

From Synthetic Biology to Engineering Biology

Responsible Innovation: Industrial Biotechnology and Engineering Biology

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Note: material is not necessarily a formal reflection of the views of the EBLC

Is Engineering Biology just a different name for Synthetic Biology?

Engineering Biology

Review Article

Synthetic biology, engineering biology, market expectation

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<http://bit.ly/2WlWtje>

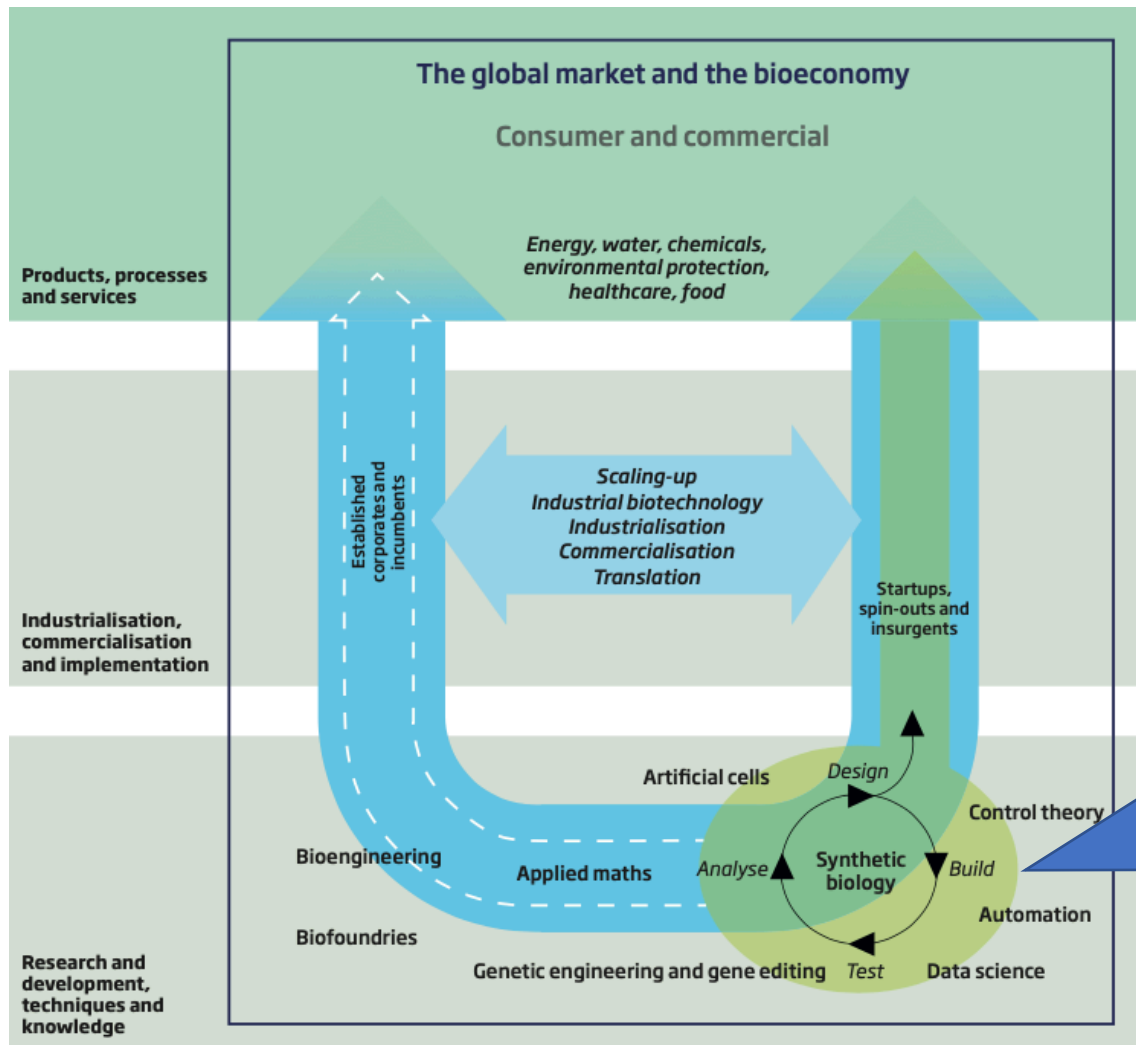
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No - they have distinctive characteristics :

Synthetic Biology is a technology platform providing the launchpad for commercial development.

