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**NEW SOURCES OF GROWTH: KNOWLEDGE-BASED CAPITAL – INTERIM PROJECT FINDINGS**

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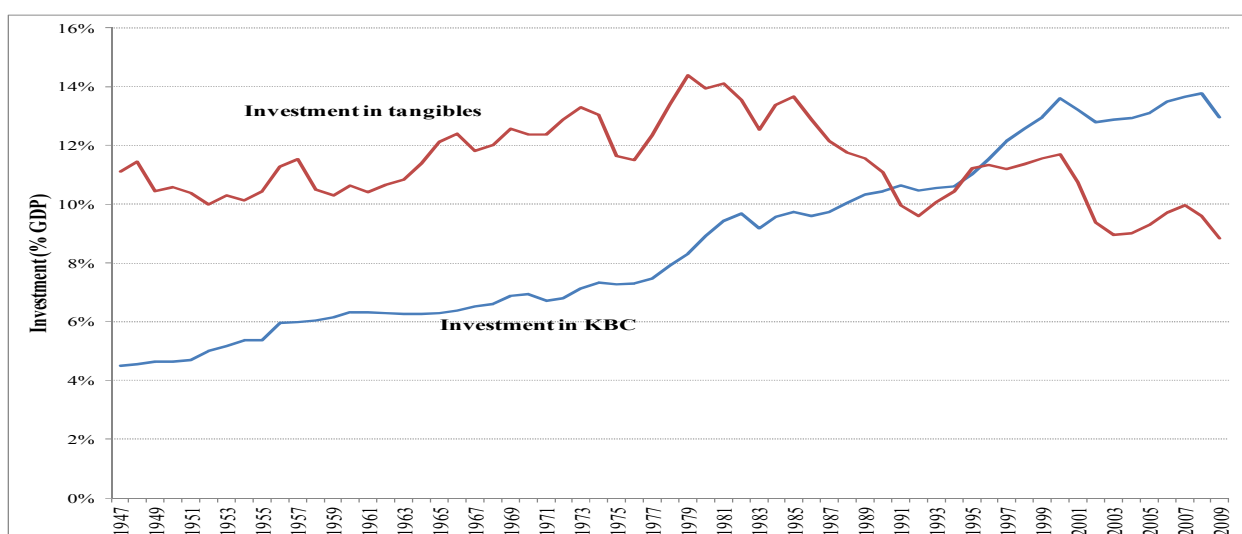
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## 1. Introduction

1. Investment and growth in OECD economies are increasingly driven by knowledge-based capital (KBC). In many OECD countries, firms now invest as much or more in KBC as they do in physical capital such as machinery, equipment and buildings. This shift reflects a variety of long-term economic and institutional transformations in OECD economies. The rise of KBC creates new challenges for policymakers, for business and for the ways in which economic activity is measured. Many policy frameworks and institutions are still best suited to a world in which physical capital drove growth. With many OECD Member and partner countries facing sluggish economic growth and high unemployment, new thinking is needed to update a range of framework conditions – from tax and competition policies to corporate reporting and intellectual property rights. Updated policies could help yield significant economic value from forms of KBC that have thus far received scant attention, such as design and data. For instance, research suggests that the use of geo-location data, such as GPS, and location-based services could generate almost USD 500 billion in consumer value by 2020.

2. Three types of KBC can be distinguished: computerised information (software and databases); innovative property (patents, copyrights, designs, trademarks); and economic competencies (including brand equity, firm-specific human capital, networks joining people and institutions, and organisational know-how that increases enterprise efficiency). Research on KBC is showing that growth can arise from previously under-appreciated sources. For instance, firms' organisational know-how – a form of KBC - can increase the value of computer assets by a factor of ten.

