Sources of Economic Growth of the Russian economy in 1995-2006

Russia KLEMS Progress Report

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Summary

This paper examines the supply-side perspective of economic growth of the Russian economy in 1995-2006. We develop a new, detailed database of inputs, outputs and productivity measures at the level of 35 industries. Sector-wise, we find that labor productivity growth in Market Services is the major source of economic growth in Russia. Our analysis also shows that a substantial part of labor productivity growth is the result of labor reallocation. These results support the hypothesis of a productivity-boosted *intensive* growth pattern. In contrast to popular impressions, our findings indicate that the contribution of mining and energy-intensive sectors to labor productivity growth in Russia is relatively modest.

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1. Introduction

The U-shaped economic growth pattern of the Russian economy in transition is common for many former Socialist countries. The lowest point of real GDP is 60 per cent of the level of 1990, was passed in 1998, the year of a financial crisis. The post-crisis recovery accompanied by high growth rates of 6.7%[2]. A supply-side analysis of growth could explain such performance, unveiling sources of growth. What we know about them at this stage is largely based upon empirical studies at the level of total economy or few highly aggregated sectors. In literature[3] growth in Russia is mainly driven by multifactor productivity (MFP), as in other economies in transition.

Growth accounting at the *level of industries* has been developed in Jorgenson, Gollop and Fraumeni (1987); and Jorgenson, Ho, and Stiroh (2005). For example, productivity growth rates gap between US and EU has been explained in the paper of van Ark, O'Mahony and Timmer (2008) by dissimilarities in performance of Market Services. For the five European economies in transition Havlik, Leitner and Steher (2008) have found convergence of sectoral structure to Western European economies, which accompanied catching-up of productivity. The paper has pointed out to manufacturing as main engine of growth and productivity. However, far too little attention has been paid to sources of growth at the level of industries of the Russian economy[4].

Absence of supply-side analysis of economic growth at a detailed industrial level, and the problem of capital measurement place in question MFP as a major source of economic growth in the Russian economy. There are two alternative stories of Russian economic development after transition, based on a neoclassical growth accounting framework. Real value added growth rates may be explained mainly by inputs growth or by productivity. This simple idea leads to *extensive* or *intensive* growth hypotheses, which would be used to explain growth pattern of the Russian economy.

Russian economic history for many decades before transition is a story of extensive growth. During last one and half centuries it was Manufacturing, which was considered as an engine of economic growth of the Russian economy. Russia's drive to

[2] Average growth rates of official real GDP in 1999-2006.
[3] See, for example, De Broek, Koen (2000), Dolinskaya (2001), Iradian (2007), Rapacki, Próchniak (2009).
[4] De Broek, Koen (2000) and Dolinskaya (2001) consider few major sectors of the Russian economy.

modernisation started in the mid 19th century. Through large scale investment by the state a process of industrialisation was started with the aim to catch-up with the more advanced countries in Europe. Economic growth was based on the exploitation of cheap labour and excessive investment directed by large state-led banks. This process intensified after the Revolution of 1917. High investment rates were forced by limiting consumption. In the 1950s and 60s, the apparent success of the Soviet economy became a subject for discussions in professional economic literature. In 1970, Russian GDP per capita had caught up considerably and stood at 40% of the US and 60% of Europe (Fig. 1).

However, by the end of the 1960s, the limitations of the planned economic system became increasingly visible. High prices on oil and gas after the Oil Price shock of mid-1970-s along with the system of transportation provided possibility for the government to direct additional resources to consumption and investments. This breathing space was exhausted by another sharp decline in oil prices in 1985. In 1991 the income gap with Europe had grown again to 55%.

Initially, prospects for growth in former socialist countries, including Russia, appeared to be bright. In contrast to many developing countries, they had already a sizeable and experienced industrial sector and a comparatively high level of educational attainment of the population. Introduction of a free market economy and privatization of state enterprises were expected to unleash market forces improving efficiency and boosting innovation. By opening up to international trade and foreign investment (FDI) advanced technologies could be acquired. However, this expectation was not borne out (Blanchard 1997) and the decline in output was much more severe. In Russia, it took 14 years to reach the same income level as in 1991. By that time the gap with Europe has increased to 65%. In contrast, the transition of the Chinese economy away from a planning system in the 1980s was much more gradual and growth has been stable and high ever since (Fig. 1). In Russia, the crisis bottomed out in 1998. Unbalanced macroeconomic policy and a global financial crisis led to a default on foreign debt by the government. A sharp devaluation of the national currency along with an increase of oil prices launched a recovery period, with a decade of high and stable growth rates.

Extensive growth in modern Russia may be explained by competitive advantages of industries, benefited from low internal energy prices or effects of trade. Along with oil and gas-exporters, such industries have a substantial share of energy in costs. They produce metals, chemistry, and fertilizers. Another possible channel of extensive growth is a flow of investments from these energy-intensive industries to other sectors.

Intensive growth story is based on the idea that transition from plan to market is a process of gradual elimination of multiple price distortions, inherited from planned economy. In terms of Harberger (1998), planned economy assumes high costs for its level of price distortions. Plan-market transformation opens more possibilities for saving private costs and costs for the total economy in the same time. Intensive growth story assumes that industries with "Mushroom" growth patterns (Other Goods; Market Services) will dominate; the role of multifactor productivity will be substantial due to a proceeding process of elimination of multiple distortions.

Growth accounting literature[5] provides evidence of this intensive growth story. Moreover, it offers an explanation of initial productivity decline with a collapse of institutions to support long productivity chains, known as disorganization (Blanchard, Kremer 1997). A concept of disorganization is used both for economies in transition and market economies to explain slowdown or a decline of productivity[6].

One of major consequences of a long period of planned economy in former socialist countries is a substantial sectoral structure distortion. It is explained by economic policy of command economy decades, which was focused on investments at the expense of consumption (Ofer 1987). Increase of productivity due to better labor reallocation is a part of the intensive growth story either. This dimension could be essential for transition economies due to a substantial shift of sectoral structure and accompanying reallocations. A shift from manufacturing to services started in first years of transition. Such a trend was common for all economies in transition, and may be considered as consequence of reallocation of resources on the basis of market incentive (Campos, Coriselli 2002). This labor reallocation could be a substantial source of labor productivity growth.

[5] See, for example, (De Broeck, Koen 2000)
[6] About disorganization in economies in transition see, for example, Marin and Schnitzer (2005); in US and Japan – Kobayashi (2006; 2007).

Structural changes observed in former Socialist economies in two decades of transition may reflect both a remove of distortions, and global trends of economic development (Campos, Coricelli 2002). A theoretical framework for such analysis is provided by the Chenery Hypothesis (Chenery 1960; CH) According to CH, sectoral structure of the economy depends on stage of development, its size, and endowment of natural resources. With CH it is possible to measure deviations of sectoral structure of a `distorted' planned economy from a 'normal' economy. A comparison of an observed and a hypothetical CH sectoral structure of the former Soviet Union in 1988 is estimated by Döhrn and Heilemann (1996) (see Tab. 1). The table evidences that a structural change to services could be predicted.

This paper is devoted to a supply-side perspective of economic growth of the Russian economy in 1995-2006. We develop a new detailed database of inputs, outputs and productivity measures at the level of 35 industries. With standard neoclassical approach to labor productivity disaggregation between industries and shift-share analysis we establish that most important sources of economic development of the Russian economy since 1999 are labor productivity in Market Services and labor reallocation, along with labor productivity growth of Exports. The results of this research support the idea that inputs-based *extensive* growth for decades before transition has been changed by *intensive* growth, which is boosted by Market Services.

