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**Research Report**

## When high growth is not enough: Rethinking Russia's pre-crisis economic performance

BOFIT Policy Brief, No. 6/2014

**Provided in Cooperation with:**

Bank of Finland, Helsinki

*Suggested Citation:* Voskoboynikov, Ilya; Solanko, Laura (2014) : When high growth is not enough: Rethinking Russia's pre-crisis economic performance, BOFIT Policy Brief, No. 6/2014, Bank of Finland, Institute for Economics in Transition (BOFIT), Helsinki, <https://nbn-resolving.de/urn:nbn:fi:bof-2014081034>

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BOFIT Policy Brief  
2014 No. 6

Ilya Voskoboynikov and Laura Solanko

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economic performance



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BOFIT Policy Brief  
Editor-in-Chief Iikka Korhonen

BOFIT Policy Brief 6/2014

Ilya Voskoboynikov and Laura Solanko:  
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6.6.2014

ISSN 2342-205X (online)

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## Contents

Abstract .....	3
Introduction .....	4
Sources of Russia's growth, 1995–2008 .....	4
Energy sector and skill-intensive services drive growth .....	7
Conclusions .....	11
Literature .....	12
Appendices .....	13

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Ilya Voskoboynikov<sup>1</sup> and Laura Solanko<sup>2</sup>

## When high growth is not enough: Rethinking Russia's pre-crisis economic performance

### Abstract

Based on newly available data, we argue that multifactor productivity increases over the period 1995–2008 generated only about a half of Russia's GDP growth, a smaller increase than most previous estimates. Further, growth in multifactor productivity seems to have contributed to a smaller share of GDP growth in 2003–2008 than in the first seven years of our observation period. These results imply that increases in capital inputs, and consequently investments in fixed capital, are more important than previously thought for Russia's economic growth. Detailed analysis of industry-level data reveals two drivers of economic growth in the period: the extended oil & gas sector and high-skill-intensive services. Our analysis indicates that growth in the extended oil & gas sector reflected increased capital inputs, while growth in high-skill-intensive services seems to be part of catching up with more advanced markets. Neither sector is likely to spur growth in the coming decade.

Keywords: growth, Russia, productivity, structural change

JEL: L16, O47

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## Introduction

The Russian economy has grown rapidly since the mid-1990s. Real GDP almost doubled between 1995 and 2012. Growth in the 2000s prior to the global financial crisis was quite robust, with GDP growing averaging 7.2 % annually in 2000–2007. It is widely accepted that underutilized fixed capital inherited from the Soviet Union, a global boom in commodity prices that bolstered consumption and investment growth, and the maturing of many market-based institutions were among the factors contributing to this high growth. They encouraged economic actors to find better ways to satisfy consumer demand, use existing resources more efficiently, and invest in modern capacity. The distortions inherited from the Soviet economy were so overwhelming that productivity increases were expected to be the major engine for economic growth in the formerly planned economies – Russia included.

This is the narrative we find in most of the growth accounting literature for Russia. Recent growth accounting studies conclude that economic growth was mainly driven by improvements in the efficiency of input use as measured by multi-factor productivity (MFP) growth, rather than growth in labor and capital inputs. Entov and Lugovoy (2013), Jorgenson and Vu (2011) and Kuboniwa (2011) all find that the rate of MFP growth was much higher than input growth rates in the period from about 1995 to 2008. Izyumov and Vahaly (2008) point out that capital input growth is even negative in this period, and all that output growth is due entirely to MFP growth. Despite the wide variety of methods and data used, these findings consistently tell the same story. Moreover, compared to a large group of developed and developing countries, Russian MFP growth of around 5 per cent annually since the mid-1990s appears to be among the highest in the world (Jorgenson and Vu 2011). This supports the view that Russia managed to change from an extensive inputs driven growth path to a more intensive productivity-driven growth trajectory.

The recent contribution of Timmer and Voskoboynikov (2014), however, challenges the established wisdom. By carefully developing a new and consistent set of output and input measures for 34 industries for the period 1995 to 2008, they show that the contribution of MFP in Russia's growth was smaller than previously thought. They take into account revisions in the National Accounts Statistics, changes in industrial classifications, measurement issues of labor and capital, and estimates of factor shares in value added. Special attention is paid to the construction of proper measures of capital services in the tradition of Jorgenson, Gollop and Fraumeni (1987), which are used instead of the capital stock measures that dominate previous research.

