A comparative study of intangible investment in Egypt and South Africa

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Abstract

Purpose – The purpose of this paper is to understand the recent developments and trends of intangible investment in Egypt and South Africa.

Design/methodology/approach – This paper follows the framework pioneered by Corrado, Hulten and Sichel (2005, 2009) and measures investments in scientific R&D, organizational capital, and brand equity using the expenditure-based approach.

Findings – The main findings are that South Africa invests consistently and considerably more in intangible assets than Egypt. Among the three intangible assets examined, namely, scientific R&D, organizational capital, and brand equity, South Africa seems to invest more evenly across these assets, whereas intangible investment in Egypt is predominantly driven by investment in brand equity and very little in R&D.

Originality/value – This is the first paper to formally examine intangible investment in African countries. The ballpark estimate provided in this study is a useful step forward in understanding the trends of intangible investment in Egypt and South Africa.

Keywords Africa, Comparative study, Intangible investment, Knowledge-based capital

Paper type Research paper

1. Introduction

Since the influential work of Corrado *et al.* (2005) which standardized and popularized the measurement approach of investment in intangible assets, evidence is growing stronger that investment in intangible capital, also known as knowledge-based capital (OECD, 2013), has become increasingly more important over time. According to the estimates constructed by Corrado and Hulten (2014), the share of intangible investment had already exceeded the share of tangible investment in the USA by the early 1990s and reached over 14 percent of gross domestic product (GDP) in 2010 (see Figure 1). This increasing importance of intangible investment is not only specific to the USA or industrialized economies such as the European Union (Corrado *et al.*, 2012), studies that look at other parts of the world, such as China (Hulten and Hao, 2012) and Brazil (Dutz *et al.*, 2012), also show a similar pattern with investment composition gradually shifting away from tangible to intangible assets. By including intangible capital estimates in a growth accounting framework, the extant literature also finds that intangible capital plays an important role in determining labor productivity growth (e.g. Corrado *et al.*, 2009; Fukao *et al.*, 2009; Roth and Thum, 2013; van Ark *et al.*, 2009). This new finding suggests that the role of measured total factor productivity (TFP) or "our measure of ignorance" as it was coined by Abramovitz (1956) is reduced, while capital deepening (tangible and intangible combined) constitutes the dominant source of growth.

Despite the growing interest and the rapidly expanding literature on intangibles, most studies tend to focus on advanced or emerging economies. No study has yet looked at intangible investment in Africa, a continent that experienced very fast or even miraculous economic growth in the last decade (McMillan and Harttgen, 2014; Young, 2012)[1]. It is of interest in itself to examine what has been the investment pattern or trend in intangible assets in Africa? It could also be relevant to the query whether the "African Growth Miracle", dubbed by Young (2012), can be sustained in the long run as knowledge-based

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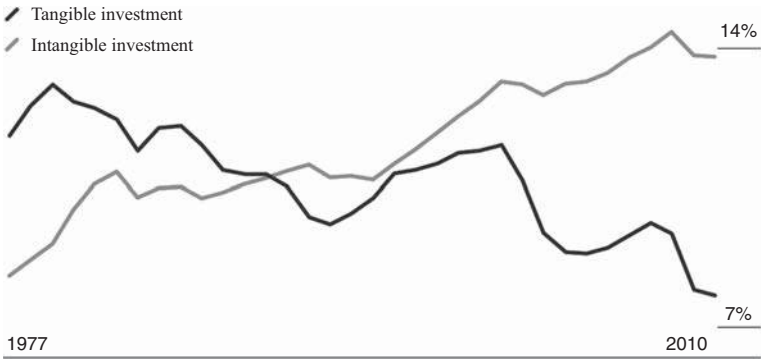

Figure 1.
Intangible investment in the USA

Source: Corrado and Hulten (2014)

intangible capital is increasingly recognized as a highly important driver of future growth (e.g. OECD, 2013). To fill the gap, the current study focuses on two specific African countries, namely, Egypt and South Africa where the data are available, and estimates their investments in intangibles over the period 1995-2011. Given the comparability of the data source, this paper provides detailed descriptive analysis by comparing the two countries in terms of their levels and compositions of investment in intangible assets.

