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The System Contribution of Intangible Assets to the Long-Term Growth of the Russian Economy

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1.Introduction

1.1. The significance of intangible assets

In recent decades the long-term economic growth of leading developed economies is determined by factors of production that are most susceptible to new technologies, which form the knowledge economy in the process of their accumulation and development. Among these factors, along with highly qualified workforce and information and communication equipment, are intangible assets. In a broad sense, intangible assets mean objects that do not have physical content, but generate income, or create conditions for its receipt in future.

At the same time, there are a lot of questions regarding the accuracy of valuation of intangible assets in economic growth. Economic researchers, data providers, and political analysts are interested in answering these questions because they can lead to a more accurate assessment of the long-term economic growth rate and the rate of technological progress, as well as to an improvement in national wealth statistics.

It is significant that even such a large accounting standard as the System of National Accounts began to pay more and more attention to intangible assets. The 1993 SNA recommended to capitalize investments in databases (along with software), and the 2008 SNA further expanded intangible component and included R&D in official accounting.

1.2. KLEMS

In particular intangible assets accounting has become possible due to the publication of industry indicators of output, labor, capital, intermediate consumption products and total factor productivity in the framework of the World KLEMS project (www.worldklems.net).

Comparable statistical data series is an important advantage of this project. This condition creates wide opportunities for cross-country analysis.

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The decomposition of GDP growth rates is represented as the sum of industry contributions of factors of production, among which the services of information and communication technologies (hereinafter - ICT capital), which in a certain way (in accordance with the SNA[2]) reflect the contribution of intangible assets, plus the effect of reduction real costs per unit of output - total factor productivity (TFP). Principles of data generation in Russia KLEMS and some limitations is given in Appendix 1.

Consider the decomposition of the growth rates of gross value added of a number of European Union countries for the period 1995-2009, calculated on the basis of the EU-KLEMS data series in Table 1. Here we present the contribution of labor to the growth of value added, the contribution of ICT and non-ICT capital services, as well as the contribution of TFP. The average value of the contribution of ICT capital services among the countries is 0.388 percentage points with an average GDP growth is 1.946. The highest contribution of ICT capital services during the reporting period is observed in the UK. At the same time, the share of ICT capital in the contribution of capital services exceeds the share of non-ICT capital. A similar situation is also observed in Austria. With a fairly average contribution of ICT capital to growth in Austria - 0.405 percentage points, it exceeds the non-ICT capital contribution, which is 0.381 percentage points, thereby forming the most of the capital contribution to growth. In other countries, the component of non-ICT capital prevails.

Table 1

Decomposition of the growth rates of gross value added of a number of European Union countries for the period 1995-2009

	United Kingdom	Netherlands	Spain	Austria	Finland	Germany	France	Italy	Average
Gross value added, volume indices	2,314	2,253	2,858	2,049	2,529	1,168	1,601	0,797	1,946
Contribution of Labor (p.p.)	0,783	1,047	1,790	0,533	0,922	-0,139	0,604	0,545	0,761
Contribution of ICT capital services to value added growth (p.p.)	**0,644**	**0,468**	**0,408**	**0,405**	**0,364**	**0,345**	**0,242**	**0,230**	**0,388**
Contribution of non-ICT capital services to value added growth (p.p.)	0,607	0,526	1,367	0,381	0,416	0,600	0,543	0,743	0,648
Contribution of TFP to value added growth (p.p.)	0,318	0,247	-0,753	0,806	0,904	0,408	0,240	-0,604	0,196

Source: EU-KLEMS, 2012 release

[2] This refers to the fact that KLEMS is built on the basis of official statistics and the SNA, and reflects the list of intangible assets that are officially capitalized.

Russia is also a participant in the World-KLEMS project, so we can form a comparable decomposition of value added growth. Table 2 presents the decomposition of the growth rates of Russia's gross value added for the period 1995-2009, broken down into shorter time periods for further comparisons.

Table 2

Decomposition of the growth rates of gross value added of a Russian economy for the period 1995-2009

	1995-2003	2004-2009	1995-2009
Gross value added, volume indices	3,375	3,842	3,824
Contribution of Labor (p.p.)	0,589	0,310	0,523
Contribution of ICT capital services to value added growth	0,322	0,292	0,166
Contribution of non-ICT capital services to value added growth	-0,284	2,647	0,889
Contribution of TFP to value added growth	2,748	0,593	2,245

Source: Russia KLEMS, 2017 release

As we can see, the contribution of ICT capital services to the growth of value added in Russia is slightly lower than the average European value, and the component of non-ICT capital significantly prevails.

