Environmental Implications of Russia's Accession to the WTO

David G. Tarr, NES and Natalia Turdyeva, CEFIR
October 2015

We investigate the environmental impacts of Russia's World Trade Organization (WTO) accession with a computable general equilibrium model incorporating imperfectly competitive firms, foreign direct investment and endogenous productivity. The WTO accession affects CO2 emissions through technique (−), composition (+) and scale (+) effects. We consider three complementary policies to limit CO2 emissions: cap and trade, emission intensity standards, and energy efficiency standards. With imperfectly competitive firms, gains from WTO accession result with any of these policies.

Environmental Policy Debate in Russia

Russia's natural endowments have, based on production and export of raw materials, been a key driver of economic growth in the current millennium. As a legacy of the Soviet period, many industries are characterized by high resource usage, very high-energy intensities, and obsolete production processes.

The quality of environmental conditions in Russia is inadequate in about 15 percent of the country's territory: according to Rosgidromet (2013), in 138 cities that accounts for 57 percent of the urban population, the level of air pollution is characterized as high or very high. The main sources of air pollution are particulate matter, sulphur dioxide and nitrogen oxide linked primarily to fossil fuel combustion (International Finance Corporation (IFC), 2008).

Russia is currently the world's fourth largest emitter of greenhouse gas emissions. While Russia ratified the Kyoto Protocol in 2004, it has so far refused to commit to the internationally binding post-Kyoto commitments. Nonetheless, Russia is still pursuing a national greenhouse gas emission reduction program of between 15 percent and 25 percent from 1990 emission levels by 2020, as well as a broader set of policies for sustainable development (Ministry of Natural Resources and the Environment of the Russian Federation, 2014). Along with the emission-reduction targets, the Russian government emphasizes the need for increased investments in energy and resource efficiency (Ministry of Energy of the Russian Federation, 2010), cleaner technologies, recycling and reuse of wastes.

Against this background, Russia's WTO accession has engendered concerns about potentially negative environmental impacts. The WTO accession is a comprehensive process that involves multiple reforms including maximum tariff commitments on goods, non-protective application of standards and norms, market access for foreign suppliers of services, rules on trade-related investment measures, and limitations on trade-distorting agricultural subsidies. Such comprehensive changes in policies and institutions are likely to lead to considerable changes in the structure of the economy. The structural changes can have complex impacts on the environment that are very difficult to predict based on theory. Using the terminology of Grossman and Krueger (1993), the potential environmental impacts can be decomposed into: *(i)* a composition effect, namely inter-industry impacts along the lines of comparative advantage (toward or away from dirty industries) and competitive pressures that could shift output toward more efficient firms and lower input use; *(ii)* a scale effect due to output changes induced by trade liberalization; and *(iii)* a technique effect, due to the use of more efficient imported technology (which could reduce input use and emissions), changes in process efficiency, and changes in fuel mix.

Given that the Russian Federation's Program on Environmental Protection 2012–2020 emphasizes the need for environmental policies to accompany economic growth to achieve sustainable development, policy makers in Russia are concerned about the environmental effects of the WTO accession, and may wish to implement regulation in order to mitigate potentially negative implications for the environment.

Simulation Results

In our forthcoming paper, Böhringer et al (2015) we address the question of the economic and environmental impact of Russia's WTO accession. We extend a 10-region, 30-sector computable general equilibrium model of the Russian economy (Rutherford and Tarr, 2010) by incorporating emissions data, and by allowing inter-fuel substitution in production and consumption activities. There is substantial and growing econometric evidence that greater access to business services increases productivity in the firms that use these business services. Our model, by allowing for imperfectly competitive goods and business service sectors (i.e. an IRTS model), captures these endogenous productivity effects. We show that this is crucial for the policy conclusions.

