

**Estimating GDP and Volatility in
the Russian Empire, the Soviet Russia and the present Russia:
1860-2017**

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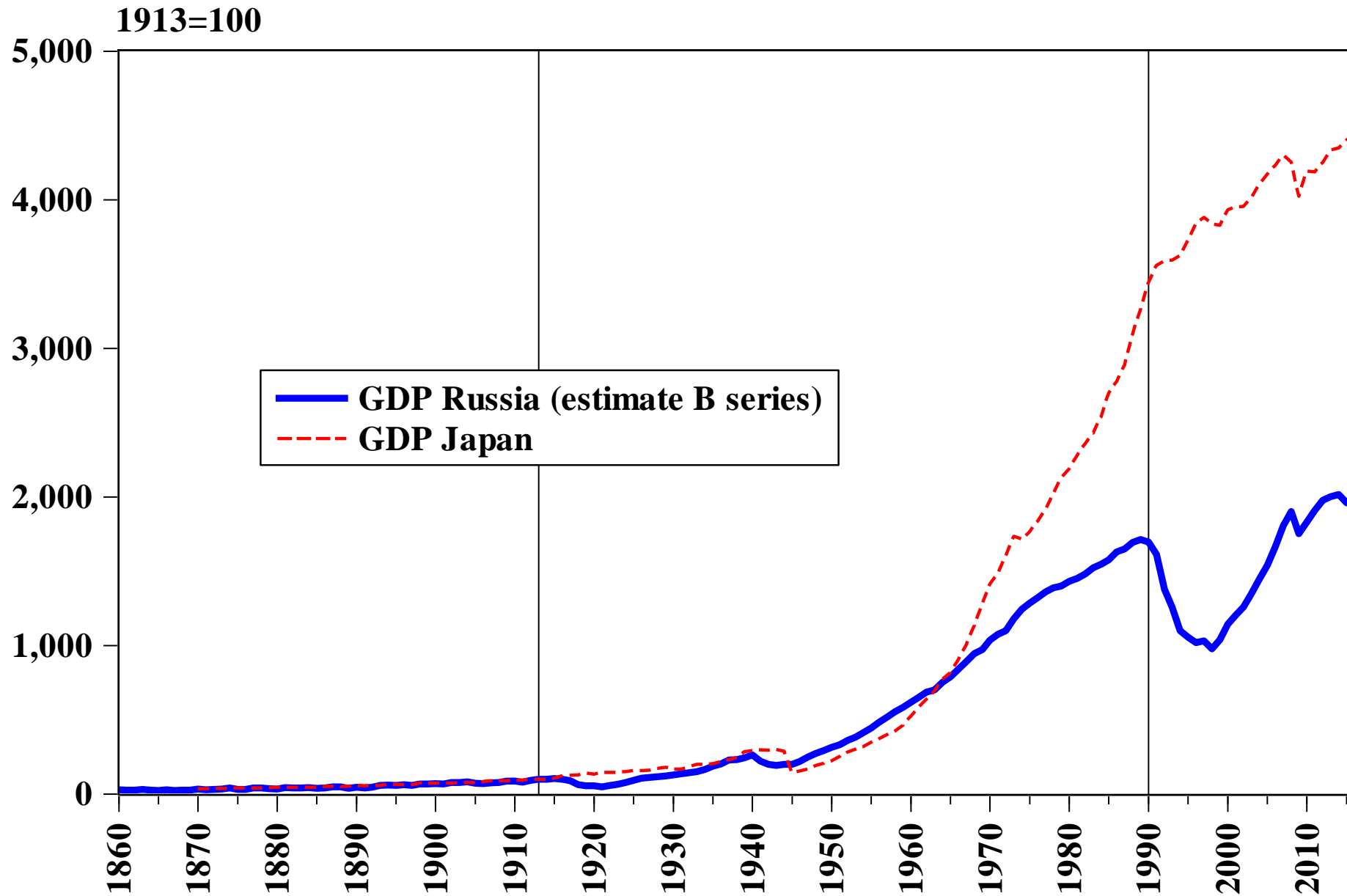
Tasks

- We provide our joint team estimates of GDP growth path in the Russian Empire and the Soviet Russia for 1860-2017, which is finally integrated into our GDP estimate in the present territory of Russia.
- We also provide international comparisons of estimated GDP, including its volatility. This would contribute to a clarification of the background of the 1st revolution in 1917.
- We also try to examine the background of the 2nd revolution in the end of 1991.

