La misurazione del capitale immateriale a livello regionale

Emanuela Marrocu e Raffaele Paci

Università di Cagliari e CRENoS

Il capitale regionale: privato, pubblico e immateriale
Banca d'Italia, Roma, 18 marzo 2014

Background

Firms competitive strategy in industrialised countries is increasingly based on activities like inventions of new processes and products, improvements of employees skill, innovative property, organizational capital, creation of reputation for company's products.

All these items constitute the "intangible capital", which is expected to increase firms' productivity and, consequently, the economic performance of local economies. This is why intangible asset (IA) are regarded as the cornerstone of the knowledge economy (Melachroinos and Spence 2013).

In the last two decades the economic literature has been devoting a large effort to properly define and compute intangible assets and to assess their role following two main approaches:

- micro (firms)

- macro (countries, regions)

Micro approach - firms

Accounting approach: IA are considered as part of firms investment (OECD, 1998).

Key issue: obtain an accurate measure of intangibles based on company balance sheets information on software, R&D expenditure, patents, economic competencies and employee training, start-up costs, advertising (Stolowy and Jany-Cazavan 2001; Wyatt, 2005).

Result: intangible capital is an important and growing component of total capital stock
US: Corrado et al. (2005, 2009) investment in intangibles has roughly the same value of investment in tangibles; similar results in Hulten and Hao (2008) for R&D intensive firms. Italian manufacturing firms: Bontempi and Mairesse (2008) intangible capital amounts to one third of tangible stocks. Hall and Mairesse (1995, 1996) for France and US.

Knowledge-capital model (Griliches, 1979): firm's knowledge (measured by R&D expenditures, patents or new products) is included in firm production function. However the knowledge capital does not include only technological elements but also other intangible capital like human and organisational capital.

Macro approach – countries, regions

IA in the form of human and technological capital in a area/region are interpreted as localised externalities which influence positively the firms agglomeration and economic performances at the local level.

Employment growth:

Glaeser et al. (1992) and Henderson et al. (1995) for US
Combes (2000) for France; Paci and Usai (2008) for Italy LLS manufacturing and service sectors.

Labour productivity or TFP:

• *using firms data*: Cingano and Schivardi (2004) for Italy; Henderson (2003) for US
• *using aggregate regional data*: Dekle (2002) Japan; De Lucio et al. (2002) Spain, Artis et al. (2009) UK. Dettori et al. (2010) simultaneous effects of IA (human, social, technological capital) on TFP level for 199 European regions using a spatial lag model.

Intangible assets measurement issues / 1

Historically, intangible inputs (e.g. software, R&D) have been considered as intermediate expense and not as an investment by both firm-level and national income accounting procedures.

The exclusion of intangibles from GDP "obscures the role of many factors at the centre of the innovation process that have, according to available evidence, played an important role in economic growth" (Corrado, Hulten and Sichel, 2009, CHS).

The crucial question is whether it is better to capitalise or to expense intangibles. This controversial issue has not been settled yet, as it is evident from the ongoing debate, started by International Accounting Standards Committee (IASC) when developing the International Financial Reporting Standards (IFRS) designed to be universally adopted.

Intangible assets measurement issues / 2

The current debate on IA measurement has highlighted the following issues:

- Economic vs. Accounting notions of IA conflict: different objectives
- There are no standard, generally accepted, procedures to measure IA
- The definition (and measure) adopted for IA depends on a number of dimensions   (specific purpose of the analysis, micro vs. macro level, country, time period)
- Subjective assumptions made in order to measure IA have played a crucial role: low degree of comparability of the results.

