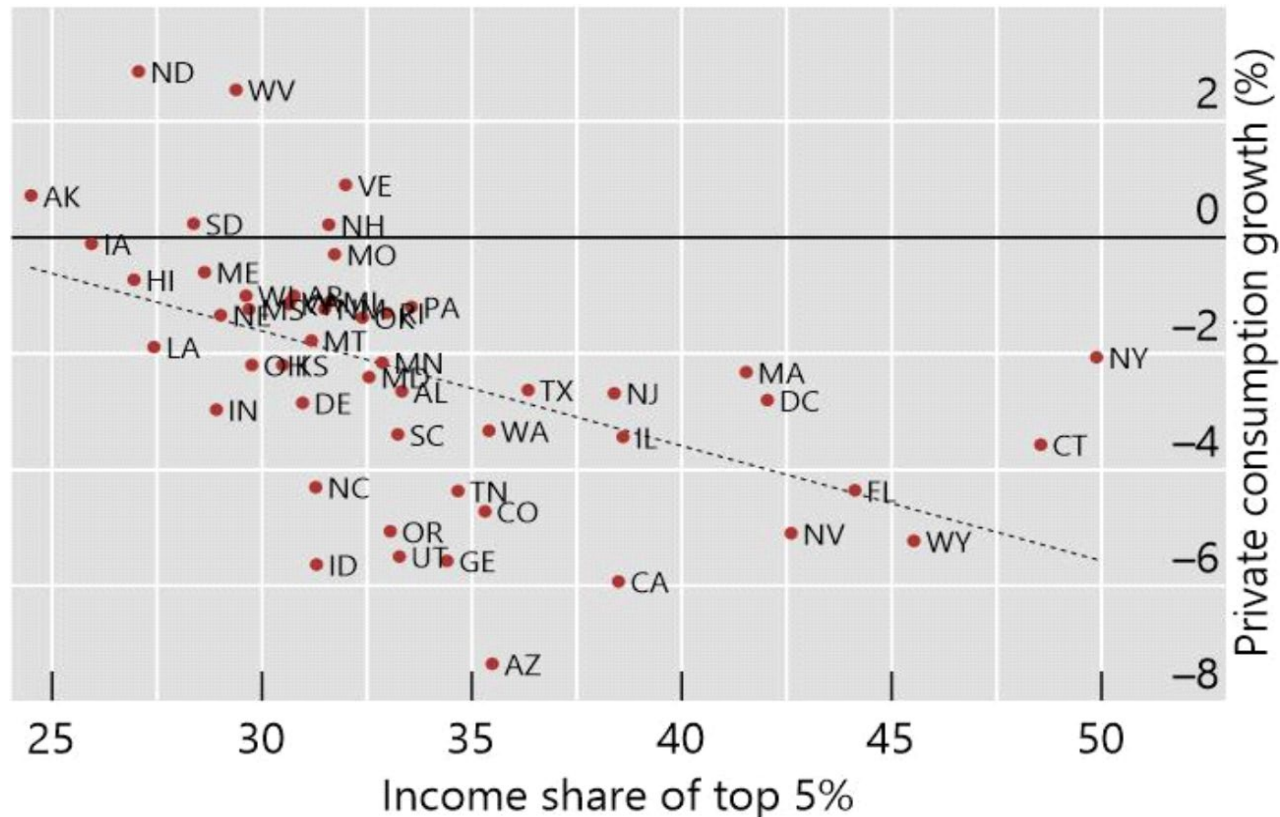


Source: Estelle Sommeiller and Mark Price

<https://www.epi.org/publication/the-new-gilded-age-income-inequality-in-the-u-s-by-state-metropolitan-area-and-county/>

Source: Kharroubi, Kohlscheen, Lombardi, Mojon and Pereira (2021), in progress

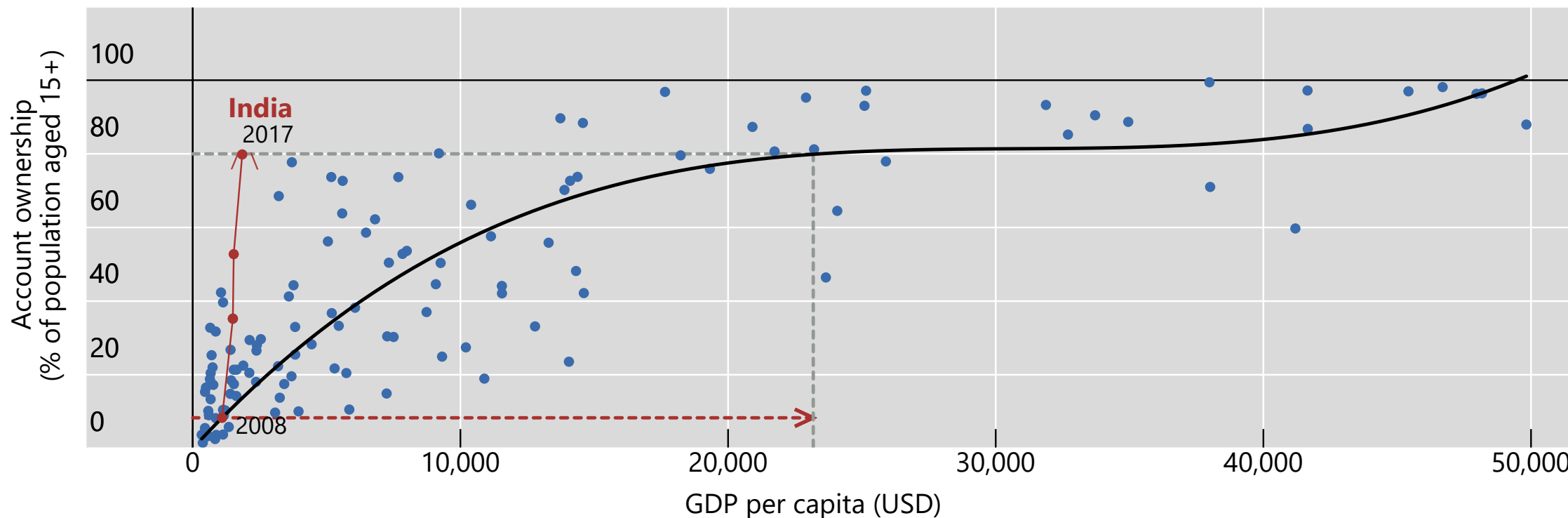
GFC: more unequal US states had steeper declines in consumption¹



¹ Aggregate private consumption growth between 2007 and 2009 as a function of the income share of the top 5% earners in the respective state

One possibility to boost transmission of policies: technological infrastructures can achieve impressive gains in inclusion

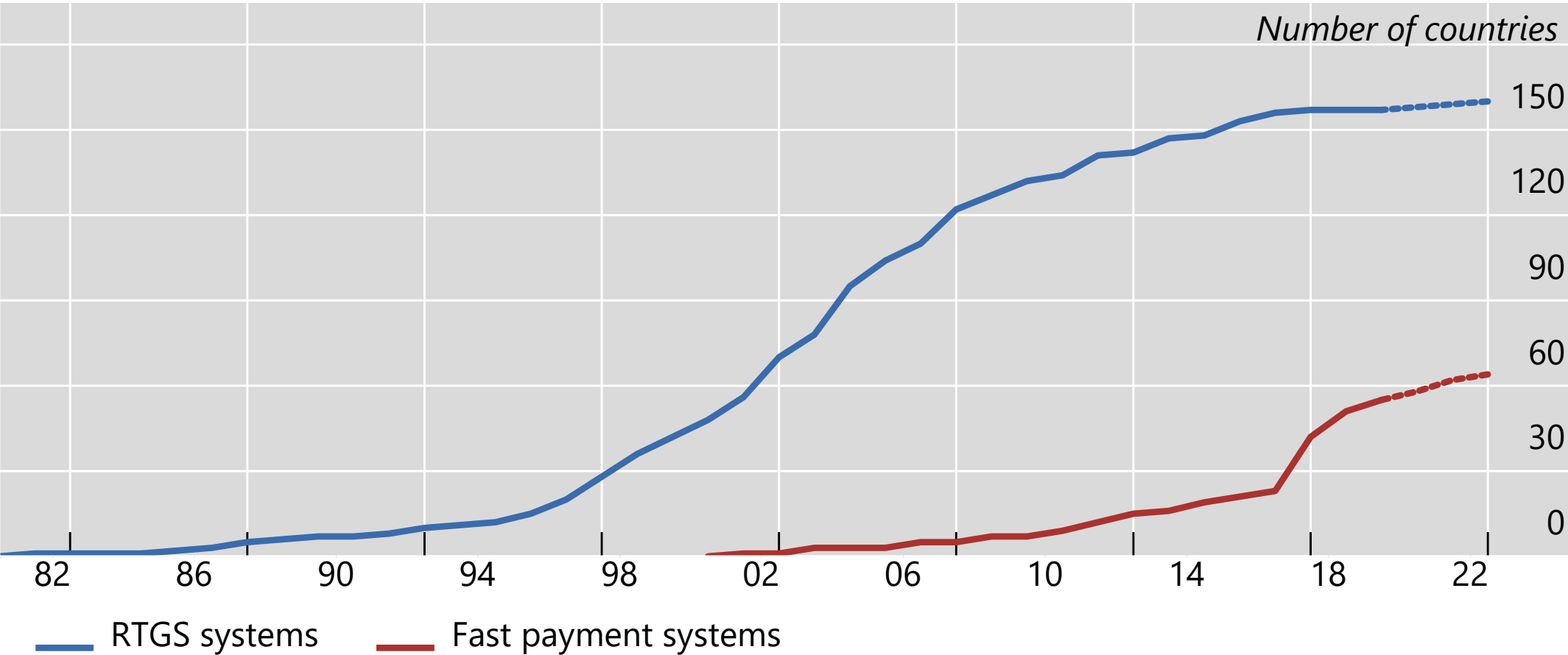
Progress with account access after India's "Aadhaar" digital ID



