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ЭКОНОМИЧЕСКИЙ РОСТ В БЕЛАРУСИ: ЭМПИРИЧЕСКИЕ ФАКТЫ И ИХ ИНТЕРПРЕТАЦИЯ

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Проведен анализ среды долгосрочного экономического роста в Беларуси. Показано, что долгосрочный экономический рост в Беларуси в 1997–2016 гг. характеризовался достаточно высокими темпами, но вместе с тем и неустойчивостью. Отмечено, что приводимые оценки, характеристики и расчетные качественные показатели свидетельствуют о том, что неустойчивость и резкие перепады в темпах роста были обусловлены недостатками в факторах производительности. Даны рекомендации по выбору приоритетов в политике экономического роста, которые позволят усилить его потенциал в Беларуси.

Ключевые слова: экономический рост; Беларусь; общефакторная производительность; (не)воплощенный технический прогресс.

ECONOMIC GROWTH IN BELARUS: WHAT LIES BENEATH THE STYLIZED FACTS

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This article deals with the assessment of long-run growth environment in Belarus. The paper provides evidence and stylized facts about Belarusian growth. It shows that Belarusian long-run growth rate in 1997–2016 was rather high, but experienced unsustainability. Estimates and indicators presented in the study witness that the unsustainability stems from the lack of productivity fundamentals. A number of recommendations on growth enhancing policy has been formulated in the study, which would allow strengthening growth potential in Belarus.

Key words: economic growth; Belarus; total factor productivity; (dis)embodied technological progress.

Introduction

After the Great Recession global growth has weakened considerably. Weakening long-term growth challenges roughly every individual country. At a high degree of generalization, major reasons for long-term growth weakening may be summarized as follows: 1) less financial deepness in post-crisis period restricts capital and total factor productivity (TFP) growth; 2) decreasing global imbalances restrict technological diffusion and other positive spillovers stemming from global trade and financial linkages; 3) stabilization policies carried out to 'cure' the crisis cause negative long-term implication for future growth, e. g. excessive public debts restrict human capital investments, bailouts during the crisis cause maintaining inefficient allocations, etc.

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But despite somehow similar challenges, growth agenda still differs considerably for developed and emerging world. For developed countries growth weakening is mainly associated with adverse demographic trends, temporary stop in human capital accumulation, less efficient allocation of inputs. However, their physical capital accumulation tends to return to a relatively good shape [1]. For emerging markets, losses in productivity growth and adverse demographic trends are aggravated by the deficit of capital accumulation, which tends to become persistent (e. g. because of insufficient financial attractiveness of the region in after-crisis environment) [1].

Furthermore, some recent studies visualize new challenges for emerging markets, which might restrict TFP gains. First, the concept of middle income trap nowadays experiences a kind of prosperity [2; 3]. In terms of growth decomposition, it might mean that approaching the technological frontier makes TFP gains more complicated per se. Hence, in order to keep on growing, the country might involve new productivity enhancing factor, not just exploit and improve existing ones. Second, there is a widening evidence showing that emerging markets are too sensitive to external conditions [4]. Moreover, the mechanism of closing the gap between developed and emerging countries is not automatic and depends on the stance of the global macro environment [4]. The convergence tends to stem from emerging markets, whose growth is more volatile because of sensitivity to external conditions. Hence, during favorable global environment their might be relatively rapid convergence, and vice versa during the periods of growth slowdown. In terms of the growth decomposition, it might mean that technological diffusion and international reallocation are dampened during global slowdowns.

First look at the Belarusian growth performance – the country has experienced a painful growth rate rebalancing during the last decade – might give a rise to a hypothesis that regional trends are behind weakening growth. However, there are also a bulk of anecdotal evidence causing doubts in growth decline due to external conditions: 1) too rapid and huge long-term growth easing vs. still a wide room for a catch-up growth[1]; 2) persistent recession throughout late 2014 and early 2017; 3) asynchrony in growth dynamics with other CEE countries; majority of transition indicators (e. g. those by the EBRD) witness that Belarus is under-reformed country.

Majority of country studies of Belarus' economic growth indicate a wide range of specific factors behind the growth decline. For instance, frequently the dependence of the Belarusian long-term growth rate on specific conditions of oil and gas trade is being emphasized [5]. Kruk and Bornukova argue about poor sustainability of Belarusian growth associated with poor contribution from total factor productivity (TFP) gains [6]. More precisely, they remark huge misallocations of inputs (capital and labor) and specific policies masking inefficiencies of state-owned enterprises as obstacles for TFP growth. In this study the authors run growth accounting procedure and show that Belarusian growth was almost fully driven by capital accumulation, with extremely poor role of TFP. This schedule of growth has born an unconventional «conflict» between capital and TFP growth, reflecting in accumulation of huge allocative inefficiencies (first of all, capital misallocation) [6]. Other studies on Belarusian growth decompose it with a set of different assumptions, but still conclude that capital accumulation was a core driver of growth, while the economy suffered from the lack of productivity growth [7; 8]. Adarov, et al. emphasize the role of quasi-fiscal interventions and soft-budget constraints in Belarusian growth agenda, which were aimed at spurring the national economy and securing the growth rate above the natural one until possible [9]. Taken together, these studies form a background stating that the lack of sustainability was an intrinsic feature of Belarusian growth. From this perspective, considerable long-term growth decline occurred turn out to be a natural phenomenon, caused by domestic drivers.

In this paper, I aim at studying Belarusian growth phenomenon from the international perspective. More precisely, I embed and assess Belarusian growth dynamics into regional context. For this, I introduce and compute the set of indicators, assessing the dynamic properties and the quality of growth performance. Looking at Belarus from international perspective is to shed more light on the proportion of factors behind the growth decline in Belarus. Furthermore, I refresh some domestic insights of Belarusian growth in order to match and compare domestic and international view. Together this forms a reasonable ground for formulating priorities for growth-enhancing policies in Belarus.

Data and methodology

For incorporating Belarus into international growth perspective, I quantify and assess growth schedule for the country and for a set of emerging markets constituting a reference group. As the reference group, I use the group of 37 countries assorted in EBRD Transition report [2][2]. This sample is meaningful and informative

[1]Belarusian PPP-based GDP per capita is approximately in the middle of emerging world; market exchange rate-based GDP per capita is far behind majority of CEEs. For more details see [1].

