

The New Approaches Toward Productiveness of Labor and Salaries Research on the Basis of the Blockchain Technology

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Abstract. the present article studies the economic processes in the framework of the economy of labour topical area. The purpose of the article is to introduce a new approach towards interpretation of the productiveness of labour concept, of quantitative methods for its measurement and of the extensive use of the blockchain technology for organizing the salary payments. The initial research of the market was executed with the use of methodology for the personal services sector. The result of the quantitative analysis are used by the economic entities in order to improve in-house procedures and ruled for business organization, as well as to improve competitiveness of the entities. The quantitative estimation of the productiveness of labour in the entities has not been performed yet and constitutes a novelty. The work represents the research areas that allow amplifying the spheres of investigation for the young scientists.

1. Introduction

The importance of distinct assets productiveness, including productiveness of labour in the improving of the prosperity level of the society constitutes a universally recognized factor at the modern stage of the humanity development. The Government of the Russian Federation (hereinafter – the RF) has passed a decree¹ adopting the plan of steps for providing the growth of productiveness of labour, creation and modernization of the high-performance workplaces, setting forth a complex of measures for improvement of the situation in this economy area of strategic importance². In the framework of development of the given area, according to the authors, it is necessary to set the following tasks: to perform an ample range of scientific researches, to elaborate new materials of the methodological nature and to provide for their use, to create a corresponding legal and informative base, to introduce the modern digital technologies (blockchain). The deep analysis of the problems related to the productiveness of labour and correspondent payments for such an effective activity is impossible without elaboration of the new approaches towards understanding of the essence, genesis, interaction with other economic factors situated within the new labour economy. Only the given complex research of these questions, in the authors' opinion, allows defining their true significance for functioning of the organizational and economic systems in the conditions of the digital economy [10, 23].

¹ The Government of the Russian Federation, decree No.1250-r dated 09.07.2014

² Including scientific, methodic, legal and informative basis of the activity aimed at improving the productiveness of labour.

2. Methodology of the research and hypotheses

In the modern researches the growth of the productiveness of labour is connected with the process of leaning, i.e. in decreasing the general spending of the direct labour and the past labour on a per unit basis regarding the goods, not only direct labour [4, 5, 7]. In the literature there has been a longstanding discussion about which index of the quantum of output should be used to calculate the parameters of productiveness of labour – the gross production (its modifications) or net production in its variations. The position of both supporters and opponents of the net production in all its modifications has often been lopsided because of the attempts to counterpose the gross production againsts the net one, and the net one – against the normatively net; there has been problems in the elaboration of an alternative scheme: either one, or the other [2, 3, 17]. As the results of various discussions showed, the absolute majority of their participants supposed that there might not be a universal, suitable for all the cases and conditions, ideal way to measure the productiveness of labour; all the participants supported the ample use of differentiated indices and other numbers [26, 27, 28]. The new conditions of the social and economic development of the post-industrial society demand a correspondent mirroring in the labour economy theory for the new economic trends, such as, for instance, neoinstitutionalism (hereinafter – NI) and new institutional economic theory (NIET) [18, 21].

The western economists³ study the essential problems of the economy of labour leaving the lean towards measuring the productiveness of the production factors (capital, labour, materials, energy and side services), and also the total (multifactor) productiveness of the featured groups of factors [1, 6]. Among the western researches we should particularly highlight G.Emerson, who has introduced the mere notion of productiveness into the science on production management. Thus, on the surface of the economic phenomena in case of both soviet and western scientists “the productiveness of labour turns into productiveness of the factors of labour”, this leads the measurements of the productiveness of labour to a methodological dead end.

N.A.Gorelov states that whilst the creative energy of a person “is drawn out” the social ambient, its use or generation providing the final product with the demanded productiveness of labour constitutes a complex function from the conditions of the social ambient (institutional ambient), which depends on the level of development of culture, science, morality, ethic etc. Thus, among the economists the understanding of the given phenomenon as being social is seen clearer and clearer, and there appear attempts to reveal connection between productiveness of labour with such a notion as human capital [14, 20]. The latter constitutes the possibility to create a space based on the social relations, on the utility for other people, on belonging to different groups, i.e. – to create a culture. The elements of such a culture are: tangible and intangible wealth, the examples of behavior, traditions, customs and correspondent social institutions. In other words, the notion of the productiveness of labour based on a certain level of the human capital, is attributed typically institutional features. The influence of the human capital factor on the productiveness of labour, in our point of view, should be represented in a more detailed way. At the moment we could mark three basic approaches towards the problem of calculation of the given index:

