Coming to grips with Intangibles

Getachew A. Tessema *Australian Bureau of Statistics, Canberra, Australia*
getachew.tessemas@abs.gov.au
Branko Vitas *Australian Bureau of Statistics, Canberra, Australia*
branko.vitas@abs.gov.au

Abstract

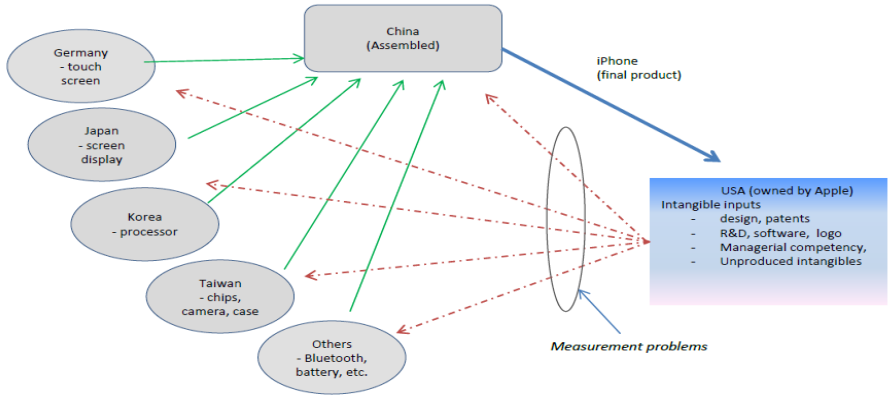
In an era of knowledge based economy investment in intangible assets such as knowledge and innovation play important role in economic growth. In recent years there has been considerable debate on the role of intangible assets in economic growth particularly in advanced economies. Investment in intangible assets is as much as in tangible assets and has been on the rise in recent years. The studies also indicate that there exist positive association between previously unmeasured intangible assets and observed patterns of economic growth. Variations in multifactor productivity have been also associated with the differences in investment of intangibles. However, unlike tangible assets, intangible assets have conceptual and measurement difficulties as a result of which only a handful of them have been considered as assets in the SNA2008. This paper reviews some of the recent empirical literature that considers a wide range of intangible assets and assesses potential implications in the context of the system of national accounts. It highlights some issues relating to measurement and data sources encountered by national statistical offices which are critical for the expansion of intangible assets boundary in the SNA. An overview of the experience of the Australian System of National Accounts is also provided.

Key words: productivity, growth accounting, Data Quality Framework

1. Introduction: what are we trying to measure?

Intangible assets such as ideas, skills and innovative potential play an important role in the economy especially in highly developed economies. As the production of goods becomes more sophisticated or knowledge-based, inputs of intangible capital has become vital for the competitiveness of firms and the economic performance of countries. An example of this is to look into the role of intangible assets in the production of Apple's iPhone see Figure 1. Apple own the iPhone (a US firm), while the product is assembled in China from parts supplied by Japan, Germany, South Korea, Taiwan and other countries. The physical inputs can be measured using conventional measures.

Figure 1 An example of intangible assets in the production of iPhone



Note: compiled from various sources (list of components only indicative)

Apple provides key inputs in the form of intangible assets that are critical for the success of its global operations. These include the design of the iPhone, software, R&D, the company logo/name, patent, managerial competencies (firm-specific know-how and skills, organisational capital etc.). With the exception of R&D and software, the various intangibles provided by the US are outside the asset boundary of intellectual property products of SNA 2008. As a result, despite the importance of these assets in the output and quality of the product, most are recorded as intermediate inputs rather than capital in the national accounts. This understates capital investment and has wider implications on other measures of the economy such as multifactor productivity (MFP) analysis, trade and capital services. Thus the challenges for a National Statistical Office (NSO) are to define the scope of intangible assets and overcome the measurement problems.

2. What are intangible assets?

Intangible assets, also known as intellectual capital or knowledge assets are defined in a variety of ways. They are generally referred to as assets that provide future benefits but do not have a physical embodiment that can be observed (Lev 2001, Nakamura 2001, Cummins 2005). Intangibles are numerous and complex in nature. In contrast the asset boundary of intangible assets in the SNA2008 has been limited to only a few assets such as R&D, Computer software, mineral and petroleum exploration, and artistic originals.

