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Mapping out vulnerable sectors in the Eastern Partnership countries

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Mapping out Vulnerable Sectors in the Eastern Partnership Countries

STRUCTURAL CHANGE, VISEGRAD EXPERIENCE AND RELEVANCE FOR EU POLICY

Edited by
ANDRÁS DEÁK

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In the middle of 2014, when we launched this project, it became obvious, that the period of relative prosperity and growth of the 2000s at the Eastern border of the EU came to an end. Economic slowdown in the post-Soviet space, currency crises in Ukraine and Belarus, emerging problems in Moldova signaled, that macro-stability stands on weak fundaments and showed the vulnerability of local economies. Coupled with the fall of the Yanukovich-regime and the conflict in Eastern Ukraine, 2014 very much looked like a historical turning point and the beginning of a new era. The future was misty with only a few points of certainty. It was clear, that Western institutions will have to engage the region more actively, the Russian economy will not be able to maintain its tractional capacity any more and some domestic reforms turn from an option into a must in Belarus, Moldova and Ukraine. Nonetheless, due to the deterioration of the external environment and domestic situations, these processes seemed to be increasingly painful, with uncertain results.

In this Report we analyzed two sectors, namely the machine and energy industries in Belarus, Moldova and Ukraine, that have particular importance in this new era. Due to their sheer size in the local GDPs, labor markets and foreign accounts, Russia's overrepresentation in the sectoral matters, the local governments will have to address the problems of these two branches in a more dedicated way. In one way or another, but some sort of solution to these sectoral problems has to be found in the years to come. Mismanagement may constitute a major impediment to local reforms, while successful responses can ease the process remarkably and improve the domestic business climate significantly. The same is true for the Western assistance and EU policies: even if Western governments usually do not address sectoral issues and focus on the foreign and macroeconomic landscape, in these particular cases problems may easily overspill the regional borders. While a common understanding regarding the necessity of experience transfer has been emerging in the field of energy, machine-building industries are still largely ignored by the Western donors.

The three Reports published in this book hopefully provide an insight into regional sectoral trends and outline some basic understanding of potential cooperation between Western and local industries, governments. I would like to express my gratitude to my colleagues from the partner institutions, to Sierz Naurodski (CASE-Belarus), Ion Muntean (IDIS Viitorul, Moldova), Malgorzata Jakubiak (CASE, Poland), Vladimir Benc (SFPA RC, Slovakia) and Vitaliy Kravchuk and Mykola Ryzhenkov (IER, Ukraine) for authoring the respective Reports and to many others, who enriched them with their observations. I am also indebted to the International Visegrad Fund (main sponsor), the Royal Dutch Government and the Hungarian Academy of Sciences, who supported the project financially. Furthermore, I am very thankful to my colleagues who helped me in organizing the related presentations, events and conferences, in particular Ágnes Szunomár (HAS CERS IWE, Hungary) and Iryna Kosse (IER, Ukraine).

András Deák

Macroeconomic Report

September 2015

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List of Abbreviations

BNM - National Bank of Moldova
BoP - Balance of Payments
CD - Certificate of Deposit
CIS - Commonwealth of Independent States
DCFTA - Deep and Comprehensive Free Trade Agreement
EBRD - European Bank of Reconstruction and Development
EFTA - European Free Trade Association
EP - Eastern Partnership
FDI - Foreign Direct Investment
FTA - Free Trade Agreement
IMF - International Monetary Fund
MFN - Most Favoured Nation
NBRB - National Bank of the Republic of Belarus
NBU - National Bank of Ukraine
UNCTAD - United Nations Conference on Trade and Development
VAT - Value Added Tax
V4 - Visegrad Four: Czech Republic, Hungary, Poland, Slovakia
WTO - World Trade Organization

Introduction

The aim of this Report is to provide a macroeconomic setting for future structural reports. It also provides ato olkit for the sectoral reports in the sense that it offers a set of macroeconomic points of reference.

Whenever possible, we try to identify the vulnerable sectors themselves. By vulnerable sectors we mean sectors with the following attributes: (1) significant input into GDP, (2) high or almost exclusive dependence on domestic/CIS markets, and high level of integration into post-Soviet value chains, (3) declining competitiveness. The reason for this is dictated by the wider aims of the whole project, which are, among others, to raise public awareness of the actual problems faced by these declining sectors and to provide a detailed account of how the management of these sectors may affect social sustainability in the modernization of the respective EP countries.

Notwithstanding the focus on the designated economic sectors, the report covers the usual aspects of macroeconomic policies. It starts with a discussion of the economic development of Belarus, Moldova and Ukraine since the early 2000s, expounding on how demand has contributed to growth (or decline). This is followed by an analysis of production trends, which singles out some of the vulnerable sectors. Public finances and labor markets are discussed next. As the next step, we perform a detailed analysis of trade in merchandise and balance of payments. Monetary and exchange rate policies are reviewed next. We also formulate projections for the near future and conclude with policy recommendations.

