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Session:

Cyclical Patterns of Railroad Freight Transportation in Russia

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Abstract

Railroad freight transportation is an old but still very important sector of the Russian economy: it accounts for one-sixth of all freight transportation and more than 0.6% of total GDP. The uniqueness of this Russian sector is the existence of statistical time-series (annual, monthly and even daily) since 1920. At the moment not all of these long time-series are available for a researcher, but in the future they may be very helpful in tracing the historical trajectory of the Russian economy: they are much longer and much more comparable through time than any other indicator. *If* the cyclical dynamics of railroad freight transportation are closely related to the cyclical dynamics of the whole economy, one may reconstruct the main features of the latter even without any other statistical information (which is often absent or unreliable for Soviet Russia). And *if* the railroad freight activity has a definite cyclical pattern, this indicator may be useful in monitoring Russian business cycles in real-time.

This paper investigates the relationship between the fluctuations of railroad freight transportation and general Russian business cycles for 1995-2011. The result is quite promising: for many kinds of goods railroad freight transportation is not simply a coincident but rather a leading cyclical indicator. The paper proposes some reasons for this.

Key Words: Business cycles, Turning points, Recessions, Transportation, Russia

Novelty of the contribution: First systematic description of cyclical patterns of railroad freight transportation in Russia. Dating of turning points, estimation of leads and lags for different types of freight.
Data set: Official statistics on Russian "basics branches", industry and railroad transportation.
Methods: Analysis of turning points.
Most relevant references: cycles in railroad freight transportation.

JEL Classification: C82 - Methodology for Collecting, Estimating, and Organizing Macroeconomic Data; Data Analysis; E32 - Business Fluctuations; Cycles

1   Introduction

Railroad freight transportation is not in the focus of researchers in the field of business cycles. There were some investigations in the middle of the last century and before (e.g. Burns, 1954) but there was a long pause later. Even in the reference lists of such studies as (Klus et al., 2005) and more recently (Lahiri and Yao, 2012), there are only a few items on this issue. The reason is quite simple: for years there were no satisfactory monthly statistics on railroad freight transportation in the United States.

But in Russia the situation is quite different. In 1920, shortly after the communist revolution, a well-arranged system of railroad statistics was created. Under the Soviet planned economy this was much easier than in a market-oriented economy, as the whole railroad system was under full state control. But because of high secrecy (which is typical for socialist economies), only a few figures from all the collected information -- which was very detailed -- were published. All other information was marked as a "secret" or "top secret". Historical data has only become partially (!) available in recent years.

In post-Soviet Russia, a lot of railroad statistics are published monthly. But they have never been used in research on business cycles as this kind of research is still not very popular in Russia. Thus our paper is the first attempt to analyze the cyclical patterns of railroad freight transportation and to compare them with the total business cycle in Russia. We also defined the turning points for railroad freight transportation activity and its leads and lags in relation to the total Russian business cycle.

2   The Data

2.1   Business Cycles in the Post-Soviet Economy

We have no possibility here to discuss a very interesting question about cycles under a planned economy or about the nature of transition from a planned to a market economy (this period may or may not be considered as a phase of Russian business cycle). Rather we shall pay attention to the period *after* transition, therefore on 1995 and beyond.

As there are no "official" (or generally accepted) dates for Russian cyclical peaks and troughs, we have used our own estimates. They are based on the seasonally adjusted monthly index which has six "basic economic branches" (industry, agriculture, construction, transportation, retail trade, and wholesale trade) as its components. This aggregated index is shown in Figure 1. The separate indexes for industrial output and railroad freight transportation are also plotted there.