In this short note we use the methodology of Timmer and Voskoboynikov (2014) to highlight the changes in Russia's productivity growth. The next section explains how the contributions of MFP, labour and capital have evolved in Russia during the period of 1995-2008 and during two sub-periods. Section three looks at the industry-level evidence of growth and its components. The last section concludes.

## Sources of Russia's growth, 1995–2008

The standard approach of most growth accounting studies is to decompose output growth into a weighted average of growth in labor and capital inputs and change in multifactor productivity. The challenge is accurately measuring inputs in the first place. This study is based on a new dataset produced by Growth and Development Centre at the University of Groningen and the Laboratory for Research in Inflation and Growth at Higher School of Economics in Moscow within the World KLEMS initiative. The dataset includes detailed time series on output, capital and labor for 34 industries for the period of 1995 to 2008 using the international NACE 1.0 classification. The

Russia KLEMS dataset and methodology description are publically available at <http://www.worldklems.net/data.htm>.

Most previous studies on Russian data use one of two standard approaches to proxy capital input. The first approach takes official gross capital stocks in constant prices, which in some studies is adjusted on capacity utilization in manufacturing. The second approach involves estimation of net capital stock growth with variants of the perpetual inventory method using official series for investment and investment deflators.

Timmer and Voskoboynnikov (2014) argue that both approaches underestimate the capital contribution. To correct this, they apply a concept of capital services taken from pioneering paper of Jorgenson (1963) (see Shreyer 2009 for an overview of the measurement issues). Their capital services approach gives larger weights to assets with high rental prices such as machinery and ICT equipment. In deriving the results, we rely on this approach as specified in Timmer and Voskoboynnikov (2014). For detailed explanation on the sources used in deriving capital and labor series, as well as the production function approach used in the growth accounting, the reader is kindly referred to their original article.

Our analysis only considers the market economy, i.e. the overall economy without non-market services such as public administration, education, health care, and social work. Measures of these non-market services in Russia's System of National Accounts are cost-based, making productivity measurement inaccurate (Timmer and others, 2010). The share of non-market services in Russia's total value added is low by international standards, fluctuating around 15 % during the period studied.

Using fresh data that more accurately reflect the capital contribution, our growth accounting exercise shows that productivity growth in Russia (as measured by MFP) averaged 2.6 % annually for the period 1995–2008 (see Table 1a). This impressive productivity growth explains 53 % total value added growth over the period (see Table 1b). That is, however, much lower than the 70 % share many previous studies attribute to productivity growth. Moreover, our figure is closer to estimates of the contribution of MFP growth in total value-added growth rates for other transition economies.<sup>3</sup> Thus, while better use of labor and capital was the single major source of growth in the Russian economy, increases in capital inputs clearly contributed much more to growth than previously understood.

The growth performance of the Russian economy in latter half of the observation period is clearly different from the first half. After the 1998 financial crisis, the economy gradually stabilizes and GDP growth accelerates from 2000, buoyed by a persistent rise in world oil prices and Russia's gradual integration into the global economy. Thus, we ask if the contributions of MFP, labor, and capital change over the years.

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<sup>3</sup> The contribution of MFP to total value-added growth rates in 1995–2007 was estimated to be 41 % for the Czech Republic, 52 % for Slovenia, and 68 % for Hungary (Voskoboynnikov, 2014).

Table 1a. Growth rates for value added, labor inputs, capital inputs, and MFP in 1995–2008

	1995–2008	1995–2001	2002–2008
<i>Growth rates (annual real growth rate, %)</i>			
<i>Value added</i>	4.8	2.2	7.5
Labor	1.3	1.2	1.6
Capital	2.9	-0.1	6.2
MFP	2.6	1.7	3.6

Source: Author's calculations based on worldklems.net data. The table reports weighted averages of annual growth rates in the 34 sectors analyzed. The weights used are sectoral shares in total value-added for the respective year.

