FINANCING GREEN ENERGY: UNLOCKING PRIVATE INVESTMENT IN RENEWABLE ENERGY

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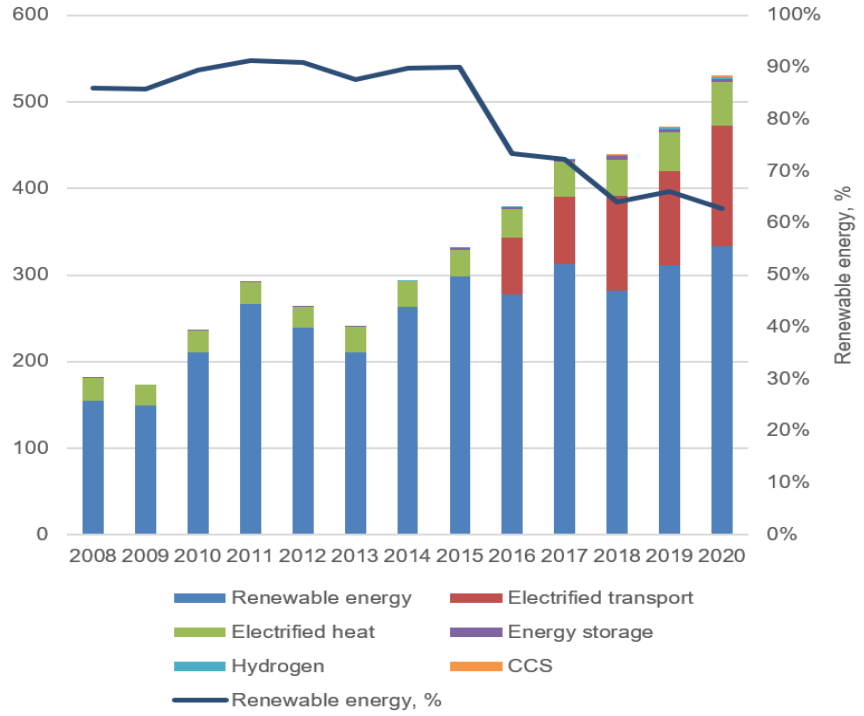
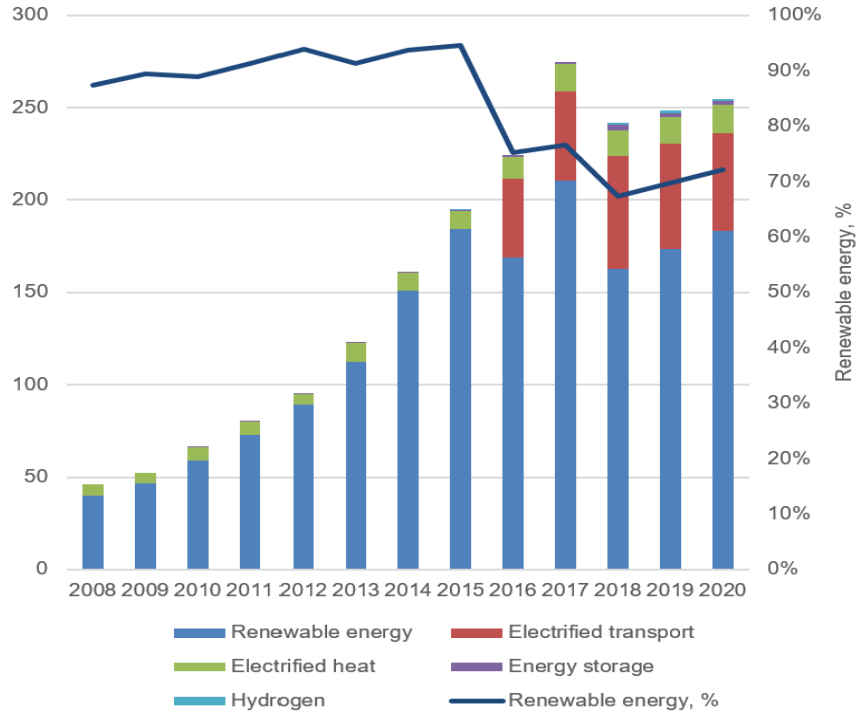
Investment in low-carbon energy transition reached a record high $531 billion in 2020, despite the COVID-19 crisis, with the Asia-Pacific region accounting for half of all investment in low-carbon energy transition

World ($ bln)



Asia-Pacific ($ bln)



Source: Azhgaliyeva, D., J. Beirne, and R. Mishra, 2022. "What Matters for Private Investment in Renewable Energy?" *Climate Policy*, forthcoming.

