

Session A-52. Economics of Income and Wealth (organized collaboration with International Association for Research in Income and Wealth with the support of Federal State Statistic Service)

**The contribution of intangible assets to the growth of sectors of the Russian economy
or what innovations are active?**

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Annotation

The work is devoted to assessing the industry structure of capital services contribution related to intangible assets to growth of Russia economy in the period from 2010 to 2016 in comparing with OECD countries. We use data from Russia KLEMS, supply and use tables and Rosstat official data. Intangible assets are measured in the extended interpretation proposed by Corrado, Hulten and Sichel (2005). The extended interpretation involves accounting for a number of intangible assets that are not included in the classification of SNA 2008 assets.

We find the contribution of intangibles to average value added growth to be higher in market services than in manufacturing. It is first difference from the OECD countries, where intangible assets participate more evenly in services and manufacturing. The common between Russia and the OECD is that research and development are important in manufacturing, and intangible assets not related to R&D are more important in the service sector. But in general, the role of research and development in Russia is much lower.

Key words: economic growth, Russian economy, industry level, intangible assets, ICT, Russia KLEMS, World KLEMS.

JEL: O470 - Empirical Studies of Economic Growth; Aggregate Productivity; Cross-Country Output Convergence;

O570 - Comparative Studies of Countries;

E220 - Investment; Capital; Intangible Capital; Capacity

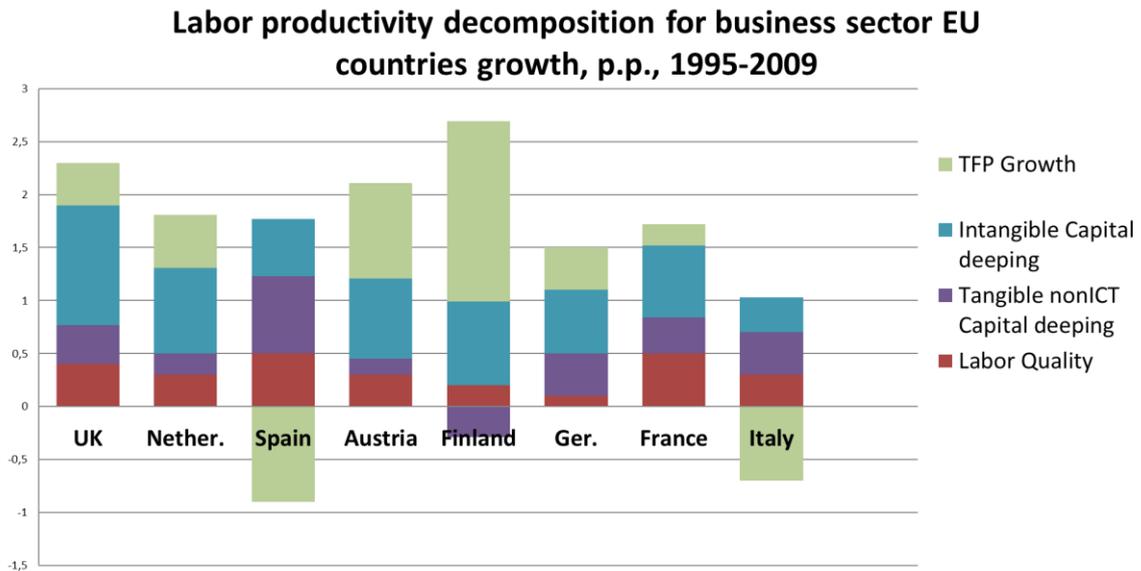
1. Introduction

During the past two decades, growth in aggregate productivity has been quite unevenly distributed across the advanced economies. While earlier work explored the effect of differences in ICT investment and in multifactor productivity, more recent work considers the role that investment in intangible assets plays in explaining cross-country differences in labor productivity growth. A smaller part of the intangible investments such as software are included in standard national accounts data and in international data provided, e.g., by the EU KLEMS project. Most intangible assets such as R&D, organizational capital and training are to date not treated as investment in national accounts (R&D is to be added according to SNA 2008). It can be saying, that intangible assets are inherently not only indicators, but also drivers of innovative growth.

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According to current estimates, the share of intangible assets as a growth factor in value added in the period 1998-2007 in a number of OECD countries amounted to 14.4% (Corrado et al, 2017). Diagram 1 shows labor productivity decomposition for business sector of eight EU countries, which confirms the importance of intangible capital-labor ratio in growth.