1.3. Extended estimates of intangible assets. Background

It is important to note that an asset such as intangible capital is difficult to measure. This is associated with a number of reasons related to the peculiarities of national accounting systems, in particular accounting standards. Moreover economists' interest in intangible is quite young, at first time all attention was focused on ICT, as a messenger of the computer revolution. Both at the company level and in the practice of accounting for national income, expenditures on intangible resources, such as software and R&D, have historically been subsume under intermediate costs, and not as part of GDP investments. Along with this, the exclusion of intangible assets hides the role of many factors in the center of the innovation process.

For example, Alan Greenspan in 1999 observed that the negative trends in measured productivity observed in many services industries seemed inconsistent with the fact that they ranked among the top computer-using industries. The observation that many of the services industries that had negative productivity trends were among the top computer-using industries owes, at least in part, to Stiroh (1998) and Triplett (1999).

Economists are improving approaches to valuing intangible assets and their contribution to economic growth.

Brynjolfsson et al. (2002), focus on ICT, estimate the returns to the above using a production function approach at the firm level, with no data on intangibles, and find a high estimated output elasticity relative to a plausible ICT income share. Typically this is rationalized as omitted variable bias where intangibles are omitted but are complementary to ICT. Bloom, Sadun and Van Reenen (2012) build a dynamic model to empirically test for the complementarities between IT and firm's internal organization and find significative coefficients. Analternative approach is taken by Basu et al.(2004).They use industry data and assume intangibles are related to ICT and then model there growth rates. Acharya (2016) goes a step further and uses R&D as a proxy for all intangibles. A problem with the R&D proxy approach is that R&D is but one intangible and results are indeterminant; it may be a major source of spillovers (or the opposite, that another intangible assets is the major source and is highly correlated with R&D).

Special attention is given to the revolutionary approach, first applied by Corrado, Hulten and Sichel (hereinafter referred to as the CHS) in 2005, and is developing to this day. They developed a valuation technique by measuring extended list of intangible assets at the cumulative level in the US economy, extend beyond to their correlation with ICT. The CHS used the economic view of investment to formalize the case for capitalizing on a wide range of intangible assets (not only R&D and ICT) in companies and national accounts. This work attracted the attention of macroeconomic policies and growth analysts with its commitment to innovation.

The 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).

With regard to R&D, the approach of CHS was to substantially expand the traditional notion of product and process R&D, an approach generally accepted by both European projects. The basic idea was to include (1) the nontechnological costs of design (industrial and nonindustrial) and services innovation (including investments by financial services firms not captured by R&D surveys), (2) the costs of marketing and launching new products, including ongoing investments to maintain the value of a brand, and (3) organization and human capital management innovations.

Table 3 presents the decomposition of the growth of labor productivity in the business sector of 8 countries of the European Union for the period 1995-2009, according to the estimates of the CHS.

Table 3

Decomposition of the growth of labor productivity in the business sector
8 countries of the European Union for the period 1995-2009

	United Kingdom	Netherlands	Spain	Austria	Finland	Germany	France	Italy
Labor Productivity Growth	2,3	1,8	0,8	2,2	2,5	1,5	1,7	0,3
Labor Quality	0,4	0,3	0,5	0,3	0,2	0,1	0,5	0,3
Capital deeping	1,5	1,0	1,3	0,9	0,5	1,0	1,0	0,7
Tangible nonICT Capital deeping	0,37	0,20	0,73	0,15	-0,29	0,40	0,34	0,40
Intangible Capital deeping	1,7	0,81	0,54	0,76	0,79	0,60	0,68	0,33
ICT	0,71	0,44	0,37	0,38	0,28	0,34	0,30	0,22
R&G	0,05	0,05	0,05	0,16	0,25	0,09	0,07	0,02
Non R&D Intangibles	0,41	0,32	0,12	0,22	0,26	0,16	0,31	0,09
TFP Growth	0,4	0,5	-0,9	0,9	1,7	0,4	0,2	-0,7

Source: Corrado et al, 2014

In this table, we see that intangible capital is not only a larger component of capital, but also exceeds the contribution of labor to growth.

For clarity, we use a rather rough (with a number of reservations[3]) comparison of estimates of intangible assets made on the basis of KLEMS databases and on the basis of an extended approach of the CHS in Table 4. As we can see that, estimates of the contribution of intangible assets according CHS are significantly increased with a decrease in the component of tangible assets as a growth factor.

Table 4

Capital Deeping Structure by KLEMS and CHS

		Non ICT share in Capital Deeping	***ICT share in Capital Deeping***
United Kingdom	KLEMS	48,5%	51,5%
	Expanded approach	17,9%	82,1%
Netherlands	KLEMS	52,9%	47,1%
	Expanded approach	19,8%	80,2%
Spain	KLEMS	77,0%	23,0%
	Expanded approach	57,5%	42,5%
Austria	KLEMS	48,5%	51,5%
	Expanded approach	16,5%	83,5%
Finland	KLEMS	53,3%	46,7%

[3] A comparison is made of the data available for the under review period for decomposition of the value added growth of the European economies based on KLEMS with the decomposition of labor productivity growth in the business sector of similar European economies based on the CHS.

