Box I.3: Intangible investment and the macroeconomic outlook

The importance of intangible investment, such as, for example, R&D or software, for understanding productivity, competitiveness and economic growth has been recognised for a long time by the economic literature and statisticians. [1] The consideration of investment in intangibles contributes to a better understanding of differences in (trend) productivity developments across countries. As intangible investment is less prone to boom and bust cycles than 'traditional' capital formation and has held up rather well in the crisis, its inclusion also matters for gauging the depth of the post-2008 investment shortfall. This matters for economic forecasting and the derivation of economic policy advice.

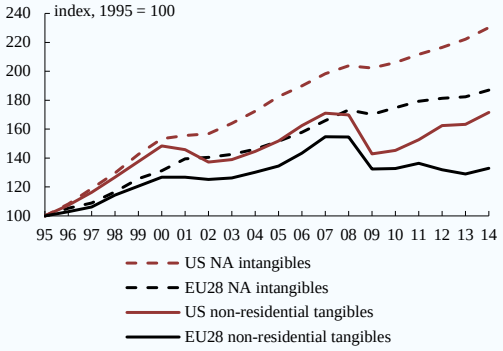
The asset boundary in official national accounts has been continuously expanded in recent decades in order to better account for the role of intangibles. Current national accounts according to the 2008 SNA/ESA 2010 standard record a range of specific intangibles under the asset category 'intellectual property products', namely R&D, mineral exploration, computer software and databases, entertainment, literary and artistic originals. Similar to investments in tangible assets, expenditures by businesses or government on these intangibles are treated as gross fixed capital formation (GFCF) and make for a sizable and rising share in overall investment.

Investments in intellectual property products currently account for close to 4% of GDP and 19% of total annual fixed investment in the EU28. The share of intangibles in non-residential investment currently stands at 25%. Over half of investments in intangibles currently recorded by national accounts consist of R&D. By comparison, the GDP share of intellectual property products in the US currently stands at somewhat over 5% of GDP (and 31% of non-residential investment).

Intangible investment, as a significant and growing component of overall investment, are increasingly relevant for analysing current economic trends and forecasting future growth. As shown in Graph 1, intangibles have been growing more dynamically than investments in (non-residential) tangible assets. In fact, over the past two decades, the volume of annual GFCF in intellectual property products increased by 130% in the US and 87% in the EU-28. By comparison, the annual volume of tangible non-residential investment in the US stands at 70% above the level of 1995 and increased by only 30% in the EU.

Investments in intangibles have been, in general, less cyclical than tangible investment. Their relative resilience to the economic crisis that started in 2008 is remarkable, compared to investments in tangibles.

Graph 1: **Non-residential tangible and intangible GFCF in the EU-28 and the US, total economy**



Source: Eurostat NA for EU-28, BEA for US

The rising importance of intangibles is also reflected in their contribution to GDP growth. As shown in Graph 2, GFCF in intangible assets (acc. to the ESA 2010 definition) accounts on average for more than a third of the overall contribution of investment to real GDP growth. Graph 2 also helps to illustrate the effect of the change of the national accounts asset boundary between the recently implemented 2008 SNA/ESA 2010 and the previous SNA1993/ESA95 [2]; mainly due to the capitalisation of R&D (which was previously not treated as investment but as intermediate consumption), the average contribution of intangible GFCF to GDP growth has approximately doubled.

Conceptual considerations and the increased quantitative relevance of intangible investment have led some researchers to call for a further expansion of the asset boundary in national accounts beyond those intangibles which are currently treated as GFCF. Based on the broad notion that any use of resources that reduces current consumption in order to increase it in the future should qualify as an investment, this line of research suggests that a number of additional types

[1] See, for example, Moulton, R. B. (2004). "The System of National Accounts for the New Economy: what should change?". *Review of Income and Wealth* 50(2), pp.261-78.

[2] See System of National Accounts 2008, Annex 3: Changes from the 1993 System of National Accounts.

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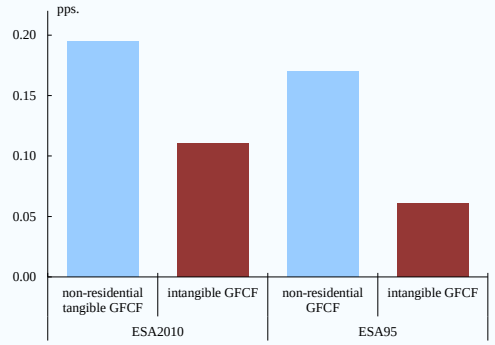
Box (continued)

of intangibles should be capitalised and treated as GFCF [3] Since the notion is broad, the possible coverage of intangibles is extremely diverse, potentially representing a large proportion of current expenditure (see below).