Following the broader literature and due to data constraints, this paper confines the scope of analysis to the market-sector economy and focuses on three specific intangible assets (i.e. scientific research and development, organizational capital, and brand equity)[2]. Using the expenditure-based approach for measurement, this paper finds that investments in intangibles as a portion of GDP have grown from 1.9 to 2.8 percent in South Africa over the period 1995-2011. Whereas, the investment share of intangibles remained stagnant at about 0.5 percent of GDP in Egypt in the same period. If one looks deeper by asset types, the increase in the investment share of intangibles in South Africa is mainly driven by the increasing share of investment in organizational capital; while investments in brand equity and R&D remained fairly constant at 1 and 0.4 percent of GDP in South Africa.

In terms of investment composition of intangible assets, the differences between the two countries are also noteworthy. The share of business investment in R&D is almost negligible in Egypt which accounts for merely 3.5 percent, while the investment share of brand equity constitutes more than 75 percent of total intangible investment. In relative terms, South Africa seems to have much more balanced investments across these intangible assets, with investment in R&D, organizational capital, and brand equity accounting for 20, 35, and 45 percent, respectively. Over time, these compositional shares seem to change in the direction where organizational capital becomes more important in South Africa.

This paper is closely related to the emerging literature on estimating intangible investment (e.g. Corrado *et al.*, 2005, 2009, 2012; Fukao *et al.*, 2009) and it contributes to the literature by providing the first estimates on intangible investment for two African countries. It would have been desired to include as many African countries as possible in the analysis, data constraints, however, only allowed the paper to examine Egypt and South Africa specifically. It is important to note that this paper emphasizes on the descriptive analysis of intangible investment flows and does not measure the corresponding intangible capital stocks or services of these two African countries. Thus, the current study cannot incorporate the estimates of intangibles in economic models (e.g. the growth accounting framework) to probe the quantitative importance of intangible capital in economic growth. This would be a worthwhile attempt for future research that could cover the estimates of the entire list of intangible assets identified by Corrado *et al.* (2005).

The remainder of the paper is organized as follows. Section 2 discusses the measurement approach of each of the intangible assets examined in the paper and their associated data sources. Descriptive analysis and results are described in Section 3 where the paper tries to compare and contrast the two countries in terms of their investment patterns and trends in intangible assets. Section 4 turns to examine the possible policy implications based on the descriptive findings. Concluding remarks and limitations of this study are discussed in length in Section 5.

2. Measurement approach and data sources

This section begins with a general description of the measurement approach for intangible investment, followed by detailed discussions on how each intangible asset is estimated as well as the associated data sources used.

2.1 General approach

In their pioneering work, Corrado *et al.* (2005) set out the conceptual framework to identify and categorize the list of intangible assets at the level of the aggregate economy (see Figure A1 for an overview). It, however, remains a daunting challenge to quantify investments in those intangible assets as they are often created for internal use and lack market transaction data for objective valuation[3]. To circumvent this problem, researchers turned to use the expenditure-based approach as an alternative. The central idea of this approach is that firms are assumed to invest in (intangible) assets until the discounted present value of the future expected income stream equals to the cost of producing the marginal asset (Jorgenson, 1963). Following the most recent guidelines of System of National Accounts 2008, all R&D expenses will be treated as investment. For own-account organizational capital, however, only 20 percent of the manager's labor compensation will be regarded as conducive to organizational development (Corrado *et al.*, 2005). As for advertising, the current literature suggests that about 60 percent of advertising expenditures have long-lasting benefits and should be capitalized as investment (Corrado and Hao, 2014). Taken together, investment in intangible asset j at time t in country c can then be calculated as follows:

$$n_{j,c,t} = d_j \cdot E_{j,c,t} \tag{1}$$

where d_j represents the asset-specific capitalization factor (e.g. 0.2 for organizational capital and 0.6 for advertising). E denotes the amount of expenditures on asset j. Assuming that the production factors are paid at their marginal productivity, the reclassification of some of expenditures as investments expands the conventional GDP accounting identity[4]:

$$MGDP' = mY + N = \overbrace{C + I + \underbrace{N}_{added}}^{Expenditure\ side\ GDP} \tag{2}$$

where m denotes the share of the market economy (i.e. total output subtracted by output produced by public sectors such as education, public administration, and health); N is the sum of market investment in R&D, organizational capital and brand equity (i.e. $N \equiv \sum_{j=1}^{3} n_j$).

