What we can learn from the past

Conference

New World, New rules

Rethinking science policy in a fragmenting world

BELSPO-MERI

WTC III - October 6, 2025

EU Commission

- In January 2024 the EU Commission adopted the Economic Security Package, this includes two initiatives:
- White paper on enhancing support for R&D involving technologies with dual-use potential
- A proposal for a Council Recommendation on Research Security

Open Strategic Autonomy

Strategic autonomy

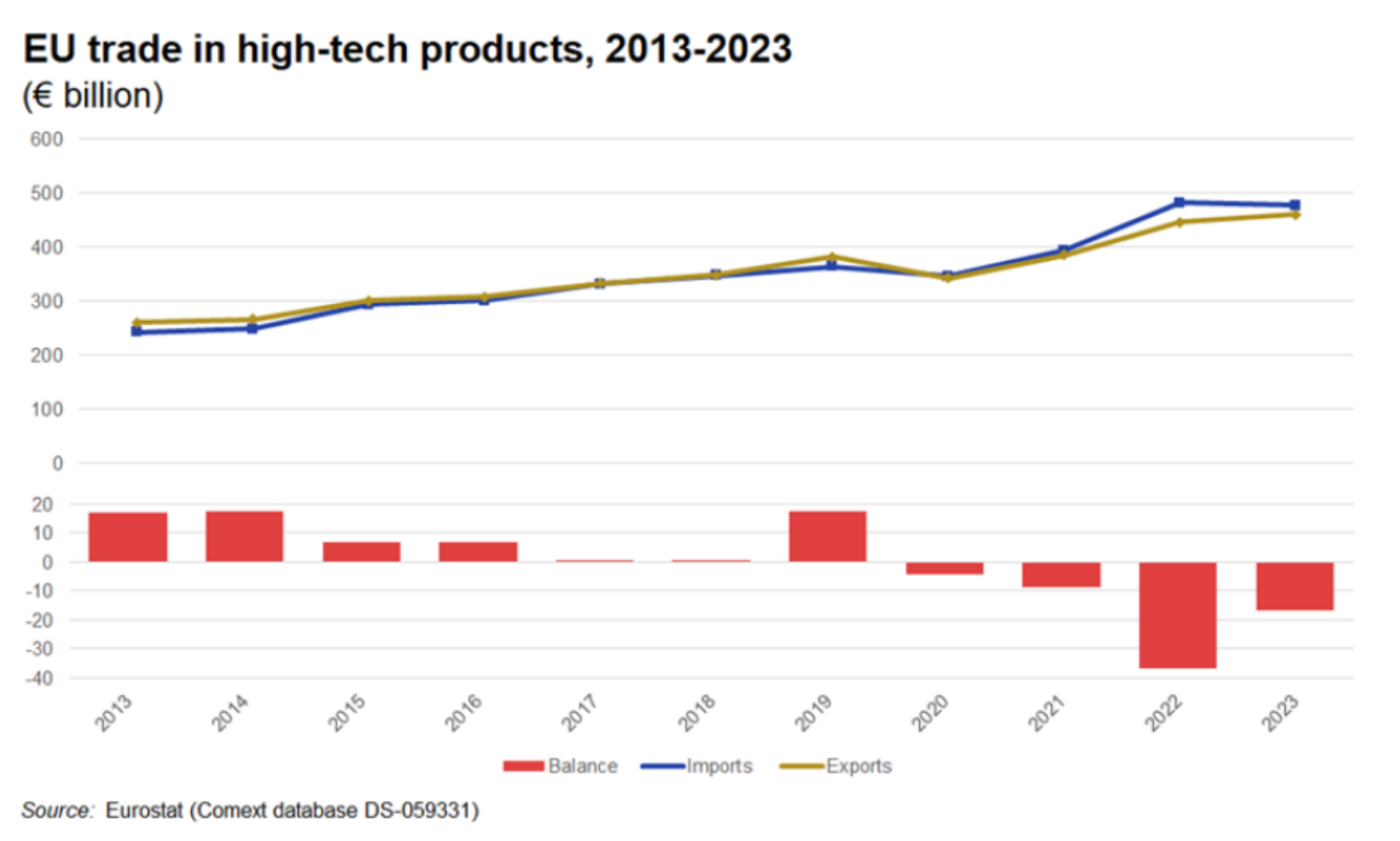
- Rare earth materials: unevenly distributed across the globe
- Production costs: higher energy prices in EU compared to the US and China
- Workforce with the skills to develop new technologies
- Dependance on the import of high-tech products