Germany	Expanded approach	-58,0%	158,0%
	KLEMS	63,5%	36,5%
France	Expanded approach	40,0%	60,0%
	KLEMS	69,2%	30,8%
Italy	Expanded approach	33,3%	66,7%
	KLEMS	76,4%	23,6%
	Expanded approach	54,8%	45,2%

Source: based on Corrado et al, 2014 and EU-KLEMS 2012 release

In addition, the share of intangible assets as a value added growth factor of the business sector in the period 1998-2007 in Europe[4] averaged 14.4% (Corrado et al, 2017). For Russia this indicator amounted to only 2.6% of the value added of a market economy in the same period (based on Russia KLEMS).

This Corrado approach received a wide response among economists and applied to the valuation of intangible assets in United Kingdom (P. Goodridge, J. Haskel. G. Wallis 2012), Australia (P. Barnes 2010), Japan (Fukao et al. 2009), Finland (Jalava et al. 2007), The Netherlands (van Rooijen-Horsten et al. 2008).

1.4. Research question

At the same time, this approach has not been applied to Russia yet.

We made an attempt to apply a new approach to the valuation of intangible assets in the Russian economy, and capitalized of an expanded list of intangible assets. The sources of growth are compared with and without intangible assets. Also have been investigated the possibilities and resources of current statistical forms, official observations and industry studies.

We use new estimates to address the following issues: how large growth remained without accounting without the inclusion of intangible assets; what is the contribution of intangible capital to growth; how the inclusion of intangible assets affects the distribution of growth between capital accumulation and growth of multifactor productivity; and what is the increase in growth after 2004 with intangible assets? As far as we know, this is the first article that addresses these issues as part of accounting for growth with an expanded list of intangible assets.

2. Model

2.1. Theoretical base

To analyze intangible assets as a source of growth for the Russian economy, we use the standard methodology for accounting for growth, which allows us to break down the growth rate of production by the weighted average of the growth of various resources and changes in productivity (Schreyer 2001). We follow the presentation of growth accounting based on the value added of Jorgenson, Ho, and Styro (2005, Ch. 8).

[4] 10 EU countries: France, United Kingdom, Germany, Italy, Spain, Austria, Netherlands, Finland, Denmark, Sweden

Contemporary growth accounting is organized around the concept of the aggregate production function. Aggregate real output is assumed to be related to inputs of labor and capital via an aggregate production function, with provision for changes in the productivity of the inputs. When efficiency change has the Hicks-neutral form, the production function can be expressed as

(1) $$Q_t = A_t F(K_t, L_t),$$

where Q_t denotes real output, K_t and L_t are capital and labor, and A_t is an index of the level of TFP. In econometric studies of growth, the production function is given a specific parametric form, and the parameters of F( ) are then estimated using a variety of techniques.

In the index-number (nonparametric) approach of Solow (1957) and Jorgenson and Griliches (1967), the growth rate of output is equal to the shared-weight growth rates of labor and capital:

(2) $$g_Q = s_K g_K + s_L g_L + g_A.$$

(The g terms are growth rates, and the s terms are factor shares.)

The present study uses the concept of capital as a factor of production. The flow of capital services is estimated based on the theory of user costs, developed by Jorgenson (1963), as well as Jorgenson and Yoon (1991). This approach takes into account variation in productivity of different types of assets. For example, one ruble of investments in buildings generates much less capital services per year than the same ruble invested in software, because buildings are much longer in operations.

The measurement of capital as a factor of production is based on the assumption that the flow of capital services of each type k (K_{kj}) is proportional to the average value of capital stocks of this type at the end of the current (τ) and previous years ($S_{kj,\tau}$ и $S_{kj,\tau-1}$) in this industry j . In turn, the growth rate of capital services $\Delta \ln K_j$ is calculated as the average growth rate of capital stocks of each type:

(3) $\Delta \ln K_j = \sum^{Nk}_{k=1} \cdot \tilde{v}^K_{kj} \Delta \ln S_{kj}$,

where N_k – this is the number of asset types, whereas

(4) $\tilde{v}^K_{kj} = 0.5 \, (v^K_{kj,t} - v^K_{kj,t-1})$

the period average shares of each type in the value of capital compensation

(5) $$v^K_{kj} = \frac{p^K_k \cdot S_{kj}}{\sum^{Nk}_{k=1} p^K_k \cdot S_{kj}}.$$

Rental price of capital $p^k_{k,t}$ reflects the price at which the investor is indifferent between buying and renting the capital good via a one-year lease in the rental market. In the absence of taxation the familiar cost-of-capital equation is given by standard equation for calculating the alternative cost of using capital:

(6) $p^k_{k,t} = p^I_{k,t-1} \cdot r_t + \delta_k \cdot p^I_{k,t}$,

where r_t the nominal rate of return, δ_k the depreciation rate of asset k, reflecting an asset's loss of market value under normal operating conditions, и $p^I_{k,t}$ the investment price of asset k. From this equation it follows that rental payments for asset use are determined by the rate of return, the economic depreciation rate, as well as holding gains associated with changes in market prices for this type of asset.