1) cost approach (E.Engel, T.W.Schultz) – based on calculation of all the costs related to investments in a human;

2) income (W.Petty, R.Nicholson, J.M.Clark, D.Lorgenson) – based on the calculation of the current cost of the income stream from the asset under research;

3) index methods of calculation of cost of the human capital were set by S.Mulligan and X.Sala-i-Martin (1995). In this case they use the approximation of the human capital with the aid of the index appearing resulting from the ratio of the average salary in the country given and the average income of a non-qualified worker. Thus, the authors offered a methodic than allows to limit the influence of the technic and technological factors on the final result. In the practical calculations, depending on the time periods under research, the following formula is used:

³ The famous works of the following western specialists are of a wide fame: J. Grayson, P. Drucker, G. Davis, D.U. Kendrick, K. Kurosawa, P.M. Lerera, A. Lawlor, P. Mayley, W. Morris, W. Rach, D.S. Sink, W.T. Stuart, J. Felix.

$$hi = \sum wi,e * Li,e / wi,0,$$

Whereas

Wi,e – salary of a worker in state i, who has an e-level of education,

Wi,0 - salary of a worker in state I, who has the lowest level of education (secondary or primary education or total lack thereof),

Li,e – the share of all the specialists in state I, who have an e-level of education.

In the previous works (A.V. Czernoalov, P.V.Solodukha, P.A.Czernoalov 2017, A.V. Czernoalov, Z.Tsekhanovskiy, Z.Shimanski, P.A.Czernoalov 2018) the authors formulated the following hypotheses: the higher the level of development of institutions for the digital economy conditions, and, thus, the higher the level of the workers' human capital, the smaller the critical period between two innovative cycles of an entity is, i.e. there is a high level of productiveness of labour routines. Moreover, while studying economic entities, one should take opportunism into account, which is a sensitive and a deep-root feature on a human personality. There are different methods for taking opportunism into account: from the offered by J.Kornai method based on the estimation of honesty and confidence via calculating the number of transactions with prepayments and their ration to the overall number of agreements, to cost methods implying the use of quantitative ways of calculating correspondent transactional expenses of the opportunist behavior and index numbers, to use of which lean the authors of the present work.

Given the exposed methods of calculation of the level of the human capital, the content of the hypotheses formulated above and the remarks on the consideration of the opportunist behavior, we offer the following formula for calculating the productiveness of labour and performance of the further practical research:

$$Pi = \sum hi * (1-Ri,e) / ni,0,$$

Whereas

hi – the index of the human capital in state i (or in an entity) of a worker, who has an e-level of education,

Ri,e – the index of the opportunist behavior level in state i (or in an entity) of an average worker),

Ni,0 – the share of those who work in the total amount of population in state i.

3. The discussion of the research results and formulation of conclusions

On the grounds of the collected statistical data out of the documentation of several entities from the cleaning service market of the city of Moscow and the region of Moscow, the city of Warsaw and the voivodship of Warsaw, also having used the information got as a result of performing several questioning sessions; there has been formed data necessary for performing the correspondent calculations, resumed in Table 1. In the same table (with the use of the abovementioned formulas) the index numbers of the human capital and productiveness of labour are exposed.

The analysis of data from Table 1 reveals that the cleaning services market both in Moscow and in Warsaw is, as a rule, represented by small and medium-sized entities (SMSE), with the total number of workers between 40 and 100 in one case and between 13 and 80 in another, which corresponds to the peculiarities and SMSE. At that there could be noticed a substantial difference in the average income per worker, but the difference of the average salary between a qualified and a non-qualified workers are more or less the same: in Moscow this index equals to 47% from a qualified worker salary, and in Warsaw 45% correspondently. In this connection the estimate of the human capital in both cities is also approximately the same but, nevertheless, for the reason that Moscow constitutes a larger object for research with a population several times greater, the competition in the labour market causes the flow of the workers with a higher index of the human capital to SMSE (Table 1) – this fact also confirms a somewhat higher index of the share of qualified workers. Ethnometrical estimation performed by the authors in the previous works show that non-qualified workers in Moscow possess a rather high level of opportunism in comparison to the same category of workers in Warsaw, which essentially influences the productiveness of labour index, which is several times higher at some of the Warsaw SMS entities than at those in Moscow.

Table 1. Selected economic indices of the cleaning market entities economic activity of the city of Moscow and the city of Warsaw in 2011-2015.