Structure of presentation

1. Background
2. Empirical methodology
3. Empirical results
4. Key policy takeaways

Background

- Barriers for investments in renewable energy

  such as subsidies to electricity generated from fossil fuels,

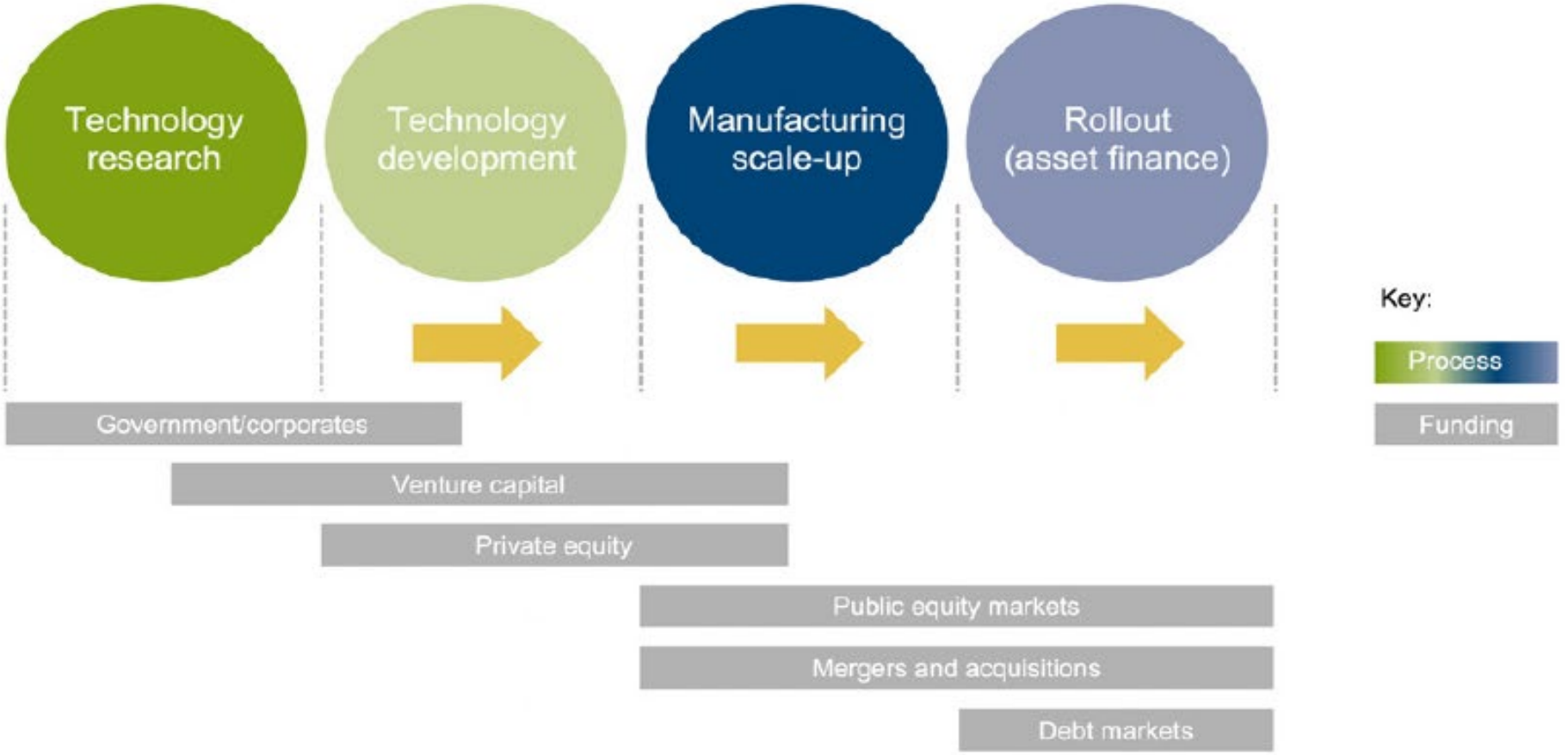
  high initial capital costs

  lack of skills or information and uncertainties (Azhgaliyeva et al. 2019; Menanteau et al., 2003) and

- Literature studying the effectiveness of energy policies on private investments in renewable energy is highly limited.
- Empirical literature focuses on the total investment in renewable energy (Eyraud, Clements, and Wane 2013), or total private investment in renewable energy (Azhgaliyeva et al. 2019)
- We distinguish between sources of private investments

Background (Cont.)