Layout of the presentation

IA measurement approaches:

Firm level

- Italy: Bontempi and Mairesse (NBER WP, 2008)

  ISFOL Intangible Asset Survey

- Europe: Marrocu, Paci and Pontis (Industrial and Corporate Change, 2012)

Country and *regional* level

- Corrado, Hulten and Sichel (The Review of Income and Wealth, 2009), US
- Marrano, Haskel and Wallis (The Review of Income and Wealth, 2009), UK
- Melachroinos and Spence (Regional Studies, 2013), UK regions

Measuring intangible investment at firm level

Very debated issue in the US, as emphasized in Siegel and Borgia (2007) "*the accounting profession is facing significant challenges. One of the key problems that the profession faces is to effectively respond to the criticisms of how intellectual and other capital is measured. A continued failure to effectively address this issue* undermines the credibility of reported earnings *and, therefore, the association between such earnings and stock market valuations*" (Gelb and Siegel, 2000).

Arguments about the inability *of current US Generally Accepted Accounting Principles (GAAP) to measure the activities of knowledge-based, hi-tech, research dependent entities are coming at a time when the accounting profession is under fire from the Securities & Exchange Commission (SEC), the International Accounting Standards Board (IASB), and—in the wake of Enron—the polity at large (Gelb and Siegel, 2000).*

Criticisms emanating from the SEC relate to accounting procedures that fail to disclose, and might help to conceal massive fraud. The IASB is pressuring the FASB to become increasingly flexible in an effort to harmonize the global economy*. In contrast to GAAP, International Accounting Standards (IAS) emphasize conformance to principles, more than specific rules, where the fundamental criterion is that the statements fairly reflect the* underlying economic reality of the business*, rather than conformance to some "checklist" of technical criteria (Barth, Kasnik and McNichols, 2001).*

In Italy the reporting of intangibles for non listed companies is based on a combined set of norms: national GAAP (based on articles 2424-2426 of the Italian Civil Code, on Legislative Decree no. 127/9 and on principle no. 24 of the Commissione per Statuizione dei Principi Contabili of the Consiglio *Nazionale dei Dottori Commercialisti e Ragionieri*), IAS38 and IFRS3 standards.

This combination allows to consider as investment in intangibles a larger set of expenses than those implied by IAS/IFRS. The Italian GAAP, on the other hand, requires that other specific intangibles (or those intangibles that do not qualify for capitalisation as assets) be recognised as costs when incurred.

Start-up and formation costs, as well as expenditure in applied research, are examples of intangibles capitalised as assets in Italy but not by the IAS/IFRS. The latter establish that on the basis of the prudence principle such costs can only be expended. This is due to the uncertain, discontinuous nature of such intangibles which makes the amount of intangibles to be capitalised too subjective and determined on the basis of the managers' discretion.

By exploiting the combination of GAAP and IAS38 rules in Italy, Bontempi and Mairesse (BM, 2008) reconstruct the intangible capital (IC) stock for a sample of 14,254 Italian manufacturing firms over the 1982-1999 period (data source: Company Accounts Data Service CADS, Centrale dei Bilanci):

$$IC = IKBS + IKCA$$

where IKBS are intangibles capitalised as assets and reported in company balance sheets at book values and net of depreciation; they include applied R&D, patents and marks and brands (formation-expansion assets, goodwill and deferred financial charges are discarded)

IKCA (termed by BM "intangibles capitalised by us") are intangibles obtained by capitalising the corresponding direct expenses reported by firms in their current accounts. They include basic R&D, patents not respecting recognition-as-an-asset criteria and advertising.

On the basis of their use in the productive process the intangible capital stock is also disaggregated into Intellectual capital (IK) and Customer capital (CK):

$$IC = IK + CK,$$ with IK including R&D and patents and CK including trade marks and advertising.

The table below, taken from Bontempi and Mairesse (2008), shows the assumptions made in measuring intangible investments.