Diagram 1



Source: Corrado et al, 2014

Extended interpretation of intangible assets proposed by Corrado, Hulten, Sichel (CHS) in 2005 is popular for this kind of research. This interpretation involves accounting for a number of intangible assets that are not included in the classification of SNA 2008 assets, including brand equity and company-specific resources, including human capital. Accounting for additional assets in an extended interpretation implies an appropriate revaluation of the flow of capital services, as well as adjusting the dynamics of output taking into account the value added generated by additional assets.

In our previous work for the first time CHS approach was taken for Russia in aggregated analysis. In an expanded interpretation, the contribution of intangible assets amounted to 0.28 percentage points out of 2.92% average value added growth during 2004-2014. Those in addition to increasing the contribution, revaluation of an expanded number of assets led to a slowdown in the overall growth rate of value added in Russia. One of important conclusions we came to, that the structure of investments in intangible assets in Russia is significantly different from the OECD countries, in particular the United States. In Russia the largest share of investments related to the implementation of existing technologies in production and specific human capital demanded by a particular enterprise. At the same time, in OECD countries the most significant share of investments is in research and new developments.

In addition to a common understanding of the sources of economic growth, for an in-depth assessment of productivity and cause-and-effect relationships occurring in the economy leading to overall growth or deterrence of progressive movements, industry analysis is important. For Russia these problems considering intangible assets have not been previously considered in the framework of growth accounting.

The industry analysis contribution of intangible assets for developed countries is widely practiced, and its results are available for comparison. For example, according to Corrado et al, in developed countries such as Finland, Germany, Austria, research and development are important in manufacturing, and intangible assets not related to R&D are more important in the service sector.

In this paper we first focus on industry level analysis of the contribution of intangible assets in growth of Russia economy. Comparison the industry structure of growth contribution of capital services related to intangible assets in Russia and the OECD countries has been made. Based on the results of our research, we also try to answer the question, what kind of intangibles drive each economic sector.

In our work we use the classification of intangible assets close to that used in the Corrado approach. The data set covers 34 industries grouped into seven categories for the period 2010-2016 in the industry classification NACE 1.0. We use data from Russia KLEMS, supply and use tables (or input-output tables) and Rosstat official data.

2. Related Research

There are several studies on intangibles at the sectoral level with data for single countries or a small number of countries (see Haskel et al. (2010), Haskel and Pesole (2011) and Peters et al. (2010)). With UK data for the years 2000-2009, Goodridge et al. (2012) find manufacturing to be the industry with the highest ratio of intangible investment to value added. Chun et al. (2012) compare Japanese with Korean data and find that the share of intangible investment in value added is higher in Japan for many industries. Meanwhile it turns out to be higher in some Korean service industries. Estimating the influence of intangibles on conventional MFP for Japan, the authors find a significant positive effect for the market economy but no clear effect for the service sector. Other country-specific growth accounting studies with intangibles at the sectoral level are Baldwin et al. (2012), Barnes and McClure (2009) as well as Fukao et al. (2009).

Niebel et. al (2013) for 10 EU countries find the contribution of intangibles to labor productivity growth to be higher in manufacturing than in services in period 1995-2007. This is in line with results found by Chun et al. (2012) for Japan. The high contribution of manufacturing is associated with a high share of intangible investment in value added in this sector. A large part of its intangible investment falls into the category R&D. In addition to the investment being higher, the assumed low depreciation rate of R&D capital may have an effect on the high contribution of

intangibles to productivity growth in manufacturing. Meanwhile services are responsible for the high contribution of intangibles observed in the UK. The UK exhibits higher shares of intangible investment in value added in business services and financial intermediation than other countries.

Country groups analyzed also by Corrado et al. (2014, 2016) and came to opposite results. It was found, that in period 1995-2010 for 14 EU countries intangible investment has grown in manufacturing and services, but most strongly in services. Average annual rate of growth of intangible investment is relatively higher in the service sectors (5.4 percent) than in manufacturing (3.0 percent) in all sample countries. Finland is the sole country where intangible capital accumulation is more dynamic in manufacturing than services. Second, the contribution of intangibles to labour productivity growth is similar in both manufacturing and services and in the high growth economies (Austria, Germany, Finland, France, Netherlands, UK) exceeds the contribution of labour quality. Third, the very large size of the service sector means that countries with good manufacturing but poor service productivity growth (Germany and France) have done relatively badly overall and those with good service sector growth (UK, Netherlands) have performed well. R&D is important in manufacturing Finland, Germany, Austria and Spain. Non-R&D intangibles are more important in the other countries and everywhere in services.

3. Approach and data

As already noted, for the evaluation of intangibles in growth widely used approach developed Corrado, Hulten and Sichel (hereinafter referred to as the CHS).