Figure 1   Seasonally Adjusted Base Indexes (SAAR), 2005 = 100
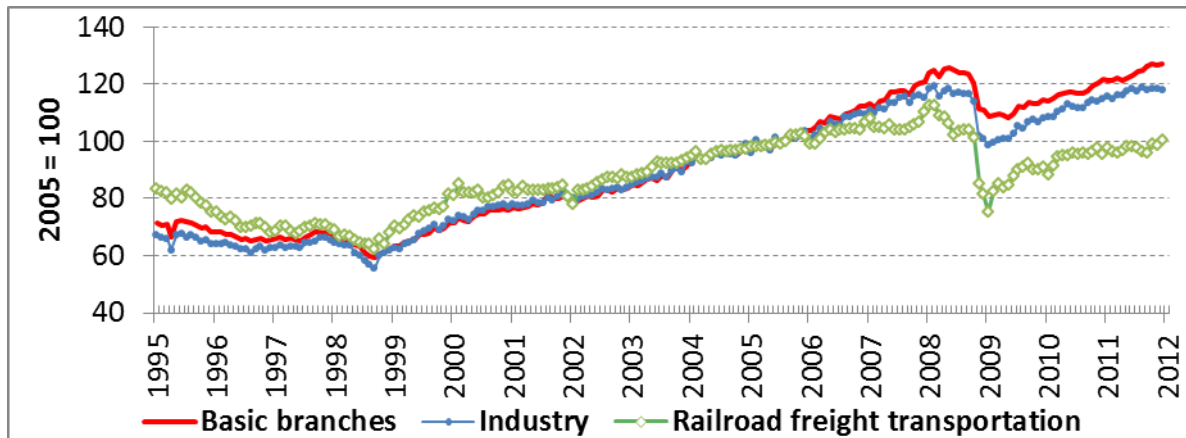
Source: Rosstat. Author's calculations

One may see from Figure 1 and Table 1 that in most cases the turning points for the basic branches and for industry are the same or near to one another. The turning points for railroad freight transportation usually coincide with the turning points for industry, but there was no pronounced expansion in this sector in 1997.

Table 1 Turning Points for Basic Branches, Industry and Railroad Freight Transportation

Type of Goods	Basic branches	Industry	Railroad Freight Transportation
Trough	Aug. 96	Aug. 96	May 97
Peak	Sep. 97	Nov. 97	Oct. 97
Trough	Sep. 98	Sep. 98	Sep. 98
Peak	May 08	Feb. 08	Feb. 08
Trough	May 09	Jan. 09	Jan. 09

Source: Author's calculations

2.2   Statistics on Railroad Freight Transportation

Since 1995 the monthly statistics on railroad freight transportation have been published regularly by Rosstat (the Russian government's statistical agency). We used the data on the total amount (in millions of tons) for all goods transported by railroads in all months from January 1995 till December 2011. Since 1997 the total amounts for 14 separate kinds of goods (listed in Table 2) have also been available.[1]

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[1] To be more precise, there are only 12 separate kinds of goods. Two items ("imported goods" and "other goods") are rather combined categories of multitudes of goods.

Table 2   Main Goods Transported by Russian Railroads

Type of Goods	Weight (average for 1997-2011),%
TOTAL	100.0
Coal	23.1
Crude oil and oil products	17.5
Construction materials	14.7
Other goods*	12.5
Iron and manganese ore	8.3
Ferrous metals	5.9
Primary forest; lumber and wood products	4.4
Fertilizers	3.4
Cement	2.6
Non-ferrous ores	2.0
Grain and grain mill products	1.9
Ferrous scrap	1.8
Imported goods	1.2
Coke	1.0

Note: * - a difference between total amount and all listed categories

Source: Rosstat. Author's calculations

3   Cyclical Patterns of Railroad Freight Transportation in Russia

3.1.   Peaks and Troughs

As Rosstat never adjusts railroad freight transportation time-series for seasonal factors, we calculated the seasonally adjusted series using the Tramo/Seats algorithm from the Demetra program.[2] This made it possible to seek for cyclical peaks and troughs for each kind of goods listed in Table 2. We used three methods to define cyclical turning points: by Bry and Boschan (1971); by Harding and Pagan (2002); and by simply taking the local maximums as peaks and the local minimums as troughs. In most cases the results were the same; they are shown in Table 3.