belspo

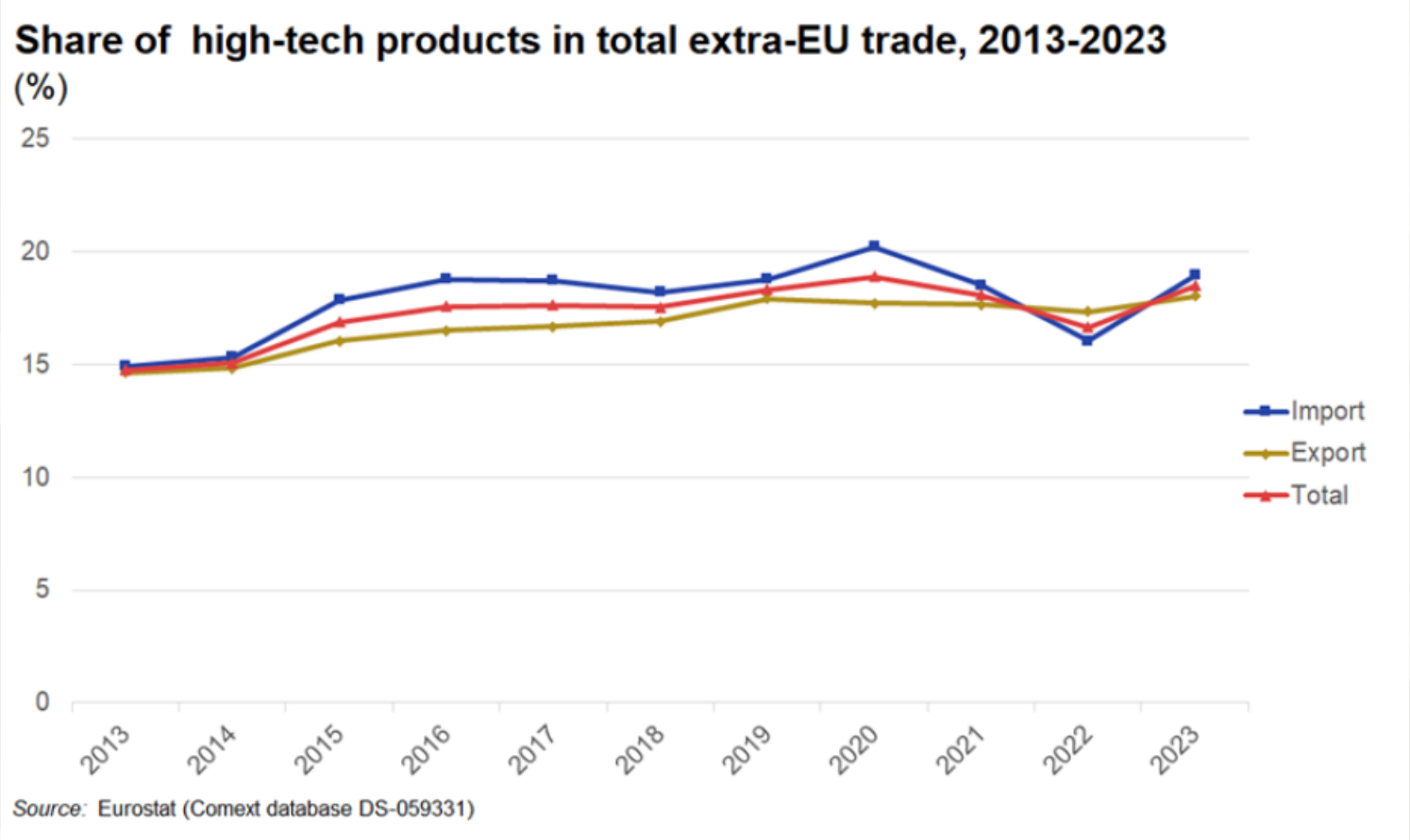
High-tech products

- 9 groups in the standard international trade classification (SITC): aerospace, computers, electronics-telecommunications, pharmacy, scientific instruments, electrical machinery, chemistry, non-electrical machinery and armament.