Year	Average number of full-time and part-time workers, units	Payroll budget, thousands euro.	Average salary, euro.	Average for qualified workers, euro.	salary non-work-ers, euro.	Quality-qualified workers share	Index of human capital	Opportunist behavior ⁴	Share of full-time in-workers	Index of institutional productivity of labour
<i>L</i>	<i>V = Ly</i>	<i>wi,e</i>	<i>wi,0</i>	<i>Li,e</i>	<i>hi</i>	<i>Ri,e</i>	<i>ni,0</i>	<i>Pi</i>		
Limited liability company (LLC) «ABC» Moscow and branches										
2011	72	27502,8	380,15	179,43	0,318	0,67	1-0,46	0,55	0,66	
2012	81	33747,1	412,45	196,76	0,311	0,65	1-0,45	0,43	0,83	
2013	91	41345,39	453,81	214,19	0,347	0,72	1-0,45	0,45	0,88	
2014	67	20449,86	305,24	143,46	0,211	0,45	1-0,44	0,42	0,60	
2015	82	32788,47	400,32	188,95	0,29	0,61	1-0,45	0,47	0,71	
LLC «BCA» Moscow and branches										
2011	76	29614,5	390,45	184,29	0,292	0,61	1-0,37	0,51	0,75	
2012	83	33460,7	400,34	188,96	0,238	0,49	1-0,40	0,49	0,6	
2013	80	33953,76	423,24	199,76	0,328	0,68	1-0,39	0,45	0,92	
2014	75	22506,1	300,05	141,62	0,272	0,57	1-0,41	0,41	0,82	
2015	85	31354,02	367,34	171,96	0,28	0,60	1-0,38	0,47	0,79	
LLC «AAC» Moscow and branches										
2011	38	11440,0	299,00	141,00	0,338	0,7	1-0,46	0,59	0,66	
2012	87	25110,0	287,00	135,00	0,443	0,93	1-0,49	0,62	0,77	
2013	88	29963,2	342,00	161,00	0,465	0,97	1-0,5	0,66	0,73	
2014	40	10355,5	260,00	122,7	0,524	1,1	1-0,5	0,42	1,30	
2015	97	29065,3	300,00	141,67	0,42	0,88	1-0,5	0,50	0,88	
LLC «YX» Warsaw and branches										
2011	26	29143,0	1103,6	490	0,247	0,54	1-0,11	0,34	1,41	
2012	31	34319,7	1100,0	490	0,272	0,60	1-0,13	0,33	1,58	
2013	35	40026,34	1134,0	490	0,249	0,56	1-0,11	0,35	1,42	
2014	43	49810,9	1145,0	490	0,20	0,47	1-0,09	0,35	1,22	
2015	44	50157,57	1150,0	490	0,21	0,49	1-0,11	0,36	1,21	
LLC «ZX» Warsaw and branches										
2011	51	44176,1	867,0	490	0,238	0,41	1-0,13	0,34	1,05	
2012	53	51792,4	978,0	490	0,208	0,40	1-0,20	0,34	0,94	
2013	64	63116,0	987,0	490	0,216	0,42	1-0,09	0,36	1,06	
2014	78	78419,3	1009,0	490	0,20	0,41	1-0,09	0,34	1,1	
2015	68	70836,5	1043,0	490	0,27	0,57	1-0,10	0,35	1,46	
LLC «YZ» Warsaw and branches										
2011	17	13765,0	789,0	490	0,243	0,39	1-0,12	0,46	0,75	
2012	17	14820,6	876,0	490	0,195	0,34	1-0,13	0,40	0,74	
2013	19	15384,6	803,0	490	0,209	0,32	1-0,20	0,41	0,62	
2014	18	16448,3	903,0	490	0,270	0,49	1-0,13	0,42	1,02	
2015	13	13076,7	980,0	490	0,22	0,44	1-0,20	0,47	0,75	

⁴ The data is calculated under a separate method on the basis of selected questionnaires of workers and cleaning companies managers

One of the areas of improvement of the productiveness of labour and ordering the salaries payment system among the workers given the example of the cleaning services market in Moscow and in Warsaw is introduction of the digital technologies into the economic routines, which should decrease the level of opportunism among the members of staff [8, 15]. One of the perspective technologies is blockchain. In the modern conditions there is a diffusion of the blockchain technology in the state government system and also in the organizational activity of the economic entities. Due to unification of the technological solutions, blockchain has several bright distinctive peculiarities: openness, stability of data stored, and also the possibility of publication and control in a decentralized network of a performed logic (program code) [9, 19, 21, 31].

Table 2. The elements of the blockchain system created in the framework of the self-governed organizations in the sphere of cleaning.