Methodology for estimates of GDP growth

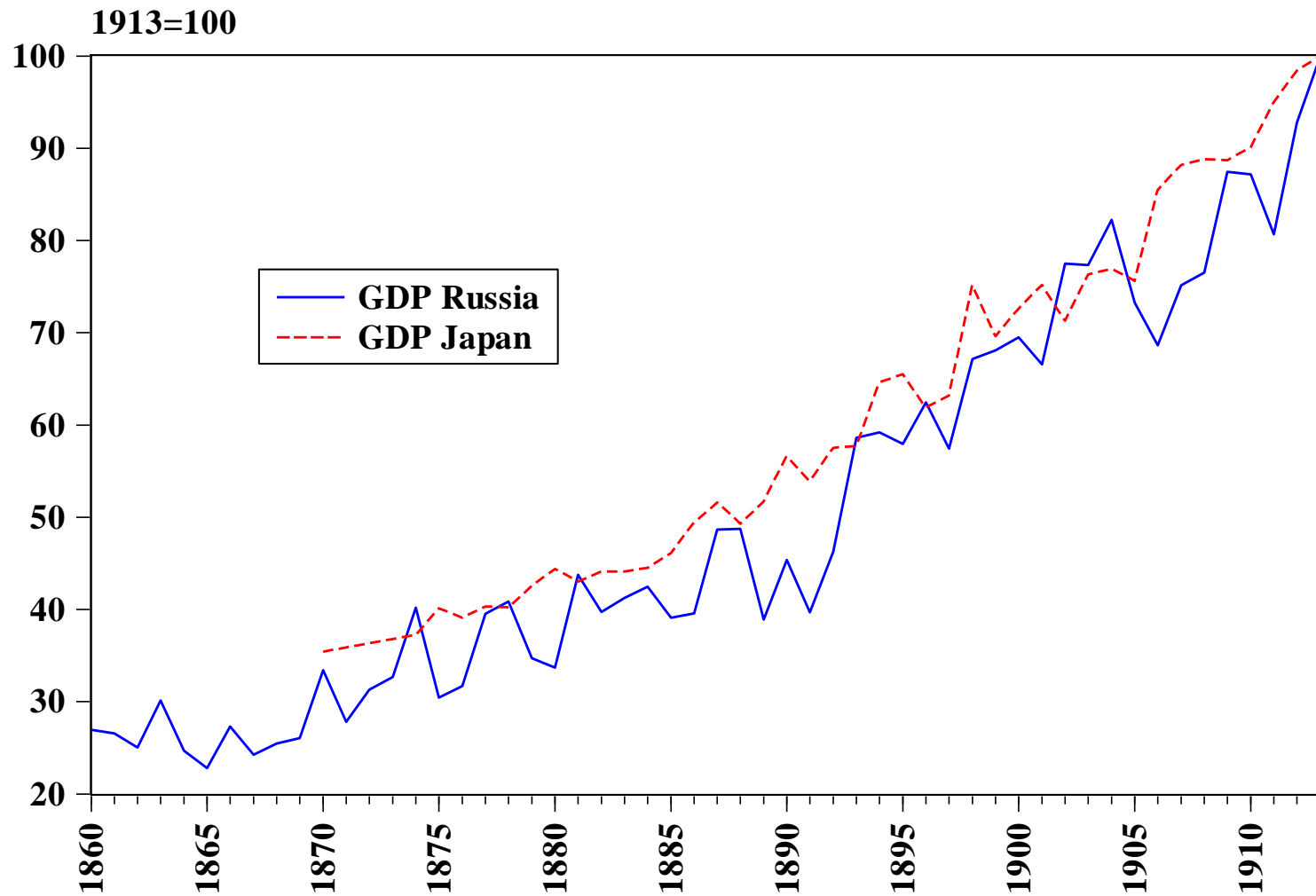
- Production approach focusing on quantities without heavily relying on price statistics.
- Russian empire: industry and agriculture: Suhara [2017]. A well known Conventional method for small industry, construction, and T&C. Trade and services are our estimates. We consider the scale of GDP of the present Russia is proportional to populations, assuming the equality of growth rates between Russian Empire and the present Russia. An estimate of population in the present Russia for 1867-2017 is utilized in our estimate of per capita GDP.
- We link Markevich and Harrison [2011]'s estimate of the USSR for 1913-1928 to our estimate except agriculture.
- For 1913-1990, data on industry and agriculture are from Suhara [2017] (estimate A); and Kuboniwa-Ponomarenko [2000] and Kuboniwa [1997] for 1960-1990 (estimate B). Data on physical growth of construction, T&C, trade, non-material services are from Kuboniwa [2017]. Bench-mark value-added structures in current prices for 1961, 1965, 1970, 1975, 1980, and 1985 are employed.

GDP growth in Russia and Japan: 1860-2016



Sources: Author's estimates, ROSSTAT, Ohkawa [1974], Maddison [2010], ESRI.

GDP growth in Russia and Japan: pre-1913 period



Sources: Ohkawa et al. [1974], Maddison [2010], Author's estimates based on Suhara [2017].

GDP growth in Russia and Japan: 1860-1913

Russian growth rate was not so bad, while per capita growth rate was bad.

International comparison of Russian growth for 1860-1913

	GDP growth rate %			per capita GDP growth rate %		
	1860-1913	1860-1885	1885-1913	1860-1913	1860-1885	1885-1913
Russia	2.5	1.5	3.4	0.9	-0.1	1.8
USA	3.9	4.0	3.7	1.7	1.6	1.7
Japan	2.4	1.8	2.8	1.5	1.0	1.7
France	1.4	0.9	1.8	1.2	0.6	1.6
Germany	2.7	2.1	3.1	1.5	1.2	1.8
Italy	1.8	1.0	2.4	1.1	0.3	1.7
UK	1.9	1.8	2.0	1.0	0.9	1.1
West Europe 12 countries	2.2	1.9	2.5	1.4	1.1	1.6

Sources: Author's estimate, Maddison [2010], Maddison Project [2013].