**Figure 1: Business investment in KBC and tangible capital, United States, % of GDP (1947-2009)**



3. Across Europe, investment in KBC accounts for 20 to 25% of average labour productivity growth. In the United States, between 1995 and 2007, some 27% of growth in labour productivity resulted from business investment in KBC. Unlike physical capital, investments in many forms of KBC - such as R&D, design and new business models - create knowledge that spills over into other parts of the economy, spurring growth. KBC can also foster growth because the initial cost incurred in developing knowledge – typically through R&D – is not re-incurred when that knowledge is used again. This can lead to economies of scale in production.

4. The environment for investment in KBC is likely to determine which countries retain or move into the highly value-adding segments of which industries. For example, in 2006, the iPod accounted for

41 000 jobs, with 27 000 outside the United States and 14,000 inside. But US workers – where investments were occurring in forms of KBC such as design, R&D, software and marketing - earned a total of USD 753 million, while those abroad earned USD 318 million. Today, the value of some leading global companies resides almost entirely in their KBC. At the start of 2009, for example, physical assets accounted for only about 5% of Google’s worth. And KBC is transforming the determinants of competitive success. In the automotive sector, the cost of developing new vehicles is increasingly dominated by software, while high-end vehicles rely on millions of lines of computer code and advanced on-board processors.

5. It is clear that jobs producing or manipulating knowledge tend to be highly-skilled – scientists, engineers, programmers and IPR lawyers. Growth driven by KBC may be one factor fueling the growing income inequality across OECD countries. On the other hand, mature industries under pressure from low-wage competitors in sectors like autos, apparel or footwear have been able to re-invent themselves and maintain lower skilled jobs through the exploitation of clever branding, software enabled features and new business models. Additional work is needed to fully understand the role that KBC has on demands for skills and the distribution of returns from this capital.

6. To address the rise of KBC – and contributing to the OECD’s work on New Approaches to Economic Challenges - the OECD has embarked on a two-year horizontal project, *New Sources of Growth: Intangible Assets*. For OECD Member countries and key non-Members this work aims to:

- Provide evidence of the economic value of KBC as a new source of growth; and
- Improve understanding of current and emerging challenges for policy, in such areas as taxation, competition, intellectual property rights, personal data, and corporate reporting.

7. The *New Sources of Growth* project draws on expertise from across the OECD Secretariat and Committees. Led by STI, key substantive inputs are provided by CTPA, DAF (Corporate Affairs and Competition), ECO and STD. This note outlines the scope of the work, its policy relevance and preliminary project findings.

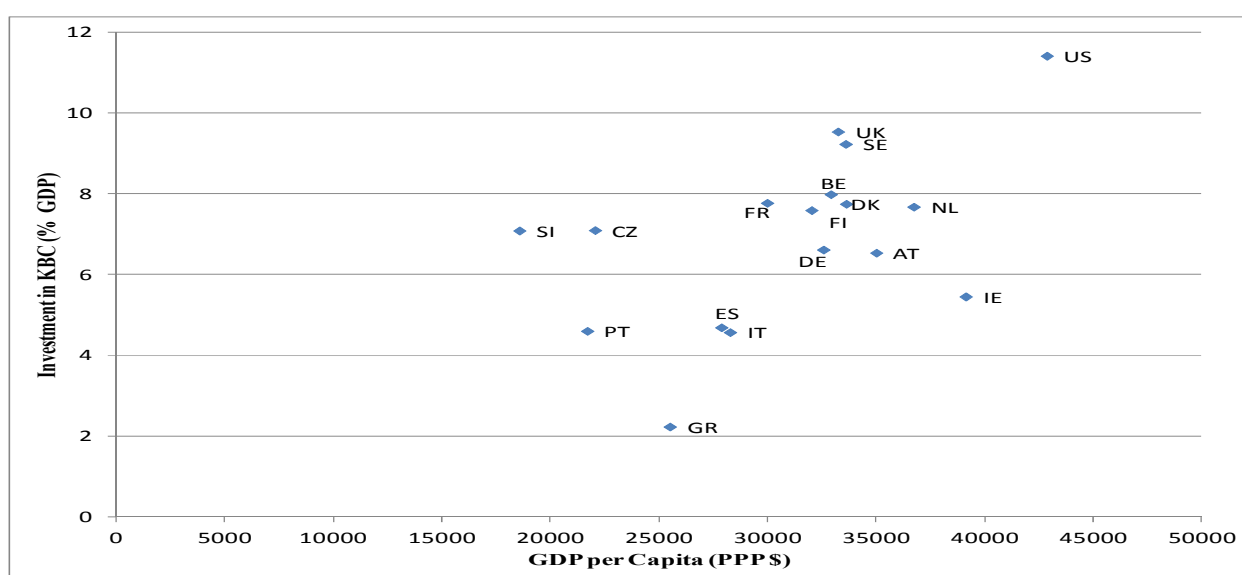
## 2. The growing importance of knowledge-based capital for growth