FINANCING CONTINUUM



Source: UN environment, Frankfurt School-UNEP Centre, Bloomberg NEF (2019)

Definitions of Asset Classes Private Investments in Renewable

Venture capital and private equity: Venture capital funding for the purposes of expansion by companies in the clean energy industry.

Asset finance: Financing of renewable energy projects via the balance sheets or financing mechanisms such as syndicated equity from institutional investors or project debt from banks.

Public market: New equity raised on capital or over-the-counter markets by publicly quoted companies in the clean-energy industry.

Small-scale solar: Rooftop solar PV with capacity below 1 MW.

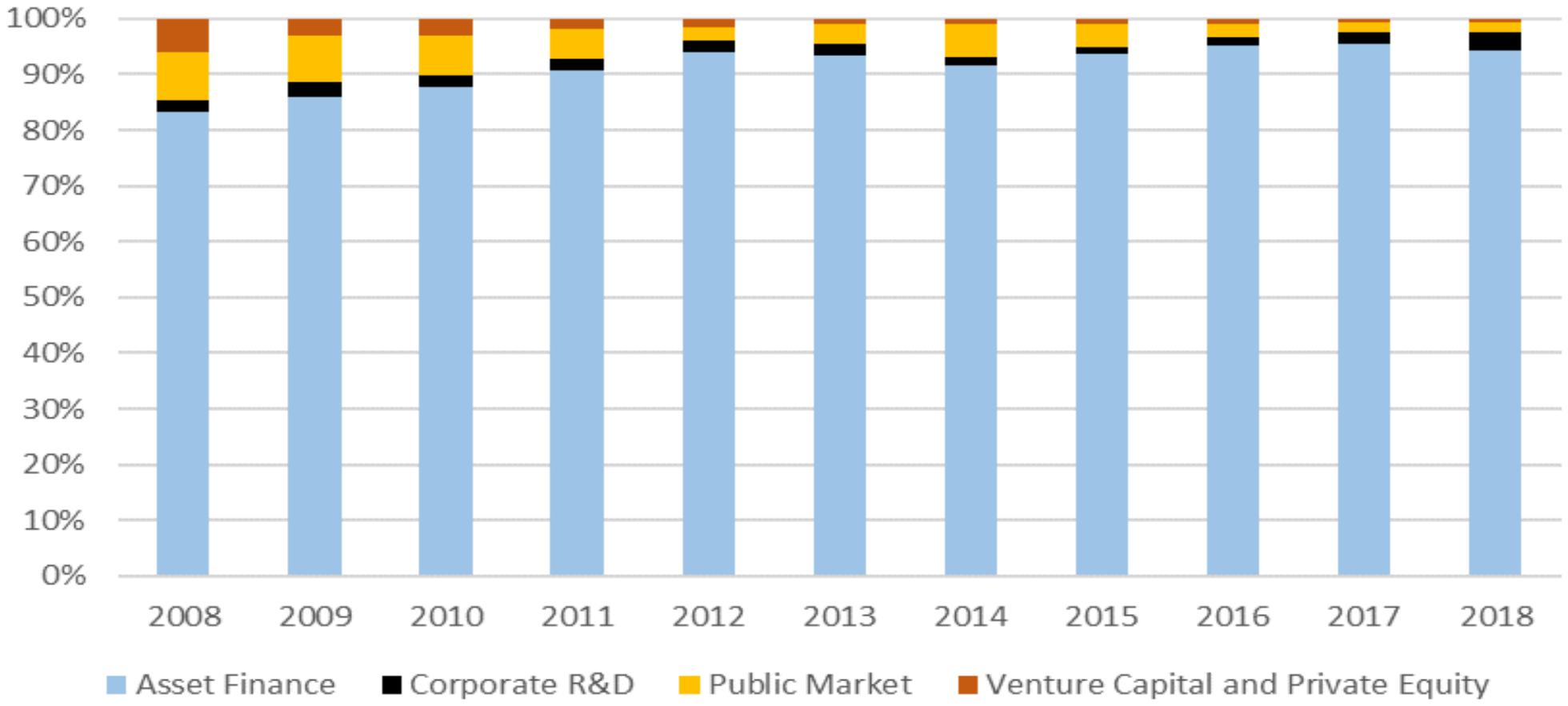
Government R&D: Government R&D expenditure data converted from current prices in national currencies into US dollars.