[2]The whole set includes 37 countries: Albania, Armenia, Azerbaijan, Bulgaria, Bosnia, Belarus, Cyprus, Egypt, Estonia, Georgia, Greece, Croatia, Hungary, Jordan, Kazakhstan, Kyrgyz, Lebanon, Lithuania, Latvia, Morrocco, Moldova, Macedonia, Montenegro, Mongolia, Poland, Romania, Russia, Serbia, Slovak Republic, Slovenia, Tajikistan, Turkmenistan, Tunisia, Turkey, Ukraine, Uzbekistan, Kosovo.

because of the number of reasons. First, this group assumes rather huge variation in income level (the countries in the sample include extreme cases of lower and upper middle income), but still united by the emerging agenda. Second, this sample is somehow novel because tends to expand the emerging context by means of joint analysis of countries from different geographical regions. Third, in [2] the EBRD has presented a new set of transition indicators, which further contributes into the informational contents of the sample considered.

For quantifying growth characteristics and documenting their dynamic properties I use the World Bank's World Development Indicators database as the main data source. While the study aims at focusing on long-term horizon, I try to engage into the analysis as long period as possible. For majority of the countries, GDP indicators are available from the beginning of 1990s. The panel becomes the most balanced in terms of data availability, if starting it since 1992, while the latest data available is 2016. When studying long-term growth (see the discussion below), the period considered includes two decades between 1997 and 2016.

I use PPP-based GDP in 2011 international dollars (notated as Y_t) as the basic 'raw' indicator for assessing growth performance. First, I compute 5-year moving average of GDP growth (γ_t), according to (1):

$$\gamma_t = \left(\frac{Y_t}{Y_{t-5}} \right)^{1/5}, \quad (1)$$

where Y_t is PPP-based GDP in 2011 international dollars for the year t.

It should be emphasized herewith that I do not interpret this indicator directly as the assessment of potential GDP. For instance, Coibion, et al. show that none of existing techniques aimed at extracting potential GDP may be treated as the successful one, because majority of the techniques are sensitive not only to supply, but also to the demand shocks [10]. From this perspective, the authors show that one of the simplest measure – 5-year moving average of growth – produces pretty similar (although unsatisfactory in their context) results [10]. Taken both these issues together – doubts in the consistency of roughly any existing methodology for extracting potential output and similarity of results among existing methodologies – I utilize a simple and intuitively easy interpreted measure of 5-year moving average growth. But I treat it as just the property of long-term growth path, not obviously representing the growth potential of the economy. I use the term «trend growth rate» for this γ_t indicator.

Basing on γ_t I get the first measure of long-term growth, which is the mean of γ_t (notated as $\bar{\gamma}$).

Second, I assess the success of the country in closing the gap vs. technological frontier, which I call 'change in distance to frontier'. While growth indicators are considered (because of dealing with 5-year moving average) since 1997, for distance to frontier (being measures levels), I use 1996 as the starting observation. In respect to the proxy of the technological frontier, it is common to use the US GDP for this purpose. Hence, I compute the indicator of interest according to (2):

$$\text{CDF} = \frac{Y_{2016}}{Y_{2016}^{\text{US}}} - \frac{Y_{1996}}{Y_{1996}^{\text{US}}}, \quad (2)$$

where CDF is change in distance to frontier; Y_{1996}, Y_{2016} – PPP-based GDP in 1996 and 2016; Y_{2016}^{US}, Y_{1996}^{US} – US GDP (in 2011 international dollars) in 1996 and 2016.

Third, I measure a relative success of growth performance within a reference group, again operating with the sample between 1996 and 2016. For each of these years I compute the ratio of country's GDP to reference group mean. The change between these ratios in 1996 and 2016 (according to (3)) assesses relative success of the country *vs*. other countries in the sample:

$$\text{QGR} = \frac{Y_{2016}}{\overline{Y_{2016}}} - \frac{Y_{1996}}{\overline{Y_{1996}}}, \quad (3)$$

where QGR is quality of growth *vs*. the reference group.

Fourth, I compute the indicators measuring the volatility of growth. Modern growth theory considers sustainability as extremely important property of the growth path. The lack of sustainability might signal about unreliable fundamentals behind the growth. Moreover, unstable growth per se may cause deterioration of future growth perspectives.

I compute four indicators measuring the growth sustainability. The first one is a standard deviation of γ_t throughout 1997–2016, which is notated as $\sigma(\gamma)$. Second is the coefficient of variation of γ_t, computed according to (4):

$$\text{CV}(\gamma) = \frac{\sigma(\gamma)}{\bar{\gamma}}, \quad (4)$$

where $\text{CV}(\gamma)$ is the coefficient of 5-year average growth variation; $\bar{\gamma}$ is the mean of the country's γ_t between 1997 and 2017.

Third measure of variation is pretty close to $CV(\gamma)$ but has got better economic intuition as it may be interpreted as the value of «sustainable» growth. I compute it according to (5):

$$SGR = \overline{\gamma} - \sigma(\gamma), \tag{5}$$

where SGR means stable growth rate.

The fourth measure of sustainability is the sample range throughout 1997–2017 according to (6):

$$SR = \max(\gamma_t) - \min(\gamma_t), \tag{6}$$

where SR denotes sample range.

Fifth, I compute the indicators measuring the current stance of the growth environment *vs*. its own growth path. Herewith, I use two relative indicator. The first one measures the current stance *vs*. its own growth path, according to (7):

$$CSA = \gamma_{2016} - \overline{\gamma}, \tag{7}$$

where CSA denotes «current stance *vs*. average».

The second one, compares current growth perspectives to the best period of the country's 20-year history, according to (8):

$$CSM = \gamma_{2016} - \max(\gamma_t), \tag{8}$$

where CSM denotes «current stance *vs*. maximum».

Finally, I try to incorporate major properties of growth into integrated indicator of growth quality (notated as GQI). I base it on SGR, with additional reward for the country for growing closer the technological frontier and having relative success in comparison to a reference group (and penalizing the country otherwise). The indicator is computed according to (9):

$$GQI = SGR \cdot \omega_1 \cdot \omega_2, \tag{9}$$

where GQI is the growth quality indicator, ω_1 is the standardized (between 0 and 1) measure of the distance to technological frontier throughout 1996 and 2016, and ω_2 is the standardized (between 0 and 1) measure of relative growth performance within the reference group.

Having assessed the quality of growth, I state that Belarusian growth path suffers from the lack of sustainability, which might signal about productivity deficit. To get an additional evidence in respect to this hypothesis, I focus on the question: do Belarusian indicators of relative productivity (i. e. in comparison to other reference group countries) may explain the country's current well-being level? If the growth decline is a temporary phenomena, productivity scores should witness that Belarus underperforms currently. Otherwise, just the poor stance of TFP might be an explanation of growth problems (i. e. poor rate and high volatility). For this, I run a number of «naive» cross-section growth regressions, using different measures of output as the response variable, and a set of EBRD productivity indicators [2], World Economic Forum (hereinafter, WEF) [11] and UN's Human Development Index as explanatory variables. While the list of such variables is rather wide and some of the explanatory variables reveal huge correlations, besides using «raw» variables as explanatory ones, I also run principal component analysis and test obtained principal components as explanatory variables. Table 1 reports the whole list of the variables that were used for specifying «naive» growth regressions.