Graph 2: **Contribution of tangible and intangible GFCF to real GDP growth - ESA 2010 vs. ESA 95, EU 28 av. 1996-2013**

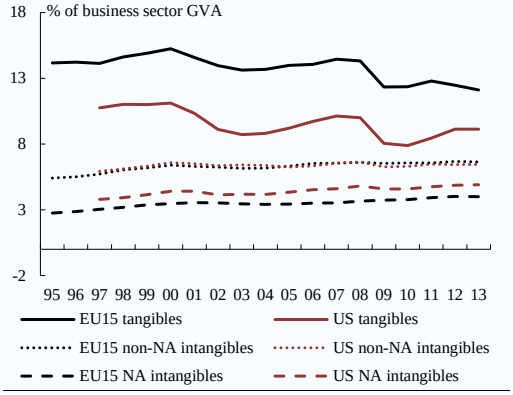


Source: Eurostat national accounts

One widely used conceptualisation of an extended set of intangible assets proposes to add to the existing intangibles in national accounts ("NA intangibles") certain previously unmeasured asset types ("non-NA intangibles"), namely investments in new product developments in financial services, advertising and market research, firm specific human capital, and organizational know-how. [4]

Academic estimates for the non-NA intangibles have been developed, notably, in the context of the INTAN-Invest project. [5] A look at the INTAN-Invest data gives an indication of the potential impact on the composition of overall investment and the level of gross value added (GVA) if the asset boundary was expanded to include these non-NA intangibles. Calculations for the non-residential business sector (i.e. excluding dwellings and public sector GFCF which are not covered by the INTAN-Invest data) suggest that including the non-NA intangibles would, on average, increase the level of non-residential business sector GVA by around 6%, [6] both in the EU and the US (Graph 3). They would on average also exceed the value of those intangibles which are already treated as GFCF in national accounts.

Graph 3: **Business sector non-residential GFCF by asset type, EU-15 vs. US**



Notes: Business sector defined as NACE Rev. 2 activities A to N (excluding L) plus R and S. Source: Own calculations based on a forthcoming update of INTAN-Invest data (intangible GFCF) and Eurostat/BEA national accounts data (business sector GVA).

Note that for some countries, such an extended definition of intangible assets would imply that close to or even more than half of all non-residential business sector investments would consist of intangibles (NL, FI, US, FR, UK, SE) (Graph 4).

As with the NA intangibles, the non-NA intangibles also show a clear positive upward dynamic (although on average not necessarily stronger than the traditional NA intangibles) compared to tangible investment. Therefore, and in addition to further increasing the level of overall investment, GVA and GDP, any inclusion of additional (sub-) categories of intangibles could be expected to further increase the already significant

[3] See e.g. Corrado, C., C. Hulten, and D. Sichel (2009). "Intangible capital and U.S. economic growth". *Review of Income and Wealth* 55(3), pp. 661–85.

[4] See e.g. Corrado, C., J. Haskel, C. Jona-Lasinio and M. Iommi (2012). "Intangible Capital and Growth in Advanced Economies: Measurement Methods and Comparative Results". *IZA - Institute for the study of Labour*, Discussion Paper Series DP 6733.

[5] For data and underlying methods see the INTAN-Invest database: http://www.intan-invest.net/. Note that the present analysis is based on a forthcoming update of the INTAN-Invest data.

[6] The reason why treating additional intangibles as GFCF would increase the level of business sector GVA and consequently overall GDP is essentially the same which led to an upward shift in GDP due to the capitalisation of R&D in the context of the recent implementation of the 2008 SNA/ESA 2010: Business expenditures on these (additional) intangibles are reclassified from intermediate consumption (which are used up in the current production process and do not add to GVA) to gross fixed capital formation (which does add to GVA). For further information on the capitalisation of R&D (including also for public sector R&D), its measurement and its impact on national accounts aggregates, see Eurostat (2014). "Manual on measuring Research and Development in ESA 2010", 2014 edition.

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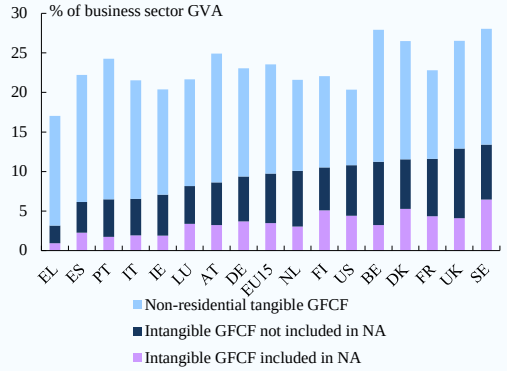
Box (continued)

contribution of intangible investment to GDP growth.

Graph 4: **Business sector non-residential GFCF by asset type, average 1995 to 2013**



Notes: Business sector defined as NACE Rev. 2 activities A to N (excluding L) plus R and S. US: average 1997 to 2013. Source: Own calculations based on a forthcoming update of INTAN-Invest data (intangible GFCF) and Eurostat/BEA national accounts data (business sector GVA).