Although the report often looks back to the early 2000s or even earlier, we focus mostly on the period after 2009. The countries in focus were hit hard during the 2008-2009 financial crisis, which exposed the previously hidden problems of their vulnerable economic sectors. Thus the crisis provides a natural starting point for the analysis. We try to show how the EU Eastern partners dealt with the post-crisis challenges. While doing this, we also try to assess how macroeconomic imbalances can be managed and what their implications are for economic policies.

As of this writing, Ukraine is plunging into a period of deep macroeconomic instability, creating a situation that adversely affects Belarus and Moldova as well.[1] To even contemplate economic recovery in the region, ending the territorial dispute between Russian and Ukraine is the first essential step. However, we must set aside this political issue to focus on identifying the necessary steps in the sphere of economic policy.

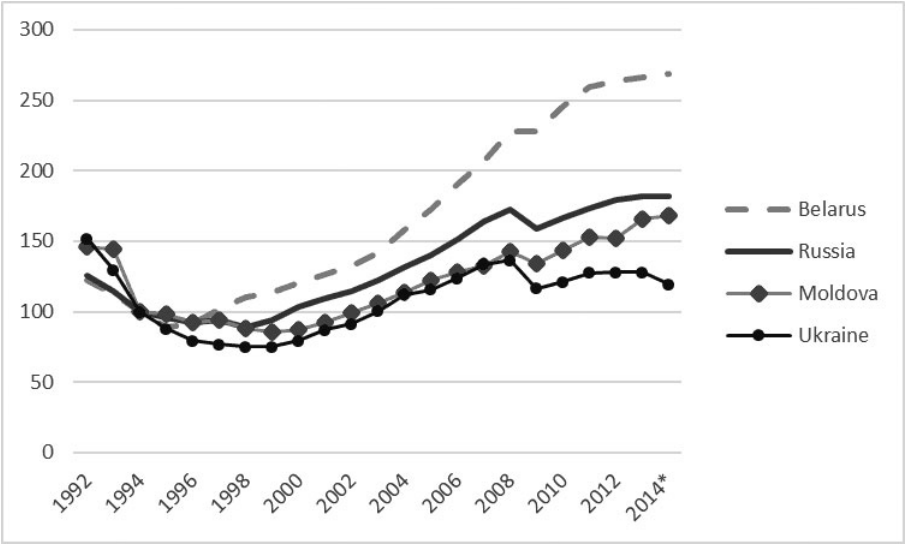
Post-2000 recovery and its sources – View from the demand side

Following the collapse of the Soviet Union, the Eastern EU partners plunged into an almost decade-long stagnation. The early 2000s brought recovery, which was largely fuelled by the mix of favorable external conditions and the economic rise of Russia (this, in turn, resulted from a combination of rising commodity prices and economic reforms). Through trade and capital ties, as well as on account of sharing the same ‘Soviet industrial heritage,’ all three EP countries that

[1] Through trade, investment and financial links.

our analysis focuses on depend to a significant extent on Russia. This relationship is reflected in the evolution of their GDP figures (see Figure 1).

Figure 1. *GDP evolution in Belarus, Moldova, Russia and Ukraine, 1992-2014*



Source: own calculations on the basis of IMF WEO database, October 2014
note: real GDP index with 1994 = 100; * – estimate

The global financial crisis of 2008-2009 resulted in a temporary downfall or stagnation (Belarus) of production. Declining global trade volumes and lower commodity prices, combined with sudden capital outflows, put national currencies under pressure. During this time, the Ukrainian and Belarusian currencies depreciated markedly. Substantial levels of exposure to external financing, coupled with rising costs in said financing, exerted pressure on fiscal policies. All this was reflected in the steep drops in 2009 of the GDPs of Russia, Moldova and Ukraine. The crisis also exposed the vulnerabilities of the Ukrainian and Moldovan banking sectors. Domestic policy responses were largely of a one-off nature and failed to address the underlying structural problems.[2] However, Russia, Belarus and Moldova continued to grow afterwards until the year 2014.

Post-2009 growth in Belarus has been fuelled by consumption and investment, while the country's trade balance has exerted negative pressure on growth throughout most of the last few years. As both consumption and investment were subsidized throughout the period, it is hard to perceive them as stable pillars of growth in the very near term.

In Moldova, these have been consumption and investment as well, in this case fuelled by remittances from abroad. Taking into account that the majority of Moldovan labor migrants seek work in Russia and Ukraine (Cantarji and Mincu, 2013), in the near term the present deterioration of the economic situation there creates a downward pressure on Moldovan growth as well.

Ukraine has practically stagnated since the 2008-2009 financial crisis. Its GDP took a deep dive in 2009, then rebounded a bit in the following two years and stopped growing afterwards. Its exports, consisting in large part of metals and metal products, have been hampered, its wages and costs have been rising without matching improvements in productivity. There were no reforms addressing structural problems. Thus, the vulnerabilities of the shrinking, energy-intensive economy, which was dependant on gas imports from Russia, were increasingly exposed.

[2] With Moldova being an exception in some respects, like improvement in entrepreneurial regulations.