Table 1- Definition of intangible capital ($K = IKBS+IKCA = IK+CK$) and tangible capital (C) based on company current and capital accounts

PANEL A: Intangible assets categories	Intellectual capital: IK	Customer capital: CK	Not considered
Intangible assets: $IKBS$	I2. ($IKBS^{rd}$) Applied research and development costs; advertising costs functional and essential to the start-up phase. I3. ($IKBS^{pat}$) Purchased patents, intellectual property rights and applied software (included unlimited licences to use the said software). Internally developed patents, intellectual property rights, software (protected by law).	I4. ($IKBS^{mark}$) Trademarks and similar rights, public concessions and licences.	I1. ($IKBS^{start}$) Formation-expansion-start-up expenses (not considered). I5. ($IKBS^{good}$) Goodwill (not considered). I6. Being evaluated and payments on account (reallocated to I1.-I5. categories). I7. ($IKBS^{fin}$) Others, largely deferred financial charges (not considered).
Intangible capital constructed from direct expenses: $IKCA$	I8. ($IKCA^{rd}$ computed from DE^{rd}) Basic R&D, and applied R&D not complying with recognition-as-an-asset criteria. I10. ($IKCA^{pat}$ computed from DE^{pat}) Patents, intellectual property rights and software purchased subject to a limited user's licence obtained against payment of regular fees, or obtained free of charge, or not complying with recognition-as-an-asset criteria.	I9. ($IKCA^{adv}$ computed from DE^{adv}) Advertising not related to I1., but operative and recurrent.	

PANEL B: Tangible assets categories	Tangible assets: C		Not considered
	T1. ($TKBS^{bui}$) Lands and buildings. T2. ($TKBS^{pla}$) Plant and machinery. T3. and T4. ($TKBS^{equ}$) Equipment, furniture and hardware.		T5. ($TKBS^{oth} + TKBS^{unc} + TKBS^{lea}$) Other tangibles (mainly divested, fully depreciated or no longer utilised) plus incomplete tangibles (mainly under construction or being purchased) plus leased tangibles (for building societies).

Since 2005 Italian listed companies have to comply with international accounting standards. The transition process to international GAAP is very complex and is remarkably affecting accounting traditions and organizational procedures (Teodori and Veneziani, 2010).

The most salient differences between the IAS/IFRS and the Italian accounting rules derive from the different "users" addressed:

- the IASB gives priority to investors as the main users of firms' financial statement (Anglo-Saxon tradition oriented to public companies mainly operating in well-developed stock exchange markets)
- the Italian accounting rules and practices tend to privilege creditors (in a context dominated by SMEs with family shareholding), so more emphasis on the principle of prudence to avoid overestimation of the assets (Teodori and Veneziani, 2010).

In Italy the introduction of IAS38 has reduced the set of intangible assets for listed companies: no longer possible to capitalize long-term costs (start-up, research and advertising costs) because, although such costs could indirectly contribute to the production of future economic benefits, they do not generate an asset.

ISFOL and ISTAT are currently carrying out the Intangible Asset Survey.

They have adopted the survey approach proposed by the British Office for National Statistics (in cooperation with Imperial College and NESTA), which entails measuring innovative capabilities by analysing firms' expenditures with respect to the time horizon needed to accrue the intangible investment benefits.

Surveyed firms include all companies with at least 50 employees (operating in the ATECO 2007 sectors C, D, E, F, G, H, I, J, K, O) and a sample of smaller size firms (28,000 units)

The survey started in July 2013

Results from the pilot survey indicate that:
- the majority of firms have invested in firm-specific training and in R&D
- only 34% of firms invested in design
- R&D has an average life of 5 years
- training, trademarks and firm reputation are expected to yield benefits within two years
- during the recent economic crises only 25% of firms reduced investment in intangibles
- 60% of the firms declared to have increased training investment in order to accelerate the recovery phase.

Measuring intangible capital at firm level in Europe

Marrocu, Paci and Pontis (ICC, 2012) attempt to account simultaneously for intangible capital accumulated directly by the firms and the intangible assets available in the region where firms are located, which enhance firms productivity as positive externalities.