Table 1

Description and notations for model variables

Notation	Description
Y16	PPP-based GDP in 2011 international US dollars
y16	Standardized Y16 between 0 and 1
ebrd_1	EBRD's score measuring the quality of market structure and the intensity of competition on it
ebrd_2	EBRD's score measuring the quality of public and corporate governance
ebrd_3	EBRD's score measuring the quality of environmental and ecological properties of the economy
ebrd_4	EBRD's score measuring the inequalities (higher score means lower inequlity)
ebrd_5	EBRD's score measuring the resilience of the economy (mainly financial stability and energy sector sustainability)
ebrd_6	EBRD's score measuring the openness to foreign trade and trade infrastructure
wef_1	WEF score of the quality of institutions
wef_2	WEF score of the quality of infrastructure

Ending table 1

Notation	Description
wef_3	WEF score of the quality of macroeconomic environment
wef_4	WEF score of the quality of health and primary education
wef_5	WEF score of the quality of higher education
wef_6	WEF score of the goods market efficiency
wef_7	WEF score of the labor market efficiency
wef_8	WEF score of the financial market efficiency
wef_9	WEF score of the level of technological readiness
wef_10	WEF score of the market size
ei_hdi	Education sub-index of the Human Development Index
lei_hdi	Life expectancy sub-index of the Human Development Index
ebrd_pc1	1st principal component of ebrd_1, …, ebrd_6
ebrd_pc2	2nd principal component of ebrd_1, …, ebrd_6
wef_pc1	1st principal component of wef_1, …, wef_10
wef_pc2	2nd principal component of wef_1, …, wef_10
wef_bas_pc1	1st principal component of wef_1, …, wef_4 (i. e. of basic factors of competitiveness according to WEF)
wef_eff_pc1	1st principal component of wef_5, …, wef_10 (i. e. of efficiency factors of competitiveness according to WEF)
wef_eff_pc2	2nd principal component of wef_5, …, wef_10 (i. e. of efficiency factors of competitiveness according to WEF)
hdi_pc1	1st principal component of ei_hdi and lei_hdi

Note: the sources of data for variables notated as «ebrd» is [5], for those notated as «wef» – [15], those notates with «hdi» – the database of the UN Human Development Index.

The dataset according to table 1 is cross-sectional one, including correspondent scores for 2016 and 2017 years. However, for some countries from the reference group either the whole set of these indicators, or the part of it is unavailable. If that a case, I remove such countries from the data set, except Belarus. Finally, I have the cross-section of 33 countries for this exercise[3].

Belarus is not included into Global Competitiveness database and correspondingly such kind of data for does not exist for the country. However, while just Belarus is the core country of my interest, I run correspondent regressions with missing values for wef variables for Belarus. But at the second step, when assessing the accuracy of correspondent forecast for Belarus, I use some indicative values instead of missing one for Belarusian wef variables. For obtaining this indicative values, for each individual wef indicator I take an arithmetic mean from the subset of countries that reveal most similarity to Belarus by correspondent parameter[4].

It should be emphasized that naive growth regressions are not aimed at uncovering the «true» sources of growth in the reference group. Rather, I interpret them as possible approximation of growth generation process. Having such approximation at disposal, I aim at uncovering whether such kind of productivity-based approximation fits Belarus or the country is an outlier.

Growth in Belarus *vs*. in other emerging markets

In table 2, I report the results of computations, which reveals the growth schedule for the countries from the reference group. The indicators signal that despite Belarus was among the leaders by the average value of the

[3]The countries that are excluded because of the unavailability of the data are: Lebanon, Turkmenistan, Uzbekistan, and Kosovo.

[4]For Belarus wef_1 is the arithmetic average from the values for Azerbaijan, Bulgaria, and Serbia; wef_2 – Lithuainia, Latvia, and Ukraine; wef_3 – Armenia, Greece, Russia, and Ukraine; wef_4 – Latvia, Poland, Russia, and Ukraine; wef_5 – Armenia, Azerbaijan, Bulgaria, Bosnia and Herzegovina, and Ukraine; wef_6 – Armenia, Azerbaijan, Bulgaria, Bosnia and Herzegovina, Russia and Ukraine; wef_7 – Albania, Armenia, Bulgaria, Bosnia, Russia, Serbia, and Ukraine; wef_8 – Armenia, Bulgaria, Moldova, Poland, Romania, Russia, and Ukraine; wef_9 – Croatia, Montenegro, Poland, Romania, Russia, and Ukraine; wef_10 – Azerbaijan, Bulgaria, Croatia, Hungary. Majority of indicative values reveal relatively good performance of Belarus in respect to the reference group mean. However, the country tend to be a definite outsider by indicators wef_2, wef_5, wef_6, wef_8, and wef_9. These indicators measure the stance of macroeconomic environment, quality of higher education, goods and financial markets efficiency, and technological readiness.

trend growth rate, it definitely experiences the lack of growth sustainability. Within the group of sustainability indicators Belarus is among lagging countries. Furthermore, Belarus displays the most drastic decline of trend growth rate in recent past. This makes the country distinct in respect to the reference group, especially in latest periods. Fig. 1 illustrates this evidence in a more vivid manner.

This decline determines that the current stance of the long-term environment in Belarus is considerably worse than in other countries of the reference group.