In recent years, improvements have been made to both the methodological and empirical aspects regarding various elements of intangibles. For example, a 2006 World Bank report defines intangibles more broadly to include human capital, social capital and institutional infrastructure such as the judiciary. Corrado, Hulten and Sichel (2005, 2006) used an improved growth accounting framework and further expanded the class of intangibles included in the model. In their example, various elements that constitute intangible capital are classified into three broad categories: computerised information, innovative property and economic competencies, consisting of up to 13 types of intangibles in total. This framework has attracted numerous studies and provides a useful dimension in estimating investment in intangible capital and assessing their likely impacts in measuring economic growth and productivity. Schreyer (2007) notes that the Corrado et al approach appears more practical from the perspective of monitoring intangibles as part of a periodic measurement program carried out by a statistical office. Although the impact of a wide range of intangibles provides useful information, the framework does not distinguish the relative importance of specific intangible assets in the economy.

3. How important are intangible assets?

There is wide consensus among researchers and policymakers on the growing role intangible assets play on firm productivity and the performance of economies. This is especially true in knowledge-based economies where innovations such as R&D, software and organisational capital are considered major drivers of economic performance. There has been increasing attention in the empirical literature trying to measure investment in intangible assets and their role in measuring productivity and economic performance. The empirical estimates vary depending on the analytical methodology and assumptions, scope of intangibles etc., nevertheless they provide important insights on the size and role of intangibles especially in highly developed economies.

The World Bank report, '*Where is the Wealth of Nations? Measuring Capital in the 21st Century'* estimates that intangible assets account for 78% of the world's wealth and varies from 59% for developing countries and 80% for high income (OECD) countries. While based on a broad definition of intangibles, it highlights the role intangibles play in

developing and developed economies. Evidence from several OECD countries indicates that investment in intangible assets related to innovation (R&D, software, skills, organisational capital and branding) is as much as in tangible assets such as machinery, equipment and buildings. In the UK and US investment growth in intangibles was faster than in tangibles (Corrado, Hulten and Sichel, 2005, 2009).

Intangible assets have been measured using different methodological approaches such as growth accounting, financial market valuation and econometric techniques. The growth accounting approaches have received increased attention in recent studies. The theoretical foundation of the growth accounting method traces back to the sources-of-growth (SOG) framework proposed by Solow (1956, 1957) and has been widely applied in measuring MFP. The conventional SOG framework decomposes output growth in to its components - growth in weighted share of factor inputs and a residual term, which is referred to as MFP growth. By implication, any spill overs and measurement errors are also attributed to the residual term. Since many intangibles are treated as intermediate expenses, using the SOG framework does not provide an explicit measure of intangibles in the economy.

Corrado, et al. (2005, 2006) took the conventional SOG framework a step further to develop an expanded version that allows for the inclusion of a wide range of intangibles and the explicit measurement of their contribution to MFP. Using US data they estimated that investment in intangible assets averaged 12% of GDP between 1998 and 2000. Their results show that considering a wide range of intangible assets (capital deepening) contributes to increases in labour productivity and a decrease in MFP.

The new SOG approach has been applied in a number of other countries such as the UK (Marrano, Haskel and Wallis 2007), Japan (Fukao, Hamagatta, Miyagawa and Togogi 2007) and other OECD countries. The major implications of these studies include:

- Previously unmeasured intangible assets are significant and vary between countries.
- There is a pattern showing a positive relationship between intangible assets and economic growth and labour productivity in almost all studies, and a decline in the importance of MFP.

However, any comparison can only be considered as indicative due to the experimental nature of the methodology as well as the different assumptions used in different countries to overcome data limitations. Since official statistics are distinctively different in nature and purpose from other sources of information the validity of empirical evidence should be viewed in the context of conventions, standards and classifications required in the system of national accounts. In other words, more work on intangible assets is needed to provide consistent definitions, measurements and classifications before any considerations are made to expand the asset boundary for intangibles.

4. Some experiences from of the Australian System of National Accounts (ASNA)

Consistent with the recommendations in the SNA, intangible assets in the Australian System of National Accounts include R&D, computer software, mineral and petroleum exploration, and artistic originals. Intangible assets account for 11% of private gross fixed capital formation in 2011-12, of which 44% is attributed to R&D and 31% to computer software. Due to the inherently complex nature of intangibles, challenges remain with regard to measurement. The challenges to expand measurement of intangible assets in the national accounts beyond the current scope are even larger. While it is acknowledged intangible assets play a significant role in the performance and productivity of firms and economies, for the National Accounts two broad questions arise:

- what assets should be included in the accounts? and
- how do we measure these assets?