Table 1b. Contributions of labor, capital, and MFP to total value-added growth in 1995–2008, %

	1995–2008	1995–2001	2002–2008
<i>Contributions to total value-added growth (percentage points)</i>			
<i>Value added</i>	4.8	2.2	7.5
Labor	0.6	0.3	0.9
Capital	1.7	0.2	3.0
MFP	2.6	1.7	3.6
<i>Contributions to total value-added growth (percentage)</i>			
<i>Value added</i>	100.0	100.0	100.0
Labor	12.3	11.5	12.6
Capital	34.7	8.8	39.7
MFP	53.1	79.7	47.7

Source: Author's calculations based on worldklems.net data. The table reports weighted averages of contributions to total value-added growth in the 34 sectors analyzed. The weights used are the sectoral shares in total value-added for the respective year. In each sector, the contribution is calculated as (growth in labor/capital)\*(labor/capital share) in the sector. MFP is the unexplained part of value-added growth.



The KLEMS data cover a sufficiently long period up to the recent financial crisis to permit simple dynamic analysis. We also split the data into two periods of roughly equal lengths (1995–2001 and 2002–2008) and perform the same analysis for each period separately. The results are reported in columns 2 and 3 in Tables 1a and 1b. It is immediately apparent that growth in total value added is dramatically higher in the second period and that Russia's growth structure is evolving.

First-period growth, while sluggish overall, is clearly driven by productivity growth. Growth in MFP explains over 70 % of total value-added growth in Russia, which is quite in line with estimates of many earlier studies. Capital inputs barely change and the contribution of changes in capital inputs to total growth is negligible.

During the second period, however, the share of value-added growth explained by productivity increases declines remarkably. During 2002–2008, the contribution of increases in capital inputs accounts for a whopping 40 % of total growth, while the contribution of MFP drops from 80 % to 48 %. In other words, growth in fixed capital investments assumes a more prominent role in driving economic growth in Russia. Notably, growth rates in labor inputs remain relatively constant over both periods.

Russia's distinct shift to more capital-intensive growth has not been documented for other European transition economies.

## Energy sector and skill-intensive services drive growth

Given that aggregate growth accounting likely masks sectoral differences, the preceding analysis raises the natural question as to the drivers of growth in MFP and capital inputs in Russia. The Russia KLEMS database allows examining these issues at sectoral level. While it includes details for 34 sectors of the economy separately, we construct six broad sectors for the sake of clarity: extended oil & gas (energy), high- and low-skill-intensive industries (HSI and LSI, respectively), high- and low-skill-intensive services (again, HSI and LSI), and non-market services. To enable international comparison, the classification in to the six sectors (Appendix A1) largely conforms to the study of O'Mahony and van Ark (2003).

The only major difference to the standard approach is our treatment of the energy sector. Estimating the real share of oil and gas in the Russian GDP is notoriously difficult; estimates range from an official figure below 10 % to 23 % (World Bank, 2005). The major stumbling block is the fact that most refining, trade, shipping and transportation of oil and gas is done by separate entities outside the "mining and quarrying" classification.<sup>4</sup> As an effort to partly account for the widespread practice of transfer pricing within vertically integrated energy corporations, our measure of "extended oil & gas sector" includes "mining and quarrying", "fuel" and "wholesale trade."

Several interesting findings emerge from the analysis of sectoral data. We first look at the value-added shares of our six broad sectors in 1995 and in 2008 (Table 2). It is immediately clear that the share of extended oil & gas in the total value added has increased from one-fifth in 1995 to almost a quarter in 2008. Instead of diversifying, it seems the Russian economy is becoming increasingly dependent on oil, gas, and other raw materials. The increase in the share of the extended oil & gas coincides with rising world commodity prices and rapid growth in wholesale trade.

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<sup>4</sup> See Simola (2013) for a recent summary of studies on this issue.

Table 2. Sectoral shares of value-added and annual real growth rates

	Value-added share (current prices)		Annual real growth rates (%)
	1995	2008	
Total economy	100.0	100.0	4.6
Extended oil & gas	20.1	24.7	4.9
<b>Goods</b>			
HSI	3.6	3.6	3.9
LSI	22.0	14.8	2.7
<b>Services</b>			
HSI	5.1	11.2	10.7
LSI	35.3	29.8	4.6
Non-market services	13.9	16.0	3.4

Source: Authors' calculations based on [www.worldklems.net](http://www.worldklems.net) data. Note: Goods and services are broken down by component, e.g. "high-skill-intensive" and "low-skill-intensive" goods production.

