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Technology sovereignty

From demand to concept

EXECUTIVE SUMMARY

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Background and motivation

Calls for technology sovereignty in Europe were becoming louder even before the current Corona crisis. Growing geopolitical uncertainties and the threat of global trade conflicts are questioning the optimism of recent decades concerning the interdependence of our economies. In Germany, this is triggering a discussion about how independent a state or a federation of states must and can be with regard to critical technologies. It becomes clear that there is an increasing conflict between the call for technology sovereignty on the one hand, and the dominant economic model on the other, in which global specialization and the division of labor combined with open trade increases the welfare of all. Germany, in particular, as an export nation, and the EU as an economic area must consider the question of technology sovereignty carefully and in a differentiated manner.

We present one conception of technology sovereignty in this position paper. Our intention is to enrich the current debate and improve differentiation. We develop the criteria and key analytical steps needed to determine the criticality of technologies and the degree of technology sovereignty. Building on this, we develop modified strategies to safeguard or to produce technology sovereignty.

What is technology sovereignty?

We define technology sovereignty as the ability of a state or a federation of states to provide the technologies it deems critical for its welfare, competitiveness, and ability to act, and to be able to develop these or source them from other economic areas without one-sided structural dependency.

Our definition of technology sovereignty therefore does not imply comprehensive technology autarky that questions the international division of labor and globalization and aims at providing every technology classified as critical. Primarily, it describes preserving options by developing and maintaining own capabilities and avoiding one-sided dependencies. Technology sovereignty is therefore a necessary, but by no means sufficient condition for the self-determined creation and diffusion of critical innovations (innovation sovereignty) and therefore for self-determined economic trade (economic sovereignty). It is insufficient to focus on technology sovereignty alone.

How do we determine whether technology sovereignty exists and whether we should pursue it?

Analytical steps

While from the viewpoint of the state, the aim is often to achieve *technological competitiveness* in as many areas as possible, we propose a more differentiated and selective approach to determining whether sovereignty exists or is indeed required for a specific technology:

- The first step is to analyze whether a technology is currently *critical*, meaning indispensable (or will be critical in future) and why, and to what extent access to it could be threatened by external shocks.

- The second step is to differentiate precisely in which *functional context* a technology is critical. Here, we distinguish between a technology's contribution to *economic competitiveness*, its contribution to *meeting key societal needs* such as healthcare, for example, or energy supply, and to *sovereign tasks*. This distinction is important because it determines whether and for what precisely a particular technology is absolutely indispensable, and whether there may be functional substitutes that eliminate dependence on a specific technology.

- The third step is to define the appropriate *spatial-political system boundaries* within which technology sovereignty should be achieved. The degree of economic and political interdependence determines the security of supply as well as the degree of dependency on actors outside the system. For Germany, this frame of reference should *in principle* be the EU in view of the manifold existing economic, institutional, and political interdependencies.

- In the final step, we consider the factors needed to *produce technology sovereignty*. We distinguish here between:

  - *already existing own* competencies and resources or the possibility to *develop* the necessary competencies and resources ourselves if needed, and
  - *access* to resources, competencies, and upstream services of third parties (*security of supply*).

Constraints on technology sovereignty are to be feared if there is no security of supply from third parties for those

critical resources or competencies that a state or a federation of states cannot provide or develop itself.

The joint analysis of these dimensions can determine the current and the desirable degree of technology sovereignty in a given situation and, where needed, strategies can be developed to preserve or to generate technology sovereignty. A systemic perspective must always be taken here in order to comprehensively assess and develop both resilience to shocks and adaptability in a dynamic global environment.

Methods and data sources

A series of analytical steps are needed to develop strategies to preserve or produce technology sovereignty. Our position paper presents various methods and data sources for these steps. To gain a *better understanding of our own competencies and resources*, the methods range from patent and publication analyses through analyses of standardization activities to trade statistics grouped and analyzed by technology. Concerning the *dependence on other countries* or access to the resources and competencies of other countries, the analyses include data sources such as technology-specific trade statistics, complexity indices to identify value chains, and information about the governance behavior of countries based, for instance, on WTO compliance analyses or the World Governance index.

We use two case examples in our position paper – 5G technologies, and Industry 4.0/robotics – to illustrate how the concept can be applied and used to define modified strategies that go beyond the current debate.

How can technology sovereignty be produced and preserved?

Strategic recommendations

The position paper's first general recommended strategy is to provide the *competencies* for the complex analysis to determine the necessity of technology sovereignty and to develop the *necessary methods*. This is a prerequisite to developing modified strategies to produce and preserve technology sovereignty. It must remain clear at all times that *technology sovereignty is a necessary, but not sufficient condition for innovations* which ensure economic competitiveness and that society's needs are met. The consideration of technology sovereignty must supplement and cannot replace what is required of a future-oriented innovation policy.

The concrete recommended strategies comprise a number of actions:

- Sufficiently broad *investments in research and development* are the basic prerequisite for establishing sovereignty in critical technologies now and in the future. Any reduction of existing R&D competencies that are currently used or could easily be mobilized in areas where there is a threat of dependence on third parties should be avoided.
- *International research cooperation and technology partnerships* are an important instrument for mobilizing complementary competencies and achieving technology interdependence with other selected countries by means of knowledge interdependencies, thus reducing one-sided dependency on third parties.
- Actively *influencing standards* to direct international markets towards our own technologies as well as patent pools or Open Source software and hardware which prevent monopolization and thus structural dependencies.
- Creating *regulatory framework conditions* in critical technology fields that *foster innovation and production*.
- Promoting *innovation-oriented procurement* that provides our own companies with the necessary incentives to invest in critical technologies.
- Strengthening *international organizations* such as the WTO to ensure compliance with agreed multilateral

regulations as much as possible despite global trade conflicts. This is important since, in addition to the single European market, free world trade with its strong competition incentives remains an important boundary condition for technology sovereignty.

The concept of technology sovereignty is also congruent with increased investment in the resilience of the EU's economic and social systems so that these can recover rapidly from shocks and disruptions, and adapt quickly to changing contexts. This is an important cornerstone of any consideration of future-proof technology sovereignty. The EU states already have the right prerequisites for this as their economies are strongly oriented towards open competition, and their societies are influenced by subsidiarity and, above all, are democratically organized. All this means the EU's ability to adapt is fed by a diverse pool of economic, political, scientific, and civil society resources. Fostering the broadest possible basis of competencies and capacities in critical technology fields is an important element in lowering the vulnerability of the EU to potential disruptions and shocks – especially in times of increasing global uncertainty. In line with a systemic approach to resilience, key technological abilities should therefore be promoted, innovation networks built, and experimental learning enabled, for example, in regulatory sandboxes.

Impressum

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