Table 2

Growth quality indicators for emerging markets

Country	Average long–term growth $\bar{\gamma}$	Distance to frontier			Quality of growth *vs.* reference group			Growth sustainability indicators			Stable growth rate	Current stance of growth environment		Growth quality
		$\frac{Y_{1996}}{Y_{1996}^{US}}$, %	$\frac{Y_{2016}}{Y_{2016}^{US}}$, %	CDF	$\frac{Y_{1996}}{\overline{Y}_{1996}}$	$\frac{Y_{2016}}{\overline{Y}_{2016}}$	QGR	$\sigma(\gamma)$	$CV(\gamma)$	SR	SGR	CSA	CSM	GQI
Poland	4.2	29.6	48.8	19.2	138.8	159.6	20.8	1.0	0.2	3.1	3.2	–1.6	–3.1	1.93
Lithuania	5.4	24.5	52.4	27.9	114.9	171.2	56.3	2.6	0.5	8.9	2.8	–1.4	–6.0	1.64
Slovak Republic	4.0	34.7	54.7	20.1	162.8	178.9	16.1	1.7	0.4	6.4	2.3	–1.5	–4.9	1.57
Latvia	5.3	21.1	44.5	23.4	99.2	145.5	46.3	3.6	0.7	11.9	1.7	–1.6	–7.2	0.82
Albania	5.5	11.2	21.4	10.3	52.5	70.1	17.6	1.8	0.3	6.8	3.7	–3.3	–6.6	0.75
Turkey	3.1	32.1	44.4	12.3	150.8	145.3	–5.5	1.9	0.6	6.5	1.2	0.7	–2.3	0.70
Estonia	4.3	30.0	52.1	22.1	140.7	170.2	29.4	3.3	0.8	10.1	1.0	–1.9	–6.4	0.66
Mongolia	5.0	10.6	21.3	10.6	49.9	69.5	19.6	2.3	0.5	7.6	2.7	0.0	–4.0	0.54
Belarus	*5.3*	*13.9*	*31.4*	*17.5*	*65.2*	*102.7*	*37.6*	*3.6*	*0.7*	*13.8*	*1.7*	*–5.8*	*–11.0*	*0.54*
Georgia	6.3	6.5	17.4	10.9	30.3	56.9	26.5	2.7	0.4	14.1	3.6	–1.5	–6.2	0.49
Romania	3.5	27.1	40.6	13.5	127.3	132.8	5.5	2.5	0.7	8.3	1.0	0.1	–4.6	0.48
Bulgaria	3.6	21.3	33.2	11.9	100.0	108.7	8.7	2.4	0.7	7.2	1.1	–1.1	–5.1	0.44
Hungary	2.4	37.7	47.6	9.9	177.0	155.7	–21.2	1.8	0.7	5.3	0.6	–0.2	–2.3	0.42
Kazakhstan	4.8	20.9	44.0	23.1	97.9	143.7	45.8	3.9	0.8	14.7	0.9	–2.8	–8.3	0.41
Tunisia	2.8	16.0	20.2	4.2	75.0	66.0	–9.0	1.1	0.4	3.8	1.6	–1.6	–3.1	0.40
Armenia	7.0	5.8	15.3	9.6	27.1	50.2	23.1	4.0	0.6	13.4	3.0	–4.0	–10.7	0.34
Egypt	2.4	16.0	19.4	3.4	75.1	63.3	–11.8	1.1	0.4	3.8	1.3	–1.4	–3.3	0.32
Serbia	3.2	18.7	25.8	7.0	87.8	84.2	–3.7	2.3	0.7	6.3	0.9	–2.1	–5.7	0.30
Morocco	2.8	10.7	13.6	2.9	50.3	44.6	–5.7	0.8	0.3	2.6	2.0	–1.2	–2.1	0.28
Kosovo	3.7	10.0	17.5	7.5	47.2	57.3	10.1	1.4	0.4	5.3	2.3	–1.0	–5.0	0.26
Macedonia	2.3	19.0	24.5	5.5	89.3	80.1	–9.2	1.5	0.7	6.9	0.8	0.1	–2.8	0.23
Montenegro	2.6	24.4	29.4	5.0	113.5	96.1	–17.4	2.1	0.8	7.2	0.5	–1.0	–5.2	0.19
Uzbekistan	4.2	5.5	11.3	5.8	25.9	37.1	11.1	2.6	0.6	9.1	1.6	2.0	–0.6	0.12
Moldova	3.9	6.1	9.3	3.2	28.5	30.3	1.9	2.5	0.6	9.6	1.4	–0.5	–3.9	0.09
Turkmenistan	5.0	11.9	29.4	17.5	55.8	96.0	40.2	5.0	1.0	17.7	0.1	1.9	–2.9	0.02
Croatia	2.2	34.3	40.2	5.9	160.9	131.4	–29.6	2.2	1.0	6.7	0.0	–1.6	–4.3	0.01
Tajikistan	2.7	2.6	5.2	2.6	12.1	17.0	4.9	6.0	2.2	22.7	–3.2	1.8	–3.5	0.00
Kyrgyz Republic	2.3	4.4	6.2	1.8	20.7	20.2	–0.5	2.5	1.1	10.5	–0.2	0.2	–1.8	–0.01
Slovenia	2.1	47.1	55.9	8.8	221.2	182.9	–38.4	2.2	1.0	6.9	0.0	–1.5	–3.9	–0.03
Azerbaijan	7.4	8.2	30.0	21.8	38.6	98.1	59.6	8.1	1.1	31.2	–0.7	–7.1	–19.6	–0.18

Ending table 2

Country	Average long–term growth $\bar{\gamma}$	Distance to frontier			Quality of growth *vs.* reference group			Growth sustainability indicators			Stable growth rate	Current stance of growth environment		Growth quality
		$\frac{Y_{1996}}{Y^{US}_{1996}}$, %	$\frac{Y_{2016}}{Y^{US}_{2016}}$, %	CDF	$\frac{Y_{1996}}{\overline{\overline{Y_{1996}}}}$	$\frac{Y_{2016}}{\overline{\overline{Y_{2016}}}}$	QGR	$\sigma(\gamma)$	CV(γ)	SR	SGR	CSA	CSM	GQI
Bosnia and Herzegovina	7.5	8.7	21.0	12.3	40.7	68.6	27.9	8.6	1.1	31.6	–1.1	–5.1	–30.0	–0.21
Jordan	1.2	16.9	15.7	–1.1	79.1	51.5	–27.6	2.2	1.8	6.6	–1.0	–3.1	–6.0	–0.21
Russia	2.9	30.5	45.1	14.6	143.4	147.4	4.1	3.8	1.3	13.4	–0.8	–3.0	–7.9	–0.49
Ukraine	1.5	11.3	14.4	3.0	53.2	47.1	–6.2	5.7	3.8	21.5	–4.2	–3.1	–10.9	–0.64
Lebanon	0.8	31.9	24.4	–7.6	149.9	79.6	–70.3	2.8	3.7	10.1	–2.0	–4.5	–9.6	–0.84
Cyprus	1.0	65.2	58.6	–6.6	305.9	191.4	–114.5	2.3	2.3	7.0	–1.3	–2.2	–4.6	–1.26
Greece	0.7	53.7	45.5	–8.2	252.2	148.9	–103.3	3.4	4.7	9.9	–2.7	–2.2	–5.7	–2.13
Average	3.65	21.1	30.6	9.5	8629*	16297**	–	2.96	1.07	10.5	0.7	–1.7	–6.2	0.2

Note. The countries are ranked by GPI. *Average level of PPP-based GDP in 1996 in 2011 international US dollars in the reference group; **average level of PPP-based GDP in 2016 in 2011 international US dollars in the reference group.