Corporate R&D: Corporate R&D expenditure data converted from current prices in national currencies into US dollars.

Source: Azhgaliyeva et.al. (2019)

Background (Cont.)

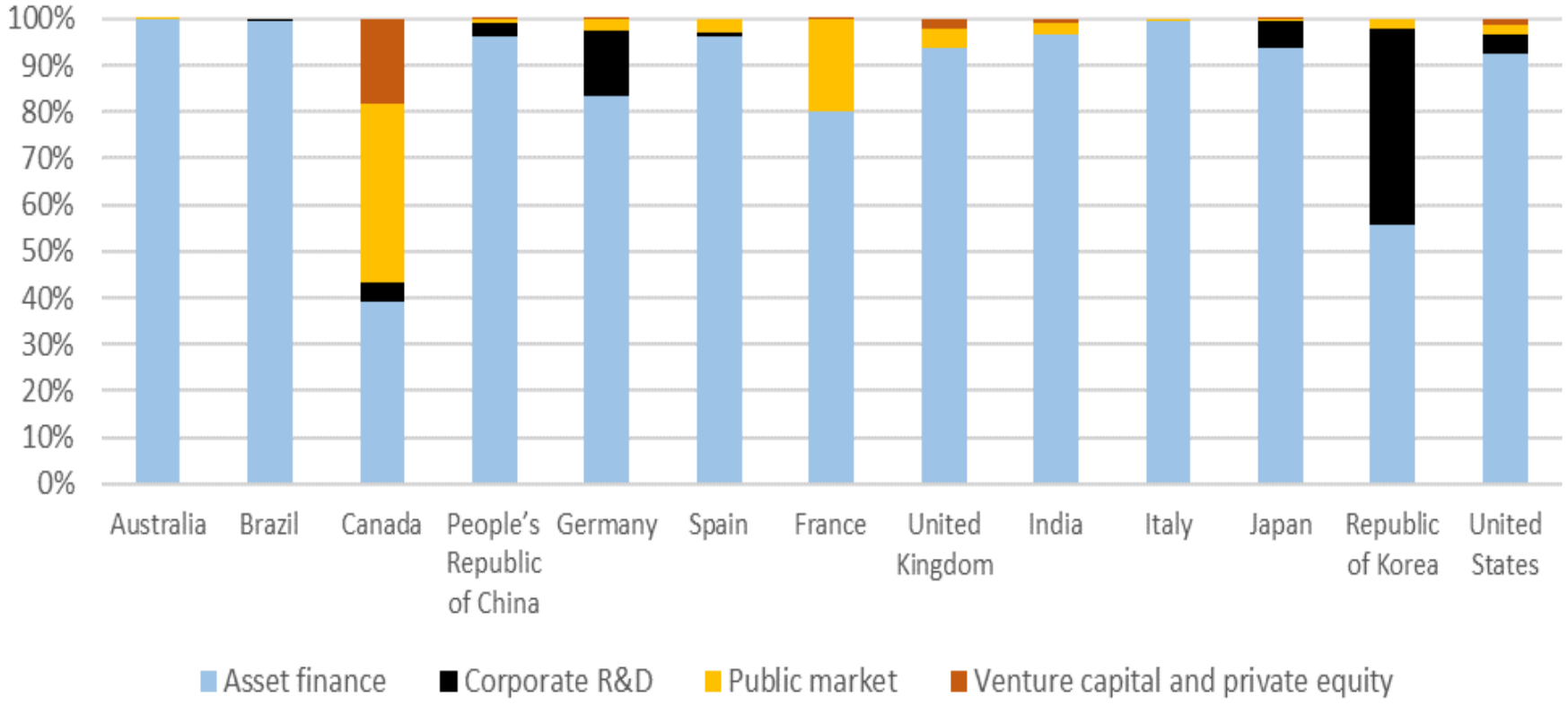
Share Asset Class in Private Investment, by Year



Source: Authors own, computed using data from Bloomberg NEF - BNEF.com

Background (Cont.)