A Cobb-Douglas production function was estimated by including firms intangible capital and also external regional endowments (human, social and technological, public capital) over the period 2002-2006 for 116 regions of six countries (France, Italy, Netherlands, Spain, Sweden, United Kingdom).

IA are measured by means of the variable "intangible fixed assets", specified in the Amadeus Bureau Van Dijk databank on the basis the enterprises balance sheets, IT includes: R&D expenditures, patents, copyrights, software, employee training, trademarks and other similar costs.

The intangible fixed assets measure has the advantage of being harmonized for most European countries (more than 46) and therefore allows for comparability of results.

Measuring intangibles at country and regional level

The standard Systems of National Accounts do not categorize most intangible as investment.

The main reasons are that:
- they are produced within the firm that uses them, no market observable and *verifiable* data with which to estimate the value of current production
- many types of intangible capital are *non-rival*
- intangibles in the form of intellectual capital are *non-appropriable*.

At country level the solution proposed by Corrado, Hulten and Sichel (CHS, 2009) is simply based on reconsidering capital theory.

Capital theory implicitly defines capital in the context of an optimal consumption plan based on the maximization of an inter-temporal utility function subject to the usual constraints (Weitzman, 1976). The solution to this optimization problem results in the optimal path of consumption over time and thus consumer saving behavior, which ultimately determines the paths of investment and capital (CHS, 2009).

Therefore, *any* use of resources that reduces current consumption in order to increase it in the future qualifies as an investment: here the economic – rather than accounting – notion of investment prevails. This implies that expenditure in intangible goods should be considered as investment.

CHS proposal at country level

The capital theory result calls for *symmetric* treatment of *all* types of capital and that business expenditures aimed at enhancing the value of a firm and improving its products, including human capital development as well as R&D, be accorded the same treatment as tangible capital in national accounting systems (CHS, 2009).

According to CHS the real issue of whether intangibles should be classified as intermediates or as capital depends on the economic character of the good.

As emphasized by CHS "the capitalization issue pivots on whether the provision of intangible capital increases future output and consumption, not whether it is partly non-appropriable or non-rival, and these two features do not invalidate the need to capitalize many intangible expenditures.

Moreover many types of intangible capital (brand equity and organizational and human competencies) are not purely non-rival, but instead are firm-specific and valuable, at least in part, because the firm is able to exclude competitors from gaining access to key information and technology".

CHS categories of intangible investments

CHS identify 3 main categories of intangible investment:

1. **Computerized information** (US National Income and Product Accounts, NIPAs)

2. **Innovative property**
   a) *Scientific R&D* (National Science Foundation)

   b) *Non-Scientific R&D* (revenues of non-scientific commercial R&D industry, Census Bureau's Services Annual Survey)

3. **Economic competencies**
   a) *Brand equity*
   includes spending on strategic planning, spending on redesigning or reconfiguring existing products in existing markets, investments to retain or gain market share, and investments in brand names. Largest part of investment in brand equity are advertising expenditures, only 60% capitalized

   b) *Firm-specific human and structural resources*
   includes the costs of employer-provided worker training and an estimate of management time devoted to enhancing the productivity of the firm; estimates based on Bureau of Labor Statistics (BLS) surveys and SAS revenues for the management consultant industry and trends in the cost and number of persons employed in executive occupations.

CHS estimates of intangible investments

Business Investment in Intangibles (billions of dollars, annual average for period shown)