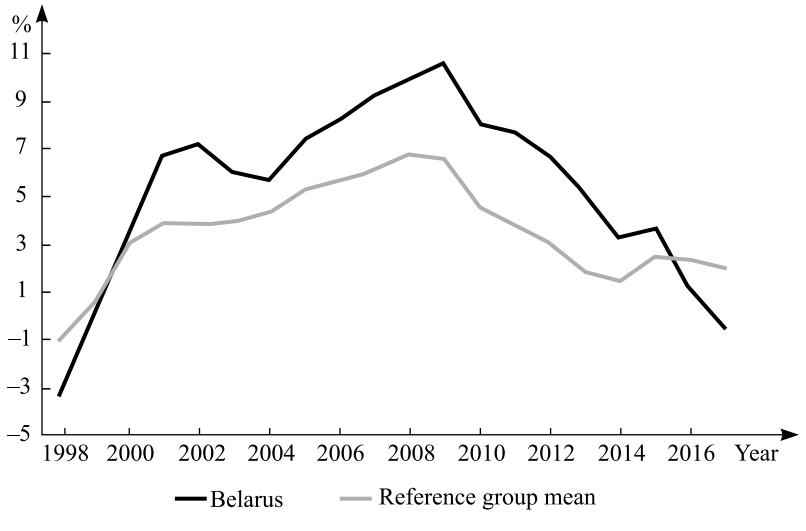

Fig. 1. The evolution of trend growth rate (5-year moving average)

Moreover, although the country is still relatively successful within the whole period of two decades, poor growth environment in recent periods restricts the success accumulated during periods of high growth. This leads to an interpretation that the country staked on growth spurring, which resulted in sacrificing growth sustainability.

Table 3 reports estimation results of the set of 'naive' growth regressions where explanatory variables are TFP-based ones[5]. Table 3 reports forecast accuracy of these models for Belarus. All TFP-based model do forecasting job for Belarus extremely well, i. e. the forecast error is not more than the half of the correspondent standard deviation. I interpret it in a manner that the current level of the country's well-being (GDP) corresponds to the level predicted by productivity fundamentals. Hence, it gives a rise to an explanation that recent huge decline in a trend growth rate was pretty natural and reflected the adjustment to fundamentals. At the same time, it means that previous success of Belarusian growth path was likely to be driven mainly by the factors other than productivity gains. Hence, unsustainable basis of growth in the past explains why the decline of trend growth rate in Belarus was substantially higher than in other countries from the reference group. Furthermore, all the «naive» growth regression predict the level of well-being lower than the current one (although, as mentioned, this difference is pretty small). The latter might signal that there still might be a threat of some further downside adjustments of the well-being towards its natural (i. e. corresponding to productivity fundamentals) level.

[5]Here I report only regression with best statistical properties representing the bulk of the variables considered. However, roughly all the variables indicated in table 1 contain some explanatory power for the well-being level.

Table 3

«Naive» Growth regressions

Dependent variable	Ln(Y16)		y16		y16		y16	
Regressors and coeffecients	const	4.42 (0.6)**	const	0.50 (0.03)**	const	0.50 (0.03)**	const	0.50 (0.03)**
–	ln(ebrd_1)	1.53 (0.27)**	hdi_pc1	0.19 (0.03)**	ebrd_pc1	0.05 (0.02)*	ebrd_pc1	0.10(0.01)**
–	ln(wef_2)	1.29 (0.57)*	–	–	wef_pc1	0.06 (0.02)*	wef_eff_pc2	0.09 (0.02)**
–	ln(wef_10)	0.67 (0.27)*	–	–	wef_pc2	0.09 (0.02)**	–	–
Adjusted R-squared	0.76		0.54		0.78		0.78	
F-statistic	34.43**		37.15**		38.23**		55.25**	
Ratio between forecast error for Belarus to standard error of the regression	–0.12		–0.09		–0.02		–0.50	

Note. Standard errors of coefficients are given in parenthesis. *Indicates statistical significance at 5 % level; ** indicates statistical significance at 1 % level. Ratio between forecast error for Belarus to standard deviation of the regression contains the difference between regression forecast and actual value for Belarus in the numerator, and regression standard error in the denominator.

Combining the properties mentioned above, I emphasize the following stylized facts of Belarusian growth during last 20 years:

1) Belarus' long-term growth rate throughout 1997–2016 was pretty high in comparison to other emerging markets;

2) Belarusian growth was not sustainable. Huge volatility in trend growth rate was an important feature of the national growth path;

3) Belarus has tended to spur trend growth artificially, which caused huge boosts and busts in trend growth rate. In other words, the country has sacrificed growth sustainability in favor of temporary high growth rate;

4) Belarus has experienced one of the largest decline in trend growth rate in comparison to other emerging markets;

5) current long-run growth environment in Belarus is worse than in majority of other emerging economies. This is likely to be consistent with the quality of productivity fundamentals in the country;

6) properties 1–5 together have secured for Belarus an upper-middle position in the ranking of the quality of growth during 1997–2016.

Domestic insights of Belarusian growth path

Growth accounting and TFP comparisons are widespread elements in the literature on growth and productivity analysis. For this study I fall back upon time-series approach, identical to those launched in [6].

Traditionally, the biggest challenge for productivity analysis is associated with a proper measurement of capital. Before 2000s, the mainstream approach assumed straightforward employment of data on capital stock for productivity analysis (e. g. [12]). Since 2000s measuring capital input through flow variable – capital services – has become a new mainstream. This approach usually argues that using capital stock as the input results in overestimating TFP contribution to growth.

For Belarus, feasible assessment of capital series is of particular importance, because the difference between available assessments is extremely huge. I utilize the concept of productive capital/capital services and methodology for it reported in [6]. Figure 2 provides annual growth rates of capital services index obtained by means of this procedure.

At a first glance, such a huge growth of capital input may raise doubts. Nevertheless, I argue this result is compatible with reality. Interpretation of definitely high growth rates is three-fold. First, during 2005–2011 there was a huge acceleration in investment activity. For instance, the share of gross fixed capital formation in GDP jumped from about 26.5 % in 2005 up to roughly 40 % in 2011 (decreasing somehow afterwards). Second, there was a substantial change in the structure of productive capital: the contribution of building and structures was decreasing prominently in favor of machines and equipment (reflecting corresponding focus in