The evolution of production in Belarus, Moldova and Ukraine

Even though the three EP countries managed to significantly expand their service sectors after the fall of the Soviet Union, the high share of agricultural production in the overall value added puts them at a striking difference as compared to the EU countries. In the Visegrad states, agriculture accounts for around 3% of GDP, while in a country like France its contribution is below 2%. Currently, the agricultural sectors of Ukraine, Belarus and Moldova account for 7 to 15% of their respective GDPs, which cannot be explained by comparative advantage alone. The contribution of industry to their GDPs seems rather low.

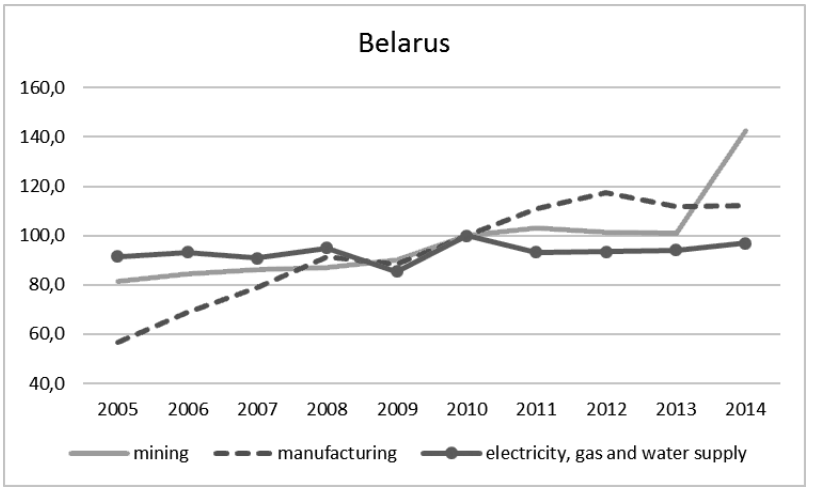
Table 1. *GDP composition, by sector of origin, 2014 est.*

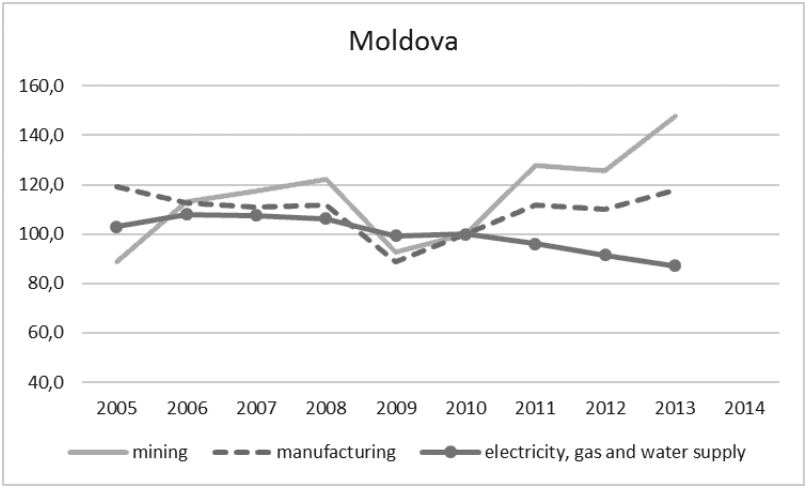
	Ukraine	Belarus	Moldova
Agriculture	12.1%	7.3%	15.7%
Industry	29%	37%	20%
Services	58.8%	55.7%	64%

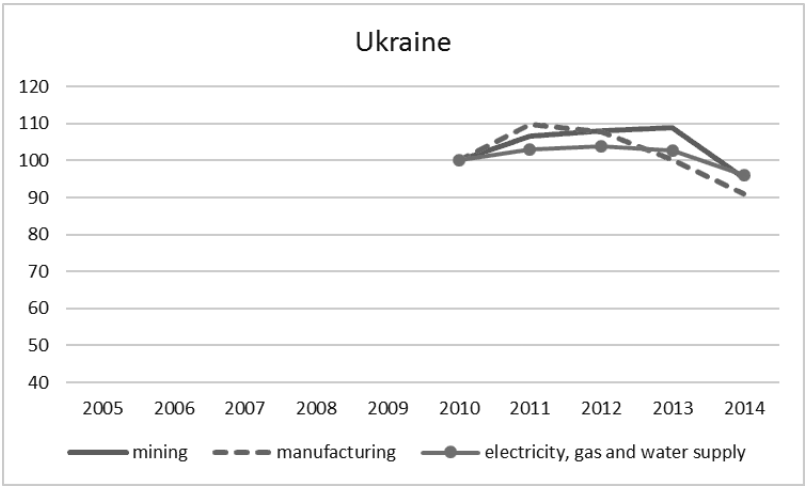
Source: CIA World Factbook

Leaving aside agriculture and services and looking at industrial production only, we observe fairly different trends over time. It is apparent that since 2009, manufacturing volumes have to some extent been growing in Belarus, while over the same period the corresponding numbers rebounded to pre-2009 levels in Moldova and production shrunk in Ukraine (see Figure 2). Among the three EP countries, Ukraine's industry was the hardest hit after the financial crisis. Its manufacturing production spiked for a single year only (2011) and plunged afterwards. In the light of the recent military conflict and the disruption of economic activity, the country's short-term prospects remain gloomy.