8. Recent research shows that:

- In many countries, *business investment in KBC is growing faster than investment in physical assets*. For instance, in Australia, annual growth in business investment in KBC has been around 1.3 times that of physical capital since 1974-75. In Japan, the ratio of intangible investment to GDP has risen throughout the past 20 years. In Canada, between 1976 and 2008, real investment in KBC increased at 6.4% a year, while investment in physical assets grew at 4.1% a year. And in the United States, research shows almost continuously rising business investment in KBC for at least 60 years (figure 1).
- There are big differences across countries in the shares of business investment in KBC. *As a share of GDP, the business sector in richer countries invests proportionately more in KBC* (see figure 2).
- Overall business investment in KBC can be large. In the United States, total investment in KBC in 2007 is estimated at USD1.6 trillion, some 11.3% of GDP. By omitting accumulated investments in KBC, around *USD4.1 trillion was calculated to have been excluded from published national accounts data in the United States in 2007*.

- Furthermore, *if business' investment in KBC is fully reflected in national accounting systems – which is not currently the case - then this can significantly change the observed sources of growth.* For instance, estimates for the 27 EU countries show that once KBC is properly treated as investment, measured labor productivity growth increases significantly in all countries.
- A variety of macro- and micro-economic studies, covering various time periods, find a *positive relationship between investment in KBC and growth, productivity change and positive business outcomes.* For instance, at the micro-level, in the United Kingdom in 2004, around half of export sales from winners of the Queens Award for Exports were attributed to investments in design. In the United States, firms that base significant decisions on investments in data exhibit levels of output and productivity 5-6% higher than would be expected given their other investments and usage of information technology.

**Figure 2: Business investment in KBC and GDP per capita (2005-09)**



Source: Corrado, C., Haskel, J., Jona-Lasinio, C. and Iommi, M. (2012, forthcoming), Joint database on intangibles for European policy making - Data from INNODRIVE, COINVEST and The Conference Board. Note: AT=Austria, AU=Australia, BE=Belgium, CZ=Czech Republic, ES=Spain, DE=Germany, DK=Denmark, FI=Finland, FR=France, GR=Greece, IE=Ireland, IT=Italy, JP=Japan, LU=Luxembourg, NL=Netherlands, PT=Portugal, SE=Sweden, SI=Slovenia, UK=United Kingdom, US=United States.

- Enabling business investment in KBC has become a priority in many emerging economies. For instance, policymakers have set the goal of making China an “innovation-oriented” society by 2020, which requires sustained investment in KBC. New research indicates that investments in KBC were equivalent to 7.5% of China’s GDP in 2006. This rate - comparable to Germany and France – rose from 3.8% in 1990. China is investing in IP, acquiring/developing global brands and promoting design. Other examples include Thailand’s establishment of an IP capitalisation project, Brazilian assets in aero-space, and Indian information technology.
- *The assets that make up KBC are still poorly measured.* While some progress is occurring – in the United States in 2013, R&D will appear as an investment, for the first time, in the measure of GDP - the development of international comparative data is in its infancy. Measurement frameworks do not fully reflect the reality of the knowledge economy.