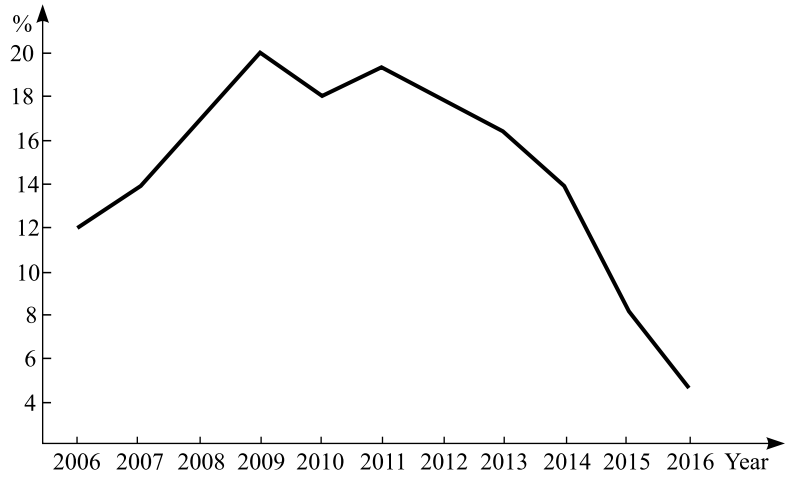

Fig. 2. Estimates of capital services growth rate in Belarus

capital investments). For instance, for 2005 we estimate the share of buildings and constructions in productive capital as 49.4 % vs. 31.8 % in machines and equipment, while for 2015 this relationship amounted to 27.4 % vs. 50.3 %. So, while machines and equipment produce much more services in respect to their own value in comparison to buildings and structures, their growing share in productive capital becomes a powerful channel of growth in capital services. Third, the methodology used (due to specific investment deflators) may capture somehow changes in relative prices among different cohorts of capital assets due to technical progress: more recent cohorts of assets are to be valued higher (besides the issue of depreciation), reflecting their better quality.

Decomposition of growth for the entire Belarusian economy witnesses that just the accumulation of capital was the key driver of long-term growth in Belarus (fig. 3).

At the first sight, this diagnosis is not that surprising and disappointing. For instance, a capital-based growth is a widely accepted diagnosis for the countries that rely on «catch-up strategy». For instance, «Young demonstrates that accumulation of capital explains a huge part of growth in majority of «Asian tigers» through 1960–1990 [13]. However, in their case, rapid capital growth was accompanied with not particularly low, but not extraordinary high productivity growth» [13]. However, in Belarusian case we must emphasize that capital was roughly the only engine of Belarusian growth.

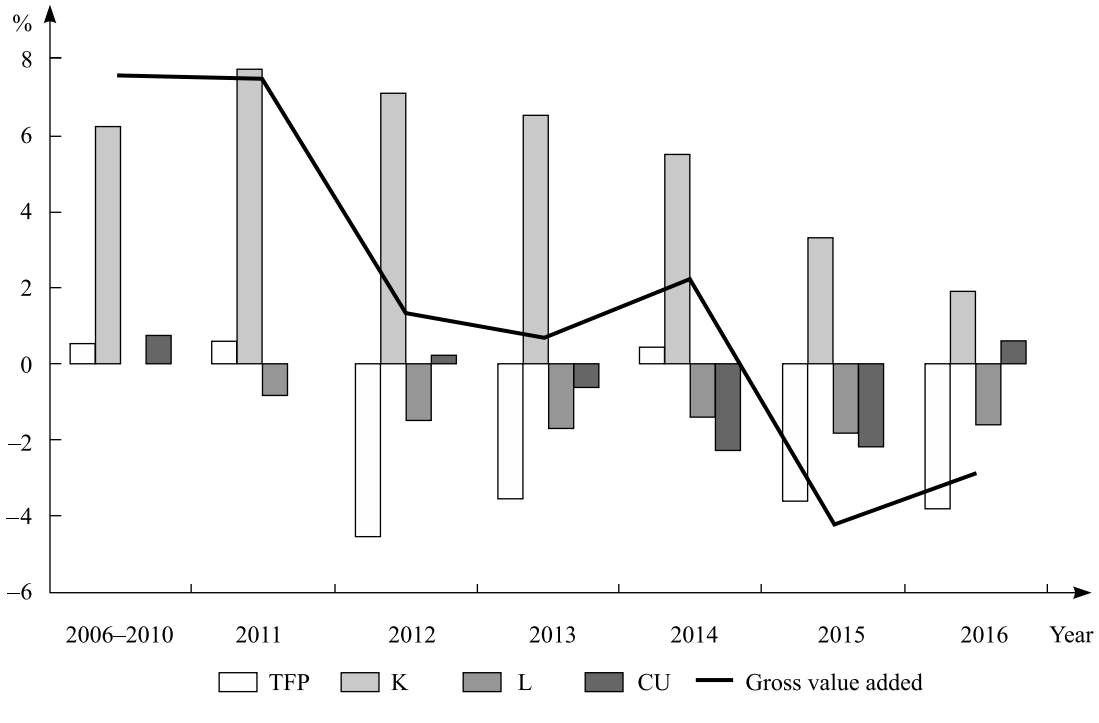

Fig. 3. Decomposition of growth for Belarusian economy (contribution to growth, percentage points).
N o t e. K denotes contribution of capital input, L – labour,
CU – capacity utilization, TFP – total factor productivity.

This tremendous role of capital in Belarus worsens the diagnosis considerably. A country is expected to rely on extending productive capacities when the return on capital (marginal productivity of capital) is higher than its user cost. However, when the return on capital has reduced (due to accumulation of new capital), this strategy cannot work anymore and additional «injections» of productivity are inevitable in order to secure growth. Otherwise, a sudden shift in a growth rate would happen as soon as the capital accumulation potential has been exhausted.

Hence, I argue that Belarusian growth, because of experiencing the lack of TFP-basis, was not sustainable. Furthermore, I argue that a room for exploiting the strategy of capital extension has either exhausted, or at least is close to exhaust: a rapid decrease in return on capital and its value approaching reasonable level of capital user cost signals about it (table 4).

Table 4

Marginal productivity of capital, %

Indicator	Year							
	2005	2010	2011	2012	2013	2014	2015	2016
MPK*	38.4	37.8	35.5	33.6	28.4	26.1	23.5	20.2
MPK-CU**	53.1	50.4	46.0	42.4	36.3	32.9	29.6	25.4

*The indicator is computed based on production function approach, i. e. MPK = $\alpha \cdot Y/K$ (it is interpreted as the return on total capital accumulated); **the indicator is computed based on production function approach with the adjustment to capacity utilization rate, i. e. MPK = $\alpha \cdot Y/K$ (it is interpreted as the return on capital engaged in production).

Finally, I argue that the lack of productivity gains is a major characteristic of recent growth in Belarus. Furthermore, I admit that productivity growth should be the top priority for growth in Belarus.

Choosing right growth priorities

A notion about the lack of productivity growth seem to be univocal diagnosis for Belarusian growth path. However, the decomposition of growth by the factors is not the same as detecting the sources of growth. So, a further question – what should be the sources of productivity growth – generates ambiguous solutions, which actually results in different growth strategies. The sources of productivity growth may be treated according to different classifications. The most simple is the one directly connected with the production function, i.e. productivity gains can be dissected for those stemming from capital *vs*. those not associated with inputs.