Engineering Biology draws upon this platform but may also accommodate a broader range of techniques as needed to deliver to market the intended functioning product or service.



ENGINEERING
BIOLOGY
A PRIORITY
FOR GROWTH



December 2019

Synthetic Biology at the heart of
Engineering Biology

- applying the DBLT cycle
- automating 'learning by doing'
- increasing predictability & affordability
- facilitating ever greater challenges

<https://www.raeng.org.uk/publications/reports/engineering-biology-a-priority-for-growth>

Engineering Biology is an overarching term that incorporates platform research and development (synthetic biology) and industrial translation to address market needs

Engineering Biology embraces the full range of technologies that must be harnessed to translate biodesign into commercially viable operations, scaled and regulated to deliver widespread economic prosperity and associated societal benefits.

Engineering Biology – Why Now?

The shift in terminology to **Engineering Biology** does not signal an end the continuing advancement of synthetic biology as an underpinning research platform

but instead

heralds in a new era in which the opportunities and benefits arising from its commercial translation are becoming increasingly recognised by the wider community



Engineering Biology: putting SynBio to Work

UK Engineering Biology Leadership Council (EBLC):
the industry and government-led co-ordinating body
overseeing the UK's ongoing research, translation and
commercial development of synthetic biology,
alongside related innovative biotechnologies

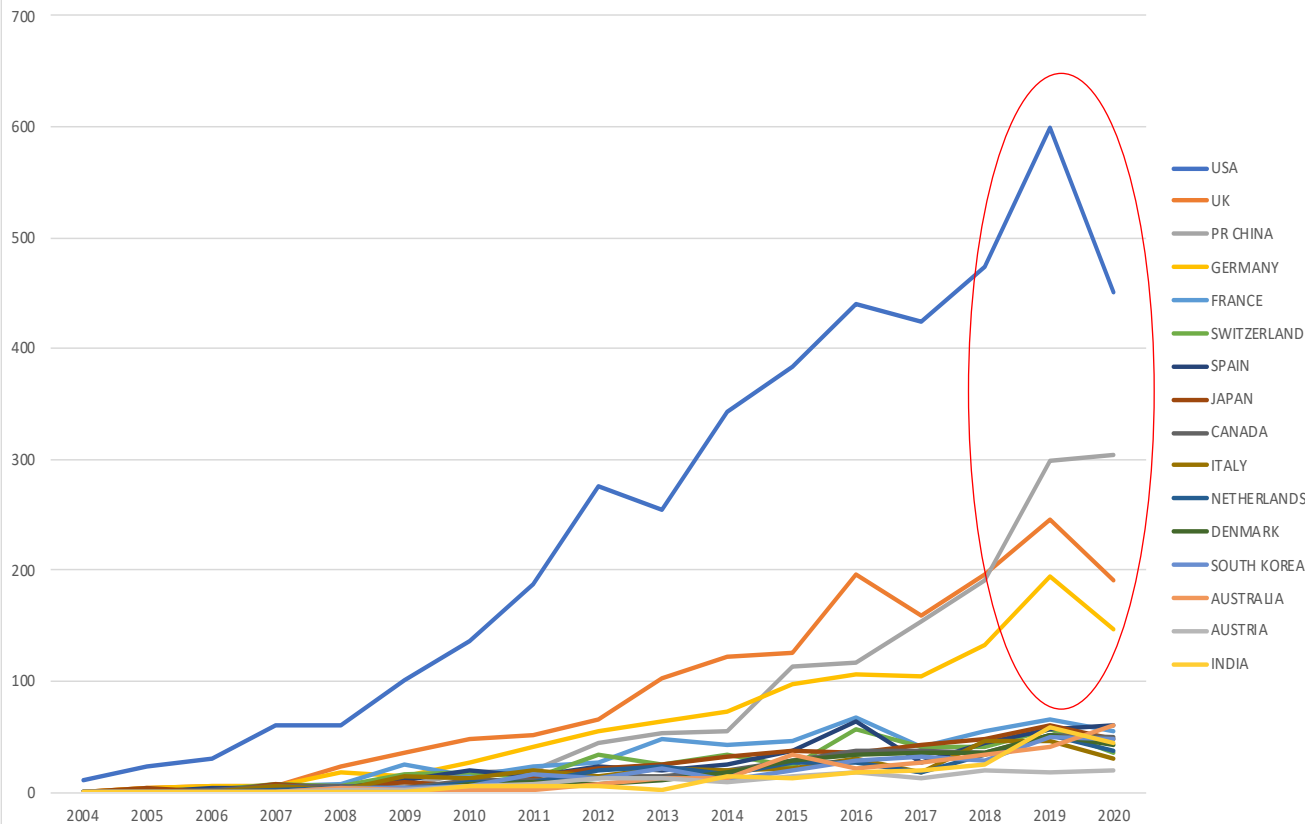
Shaping the
'translation and commercialisation eco-system' and
collaborating with other key stakeholders as needed