Leading role of Market Services may be explained by multifactor productivity-based growth pattern of the Russian economy. This shift of the Russian economy from capital-concentrated Manufacturing to Services may be considered both as a consequence of overindustrialization in years of planned economy, and as a global trend of development, which is common for developed economies. However, further research is needed to split labor productivity growth rates into capital intensity and multifactor productivity contributions directly (in progress now).

2. Approach

This is the approach to answer the following three questions. First, what is a contribution of each sector to labor productivity growth rates? Second, what is an impact of labor reallocation to labor productivity growth rates? Finally, how to calculate real value added growth rates, taking into account double deflation?

Supply and Use tables (SUT) time series[7] both in constant and current prices provides data of nominal gross output GO_j, real gross output quantity index GO_j^{QI}, nominal gross value added VA_j, nominal intermediate inputs II_j, and real intermediate inputs II_j^{QI}, all indexed by time *t* (skipped if possible) and industry *j*. Data on employment L_j (number of workers) is also given.

Quantity index of value added of a particular industry *j* VA_j^{QI} is defined as (Productivity, OECD Manual 2001)

$$(1) \qquad d\ln VA_j^{QI} \equiv \frac{1}{s_{GO_j}^{VA_j}}\left(d\ln GO_j^{QI} - s_{GO_j}^{II_j} \cdot d\ln II_j^{QI}\right),$$

where $s_{GO_j}^{VA_j}$ and $s_{GO_j}^{II_j}$ are shares of nominal value added and intermediate inputs in gross output for a corresponding industry[8].

Labor productivity growth rates for an industry *j* is

$$(2) \qquad d\ln LP_j^{QI} \equiv d\ln VA_j^{QI} - d\ln L_j .$$

Aggregated quantity indices of value added and labor are

$$(3) \qquad d\ln VA^{QI} = \sum_j s_{VA}^j \cdot d\ln VA_j^{QI} ,$$

$$(4) \qquad d\ln L^{QI} = \sum_j s_L^j \cdot d\ln L_j .$$

Aggregated labor productivity quantity index

[7] See details about Russian SUT in the section "Data"

[8] The following notation for shares is used: (i) $s_B^A \equiv \frac{A}{B}$; (ii) $s_A^{A_j} \equiv s_A^j$.

(5) $$d \ln LP^{QI} \equiv d \ln VA^{QI} - d \ln L^{QI}$$

may be decomposed in the following way (Productivity, OECD Manual 2001; Nordhaus 2001; Stiroh 2002):

(6) $$d \ln LP^{QI} = \sum_j s_{VA}^j \cdot d \ln LP_j^{QI} + \sum_j \left(s_{VA}^j - s_L^j \right) \cdot d \ln L_j \ .$$

The first item of the right side of (6) accounts for labor productivity growth within an industry, caused by internal sources of growth. The second item reflects an influence of interaction between changes of industry weights and labor input levels between industries. Reallocation "between" effect is positive if labor inflows to the industry with the higher than average level of labor productivity.

3. Data[9]

Three variables of sectoral data are necessary to implement the labor productivity decomposition. The variables are real value added, nominal value added, and labor input.

Early years of transition are very difficult for statistical measurement of the Russian economy due to a transformation both in economics and statistics. Russian state statistics succeeded such features planned economy statistics as

- detailed elaboration of physical measures;
- exaggerated interest to Manufacturing and Agriculture;
- disdain of Services;
- inability to measure prices;
- a lack of experience in providing of households surveys;
- unique system of classifications, which is inconsistent with international standards;
- a system of material balances instead of SNA;
- non-transparency of methodologies and poor quality of official statistical publications.

[9] See more detailes in the Appendix

A transition in statistics from late 1980-s to present is connected with a shift to international approaches, introduction of SNA-93 and price statistics in early 1990-s; a gradual substitution of old Soviet statistical classifications by international; implementation of conventional forms of statistical observation of labor market such as the Labor Force Survey, gradual improvement of statistical publications and the level of transparency. In particular, a change of the old industrial classification to a new one (NACE 1.0) took place in 2003-2004 years.

Official data of nominal value added in a new classification is available since 2002. Output time series used in this paper for the period 1995-2001 have been obtained with the official set of bridges.

3.1. Output

The algorithm of recalculating OKONKh historical time series into OKVED time series (1995-2001) is based on "OKONKh (All-Union Economic Sector Classification System) [10] to OKVED (All-Russia Economic Activity Classification)[11] bridge" published by the Center for Economic Classifications under the Ministry of Economic Development in 2002.

Calculations were performed on the basis of detailed output information under the Old classification and bridge-derived value difference matrices for the Old classification sectors and the New classification kinds of activities supplied by the Rosstat, the lines of each matrix reflecting activities in compliance with as much detailed OKONKh list as possible.

The results of recalculation of indicators derived from the said matrices were then compared to empirical output data across OKVED for 2002[12] which were assumed as reference. Where the calculated results varied considerably from reference values, the calculated results were adjusted. Adjustment was performed by changing the distribution ratios of OKONKh sectors between several OKVED activities. In some cases, additional

[10] In the following text it is mentioned as "the Old Classification".
[11] In the following text it is mentioned as "the New Classification". The New classification is an adapted version of NACE 1.0. To the level of four digits it is similar to NACE 1.0.
[12] Rosstat collected the 2002 primary data simultaneously for two classifications – OKONKh and OKVED – to facilitate transition from one system to another.

judgment-based adjustment was performed upon agreement of the staff of the relevant Rosstat divisions.

The 2002-2005 time series were produced on the basis of the published SNA output data for OKVED activities for these years. Class C "MINING AND QUARRYNG" and D "TOTAL MANUFACTURING" data were additionally disaggregated on the basis of more detailed primary information.

For all calculation periods, consistency between the total value of calculated indicators and the officially published output bottom line for the economy as a whole (the OKONKh list before 2002) was observed.

The database of the paper is based on 35-industries of NACE 1.0 (Tab. 5). A split between industries of Exported Goods and Other Goods sectors is based on relative comparative advantages (RCA) indices. RCA indices have been calculated using the International Trade in Goods database[13]. If major products of an industry have comparative advantages, the industry was put into Exported Goods sector.

3.2. Double Deflation

Value-added based labor productivity measure is sensitive to a double deflation procedure. A redistribution of labor productivity between industries could be sensitive to changes of relative prices of output and intermediate inputs, as it has been shown for retail trade sector (Timmer, Inklaar, and van Ark 2005), semiconductors and computers industry (Triplett 1996). Comparisons of productivity levels between industries are not robust to double deflation either, as it has been shown for pre-war UK-Germany comparisons (Fremdling, de Jong, and Timmer 2007).

All these issues could be not essential if double deflation is used by Russian official statistics. However, it is not clear if double deflation is implemented or not, and for what years[14]. Another reason why we refrain from official real value added data is the fact, that a definition of this measure used by Rosstat is not available, so it is impossible to control inconsistency bias at the level of industries.

[13] http://www.intracen.org/tradstat/sitc3-3d/indexre.htm
[14] It is mentioned by Rosstat officials that double deflation procedure is used in official data (Masakova 2006), but no details are given.

Our imputations of value added are based on the definition (1) and imputed data of SUT time series in constant prices. The only detailed benchmark SUT for the Russian economy was compiled as of 1995 for 120 industries in the Old classification. Less detailed SUT's have been published in 1996-2003 in the Old classification, and in 2004-2006 in the New classification in current prices only. All SUT's are consistent with SNA of corresponding years.

We have imputed SUT's for the period in questions in three steps. First, we calculated SUT's of 1995-2003 in the new classification, using official bridges. Second, we obtained implicit deflators of gross output as a ratio of official nominal gross output values and the physical volume indices. If necessary, nominal values were disaggregated with more detailed data of gross output or goods and services dispatched. Finally, we implemented the imputation methodology of Temurshoev, Timmer (2010).

