JRC140398

European Commission

SCIENCE FOR POLICY BRIEF

Industrial Innovation & Competitiveness

The effects of intangibles on productivity and resilience during crises and the green transition

HIGHLIGHTS

- → Intangible capital is a key driver of productivity growth, competitiveness and resilience.
- → Unlike tangible investment such as machinery and equipment, investment in intangible assets, especially R&D, shows low sensitivity to adverse demand shocks.
- → R&D intensive firms seem to be more resilient (higher employment) during crises and recover faster (higher productivity) afterwards.
- → Productivity growth can contribute to decarbonisation, but in many instances productivity growth and decarbonisation lead to conflicting objectives, which needs to be addressed through policy action.

BACKGROUND

This policy brief reports policy-relevant results related to productivity from two recent JRC studies, the first one investigating the importance of intangible assets for productivity growth and the second one focussing on how to reconcile productivity growth with the green transition, in particular through green R&D investment.

INTANGIBLES AND PRODUCTIVITY GROWTH

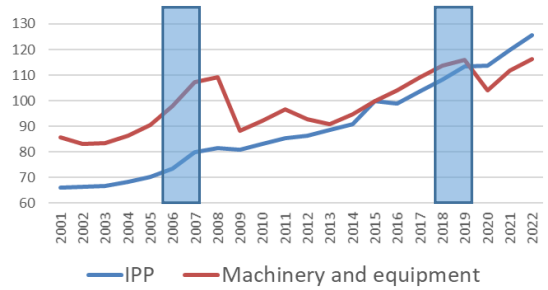
Investment in intangibles has been on the rise in the last decades.

Investment in intangible assets such as R&D, software and databases has been increasing in Europe over the last two decades at a higher pace than those in tangible assets such as buildings, machinery and equipment (Figure 1). Nevertheless, the EU is lagging behind both the US and the UK in intangible intensity (intangible investment over value added, Figure 2), both in intangibles accounted in the National Accounts (IPP) and in non-National Accounts intangibles. Non-National Accounts intangibles (like organisational capital) play an important role in productivity growth especially in the service sector (Bauer et al., 2020).

Unlike tangible investment, intangible investment was very resilient during the Global Financial Crisis (GFC) and the COVID-19 pandemic. In particular, investment in intellectual property was rising throughout both crises (Bauer et al., 2024). However, tight credit conditions can create a trade-off between tangible and intangible investment financing in sectors exposed to external finance (Altomonte et al., 2022). Firms usually finance intangibles with their own liquidity (due to the lack of collaterals), which liquidity may be diverted to fund tangibles in case of financial stress. Indeed, if firms have to make hard choices to survive in the short term, they will preferentially invest in tangibles (investment needed for current production) rather than in intangibles (more future production-oriented investment). This finding strengthens the case for ensuring uninterrupted financing of firms during crises.

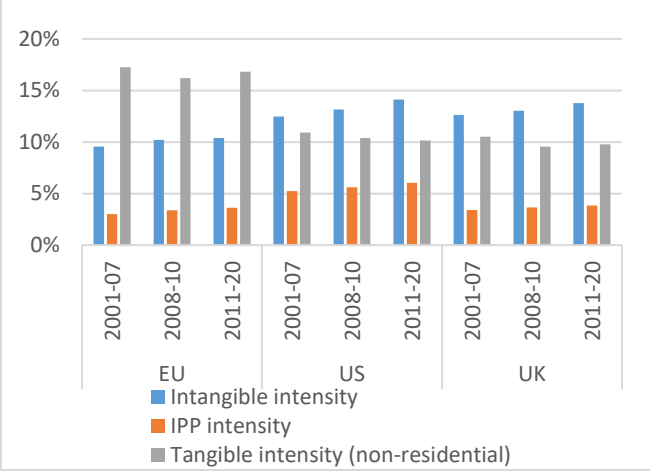
Joint Research Centre

Figure 1 – Investment in Machinery and Equipment and in Intangibles (IPP) in EU27 (excluding Ireland) (chain linked volumes, 2015=100)



Note: Own calculation based on Eurostat's National Accounts data. IPP (intellectual property products) are the intangible assets included in National Accounts (R&D, software and other intellectual property products). The shaded areas show the GFC and the COVID-19 period.
Source: Bauer et al. (2024).