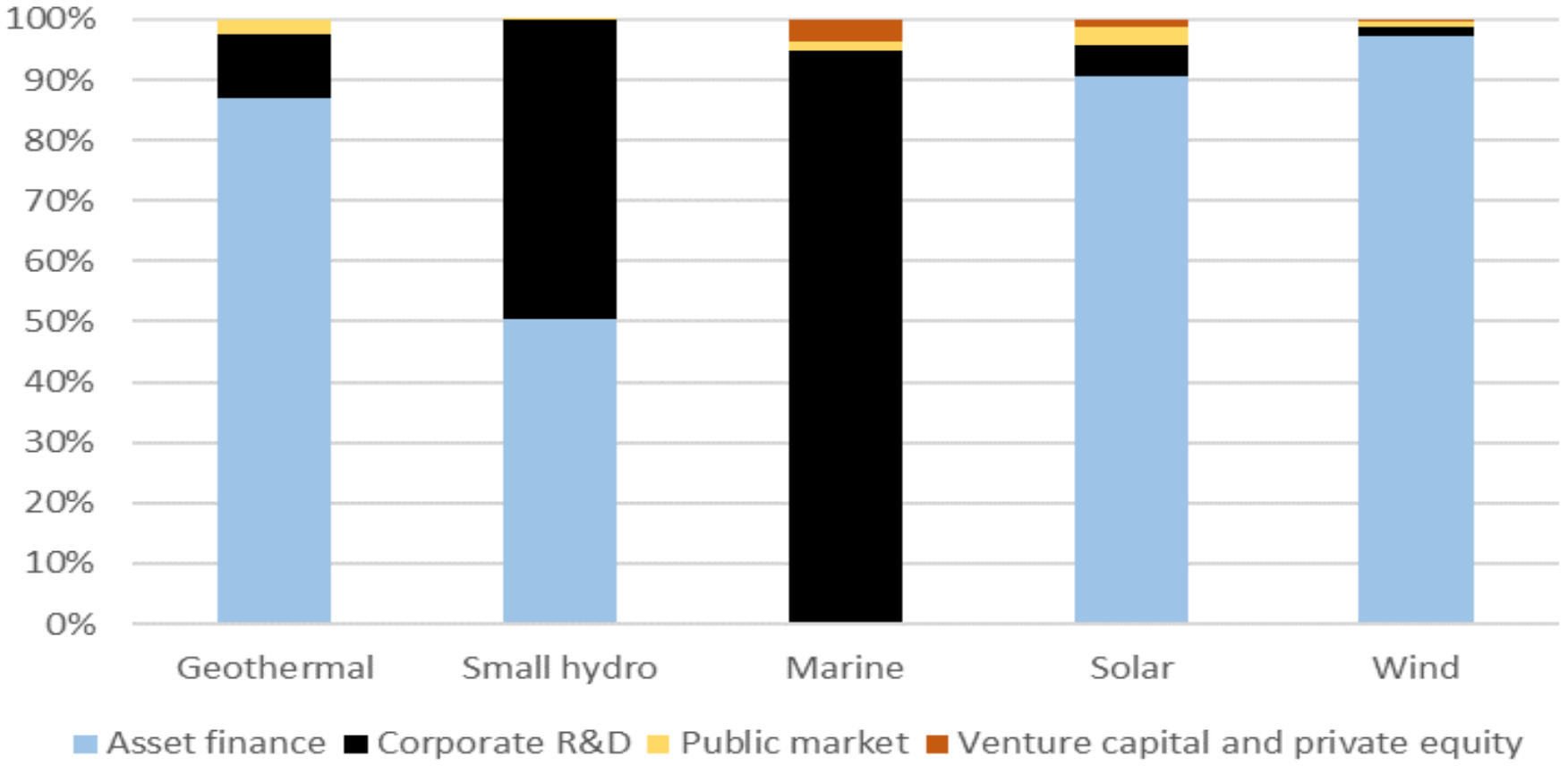
Share Asset Class in Private Investment in RE, by country (2018)



Source: Authors own, computed using data from Bloomberg NEF - BNEF.com

Background (Cont.)