Our second observation on the results reported in Table 2 is that two sectors appear to drive overall growth: extended oil & gas and HSI services. Average growth in non-market services and in goods production (both HSI and LSI) remains muted over the period.

To investigate further, we reproduce separately the standard growth accounting for each of the five broad sectors of our market economy. Table 3 shows that the sources of growth vary significantly across sectors. Extended oil & gas and HSI services stand out as the extremes.

Table 3. Sector-specific growth rates of inputs and MFP in 1995–2008 (market economy)

	Annual real growth rates (%)			Contribution to total (percentage points)		
	Labor input	Capital input	MFP	Labor input	Capital input	MFP
<b>Market economy</b>	1.3	2.9	2.6	1.3	2.9	2.6
<b>Goods</b>						
HSI	-2.5	-0.2	5.6	-0.1	0.0	0.2
LSI	-0.7	0.6	2.8	-0.2	0.1	0.6
<b>Services</b>						
HSI	1.2	2.8	9.0	0.1	0.3	0.9
LSI	1.9	4.2	1.7	0.7	1.6	0.6
<b>Extended oil &amp; gas</b>	2.7	3.4	0.8	0.7	0.9	0.2

Source: Author's calculations based on worldklems.net data. Note: Goods production and services are broken down by component, e.g. "high-skill-intensive" and "low-skill-intensive" goods production.

Over the period, multifactor productivity growth is highest in HSI production (both goods and services). The average annual productivity growth in HSI services (e.g. financial services) is 9 % and close to 6 % for HSI goods production (e.g. machine-building and petrochemicals). In contrast, productivity growth is extremely low in the extended oil & gas sector (mining and quarrying; wholesale trade) with MFP rises of less than 1 % a year. That is less than half the MFP growth rate in the LSI services, our next-to-last sector in terms of MFP growth.

The growth in extended oil & gas is largely driven by increases in capital and labor inputs. In particular, annual growth of capital inputs in extended oil & gas averaged 3.4 %, second only to the growth rate of LSI services. The latter, however, includes sectors like retail trade, hotels and restaurants that barely existed before 1995. Overall, about half the increase in labor inputs went to the extended energy sector.

Our sectoral breakdown of the Russian economic growth raises two troubling findings. First, despite high productivity growth, HSI goods production (e.g. machine-building) as a share of total value added remained constant at 3.6 %. Second, the sectors that have rapidly become more efficient have attracted less capital input flows, while the sector with the least productivity gains has experienced a high growth in capital inputs. This implication is that the Russian financial system is doing a rather poor job in allocating funds to their most efficient use.

Finally, we checked how the structure of growth has evolved over time at the sectoral level. The results are reported in Table 4. It is immediately clear that growth in both capital inputs and productivity intensified significantly during the second period. During both periods, increases in capital inputs are highest in LSI services and in extended oil & gas. MFP growth is lowest in the extended oil & gas in both periods. During our second period, growth in capital inputs was much faster than productivity growth in almost every sector. Productivity growth only consistently outpaces growth in capital inputs in the HSI sectors.

Table 4. Sector-specific average annual real growth rates of inputs and MFP, % (market economy)

	1995-2001			2002-2008		
	Labor input	Capital input	MFP	Labor input	Capital input	MFP
Market economy	1.1	-0.1	1.7	1.7	6.2	3.6
Goods						
HSI	-3.0	-3.4	5.3	-2.1	4.6	7.3
LSI	-1.2	-2.3	3.1	0.0	5.1	2.1
Services						
HSI	-2.4	-0.3	11.6	3.8	6.0	7.6
LSI	1.4	1.1	0.3	2.2	7.7	3.2
Extended oil & gas	4.6	0.8	-0.8	2.1	5.4	2.9