in response to:

- increasing 'market demand' for the generation of innovative solutions to significant sustainability challenges both local and global, spanning food, chemicals, materials, energy and the environment
- potential future role for the UK Bioeconomy as a major contributor to the Green Industrial Revolution

UK investment in synthetic biology R&D has helped maintain our world-leading role to date

Synbio publications by author nationality: top 16 out of 85 countries total (from WoS)



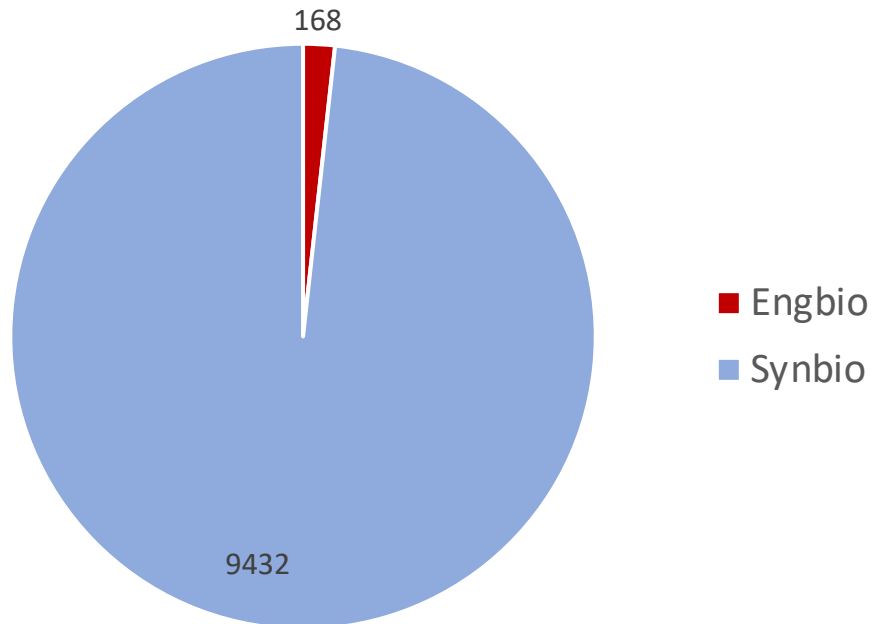
Research output dominated by four countries:

US (35%)
UK (13%)
China (11%)
Germany (9%)
(cumulative % 2004-2020*)

Commercial benefits are enhanced by the capacity of our research community to recognise significant discoveries being made globally as well as in the UK, then rapidly translating options arising into innovative applications. Agility is a critical factor.

*2020 data corrected up by 10% to anticipate year end

WoS publications 2010-2020



The language of the scientific community is 'Synthetic Biology'

Less than 2% research publications in past 11 years use the term 'Engineering Biology' compared to 'Synthetic Biology'.

Just 37 (0.4%) use both 'Engineering Biology' and 'Synthetic Biology' terms

The majority of other publications using the term 'engineering biology' address topics unrelated to the field of synbio.