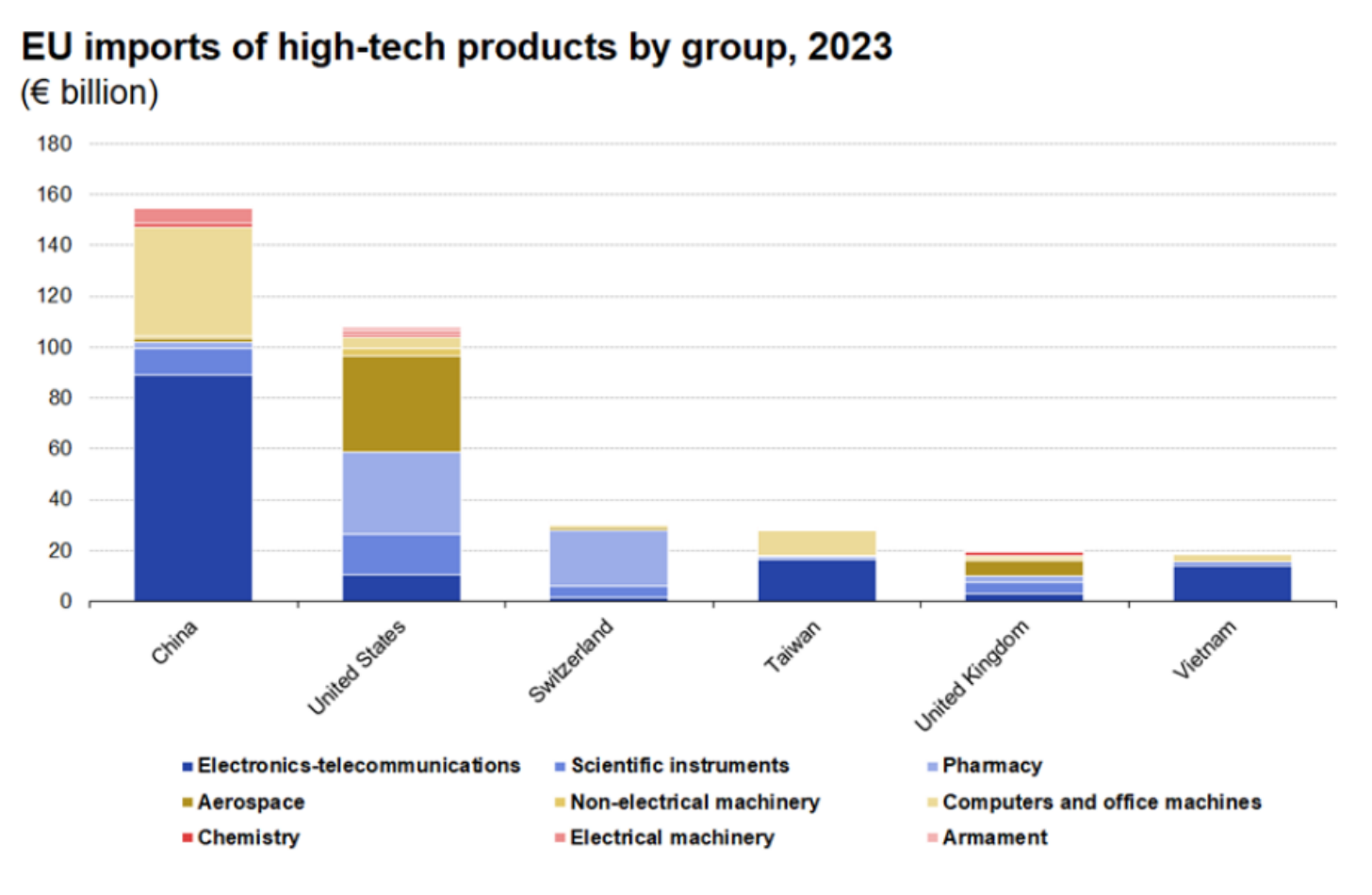
EU trade in high-tech products



Share in total extra-EU trade



High-tech products by group



Telecom industry

- War in Ukraine: battle between a small country and a former superpower with a nuclear arsenal
- Data war: Star Link system, comparative advantage in real-time information about the movement of the enemy's troupes
- Difficulty of finding an alternative, limited market competition offering the same services and quality, dependance on foreign systems

Dual-use technologies

Technologies for military and civilian purposes

The Wright Flyer, a "pusher" aircraft designed in 1903

- Tank (WO I): break deadlock of trench warfare
- RADAR (WO II): cavity magnetron
- WO I: first major conflict in which airplanes were used
  - Primitive start: throwing grenades, firing handheld firearms
  - Fighter aircraft: pusher was less performant than the tractor configuration, synchronize machine gun and the propeller
- Military inventions with civilian uses (wikipedia): nuclear technology, jet engine, …
- (pictures Wikipedia)