Results of a sensitivity analysis of labor productivity growth rates are presented in the table 3. Gross-output based measures of labor productivity could be considered as "value-added based" labor productivity indices with the assumption, that $d \ln GO^{QI} = d \ln VA^{QI}$ and used as a proxy of official indices for the whole period.

According to the table 3, major conclusions remain the same for both approaches. Double deflation leads to lower values of labor productivity growth rates in most industries in 1995-1998, and higher rates in 1999-2006, which could be explained by a substantial change of relative prices on inputs and outputs after the appreciation of ruble in the crisis of 1998.

3.3. Labor

The dataset includes a number of workers for the period of 1995-2006 in 35 industries of the new classification. It is based on the Labor Force Survey data.

There is no official SNA-consistent employment data, which would be published by Rossat. Major sources of employment data at macro level are the Labor Related Establishments Survey (LRES) and the Labor Force Survey (LFS)[15].

LRES is based on *official* reports of firms. It covers *employee* of large, medium and small firms, and government organizations. Data is available for all years in question.

[15] We use the International Labor Organization terminology, naming Russian statistical surveys

Rosstat has been publishing data on employee at the level of one digit in the new classification since 1995. Data on education, age and gender is limited and not published. More detailed data of three-four digits of the new classification is available since 2002

An object of observation of the Labor Force Survey is a household. LFS covers all kinds of labor force, including self-employed and partially employed, formal and informal activities. Methodology of LFS is based on recommendations of International Labor Organization. The first round of LFS in Russia took place in November1992. From 1999 it takes place on a quarterly basis. Data on a number of workers is available at the level of one digit of OKVED from 1997. In addition, more detailed data of Russian LFS is published by sub industries of Manufacturing (D in NACE 1.0). Since the survey has been initially based on the ILO methodology, data was collecting with NACE 1.0-consistent industrial classification even in years 1997-2001, in other words, before the New classification had been adopted. The Survey provides a set of determinants of labor force quality such as education, age, and gender. However, a weak point of LFS is a poor quality of industrial allocation of labor. This disadvantage is common for household surveys in other countries. It is explained by mistakes of respondents, when they answer the question about a sector in which they have a job.

LFS and LRES datasets on a number of employees are not consistent (see Fig. 2, 3). The difference between levels of the two measures is about 7 millions in 1998, and increases afterwards. By 2008 it is about 18 millions, of which about 3.5 millions fall at Wholesale and retail trade, by 2 millions falls at Manufacturing, Transport and Communications, and 1.5 millions on Agriculture (Fig. 2 and 3). The discrepancy is explained by self-employed, secondary employment, and an increase of a number of the employee, who have jobs in firms not covered by LRES (Vishnevskaia et al. 2000).

The dataset of employment used in this study is based on the LFS data of a number of workers at the level of one digit of the new classification. The LRES dataset is used for a decomposition of sectoral data to the level of detalization of the new sectoral classification, and for imputations of employment growth rates in 1995-1997, not covered by LFS. Taking into account data availability, such an approach seems preferable for four reasons. First, the LFS dataset is the only one, which is representative for the whole population of Russia. In contrast to LRES, it covers informal activities, secondary jobs,

self-employment, and mobilized personnel in different government organizations. From this point of view, LFS corresponds to Russian SNA and SUT's, in which adjustments for different forms of shadow economy and informal activities are implemented by Rosstat. Second, LFS provides sufficient information about such labor quality indicators as gender, education and age[16]. Third, LFS is the only source of real hours worked, including secondary and shadow activities, and self-employment. Forth, LFS is based on methodology and recommendations of International Labor Organization, which provides better consistency with the LFS-based data for other countries.

In comparison with LRES, there are two key disadvantages of LFS, which are low accuracy of industrial classification and inconsistency with such measures of firm-based statistics as output and investments (capital stock).

The dataset has been obtained by the following way. LFS data was decomposed by the new classification industries (Table 5) with a more detailed LRES data for the benchmark year 2002. Data before this year has been imputed with the assumption of the same growth rates in an industry, for which LFS data is available, and sub industries to be imputed. Data after this year has been decomposed with detailed LRES data. Year 2002 as the benchmark year has been chosen, because it is the first year for which detailed sectoral data in the new classification are based on direct observations, and because of a relatively low level of the discrepancy of a number of employees between LRES and LFS in comparison with the following years (see Fig. 2, 3).

4. Preliminary results and discussion

4.1. Labor Productivity Growth is boosted by Market Services

Labor productivity growth is major source of economic development of the Russian economy in 1995-2006, as can be seen from the table 2. What is the *sectoral structure of labor productivity growth*? Table 4 presents results of labor productivity decomposition by sectors and industries. It indicates that engines of growth are Market Services and Exported Goods. A direct contribution of value added productivity growth of Market Services ("Within" column) dominates for two reasons. First, labor

[16] Not used for this version of the paper, but will be explored later.

productivity of the sector is above average. Second, as shown in Fig. 4a, its share is almost half of total value added, and the largest in the economy.

Growth pattern had changed after the crisis of 1998. Before the crisis Russian ruble had been highly appreciated. Devaluation of ruble due to the crisis promoted production of import substituted goods, and an increase of export. Before the crisis, output fall could be explained by labor decline and zero productivity growth (Tab. 2). If we now turn to the post-crisis period, outstanding output growth of 7.4 per cent[17] had been achieved with 6.2 per cent growth of labor productivity along with a moderate increase of labor.

Comparing results for the periods before and after the crisis (Table 4), it can be seen that only two industries[18] provide a substantial impact to labor productivity growth rates in both of them, which are export-oriented Mining and Wholesale Trade. A possible explanation for this might be that Mining had strong demand from the world market and an access to investments even in the recession before 1998. A strong position of Wholesale Trade could be interpreted as following. A substantial share of wholesale trade services is intended to support Mining export.

One unanticipated finding is a sharp increase of labor productivity growth rates impact of Agriculture after the crisis (from -0.25 to 0.74). It could be a consequence of increased demand due to changes of terms of trade, and import substitution effects, accompanied by labor outflow. However, these results must be interpreted with caution because quality of rural employment data is worse than of other industries.

A shift to better measures of labor inputs, based on such quality indicators as gender, gender and education could cut this effect down.

A domination of Market Services in labor productivity growth rates is not common both for developed economies and for economies in transition. The results of van Ark, O'Mahony and Timmer (2008) indicate that an impact of Market Services in labor productivity growth rates prevails over other sectors in US, and in two of 10 Old members of EU, which are United Kingdom, and the Netherlands. Only Czech Republic

[17] Yearly averaged growth rates of real value added in 7.4 per cent are higher than the official value of 6.7 per cent of the same period 1999-2006. This difference is explained by double deflation of real value added reported in Tables 2 and 4 (see "Data"section).
[18] Apart from Non-market services.

is similar to Russia among five other East European economies considered by Havlik, Leitner and Stehrer (2008).

In long run perspective, services-driven growth is unprecedented for the Russian economy. For many decades before transition capital intensity in a sector of production of goods had been a major engine of growth (De Broek, Koen 2000), keeping sector of Services underdeveloped. By 1988 a share of Market and State Services of the economy of the Soviet Union (Döhrn and Heilemann 1996; data is presented in Tab. 1) was 27.8 per cent of Net Material Product instead of 52 per cent hypothetical for the economy of the same level of development.

Further research is needed to clarify also the following questions. Is this outstanding performance of the leaders of Market Service sector (Wholesale trade and Inland transport) connected with vertical integration of such large Mining-based monopolies as Gazprom or Rosneft'[19]? Why labor reallocation in many industries in 1995-1998 was negative? For example, the most productive sector (Market Services) demonstrated the highest internal (within) labor productivity growth rates in years before the crisis[20]. How outstanding labor productivity growth in Agriculture in 1999-2006 may be explained?