The first type may be interpreted as the one based on technical progress embodied in capital (embodied technical progress (ETC)). In other words, equipment investments are to provide productivity growth per se [14–16]. More recent studies provide evidence about importance of this mechanism for modern transition agenda [17].

This approach is frequently warmly welcomed in Belarus' growth experience. Actually, the story of capital-based growth can be captured as an attempt to secure productivity gains due to capital accumulation. Furthermore, the response to weakening growth after the global crisis pushed the authorities not to giving up such practices, but just on the contrary to intensify them. In 2012 Belarusian government initiated so called modernization campaign. The idea of this campaign is to accomplish rapid re-equipment of large Belarusian firms, which is expected to push their productivity. The government considers this channel to be self-sufficient, hence staking on it almost exclusively.

The second type of productivity gains can be treated as disembodied or so-called neutral productivity growth (NPG), i. e. productivity gains independent on the quantity of either capital or labour inputs. NPG may be split for a number of channels: neutral technical change, technical efficiency (characterized by the distance between actual position of firms and the production frontier), scale economies, and allocative efficiency [18]. In case of Belarus, I argue that the biggest potential for enhancing NPG may stem from strengthening macroeconomic stability, improving the quality of higher education, the level of competition in goods markets, and efficiency of financial market. Just in these characteristics Belarus suffers from lagging from most successful emerging markets.

As a rule, growth models do not assume any trade-off between NPG and ETC. For instance, a firm succeeds to implement a new technology (independent on capital of labor inputs), which results in higher productivity. This will lead to attracting additional inputs – capital and labor – given higher factor returns due to productivity gains. New capital (equipment), in turn, is to generate additional gains in productivity. Hence, productivity growth may stem from both tracks complementing each other. In this sense, the issue of decomposing actual sources of productivity growth – capital or technology itself – becomes largely meaningless.

The idea of Belarusian modernization – that ETC comes first, and other things do not matter – substantially changes this growth pattern. Rapid technical re-equipment makes the lack of financial sources for investments roughly inevitable, as national savings can hardly be enough for surge in investments. The government in Belarus partially solves this problem through centralized reallocation of financial resources. However, this reallocation negatively impacts allocative efficiency. Further, it is likely to have a similar adverse effect on technical efficiency and scale economies. Hence, in Belarus the trade-off between ETC and NPG arises: artificial pushing of ETC suppresses NPG.

A misbalance between the ETC and NPG resulting from the artificial ETC stimulation raises serious concerns about existing growth-enhancing priorities. However, «modernization ideology» uses a counter-argument: productivity gains from ETC may be sufficiently large to allow sacrificing potential gains from NPG growth.

From this perspective, one can compare both channels through three following criterions:

1. ***How large is the productivity effect from both channels?*** In order to get a quantitative assessment I employ the model from [19] that dissects NPG and ETC for a balanced growth path (the equilibrium trajectory when capital and output grow with the same rates). I apply to the model our estimates of the Belarusian growth parameters. For assessing ETC growth rate, I employ an approach by [12]. The latter produces an assessment of an average ETC productivity growth in 2005–2012 (period that might reflect the best results of ETC policies) from –1.55 up 6.40 % (depending on the measures of correspondent prices). The mean of the corridor seems to be rather close to the one [12] estimate for developed countries (3–4 %). Hence, for current exercise I use a value of 3.5 % for Belarusian ETC. In this manner I get the estimates of output growth rate returns on growth rate of NPG (1.69) and ETC (0.41). This means that the change in the growth rate of NPG by 1 percentage point results in 1.69 percentage point increase of output growth rate, while the latter will increase by only 0.41 in case of 1 percentage point increase of ETC. However, the range in which NPG and ETC may vary due to the government policies is highly important as well.

2. ***How large is the sensitivity of NPG and ETC to government stimulation?*** Economic modelling assumes that once an economy is on a balanced growth path (the stock of capital rises by the same growth rate as output), the ETC growth rate is exogenously determined by global technology gains. In this case, an attempt to push ETC by excessive capital accumulation will only generate a savings-investment misbalance. Hence, this kind of stimulus policy makes sense only if the economy has not yet entered balanced growth trajectory. Whether this is the case for Belarus is still an open question, although findings from growth accounting exercise signal that this stance has already been achieved.

Existing options for stimulating NPG seem to be much more numerous. First, technical efficiency and scale economies may progress substantially due to changing environment, with more intense competition and tighter budget constraints. Such environment will force firms to increase their flexibility and adaptability, which will finally result in more technical efficiency and more proper scaling. Second, Belarus has accumulated great growth potential in the sphere of allocative efficiency. Due to long period of inefficient capital accumulation, its proper reallocation can provide up to 10 % growth of output.

3. ***What are the costs of growth stimulation?*** In case of NPG, actually there are no direct costs. Enhancing more flexibility and adaptability for firms, along with establishing tough budget constraints does not require new financial injections. These goals may be achieved through legislative activity, implementing new practices and standards into business activity.

As for ETC, a number of undesirable outcomes may be interpreted as costs. First, while stimulating productivity growth due to technology background, artificial ETC stimulation may further dampen allocative efficiency in Belarus. Second, an attempt to boost it requires sources for additional investments, which typically exceed available savings. Hence, the country is likely to face the deficit of savings-investments balance. The latter is to determine current account deficit, the necessity of external borrowings, and vulnerability of financial market.

Conclusions

In this study, I have provided numerous evidence that Belarusian growth path has specific features that are different to majority of other emerging markets. This comprises a number of stylized facts about Belarusian growth path. The key outcome might be that Belarusian growth, although attractive in the past, has found out to be unsustainable. I provide evidence, which shows that the lack of productivity basis is behind this unsustainability and rapid growth decline in recent years.

Domestic insights support the conclusion about the deficit of productivity fundamentals for growth in Belarus. I have decomposed economic growth rates in Belarus in 2006–2016, and found that capital accumu-

lation was the main driver of growth in 2000's. Extremely rapid capital accumulation was sufficient condition for growth only for a very limited time-period and could not enhance growth sustainability. The targeted effect of «embodied technological change» was miserable and led to unproductive hoarding of capital. Targeting ETC led to a distorted causality between capital accumulation and productivity growth. Hence, a very strange trade-off between capital and productivity arose: more capital leads to less productivity (because of unproductive investments and wrong reallocation). Within this growth agenda, the country definitely needs improving the drivers of productivity. Improving macroeconomic environment, quality of higher education, the level of competition and efficiency of goods and financial markets seem to be key priorities for growth enhancing policies.

Библиографические ссылки

1. Where are we headed? Perspectives on Potential Output // World Economic Outlook, April 2015. Washington, 2015. P. 69–110.