Notes:

Japan's data start with 1870.

West Europe 12 countries are Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Sweden, Switzerland and UK.

International comparison of Russian GDP in 1913 US\$ (gold standard)

	GDP (mln US\$)				per capita GDP (US\$)			
	1860	1870	1885	1913	1860	1870	1885	1913
Russia								
Russian Empire	2,648	3,283	3,840	9,825	35.9	38.7	30.8	56.8
USSR	2,161	2,679	3,133	8,017		30.2		51.3
present Russia	1,459	1,808	2,115	5,412	35.3	38.0	36.1	56.8
USA	5,308	7,529	14,236	39,600	166.7	187.1	250.3	407.0
Japan		916	1,193	2,617		27.7	38.4	50.6
France	4,665	4,765	5,797	9,550	125.1	124.0	145.9	230.3
Sweden	288.2	357	493	1,089	75.4	85.7	105.6	193.8

Sources: Author's estimations, Maddison [1995; 2010], Edvinsson [2015], Edvinsson ed. [2016]. Ohkawa et al [1974], Kumo et al. [2004]., US Census Bureau [1975].

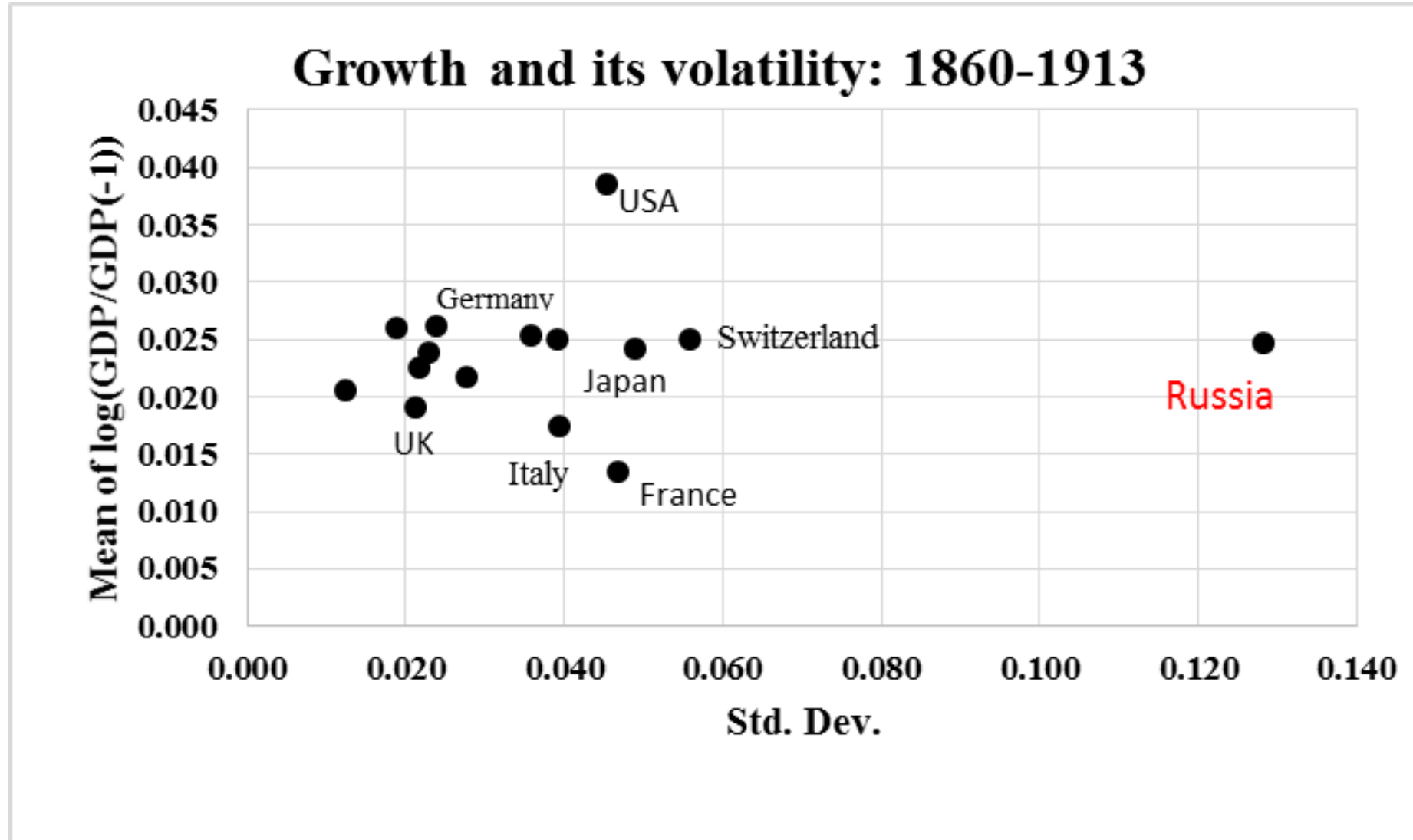
International comparisons of Russian GDP

using Maddison's 1990GK\$ and World Bank's 2011 international \$.