	1950–59	1960–69	1970–79	1980–89	1990–99	2000–03
1. Total CHS intangibles	19.4	41.9	103.4	349.3	749.8	1,226.2
2. Computerized information (mainly computer software)	–	0.8	4.5	23.2	85.3	172.5
3. Innovative property						
(a) Scientific R&D	7.7	16.9	34.0	104.6	157.7	230.5
(b) Non-scientific R&D	0.5	1.7	10.9	58.4	145.2	237.2
4. Economic competencies						
(a) Brand equity	5.3	9.5	18.2	54.4	105.7	160.8
(b) Firm-specific resources	5.9	13.0	35.7	108.7	255.9	425.1
Related series						
5. Computer software, NIPAs	–	0.7	4.5	22.7	83.6	169.6
6. Industrial R&D, NSF[2]	5.2	14.1	25.3	75.8	136.9	196.0
7. Advertising, Coen report	8.6	15.0	30.6	89.6	165.0	240.3
8. Business fixed investment, NIPAs	38.2	71.5	188.4	485.7	807.1	1,141.9
8a. Tangibles	35.6	67.3	171.4	421.1	676.5	893.4
8b. Intangibles[3]	2.5	4.2	17.0	64.6	130.7	248.5
Memo:						
9. CHS intangibles, ratio to NIPA tangibles	0.54	0.62	0.60	0.82	1.10	1.36
10. New CHS intangibles[4]	16.9	37.7	86.3	284.7	619.2	977.7
11. Non-farm business output, ratio of existing to adjusted for new CHS intangibles (λ)	0.95	0.94	0.94	0.92	0.90	0.89

Source: CHS, 2009

CHS construction of intangible capital stock

To construct the intangible capital stock the usual perpetual inventory method is applied. The non-farm business output price deflator is applied to obtain the real intangible investment series. Moreover, CHS maintain the following assumptions:

Category	Depreciation rate (percent)	Year Initial Stock set to zero
Computerized information (other than software)	33	1958
R&D, scientific	20	1928
R&D, non-scientific	20	1945
Brand equity	60	1928
Firm-specific resources	40	1946

Source: CHS, 2009

Main results of the CHS growth accounting analysis

TABLE 2

Value, Growth Rate, and Income Share of Business Intangible Capital

	Value (billions of dollars)	Growth Rate of Real Capital (percent change)		Share of Total Income (percent)	
	2003	1973-95	1995-2003	1973-95	1995-2003
1. Total	3636.1	6.2	6.9	9.4	13.9
2. Computerized information (includes software)	511.9	16	13	0.8	2.3
3. Innovative property					
3a. Scientific	922.3	3.6	3.9	2.4	2.5
3b. Non-scientific	864.4	12.4	7.2	1.0	2.2
4. Economic competencies					
4a. Brand equity	271.8	4.2	4.6	1.7	2.0
4b. Firm-specific resources	1065.6	5.3	6.2	3.5	5.0
Memo:					
5. New CHS intangibles	3132.9	4.7	4.6	8.6	11.7

Source: CHS, 2009

CHS annual change in labour productivity

TABLE 4
Annual Change in Labor Productivity, Non-farm Business Sector

	1973–95	1995–2003	*Memo*: Accel
Published data, excluding			
1. Labor productivity (percent)	1.36	2.78	1.42
Contribution of components:			
2. Capital deepening	0.60	0.98	0.38
3. IT equipment	0.33	0.70	0.37
4. Other tangible capital	0.27	0.28	0.01
5. Labor composition	0.28	0.38	0.10
6. Multifactor productivity	0.48	1.42	0.94
Published data, including business investment in intangibles			
1. Labor productivity (percent)	1.63	3.09	1.45
Contribution of components:			
2. Capital deepening	0.97	1.68	0.71
3. Tangibles	0.55	0.85	0.30
4. IT equipment	0.30	0.60	0.30
5. Other[3]	0.25	0.24	-0.01
6. Intangibles	0.43	0.84	0.41
7. Software	0.12	0.27	0.15
8. Other (new CHS)	0.31	0.57	0.26
10. Labor composition	0.25	0.33	0.08
11. Multifactor productivity	0.41	1.08	0.67

Source: CHS, 2009

Results based on the growth accounting model strongly suggest that intangibles matter for national income and wealth accounting. "Indeed, our estimates, rough as they may be, imply that the traditional practice of expensing intangibles results in a seriously distorted picture of the sources of growth." (CHS, 2009)

From country to regional intangible assets / 1

Melachroinos and Spence (MS, Regional Studies, 2013) propose a novel approach to regionalize national intangible series for the case of United Kingdom Government Office Regions (9 plus Scotland and Wales, Northern Ireland excluded).