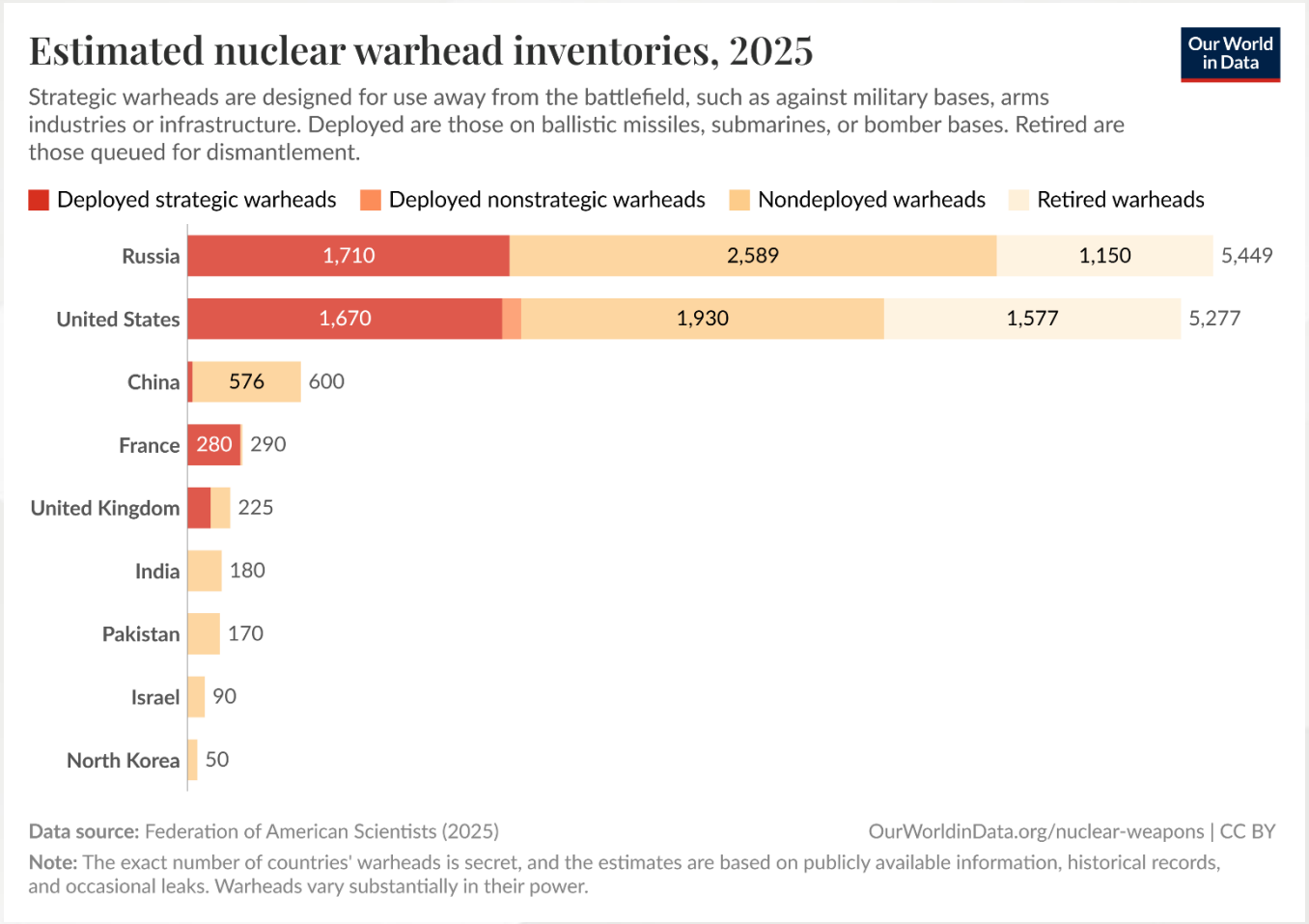
belspo

Chip industry

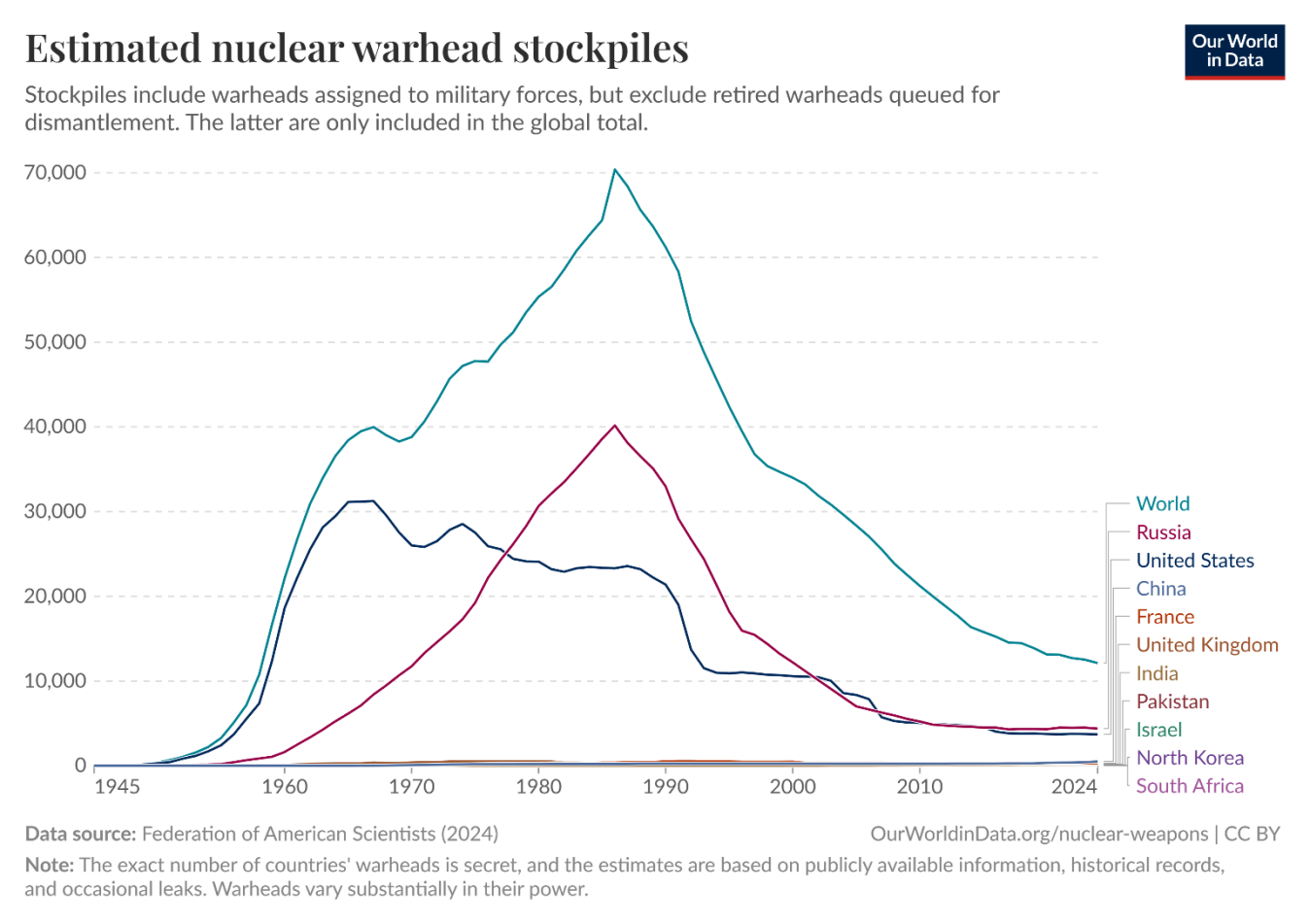
- Nobel prize for the invention of the transistor: Shockley, Bardeen and Brattain (1956)
- Fairchild: start of Silicon Valley
- Start of the chip industry: space program (Apollo program) and guided missiles (Vietnam war, Thanh Hoa bridge)
- Successful extension to consumer products, intensive use of global value chains
- 1965: defence dollars bought 72% of all integrated circuits
- McNamara Depression -> price went down from $20 to $2.

belspo

Nuclear weapons



Nuclear weapons



Technologies for peace

- End of the second world war
- Baruch plan: international body that would control all nuclear materials on earth
- Plan was rejected by the Soviets – beginning of the nuclear arms race
- 1958: conference of experts to study the possibility of detecting violations of a possible agreement on the suspension of nuclear tests

Technologies for peace

- Soviets did not allow onsite compliance visits – risk of espionage
- Atmospheric tests: radioactive isotopes disperse in the atmosphere, can be detected thousands of kilometers away
- Underwater tests produce distinctive sounds, that can be picked up by hydrophones
- Underground tests are much harder to detect

belspo

Technologies for peace

- The difficulty was to distinguish a nuclear test from an earthquake, every day up to 300 earthquakes with a magnitude of 3 or greater
- Richard Garwin (physicist) and John Tukey (mathematician)
- Fourier transformation (1822 – the analytic theory of heat, any function can be expressed a series of sines (and cosines))
- Fast Fourier transformation: significant improvement in the reduction of required computer calculations

belspo

Military spending and economic growth

Belgium

- NATO norm: military expenditure 5% of GDP (1.5% for infrastructure)
- Draft of the military program law for the period 2026-2034: multiannual budget of 34.2 billion euro
  - F35 fighter jets: 1 billion euro
  - 2.3 billion euro for purchase of ammunition
  - 965 million euro for military data centers (can also be used by other government administrations to securely store data)

belspo

Technology - the decisive factor?

- Fuller and Creveld: technology determines the outcome of war <> Howard and Gray: strategy (operational, social, and logistical dimensions)
- American civil war: population size, industrial base was concentrated in the north
- World War II: Manhattan project: contributed to the accelerated surrender of Japan in the South Pacific.
- Vietnam war (?)