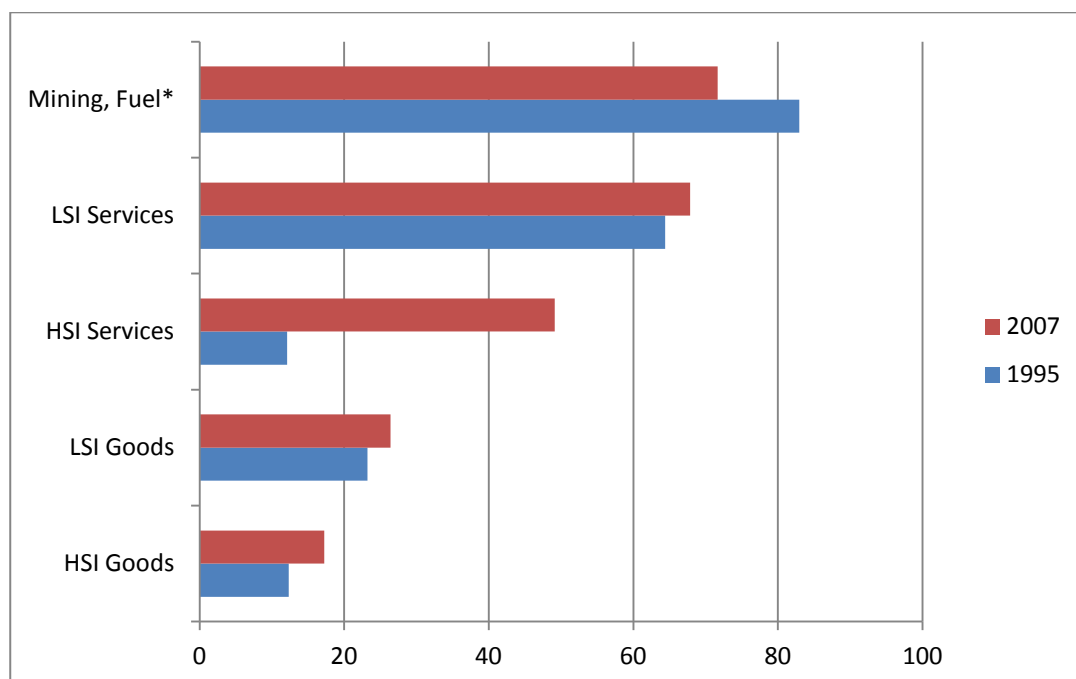
Source: Authors' calculations based on worldklems.net data. Note: Goods production and services are broken down by component, e.g. "high-skill-intensive" and "low-skill-intensive" goods production.

A dramatic change occurs in productivity growth in HSI services. While productivity growth in all other sectors accelerates or stays at the same level, the high growth of HSI services moderates

considerably. Annual productivity growth averages 12 % in the first period, but only 8 % in 2002–2008. Our interpretation is that the rapid growth in the first period reflects adoption of best practices of global financial markets and rollouts of various business services. Much of Russia's catching up in financial services is achieved during the first period as the low hanging fruit are gathered. As increased sophistication is needed to approach the technology frontier, the process slows in the latter period.

Low initial levels of productivity in Russia, especially in high-skill-intensive services indicate that there was indeed plenty of room for productivity increases from adopting and imitating best practices. The catching-up in HSI services is significant. The level of MFP documented in the sector increases from 12 % to 49 % of the German level (see Figure 1 below). Nevertheless, the levels achieved in Russia by 2007 are low relative to many European transition economies (see Tables A2a and A2b in the Appendix for details).

Figure 1. MFP levels in Russia compared to Germany, Germany =100.



Sources: Authors' calculations based on worldklems.net data and Voskoboynikov (2014). Note: \*For Russia, "extended oil & gas" includes "mining and fuel" and "wholesale trade."

The constant deceleration in MFP growth as Russian service companies approach the technology frontier implies an overall slowing in productivity growth rates for the market economy as a whole.

## Conclusions

The Russian economy experienced a long period of growth from the mid-1990s to the 2008 financial crisis with annual GDP per capita growth averaging 3.7 % between 1995 and 2008. According to the prevailing narrative, this growth was mainly driven by sustained increases in multifactor productivity stemming from removal of distortions created under the planned Soviet economy. Using newly available, internationally comparable, data and the growth accounting methodology of Timmer and Voskoboynikov (2014), we argue that average annual multifactor productivity growth amounted to 2.6 % over the period. This remarkably high growth indicates that productivity growth accounted for about 56 % of Russia's economic growth in the 13 years before to the global financial crisis. The figure is substantially lower than many previous estimates. We found that MFP growth explained over 70 % of total value-added growth in the period 1995–2001, but less than 50 % in the 2003–2008 period. As the contribution of labor held relatively constant at around 10 %, our finding implies that increases in capital inputs, and, consequently, investments to fixed capital, have been even more important than previously thought for economic growth in Russia.