Source: D'Silva et al (2019).

Technology can allow for real-time instant payments, reduce fixed cost for poor households and increase speed of smaller financial transactions

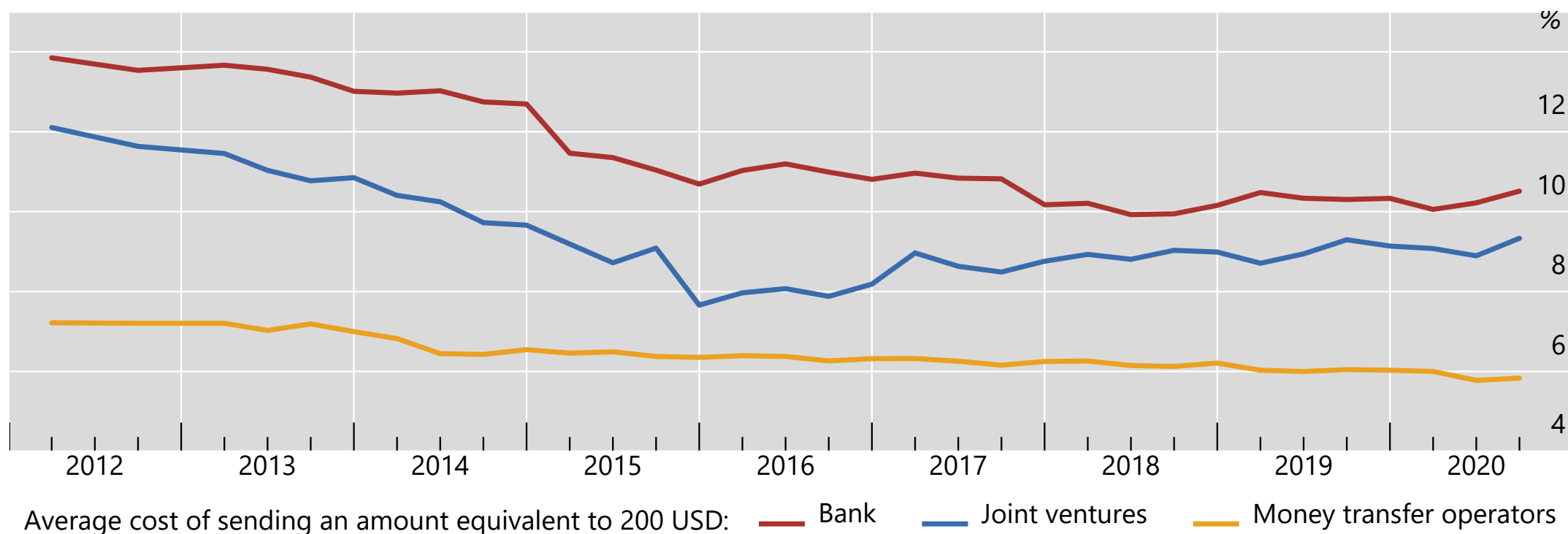
Diffusion of retail fast payment systems around the world



Source: BIS (2020).

Technology has reduced the costs of migrants' remittances

Payment innovations reduce remittances costs

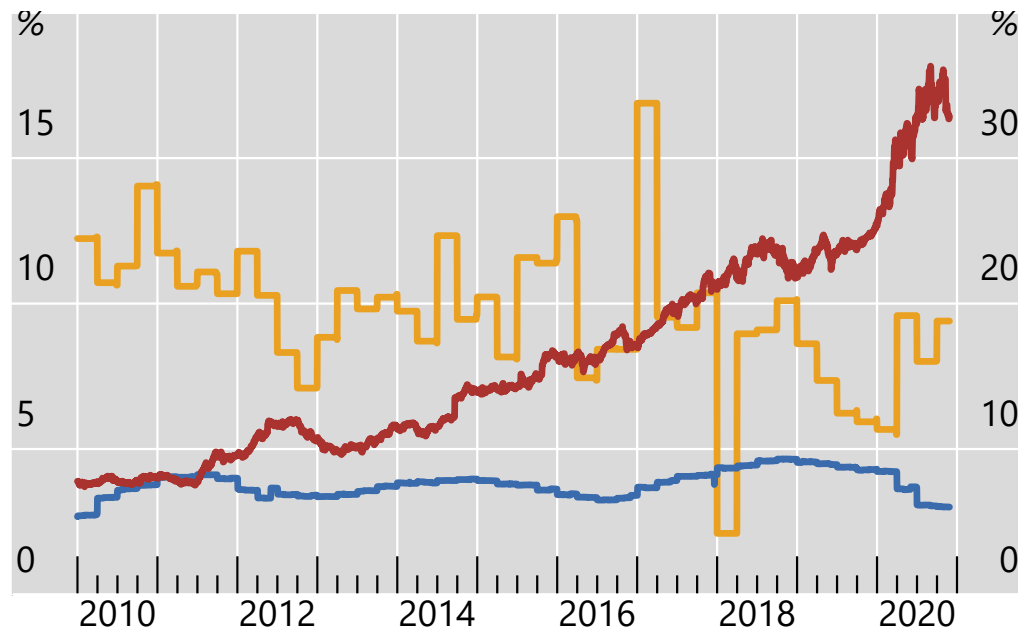


Joint ventures = partnerships between non-bank firms and financial institutions.

Sources: World Bank, *Remittance Prices Worldwide*, remittanceprices.worldbank.org.

Big techs have a rising share in overall market cap and higher profitability and the “tech premium” in labour markets is rising → increase in inequality?