2.2 Investment in R&D

Relative to investments in the other two intangible assets, R&D investment is most well-researched and gained most importance in the economics literature. This is also reflected in the recent revision of SNA 2008 proposing to fully capitalize R&D expenses as investment[5]. This paper uses data from the UNESCO Institute for Statistics to measure

business investment in R&D. The relevant expense item to capture market investment in R&D would be the gross expenditures on R&D performed by business enterprises (BERD). Data on this specific item, however, are very limited. This is especially the case for Egypt where the BERD data are merely available for 2014 and missing for all the other years. To approximate the BERD values, this paper obtains information on gross expenditures on R&D (GERD) which has much richer data coverage[6]. To complete the estimates in business R&D from 1995 to 2011, this paper first linearly interpolates whenever data are missing between two observed data points and then extrapolates back in time by keeping the ratio of BERD in GERD (i.e. $(BERD)/(GERD)$) constant. To be specific, the interpolation and extrapolation procedures take the following form:

$$\underbrace{y^X = y_0^X + \left(y_1^X - y_0^X\right) \times \left(\frac{t - t_0}{t_1 - t_0}\right)}_{interpolation}; \underbrace{BERD_{t-1} = GERD_{t-1} \times \left(\frac{BERD_t}{GERD_t}\right)}_{extrapolation} \tag{3}$$

where y_0 and y_1 on the left panel denote two data points observed at year t_0 and t_1; y is the missing value to be interpolated at year t where $t_0 < t < t_1$.

2.3 Investment in organizational capital

Organizational capital is a relatively new concept[7]. It mainly refers to the knowledge of organizational structures or management know-how that allows the firm to increase its productivity with a given level of technology. Some well-known examples include the just-in-time production process that enabled Japanese car manufacture Toyota to outperform other competitors in the automotive industry or the build-to-order distribution system that made Dell Computers to capture a large market share in the personal computer market.

Following the broader literature, this paper measures investment in (own-account) organizational capital by assuming that 20 percent of managers' time are spent on optimizing or improving the efficiency of organizational structures (Corrado *et al.*, 2005). In other words, the investment in organizational capital in country c at time t can be calculated as follows:

$$N_{c,t}^{OC} = \left(20\% \cdot L_{c,t}^{Managers}\right) \cdot EMP_{c,t}^{Managers} \tag{4}$$

where L refers to the labor compensation accrued to the managers and EMP denotes the total number of managers employed in the economy. To retrieve data on the level of employment *(EMP)*, this paper resorts to the International Labor Organization database where it provides the most comprehensive information on labor statistics characterized by occupations. It would have been ideal to retrieve employment data according to the 2008 international standard classification of occupations (ISCO-08) since it separates corporate managers from legislators and government officials. Employment data based on this classification, however, are very scant and as a result of which an older occupational classification (i.e. ISCO-88) is used as an alternative for its better data availability (see Table AI for a detailed outline of ISCO-88 occupational classification).

Relative to the employment data, wage data is even more scarce. There is virtually no information provided regarding the wage rate or labor compensation of the managers in both countries. As a consequence, the labor compensation figures have to be externally imputed and this is done in two steps. First, this paper obtains the average labor compensation in the economy by using data from the Penn World Table 8.1 (PWT) as follows:

$$W_{c,t}^{Mean} = \left(\frac{labshare \cdot cgdpo \cdot pl\_gdpo}{emp}\right)_{c,t} \times xr_{c,t} \tag{5}$$

where *labshare* indicates the share of labor compensation in GDP at current national prices; *cgdpo* is the output-side GDP calculated at current PPPs (denominated in 2005 USD); *pl_gdpo* denotes the price level of GDP; *emp* is the total number of persons working in the economy; and *xr* is the market exchange rate used to convert currency unit back to local currency.