4.2. Growth Accounting and the Role of Capital Services

A major problem to be solved to produce a full set of growth accountings is an estimation of capital services. This part of the project has not completed yet. However, capital services have been evaluated for five major sectors of the Russian economy in the old classification (Manufacturing, Agriculture, Trade, Construction, Communications and Transport) in 1990-2004. Results are reported in the Appendix.

For Manufacturing[21], for example, multifactor productivity provides a major contribution to growth rates (Fig. 5). Value added decline with growth rates -2.2 per sent

[19] According to official declaration, major activity of Gazprom is Wholesale trade. Major pipelines are included into Inland transport.
[20] Negative "between" effect of Market Services in 1995-1998 is explained by a decrease of a number of workers and positive difference of value-added and labor shares in (6). Such a counterintuitive outflow of labor could be connected with poor quality of labor decomposition between industries in 1995-1997.
[21] Manufacturing in the old classification roughly corresponds to Mining (C), Manufacturing (D) and Energy distribution (E) of the new classification.

per year is a sum of a fall of hours worked (-4.0 per cent per year) and moderate growth of labor productivity (1.9 per cent a year). A contribution of MFP growth or labor productivity is 1.4 per cent per year. It dominates capital intensity growth (0.5 per cent) and almost zero growth due to changes in labor composition. Along with manufacturing, intensive MFP-boosted growth is demonstrated by Agriculture, Construction and Transport.

In contrast, capital intensity contribution is essential for Trade and Communications. Taking into account a substantial role of Services, this is the evidence of substantial investments in the two Market-services related sectors, and, probably extensive, growth.

5. Conclusion

The paper develops a new detailed dataset of productivity measures for the Russian economy in transition. It provides evidence that labor productivity growth in market services forms a labor productivity pattern in the Russian economy in transition. This specific role of market services may be explained by to complementing trends. First, it is a catch-up of underdeveloped Market Services sector; second is a global increase of labor productivity in Distribution services. Two other substantial sources of labor productivity growth are sector of Export Goods and labor reallocation.

Returning to the two alternative growth stories posed at the beginning of this study, it is now possible to add more in favor of intensive one. Economic growth in Russia is boosted by market services, which are *less capital intensive*, than manufacturing or mining. Another important factor of growth, labor reallocation, is a part of the intensive story as well.

Results open a possibility for two generalizations. First, the role of Mining is unexpectedly modest in labor productivity economic growth. Second, a major source of labor productivity growth is a catch-up in services, which is observed in many East-European former Socialist countries.

This research has thrown up many questions in need of further investigation. A growth accounting exercise is necessary to clarify a role of capital intensity in growth. This part of the project is in progress now. We need more accurate measures of labor

input, based on hours worked by different groups of labor force. Finally, further disaggregation of Market Services is necessary to identify sources of growth better.

6. References

Blanchard, Olivier Jean. *The Economics of Post-Communism Transition*. Oxford: Oxford University Press, 1997.

Blanchard, Olivier and Kremer, Michael. "Disorganization." *Quarterly Journal of Economics*, 1997, *112*(4), pp. 1091-126.

Campos, Nauro, F. and Coricelli, Fabrizio "Growth in Transition: What We Know, What We Don't, and What We Should." *Journal of Economic Literature*, 2002, *40*(3), pp. 793-836.

Chenery, Hollis B. "Patterns of Industrial Growth." *American Economic Review*, 1960, *50*(4), pp. 624-54.

De Broeck, Mark and Koen, Vincent. "The Great Contradictions in Russia, the Baltics and the Other Countries of the Former Soviet Union: A View from the Supply Side." *IMF Working Paper*, 2000, *WP/00/32*.

Dolinskaya, Irina. "Explaining Russia's Output Collapse: Aggregate Sources and Regional Evidence." *IMF Working Paper*, 2001, *WP/01/16*.

Döhrn, Roland and Heilemann, Ullrich. "The Chenery Hypothesis and Structural Change in Eastern Europe." *Economics of Transition*, 1996, *4*(2), pp. 411-23.

Fremdling, Rainer; De Jong, Herman and Timmer, Marcel P. "British and German Manufacturing Productivity Compared: A New Benchmark for 1935/36 Based on Double Deflated Value Added." *The Journal of Economic History*, 2007, *67*(02), pp. 350-78.

Harberger, Arnold C. "A Vision of the Growth Process." *The American Economic Review*, 1998, *88*(1), pp. 1-32.

Havlik, Peter; Leitner, Sebastian and Stehrer, Robert. "Growth Resurgence, Productivity Catching-up and Labor Demand in CEE's." *wiiw Statistical Reports*, 2008, *3*, pp. 70.

Iradian, Garbis. "Rapid Growth in Transition Economies: Growth-Accounting Approach." *IMF Working Paper*, 2007, *WP/07/16*

Izyumov, Alexei and Vahaly, John. "Old Capital Vs. New Investment in Post-Soviet Economies: Conceptual Issues and Estimates "Comparative *Economic Studies*, 2008, *50*(1), pp. 111-57.

Jorgenson, Dale W.; Gollop Frank M. and Fraumeni, Barbara. *Productivity and U.S. Economic Growth*. Amsterdam: North-Holland, 1987.

Jorgenson, Dale W.; Ho, Mun S. and Stiroh, Kevin J. *Information Technology and the American Growth Resurgence* Cambridge: The MIT Press, 2005.

Kobayashi, K. "Payment Uncertainty, the Division of Labor, and Productivity Declines in Great Depressions." *Review of Economic Dynamics*, 2006, *9*(4), pp. 715-41.

Kobayashi, K. "Payment Uncertainty and the Productivity Slowdown." *Macroeconomic Dynamics*, 2007, *11*(2), pp. 231-48.

Lazarev, V. and Gregory, P. "Structural Convergence in Russia's Economic Transition, 1990-2002." *Economic Change and Restructuring*, 2007, *40*(3), pp. 281-304.

Marin, Dalia and Schnitzer, Monika. "Disorganization and Financial Collapse." *European Economic Review*, 2005, *49*(2), pp. 387-408.

Masakova, I.D. Regulation of the Russian GDP Series in Connection with the Transition to New Classifications. U.N. Economic and Social Council. Economic Commission for Europe. 8th Meeting of the Group of Experts on National Accounts, 25-28 April 2006, Geneva.

Methodological Regulations on Statistics, Vol. 1-5 (In Russian: Metodicheskie Polozheniia Po Statistike. Vyp. 1-5). Moskva: Rosstat, 1996-2006.

Nordhaus, William D. "Productivity Growth and the New Economy." *National Bureau of Economic Research Working Paper Series*, 2001, *No. 8096*.

Productivity, OECD Manual. "OECD Productivity Manual: A Guide to the Measurement of Industry-Level and Aggregate Productivity Growth," Paris: OECD, 2001.

Ofer, Gur. "Soviet Economic Growth: 1928-1985." *Journal of Economic Literature*, 1987, *25*(4), pp. 1767-833.

Rapacki, R. and Próchniak, M. "Economic Growth Accounting in Twenty-Seven Transition Countries, 1990-2003." *Eastern European Economics*, 2009, *47*(2), pp. 69-112.

Stiroh, Kevin J. "Information Technology and the U.S. Productivity Revival: What Do the Industry Data Say? ." *American Economic Review*, 2002, *92*(5), pp. 1559-76.

Temurshoev, Umed and Timmer, Marcel. "Joint Estimation of Supply and Use Tables." *GGDC Research Memorandum*, 2010, *GD-116*.

Timmer, Marcel P.; Inklaar, Robert and van Ark, Bart. "Alternative Output Measurement for the U.S. Retail Trade Sector," *Monthly Labor Review.* US Department of Labor, 2005, 39-45.