Acknowledging the endogeneity of environmental policy with trade liberalization, and the stated objective of the Russian government to reduce CO2 emissions, our analysis goes beyond an isolated impact assessment of Russia's WTO accession. More specifically, we combine the policy changes of the WTO accession with three alternate environmental regulations designed to reduce CO2 emissions: market-based cap and trade, emission intensity standards, and energy efficiency standards.

A simulation of the cap and trade regulation imposes a 20 percent reduction of CO2 emissions in Russia through a system of tradable emission rights (or equivalently a nation-wide CO2 tax). In the case of uniform emissions intensity standards, we require that all sectors and regions, except for fossil fuels sectors (coal, crude oil, and gas), uniformly reduce the intensity of their CO2 emissions per unit of the value of output produced. We solve for the uniform reduction in the intensity of CO2 emissions so that a twenty percent reduction in CO2 emissions is achieved. In the case of uniform energy efficiency standards, we require that, in all regions, all sectors except electricity and fossil fuel production equiproportionaly reduce their use of gas, refined oil and electricity. We solve for the uniform reduction in the use of energy inputs such that a twenty percent reduction in CO2 emissions is achieved.

Using our IRTS model, we find that WTO accession alone will increase environmental pollution in Russia (a 4.3 percent increase of the CO2 emissions, see Table 1). We estimate an expansion of dirty industries in Russia: ferrous and non-ferrous metallurgy, chemical industry, coal extraction, oil refinery, and electricity production (for more industry-level details see Böhringer et al., 2015). Our decomposition shows that the negative effect on the environment of the composition effect (especially the relative expansion of dirty industries; accounts for 1 percent increase) and the expansion of output (scale effect; accounts for 4.9 percent increase) dominate the positive impact on the environment of the technique effect (which includes importing new, more efficient technologies, processes and services; accounts for a 1.6 percent decrease in the CO_2 emissions).

In Table 1, we show the economy-wide estimated gains for all seven scenarios. In particular, our cap and trade policy costs 1.4 of consumption since without additional environmental regulation, the estimated overall Russian economy average welfare gain from the WTO accession is 8.6 percent of consumption. Rutherford and Tarr (2008) reveal that the source of the largest gains is the reduction in barriers against foreign investors in services – accounting for about 70 percent of the total gains. In our model, new service providers increase the productivity of sectors that use services. Russian commitments to reduce barriers against multinational service providers could allow multinationals to obtain greater after-tax returns on their investments in Russia and thus initially create positive profits. This could induce the multinationals to increase foreign direct investment to supply the Russian market until the additional entry restores a zero-profit equilibrium. Although we find that there is some decline in the number of purely Russian owned businesses serving the service markets, on balance there will be additional service providers. Russian users of business services will then have an improved access to the providers of services in areas like telecommunication, banking, insurance, transportation and other business services.

Table 1. Nation-Wide Impacts – IRTS Models

	WTO accession alone	WTO Accession plus			Carbon Reduction Policies Alone		
		carbon emissions trading	emissions intensity standards	energy intensity standards	carbon emissions trading	emissions intensity standards	energy intensity standards
Aggregate welfare							
Welfare (EV as % of consumption)	8,6	7,2	6,4	0,6	-1,1	-1,7	-5,9
Welfare (EV as % of GDP)	4,0	3,3	3,0	0,3	-0,5	-0,8	-2,7
Carbon Dioxide Emissions and Decomposition							
CO2 price (ruble per ton of CO2)		112,4			96,0		
CO2 emissions, decomposed into:	4,3	-20,0	-19,2	-19,7	-20,0	-20,0	-19,8
Output effect (% of CO2)	4,9	3,6	2,7	-3,0	-1,0	-1,8	-6,1
Composition effect (% of CO2)	1,0	-3,6	-0,4	-6,5	-3,1	-1,0	-6,0
Technique effect (% of CO2)	-1,6	-19,5	-20,3	-10,6	-16,3	-17,1	-8,2

Source: Böhringer et al. (2015).