Military spending and economic growth

- Military spending = government expenditure → increased demand for good and services → economic growth (Keynesian argument)
- Trade-off between military spending and resources left for education, social welfare and productive investments in the business sector
- Resources-constrained countries: effect is more negative

belspo

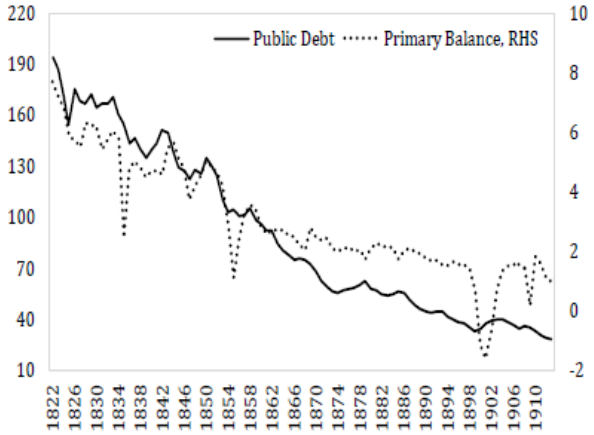
Military spending and economic growth

- US: Defence R&D supported by the US government stimulates additional innovation in the private sector
- France: reallocation of public spending from civilian unproductive public consumption toward military R&D investment -> positive effect on GDP
- UK: involvement in Afghanistan and Iraq on health spending, military spending and economic growth -> there is no evidence of changes in the national income following the sharp increase in government spending
- Latin American economies (1820-2016): large share of military expenditure in total spending crowded out investment in education and R&D, which in turn had persistent effects on economic development.
- Panel of 35 non-OECD countries (1988-2019): negative effect of military spending on economic growth

belspo

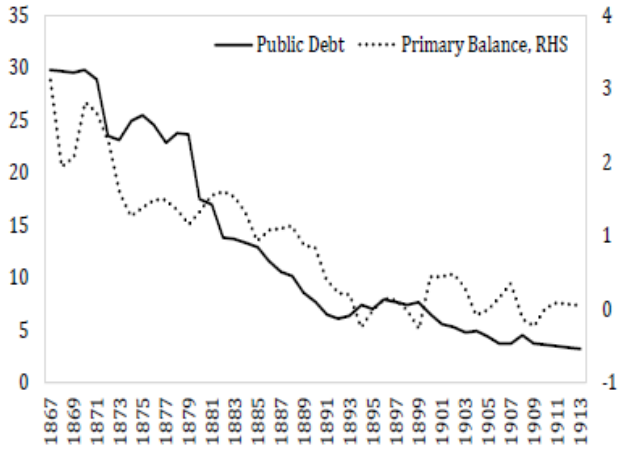
Wars and national debt

Figure 2. Public Debt and Primary Balance in the United Kingdom
(In percent of GDP)



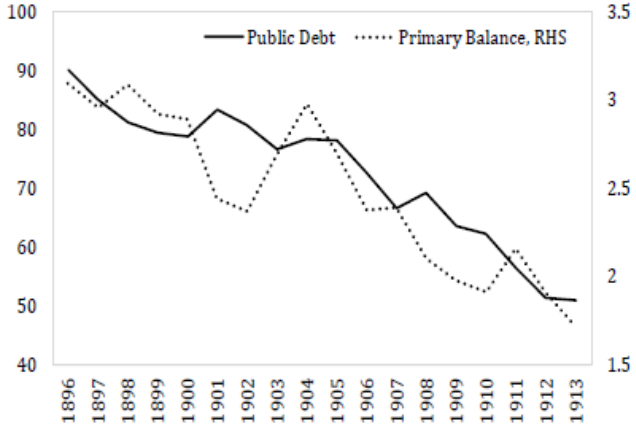
Sources: The Bank of England's database 'A millennium of macroeconomic data: https://www.bankofengland.co.uk/-/media/boe/files/statistics/research-datasets/a-millennium-of-macroeconomic-data-for-the-uk.xlsx and authors' calculations.

Figure 3. Public Debt and Primary Balance in the United States
(In percent of GDP)



Sources: Carter (2006) and authors' calculations.

Figure 4. Public Debt and Primary Balance in France
(In percent of GDP)