Figure 2. *Volume of industrial production in Belarus, Moldova and Ukraine, by main economic activities, 2005-2013*







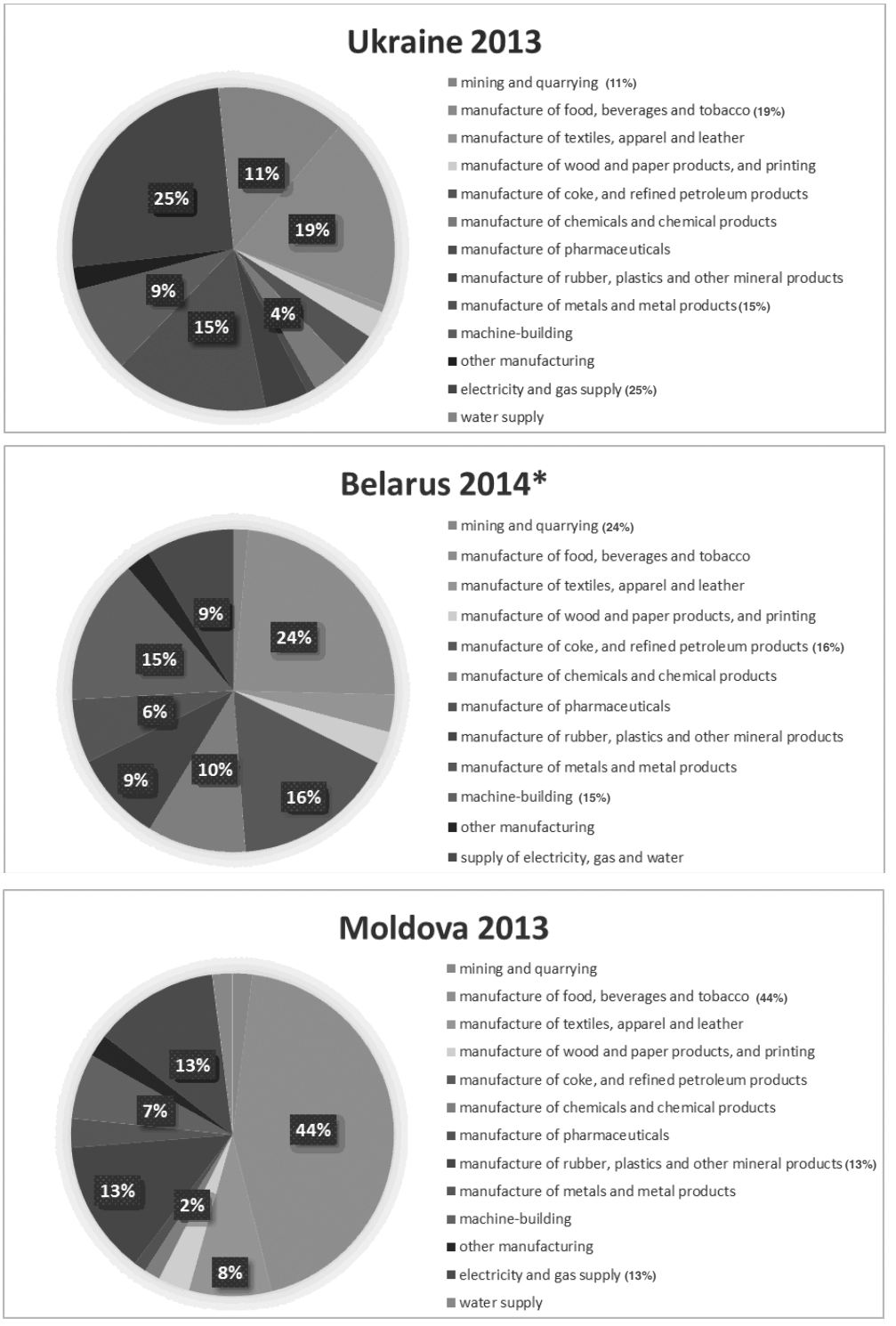
Source: own calculations on the basis of data from the national statistical offices of the respective countries

Looking at the relative importance of various industrial branches, we see a fair amount of differences.

The supply of electricity and gas is by far the most important single industrial activity in Ukraine, which reflects an outdated industrial structure with mining and production of metals serving as the pillars. Machine-building has also played an important part, though its share has been declining in recent years (see Table 14 in the Statistical Appendix, which shows that the total share of machine-building industries is decreasing faster than that of manufacturing). Similarly, the Ukrainian chemical industry has also been in decline for some time. Both machine-building and chemical industries produce for the domestic and the CIS market, and their waning role has been an important factor in the decline of the entire Ukrainian manufacturing sector. These two branches, which are simultaneously very vulnerable and important, are the focus of this project, which is why we are going to examine their dynamics and their relative importance for the two other economies as well.