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[2] We are grateful to Nickola Kondrashev for making these estimates

Table 3   Peaks and Troughs for Railroad Freight Transportation of Various Goods

Type of Goods	1998 Crisis		2008-2009 Crisis	
	Peak	Trough	Peak	Trough
TOTAL	Oct. 97	Sep. 98	Feb. 08	Jan. 09
Coal	Oct. 97	Sep. 98	Feb. 08	Jan. 09
Crude oil and oil products	Jun. 97	Jun. 98	Feb. 08	Jan. 09
Construction materials	Jan. 97	Nov. 98	Feb. 08	Jan. 09
Other goods*	Oct. 97	Aug. 98	Jan. 08	Jan. 09
Iron and manganese ore	Nov. 97	Sep. 98	Jul. 08	Nov. 08
Ferrous metals	Sep. 97	Sep. 98	Jun. 08	Nov. 08
Primary forest; lumber and wood products	Oct. 97	Sep. 98	Mar. 07	Jan. 09
Fertilizers	Sep. 97	Jul. 98	Aug. 08	Nov. 08
Cement	May 97	Jan. 98	Jan. 08	Apr. 09
Non-ferrous ores	Jun. 97	Sep. 98	Jan. 08	Jan. 09
Grain and grain mill products	Aug. 97	Aug. 98	Nov. 07	Dec. 08
Ferrous scrap	Nov. 97	Sep. 98	Aug. 08	Nov. 08
Imported goods	Mar. 97	Oct. 98	Mar. 07	Mar. 09
Coke	Nov. 97	Jul. 98	May 08	Jan. 09

Note: * - a difference between total amount and all listed categories

Source: Author's calculations

3.2.   Heightened Cyclical Volatility

From 1989 till 1996 there was a very long (8 years!) period of continuous decline of the Russian economy; as a result it had approached its "bottom". As the 1998 crisis occurred after a mild and short expansion in 1997, this crisis was not deep (there was "no place" to fall for the economy). On the contrary, the 2008-2009 crisis happened after a long (10 years) period of rapid growth, and there were serious signs of overheating just before the drop. Thus the 2008-2009 crisis was very profound. However, in both cases the decline in the volume of railroad freight transportation for the majority of goods was much more significant than the decline in the output of the basic branches and even than the decline of industrial production. The drops in percentages from the peaks to the troughs for both recessions are shown in Table 4.

Table 4 Crisis Drops in Russia: Troughs to Peaks, % change

Category	1998 Crisis	2008-2009 Crisis
Basic Branches	-13.4	-14.0
Industrial production	-15.9	-17.4
Railroad Freight Transportation, Total	-12.9	-33.0
Coal	-15.9	-22.6
Crude oil and oil products	-12.2	-10.1
Construction materials	-16.2	-62.8
Other goods*	-20.9	-42.5
Iron and manganese ore	-15.9	-52.0
Ferrous metals	-22.2	-43.8
Primary forest; lumber and wood products	-14.4	-56.4
Fertilizers	-10.5	-45.5
Cement	-15.2	-44.6
Non-ferrous ores	-26.9	-30.0
Grain and grain mill products	-46.2	-31.4
Ferrous scrap	-27.7	-77.9
Imported goods	-49.1	-53.7
Coke	-15.7	-57.4

Note: * - a difference between total amount and all listed categories

Source: Author's calculations

How may it be explained? One may note that for the most part railroad freight transportation in Russia consists of raw materials and nonindustrial supplies. On the average, fluctuations of total industrial output and raw materials output are alike, and this is not surprising, as the latter makes up a large part (70% or more) of the structure of Russian industry.[3] So, if the railroad freight transportation dropped more than the whole economy or industrial production (and it did, in fact!) we may have two explanations. The first is that the stocks of raw materials and supplies grew significantly during both recessions. There is no available information on the trajectory of raw materials stocks in Russia; therefore we can't check this hypothesis in a straightforward way. However, we don't believe this explanation works, because according to the Russian SNA the total amount of stocks (not only of raw materials but also of final products) dropped markedly in 1998 as well as in 2008-2009. Hence we prefer the second explanation: that the goods which are usually transported by railroads are more sensitive to cyclical movements than raw materials on the average, or the whole industry, or the whole economy.