For each individual asset, stocks were estimated on the basis of investment series using perpetual inventory method (PIM) with geometric depreciation profile. According to PIM, the capital stock (S) is defined as a weighted sum of past investments with weights given by the relative efficiencies of capital goods at different ages:

(7) $S_{k,t} = \sum^{\infty}_{\tau=0} \partial_{k,\tau} \cdot I_{k,t-\tau}$,

where $S_{k,t}$ – asset stock of type k at the end of the year t, $\partial_{k,\tau}$ is the productivity of an asset of type k and age τ relative to the productivity of a new asset of this type, $I_{k,t-\tau}$ is an investment in an asset of type k made in the period $t - \tau$. Moreover, it is assumed that capital services generated by assets of different vintages are equivalent and can replace each other (they are perfect substitutes). By analogy with most of the work in this area, a geometric pattern of retirements is assumed. For a given economic depreciation δ_k, which does not change over time, but varies by asset type, we have $\partial_{k,\tau} = (1 - \delta_k)^{\tau}$, so

(8) $S_{k,t} = \sum^{\infty}_{\tau=0} (1 - \delta_k)^{\tau} \cdot I_{k,t-\tau} = \sum^{t-Tb-1}_{\tau=0} (1 - \delta_k)^{\tau} \cdot I_{k,t-\tau} + (1 - \delta_k)^{\tau-Tb} \cdot S_{k,Tb,}$

где $S_{k,Tb}$ – net capital stock (for asset type k) at the end of the year of the initial valuation Tb.

To evaluate capital services based on the model described above, we need dynamic series of nominal investments by industry and type of asset, starting from the year following the year of the initial assessment, investment price indices $p^I_{k,t}$, capital stock indicators at the residual value $S_{k,Tb}$ at the end of the year initial assessment of Tb, the rate of return r_t and the economic depreciation rate by assets types δ_k.

In this paper, the first three indicators are obtained from official Russian statistics. The fourth indicator, the risk-free interest rate in the framework of the Russia KLEMS-based approach, is calculated, and for the new approach it is considered exogenous and is assumed to be 4 percent per year in accordance with the OECD recommendations for measuring capital in countries where is no more reliable estimates[5].

Following the neo-classic theory underlying growth accounting, the nominal rate of return is determined ex-post in the so-called endogenous approach (Jorgenson, Ho, and Stiroh 2005). It is assumed that the total value of capital services for each industry equals its compensation for all assets. This procedure yields an internal rate of return that exhausts capital income and is consistent

[5] См. (OECD 2001a), с. 133.

with constant returns to scale. This nominal rate of return, which is the same for all assets in industry, but varies across industries, is divided as a residual:

(9)

$$i_{j,t} = \frac{p^K_{j,t} K_{j,t} + \sum_k \left(p^I_{k,j,t} - p^I_{k,j,t-1}\right) K_{k,j,t} - \sum_k p^I_{k,j,t} \delta_{k,j} K_{k,j,t}}{\sum_k p^I_{k,j,t-1} K_{k,j,t}}$$

where $p^K_{j,t}$ $K_{j,t}$ is the capital compensation in industry j, which is derived as value added minus the compensation of labor.

The rates of economic depreciation are taken from the work of Barbara Fraumeni (1997) [6], which was carried out according to the US Bureau of Economic Analysis. The application of data for the United States to the Russian economy is due to the fact that the ultimate goal of constructing estimates of capital services in this work is cross-country comparisons of productivity, and there have been no methodological comparability studies of economic depreciation in different countries. This approach is common to all countries represented in the EU KLEMS database[7].

3. Data

As noted earlier, the method proposed by Corrado, Hulten and Sichel, which uses a symmetrical approach to tangible and non-tangible assets, is fundamental to this study.

The main argument in favor of the last statement is follows. Capital theory implicitly defines capital in the context of an optimal consumption plan based on the maximization of an intertemporal utility function subject to the usual constraints (Weitzman, 1976). The solution to this optimization problem determines the optimal path of consumption over time and thus consumer saving behavior, which in turn determines the paths of investment and capital. As discussed in Hulten (1979), the solution to this optimization problem has an important implication for the treatment of intangible capital: any use of resources that reduces current consumption in order to increase it in the future qualifies as an investment.

The status of tangible assets as capital is undeniable. Such assets are created when today's resources are set aside and used to expand tomorrow's manufacturing facilities. The criterion equally applies to business expenses aimed at increasing the value of the company and improving its products, including organizational development and the development of human capital, as well as R&D, as firms spend resources on such activities in order to increase their future production capacities due to "organic growth ”or innovation.