### 3. Policy perspectives

9. Business investment in KBC underpins the entire knowledge economy. Many areas of policy affect these investments, from framework and regulatory policies to targeted investment support. This section reviews preliminary policy insights from the *New Sources of Growth* project – insights which are broadly applicable to OECD countries at lower and higher income levels, as well as many emerging economies - while describing work in progress and future analytic challenges.

10. **Tax policies will likely need review:** to support competitiveness and encourage R&D, many governments subsidise R&D expenditure and limit tax on income derived from KBC. But cross-border tax planning by multi-national enterprises (MNEs) may result in effective tax rates (ETRs) on R&D well below intended levels. Moreover, tax systems may be encouraging the migration of KBC to offshore holding companies, and the use of KBC in foreign rather than domestic production, weakening the original rationale for tax incentives for R&D. The OECD is developing new ETR measures to provide guidance on a range of tax policy choices. Currently, no systematic approach is being taken to assess the amounts of income being shifted internationally through MNE tax planning involving KBC. But the magnitudes involved are significant. For example, research suggests that the potential annual revenue cost from income shifting by US-based MNEs may be as high as USD 60 billion, with possibly half of this due to aggressive transfer pricing of KBC-related transactions.

11. **Competition policy analysis must evolve:** many competition agencies are wrestling with the analysis of competitive behaviour in the digital economy, where entirely new sectors and business practices (highly reliant on IP) are rapidly emerging. OECD is assessing competition policy challenges in the digital economy and the broader issue of IP and competition. Early work suggests that in the digital economy the most significant competition takes place between companies using very different business models. For example, Apple, Google, and Microsoft all compete in the market for mobile phone operating systems, but they have very different business models. Apple does not license its Operating System (OS), reserving this exclusively for its own brand of phones. Google offers handset manufacturers free licenses to the Android system. And Microsoft licenses its mobile OS for a fee. Competition *among* platforms is more important to innovation than competition *within* platforms, so competition authorities should give priority to the former type of competition issues. Eliminating anti-competitive product market regulation, and enforcing competition rules, is also fundamental.

**Box 1. Design– a form of KBC driving innovation and growth**

Beyond the physical appearance of products, design is often integral to all stages of the business process, from basic research to manufacture, marketing and after-sales services. One study in the United Kingdom suggests that design spending might be more than twice as large as business spending on R&D. And design plays important roles in innovation and firm performance. For instance:

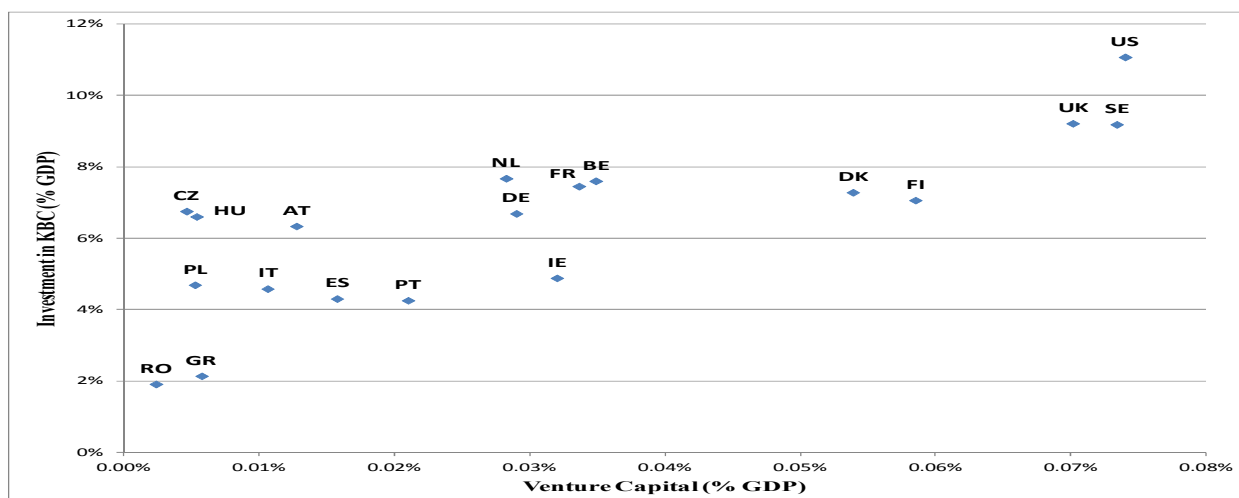
- A number of world-beating products owe at least part of their success to different facets of design. Research published in 2010 indicated that the iPhone had then added around USD30bn to the value of the Apple Corporation, with only 25% of this attributable to patentable technology stemming from R&D. Much of the rest arose because of Apple's innovations in design, marketing and management. Companies in traditional industries such as textiles, apparel and furniture are also able to succeed based on design competencies.
- 67% of exporters in New Zealand have identified design as central to their commercial success.
- In 2007, almost half of businesses in the United Kingdom believe design contributes to increased market share and turnover. And in 2004, among firms in the United Kingdom that saw design as integral to their business, nearly 70% had introduced a new product or service in the previous three years (compared to just 3% of companies in which design played no role).