	1860	1870	1885	1913	1860	1870	1885	1913
	GDP in 1990GK mln\$				per capita GDP in 1990GK \$			
Russia								
Russian Empire	76,756	95,168	111,303	284,777	1,039	1,120	894	1,646
USSR	62,626	77,648	90,813	232,351		876		1,488
present Russia 1	42,275	52,416	61,303	156,847	<i>1,024</i>	1,103	1,047	1,646
present Russia 2	19,014	23,575	27,572	70,545	461	496	471	748
USA	69,346	98,374	185,992	517,383	2,178	2,445	3,270	5,301
Japan		25,393	33,052	71,653		737	860	1,387
France	70,577	72,100	87,705	144,489	1,892	1,876	2,207	3,485
Sweden	4,570	5,659	7,812	17,273	1,195	1,359	1,675	3,073
Germany	59,096	72,149	99,917	237,332	1,639	1,839	2,216	3,648
UK	81,760	100,180	128,706	224,618	2,830	3,190	3,574	4,921
	GDP in 2011 mln international \$				per capita GDP in 2011 international \$			
present Russia 2	51,109	63,368	74,112	189,620	1,238	1,333	1,266	1,990
USA	110,778	157,149	297,116	826,502	3,479	3,905	5,224	8,468
Japan		38,709	50,384	109,227		1,124	1,311	2,114

Sources: Author's estimates, Maddison [2010], ICP [2014], WDI (May, 2017), Kumo et al. [2004].

Russia's large volatility of growth for pre-1st revolution : background of communist revolution



International comparison of Russia's growth volatility
SD of deviation from trend line

$$\log(\text{GDP}) = a_1 * \log(\text{GDP}(-1)) + a_2 * \text{trend} + C$$

	1860-1913	1860-1885	1885-1913
Russia	0.099	0.104	0.089
[Gregory 1982]			[0.067]
USA	0.041	0.032	0.041
Japan	0.038	0.020	0.039
France	0.039	0.044	0.028
Germany	0.023	0.026	0.014
Italy	0.038	0.021	0.039
UK	0.020	0.017	0.022
West Europe 12 countries	0.028	0.028	0.021
Russia to other countries (times)			
to USA	2.4	3.3	2.2
to Japan	2.6	5.1	2.3
to West Europe	3.6	3.7	4.1

Sources: Author's calculations and Maddison [2010].

Notes:

Data of USA and Japan start with 1870.

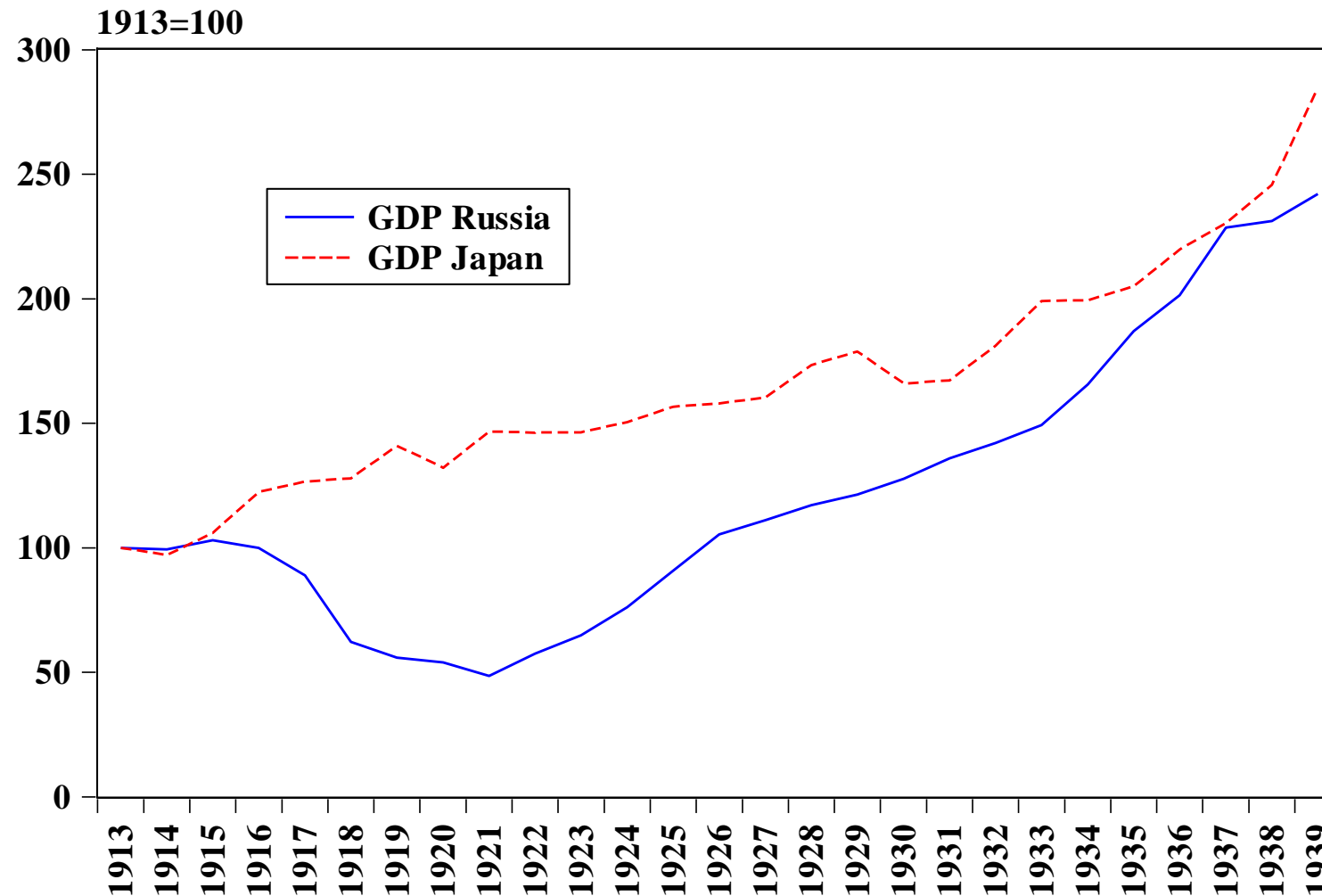
Russian growth volatility by sector in comparison with Japan