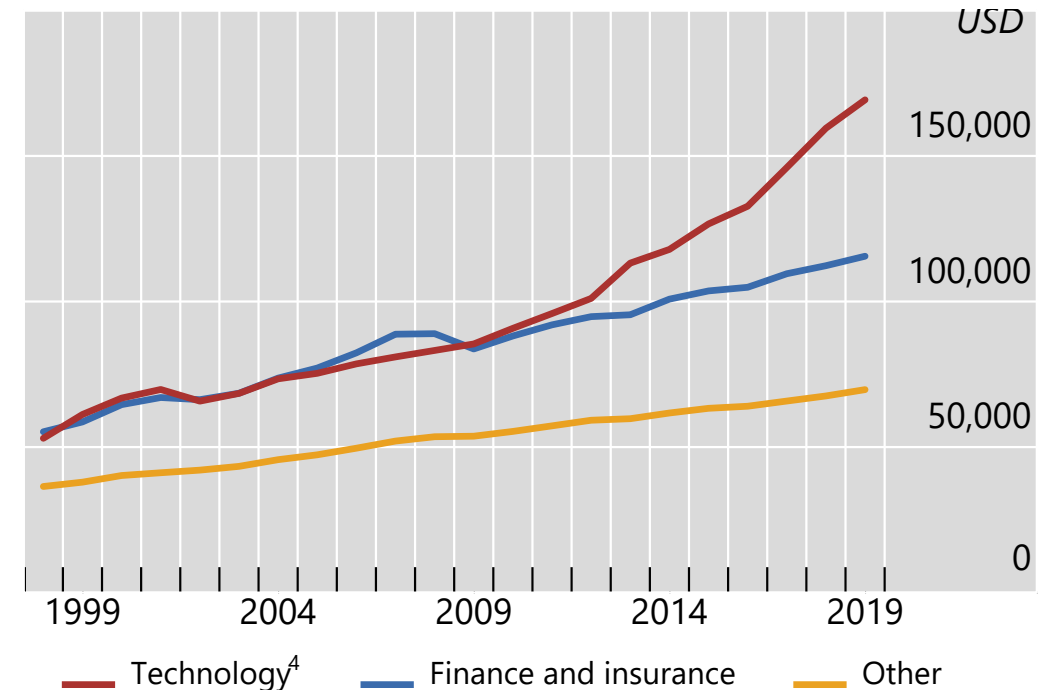
Share of big techs¹ in overall stock index² and profit margins



Lhs: — Big techs' share in world market capitalisation

Profit margin (rhs): — MSCI All Country Global Index — Big techs³

US wages per full-time equivalent employee

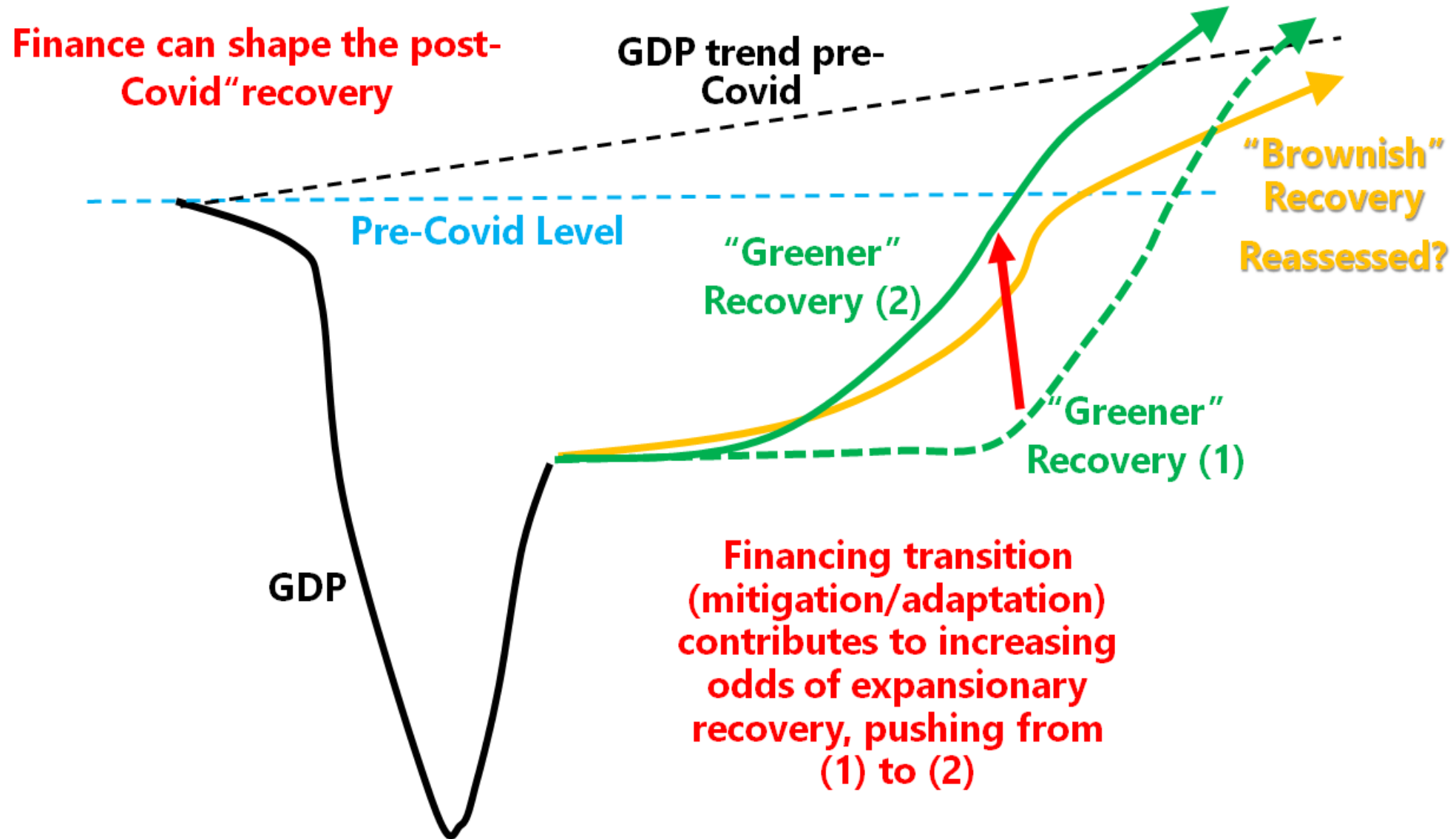


¹ The sample includes Alibaba, Amazon, Apple, Baidu, eBay, Facebook, Google, Kakao Corp, Line, Microsoft, NTT Docomo, Rakuten, Samsung and Tencent.
² MSCI All Country Global Index. ³ Average profit margin. ⁴ Average of publishing industries (includes software) and information and data processing services. The figure shows that in the last decade the average salary for employees in the technology sector has increased approximately 50% more than the wages in the financial sector.

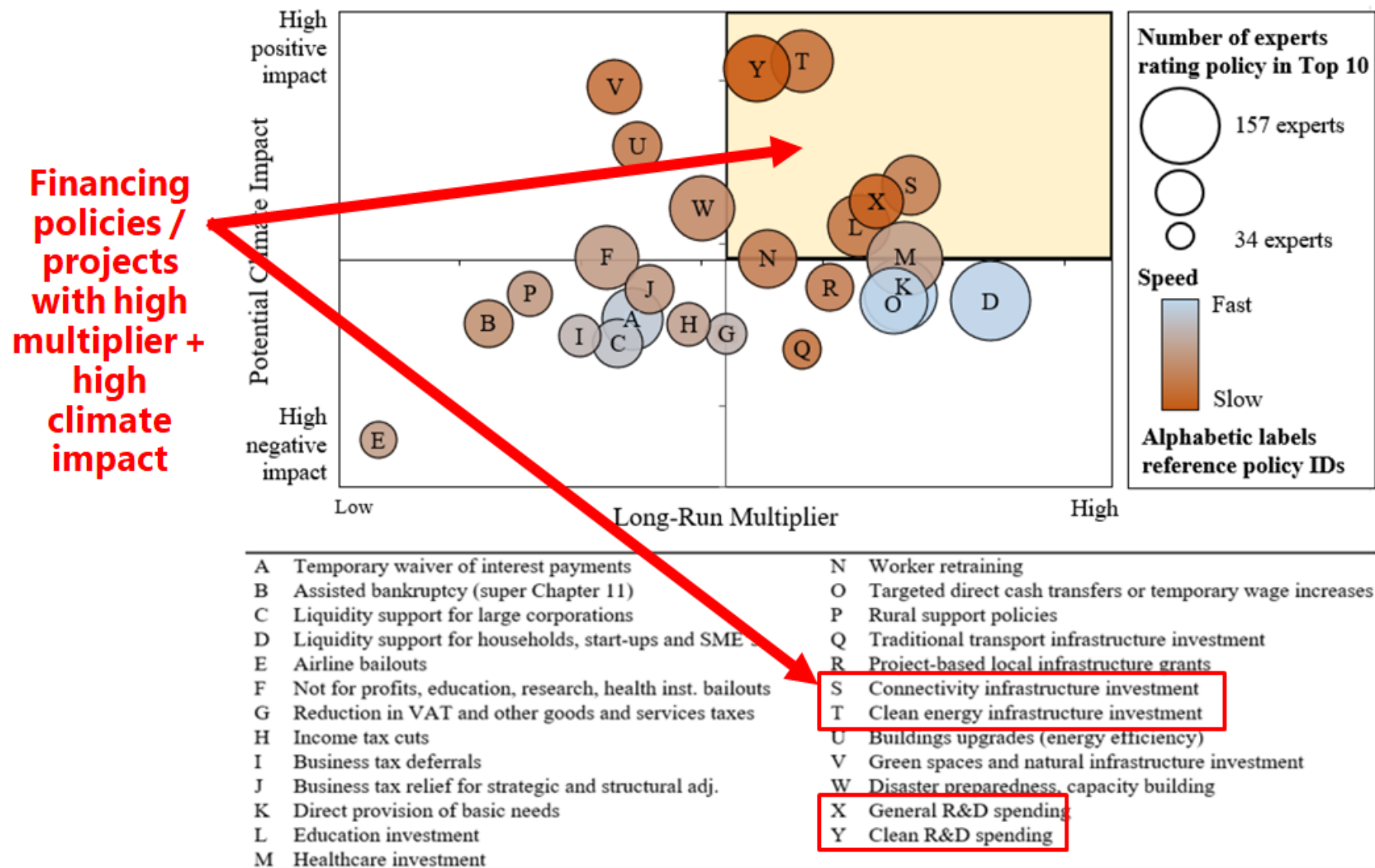
Source: Bureau of Economic Analysis; Bloomberg; author's calculations.