Triplett, Jack E. "High-Tech Industry Productivity and Hedonic Price Indices," *Industry Prodictivity: International Comparison and Measurement Issues.* Paris: OECD, 1996, 119-42.

van Ark, Bart; O'Mahoney, Mary and Timmer, Marcel P. "The Productivity Gap between Europe and the United States: Trends and Causes." *Journal of Economic Perspectives*, 2008, *22*(1), pp. 25-44.

Vishnevskaia, N.T.; Gimpel'son, V.E.; Zaharov, S.V.; Kapeliushnikov, R.I.; Korshunova, T.Iu.; Kudiukin, P.M.; Maleva, T.M. and Poletaev, A.V. Review of Employment in Russia (in Russian: Obzor Zaniatosti V Rossii). Moskva: TEIS, 2002.

Voskoboynikov, Ilya B. "Non-Market Capital and Its Influence on the Trend of Investments in the Russian Economy." *Problems of Economic Transition*, 2006, *49*(7), pp. 6-70.

Voskoboynikov, Ilya B. and Dryabina, Elena V. "Historical Time Series Data of Fixed Capital of the Russian Economy. Manufacturing (1970-2004). Data and Sources." *SU-HSE Working Paper WP2/2009/03 (in Russian)*, 2009.

7. Appendix

7.1. Tables

Tab. 1. Economic structure of the USSR in 1988. Percentage of Net Material Product (Döhrn and Heilemann 1996).

	Agriculture	Energy, Mining and Manufacturing	Construction	Market-oriented services and State sector
Observed	22.8	42.7	12.8	27.8
Hypothetical	6	34	5	52

Tab. 2. Real value added growth rates decomposition in 1995-2006
(in percentage points)

	1995-2006	1995-1998	1999-2006
Real Value Added	4.57	-2.38	7.35
Labor	0.58	-2.33	1.11
Labor Productivity	3.99	-0.05	6.23

Notes: Numbers may not add up due to rounding.

Tab. 3.
Labor productivity growth rates and double deflation by sectors (bold) and major industries
(in percentage points)

Sectors and major industries	1995-1998		1999-2006	
	Labor productivity growth rates based on			
	Gross Output	Double Deflated Value Added	Gross Output	Double Deflated Value Added
TOTAL	0.53	-0.05	5.64	6.23
Market Services	0.35	0.08	2.87	3.37
Wholesale Trade	0.12	0.10	1.37	1.67
Inland transport	-0.03	-0.17	0.61	0.73
Construction	-0.31	-0.39	0.27	0.32
Financial intermediation	0.02	-0.06	0.20	0.31
Retail trade	0.09	0.09	0.15	0.22
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of fuel	0.03	0.03	0.19	0.22
Exported goods	-0.32	-0.69	1.84	2.13
Basic Metals	-0.14	-0.28	0.48	0.88
Agriculture, Forestry, Hunting and Fishing	0.00	-0.11	0.71	0.98
Mining and Quarring	0.03	0.12	0.53	0.59
Coke, refined petroleum and nuclear fuel	0.00	-0.05	0.12	0.11
Goods	-0.10	0.13	0.58	0.57
Machinery, nec	-0.15	-0.20	0.31	0.31
Electrical and Optical Equipm.	0.04	0.07	0.07	0.13
Food, Beverage and Tobacco	-0.02	0.16	0.13	0.10
Non-market services	0.60	0.43	0.35	0.16

Source: Own calculations, based on the Russia KLEMS database
Notes: Numbers may not add up due to rounding

Tab. 4. Labor productivity growth by sectors (bold) and key industries
(in percentage points)

Sectors	1995-2006			1995-1998			1999-2006		
	Within	Between	Total	Within	Between	Total	Within	Between	Total
TOTAL ECONOMY	3.40	0.59	3.99	-0.03	-0.02	-0.05	4.99	1.24	6.23
Market Services	2.10	0.36	2.46	0.41	-0.33	0.08	2.62	0.75	3.37
Wholesale trade	0.36	0.30	0.67	0.30	-0.19	0.10	1.01	0.65	1.67
Inland transport	0.56	-0.01	0.56	-0.13	-0.04	-0.17	0.73	0.01	0.73
Construction	0.32	0.00	0.32	-0.32	-0.07	-0.39	0.35	-0.03	0.32
Exported goods	0.87	0.07	0.94	-0.60	-0.09	-0.69	1.80	0.33	2.13
Agriculture	0.43	0.05	0.48	-0.25	0.14	-0.11	0.74	0.25	0.98
Basic metals	0.28	0.02	0.30	-0.25	-0.03	-0.28	0.82	0.06	0.88
Mining & Quar.	0.36	0.00	0.36	0.30	-0.19	0.12	0.58	0.01	0.59
Non-exp. Goods	0.37	-0.03	0.34	0.02	0.11	0.13	0.63	-0.06	0.57
Machinery	0.15	-0.02	0.13	-0.21	0.01	-0.20	0.34	-0.03	0.31
Non-M. services	0.07	0.19	0.25	0.14	0.29	0.43	-0.06	0.21	0.16

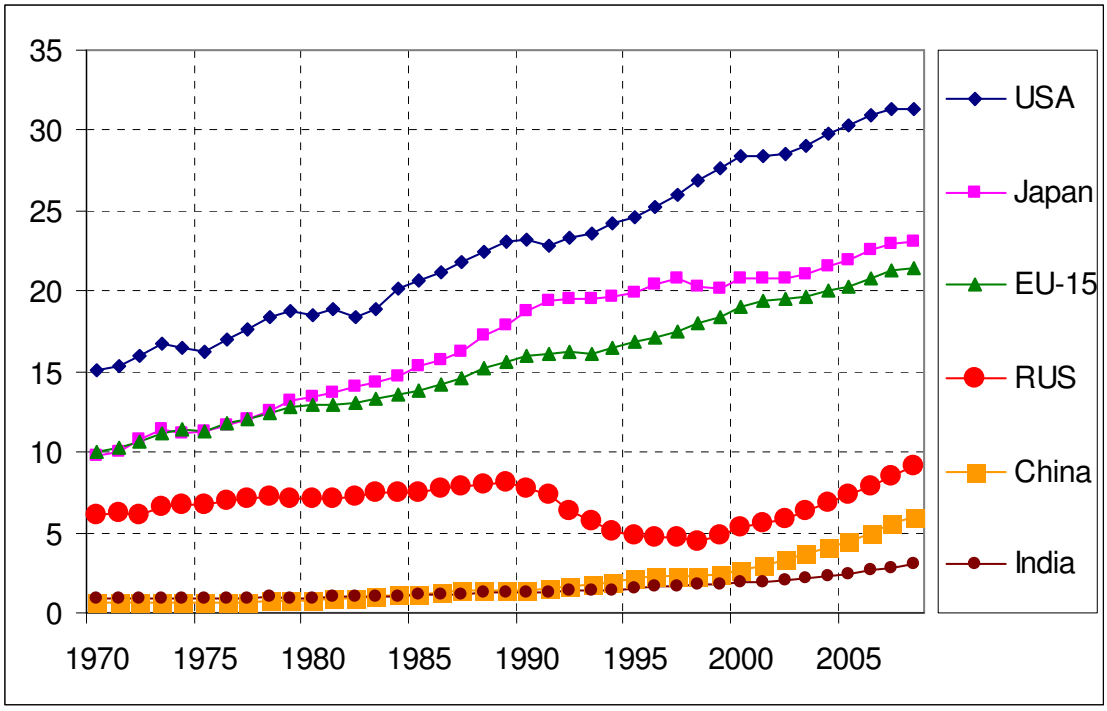
Source: Own calculations, based on the Russia KLEMS database.
Notes: Numbers may not add up due to rounding.