SD of $\log(\text{GDP}/\text{GDP}(-1))$

		GDP	Agriculture	Industry
Russia				
1860-1913	mean	0.025	0.018	0.047
	SD	0.128	0.191	0.075
1860-1885	mean	0.015	0.007	0.046
	SD	0.148	0.199	0.099
1885-1913	mean	0.034	0.028	0.047
	SD	0.110	0.187	0.047
Japan				
1885-1913	mean	0.028	0.016	0.060
	SD	0.058	0.101	0.053
Russia to Japan for 1885-1913: SD (times)				
		1.89	1.86	0.87

Sources: Author's calculations using own estimates and Ohkawa et a. [1974].

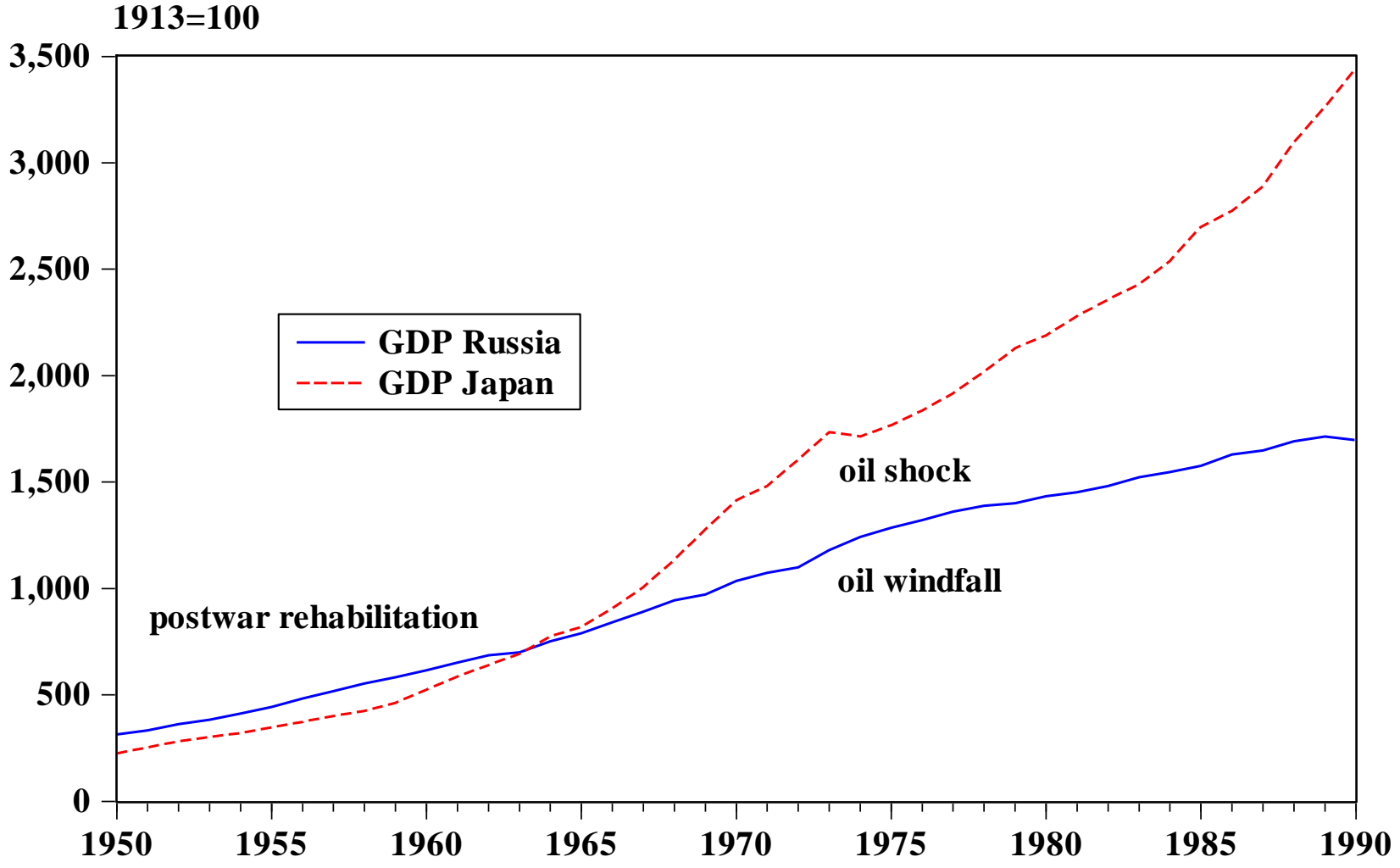
GDP growth in Russia and Japan: inter-war period