CHS included three integrated categories of intangible assets (computerized information, innovative property, including R&D, economic competencies) in the assessment and proposed options for accounting all of them. The CHS list attempted to include all other costs of developing and launching new products and services, including market research (usually excluded from R&D), and all costs of improving production processes (including services delivery systems) beyond outlays on conventionally defined ICT and R&D. In order to obtain objective estimates of investments, CHS takes into account the source of intangible assets (internally or acquired from outside).

The CHS approach, in addition to traditional research and development costs, includes nontechnological costs of design (industrial and nonindustrial) and services innovation (including investments by financial services firms not captured by R&D surveys), the costs of marketing and launching new products, including ongoing investments to maintain the value of a brand, and organization and human capital management innovations.

Following the indicated symmetrical approach to tangible and intangible assets, we collected available data for disaggregated analysis of intangibles by sectors of the Russian economy in the

period 2010-2016. Here we are largely limited by the availability of data. Table 1 shows the group of intangible assets we use, the data source and the capitalization factor².

Table 1

Intangible assets and commentary on data source

Asset type	Included in System of National Account	Data source	Capitalization factor
1. Basic intangible assets (Investments in computerized information, including software and computerized databases; Mineral Resource Exploration and Assessment Results; Entertainment and artistic originals)	Yes	Indicator i_soft Russia KLEMS	100%
2. Research and Development	Since 2008, missing from published data	Internal R&D costs (№F2-science "Information on the implementation of research and development"). Available by industries for 2010-2016. Used research and experimental development services from Supply and use tables. Available for 1998 - 2003, 2012-2016	100%
3. New product development	No	Financial intermediation services from Supply and use tables. Available for 1998 - 2003, 2012-2016	10%
4. New architectural and engineering designs, advertising, marketing research and purchased organizational capital	No	Other business services from Supply and use tables. Available for 1998 - 2003, 2012-2016	60%

For the purpose of this study, industries were grouped by major sectors (Table 2).

² The capitalization factor shows which part of the intangible expenditure data series is an investment: 100% - for expenses that are a fixed investment, capital expenditure in full; in relation to advertising and marketing research, it is assumed that only 60% of the total costs are associated with products whose effect lasts more than a year; the valuation is discounted by 20%, when the service life of an intangible asset can be at least three years, or part of the costs can be spent on routine tasks or represent current consumption;

Industry groups

N.	Using in work	Russia KLEMS (NACE 1.0.)	OKVED code OK 029- 2007 (NACE Rev. 1.1)
1.	Agriculture, Hunting, forestry and Fishing	Agriculture, Hunting, Forestry and Fishing	A B
2.	Mining	Mining and Quarrying	C
3.	Utilities	Electricity, gas and water supply	E
4.	Manufacturing	Food, beverages and tobacco	D
		Textiles and textile	
		Leather, leather and footwear	
		Wood and of wood and cork	
		Pulp, paper, paper , printing and publishing	
		Coke, refined petroleum and nuclear fuel	
		Chemicals and chemical products	
		Rubber and plastics	
		Other non-metallic mineral	
		Basic metals and fabricated metal	
		Machinery, nec	
		Electrical and optical equipment	
		Motor vehicles, trailers and semi-trailers; other transport equipment	
		Manufacturing nec; recycling	
5.	Construction	Construction	F
6.	Market services	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of fuel	G H I J
		Wholesale trade and commission trade, except of motor vehicles and motorcycles	
		Retail trade, except of motor vehicles and motorcycles; repair of household goods	
		Hotels and restaurants	
		Transport and storage	
		Post and telecommunications	
		Financial intermediation	
		Renting of m&eq and other business activities	
7.	Nonmarket services	Other community, Social and Personal services	L M N O
		Publ. Adm. & Def.	
		Education	
		Health & Soc. Work	

4. Results

First, if we look at the structure of intangible investments by industry, it strongly seen that market service sector – is a leader in volume of investments in intangible assets, as in value added share, it forms half of both indicators. The least amount of costs for intangible assets is observed in agriculture, 0.6% of all intangible expenditures.

Table 3

Intangible investment and value added shares by industries of Russia in 2010-2016, %

	Intangible Investment by industry (average %)	Intangible Investment by industry (GDP average %)	Value added share (average %)
Agriculture, Hunting, Forestry and Fishing	0,6	0,03	3,4
Mining	4,3	0,21	7,8
Utilities	2,2	0,11	2,8
Manufacturing	17,1	0,82	12,0
Construction	3,0	0,14	5,7
Market services	63,4	3,04	47,3
Nonmarket services	9,5	0,45	20,9

Source: author`s calculations

Here we should say, that situation with intangible investment in Russia quite similar with OECD countries. For example, as Corrado et. al mentioned (2016), in period of 2000-2013 services account for 64% of market sector intangible investment in the US, and for 61.4% and 57.6% in the EU14. But if we look at composition of intangibles in GDP, in Russia here a big advantage towards investment in Market services, even in OECD countries firstly, the share of expenditures on intangible assets in GDP as a whole is lager (about 7% in European countries and 9% in the USA versus 4.8% in Russia), and secondly, costs are distributed more evenly between Manufacturing and Market services.