For its richer data availability, this paper further uses the USA as the reference country to derive the annual wage rate of the US managers from the US Bureau of Labor Statistics and then calculates a relative wage differential between the average worker (i.e. derived based on PWT 8.1) and the managerial worker in the USA:

$$R_t^{US} = \left(R_{BLS}^{Managers} / W_{PWT}^{Mean}\right)_t^{US} \tag{6}$$

By assuming that the wage differential between managers and average workers are constant across countries, labor compensation for managers in Egypt and South Africa can then be approximated as follows:

$$L_{c,t}^{Managers} = R_t^{US} \times W_{c,t}^{Mean} \tag{7}$$

Admittedly, using the USA as the benchmark country may introduce bias in estimating investment in organizational capital as Egypt and South Africa are at very different stages of economic development than the USA. The wage differentials between managers and average workers tend to be smaller in countries at higher levels of economic development (Freeman and Oostendorp, 2001). If country-specific wage differentials are used for Egypt and South Africa, the investment level of organizational capital is likely to be higher than applying the relative wage differential of the USA. Due to the lack of occupational earnings data for these two countries this paper cannot properly account for this underestimation bias. That is to say, the estimates for investment in organizational capital are likely to be on the conservative side than otherwise.

2.4 Investment in brand equity

Brand equity is closely associated with advertising and market research activities. Following Corrado and Hao (2014), this paper estimates investment in brand equity using two international databases that are complied by World Advertising Research Center (WARC) and European Society for Opinion and Marketing Research (ESOMAR). The former provides advertising expenditure figures and the latter collects data on market research expenses.

It is well known in the literature that not all advertising expenditures have long-lasting effect (e.g. Bagwell, 2007). This paper assumes that about 60 percent of advertising expenditures contribute to building up brand equity (Corrado and Hao, 2014; Corrado *et al.*, 2009). Akin to Corrado and Hao (2014) this paper also applies two adjustment factors to correct for the potential underestimation of investment in brand equity. This downward bias results from the fact that the advertising expenses collected by WARC and the market research expenses provided by ESOMAR are incomplete. Previous research have shown that advertising expenses are likely to be underestimated by 39 percent (Awano *et al.*, 2010; Marrano *et al.*, 2009); while the actual expenditures on market research could be twice as large as what ESOMAR's data suggest. Given these, this paper estimates investment in brand equity as follows:

$$N_{c,t}^{BE} = \left(d \cdot \gamma_{adv} \cdot E_{c,t}^{adv}\right) + \left(\gamma_{mkt} \cdot E_{c,t}^{mkt}\right) \tag{8}$$

where γ denotes the adjustment factors (i.e. 1.39 for advertising and 2 for market research), E is the expenditure data obtained from WARC and ESOMAR, and d represents that only 60 percent of advertising expenditures can be capitalized as investment.

3. Descriptive results

Based on the measurement approach discussed above, this section turns to present the results of intangible investment estimation for Egypt and South Africa. As can be seen from Figure 2, total intangible investment (i.e. sum of investment in R&D, organizational capital, and brand equity) as a portion of intangibles-adjusted market GDP is consistently and considerably higher in South Africa than in Egypt. According to the estimates, South Africa devotes about four times more resources to intangible investment than Egypt. In addition, the contrast in their investment trends is also quite noteworthy. South Africa seems to invest increasingly more on intangibles over time. The intangible investment share rose from 1.9 percent of GDP in 1995 to over 2.8 percent in 2011. Whereas, the investment share of intangibles remained stagnant in Egypt at about 0.5 percent of GDP.

Looking further into asset types, Figure 3 reveals that the increasing share of total intangible investment in South Africa is primarily driven by increasing investment in organizational