Conclusions

In our paper, we consider environmental impacts of Russia's WTO accession with a 10-region, 30-sector computable general equilibrium model of the Russian economy incorporating imperfectly competitive firms, foreign direct investment and endogenous productivity. We find that cap and trade is the most efficient policy for CO2 emissions. Emission intensity standards are less efficient than cap and trade in part since there is no incentive to switch sectors. The switch to clean industries (the composition effect) is much weaker with imposition of emission intensity standards than under emissions trading, since all sectors must reduce the intensity of their emissions uniformly, even if they start with fewer emissions per ruble of output. Then switching production to clean industries does not help to achieve the regulatory target. We find that the costs of emission intensity standards are drastically lower than the costs of energy efficiency standards, judged on the basis of carbon emissions alone.

Our simulations could help authorities to design policies that minimize the economy-wide costs of achieving a given level of emission reduction, and thereby address political resistance to environmental regulation.

▪

References

Antweiler, W., B. R. Copeland, and M. S. Taylor, "Is Free Trade Good for the Environment?" The American Economic Review 91 (2001):877–908.

Böhringer, C., Rutherford, T. F., Tarr, D. G., & Turdyeva, N. (2014). "Environmental Perspective of Russia's Accession To the World Trade Organization" (No. 6957). The World Bank Policy Research Paper. Washington.

Böhringer, C., Rutherford, T.F., Tarr, D. G., and N. A. Turdyeva (2015) "Market Structure and the Environmental Implications of Trade Liberalization: Russia's Accession to the World Trade Organization", Review of International Economics, forthcoming.

Grossman, G. M. and A. B. Krueger, "Environmental Impacts of a North American Free Trade Agreement," in P. M. Garber (ed.), The U.S.–Mexico Free Trade Agreement, Cambridge, MA: MIT Press (1993).

IFC, "Energy Efficiency in Russia: Untapped Reserves," International Finance Corporation, Washington, DC (2008). Ministry of Natural Resources and the Environment of the Russian Federation (2014)

Ministry of Energy of the Russian Federation, "Energy Saving and Energy Efficiency Improvement until 2020," Moscow (2010). Rosgidromet (2013):

Rutherford, T. F. and D. G. Tarr, (2008): "Poverty Effects of Russia's WTO Accession: Modeling "Real Households" and Endogenous Productivity Effects," Journal of International Economics, 75, 131–150.

Rutherford, T. F. and D. G. Tarr (2010): "Regional Impacts of Russia's WTO Accession," Review of International Economics 18(1), 30–46.

David G. Tarr

New Economic School (NES)
dtarr@nes.ru
http://www.nes.ru/en/home/

David G. Tarr is a consultant and former Lead Economist with the World Bank and Adjunct Professor of International Economics at the New Economic School, Moscow. He has authored more than 60 refereed journal articles, written or edited 11 books or monographs and over 100 other professional papers.

Tarr has worked in more than 25 countries providing trade policy advice. His solely authored journal articles include articles in Econometrica, Review of Economic Studies, Quarterly Journal of Economics, Economic Inquiry, the Southern Economics Journal, the Journal of International Economics and the Journal of Comparative Economics.

Presently, his research interests include the link between the liberalization of barriers in services and growth and poverty reduction (with applications in Tanzania and Kenya), World Trade Organization accession (with applications in Russia and Kazakhstan), assessing the impact of diverse interrelated regional integration agreements (with applications in Chile, Brazil, Russia, Armenia, Tanzania, Kenya, Kyrgyzstan and Kazakhstan), and assessing the impact of trade liberalization with heterogeneous firms.

Natalia Turdyeva

Centre for Economic and Financial Research (CEFIR)
NTurdyeva@nes.ru
www.cefir.ru

Natalia Turdyeva is senior economist at CEFIR. Her research interests include international trade, industrial organization, computable general equilibrium (CGE) models including regional CGE for Russia, and the restructuring of the Russian electricity sector.