Since the volume of railroad freight transportation is an indicator which is highly sensitive to cyclical fluctuations, it may be useful for generating an alarm signal for an upcoming recession, even if it's only coincident to the business cycle.

3.3.   Coincident or Leading?

The comparison of turning points for macroeconomic cycles (= turning points for the basic branches' output) with those for railroad freight transportation activity – and by different types of goods - shows that in most cases (especially during the 2008-2009 crisis) railroad freight transportation leads the macroeconomic cycle by 3-6 months; it may also be coincident with the industrial cycle (see Table 5).

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[3] For details see (Smirnov, 2013), pp. 9-11.

Table 5   Leads (-)/Lags (+) for Railroad Freight Transportation of Various Goods, Months

Type of Goods	1998 Crisis		2008-2009 Crisis	
	Peak (Sep. 97)	Trough (Sep. 98)	Peak (May 08)	Trough (May 09)
Industrial production	2	0	-3	-4
Railroad Freight Transportation, Total	1	0	-3	-4
Coal	-3	0	-3	-4
Crude oil and oil products	-8	-3	-3	-4
Construction materials	1	2	-3	-4
Other goods*	2	-1	-4	-4
Iron and manganese ore	0	0	2	-6
Ferrous metals	0	0	1	-6
Primary forest; lumber and wood products	0	0	-14	-4
Fertilizers	-4	-2	3	-6
Cement	1	-8	-4	-1
Non-ferrous ores	-3	0	-4	-4
Grain and grain mill products	-1	-1	-6	-5
Ferrous scrap	2	0	3	-6
Imported goods	6	1	-14	-2
Coke	2	-2	0	-4

Note: * - a difference between total amount and all listed categories

Source: Author's calculations

Is this result helpful from a practical point of view? We think it is. In real-time, it's quite difficult to discern a cyclical turning point because all estimates of seasonal factors are highly unsteady near the end of a time-series. But if a dozen or more unsteady estimates show the same direction, then there are many more reasons to believe in the beginning of a new cyclical phase. In other words, it is a much more distinct alarm signal.

4   Conclusions

One may note that the physical qualities of many raw materials make them suitable for transport by railroads. Indeed, the transportation of raw materials -- not other goods -- is the main specialization of Russian railroads. The cyclical sensibility and leading qualities of raw materials, however, are well known. That is the reason for Russian railroad freight transportation activity to be a leading indicator for the macroeconomic cycle and (at least) coincident for the industrial cycle.

Therefore, monthly railroad freight transportation may be an important indicator for the regular monitoring of the Russian business cycle; the breakdown by kinds of transported goods (such as coal; oil and products; construction materials; fertilizers; etc.) may become important additions to this monitoring system.

But Russian statistics on railroad freight transportation are not only monthly. There are also *daily* statistics, which make it possible to trace the business cycle in real-time, day by day. Ordinarily there is no need for such detailed analysis, but in the pre-stormy atmosphere which exists on the threshold of a recession, daily *non-financial* information may be very useful.

The similarity of expansions and contractions in total output and total railroad freight transportation activity may also help in reconstructing the historical trajectory of the Russian economy since 1920. For the moment there are a lot of unfilled blanks in Russian economic history (e.g. the

post-revolution period; years of the first and the second Soviet five-year plans; the World War II years, etc.). It may be that no other single indicator exists which can so conveniently fill most of them in.

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