• System element	• Characteristics
• Aggregation of smart-contracts	• The “smart contracts” are concluded between a company and a client via the system
• Payment system	• Financial transactions between a cleaning company, a client and state governance bodies take place via blockchain
• In the system interface forms the rating of a cleaning company and the individual one for each worker	• The electronic system has an open for access hardwired interface bearing the quality parameters of a cleaning company and of a selected worker. A client of the cleaning company gets the access to filling this section after the smart contract performance time elapses.
• Payments, including salaries of the workers of a company	• Formation and transfer of salaries to the members of staff of a cleaning company are performed via the system.

Using the blockchain technology in the process of management of the business processes at a selected entity or a selected market level allows substantially decrease transaction expenses, provide transparency for the business processes and improve the productiveness of labour. In our opinion, it is more rational to use the blockchain technology at the level of the self-regulatory organizations operating at the cleaning services market⁵ (Association of the Russian cleaning companies, Union of the cleaning companies of Russia and others). The elements of the blockchain system created in the framework of activity of the self-regulatory organizations in the field of cleaning are exposed in Table 2. It could be assumed that after having performed a smart contract the foreman distributes the salaries considering the performance of each worker; the workers’ data are filled in the system, where their individual rating is formed. The client (under the criteria set forth) assesses the quality of the cleaning services provided within the interface of the industry application of blockchain, and on these grounds the individual rating of a cleaning company is formed – moreover, it cannot be amended or forged. Such an approach will contribute to development and promotion of those company brands which provide quality cleaning services at the market and elimination of those delivering poor services.

4. Conclusion

Given the statements of the research exposed above, we could make the following conclusions:

1. We have revealed a high extent of the opportunist behavior in the process of order execution at the cleaning market of the city of Moscow. This problem causes the necessity of reforming the institu-

⁵ The key element of the blockchain system in the field of cleaning should be the transfer from traditional paper contracts towards smart contracts concluded with clients in the economical activity of cleaning companies.

tional ambient in order to improve the productiveness of labour and reduction of the workers opportunist behavior level.

2. Experience of the companies operating at the cleaning market in Warsaw revealed that the highest effectiveness is attributed to the entities with a lower number of workers and with the use of flexible forms of labour schedules (LLC “YX”).

3. In order to improve labour performance and improvement of transparency in the process of services delivery, according to the authors, it is necessary to introduce digital technologies into the process of organization of the operation of the entities at the cleaning services market.

4. The blockchain technology constitutes a prospective area. It should be integrated at the branch level in the framework of the self-regulatory organizations, which would allow to improve the productiveness of labour, to provide for control of quality and transparency of the services delivered and to reduce the extent of the opportunist behavior among the workers of a cleaning company.

Introduction of the blockchain system at the branch level would allow to transfer the contractual relations between a cleaning company and a client into a digital area, via using smart-contracts.

References

- [1] Alekseev A N 2013 The aspects of an innovative risk of an entity: theoretical and practical aspects *Moscow S.Vitte University Herald. Series 1: Economy and management* **4(6)** pp 17-19
- [2] Alekseev A N 2016 Effectiveness of interorganizational communications in industry *Moscow S.Vitte University Herald. Series 1: Economy and management* **2(17)** pp 41-45 doi: 10.21277/2307-6135-2016-2-41-45
- [3] Blaug M 2004 Methodology of the economic science (M.Blaug, M.: «ZhVE»)
- [4] Bobrova T N, Kuznetsova A I 2015 The problem of development of the innovative city infrastructure *Moscow S.Vitte University Herald. Series 1: Economy and management* **2(13)** pp 47-51
- [5] Voronina A V, Sheveleva O M 2018 Levels of analysis of tendencies and factors of labour market development (Moscow) *S.Vitte University Herald. Series 1: Economy and management* **2(25)** pp 56-61 doi: 10.21777/2587-554X-2018-2-56-61
- [6] Gubanov R S 2014 The reasons for appearance of risks in the conditions of innovation economy development (Moscow) *S.Vitte University Herald. Series 1: Economy and management* **1(7)** pp 26-30
- [7] Kaluzhnyi V V 2006 Theory of adjoint indices of productiveness and effectiveness Economic cybernetics *International scientific journal (Donetsk)* **5** pp 15-33
- [8] Kuznetsova A I, Dolmatova A V 2016 Innovative technologies in the system of housing and public utilities (Moscow) *S.Vitte University Herald. Series 1: Economy and management* **3(18)** pp 42-49 doi: 10.21777/2307-6135-2016-3-42-49
- [9] Kuznetsova A I, Zuev S V, Leontiev V V 2013 Analysis of contractual documents and terms of reference of the state contracts for the services of realization of information systems (Moscow) *S.Vitte University Herald. Series 1: Economy and management* **1(3)** pp 33-43
- [10] Novitskiy N A, Kuznetsova A I 2017 Formation of a national system for a new technological economy management (Moscow) *S.Vitte University Herald. Series 1: Economy and management* **3(22)** pp 7-18 doi: 10.21777/2307-6135-2017-3-7-18
- [11] Povarova E S 2018 Peculiarities Of Application Of Analytical Procedures In The Audit Of Salaries Payments To Personnel (Moscow) *S.Vitte University Herald. Series 1: Economy and management* **3(26)** pp 98-102. doi: 10.21777/2587-554X-2018-3-98-102
- [12] Rudenko L G 2015 Analysis of the condition of housing and public utilities in Russia in the modern conditions (Moscow) *S.Vitte University Herald. Series 1: Economy and management* **2(13)** pp 67-78
- [13] Rudenko L G, Degtyar N P 2017 The essence of KPI and its role in company management (Moscow) *S.Vitte University Herald. Series 1: Economy and management* **2(21)** pp 50-54 doi: 10.21777/2307-6135-2017-2-50-54