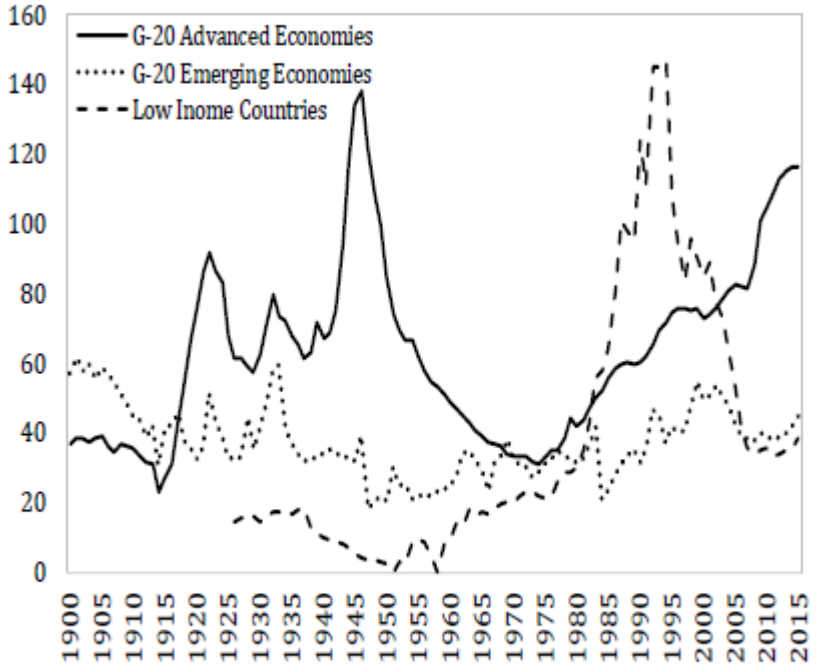


Sources: Flandreau and Zumer (2004) and authors' calculations.

belspo

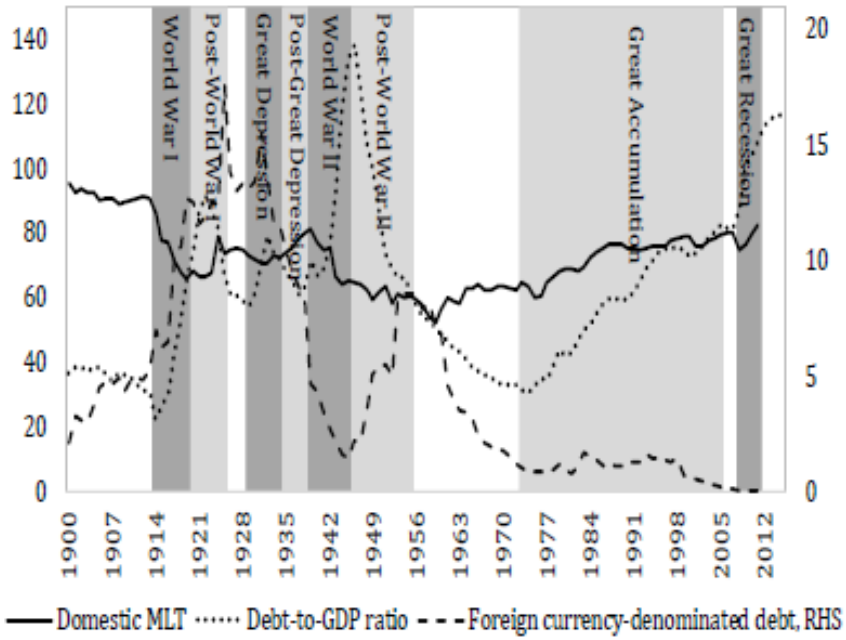
Wars and national debt

Figure 5. Public Debt Ratio
(In Percent of GDP)



Sources: Abbas et al. (2014a), and latest update of the IMF's Historical Public Debt Database (HPDD). For advanced economies, data up to 2009 are from Abbas et al. 2011, and from 2010 through 2015 are from the latest version of the HPDD. For all other countries data are from the latest version of the HPDD. PPP-GDP weighted averages.

Figure 6. Debt Composition in Advanced Economies, Maturity and Currency
(Shares in percent of total public debt, debt ratio in percent)



Source: Abbas et al. (2014b).
Notes: G20 advanced economies included are Australia, Canada, France, Germany, Italy, Japan, the U.K. and the U.S. PPP-GDP weighted averages.