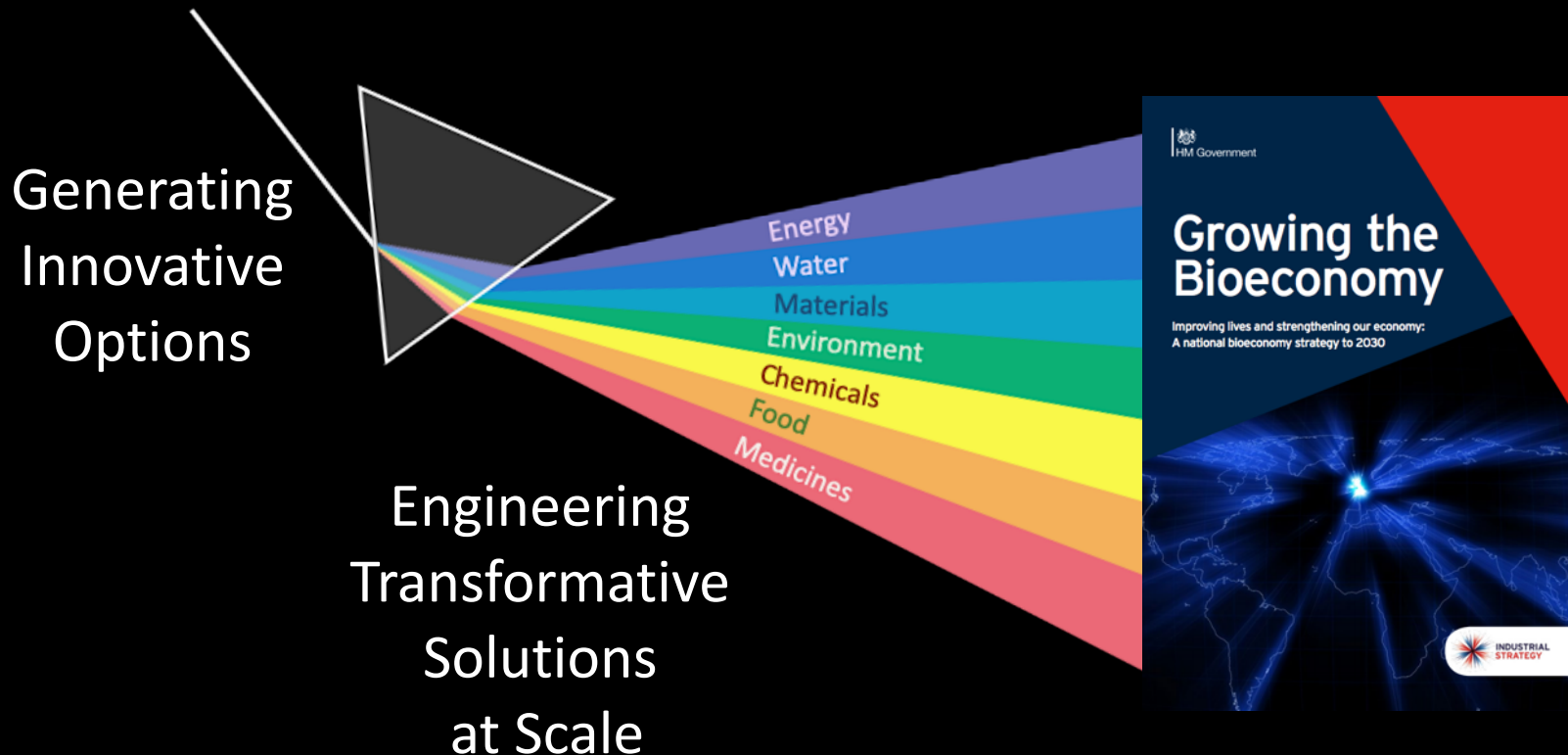
Source: Web of Science (WoS) database accessed Jan 2021