Sources: Ohkawa et al [1974], Author's estimates.

GDP growth in Russia and Japan: 1913-1939

GDP growth in Russia and Japan: postwar period



Sources: ESRI, Maddison [2010], author's estimates.

Estimates of GDP growth rate in Russia (Republic): 1913-1990

benchmark		1913- 1990	1917- 1990	1913- 1928	1917- 1928	1928- 1940	1950- 1990	1950- 1960	1960- 1990
Estimate A	chain, basic prices	3.6	4.0	1.1	2.5	6.8	4.0	7.0	3.1
Estimate B	chain, basic prices	3.7	4.1	1.1	2.5	6.7	4.3	7.0	3.4
Average of estimates A, B		3.7	4.1	1.1	2.5	6.7	4.2	7.0	3.2
Official national income (NMP)	chain, established prices		7.0				5.9	9.6	4.8
	chain, basic prices								4.9
CIA USSR	1982 adj. factor costs						3.5	5.2	2.9
(·)	figures for 1950-1987						(3.8)		(3.2)
CIA USSR	1982 established prices							6.0	
							(4.1)		(3.4)
Maddison USSR		2.8		-0.01		5.1	3.5	5.2	2.9
MH USSR	1913 prices			0.6	2.7				

Sources: Author's estimations, CIS statistics committee, Statistical year books of Republic of Russia, various years, JEC [1990], CIA [1991], Maddison [2010], MH= Markevich and Harrison [2011].

International comparison of Russian per capita growth rate (%): 1913-1990

	1913- 1990	1913- 1928	1928- 1940	1950- 1990	1950- 1960	1960- 1990
Russia (average estimate)	3.1	1.0	5.7	3.2	5.3	2.5
USA	1.9	1.4	0.5	2.2	1.7	2.4
Japan	3.4	2.4	3.1	5.9	7.6	5.3
France	2.1	1.6	-0.8	3.1	3.6	2.9
Germany	1.9	0.8	2.3	3.6	7.1	2.5
Italy	2.4	1.1	1.3	3.9	5.4	3.4
UK	1.6	0.6	2.1	2.2	2.2	2.2
West Europe 12 countries	2.1	1.4	0.8	3.0	3.7	2.8

Sources: Author's estimates, Maddison [2010].

International comparison of Russian per capita growth rate (%): 1913-1990

	1913- 1990	1913- 1928	1928- 1940	1950- 1990	1950- 1960	1960- 1990
Russia (average estimate)	3.1	1.0	5.7	3.2	5.3	2.5
USA	1.9	1.4	0.5	2.2	1.7	2.4
Japan	3.4	2.4	3.1	5.9	7.6	5.3
France	2.1	1.6	-0.8	3.1	3.6	2.9
Germany	1.9	0.8	2.3	3.6	7.1	2.5
Italy	2.4	1.1	1.3	3.9	5.4	3.4
UK	1.6	0.6	2.1	2.2	2.2	2.2
West Europe 12 countries	2.1	1.4	0.8	3.0	3.7	2.8

Sources: Author's estimates, Maddison [2010].