3. New options for Post-Covid recovery and sustainable growth (role of development institutions)

Possible stylized paths for a post Covid-19 recovery



Multipliers and CC-impact of a “green” recovery according to experts



Never waste a crisis: the Stern-Stiglitz report provides opportunities for the private sector investment and financing:

Source: C Hepburn, B O’Callaghan, N Stern, J Stiglitz and D Zenghelis, “[Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change?](#)”, *Oxford Review of Economic Policy*, no 36, S1, 4 May 2020.

Public financial sector (development banks) and IFIs working on Green Financing

And new Green Investments projects → accelerating transition

- **IFIs and public sector have important role in new Green investment projects**, national level, but also global. Coalition of Development Banks: One Finance Summit (Paris November 2020)
- **For example Green Infrastructure** among various types (and Blue infrastructure too):
 - **Urban forests**
 - **Constructed wetlands**
 - **Green and blue roofs**
 - **Rain garden**
 - **Downspout disconnection**
 - **Bioswales**
 - **Green alleys**
 - **Green school yards**



Source : worldlandscapearchitect.com

Private financial sector can provide new financial instruments to help change behavior on demand (consumers) and supply (investors) sides

- **Private sector eager to invest in new Green financial instruments**, including ESG, Green bonds; being **attentive to behavioural changes**: ex private asset managers (BlackRock), etc. **attentive to behavioural changes**;
- **But private sector needs better taxonomy of Green financial instruments** (eg., ESG criteria, BIS Green Bond taxonomy “project-based” and/or “entity-based”)
- **Meanwhile concrete actions include:**
 - **Direct co-financing with public financial sector** (One Finance Summit, public development banks, November 2020);
 - **Strengthen research partnerships** with public sector to develop Green technologies in renewable energy, carbon capture, anti-pandemic policies

Concrete examples of initiatives in sustainability and anti-pandemic finance

- **Net Zero emissions:** 113 countries have committed to be mostly carbon-neutral by 2050, representing about 50% of world GDP, and nine have set legally binding targets.
- **Net-Zero Asset Owner Alliance, Net Zero Asset Managers Initiative:** asset owners, \$5.1 trillion committed and among asset managers, \$9 trillion is committed. In June 2019, Norway's sovereign wealth fund (managing \$1 trillion in assets) signalled a gradual fossil fuel divestment policy, excluding coal from its portfolio (Reuters, May 13); commitments by BlackRock's AUM of \$7 trillion, Amundi about \$1.7 trillion AUM.
- **Portfolio Decarbonisation Coalition,** the creation of low-carbon indices, and one of the world's biggest green bond funds.
- **The European Green Deal:** multi-year package of at least €1 trillion in investment as a strategy committing to zero net emissions of greenhouse gases by 2050
- **The Biden infrastructure plan** \$2 trillion plan to overhaul and upgrade US infrastructure while taking into account climate risk and resilience. In addition, US Treasury Secretary Janet Yellen said \$1.9 trillion coronavirus relief package: "it's the right size to address the very significant problem that we have"; see J Yellen, ABC news interview by J Arnholz, 14 March 2021.

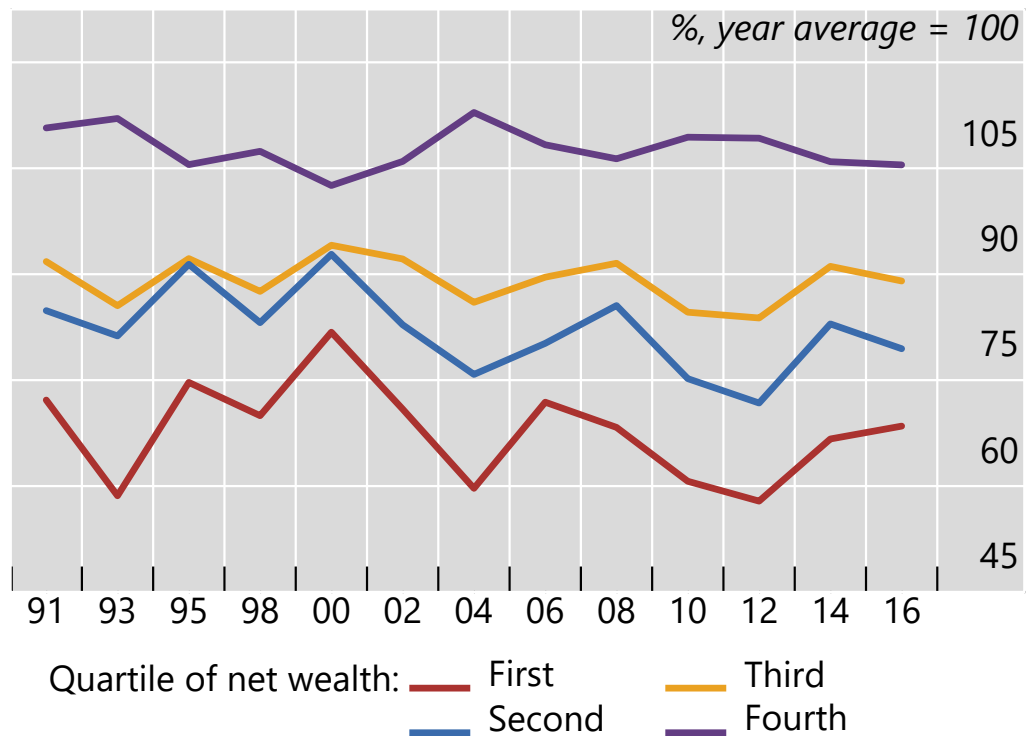
Conclusions: never “waste a crisis” use Covid-19 to aim at Green recovery

- **Covid has produced the unprecedented contraction that we feared with CC physical and transition risks.** So “never waste a crisis”, recovery can aim at being as “green” as possible. Macro conditions favourable (low rates, higher savings in some AEs, low r^* for a while, demand and awareness for “green”, ambition in US, EU, China, etc); micro “projects” exist (infrastructure, cities, “carbon footprint tracing”, new technologies and new ways to act using “social networks” etc).
- **Demand side: consumer becoming more selective, have now better information and incentives to favour lower carbon economy** (public awareness has risen to allow progress on carbon pricing, GHG emission taxation & certificates, etc).
- **Supply side: green finance investors offering new practical diversification projects/paths to lower carbon economy and finance the transition,** “green” R&D, new technologies, carbon capture, new “green” financial instruments, green infrastructure, “global funds” for MICs and LICs, etc. Schumpeterian creative destruction financing (debt, equity) of innovation (Aghion).
- **Warning: distributional consequences of CC policies and transition** are important; political economy of CC: risks and impact affect poor countries more and poor households in rich countries; international and local social ST effect of policies might be regressive on impact before MLT welfare benefits materialize. Urgent need to think and design policies with compensation & transfers as important elements to gather support and sense of “fairness” in implementation.