Food processing is the single most important industrial branch for Belarus, but it is closely followed by refined petroleum products as Belarus refines Russian oil and sells it to the EU. Manufacture of machinery accounts for almost 15% of Belarusian industrial activity. Other important branches are the chemical industry, the manufacturing of mineral products and the supply of energy. Manufacture of machinery, otherwise growing, dropped both in 2009 and in 2013-2014. The chemical industry, by contrast, has been expanding continuously through 2005-2014, with only one contraction in 2013.

Figure 3. *Structure of industrial production in Ukraine, Belarus and Moldova by types of economic activity, 2013-2014*



Source: national statistical offices of the respective countries
Note: * – provisional data

The industry of Moldova, a traditional agricultural country, is highly skewed towards food processing (see Figure 3). It is followed by light industry and the manufacturing of mineral products. Machine-building takes up a mere 7% share of industrial output; the production of chemicals is negligible. Machine-building dropped both in 2008-2009 and 2013.

Another report in the project will cover the entirety of the energy dimension for the three countries, but for the moment we would like to highlight trends in the aggregated data (see Figure

2). There does not seem to be any indication of significant improvements in the total efficiency of energy use in either Belarus or Ukraine. However, in Moldova, there appears to be reason to believe that the declining energy supply and growing manufacturing volumes, coupled with liberalized energy tariffs for households, indicate some positive changes in the local energy market.

Labor market

While at the first glance the situation in the labor markets of the three countries seems fairly positive as unemployment rates are low, this is not necessarily the case. With fewer than 1% registered as unemployed (down from 2% in 2000) and a high share of the population being economically active, the state of the Belarusian economy appears particularly favorable. However, the situation is a result of the relatively unchanged structure of production and government efforts to maintain full employment (Chubrik and Kazlou, 2013). In fact, estimates suggest that the true unemployment rate is in the range of 6% (see Table 2). It seems that with certain macroeconomic threats looming in the near term,[3] the Belarusian labor market is yet to face the burdens of structural adjustment.

The Moldovan labor market has undergone the most severe transformation of the three countries since the dissolution of the Soviet Union, including massive processes of job destruction and job creation. Since the early 2000s, there has been a dramatic fall in labor force participation. The share of the economically active population dropped from 60% in 2000 to 41% in 2013, as a result of an increasing number of persons becoming inactive (Cantarji, Mincu, 2013). As this economically inactive group also includes migrants, among others, it seems reasonable to expect that increased labor migration was an important factor behind this change.

Table 2. *Labor statistics of Belarus, Moldova and Ukraine, 2013-2014*

		Belarus	Moldova	Ukraine
		2014*	2013	2014
economically active population, in thousands		4 509.0	1 235.8	19 920.9
labor force participation rate		69 (in 2010)	41.4	62.4
unemployment rate	LFS	6.1 (in 2009)	9.3	8.9
	registered	0.5	2.4	2.4

Source: National Statistical Committee of the Republic of Belarus, Chubrik and Kazlou (2013) – Belarusian data for 2009-2010, State Statistics Service of Ukraine, National Bureau of Statistics of the Republic of Moldova
note: * – estimate

In Ukraine, the number of the economically active persons has fallen by nearly 3 million since 2000, following the rapidly shrinking population. While there were 22.8 million economically active people in 2000, the most recent data show that there are only 19.9 million now. At the same time, the rate of economic activity has remained fairly stable, and is the highest of the three countries investigated at over 60%. The unemployment rate is still below 10%, which is high but does not appear dramatic in international comparison. However, recently it has risen to the levels seen in the early 2000s, reversing a decade-long trend.

Around a quarter of the labor force in Moldova, Belarus and Ukraine have completed tertiary education (see Table 3), which makes their educational attainment very similar to those of the labor forces in the Visegrad countries.

[3] See the following section on the needs to reduce subsidies in order to maintain sustainable fiscal stance.

Table 3. *Education of the labor force in Belarus and Moldova, 2000-2009*

	Moldova		Belarus	Ukraine
	2000	2012	2009	2013
Labor force with tertiary education (% of total)	11.8	24.8	24.3	28.8*
Labor force with secondary education (% of total)	58.8	54.5	69.9	50.4*

Source: World Development Indicators; * – own calculations based on the data from Ukraine's State Statistical Service "Economic Activity of the Ukrainian Population in 2013" (in Ukrainian)

What is interesting is that in Moldova there has been a consistent trend over the last decade of a growing number of university graduates entering the labor market. At the same time, among the countries investigated, Moldova has the lowest share of workers with secondary education, which probably reflects the agricultural profile of the country and is also the result of a polarization of skills; the lower skilled segment of the population is taking agricultural jobs or engages in subsistence farming rather than pursuing formal training beyond a certain point.

A striking difference between these countries and the EU members is the low level of labor productivity in the former (see Table 4). Leaving Belarus' high productivity figures aside, we get the result that German workers are over four times as productive as Ukrainian ones, and nearly three times as productive as Moldovans. Similarly, Polish workers seem to be nearly three times more productive than their Ukrainian counterparts and nearly twice as productive as Moldovan employees.