Tab. 5. A list of industries of the database.

N	Code	Name of industry
1	AtB	Agriculture, Hunting, Forestry and Fishing
2	C	Mining and Quarrying
3	15t16	Food, Beverages and Tobacco
4	17t18	Textiles and Textile Products
5	19	Leather, Leather and Footwear
6	20	Wood and Products of Wood and Cork
7	21t22	Pulp, Paper, Paper , Printing and Publishing
8	23	Coke, Refined Petroleum and Nuclear Fuel
9	24	Chemicals and Chemical Products
10	25	Rubber and Plastics
11	26	Other Non-Metallic Mineral
12	27t28	Basic Metals and Fabricated Metal
13	29	Machinery, Nec
14	30t33	Electrical and Optical Equipment
15	34t35	Transport Equipment
16	36t37	Manufacturing, Nec; Recycling
17	E	Electricity, Gas and Water Supply
18	F	Construction
19	50	Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel
20	51	Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles
21	52	Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods
22	H	Hotels and Restaurants
23	60	Inland Transport
24	61	Water Transport
25	62	Air Transport
26	63	Other Supporting and Auxiliary Transport Activities; Activities of Travel Agencies
27	64	Post and Telecommunications
28	J	Financial Intermediation
29	70	Real Estate Activities
30	71t74	Renting of M&Eq and Other Business Activities
31	L	Public Admin and Defence; Compulsory Social Security
32	M	Education
33	N	Health and Social Work
34	O	Other Community, Social and Personal Services
35	P	Private Households with Employed Persons

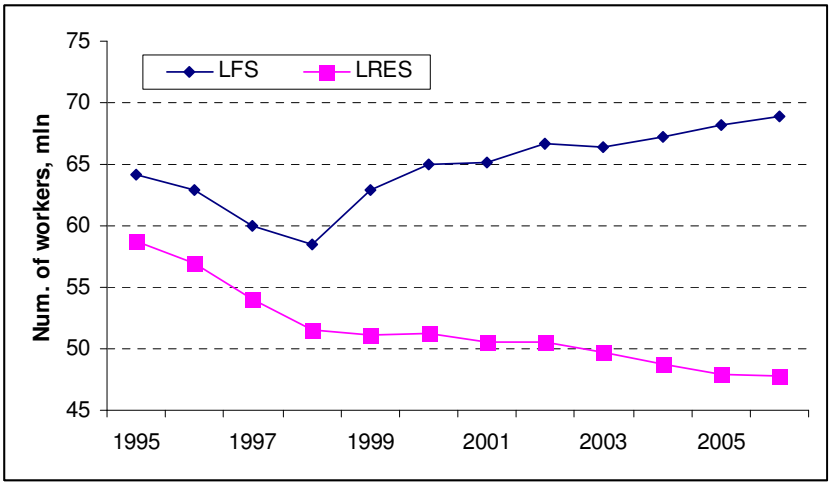
7.2. Figures

Fig 1. GDP per capita (in constant 1990 US$, PPP converted)



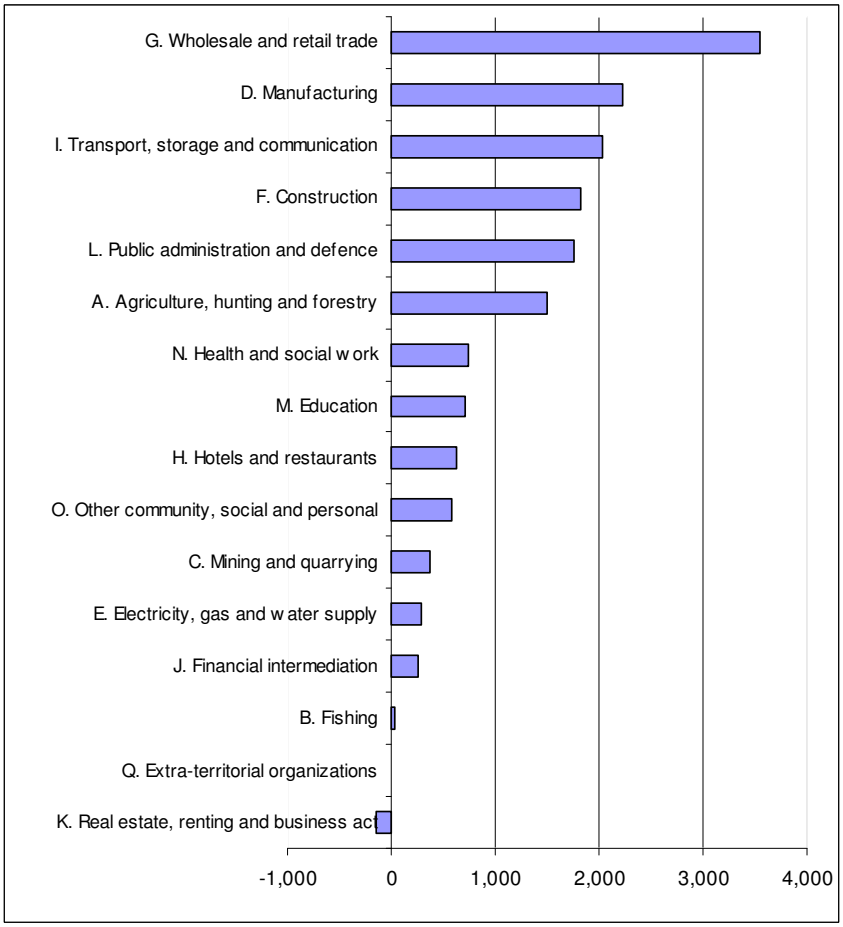
Source: The Conference Board, Total Economy Database, January 2009, http://www.conference-board.org/economics

Fig. 2. Total number of employee in the Russian economy from the Labor Force Survey (LFS) and from Labor-Related Establishment Survey (LRES) in 1995-2006.



Source: Rosstat.

Fig. 3. Difference between a number of employees from Labor Force Survey and the Labor-Related Establishment Survey in 2008.



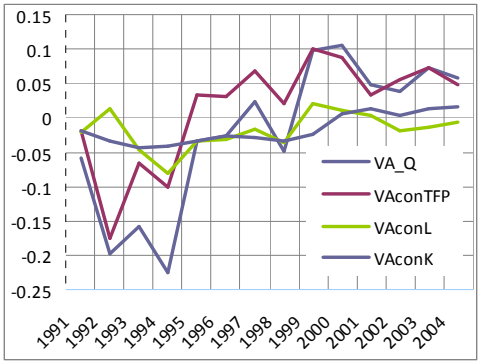
Source: Rosstat.

Fig. 4. Sectoral shares of value added (a) and labor (b) in 1995 and 2005 (percentage points).

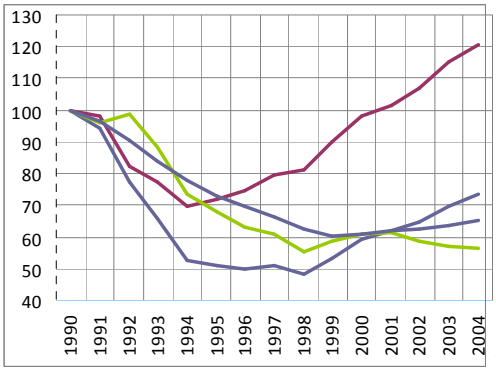
Fig. 4a.

Fig. 4b.
Source: Rosstat.