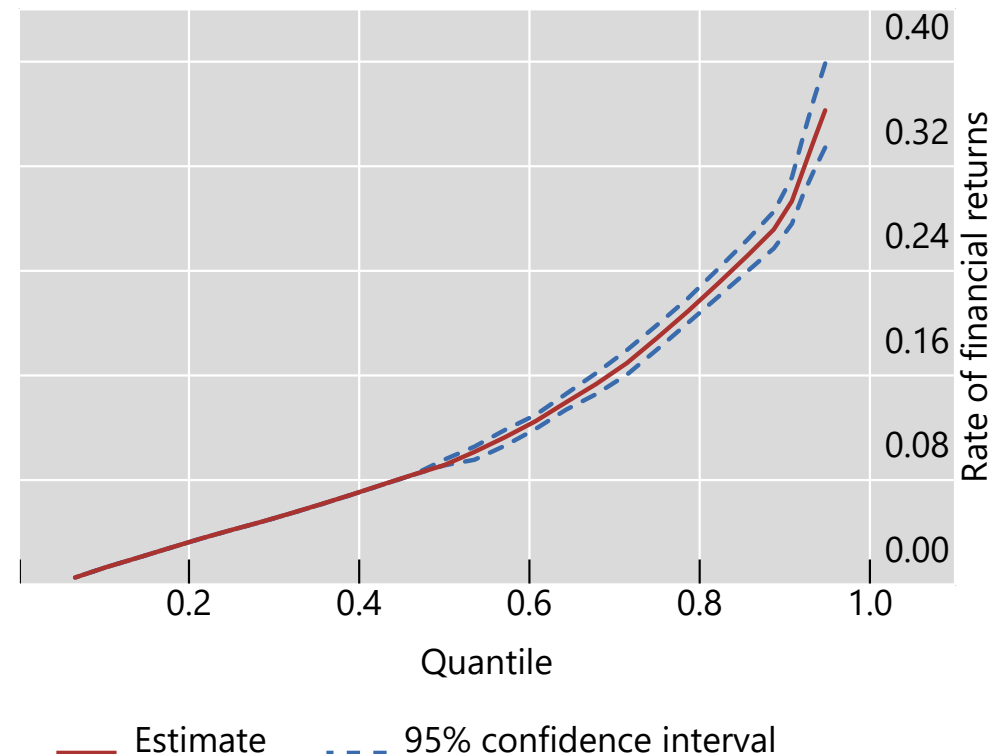
Thank You
(Annexes)

The “Matthew Effect”: inequality in returns to wealth

Rate of financial returns of Italian households by net wealth quartile¹



Effect of remote banking access on financial returns²

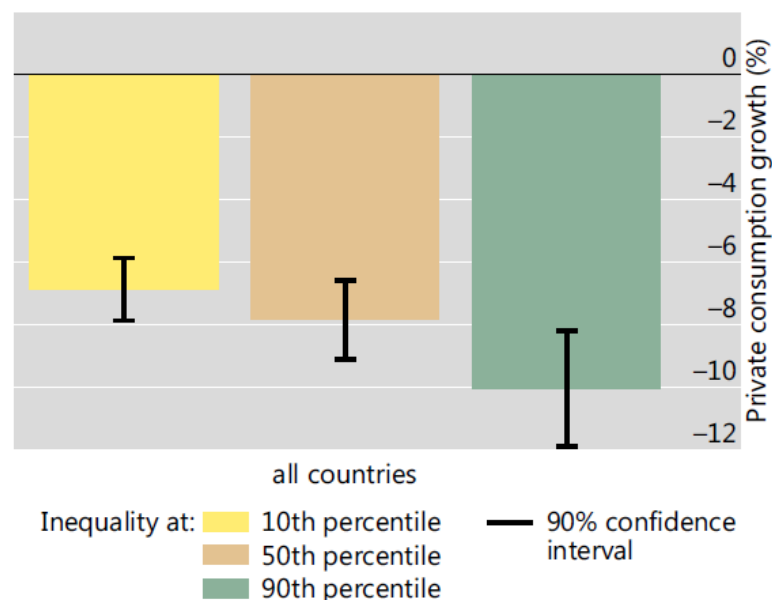


¹ The figure indicates that households with wealth in the top quartiles of the distribution have consistently received higher returns on their investments than other wealth quartiles. ² The figure indicates that remote banking access has a positive impact on the returns to household financial wealth. This increases starkly moving towards the top of the wealth distribution.

Source: Frost et al (2019).

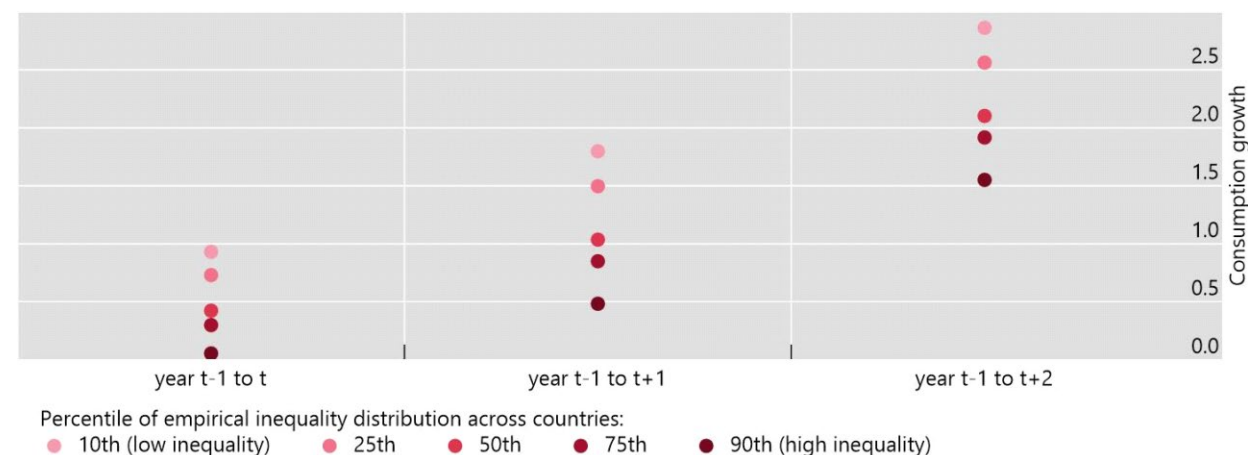
Inequality reduces the effectiveness of the transmission of MP

Recessions in more unequal countries are steeper¹...



¹ Estimated fall in per capita consumption during recession at each percentile of inequality in the income distribution. Recessions are defined as a year of negative growth and the share of income of the top 10% is taken as the indicator of inequality. Based on estimated coefficients of a cross-country panel with fixed effects. The specification regresses consumption growth on its lag, on an indicator of a recession, on the share of income held by the top 10% and on the interaction between the latter two variables. The sample period is 1972 to 2019. The all countries sample is based on 129 countries.

Effect of an expansionary monetary policy shock on cumulative consumption growth, by quantile of income concentration: **in countries with higher inequality the effect is limited in year 1 and much lower later than in more equal countries**