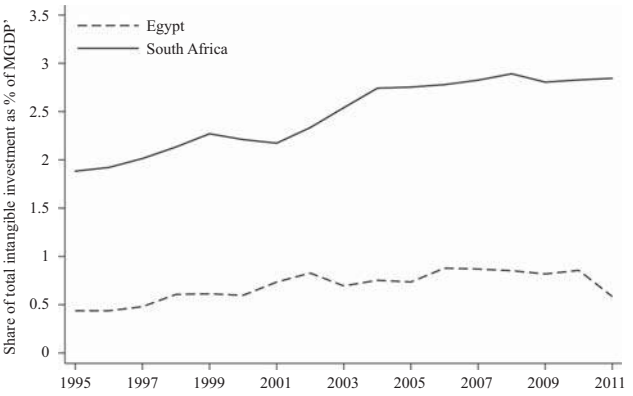

Figure 2.
Comparison of intangible investment trend, 1995-2011

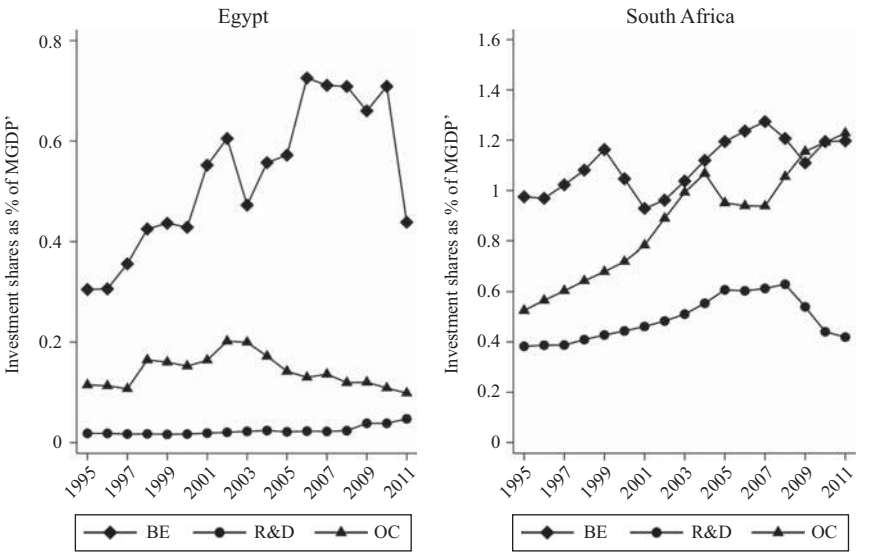

Figure 3.
Investment share in GDP by asset type, 1995-2011

capital, which has grown from less than 0.6 percent of GDP in 1995 to over 1.2 percent in 2011 (i.e. double in magnitude). Despite the volatilities, investment shares of R&D and brand equity remained largely constant during this period. Egypt, on the other hand, experienced a very weak increase in the investment share of brand equity by 0.1 percentage point. Investment shares of R&D and organizational capital did not change much over time in Egypt.

To gain a better insight, Figure 4 further shows the intangible investment composition of the two countries. As can be seen from the left panel of the figure, intangible investment in Egypt is predominantly driven by investment in brand equity. This specific investment item, on average, accounts for over 75 percent of total investment in intangibles. Whereas, merely 3.5 percent of intangible investment in Egypt come from business investment in R&D. In contrast to this extreme unevenness, the intangible investment composition in South Africa exhibits a quite different pattern. South Africa seems to have a much more balanced investment strategy than Egypt, with none of the assets accounts for more than 50 percent of total intangible investment. In ascending order, market investment in R&D, organizational capital and brand equity account for 20, 35, and 45 percent, respectively. These compositional shares also seem to change in the direction with organizational capital becomes increasingly more important over time.

In addition to examining intangible investment in relative terms (e.g. as a portion of GDP), it is also of interest to look at the absolute levels of investment in those assets. To ensure the numbers are comparable over time and across countries, the paper first needs to deflate nominal intangible investment flows into real values and then converts local currencies to international comparable dollars that take account of the differences in national price levels. In other words, the real value of investment in intangibles I in country c at time t is calculated as follows:

$$I_{c,t} = N_{c,t}/P_{c,t}/ppp_{c,\ 2011} \tag{9}$$

where N denotes nominal intangible investment summed over three assets; P is the GDP implicit price deflator constant at 2011 price; ppp is the GDP PPP divided by the exchange rate in 2011. Data on the last two variables are taken from the World Development Indicators (World Bank, 2015).