Despite the negative growth rate of value added observed in the Market services sector (Table 4), the contribution of intangible assets to value added growth is the largest one, 0.19 p.p. Second place takes Manufacturing with 0.03 p.p. of intangibles contribution to growth. Not far is Construction with a contribution of 0.02 p.p.

Table 4

Intangible assets contribution to growth by industries of Russia in 2010-2016, p.p.

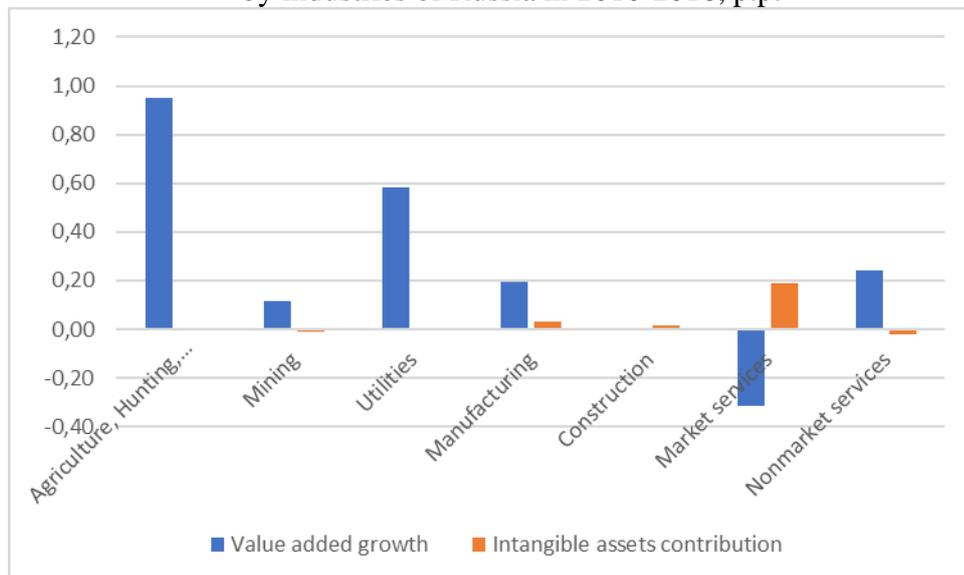
	Value added, p.p.	Intangible assets contribution, p.p.
Agriculture, Hunting, Forestry and Fishing	0,95	0,00
Mining	0,12	-0,01
Utilities	0,58	0,00
Manufacturing	0,19	0,03
Construction	0,01	0,02
Market services	-0,40	0,19
Nonmarket services	0,26	-0,02

Source: author`s calculations

Diagram 2 shows total distribution of the contribution of intangible assets by industry in the period 2010-2016. We can find negative contribution of intangible assets in Mining and Nonmarket services, and contribution close to zero in Agriculture and Utilities.

Diagram 2

Value added growth and intangible assets contribution
by industries of Russia in 2010-2016, p.p.



Source: author`s calculations

For comparison the contribution of intangibles to labour productivity growth is similar in both manufacturing and services in the high growth economies (Austria, Germany, Finland, France, Netherlands, UK).

It is interesting to note that, if we look at the contribution of intangible assets by types in industry leaders, we can find that in Market services it was formed mostly by industrial design, advertising and market research, and in Manufacturing by R&D (Table 5).

Table 5

Contribution of intangible assets by type

Market Services	Share	Growth rate
R&D	0,04	-6,82
DesignAdvMarRes	0,16	8,47
New FinProduct	0,08	7,02
Basic intangibles	0,01	12,15
Manufacturing		
R&D	0,01	18,76
DesignAdvMarRes	0,11	1,80
New FinProduct	0,01	3,63
Basic intangibles	0,00	5,25

Source: author`s calculations

This conclusion corresponds to the situation in developed countries. According Corrado, in developed countries such as Finland, Germany, Austria, research and development are important in manufacturing, and intangible assets not related to R&D are more important in the service sector.

But of course, if we compare the contribution of research and development as a whole, in Russia it much lower than in developed countries, and this indicates the untapped capacity of this sphere of competence in Russia.

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