Figure 2 – Average investment intensities (% of adjusted value added)

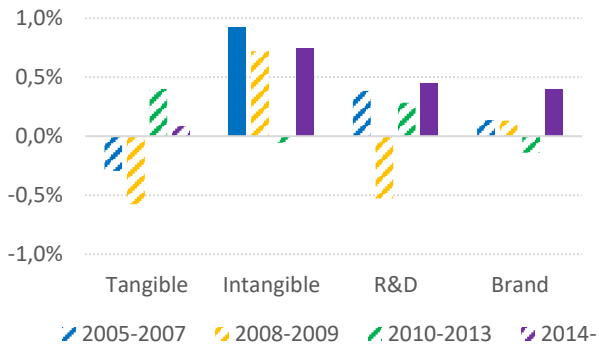


Note: EU is the EU27 excluding Ireland. Intangibles include both National Accounts intangibles (IPP) and non-National Accounts intangibles (design, brand, organisational capital and training). Value added is adjusted to include non-National Accounts intangibles when computing investment intensities.
Source: EU KLEMS

R&D intensive firms are more resilient during crises and recover faster afterwards.

Sectors with higher R&D intensity before the GFC showed higher resilience in terms of employment and hours worked during the GFC (Bauer and Genty, 2022). Moreover, these sectors recovered better by increasing their productivity faster after the GFC (Figure 3). This points to the importance of investing into intangible asset, not only to improve current productivity, but also to build resilience against potential downturns in the economy.

Figure 3 – Effect on labour productivity growth of an increase of pre-crisis investment intensity equivalent to jumping from the bottom 25% to the top 25% of the intensity distribution



Note: Striped area denotes non-significant coefficient in the panel estimation.
Source: Bauer and Genty (2022).

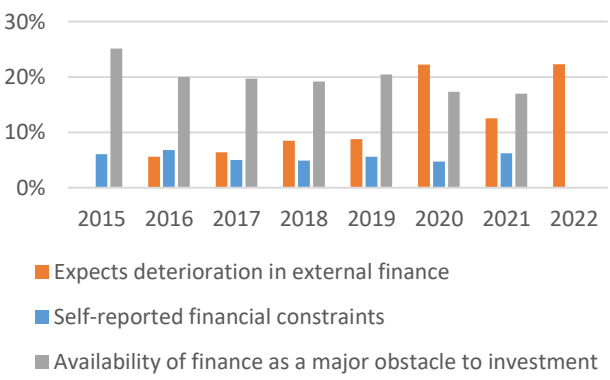
High productivity and digitalisation contributed to resilience during COVID-19

Employment in highly productive firms decreased less during the pandemic compared to low productivity firms (Teruel et al., 2023). Digitalisation also contributed to resilience at a time of lockdowns and social distancing rules. At the same time, COVID-19 led to a surge in (further) digitalisation, especially in already digitalised firms. This persistence of investment in digital technologies shows the importance of complementary investments and capabilities (e.g. management practices and skills of employees) for successful adoption of digital technologies.

Appropriate policy support can enable firms to continue investing in intangibles in the face of financial constraints.

Strong policy support implemented during the pandemic helped contain the increase in the number of financially constrained firms (Figure 4). In that way, policy support alleviated part of the negative impact of COVID-19 on investment especially in key intangible assets like R&D and training (Bauer et al., 2024).

Figure 4 – Share of financially-constraint firms



Source: Bauer et al. (2024).