2. Transition Report 2017–2018. London : EBRD, 2017.

3. *Eichengreen B.*, *Park D.*, *Shin K.* Growth Slowdowns Redux: New Evidence on Middle-Income Trap [Electronic resource]. URL: http://www.nber.org/papers/w18673.pdf (date of access: 15.01.2018).

4. Roads Less Traveled: Growth in Emerging Markets and Developing Economies in a Complicated External Environment // World Economic Outlook, April 2017. Washington, 2017. P. 65–120.

5. *Демиденко М., Кузнецов А.* Экономический рост в Республике Беларусь: факторы и оценка равновесия // Банк. весн. 2012. № 3. С. 1–59.

6. *Kruk D., Bornukova K.* Belarusian Economic Growth Decomposition [Electronic resource] // BEROC working paper series. 2014. № 24. URL: http://eng.beroc.by/webroot/delivery/files/WP_24_eng_Bornukova&Kruk.pdf (date of access: 15.01.2018).

7. *Безбородова А., Новопольцев А.* Оценка совокупной факторной производительности: модель пространства состояний // Банк. весн. 2017. № 10 (651). С. 26–34.

8. *Мирончик Н., Судник С., Качерская Е.* Анализ факторов экономического роста в Беларуси // Банк. весн. 2016. № 9. С. 1–52.

9. *Adarov A., Bornukova K., Dobrinsky R.* The Belarus economy: the challenges of stalled reforms, the Vienna Institute for International Economic Studies : res. rep. № 413. [Electronic resource]. URL: https://wiiw.ac.at/the-belarus-economy-the-challenges-of-stalled-reforms-dlp-4032.pdf (date of access: 15.01.2018).

10. *Coibion O., Gorodnichenko Y., Ulate M.* The Cyclical Sensitivity in Estimates of Potential Output. 2017. No. 23580 [Electronic resource]. URL: http://www.nber.org/papers/w23580.pdf (date of access: 15.01.2018).

11. The Global Competitiveness Report. Geneva : World Econ. Forum, 2017.

12. *Hall R., Jones C.* Why do Some Countries Produce So Much More Output Per Worker than Others? // Q. J. Econ. 1999. № 114 (1). P. 83–116.

13. *Young A.* The Tyranny of the Numbers: Confronting the Statistical Realities of the East Asian Growth Experience // Q. J. Econ. 1995. № 110 (3). P. 641–680.

14. *De Long J., Summers L.* Equipment Investment and Economic Growth // Q. J. Econ. 1992. № 106 (2). P. 445–502.

15. *Greenwood J., Hercowitz Z., Krusell P.* Long-Run Implications of Investment-Specific Technological Change // Am. Econ. Rev. 1997. № 87 (3). P. 342–362.

16. *Hornstein A., Krusell P.* Can Technology Improvements Cause Productivity Slowdowns? // NBER Macroeconomics Annual / ed. by J. J. Rotemberg, B. S. Bernanke. Cambridge, 1996.

17. *Skare M., Sinkovic D.* The Role of Equipment Investments in Economic Growth: Cointegration Analysis // Int. J. Econ. Policy Emerg. Econ. 2013. № 1 (6). P. 29–46.

18. *Coelli T. J., Rao D. S. P., O'Donnell C. J., et al.* An Introduction to Efficiency and Productivity Analysis. New York : Springer, 2005.

References

1. Where are we headed? Perspectives on Potential Output. *World Economic Outlook*, *April 2015*. Washington, 2015. P. 69–110.

2. Transition Report 2017–2018. London : EBRD, 2017.

3. Eichengreen B., Park D., Shin K. Growth Slowdowns Redux: New Evidence on Middle-Income Trap. URL: http://www.nber.org/papers/w18673.pdf (date of access: 15.01.2018).

4. Roads Less Traveled: Growth in Emerging Markets and Developing Economies in a Complicated External Environment. *World Economic Outlook, April 2017*. Washington, 2017. P. 65–120.

5. Demidenko M., Kuznetsov A. Economic growth in Belarus: factors and the estimation of equilibrium. *Bankawski vesnik* [Bank bulleten magazine]. 2012. No. 3. P. 1–59 (in Russ.).

6. Kruk D., Bornukova K. Belarusian Economic Growth Decomposition. *BEROC working paper series*. 2014. No. 24. URL: http://eng.beroc.by/webroot/delivery/files/WP_24_eng_Bornukova&Kruk.pdf (date of access: 15.01.2018).

7. Bezborodova A., Novopol'tsev A. Estimating total factor productivity: the state space model. *Bankawski vesnik* [Bank bulleten magazine]. 2017. No. 10. P. 26–34 (in Russ.).

8. Mironchik N., Sudnik S., Kacherskaya E. The analysis of economic growth factors in Belarus. *Bankawski vesnik* [Bank bulleten magazine]. 2016. No. 9. P. 1–52 (in Russ.).

9. Adarov A., Bornukova K., Dobrinsky R. The Belarus Economy: the Challenges of Stalled Reforms, the Vienna Institute for International Economic Studies : res. rep. № 413. URL: https://wiiw.ac.at/the-belarus-economy-the-challenges-of-stalled-reforms-dlp-4032.pdf (date of access: 15.01.2018).

10. Coibion O., Gorodnichenko Y., Ulate M. The Cyclical Sensitivity in Estimates of Potential Output. URL: http://www.nber.org/papers/w23580.pdf (date of access: 15.01.2018). 2017. No. 23580.

11. The Global Competitiveness Report. Geneva : World Econ. Forum, 2017.

12. Hall R., Jones, C. Why do Some Countries Produce So Much More Output Per Worker than Others? *Q. J. Econ.* 1999. No. 114 (1). P. 83–116.

13. Young A. The Tyranny of the Numbers: Confronting the Statistical Realities of the East Asian Growth Experience. *Q. J. Econ.* 1995. No. 110 (3). P. 641–680.

14. De Long J., Summers L. Equipment Investment and Economic Growth. *Q. J. Econ.* 1992. No. 106 (2). P. 445–502.

15. Greenwood J., Hercowitz Z., Krusell P. Long-Run Implications of Investment-Specific Technological Change. *Am. Econ. Rev.* 1997. No. 87 (3). P. 342–362.

16. Hornstein A., Krusell P. Can Technology Improvements Cause Productivity Slowdowns? *NBER Macroeconomics Annual.* Cambridge, 1996.

17. Skare M., Sinkovic D. The Role of Equipment Investments in Economic Growth: Cointegration Analysis. *Int. J. Econ. Policy Emerg. Econ.* 2013. No. 1 (6). P. 29–46.

18. Coelli T. J., Rao D. S. P., O'Donnell C. J., et al. An Introduction to Efficiency and Productivity Analysis. New York : Springer, 2005.

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