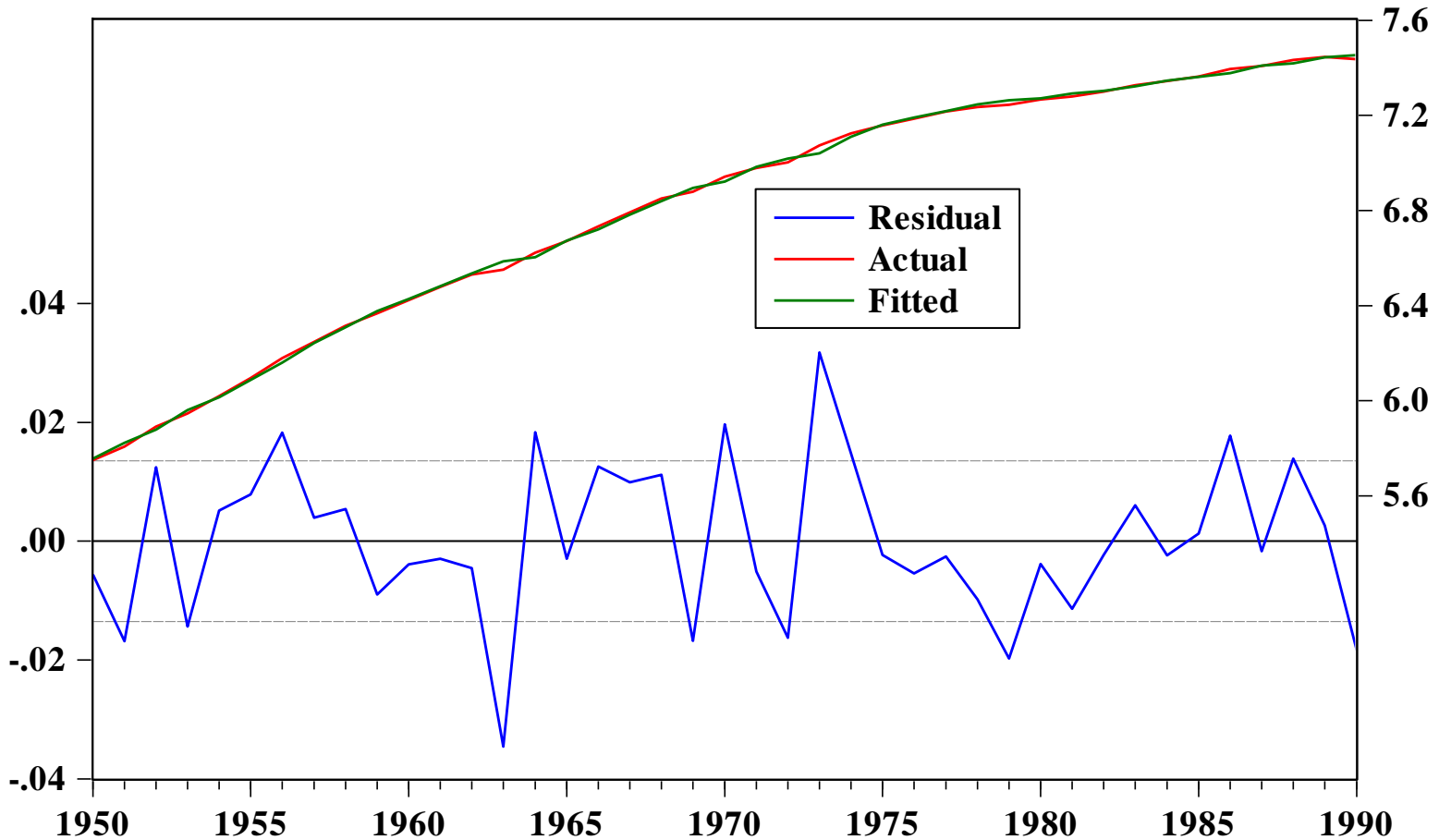
International comparison of Russian growth volatility: 1913-1990

SD of log(GDP/GDP(-1))

	1913-1990		1913-1928		1928-1940		1950-1990		1950-1960		1960-1990	
	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD
Russia A	0.036	0.076	0.011	0.145	0.068	0.035	0.040	0.026	0.067	0.012	0.030	0.022
Russia B	0.037	0.076	0.011	0.145	0.067	0.035	0.042	0.024	0.067	0.012	0.034	0.021
USA	0.031	0.063	0.029	0.056	0.013	0.086	0.035	0.024	0.034	0.031	0.035	0.022
Japan	0.045	0.097	0.037	0.056	0.044	0.055	0.067	0.033	0.085	0.025	0.061	0.034
France	0.025	0.088	0.015	0.116	-0.008	0.077	0.038	0.018	0.045	0.016	0.036	0.018
Germany	0.022	0.119	0.007	0.114	0.030	0.062	0.039	0.029	0.074	0.017	0.027	0.021
Italy	0.030	0.069	0.016	0.076	0.021	0.040	0.043	0.023	0.059	0.010	0.038	0.024
UK	0.019	0.036	0.006	0.057	0.025	0.037	0.025	0.019	0.026	0.019	0.025	0.019
West Europe 12 countries	0.027	0.067	0.018	0.079	0.014	0.053	0.035	0.023	0.044	0.022	0.032	0.021

Sources: Author's estimates, Maddison [2010].