Their starting point is the estimate of the national intangible investment series constructed by Marrano, Haskel and Wallis (MHW, 2009) for the United Kingdom over the period 1970-2004 on the basis of the CHS approach.

The MHW estimates take the form of shares of market sector Gross Value Added (GVA) adjusted to include five main categories of intangibles, namely computerized information, scientific R&D, non-scientific R&D, brand equity and firm-specific human and organizational resources.

The actual values of intangible investment in Great Britain for each investment type and year were calculated via their relative shares of unadjusted market sector GVA, then the procedure applied by MS entailed a number of steps.

Procedure followed by MS (2013):

- Regional intangible investment series for the years 1991, 1993 and the period 1995–2004 were obtained on the basis of the regional shares to the total national employment of intangible-producing Standard Industrial Classification (SIC) sectors.

  The basic assumption is that intangibles are produced by skilled labour. Consequently, the spatial distribution of intangibles should follow the spatial distribution of skilled labour performing those activities.

- The regional employment shares of the intangibles producing activities were then utilized as weights for the distribution to regions of the annual investment for each type of intangibles.

- Finally, the five classes of intangible investment were summed to provide regional totals and the GVA values were adjusted to provide the overall intangibles-adjusted measure of regional output.

- After deflating the annual investment data by using the GVA deflator, the net stock for any category of intangible assets and in any given year is obtain by applying the perpetual inventory method (depreciation rates as in CHS).

Regional Growth accounting results

When the total effect of intangibles is captured by incorporating them into output and adding them as a separate production factor in the growth-accounting framework, MS found that TFP growth rates and the contributions of labour and fixed capital to the economic growth rate are reduced. The decline in the regional TFP growth rates may indicate that there is a serious measurement problem rather than a true slowdown in productivity.

(a) Excluding intangibles

	Growth of workplace-based GVA (%)				Growth of labour productivity (%)
	GVA	Labour	Fixed capital	TFP	
South	2.17	0.05	0.49	1.63	2.09
North	2.16	0.75	0.31	1.10	0.99
Great Britain	2.17	0.42	0.38	1.37	1.51

(b) Including intangibles

	Growth of workplace-based GVA (%)					Growth of labour productivity (%)
	GVA	Labour	Fixed capital	Intangible capital	TFP	
South	2.11	0.04	0.42	0.63	1.02	2.03
North	2.26	0.67	0.27	0.44	0.88	1.09
Great Britain	2.18	0.36	0.33	0.54	0.95	1.52

Source: MS, 2009

Conclusions

The well-documented and crucial relevance of intangible investments for enhancing economic outcomes at firm, regional and country level, makes necessary to have a shared measurement approach, which is expected to:

- reduce the high degree of subjective criteria in measuring intangibles

- overcome the conflict between economic and accounting definitions

- attain harmonized national and regional economic accounts that include investment in intangibles.

References

Artis M., E. Miguelez and R. Moreno (2009) Assessing Agglomeration Economies in a Spatial Framework with Endogenous Regressors, Spatial Economics Research Centre Discussion Paper Number 23, London School of Economics. London.

Barth, M. W. Beaver, and W. Landsman (2001) The Relevance of the Value Relevance Literature for Financial Accounting Standard Setting: Another View. *Journal of Accounting & Economics*, 31, 77-104.

Bontempi M.E. and J. Mairesse (2008) Intangible capital and productivity: an exploration on a panel of Italian manufacturing firms, NBER wp 14108.

Cingano F. and F. Schivardi (2004) Identifying the Sources of Local Productivity Growth, *Journal of the European Economic Association*, 2, 720–742.