Fig. 5. Labor productivity decomposition. Manufacturing (the old classification)
Growth rates (a) and levels (b)



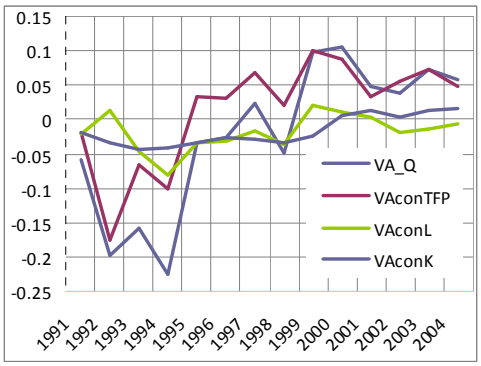
a.



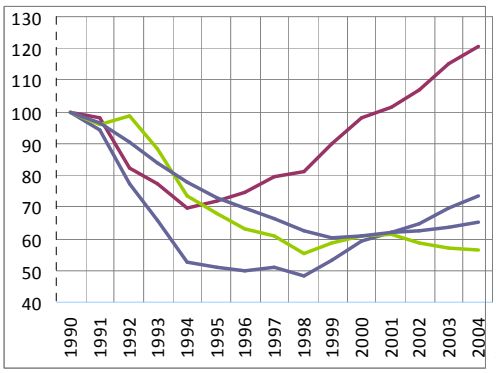
b.

Ind	VA_Q	VAconH	lp_Q	vaconkp_Q	VAconLC	VAconTFP
1990-2004	-2.18%	-4.03%	1.85%	0.53%	-0.03%	1.36%
1990-1998	-9.07%	-7.15%	-1.92%	0.75%	-0.08%	-2.59%
1999-2004	7.02%	0.14%	6.88%	0.23%	0.03%	6.62%

Fig. 6. Labor productivity decomposition. Agriculture (the old classification)
Growth rates (a) and levels (b)



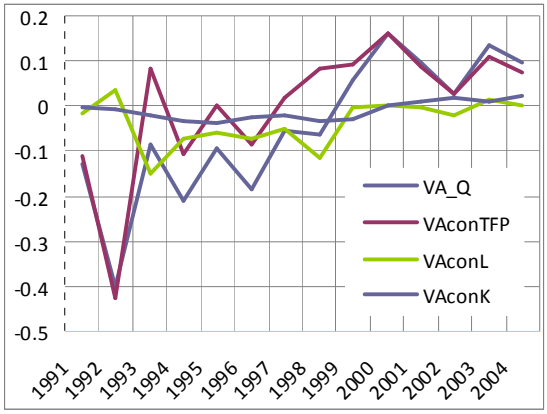
a.



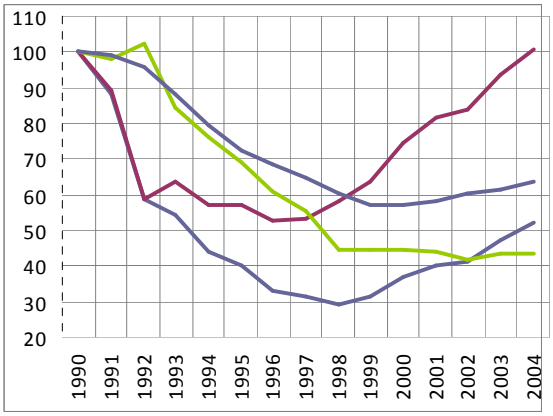
b.

Agr	VA_Q	VAconH	lp_Q	vaconkp_Q	VAconLC	VAconTFP
1990-2004	-0.89%	-8.47%	7.58%	2.21%	-0.03%	5.40%
1990-1998	-7.78%	-8.96%	1.19%	1.70%	-0.06%	-0.45%
1999-2004	8.30%	-7.81%	16.11%	2.88%	0.01%	13.21%

Fig. 7. Labor productivity decomposition. Construction (the old classification)
Growth rates (a) and levels (b)



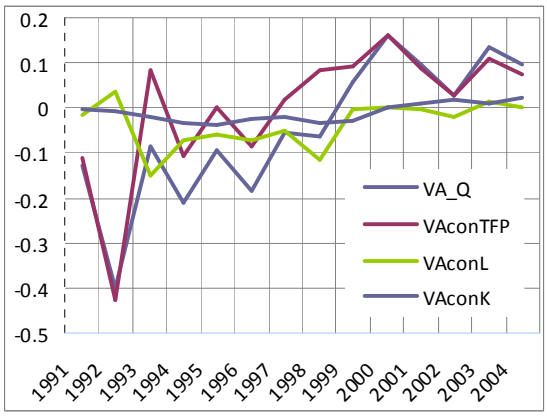
a.



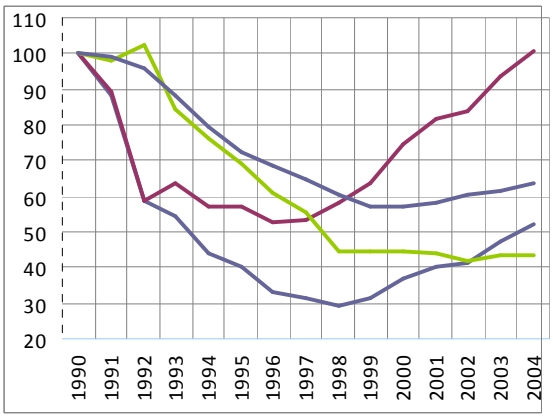
b.

Cns	VA_Q	VAconH	lp_Q	vaconkp_Q	VAconLC	VAconTFP
1990-2004	-4.64%	-5.92%	1.28%	1.27%	-0.05%	0.06%
1990-1998	-15.27%	-9.83%	-5.43%	1.49%	-0.11%	-6.81%
1999-2004	9.52%	-0.70%	10.22%	0.96%	0.04%	9.22%

Fig. 8. Labor productivity decomposition. Trade (the old classification)
Growth rates (a) and levels (b)



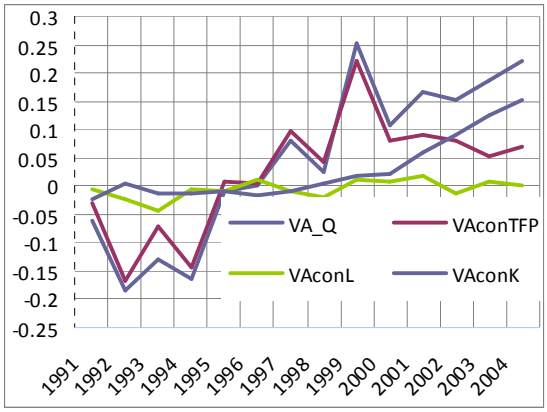
a.



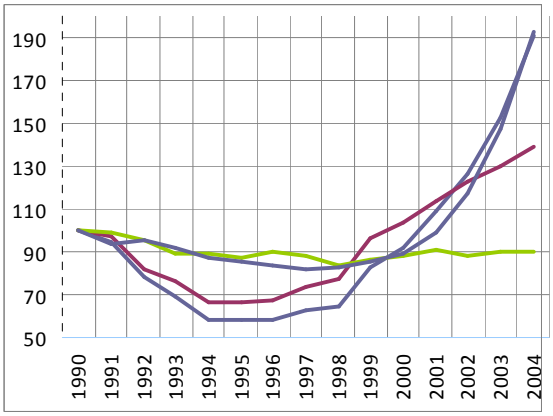
b.