[6] (Barbara Fraumeni 1997)
[7] (Marcel P. Timmer, Robert Inklaar, Mary O'Mahony and Bart van Ark 2010

This result argues for symmetric treatment of all types of capital and that intangible assets aimed at enhancing the value of a firm and improving its products, be accorded the same treatment as tangible capital in national accounting systems.

Any costs that are intended to increase the future rather than current consumption should be considered an investment. Thus, the costs of many intangible assets - computerized databases, research and development, new copyrights and licenses, brand equity and improved organizational structures - should in principle be regarded as investments in economic accounts.

Following the above arguments, an expanded list of intangible assets proposed for accounting was compiled, grouped into three categories: computerized information investment, innovative property, economic competencies. Table 5 outlines what type of knowledge capital is included in each broad group.

Table 5

Classification and level of capitalization of intangible assets proposed by CHS

Asset type	Comment	Capitalization factor
1. Computerized information investment		
a. Software	Software costs for internal use (purchased and own)	100%
b. Computerized Databases	Database creation costs	100%
2. Innovative property		
c. Mineral Resource Exploration and Assessment Results	Spending for the acquisition of new reserve	100%
d. Research and Development Results	Internal R&D Costs	100%
e. Entertainment and artistic originals	Spending for the development of entertainment and artistic originals, usually leading to copyright or license	100%
f. New product developmen	New product development costs in the financial services industries not necessary leading to a patent or copyright	8%
g. New architectural and engineering designs	Costs of new architectural and engineering projects received from specialized organizations	100%
3. Economic competencies		
h. Brand equity		
- advertising expenditures	Purchases of advertising services; advertising expenditure	40%
- market research	Outlays on market research for the development of brands and trademarks	40%
4. Firm-specific capital		
i. Human capital	Investing in employee training	100%

j. Organizational capital		
- purchased	Revenues of the management consulting industry	80%
- own-account	Wages in executive occupation	20%

Source: Corrado et. al (2017)
Notes: for more information, see: http://www.intan-invest.net.

The main component of computerized information, computer software, is already included as a fixed investment in the SNA.

Computer software consists of computer programs, program descriptions and supporting materials for both computer systems and application software. Its cost includes both the cost of initial development, and the subsequent expansion of software, as well as the acquisition of copies that are classified as assets. These types of fixed assets for Russia belong to the All-Russian Classifier of Fixed Assets (Obcherossiyskiy Klassificator Osnovnih Fondov – OKOF) «Software grouping» and begin with code 731.

Databases are a collection of data files organized in accordance with certain rules, maintained in computer memory, characterizing the current state of a certain subject area and used to satisfy the information needs of users.

If an organization records intangible assets as a site on the Internet information and telecommunication network — a set of electronic documents (files) of an organization on a computer network united under one address (domain name or IP address), it is considered as a “database”.

These types of fixed assets for Russia belong to the OKOF «Databases grouping» and begin with code 732.

The second group of innovative property includes the results of mineral resource exploration and assessment results subsoil exploration and evaluation of mineral reserves. These include information protected in one way or another, obtained as a result of information collection activities carried out as part of topographic, geological and geophysical studies, exploratory drilling, sampling, other activities to obtain geological information on subsurface resources, as well as assessing the commercial feasibility of mining. These types of fixed assets in Russia belong to the OKOF group “Exploration expenditures for mineral resources and the estimation of mineral reserves” and begin with code 720.

Although the innovative ownership category of intangible assets includes familiar R&D expenditure as a component, it is broader. It reflects not only the scientific knowledge included in patents, licenses and general know-how (not patented), but also innovative and artistic content in commercial copyrights, licenses and designs. Thus, the category includes the so-called “unscientific R&D”, in addition to the familiar component of “scientific R&D”.

The intellectual property of “Entertainment and artistic originals” includes original films, paintings, sculptures, graphics, design, graphic stories, comics and other works of fine art, original

authors' manuscripts (autographs) of literary and musical works authored by the author or printed with a technical device and signed by him, as well as copies (repetitions) of works of art that were to do by the author himself or under his supervision, signed or otherwise marked by the author. These types of fixed assets in Russia belong to the OKOF group of the same name and begin with code 740.

The third general category includes investments in “economic competencies”. This includes the costs of strategic planning, the costs of redesigning or reconfiguring existing products in existing markets, investing to maintain or increase market share, and investing in brands. Investing in specific human and structural resources includes the cost of training employees provided by the employer, and evaluating the time spent by management on increasing the firm's productivity. Undoubtedly, these costs are not accurately estimated, but business investments in specific human and structural resources through strategic planning, adaptation, reorganization and professional development of employees are important engines of innovation and profitability in the industry and the necessary approach to investment in order to be consistent with the theory of capital. In addition, according to CHS, this latter category is the largest type of intangible business investment. And the total investment in economic competence is almost equal to the volume of investment in the two other main categories combined.