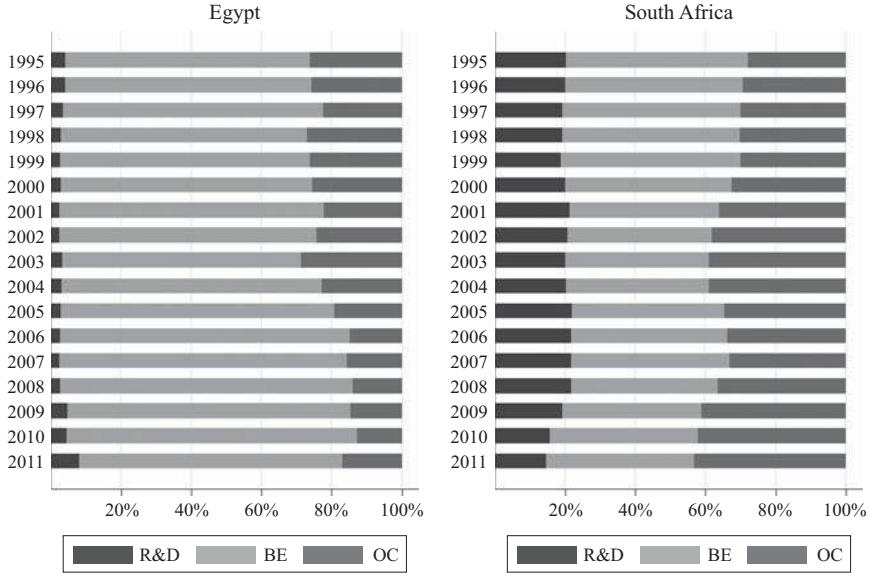

Figure 4.
Intangible investment composition, 1995-2011

As shown in Figure 5, albeit intangible investment as a share of GDP remained stagnant in Egypt, intangible investment increased in absolute terms. More specifically, the intangible investment level grew from 1.6 billion to over 4.4 billion international dollars (PPP$) in Egypt; and investment value went from 5.8 billion to nearly 15 billion international dollars in South Africa. These trends point to the fact that the gap between the two countries in terms of their intangible investment levels is widening over time. This stylized fact is also reflected in Figure 5 where the investment lines are diverging from each other over the period 1995-2011.

4. Potential policy relevance

Albeit this paper is descriptive in nature, the findings could still be of policy relevance. For instance, this paper finds that too much intangible investment in Egypt is in brand equaity (accounting for over 75 percent) while too little is invested in R&D and organizational capital. It seems worthwhile for the policy makers in Egypt to consider a different investment strategy by reallocating more resources to investment in R&D and organizational capital. This policy advise is based on the extensive empirical evidence that R&D and organizational capital are not only highly productive as factor inputs (Chen and Inklaar, 2016; Tronconi and Vittucci Marzetti, 2011), but more importantly investment in R&D generates positive externalities (Bloom *et al.*, 2013) and investment in organizational capital tends to complement the productive use of other assets such as information and communications technology (Chen *et al.*, 2016; Corrado *et al.*, 2017). In addition, by investing more in R&D and organizational capital it would also help Egypt to build up its learning capacity so that more advanced technologies or management know-how can be diffused to the country or can be disseminated at a faster pace. As Egypt is still quite far from the technology frontier, the build-up of the learning capacity in order to assimilate knowledge seems to be even more relevant and important.

5. Conclusions and discussions

As a key driver of future economic growth, investments in knowledge-based intangible assets have become increasingly more important over time (OECD, 2013). This paper seeks to provide the first estimates on intangible investment for two African countries, namely, Egypt and South Africa, over the period 1995-2011.

Based on the cost approach for measurement and relying on various international databases, this paper finds that intangible investment in South Africa is consistently and substantially higher than in Egypt, both in absolute terms and as a portion of GDP; the intangible investment share in South Africa grew from 1.9 percent of GDP to over 2.8 percent,

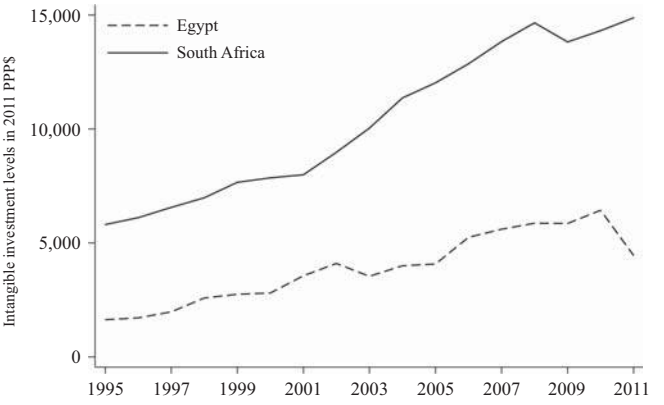

Figure 5.
Total intangible investment expressed in 2011 PPP$

while it remained stagnant in Egypt at roughly 0.5 percent; if the analysis is split by asset types, evidence shows that the increase in the investment share of intangibles in South Africa is mainly driven by investment in organizational capital, which accounts for merely 0.6 percent of GDP at the start of observation to over 1.2 percent in 2011. Lastly, by looking into investment composition this paper further shows that business investment in R&D accounts for a negligible share of merely 3.5 percent in Egypt, while over 75 percent of intangible investment come from investment in brand equity. From a comparative point of view, South Africa seems to invest more evenly across intangible assets with none of the investment items accounting for more than 50 percent of total intangible investment.