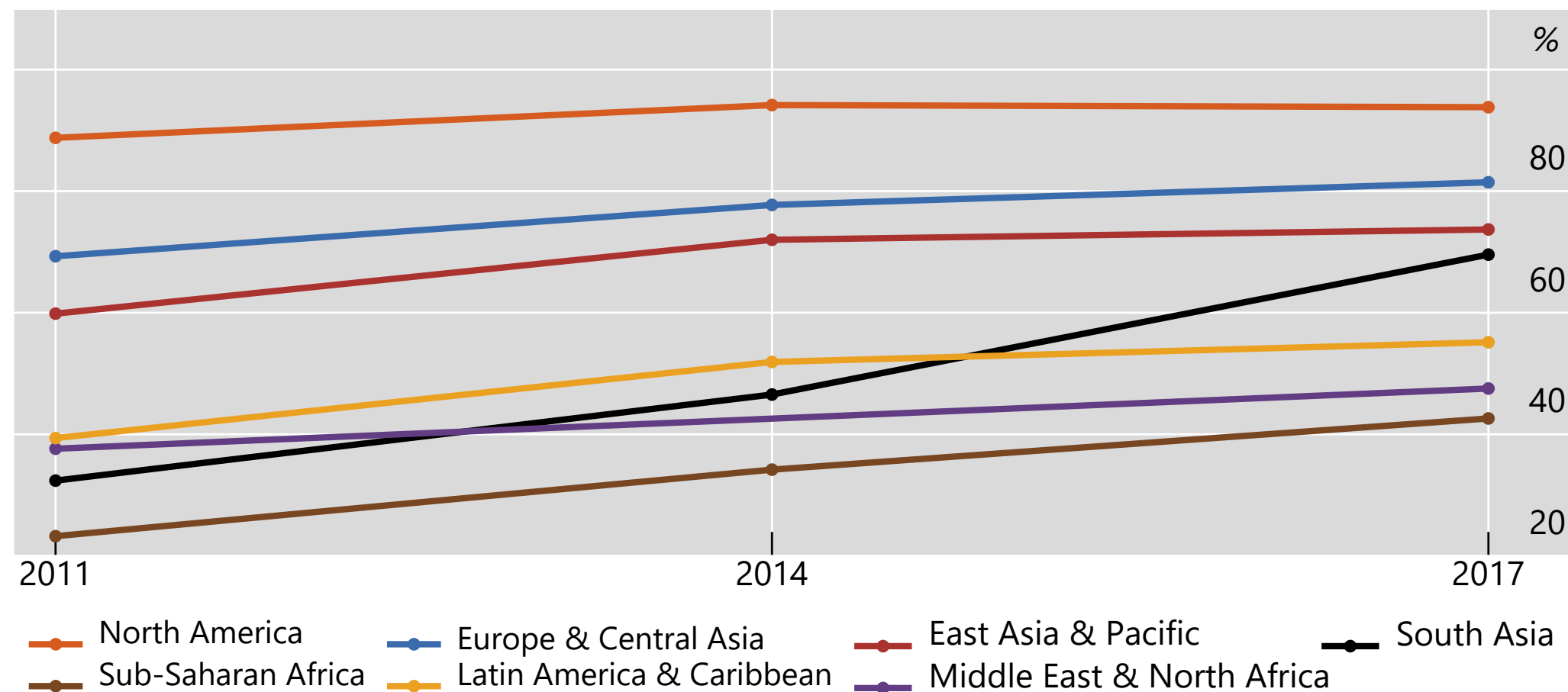


Results of the central estimates of cumulative consumption growth (in %) per 100 basis points of an expansionary monetary policy shock using a standard panel vector autoregression (PVAR) with quarterly data from 1999 to 2019 for 20 advanced economies

Source: Kharroubi, Kohlscheen, Lombardi, Mojon and Pereira (2021), in progress

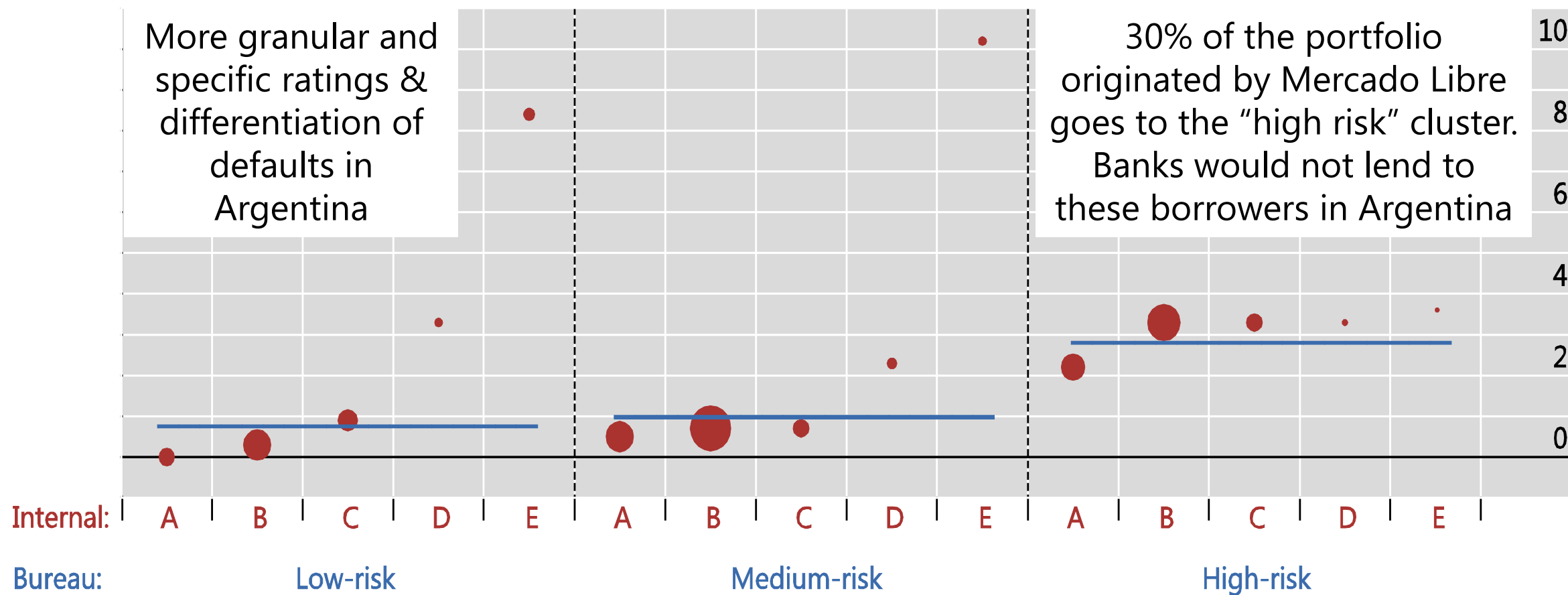
Mobile money has also increased account access

Progress with account access across regions but especially South Asia (black line)



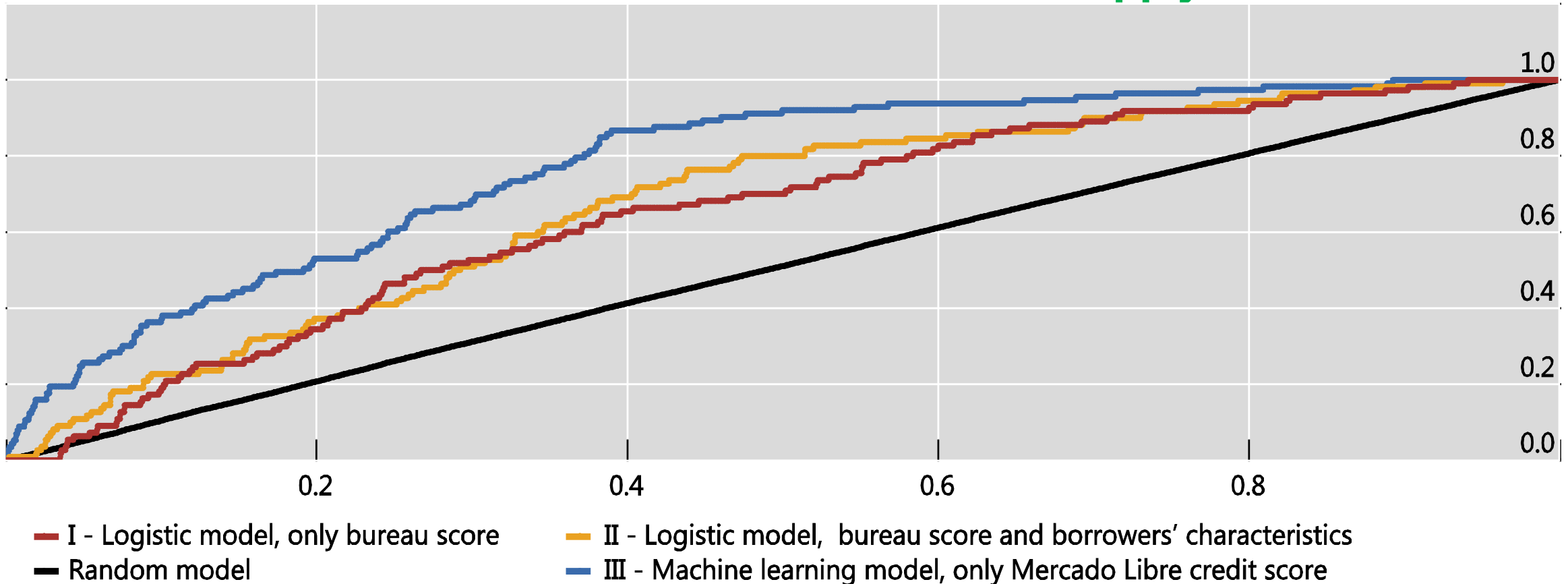
Source: D'Silva et al (2019).