PRODUCTIVITY AND THE GREEN TRANSITION

Productivity growth can contribute to decarbonisation but only under strict conditions.

The European Green Deal as the main policy program to promote both productivity growth and the green transition assumes that productivity growth and decarbonisation can go hand in hand. This is only partially true: in the majority of countries and sectors of the EU economy, productivity growth results in increased production, which in turn leads, at least in the short term, to rising emission levels even when productivity growth improves resource efficiency (due to the rebound effect). For example, energy efficiency improvements can lead to increasing demand for energy products, as productivity of each unit of energy increased. The net effect determines whether there are synergies between productivity growth and decarbonisation.

Hence, in most sectors of the policies that promote TFP growth for example by subsidising firms' R&D investment are not enough to decarbonise the economy. Instead, there are two ways in which policy can support decarbonisation: Statically, by promoting the substitution away from the most polluting technologies through incentives (such as taxes) or outright bans of the polluting technologies. In particular, reducing emissions in the energy sector to zero is critical to mitigate the rebound effect.

Box 1: Environmental Decoupling

Environmental Decoupling refers to growth in GDP, or as in this case, productivity growth without associated growth in CO2 emissions. Normally, productivity growth leads to higher levels of production, so that even when there are efficiency gains, overall emissions may increase.

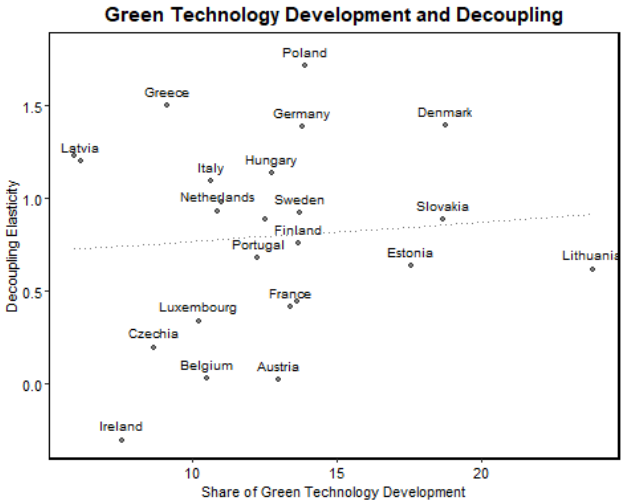
An environmental decoupling elasticity is calculated by regressing the change in CO2 intensity of the economy on the change in total factor productivity. An elasticity greater than one implies that emissions decrease with TFP growth. An elasticity between zero and one implies that the carbon intensity of production decreases with TFP growth, but emissions still increase.

The second possibility to promote decarbonisation is dynamically, by steering TFP growth in a green direction. In other words, policy should promote innovations that simultaneously lead to higher TFP and for lower emission growth (higher emission reductions in response to TFP growth.

Decoupling and the share of green R&D activity.

Figure 5 shows a small, positive correlation between the environmental decoupling elasticity and the share of green technology development. This suggests that green technology development may be beneficial to the dynamics of decarbonisation. This again highlights the usefulness of intangible investments in the form of targeted R&D during the green transition. Other forms of intangible capital, such as organisational capital, can also be important drivers of decarbonisation: the literature (see, for example, Ambec et al., 2013, and Iqbal et al., 2022) shows that organisational capital contributes to the awareness of the production process on the environment and thereby helps firms become both decarbonize and become more profitable.

Figure 5 – Country Panel of Green Tech and Decoupling



Source: Lucke (2024).

CONCLUSIONS

In summary, we conclude that intangible capital is an important driver of productivity and decarbonisation, as well as resilience. Innovation activities and organisational capital help firms become more competitive, and green innovation can help steer TFP growth in a direction that helps the economy decarbonize faster. Additionally, firms with higher levels of intangibles were more resilient during the recent crises. All three qualities should be harnessed by policymakers to improve the European economies through the Green transition.

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