Moreover, expanding the asset boundary for additional relevant intangible asset types might help to better explain innovation and productivity differentials among countries and across different sectors of the economy. Conceptually, the omission of relevant intangibles in productivity and growth accounting would tend to overstate multifactor productivity (MFP) growth [(7)] and the contribution of tangible capital and labour (composition) to GDP growth. In fact, adding further intangible assets (e.g. in growth accounting) usually decreases the contribution of MFP growth because the contribution of such intangible assets is no longer hidden in the MFP residual. [(8)] Accordingly, controlling for intangible capital in growth accounting frameworks affects the observed patterns of economic growth and productivity. For instance, based on a panel data analysis of a sample of EU countries, Roth and Thum (2013) confirmed a positive and significant relationship between intangible capital investment and labour productivity growth [(9)(10)].The empirical analysis thus confirms previous findings of Corrado *et al.* (2009) that the (further) inclusion of business intangible capital investment in the asset boundary of the national accounting framework results in a more rapidly increasing rate of change of output per hour worked.

If all relevant types of intangibles were incorporated into the national accounting framework, tangible and intangible capital deepening would together become the unambiguously dominant source of growth. In fact, evidence suggests that intangible and tangible capital can jointly explain about 90 percent of labour productivity growth [(11)] and that a significant portion of the unexplained variance in labour productivity growth is due to unobserved intangibles. Hence, adding further types of categories of intangibles into analyses of national income, wealth and growth accounting, both as an input and possibly as well as an output, may help to better understand the dynamics of productivity and economic growth. Corrado *et al.* (2009) outlined in this regard that 'non-traditional' types of intangibles, such as non-scientific R&D, brand equity and firm-specific resources, together account for nearly 60 percent of total intangible capital deepening since 1995 and that therefore growth accountants should not lose sight of these other forms of intangible capital. Furthermore, it is worth noting that the fraction of output growth per hour

(7) Given all relevant inputs were correctly accounted for, multifactor productivity (MFP), measured as a residual which accounts for effects in total output not caused by changes in the measured inputs, represents an economy's long-term technological change or technological dynamism. By omitting a relevant factor (e.g. new intangibles as part of 'capital input'), the residual (i.e. MFP) tends to be overestimated.

(8) See e.g. van Ark, B.(2015). "From Mind the Gap to Closing the Gap: Avenues to Reverse Stagnation in Europe through Investment and Productivity Growth". European Commission (DG ECFIN), *European Economy Discussion Paper* 006/2015; for empirical evidence, see also Corrado *et al.* (2009), p. 680.

(9) The results also proved to be robust to a range of alterations and hold when controlled e.g. for endogeneity.

(10) This is consistent with the possibility of total factor productivity spillovers from intangible investment beyond GDP (as suggested e.g. by van Ark, 2015) and corresponding empirical evidence (Corrado *et al.*, 2013).

(11) See Roth, F. and A.-E. Thum (2013). "Intangible Capital and Labor Productivity Growth: Panel Evidence for the EU from 1998–2005". *Review of Income and Wealth* 59(3), pp. 489-508. The authors found that intangible capital could explain around 50 percent of labour productivity growth. Other studies arrived to similar orders of magnitude, e.g. van Ark, B., J.X. Hao, C.A. Corrado, and C.R. Hulten (2009). "Measuring intangible capital and its contribution to economic growth in Europe". *European Investment Bank (EIB) Papers* 14(1), pp. 62-93. Corrado *et al.* (2009), based on analysis of US data, have found that the inclusion of intangible investment in the real output of the non-farm business sector increases the estimated growth rate of output per hour by 10–20 percent relative to the baseline case which completely ignores intangibles. Roth and Thum (2013) suggest that, once including intangible capital, the impact of tangible capital diminishes to 40 percent and MFP changes from 35 to 10 percent.

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attributable to the old 'bricks and mortar' forms of capital investment is comparably small. [12] While it is arguably inappropriate to automatically attribute the remaining just to 'knowledge capital' or 'the knowledge economy', it appears equally inappropriate to ignore the association between innovation, human capital, and knowledge acquisition on the one hand, and investments in intangibles, IT capital, labour quality change, and multifactor productivity on the other.

In conclusion, taking into account a broader set of intangible capital could therefore help to better capture the ongoing shift from tangible to intangible investment, thereby improving our understanding of the transition of developed economies into knowledge societies and drawing the attention towards policies for strengthening investments in intangible assets.

However, extending the national accounts asset boundary for additional intangible assets and eventually producing official and internationally harmonised data of high quality would depend on solving a range of significant existing conceptual and measurement challenges, e.g. related to the correct definition and valuation of such assets, identifying appropriate price deflators and measuring their depreciation. [13] It is clear that existing academic estimates range in quality and conceptual soundness depending on the type of intangible under consideration. The forthcoming multi-annual revision process of the current national accounts systems 2008 SNA/ESA 2010 is expected to consider the conceptual and practical issues for capitalising further intangibles, whether in the core accounts or in related accounts.

[12] According to Corrado *et al*. (2009) it accounts for less than 8 percent of the total corresponding growth in the US during the period 1995–2003.

[13] For an overview see Moulton, B. and N. Mayerhauser (2015). "The future of the SNA's asset boundary". Paper prepared for the 2015 IARIW-OECD Conference: "W(h)ither the SNA?" April 16-17 2015, Paris. Available at: http://iariw.org/papers/2015/moultonmayerhauser.pdf