Table 4. *Labor productivity: GDP per person employed, 2009-2012*

Country Name	2009	2010	2011	2012
Belarus	26 737.00	28 435.00	29 547.00	30 974.00
Moldova	12 273.00	13 615.00	14 600.00	15 190.00
Ukraine	9 237.00	9 585.00	10 170.00	10 552.00
countries of comparison:				
Russian Federation	17 585.00	18 318.00	19 012.00	19 656.00
Czech Republic	25 735.00	26 648.00	27 081.00	26 781.00
Hungary	20 392.00	20 520.00	20 772.00	20 328.00
Poland	25 219.00	26 075.00	26 934.00	27 502.00
Slovak Republic	30 688.00	32 526.00	32 990.00	33 513.00
Germany	41 231.00	42 699.0s0	43 393.00	43 243.00

Source: WB WDI
Note: GDP is expressed in constant 1990 PPP $

Public finances and fiscal policies

Budget revenues

In terms of public finances, Moldova, Ukraine and Belarus have a lot in common as a result of joint heritage and the exchange of experience within the CIS. As with most CIS countries, large portions of the state's tax revenues are derived from indirect taxes, i.e. VAT and excises. In 2011-2013, Moldova collected 15.6% of GDP on average in VAT and excise revenues, while in Ukraine the corresponding revenues stood at 12.1% of GDP and in Belarus at 11.1% of GDP. Notably, the base VAT rate is 20% for all three countries. Differences in tax revenue likely reflect different shares of consumption in the respective countries' GDP. In Moldova, household consumption is over 90% of GDP thanks to considerable remittances from abroad, while in Belarus the state directs significant resources to capital investments.

Table 5. *General government budget in Belarus*

% of GDP	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total revenues	**48.8**	**49.8**	**50.8**	**52.0**	**47.2**	**43.0**	**39.8**	**42.0**	**42.8**	**40.3**
Taxes	34.3	34.0	35.2	37.7	30.1	27.3	24.7	26.0	25.4	22.0
Taxes on Income and Profits including	7.6	7.8	7.7	8.6	7.0	7.2	6.2	7.5	7.7	6.7
Personal income tax	2.9	3.1	3.2	3.2	3.1	3.3	3.1	3.6	4.2	4.1
Corporate profit tax	4.2	4.2	4.1	4.9	3.5	3.6	2.2	3.9	3.3	2.6
Taxes on Property	1.8	1.6	1.6	1.5	1.2	1.1	0.9	1.0	1.2	1.2
Taxes on Goods and Services	18.6	18.6	17.5	16.0	14.7	14.1	11.8	12.0	12.9	11.7
Taxes on International Trade	2.6	2.6	6.5	8.2	5.8	3.5	5.1	4.8	3.6	2.4
Other Taxes	3.8	3.4	2.0	3.3	1.4	1.3	0.7	0.7	0.0	0.0
Social Contributions	11.3	11.7	11.6	11.2	11.5	11.7	9.7	10.5	11.8	12.1
Other Revenue	3.2	4.1	4.0	3.2	5.7	4.0	5.4	5.6	6.2	6.2
Total Expenditure	**48.6**	**48.0**	**49.6**	**48.5**	**47.6**	**44.8**	**36.7**	**41.2**	**42.7**	**40.2**
Compensation of Employees	10.9	11.0	10.3	9.0	9.1	9.4	8.4	8.9	8.6	8.7
Use of Goods and Services	8.2	9.8	9.8	9.2	7.8	7.4	6.4	7.2	5.2	5.2
Interest	0.4	0.4	0.4	0.6	0.8	0.7	1.1	1.4	1.0	1.1
Subsidies and Transfers	5.9	5.7	7.7	9.1	8.9	5.4	4.6	5.1	4.9	7.0
Social Benefits	13.1	12.9	12.9	11.9	13.0	13.6	11.4	12.7	14.1	12.1
Capital spending and other expenditure	10.2	8.2	8.5	8.8	8.1	8.3	4.9	5.9	8.9	6.1

Source: IMF (Government Finance statistics, country reports)

At the same time, revenues from personal income taxes are less than in the EU countries. This results in part from low flat tax rates on individual income, which were introduced in most CIS countries in the 2000s. As compared to the EU average of 9.5% of GDP, in 2012, the revenue from income taxes ranged from 2.3% of GDP in Moldova to 3.6-4.8% of GDP in Belarus and Ukraine. Still, corporate and personal income taxes are significant sources of revenues in Ukraine and Belarus.

Other types of taxes play a lesser role. Property taxes are relatively undeveloped in all three countries, with revenues maxing out at 1% of GDP in 2013. The recent expansion of the property tax in Ukraine may lead to higher revenues in 2015 and 2016. As part of the WTO accession, Ukraine and Moldova committed themselves to apply low tariffs on imports, while intra-CIS trade is mostly duty-free. This resulted in low revenues from import duties in these two countries (0.9% of GDP and 1.4% of GDP, respectively, in 2013). Taxes on international trade are more

important for Belarus due to higher tariff barriers (harmonized with Russia as part of the Customs Union) and large export duties on energy.