For each asset listed in table 5, a source of data on intangible expenses is associated. Therefore, the second task is to decide which part of the identifiable series of data on intangible expenses is an investment, i.e. what part of a number of indicators fits the definition of investment as "any use of resources that reduces current consumption in order to increase it in the future."

Capitalization ratios are usually set equal to one, because there is no knowledge about how much measured expenditures make up an investment. However, in some cases, such as advertising costs, long-term studies are available, and it is assumed that the ratio should be less than one, since it was found that only national or main types of expenses bring long-term benefits for the brand, sales of the company or reputation.

Thirdly, it is necessary to consider all sources of supply. Although many intangible assets are self-produced, new investments arise both from the work that the company carries out within the company and from the services or assets that it purchases from other companies. The markets for intellectual property and organizational innovation services are growing and / or firmly anchored in many developed countries, and aggregate services from intangible assets are increasingly becoming mixed. Therefore, to obtain objective estimates of investments, it is necessary to determine and take into account both sources of supply.

The capitalization factor columns of table 5 were developed by CHS in four steps: first, if economic research has clearly demonstrated that a given type of spending is fixed investment, then it

categorize 100 percent of the total spending as capital spending. For example, scientific R&D is unequivocally a long-lived investment.

Second, if economic research suggests that only a portion of the spending on an intangible pays off in a future year (or years), these findings were applied. For example, based on the results of empirical literature on advertising (Landes and Rosenfield 1994), the CHS estimated that only about 60 percent of total advertising spending was associated with advertising that had a lasting effect (i.e., an effect that lasts more than one year, compared to advertising "this is a weekly sale").

As CHS notes, there third and fourth steps are less precise: when there are a strong suspicion that the lifetime of a type of intangible may not be at least three years, or part of the expenditure may be directed to routine tasks, or represent current consumption CHS discount the point estimate by 20 percent.

Based on the principles developed by the KHS, we compiled data on intangible assets for Russia. Information about them with a comment about the data source is presented in Table 6.

Table 6

Intangible assets and commentary on data source

Asset type	Included in System of National Account	Data source	Capitalization factor
1. Computerized information investment			
a. Software	Yes	Russia KLEMS	100%
b. Computerized Databases	Yes	Russia KLEMS	100%
2. Innovative property			
c. Mineral Resource Exploration and Assessment Results	Yes	Russia KLEMS	100%
d. Research and Development Results	Since 2008, missing from published data	Internal R&D costs (Collection «Industrial Production in Russia»)	100%
e. Entertainment and artistic originals	Yes	Russia KLEMS	100%
f. New product developmen	No	Wages of highly qualified specialists in the industry 65 OKVED (Financial intermediation)	8%
g. New architectural and engineering designs	No	Form № P-1 «Information on the production and shipment of goods and services»	100%
3. Economic competencies			
h. Brand equity	No		
- advertising expenditures		Form № P-1 «Information on the	40%

		production and shipment of goods and services»	
- market research		Form № P-1 «Information on the production and shipment of goods and services»	40%
4. Firm-specific capital			
i. Human capital	No	Investing in employee training	8%
j. Organizational capital	No		
- purchased		Form № P-1 «Information on the production and shipment of goods and services»	80%
- own-account		Wages in executive occupation	20%

Source: based on official statistics from Rosstat

For assets capitalized on the SNA 2008 standard (Investments in computerized information, c. Mineral Resource Exploration and Assessment Results, Entertainment and artistic originals), Russia KLEMS is the basic source of data series. Regarding Research and Development Results, we note that, despite the fact that the asset is recommended for capitalization by the 2008 SNA standard, not all countries, including Russia, have so far included it in all relevant survey forms. Therefore, at the moment, the reference source of data for us on this asset has become the indicator of Internal R&D costs, published by Rosstat in the annual Collection of «Industrial Production in Russia». To evaluate assets such as expenses for new architectural and engineering designs projects, brand equity, and the purchased component of organizational capital, we relied on output indicators for the respective industry. To estimate the costs of new financial projects, investments in human capital and own-account component of organizational capital, we worked with statistics on employment and wages.

Table 7 shows a comparison of the structure of capital expenditures in intangible assets of the USA and Russia according to available data and similar periods.

Table 7

The structure of capital expenditures in intangible assets of the USA and Russia,%

Type of asset or expense	USA	Russia
	2000-2003	2004
1. Computerized information (mainly software)	14,1	2,7
2. Innovative property		
2.1. Scientific and technical developments	18,8	2,8
2.2. Unscientific developments	19,3	37,1
3. Economic competencies		
7. Brand equity	13,1	2,6

8. Firm-specific human capital and structural resource	34,7	54,8
GDP Percentage	**12**	**12,7**

Source: based on Corrado 2005 and author's calculations

The results of this comparison show that in Russia, as in the USA, the costs of economic competencies are significant, and intangible assets account for about 12% of GDP. Along with this, we see that the data on Russian intangible assets need more detailed refinement, especially in terms of computerized information and R&D costs[8].