- [14] Rudenko L G, Morozova M A 2016 State aid to small and medium enterprises in the foreign countries (Moscow) *S.Vitte University Herald. Series 1: Economy and management* **1(16)** pp 108-114 doi: 10.21777/2587-554X-2016-1-108-114
- [15] Rudenko L G 2015 Organizational and functional model of the management mechanism for marketability of public utilities entities (Moscow) *S.Vitte University Herald. Series 1: Economy and management* **2(13)** pp 14-24
- [16] Rudenko L G 2014 Priority forms of financial aid to small enterprises at the modern stage of the Russian economy development (Moscow) *S.Vitte University Herald. Series 1: Economy and management* **3(9)** pp 17-23
- [17] Salikhov B V, Salikhova I S 2015 Parameters and indices of quality of self-learning organizations in the cognitive economy (Moscow) *S.Vitte University Herald. Series 1: Economy and management* **1(12)** pp 126-134
- [18] Salikhov B V, Salikhova I S 2016 Structure of intellectual economy as a factor of development of cognitive competences (Moscow) *S.Vitte University Herald. Series 1: Economy and management* **2(17)** pp 122-132 doi: 10.21777/2307-6135-2016-2-122-132
- [19] Smirnova A S, Kuznetsova A I 2015 Mechanism for sustainable functioning of housing and public utilities in the conditions of city economy crisis development (Moscow) *S.Vitte University Herald. Series 1: Economy and management* **4(15)** pp 42-48
- [20] Suptelo N P 2016 Formation of a flexible system for material incentive of workers in an organization (Moscow) *S.Vitte University Herald. Series 1: Economy and management* **3(18)** pp 90-97 doi: 10.21777/2307-6135-2016-3-90-97
- [21] Blockchain technologies: modern condition and key insights online access mode URL: <https://www1.fips.ru/vse-uslugi/patent-analytics/report-blockchain.pdf>
- [22] Czernoalov A V, Solodukha P V 2017 The basics of the quantitative analysis in the institutional theory: the social aspect: monography (Moscow: RUSCIENCE) 256 p
- [23] Czernoalov A V, Kuzmitskiy M 2016 Opportunism in corporate surveillance and possibilities of its limits on the example of Poland. Materials of international scientific-practical conference "Sustainable development of the social and economic systems: science and practice" Edited by Yu S Rudenko, L G Rudenko pp 676-689
- [24] Czernoalov A V, Tsekanovskiy Z, Shimanskiy Z, Czernoalov P A 2018 Digital future or economy of happiness? monography (M.: Editorial trade corporation «Dashkov and Co») 218 p
- [25] Economy of labour 2007 Edited by Gorelov N A (St.P.: Piter) p 26
- [26] Elster J 1993 Social norms and economic theory *J.Elster* (M.: THESIS)
- [27] Bialon L 2002 Methodologic problems of human capital estimation: WPW p 12
- [28] Miciuła I, Miciuła K 2015 Methods of estimating the valor of human capital: Modern Economic Problems **11** pp 269-280
- [29] Rudolf S 2010 Influence of the new institutional economic theory on management sciences Materials of international scientific-practical conference «Institutionalistics: theory, methodology, practical aspects» (Brest, Alternative) pp 8-14
- [30] Williamson O E 1998 Economic institutions of capitalism: Entities, markets, transactions (Scientific editor house: PWN, Warszawa)
- [31] Solovev D B 2005 Determination of rational exciting currents in synchronous drives of quarry mechanical shovels *Gornyi Zhurnal* **3** pp. 70-73.