Negative growth trend and non-positive TFP with bad quality of GDP for pre-2nd revolution



Dependent Variable: log(GDP)

Sample: 1950-1990 OLS with HAC std. errors/covar

Variable	Coefficient	p-value
log(GDP)(-1)	1.007	0.0000
trend	-0.002	0.0146
C	0.212	0.0000

Adj. R² 0.999

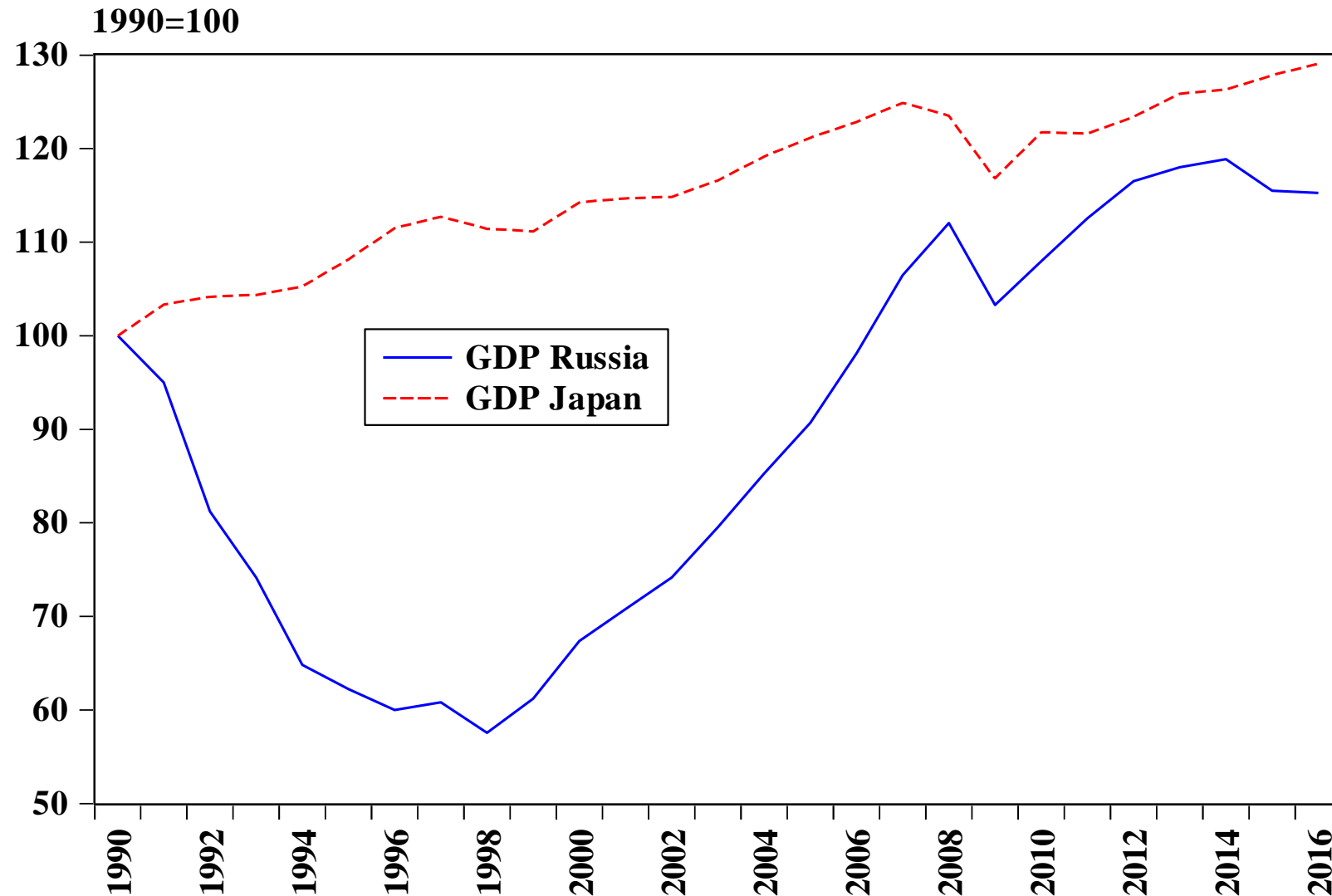
Dependent Variable: log(NMP/L)

Sample: 1971-1988 CCR

Variable	Coefficient	p-value
log(K/L)	0.683	0.0009
trend	-0.010	0.0014
C	1.653	0.0000

Adj. R² 0.997

GDP growth in Russia and Japan: post-Soviet period



Sources: ROSSTAT, ESRI.

Concluding remarks

- **Russia experienced economic growth through two revolutions. Indeed, it is the unique country.**
- **We provided our joint team estimates of GDP growth of the present Russian territory for 1860-1990. This is the first attempt in the literature.**
- **The large volatility of growth and low per capita growth constituted the background of the 1st revolution. A negative growth trend with non-positive TFP as well as the badness of GDP quality resulted in the 2nd revolution.**
- **The GDP loss (50% of GDP) during the 1st revolution was recovered by NEP and Stalinism policy, while Russia failed to its path to intensive growth with improvements of GDP quality.**
- **The GDP loss (40 % of GDP) during the 2nd revolution has not yet been fully restored even though the GDP quality has been improved to a large extent. Russia suffers from Russian disease (Kuboniwa, 2012). Catch-up with advanced economies would be rather difficult except the military industry, without oil price increases. The 2nd revolution, unlike the 1st revolution, has not yet created Russia's own clear visions for its prospective future.**