The 'Europe 2020 Flagship Initiative – Innovation Union' includes design among its ten identified priorities. And further afield, China, India, Korea and Singapore have all enacted design policies and consider design to have strategic economic importance.

12. **Intellectual property rights (IPRs) are key:** the *New Sources of Growth* project is highlighting the central importance of IPRs. A number of OECD countries have begun comprehensive reviews of their IPR frameworks, and debates on IPR have assumed new prominence in the economics press. While IPR frameworks differ significantly, concerns exist in many countries over the erosion of patent quality, the creation of incentives for litigation, delays in awarding patents, an overly broad extension of the patentable domain, and the activities of 'patent trolls' (firms that do not make, own or provide their own products or services, but instead purchase patents and file resource-consuming lawsuits against companies alleged to have infringed those patents). Many IPR systems do not reflect the complexity of modern products (e.g. mobile phones) that require the assembling of thousands of patents. The work on KBC also goes beyond patents, drawing attention to the importance of copyright and design. Fears exist regarding enforcement of copyright in the digital age and the possibility that copyright law might hinder new kinds of internet-based firms and impede research based on new text and data mining techniques. Design, too, is a critical form of KBC (Box 1). But little is known about systems to protect design rights and their effects on design investment, much of which is undertaken by small firms with limited capacities to negotiate design rights systems and enforce their design rights.

13. **Governments will need to ensure good conditions for the financing of KBC-intensive firms:** specialised financial intermediaries – such as venture capitalists and business angels – are important in allocating capital to fast-growth KBC-based firms and in matching such firms to larger incumbents with strengths in commercialising inventions. Indeed, overall levels of business investment in KBC are positively correlated with the size of the venture capital industry (figure 3). But significant cross-country differences exist in the supply of seed, early stage and venture capital investments. This raises the question of whether cross-country differences in public policy exacerbate rigidities in the financing of investments in KBC. Examination may also be needed of the effects of recent regulatory changes in financial markets on the supply of risk capital.

Figure 3: Business investment in KBC and the size of the venture capital industry (2000-07)



Source: Corrado, Haskel, Jonas-Lasinio, Iommi (2012, forthcoming).

14. Innovations have also occurred in KBC-based lending, such as royalty-based financing. *Governments can facilitate these developments in different ways*, from monitoring the broad array of securities laws and regulations and how they affect KBC-based financing, to ensuring a robust market for IP.

15. **Facilitating entrepreneurial activity is essential:** a dynamic process of firm creation and exit will facilitate resource reallocation to new sources of growth based on KBC.