Fintech increases credit-access to unbanked (higher-risk HH & SMEs): Loss rates by big tech internal ratings vs the credit bureau in Argentina



The figure shows the loss rate, i.e. the volume of loans more than 30 days past due relative to the origination volume. In its use to date, the internal rating of Mercado Libre is better able to predict such losses. It segments the originations into five different risk groups (A through E) versus the three clusters identified by the bank bureau. For a given bureau rating (i.e. low), the expected loss rate is strictly monotonous with the internal rating (i.e. internal rating orders expected loss). Conversely, given an internal rating (i.e. C, D or E), the loss rate is not strictly monotonous with the bank bureau risk. The size of the dots is proportional to the share of the firms in rating distribution. Sources: authors' calculation on Mercado Libre data.

Better prediction of default using ML big data as seen by ROC curves for the different credit score models; allows to increase supply of credit



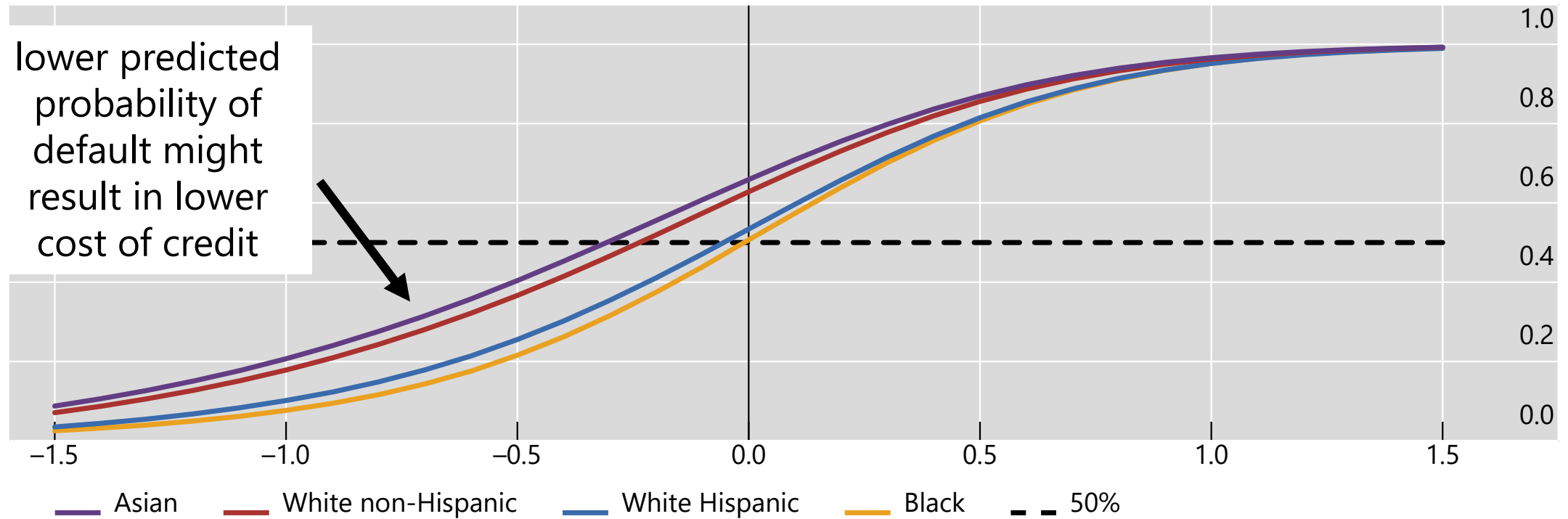
The figure shows true positive rates versus false positive rates for borrowers at different thresholds for three different models:

(I) a logistic regression with only the credit bureau score on firm i at time t as dependent variable; (II) a logistic regression with the credit bureau score and additional borrower characteristic; and (III) a machine learning model based only on the Mercado Libre internal rating. A random model is included for comparison purposes. The ROC curve shows that the machine learning model has superior predictive power to both the credit bureau score only and the credit bureau score with borrower characteristics.

Sources: Mercado Libre; authors' calculations.

But...: change in default probability in US mortgage markets of “traditional” scores vs ML-based credit scoring. All win but still discrimination?

Credit innovations may benefit differently ethnic groups (cumulative share of borrowers)

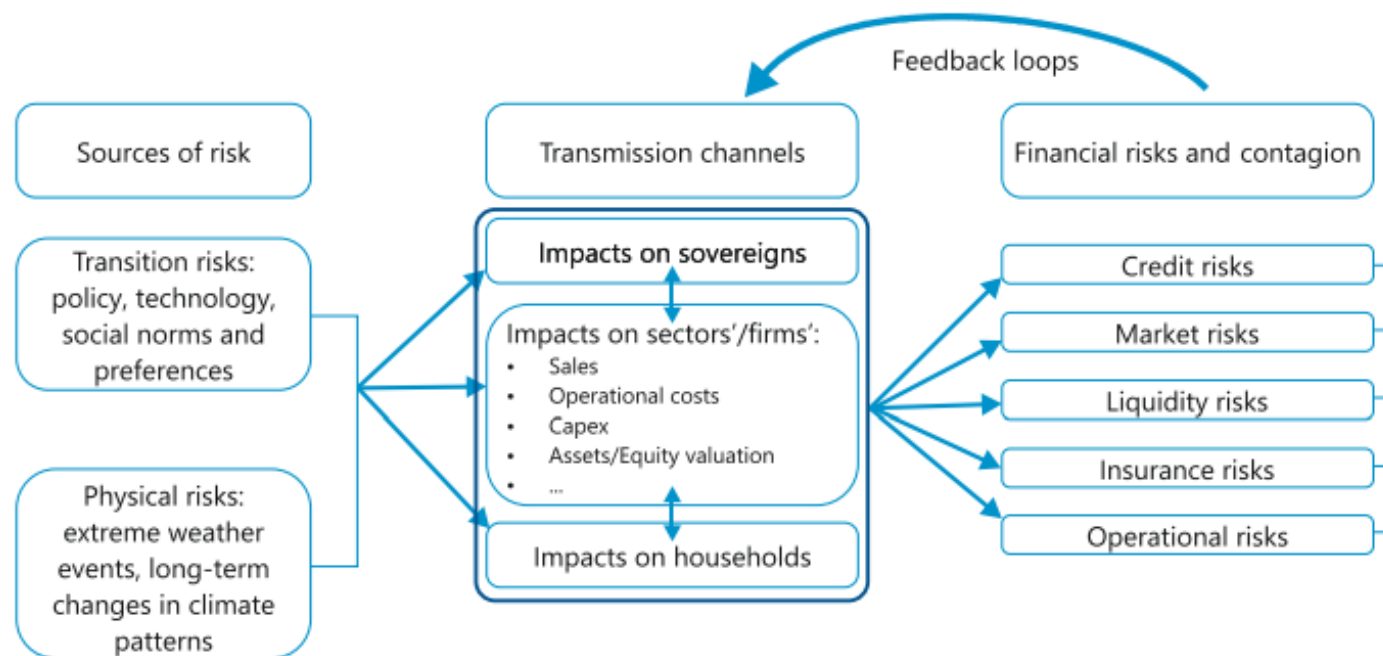


¹ On the horizontal axis is reported the change in the log predicted default probability as lenders move from traditional predictive technology (a “Logit” classifier) to machine learning technology (a “Random Forest” classifier). On the vertical axis is reported the cumulative share of borrowers from each racial group that experience a given level of change.

Sources: Fuster et al (2020); Gambacorta et al (2019).