From Tech Push to Market Pull

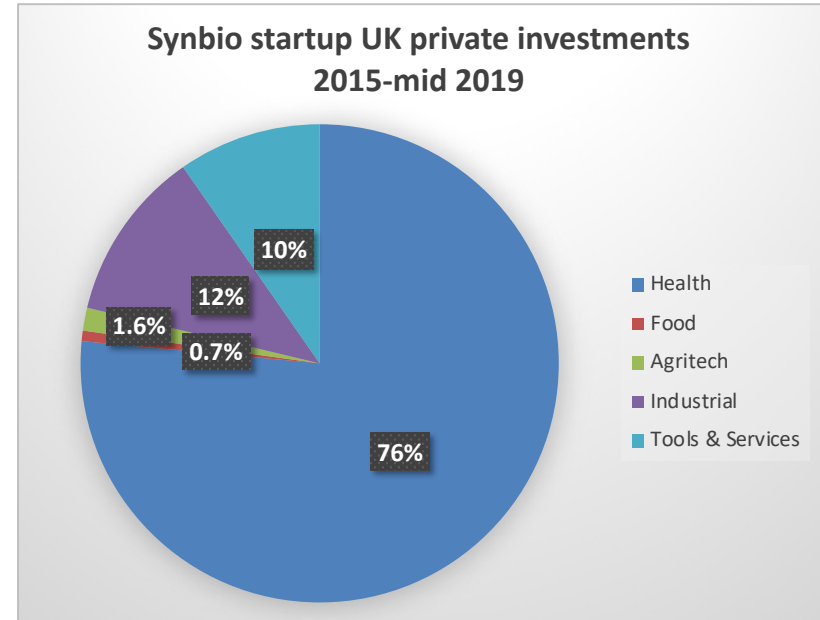
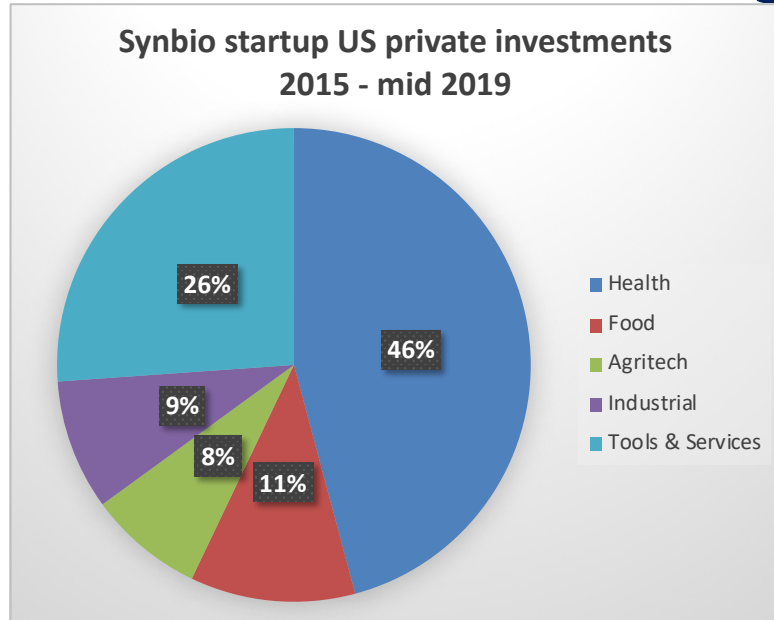


- ‘Net-zero’ will have profound impact on all fuel, chemicals and materials producers that currently rely upon fossil feedstocks
 - shifting from fossil/thermo-chem to bio/fermentation manufacturing feedstocks/processes....
 - includes many medicines
- Increasing concerns over environmental sustainability and personal health generating additional societal ‘market expectations’
 - market trends in USA (e.g. for ‘new foods’) an early indicator of emerging opportunities?
 - how will increasing awareness of global challenges and vulnerabilities shift viewpoints?
 - how to reconcile market pull for innovative solutions with the need to reassure society?
- Novel functionalities also attracting interest
 - e.g. bio-inspired advanced and ‘smart’ materials