16. **Improved corporate reporting could help:** when firms provide investors and analysts with information on investments in KBC, the exercise of ownership rights is strengthened, management and boards are subject to greater discipline, and valuation becomes more efficient. Industrial sectors more dependent on external finance grow faster in countries with higher quality corporate disclosure regimes. But accounting frameworks are unsuited to the reporting of spending on KBC. Reforms have focused on narrative disclosure frameworks. But these have not been widely implemented, and few OECD governments have created guidelines on how KBC should be reported. Policymakers could help by promoting comparability and consistency of reporting across countries, while support might be provided to facilitate reporting by small and medium-sized firms. Further deliberations in the Corporate Governance Committee are pending.

17. **Skills shortfalls represent a bottleneck:** research on the rise of KBC underscores that human capital development must be at the core of policy. Human capital subsumes KBC. For example, over half of all R&D is spent on wages for researchers. Nevertheless, skills shortages in some critical areas are acute: for instance, research in the United States suggests a shortage of some 1.5 million managers able to take advantage of data-related investment opportunities. Insights are here being drawn from the OECD Skills Strategy.

18. **KBC will create new regulatory challenges:** for example, in the near future, the Internet will connect things as well as people. A new type of user of mobile networks will emerge - the million-device user (such as car companies whose vehicles connect to the Internet). Today, however, the million-device user can be locked into 10-30 year contracts and charged costly roaming rates. Removing regulatory barriers to entry in this mobile market would allow the million-device customer to become independent of the mobile network and create competition. This will yield billions in savings on mobile connectivity and revenue from new services.

19. **Aspects of macro-economic policy may need to be recalibrated:** recognising that business' spending on KBC is a form of investment has potential implications for macro-economic management. Aggregate savings and the amplitude of business-cycle upturns and downturns may be larger than was previously measured. This insight, which requires further investigation, has barely figured in policy analysis to date.

*Other emerging areas of policy focus*

20. **Better policy can help create economic value from personal data:** personal data is now being processed and transferred around the clock and across the globe. The economic value in such data is potentially enormous, and a growing number of businesses are discovering novel uses for large databases. For instance, search engine data are fueling automated translation services and uncovering flu trends, and location data from mobile phones are revealing transportation flows. *Governments must address the privacy risks of unanticipated uses of personal data so as to enable continued innovation in data-driven services. Raising public awareness of the uses of personal data is key to building trust and understanding of the benefits from such uses. Improved measurement could also help develop policies better tailored to the scale, benefits, and risks posed by the expanding use of personal data.* More broadly, the ability to capture, analyse and make decisions based on huge volumes of data requires an expertise and technical sophistication that may accentuate the "digital divide."

21. **A fuller understanding of innovation, investment and growth requires better measurement:** despite the centrality of KBC to growth in OECD economies, aggregate measures of investment in KBC are fraught with inaccuracies and lack of comparability. Key investments in such areas as design and training are poorly captured in surveys.

22. **Opportunities exist for international collaboration:** harmonisation of regulations permitting the cross-border transmission of data, or the cross-country licensing of copyright, are just some of the areas where international collaboration would bring benefits beyond the scope of purely national initiatives.

#### **4. Project milestones and outputs**

23. A policy-oriented conference will be held in early 2013, with the launching of publications on the following subjects: Measurement of KBC and its effects on economic growth; Improving tax policy for KBC; The creation of economic value from personal data; Corporate reporting of business investment in KBC; Knowledge networks and markets; and The role of KBC in global value chains. There will also be an overall project synthesis report and a report to the 2013 MCM.

24. This project is also pointing to policy-relevant themes that will need further investigation in the medium-term, owing to their complexity and/or evolution. Among these are: understanding how the impacts of investments in KBC translate into labour market outcomes, both in terms of aggregate demand for labour and in terms of the demand for skills (in this connection, links can also be drawn with recently published OECD work – as well as the broader literature - on the causes of income inequality in OECD Member countries); assessment of the adequacy of IPR frameworks in the knowledge economy; creating economic value from personal and public data; innovations in the financing of KBC-intensive firms, tax policies, and improving internationally comparable measurement of investment in KBC and the associated macro- and micro-economic outcomes. This work will inform OECD's broader work on 'new approaches to economic challenges'.