Extra-budgetary funds

Payroll taxes, which are paid into social funds and are not included in the budget, also significantly increase the tax burden on wages. In 2013, social funds collected an additional 10-13% of GDP in payroll taxes (13.3% in Ukraine) as compared to the EU average of 11.4% of GDP (in 2012). In part, this reflected popular expectations that the state should provide benefits from cradle to grave, and in part it was the result of relatively low GDP per capita figures. The significant incidence of informally paid wages was another reason why social contributions comprise a large part of the labor costs in the three countries.

Table 6. *General government budget in Moldova*

% of GDP	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Revenue	**38,6**	**39,9**	**41,7**	**40,6**	**38,9**	**38,3**	**36,6**	**38**	**36,8**	**39,3**
Taxes	23,3	24,7	25,6	24,5	21,6	21,8	21,7	23,2	23,1	23,2
Taxes on Income and Profits including	4,4	4,9	5,2	3,5	3,2	2,8	2,8	4,5	4,2	4,4
Personal income tax	2,2	2,5	2,5	2,4	2,7	2,4	2,1	2,3	2	2,2
Corporate profit tax	2,1	2,4	2,8	1,1	0,5	0,5	0,7	2,2	2,2	2,2
Taxes on Property	0,6	0,5	0,4	0,4	0,4	0,4	0,3	0,3	0,4	0,4
Taxes on Goods and Services	16,2	17,8	18,2	18,7	16,5	17,1	17,1	16,9	17,1	17
Taxes on International Trade	1,8	1,4	1,7	1,8	1,5	1,5	1,4	1,5	1,4	1,4
Social Contributions	7,8	9,5	9,6	10,5	11,5	10,4	10	10,1	9,8	10,2
Grants	1,2	0,7	1,8	1,6	1,9	2,7	1,9	1,7	2,1	3,3
Other Revenue	6,2	5	4,7	4	3,9	3,5	3	2,9	1,8	2,6
Total Expenditure	**37,2**	**40,3**	**41,9**	**41,4**	**45,2**	**40,8**	**39**	**40,2**	**38,6**	**41,4**
Compensation of Employees	7,9	9,6	9,3	9,2	11,6	10,2	9,4	9,6	8,3	8,7
Use of Goods and Services	6,4	7,9	7,8	8,2	9	8,9	8,5	9,1	8,8	9,4
Interest	1,3	1	1,2	1,2	1,4	0,8	0,8	0,8	0,5	0,6
Subsidies and Transfers	2,1	3,2	3,2	3,2	1,9	1,3	1,2	1,3	1,3	1,4
Social Benefits	11	10,9	11,4	11,6	14,5	13,6	12,9	12,6	12,2	12,9
Capital spending and other expenditure	8,4	7,7	9	8	6,7	6	6,1	6,9	7,5	8,4

Source: IMF (Government Finance statistics, country reports)

In Ukraine, election cycles also contributed to unsustainable pension increases. In 2013, this led to pension payments climbing to 17% of GDP (one of the highest levels in Europe), and forced the government to transfer a large part (up to 4% of GDP) of budgetary revenues to the pension fund. Spending in other two countries was more restrained, as pension funds in Belarus and Moldova were almost balanced and even ran small surpluses over the last few years. In Belarus, the incidence of informal employment was also likely lower.

Subsidies

Energy subsidies are another sign of the paternalistic state. Before the 2008 crisis, they were present in all countries as energy prices for households (i.e. electricity, gas and heating tariffs) were set below cost-recovery levels. This was a significant drain on state resources, encouraged

corruption, discouraged investment in energy efficiency and resulted in very poorly targeted safety nets. After 2008, subsidies were reduced as part of efforts towards fiscal consolidation implemented in the framework of IMF programs in Ukraine, Belarus and Moldova. Currently, Belarus and Ukraine still have substantial energy subsidies that are provided mostly through cross subsidization. Energy tariffs in Moldova are close to cost-covering levels, although the recent depreciation of the local currency pushed the prices below this level. At the same time, a recent increase in gas tariffs removed a significant part of the subsidies in Ukraine. There are plans to replace them completely with targeted subsidies for low-income households by 2018.

Budget expenditures

If we look at spending as a whole, we also observe a paternalistic state in action. As part of post-crisis austerity, Moldova cut spending on wages and transfers to households (including pensions) from 26.4% of GDP in 2009 to 20.5% in 2013. But such 'social' spending still makes up well over half of all general government expenditures. In Ukraine, the government increased social benefits and public sector wages despite zero economic growth. As a result, the compensation of employees and social benefits rose to a massive 34.6% of GDP and over 70% of general government expenditures in 2013. In the case of Belarus, the government spends 'only' 21.1% of GDP on budget sector wages and social benefits. However, such expenditures still account for almost 60% of general government spending. Moreover, the government requires companies in the vast state-owned sector to increase wages considerably faster than gains in productivity would indicate. The large share of social spending reduces the economies' flexibility to react to business cycles.