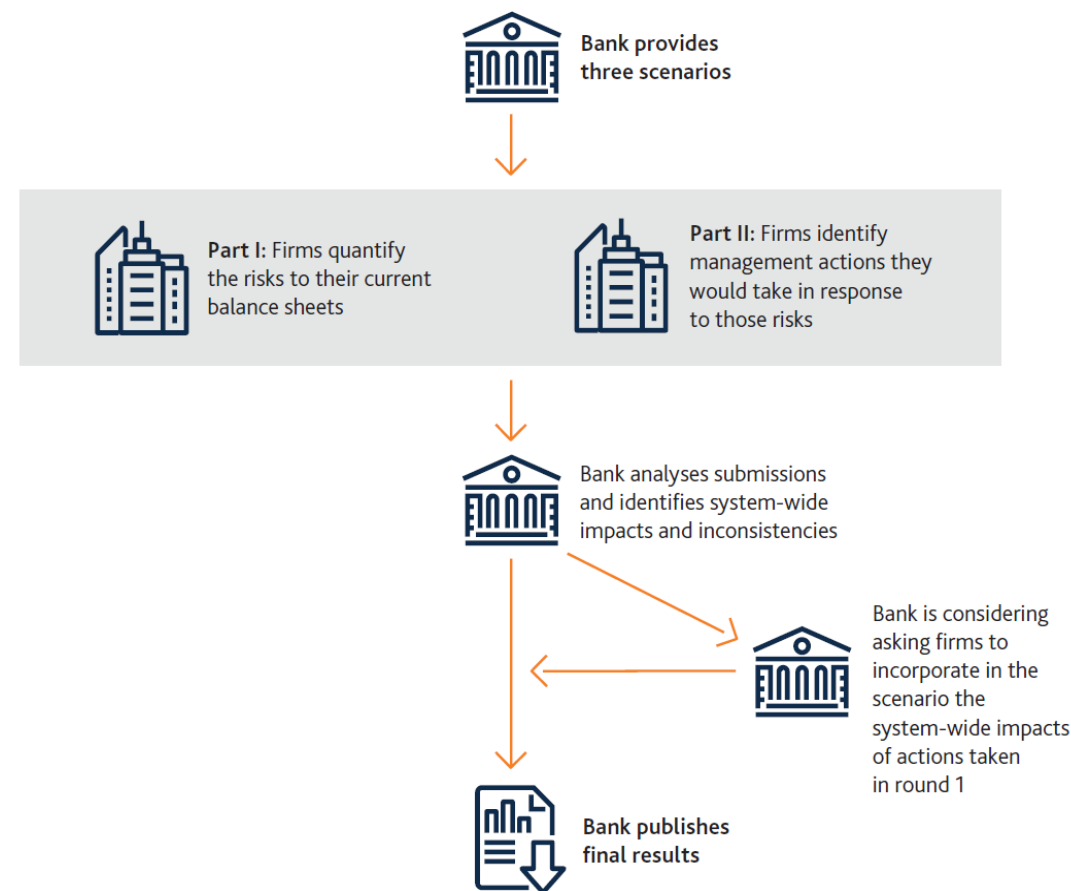
Concrete roles for central banks – models of transmission of CC-related risks

- **Analytical challenge:** understand how financial stability risks transmits
 - **Development of new models** (IAMs, general equilibrium or disequilibrium, links to human migration, global effects → some risks “not-diversifiable”, etc)
 - **Complexity of transmission of CC**, irreversible “tipping-points”, non-linearity, “cascading effects” into economy, feedback loops, etc.



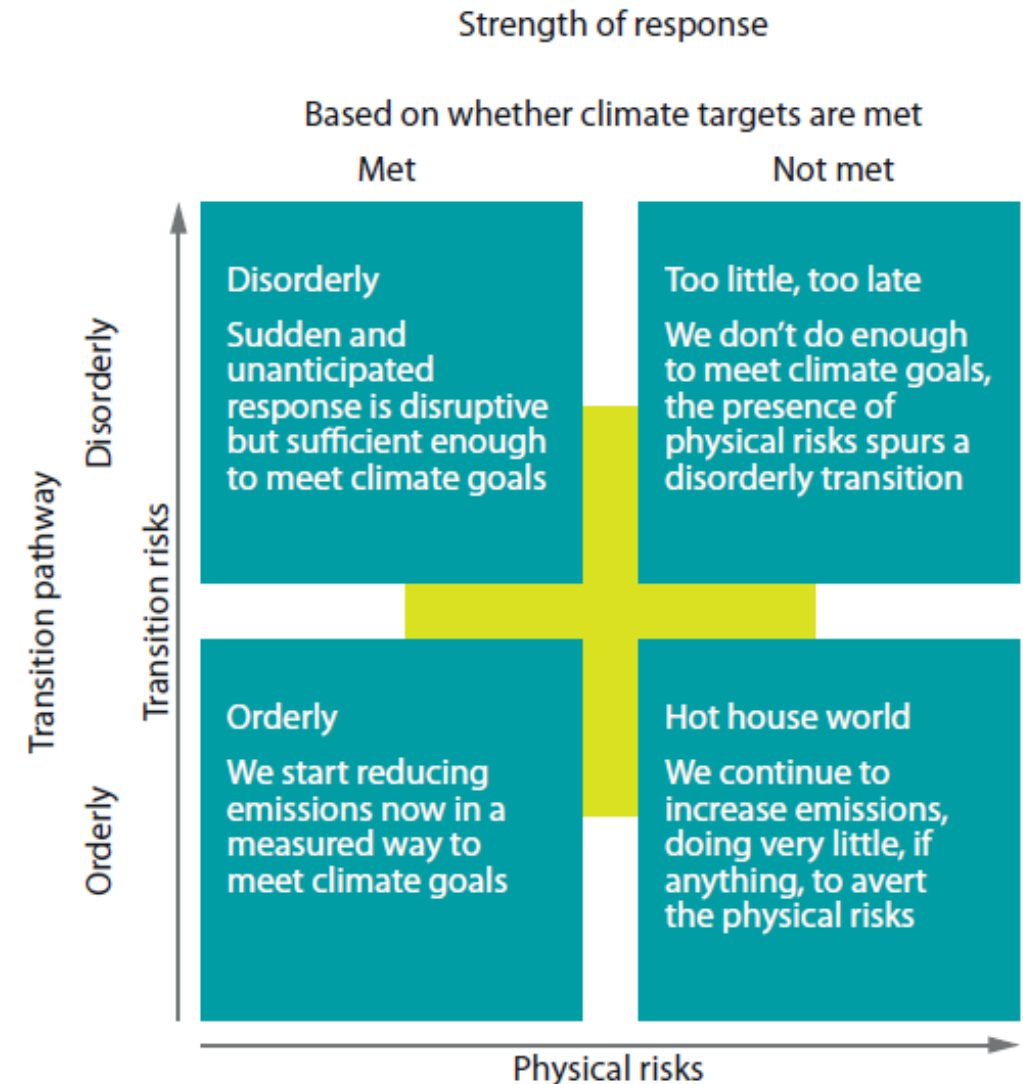
Concrete roles for central banks – stress-testing

- **Assessment and management of climate-related risks** (in the banking and insurance sector)
 - **Stress-testing** a key instrument, given the forward-looking nature of risks
 - See NGFS
 - Several CBs, supervisors taking concrete actions to incentivise banks to enhance their risk management (see Bank of England 2021 climate-stress test on the right, also in emerging markets)
 - **Disclosure of exposures** (TCFD, FSB)



Concrete roles for central banks – provision of climate scenarios

- **Scenarios are the key ingredient to stress-testing** and the NGFS has developed reference scenarios (on the right)
 - These scenarios are a public good (freely available) and increasingly used by the private sector as well (eg Blackrock “Aladdin” platform)
 - Further refinements (eg sectoral granularity, more financial variables) are in the pipeline
 - Reference scenarios can help to ensure comparability and information value in stress-tests



Concrete roles for central banks – improve taxonomy around “green”

- **Holdings of assets** for implementation of policies → hence definition of “green” is important
 - Reserve management
 - BIS green bond fund as a practical means for CBs to invest in green assets; official launch of EUR green bond fund last week
 - Moving towards sustainability and responsible investment (SRI) practices (eg SNB, BdF)
 - Pension funds
 - CBs are implementing SRI strategies; ESG disclosures in annual reports
- **Improving definitions** of “green” financial instruments, taxonomies (ESG, responsible investment)
- **Demand high from investors and civil society** to inform and guide decisions

The five Cs – Contribute to Coordination to Combat Climate Change

- **NGFS** (“coalition of the willing”) to coordinate among supervisors and central banks
 - Broad representation: Currently 83 members and 13 observers
- Coordinate and support international effort to *close data gaps* (NGFS workstream on bridging data gaps; FSB (SCAV) work to monitor and assess the implications of climate-related risks to financial stability; Irving-Fisher committee; G20 data gaps initiative etc)
- Help in developing green and sustainable finance standards
 - Engagement with issuers to improve green bond reporting to prevent green-washing
 - Support the development of ESG standards (see UBS white paper)



End