Share of Technology in Private Investment in RE, by year, 2018



Source: Authors own, computed using data from Bloomberg NEF - BNEF.com

Methodology

Data:

Variable	Country-level (13 countries)	Renewable energy-level (5 technologies)	Period-level (2008-2018)
Dependent variables: asset finance, corporate R&D, public markets, venture capital and private equity	٧	٧	٧
Independent variables:			
Government R&D	٧	٧	٧
FIT	٧	٧	٧
Tax	٧	٧	٧
Technology cost		٧	٧
Energy price index	٧		٧
GDP per capita	٧		٧
Real GDP growth	٧		٧
Public debt/GDP	٧		٧
Inflation	٧		٧
Stock market	٧		٧
Capitalization/GDP	٧		٧
Bond yield	٧		٧
Regulatory quality index	٧		٧
Soundness of banks	٧		٧
VIX (global volatility index)			٧

Source: Azhgaliyeva, D., J. Beirne, and R. Mishra, 2022. "What Matters for Private Investment in Renewable Energy?" *Climate Policy*, forthcoming.

Methodology (cont.)

Model:

$$Y_{i,j,t} = \beta X_{i,j,t-1} + \gamma Z_{i,t-1} + \chi F_{i,t-1} + \mu VIX_{t-1} + \alpha_i + \delta_j + \lambda_t + \varepsilon_{i,j,t} \quad , \quad (1)$$

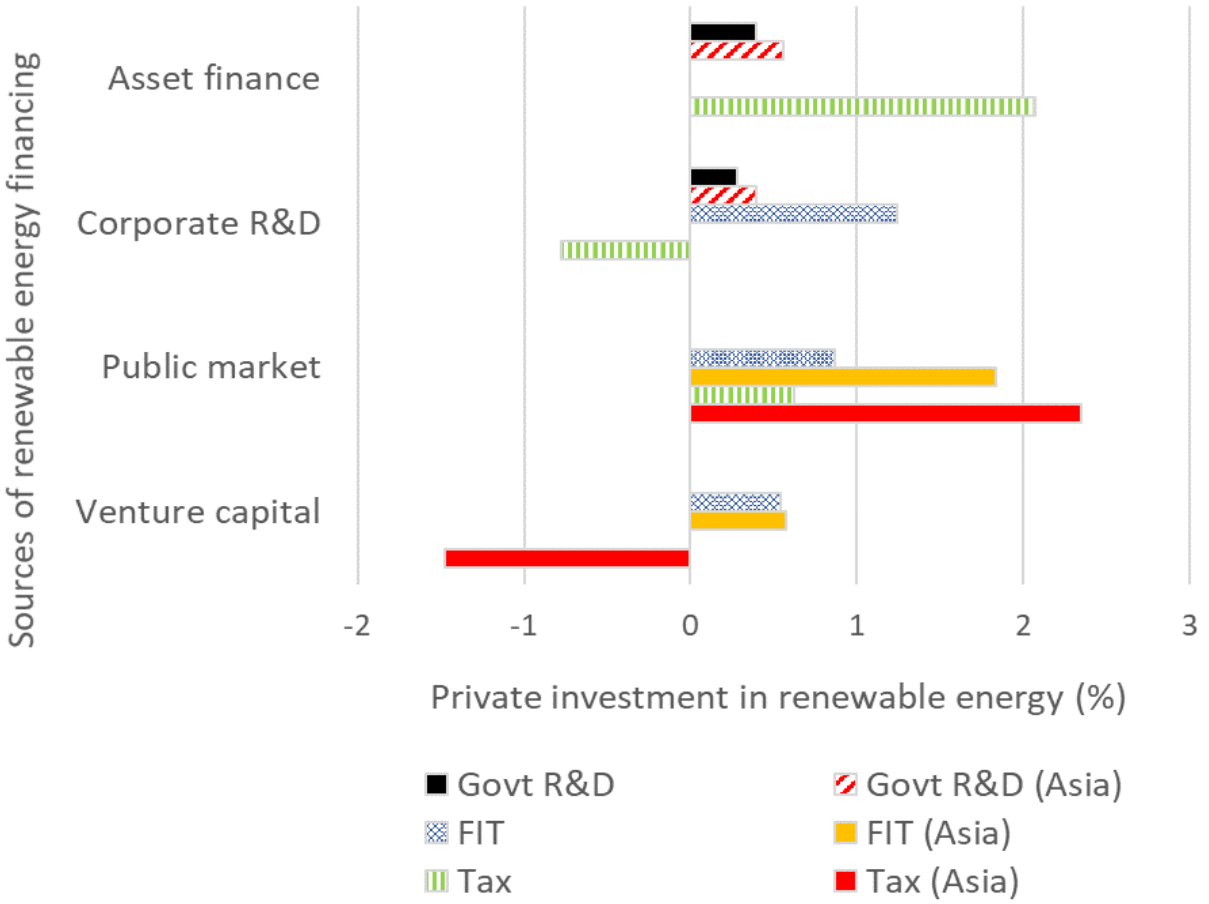
where $i = 1$ to 13 (countries), $j = 1$ to 5 (types of renewable energy) and $t = 2008$ to 2018 (years).