belspo

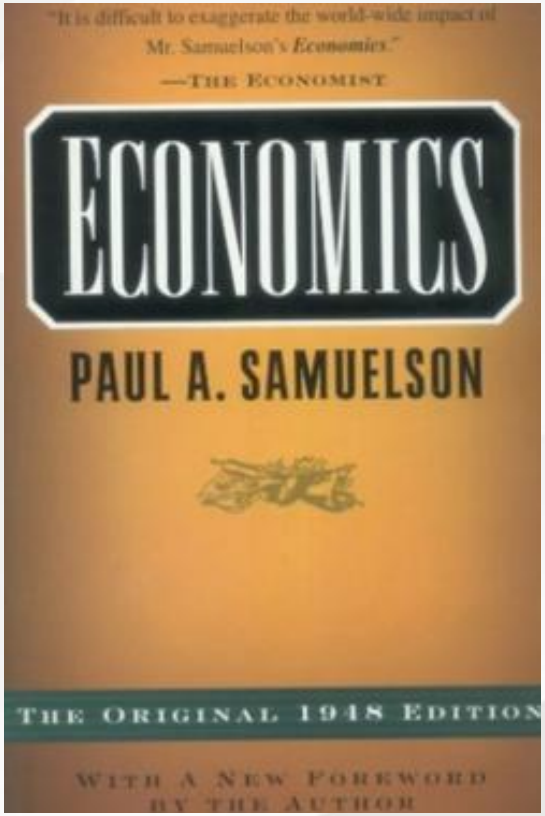
Role of Human capital

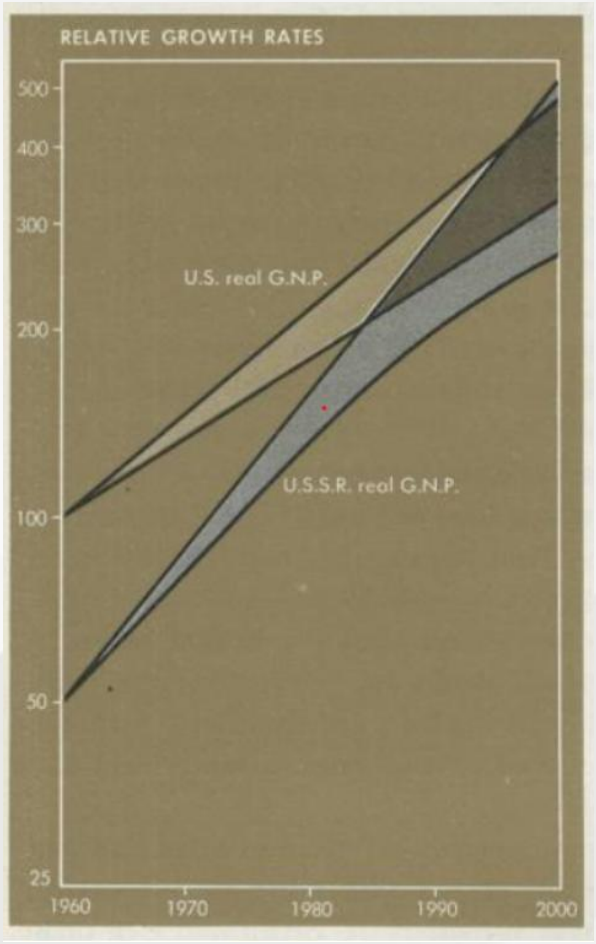
- Jeffrey Ding: Technology and the rise of great powers
  - LS mechanism (leading sectors)
  - GPT mechanism (general purpose technologies)
- Breakthrough technologies that lead to the development of new industries -> requires star scientists and engineers
- Gradual implementation of new technologies across sectors -> requires a critical mass of trained persons

belspo

Psychological factors

- Paul Samuelson (Nobel price for economics in 1970)





Psychological factors

- Truman doctrine (March 1947): containment of the expansion of communism -> played a role in the start of the Vietnam war
- Invasion in Iraq: presence of weapons of mass destruction
- Mobilisation at the beginning of the First World War (All Quiet on the Western Front - Erich Maria Remarque)

Bibliography

- Kennedy, P. (2013). *Engineers of Victory - The Problem Solvers Who Turned The Tide in the Second World War.* Penguin.
- Hacker, B.C. (2016). *Astride Two Worlds - Technology and the American Civil War.* Smithsonian Institution Scholarly Press.
- Ding, J. (2024). *Technology and the Rise of Great Powers.* Princeton University Press.
- Miller, C. (2022). *Chip war - The Fight for the World's Most Critical Technology.* Simon and Schuster.
- Muller, D. (2022, November 3) The Most Important Algorithm of All Time. Veritasium. www.veritasium.com
- EU commission (2024). *White Paper. On options for enhancing support for R&D involving technologies with dual-use potential.*
- Çalişkan, M., Liégeois, M. (2017). Technology and War Strategy. Beyond the horizon.
- Eichengreen, B., El-Ganainy, A., Esteves, R., and Mitchener, K.J. (2019). Public Debt Through The Ages, NBER working paper 25494.

belspo

Bibliography

- Bosi, S., and Laurent, T. (2006). Military R&D, Growth and the Optimal Allocation of Government Spending. Research document 06-12, Centre d'Etudes des Politiques Economiques (EPEE), Université d'Evry Val d'Essonne.
- Hanson, R. and Jeon, J. Y. (2024). The military expenditure – economic growth nexus revisited: evidence from the United Kingdom. Peace Economics, Peace Science and Public Policy, 30 (2), 207-248.
- Pallante, G., Russo E., and Roventini A. (2023) Does public R&D funding crowd-in private R&D investment? Evidence from military R&D expenditures for US states. Research Policy, 52 (8), 104807.
- Azam M. (2020). Does military spending stifle economic growth? The empirical evidence from non-OECD countries. Heliyon, 6(12), e05853.
- Madsen, J.B. (2023). Wars, Education and Economic Development. Centre for Applied Macroeconomic Analysis Working Paper 22/2023.

belspo