It is important to reiterate that this study is descriptive in nature. It does not cumulate intangible investment flows into capital stocks or services, which hampers the paper from integrating intangible capital estimates in economic models. This is a worthwhile attempt for future research that could measure the entire list of intangible assets identified by Corrado *et al.* (2005). Moreover, the results shown in the paper are suggestive and provisional, since the estimation of intangible investment for both countries has required strong yet untested assumptions, which may not be true in reality. For instance, the wage differentials between managerial workers and average workers may well be different (most probably higher) in Egypt and South Africa than in the USA.

In spite of these caveats, the ballpark estimate provided in this study for Egypt and South Africa is still a useful and important step forward in understanding the trend of intangible investment in these two countries.

Notes

1. According to Young (2012), real consumption in Africa has been growing between 3.4 and 3.7 percent per year and he dubbed this an "African Growth Miracle." Africa's impressive growth is also shown in a column by *The Economist* (2011) where the average growth rate of African countries is found to surpass the growth of the Asian counterparts between 2000 and 2011.
2. This means that this paper excludes public sectors such as Education, Health and Social Work, and Public Administration. According to the Social Economic Accounts of the World Input-Output Database (SEA-WIOD), the market-sector economy accounts for over 90 and 83 percent of the aggregate economic activities in Egypt and South Africa. Based on the INTAN-Invest estimates, the coverage of those three specific intangible assets captures nearly 60 percent of all the intangible assets identified by Corrado *et al.* (2005). In other words, the set of intangible assets covered in this paper is fairly representative of total intangible investment.
3. There have been attempts to quantify the value of R&D investment (Hall, 1993; Sandner and Block, 2011).
4. Without loss of generality and for ease of exposition, imports and exports are subtracted from the GDP identity in Equation (2).
5. Note, the GDP data used for Egypt and South Africa in this paper are still based on the SNA 1993 revision.
6. For instance, data on GERD for Egypt is only missing for four years: 1995, 2001, 2002, and 2003.
7. Organizational capital was first introduced to the economics literature by Prescott and Visscher (1980) where they defined it as the information a firm has about its assets and how these can be used in production.

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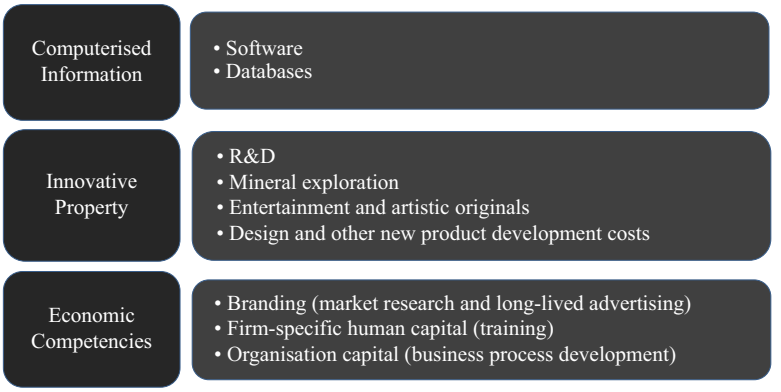
Appendix



Source: Corrado *et al*. (2005)

Figure A1.
List of intangible assets identified by Corrado *et al.* (2005)

ISCO-88	Occupations
0	Armed forces
1	*Legislators, senior officials and managers*
2	Professionals
3	Technicians and associate professionals
4	Clerks
5	Services workers and shop and market sales workers
6	Skilled agricultural and fishery workers
7	Craft and related trades workers
8	Plant and machine operators and assemblers
9	Elementary occupations
X	Not classifiable occupation

Note: The occupational group denoted in italics is considered to be conducive to the development of organizational capital
Source: International Labor Organization, ILOSTAT, and LABORSTA databases

Table AI.
International Standard Classification of Occupations (ISCO-88)

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