Cns	VA_Q	VAconH	lp_Q	vaconkp_Q	VAconLC	VAconTFP
1990-2004	-4.64%	-5.92%	1.28%	1.27%	-0.05%	0.06%
1990-1998	-15.27%	-9.83%	-5.43%	1.49%	-0.11%	-6.81%
1999-2004	9.52%	-0.70%	10.22%	0.96%	0.04%	9.22%

Fig. 9. Labor productivity decomposition. Communications (the old classification)
Growth rates (a) and levels (b)



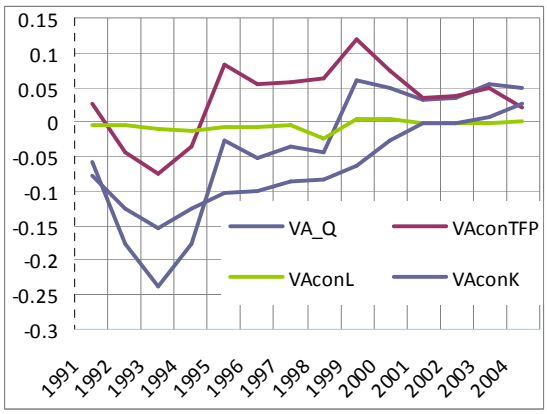
a.



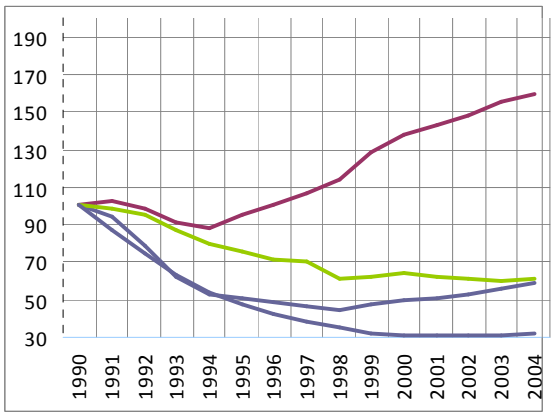
b.

Com	VA_Q	VAconH	lp_Q	vaconkp_Q	VAconLC	VAconTFP
1990-2004	4.61%	-0.66%	5.27%	2.95%	-0.05%	2.37%
1990-1998	-5.53%	-1.97%	-3.56%	-0.19%	-0.11%	-3.26%
1999-2004	18.14%	1.09%	17.05%	7.14%	0.04%	9.86%

Fig. 10. Labor productivity decomposition. Transport (the old classification)
Growth rates (a) and levels (b)



a.



b.

Trs	VA_Q	VAconH	lp_Q	vaconkp_Q	VAconLC	VAconTFP
1990-2004	-3.81%	-3.46%	-0.35%	-3.66%	-0.02%	3.32%
1990-1998	-10.10%	-6.05%	-4.05%	-5.61%	-0.04%	1.59%
1999-2004	4.59%	0.01%	4.58%	-1.06%	0.01%	5.63%

7.3. Review of Data Sources of the Project

A dataset for the Russian economy in 1990-2004 consists of published and unpublished official macro-statistics, alternative data sets, and micro-databases.

Major source of information is Rosstat. A substantial part of data is available from *official publications*, which are available for the period in question. Along with general statistical yearbooks, special editions with more detailed information are available for major sectors (manufacturing, agriculture, construction, transport, communications, and services) and issues (SNA, IOT, prices, investments, labor statistics, and methodology e.t.c.). A full set of Rosstat publications from late 1990-s is available in a digital form. Published data for previous periods is either covered by the publications available or may be obtained by request.

More detailed *unpublished official statistics* for some aspects from Rosstat is available as well. For example, we have data on price indices components of CPI and PPI in 1995-2008 (price indices on hundreds of representative goods and services, and weights for them); detailed data on statistics of capital and investments, including correspondence tables from an old classification (OKONH) to a new (OKVED which coincides with NACE 1.0 for sectors higher than 4 digits). Historical statistics data of capital stocks and flows in Manufacturing in 1970-1990 and Balances of fixed assets in 1960-1990 are also in this group.

Alternative data set consists of a detailed set of physical volume indices of gross output, which is calculated monthly from January of 1993 by a team in SU-HSE, headed by Vladimir Bessonov.

Microdatabases are provided by Rosstat (Manufacturing Census), the World Bank (NOBUS – housholds survey in 2003), and RLMS (Russia Longitudinal Monitoring Study, provided by UNC[22] in 1994- present).

[22] http://www.cpc.unc.edu/projects/rlms

Primary sources of labor data

	Labor Force Survey (LFS)	**Reports of large and medium organizations**	**Reports of small-scale enterprises**
Type of survey	Sample	Total	Sample (total in 2000)
Observation unit	Individual, 15-72 years old	Large and medium organizations of all industries of the economy	Small-scale enterprises organizations of all industries of the economy
Periodicity	quarterly	Monthly, quarterly, yearly	Quarterly, yearly
Years of observation	From 1992	From 1992	From 1992
Primary measures	Form of employment of the individual	A number of employed at the beginning and at the end of the period.	A number of employed at the beginning and at the end of the period.
Coverage	Total population aged in 15-72	Engaged in large and medium organizations.	Engaged in large and medium organizations.

There are three major primary sources of data about the level of employment. They are presented in the table below (Vishnevskaia et.al. 2002).
Individual survey advantages (e.g. LFS):
- meet the requirements of ILO;
- a broad set of variables, which describes individuals;
- covered total population in the age of 15-72.

Individual survey disadvantages:
- small sample in some cases;
- impossible to monitor changes of employment with a consistent set of firms;
- biased data about industries and size of the organization of the respondent;
- industrial disaggregation to some sectors of one-digit level.

Advantages of firm-reports based surveys:
- industry-detailed data (three-four digits);
- consistency with such firm-based measures as output and capital;
- possible to monitor changes of employment with a consistent set of firms.

Disadvantages of firm-reports based surveys:
- coverage depends on a quality of statistical register of firms;
- a number of characteristics of employed are limited;
- some groups of employee are omitted;

- self-employment persons are uncovered.

Primary Sources of Hours Worked

	Labor Force Survey (LFS)	**Reports of large and medium organizations**	**Russian Longitudinal Monitoring Survey**
Type of survey	Sample	Total	Sample (total in 2000)
Observation unit	Individual, 15-72 years old	Large and medium organizations of all industries of the economy	Individual older than 15
Periodicity	quarterly	Monthly, quarterly, yearly	Yearly (4^{th} quarter)
Years of observation	From 1992	From 1990	1994-6; 1998, 2000-7
What hours are measured	Usual and real hours worked	Hours worked	Hours worked.
Coverage of self-employed and informal economy	yes	no	yes

Capital

Methodology issues: BFA and industrial review (F11 and others); F11.

BFA: in current and constant prices; no types of assets division; a number of industries in old and new classifications.

Chronology for BFA; F11 (available).

BOF: 1960-2004 (old classification); 2003-now (new); correspondence table; current-constant prices issues.

F11: 1970-2004 (old manufacturing);
1993-2004 (old industries except Agriculture);
1994-2004 (old Agriculture);
2003-now

Investments

Data on investments is available for all the period in question. It is based on the same asset classification as capital statistics. Data on investments by assets has been collected from 1998 only.

Time series of investments in constant prices (physical volume indices) are available for all the period in question at the level of three digits of the old classification and two digits of the new one both in constant and current prices. A concordance table between the classifications is available as well.

RLMS

The Russia Longitudinal Monitoring Survey (RLMS) is a series of nationally representative surveys designed to monitor the effects of Russian reforms on the health and economic welfare of households and individuals in the Russian Federation. Data have been collected sixteen times since 1992.

For years 1994-2006 we have 3000-5000 observations each year with a full set of data about quality (age, education, gender, and wage) and quantity (hours worked) of labor by industries.

Reference: http://www.cpc.unc.edu/projects/rlms

NOBUS

This single survey of households took place in 2003. It provided by the World Bank and Rosstat. A sample size is around 100000 observations for the variables of interest. The survey involves, among others, data about hours worked, wages, education, gender, age, sector (NACE 1.0), and territory.
Reference: http://go.worldbank.org/VWPUL3S9F0