Detailed analysis of industry-level data reveals that economic growth has been driven by two broad sectors: extended oil & gas and high-skill-intensive (HSI) services. Our analysis clearly shows that growth in the extended oil & gas has been driven by increases in capital inputs, i.e. investments into fixed capital. Given the huge investments in oil and gas pipelines, oil export terminals, and the commissioning of new gas fields commissioned in past decade, we find this quite plausible. Since the end of our data sample in 2008, investment growth has slowed in the wake of the global financial crisis and increased uncertainly over the general business climate in Russia. The rapid growth in HIS services such as financial services largely represented a catching up with more advanced markets. The level of multifactor productivity in relation to German levels in the high-skill intensive sectors climbed from just 12 % at the start of the observation period to almost 50 % at the end.

Neither rapid growth in investment in the extended oil & gas sector nor rapid catching-up in technology intensive service industries is likely to spur Russia's growth in the next decade. This underlines the urgency of identifying and exploiting new growth drivers for Russia.

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## Appendices

Table A1. List of industries and economic sectors used in the analysis

NACE 1.0 Code	Name of sector/industry
<b>Market Economy</b>	
<b>Goods</b>	
<i>High-skill-intensive goods</i>	
24	Chemicals and chemical products
29	Machinery n.e.c.
30-33	Electrical and optical equipment
<i>Low-skill-Intensive goods</i>	
A,B	Agriculture, hunting, forestry, and fishing
15-16	Food, beverages, and tobacco
17-18	Textiles and textile products
19	Leather, leather goods and footwear
20	Wood and products of wood and cork
21-22	Pulp, paper, printing, and publishing
25	Rubber and plastics
26	Other non-metallic minerals
27-28	Basic metals and fabricated metal
34-35	Transport equipment
36-37	Manufacturing n.e.c.; recycling
<b>Market Services</b>	
<i>High-skill-intensive services</i>	
J	Financial intermediation
71-74	Renting of machinery & equipment and other business activities
<i>Low-skill-intensive services</i>	
E	Electricity, gas, and water supply
F	Construction
H	Hotels and restaurants
50	Sale, maintenance & repair of motor vehicles and motorcycles; retail
60-63	Transport and transport services
64	Post and telecommunications
O	Other community, social and personal Services
<i>Extended oil &amp; gas</i>	
23	Fuel
C	Mining and quarrying
51	Wholesale trade
<b>Non-Market Economy</b>	
70	Real estate activities
L	Public administration and defense; compulsory social security
M	Education
N	Health and social work

Note: n.e.c. = not elsewhere classified

Table A2a. 1995 multifactor productivity levels relative to Germany, (2005 USD, PPP-adjusted)

	Russia	Czech Rep.	Hungary	Slovenia
<i>Multifactor productivity, Germany = 100</i>				
Market economy, total	42.3	57.6	47.6	59.9
HSI Goods	12.3	28.4	30.3	36.9
LSI Goods	23.2	40.2	33.8	44.4
HSI Services	12.1	53.1	66.4	66.7
LSI Services	64.4	79.7	54.0	83.4
Mining and fuel*	83.0	99.7	95.8	35.5

Note: \*For Russia, “extended oil & gas” includes “mining and fuel” and “wholesale trade.” In other countries, “wholesale trade” is classed with LSI Services. Source: Voskoboynikov (2014).

Table A2b. 2007 multifactor productivity levels relative to Germany, USD (2005, PPP-adjusted)

	Russia	Czech. Rep	Hungary	Slovenia
<i>Multifactor productivity in 2007, Germany = 100</i>				
Market economy, total	52	64	60	74
HSI Goods	17	38	44	51
LSI Goods	26	48	43	57
HSI Services	49	77	95	92
LSI Services	68	75	61	83
Mining and fuel*	72	50	77	90

Note: \*For Russia, “extended oil & gas” includes “mining and fuel” and “wholesale trade.” In other countries, “wholesale trade” is classed with LSI Services. Source: Voskoboynikov (2014).



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