from Technology Push to Market Pull



Market Segmentation: startup private investments in UK lag those in the US



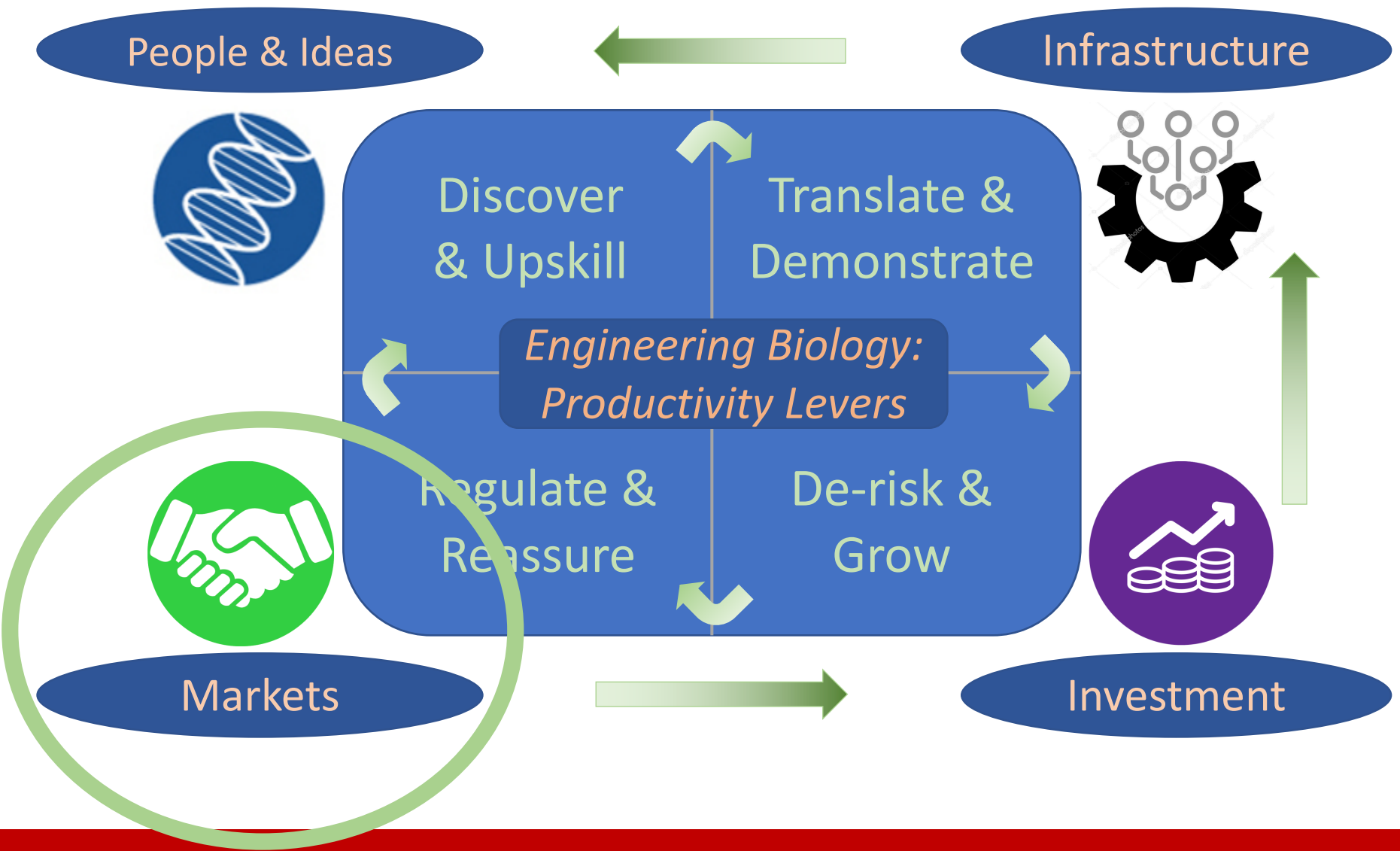
Using SynbioBeta online data published 2015 – mid 2019

Over \$12bn private investments into Synthetic Biology start-ups to date [SynbioBeta*]
(or \$20bn across Biotech more widely in 2018**)

* Synthetic Biology Has Raised \$12.4 Billion. Here Are Five Sectors It Will Soon Disrupt; John Cumbers, Forbes Magazine 4/9/2019

** How the BioRevolution could transform the competitive landscape, McKinsey 7 May 2020

<https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/how-the-bio-revolution-could-transform-the-competitive-landscape>



Thank you