This direction will be a further vector of studying the capabilities of Russian statistics.

4. The discussion of the estimation results with expanded list of intangible assets

Table 8 shows the decomposition of Russia's gross value added, taking into account the extended list of intangible assets and without it (based on Russia KLEMS).

Table 8

Decomposition of Russia's gross value added
for the period 2004-2014

	2004-2008		2009-2014		2004-2014	
	RU-KLEMS	With Intangibles	RU-KLEMS	With Intangibles	RU-KLEMS	With Intangibles
Gross value added, volume indices	7,03	6.69	2,40	2.65	3,12	3,28
Growth rates						
Growth rate of ICT capital (p.p.)	0,41	0,03	0,08	0,01	0,19	0,01
Growth rate of non-ICT capital (p.p.)	0,37	0,39	0,25	0,19	0,29	0,25
Contribution to value added						
Contribution of labor (p.p.)	0,82	0,80	0,42	0,41	0,38	0,37
Contribution of ICT capital services to value added growth	0,35	0,33	0,05	0,07	-0,09	0,16
Contribution of non-ICT capital services to value added growth (p.p.)	2,67	2,12	2,00	1,72	0,09	1,88
Contribution of TFP to value added growth (p.p.)	3,18	3,44	-0,06	0,44	2,74	0,87

Source: Russia KLEMS, release 2017, author's calculations

From a comparison of the two panels, a number of conclusions can be drawn. First, the capitalization of intangible assets increases by 5% the growth rate of output in 2004-2014 compared

[8] In particular, work in progress to create software is not reflected in official data source. The costs of creating software at the enterprise, accumulated on account 08 “Investments in non-current assets”, are not included in fixed assets accounted in form No. 11 until they are completed (debited from account 08 in debit of accounts 04 “Intangible assets”). These expenses also do not relate to work in progress for equipment, to equipment intended for installation and to facilities not completed by construction.

with the baseline scenario. In the period 2004-2008 this growth is not observed, what can be explained by the technological crisis.

Secondly, the relative importance of the factors that explain growth is changing towards later periods when intangible assets are introduced. In the first, the contribution of intangible assets to growth remained virtually unchanged; the contribution of tangible assets remained prevailing, also in comparison with labor. The inclusion of intangible assets to a greater extent affected the overall period under review, without them, in 2004-2014, the contribution of intangible assets was negative. In addition, the inclusion of capital increases the share of growth in value added attributable to capital from 0 to 70%. At the same time, the component of multifactor productivity (residual factor according to Jorgenson and Griliches (1967) is reduced to almost zero values.

Accordingly, the role of capital in accelerating productivity growth is much greater when considering intangible assets. In general, the results presented in table 8 convincingly indicate that intangible assets are important not only for accounting for national income and welfare, but also for accounting for growth. Indeed, our estimates, no matter how rough they may be, imply that the traditional practice of spending intangible assets leads to a seriously distorted picture of growth sources.

Conclusion

We believe that the inclusion of intangible assets significantly changes the measured model of economic growth: it was found that the growth rate of output increases more rapidly with the inclusion of intangible assets than in the base case, when intangible capital is completely ignored, and the deepening of capital (when it expands to cover both tangible and intangible assets) becomes the uniquely dominant source of productivity growth, while reducing the component of multifactor production water drainage. At the same time further elaboration of the issue is necessary for better understanding these processes.

In addition, for a deeper understanding of the cause-effect relationships occurring in the economy and related to intangible assets, we consider it necessary to conduct industry analysis.

Russian statistics clearly show a lack of detailed information that would be consistent with the Russian system of national accounts. These limitations include the lack of data on gross fixed capital formation at a detailed industry level and the need for additional adjustments for data collected from more limited samples. The absence of statistically agreed price indices for investment prices for certain types of capital is also significant. The approach used in this work is based on an extremely approximate correspondence of the technological structure of investment and fixed capital investments by types based on the Russian classification of assets. At the same time, taking into account the differences in price movements for certain types of capital, as can be seen, has a very

large influence on the dynamics of capital. Finally, the estimate of the net stocks of fixed capital of the initial year on the basis of data on the replacement cost used in the work is far from a theoretically based market valuation of assets. The initial estimate of inventories of new intangible assets, taken as 0 in 1994, seems even more approximate. However, there is no higher quality data for the year of initial assessment, collected by a single methodology and covering the entire economy.