For a National Statistical Office (NSO) to include a wider definition of intangible assets beyond the SNA in the production of official statistics, a number of measurement hurdles must be cleared. The ABS uses a basic Data Quality Framework (DQF) to assist in the process of determining *what and how to measure*? The DQF consists of six elements: *relevance, accuracy, interpretability, coherence, accessibility and timeliness*.

By using an intangible that the ABS includes in the national accounts (*R&D)* and one that is not included, *organisational capital* (strategic planning, adaptation and re-organisation) as examples, we provide comments on how the DQF can be used to guide a NSO in the decision process in considering a range of intangible capital for the national accounts.

Relevance refers the degree to which statistical information meets the needs of users. In determining whether to expand the asset boundary to include more intangible assets, NSO's need to have a clear understanding of what exactly are the needs of users. It is the questions that policy makers, businesses and other decision makers are trying to answer that the NSO must be aware, as it is these questions that determine what is to be measured. Therefore, the key challenges for NSOs will be to define the scope, concepts, classifications and data sources that meet user needs. Assessing resource requirements, prioritising and planning of statistical programs are important elements of this exercise**.**

In the case of R&D the ABS engaged with key stakeholders regarding the scope, concepts and classifications (e.g. Frascati) that measurement of R&D. Once these considerations were agreed to, the identification of data sources and gaps could progress. The ABS identified data gaps early in the process and introduced new collections (business, government and higher education R&D expenditure) aimed and gathering the relevant information for the purpose of measuring expenditure in R&D.

From the academic literature on the measurement of *organisational capital* it is clear that there is no universal agreement on the scope and classification issues. Therefore, one area where work needs to be undertaken in order to facilitate measurement is agreement on the scope and classification questions.

Accuracy is the degree to which information collected describes what is intended to measure. This is influenced by a number of factors including the definition and coverage, methodological difficulties, data sources and errors, coherence etc. In the Australian case R&D measurement has been undertaken for over a decade. The framework, methodology and data sources developed and used for the measurement of R&D meets the accuracy requirements. However, there are still ongoing issues, for example what is the appropriate price index to apply to current price R&D expenditure in order to derive a volume measure? What is the appropriate asset life of R&D?

Measuring *organisational capital* of firms accurately is considerably more challenging given the complexity of concepts and measurement issues involved. The challenge for a NSO is to ensure mechanisms are in place to address the methodological, measurement, data, coherence and data comparability issues on organisational capital. The questions posed about R&D relating to appropriate price indexes and asset lives are even more difficult to answer in the case of *organisational capital*. Basic questions such as 'how do you measure the value of strategic planning?' are difficult to answer.

Interpretability (interrelated with accuracy) is primarily related to concepts, definitions and classification that underlie the data, which is critical in the SNA. While the ABS introduced the capitalisation of R&D with the 2008 SNA, there is still some scepticism by some users about the utility of capitalising R&D expenditure. They argue that it does not seem to explain some of the "puzzles" that persist in productivity data.

The data on *organisational capital* as demonstrated in studies can be considered deficient in that no standard concepts, definitions and classifications have been followed to produce statistics on organisational capital that is fit-for-purpose in the context of national accounts framework. The other aspect of interpretability refers to the adequacy of the methodology used to collect and compile statistics on *organisational capital.* While both aspects are interrelated, the research indicates that different assumptions have been used in different studies in obtaining data on *organisational capital* – which makes comparability between studies or countries difficult.

Coherence reflects the degree to which information on intangible assets can be successfully brought together within the broader national accounts over time. In the case of R&D, the increase in capitalisation of R&D products was offset by a reduction in own account expenditure. Using the supply-use framework, where businesses 'purchased' R&D from another statistical unit the change was reflected in a reduction in the intermediate use of the business and a commensurate increase in gross fixed capital formation, effectively increasing value added and GDP.

In the case of *organisational capital,* how should NSOs treat the inclusion of some of the elements of *organisational capital*? What is the story to be told by if there was an increase in GFCF formation due to the measurement of strategic thinking? NSOs will need to engage with academia, business, government and other stakeholders so that the impact of proposals to measure and include *organisation capital* in a national accounting framework is clearly understood. One approach is to use a satellite accounting framework which provides the opportunity for more detailed analysis over time in assessing the feasibility of a particular area while retaining a link to the core national accounts.