Combes P-P. (2000) Economic Structure and Local Growth: France, 1984-1993, *Journal of Urban Economics*, 47, 329-355.

Corrado C.A., 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, Studies in Income and Wealth, Vol. 65, University of Chicago Press, Chicago.

Corrado C.A., D.E. Sichel and C.R. Hulten (2009) Intangible Capital and U.S. Economic Growth, *Review of Income and Wealth*, 85, 661-685.

Dekle R. (2002) Industrial Concentration and Regional Growth: Evidence from the Prefectures, *Review of Economics and Statistics*, 84, 310-315.

De Lucio J. J., J.A. Herce and A. Goicolea (2002) The Effects of Externalities on Productivity Growth in Spanish Industry, *Regional Science and Urban Economics*, 32, 241-258.

Dettori B., E. Marrocu and R. Paci (2011) Total factor productivity, intangible assets and spatial dependence in the European regions, *Regional Studies*, 46,1401-1416.

Gelb, D. and P. Siegel (2000) Intangible assets and corporate signaling. *Review of Quantitative Finance and Accounting*,15, 307-323.

Glaeser E.L., H.D. Kallal, J.A. Sheinkman and A. Sheifler (1992), Growth in Cities, *Journal of Political Economics*, 100, 1126-1152.

Griliches Z. (1979) Issues in Assessing the Contribution of Research and Development to Productivity Growth, *The Bell Journal of Economics*, 10, 92-116.

Hall B.H. and J. Mairesse (1995) Exploring the Relationship between R&D and Productivity in French Manufacturing Firms, *Journal of Econometrics*, 65, 263-293.

Hall B.H. and J. Mairesse (1996) Estimating the Productivity of Research and Development: an Exploration of GMM Methods Using Data on French and United States Manufacturing Firms, NBER wp 5501.

Henderson J. V., A. Kunkoro, and M. Turner (1995) Industrial Development in Cities, *Journal of Political Economy,* 103, 1067-1090.

Henderson V. (2003) Marshall's scale economies*, Journal of Urban Economics,* 53, 1–28.

Hulten C.R. and X. Hao (2008) What is a Company Really Worth? Intangible Capital and the 'Market to Book Value' Puzzle, NBER wp 14548.

ISFOL (2014) online document at: http://www.isfol.it/temi/Formazione_apprendimento/indagini-e-ricerche/intangible-assets-survey

OECD (1998) *Measuring intangible investment: selected bibliography*, OECD Secretariat, DSTI, Paris.

Marrocu E., R. Paci and M. Pontis (2012), Intangible capital and firms' productivity, *Industrial and Corporate Change*, 21, 377-402.

Marrano M. G., J. Haskel and G. Wallis (2009) What happened to the knowledge economy? ICT, intangible investment, and Britain's productivity record revised, *The Review of Income and Wealth*, 55, 686-716

Melachroinos K.A. and Spence N. (2013) Intangible investment and regional productivity in Great Britain, *Regional Studies*, 47, 1048-1064

References

Paci R. and S. Usai (2008) Agglomeration economies, spatial dependence and local industry growth, *Revue d'Economie Industrielle*, 123, 87-109.

Siegel P.H. and C. Borgia (2007) The Measurement and Recognition of Intangible Assets, *Journal of Business and Public Affairs*, 1.

Stolowy H. and A. Jeny-Cazavan (2001) International Accounting Disharmony: The Case of Intangibles, *Accounting, Auditing & Accountability Journal*, 14, 477-497.

Teodori C. and M. Veneziani (2010) Intangible assets in annual reports: a disclosure index, Paper 99 Dipartimento di Economia Aziendale, Università di Brescia

Wyatt A. (2005) Accounting recognition of intangible assets: theory and evidence on economic determinants, *Accounting Review*, 80, 967-1003.

Weitzman M. L. (1976) On the Welfare Significance of National Product in a Dynamic Economy, *Quarterly Journal of Economics*, 90, 156–62.

CRENoS