Secondly, the absence of investment price indices using the concept of constant quality leads to significant shifts - first of all, when recalculating investments into computing and communication equipment, as well as software, into constant prices. Estimates can be improved by using relevant US indices (see (Paul Schreyer 2002)). The third group of restrictions is associated with the ambiguity of the choice of one or another set of parameters as applied to the Russian economy. These include US economic depreciation rates. When calculating the system of accounts of economic growth, it is advisable to use different versions of such estimates to analyze the sensitivity of the final results.

Appendix No. 1

The Russian World KLEMS segment was based on the data of Federal annual statistical observation No. 11 “Information on the presence and movement of fixed assets (funds) and other non-financial assets” (hereinafter referred to as Form No. 11).

The time series are constructed by breaking down GFCF data by asset type using shares calculated on the basis of detailed information about a new input by industry and asset type based on federal annual statistical observation Form No. 11. Form N 11 was introduced in 1993, which allows us to analyze data over a sufficiently long time period. Capital stocks are divided into 8 types: residential structures, buildings and constructions, transport facilities, power machines and material working machines, computer technology, information machines, data-processing machines except computing equipment, other assets, non-material assets.

We make the assumption that the inaccuracy of the valuation of intangible assets may be due to incorrect shares of assets, classification of fixed assets and other features of Form No. 11.

Form No. 11 does not take into account the data of small and medium-sized businesses, in addition, updates and changes to the instructions for filling it out are almost annually made, which may negatively affect the completeness of the information provided by organizations.

Table 1.1. presents how the classification of intangible assets in Form No. 11 changed during the reporting period (with the exception of ICT capital).

Table 1.1.

Classification of intangible assets in Form No. 11

<table>
<tr><th>Period</th><th>2014 - 2012</th><th>2011</th><th>2010 - 2001</th><th>2000 - 1995</th></tr>
<tr><td rowspan="6">Classification</td><td>Objects Related to Intellectual Property and IP Products</td><td rowspan="6">Objects Related to Intellectual Property and IP Products</td><td rowspan="6">Intangible fixed assets (Mineral Resource Exploration and Assessment Results; computer software; Entertainment and artistic originals; High technology industrial technologies. Since 2010, also other intellectual property.)</td><td rowspan="6">-</td></tr>
<tr><td>Of which: Research and Development</td></tr>
<tr><td>Mineral Resource Exploration and Assessment Results</td></tr>
<tr><td>Software</td></tr>
<tr><td>Database</td></tr>
<tr><td>Entertainment and artistic originals</td></tr>
</table>

Source: based on Rosstat documents enacted Form No. 11

Thus, intangible assets in fixed assets began to be examined since 2001. Prior to this period, they belonged to the category of “other non-financial assets” and were not included in the composition of GFCF, i.e. the intangible component of fixed assets was identical to ICT capital. The next significant change in the classification of intangible assets occurred in 2011 after the assignment of intellectual property to fixed assets, since 2012 including research and development. This is due to

the harmonization of Russian statistics with the standards of the System of National Accounts of the 2008 edition.

Form No. 11 does not reflect intellectual property products that do not have legal or other protection. Also, incomplete work on creating software is not reflected. Not included in intangible fixed assets is the value of non-produced assets related to fixed assets - contracts, leases, licenses and the value of goodwill and business relationships (trademarks and other marketing assets).

In addition, when filling out the form of federal statistical observation No. 11, it is necessary to be guided by the principles of accounting for fixed assets. In practice, accountants have many questions when applying PBU 14/2007[9], especially regarding recognition of intangible assets in accounting, as previously noted.

In PBU 14/2007 and the Tax Code of the Russian Federation, Art. 257 intangible assets include non-material assets that can bring future economic benefits to the organization (income), used in the production of goods (work, services) or for the organization's management needs for a long time (duration over 12 months) and the availability of documents (patents, certificates and other title documents). In paragraph 3 of PBU 14/2007 it is determined that in order to accept an object for accounting as an intangible asset, seven established conditions must be met. This requires a one-time compliance. If an asset does not meet at least one criterion, such an asset cannot be recognized as intangible.

In comparison, GAAP US national accounting standards allow an intangible asset to exist for less than 12 months. Also, if an entity has an intention to sell an asset after use, then it can be classified as intangible. In Russian reporting, for such assets it is recommended separately taking into account so that it can be easily distinguished during transformation.

In PBU, a prerequisite is the separability of an asset from other property; this is not considered by American standards as an obstacle to their recognition as intangible. So, paragraph B37 SFAS No. 142 allows the existence of intangible assets that cannot be separated from other property (the production process available at the enterprise, the qualifications of employees).

In addition, the problem in accounting for intangible assets is that the international standard IAS 38 significantly different from PBU 14/2007. This leads to the recognition of intangible assets in one account and non-recognition in another, which, accordingly, distorts the financial statements and causes significant difficulties during taking to accounting.

The circumstances listed above may be an indirect cause of low valuations of intangible assets, especially in the early periods.

[9] Russian standard of accounting

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