Main results

	Asia				Total			
	Asset finance	Corporate R&D	Public market	Venture capital and private equity	Asset finance	Corporate R&D	Public market	Venture capital and private equity
Energy-specific variables								
Government R&D, log	0.55***	0.39***	0.19	-0.13*	0.39***	0.28***	0.03	-0.01
	(0.09)	(0.11)	(0.12)	(0.08)	(0.05)	(0.05)	(0.06)	(0.04)
FIT, binary	-0.22	0.09	1.84***	0.57*	-0.24	1.24***	0.86**	0.54**
	(0.36)	(0.42)	(0.48)	(0.31)	(0.33)	(0.30)	(0.35)	(0.26)
Tax, binary	1.13	-0.96	2.35*	-1.48*	2.07***	-0.78***	0.62*	0.32
	(1.05)	(1.22)	(1.39)	(0.89)	(0.32)	(0.28)	(0.33)	(0.25)
Tech. cost	-1.49***	-0.03	0.06	-0.11	-0.91***	-0.03	-0.24	0.15
	(0.38)	(0.45)	(0.51)	(0.33)	(0.27)	(0.24)	(0.28)	(0.21)
Energy price	2.81*	-1.09	-1.53	1.15	-0.09	0.16	-0.09	1.76**
	(1.59)	(1.86)	(2.09)	(1.35)	(1.12)	(1.00)	(1.17)	(0.86)
Regulatory quality x FIT	0.11	0.33	-1.65***	-0.49	0.37	-0.93***	-0.54*	-0.48**
	(0.44)	(0.52)	(0.59)	(0.38)	(0.31)	(0.27)	(0.32)	(0.24)
Regulatory quality x Tax	-5.61*	2.29	8.68**	-8.00***	-1.02***	1.53***	-0.30	0.26
	(3.09)	(3.59)	(4.06)	(2.62)	(0.31)	(0.28)	(0.33)	(0.24)

Source: Azhgaliyeva, D., J. Beirne, and R. Mishra, 2022. "What Matters for Private Investment in Renewable Energy?" *Climate Policy*, forthcoming.

Main results (contd.)



- Tax incentives (such as exemptions or reductions of import duty on renewable energy) increase total private investment.
- But reduce investments in research, development and manufacturing scale-up.
- Impacts of policies (Tax, Feed-in Tariffs and Government R&D) in Asia (PRC, India, Japan, Rep. of Korea) on investments are stronger than in other regions.

Source: Azhgaliyeva, D., J. Beirne, and R. Mishra, 2022. "What Matters for Private Investment in Renewable Energy?" *Climate Policy*, forthcoming.

Main conclusions

- Mobilizing private sector investments in low carbon infrastructure is important from the perspective of sustainable development.
- While government R&D positively affects private investment from asset finance and corporate R&D, it is not the most important driver in terms of the magnitude of the elasticity. Moreover, no significant effect is found from government R&D for public markets, venture capital and private equity financed investment.
- FITs have a particularly strong effect on stimulating renewable energy investment financed through public markets, with the findings particularly strong for the Asian sub-sample.
- Tax incentives have a mixed impact across sources of financing. Fourth, technology costs and energy prices have considerable effects on driving renewable energy investment from asset finance, with the impact notably more pronounced for the Asian sub-sample.

Key policy insights

- To maximize the impact of government R&D, policies should aim to facilitate a smoother investment environment for the private sector in the areas of asset finance and corporate R&D. This could include targeted subsidies and tax relief measures.
- Enhanced FIT mechanisms should be developed, particularly in Asia, to leverage greater investment financed via publicly quoted markets. This could also include more favorable initial fiscal incentives and terms of agreement.
- Tax incentives should be used with caution. While tax incentives have a positive effect on investment in renewable energy overall, they may negatively affect investment financed by corporate R&D and venture capital and private equity, i.e. private financing sources that are crucial for technology R&D and manufacturing scale-up.
- Countries with lower regulatory quality may need to offer higher FIT rates for policies to be effective in attracting private investment.

Thank you for your time!