The other aspects of quality framework include *accessibility* - the ease with which statistical information on *organisational capital* can be obtained once produced, and *timeliness*- the length of time on which the information becomes available. To this end important considerations should be made by NSOs, among others, to ensure delivery timelines are in line with user needs and ensure accessibility by improving search tools and systems (see ABS Cat. no. 5216.0.55.002 for further discussion).

5. Conclusion

The increased importance of intangible assets in the performance of firms, especially in highly developed economies, has attracted considerable research and analysis in recent years. Improvements have been made in methodological and empirical literature that contributes to our understanding of the importance of intangibles in economic growth and productivity analysis. The evidence suggests the inclusion of a wide range of intangible assets explicitly into the growth accounting framework can alter measures of economic growth and MFP. Broadening the boundary of intangible capital also contributes to better measurement of labour productivity. Although constrained by differences in conceptual and measurements issues, the results underline the importance of expanding the scope of intangible assets in measures of economic performance. However, the data on the various

intangibles have been generated using various assumptions and rough estimates, which differ across studies. Less attention has been focussed on the conceptual and measurement issues which makes direct comparability of research results difficult. Standard concepts, definitions and measurement methods of intangibles need to be developed in order provide consistent and comparable data across countries and over time.

To progress the measurement of Intangible Capital within official statistics, academics and NSOs should work collaboratively in moving the debate from the conceptual to the measurement issues. One opportunity to progress this may be through the development of satellite accounts which enable measurement issues to be teased out without having to meet the hurdles set for inclusion in the National Accounts proper. Another avenue to advance the measurement issues of intangible capital within the system of national accounts is for NSOs and stakeholders undertake further methodological research on selected intangibles within the umbrella of City Groups. These groups have been instrumental in the past in progressing conceptual and measurement issues on capital.

References

Australian Bureau of Statistics (2007), Information paper, Quality Dimensions of the Australian National Accounts, *ABS Cat. No. 5216.0.55.002*, ABS, Canberra.

Corrado, C., C. Hulten and D. Sichel (2005), "Measuring Capital and Technology: An expanded framework", in C. Corrado, J. Haltiwanger and D. Sichel (eds), *Measuring Capital in the New Economy*, National Bureau of Economic Research, Studies in Income and Wealth, Vol. 65, Chicago, IL: University Chicago Press, pp. 11-45.

Corrado, C., C. Hulten and D. Sichel (2006), Intangible Capital and Economic Growth, *NBER Working Paper No. 11948*, National Bureau of Economic Research, Cambridge.

Cummins, J. (2005), "A new approach to the valuation of intangible capital", in C. Corrado, J. Haltiwanger and D. Sichel (eds), Measuring Capital in the New Economy, *NBER*, Studies in Income & Wealth, Vol. 65, Chicago:
University Chicago Press, pp. 47-72.

Fukao, K., S. Hamagata, T. Miyagawa and K. Tonogi (2007), Intangible Investment in Japan: Measurement and Contribution to Economic Growth, *RIETI Discussion Paper No. 07-E-034*, Research Institute of Economy, Trade and Industry, Tokyo.

Giorgio Marrano, M. and J. Haskel (2006), How much does the UK invest in intangible assets*?, Department of Economics Working Paper No. 578*, Queen Mary, Uni. of London.

Giorgio Marrano, M., J. Haskel and G. Wallis (2007), What happened to the knowledge economy? ICT, Intangible Investment and Britain's Productivity Record Revisited, *Dep of Economics Working Paper No. 603*, Queen Mary, University of London.

Lev, B. (2001) *Intangibles: Management, Measurement, and Reporting*, Brookings Institution Press, Washington DC.

Marrano, G.M., J. Haskel and G. Wallis (2007), What happened to the knowledge economy? ICT, Intangible Investment and Britain's Productivity Record Revisited, *Department of Economics Working Paper No. 603*, Queen Mary, University of London.

Schreyer, P. (2007), 'Old and new asset boundaries: A review article on Measuring Capital in the New Economy', *International Productivity Monitor*, No. 15, pp. 77–82.

Solow, R. (1956), A Contribution to the Theory of Economic Growth, *Quarterly Journal of Economics*, Vol. 70, pp. 65-94.

Solow, R. (1957), Technical change and the aggregate production function, *Review of Economics and Statistics*, vol. 39, no. 3, pp. 312–20.

World Bank (2006), *Where is the Wealth of Nations? Measuring Capital for the 21st Century*, World Bank, Washington, D.C.