Table 7. *General government budget in Ukraine*

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Revenue	**41.5**	**43.1**	**41.8**	**43.1**	**42.1**	**41.6**	**42.8**	**44.4**	**43.3**	**40.6**
Taxes	22.3	23.2	22.4	24.1	22.9	21.8	24.1	24.3	24.3	23.9
Taxes on Income and Profits including	9.6	9.3	9.8	9.9	8.5	8.4	8.9	8.8	8.7	7.3
Personal income tax	4.1	4.3	4.9	4.8	4.9	4.7	4.6	4.8	4.9	4.8
Corporate profit tax	5.5	4.9	4.9	5.0	3.6	3.7	4.2	4.0	3.8	2.6
Taxes on Property	0.4	0.3	0.2	0.6	0.8	0.8	0.7	0.8	0.9	0.8
Taxes on Goods and Services	10.6	12.1	10.8	12.0	12.5	11.5	13.4	13.4	12.0	12.8
Taxes on International Trade	1.7	1.6	1.6	1.4	0.8	0.9	0.9	0.9	0.9	0.8
Other Taxes	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	1.9	2.3
Social Contributions	12.6	12.9	13.0	12.4	12.6	12.6	12.2	12.9	13.2	11.7
Other Revenue	6.7	6.9	6.4	6.6	6.6	7.1	6.4	7.2	5.8	5.0
Total Expenditure	**42.9**	**44.1**	**42.4**	**44.8**	**47.9**	**48.1**	**45.1**	**48.2**	**48.1**	**45.1**
Compensation of Employees	9.9	10.4	10.3	10.6	11.9	11.7	10.6	11.4	11.4	10.3
Use of Goods and Services	6.7	6.8	6.6	6.5	7.6	7.5	7.0	7.5	7.1	7.4
Interest	0.8	0.7	0.6	0.5	1.2	1.6	2.0	1.9	2.4	3.3
Subsidies and Transfers	2.3	3.2	2.9	3.7	3.0	2.5	2.0	3.1	2.0	2.4
Social Benefits	19.4	18.9	17.3	17.1	20.0	19.2	17.5	17.8	22.9	20.6
Capital spending and other expenditure	3.8	4.1	4.7	6.4	4.2	5.6	6.1	6.4	2.2	1.1

Source: IMF (Government Finance statistics, country reports)

Budget balances and dependence on external financing

In 2012 and 2013, the budget deficit in Moldova was around 2% of GDP; in Ukraine it was 4% of GDP; the budget in Belarus, by contrast, featured a tiny surplus. However, headline figures are not always useful. In Ukraine, the deficit figures did not include quasi-fiscal operations supporting state-owned banks, the state-owned gas monopoly *Naftogaz,* the pension fund or guaranteed loans raised by state companies that are unlikely to have sufficient cash flows to repay the loans. The IMF estimated that the resultant real deficit stood at 6.7% of GDP in 2014. In the case of Moldova, it could be useful to look at the deficit excluding grants from international donors, as there is no guarantee that these will keep flowing in, and their absence would bring the deficit to 3.8%. And in Belarus, there were even more quasi-fiscal operations, including spending on bank restructuring, guaranteed debt payments and 'directed lending', where the government requires banks to lend to priority companies at a discounted interest rate, but while the state serves as the guarantor for the loan. The resulting broad measure of the fiscal deficit stood at 6.3% of GDP in 2013 (according to the IMF country report).

As a result of high credit risk, the access of Ukraine and Belarus to global financial markets (Moldova has not tried to issue Eurobonds over the last 10 years) was limited over the last years. Belarus was able to issue USD 800 million in Eurobonds in January 2011, but it has failed to issue any since then. Ukraine used its windows of opportunity when demand for high-yielding securities was especially high to issue USD 9.75 billion in Eurobonds in 2011-2013 (excluding a USD 3 billion sale of Eurobonds to Russia in December 2013). At the same time, funding from official creditors was limited after Ukraine's IMF program went off-track in 2010.

Moldova was more successful in raising grants and loans from a wide range of official creditors: from the IMF and the World Bank to the EU and individual countries. After Belarus diverged from the IMF program in 2010, and was unable to raise commercial external debt, it had to rely on Russia or Russian-controlled donors for external financing.

On the domestic side, shallow financial markets limited investment in government bonds. In Ukraine, the central bank (NBU) printed money by purchasing government bonds on the secondary market. 72% of the increase in government bonds outstanding between Jan 1, 2011 and Jan 1, 2014 were purchased by the NBU, and only 23% were bought by commercial banks. Over the same three-year period, the government in Moldova raised only an equivalent of USD 150 million in domestic markets.

In Belarus, Ukraine and Moldova, privatization was not the major source of financing in 2012 and 2013. although each country has a vast publicly-owned sector sufficient for a few years of privatization. The statistics suggests that in 2011, privatization was more successful in Ukraine and Belarus. However, in Belarus the privatization of the state-owned gas monopolist was really a debt-to-equity swap, and in Ukraine a large segment of the electricity generating and transmission infrastructure was sold below market value to form a new monopolist in the electricity market.

Ukraine ran high general government deficits at a time when nominal GDP growth slowed to a crawl, and the country accumulated the highest level of external debt out of the three countries discussed here. This led to unsustainable increases in its debt level, especially after the *hrvynia* lost half its value versus the US dollar in 2014. By the end of 2014, the public debt stock of Ukraine exceeded 70% of GDP, compared to a historic low of 12% at the end of 2007. To maximize the impact of its IMF program, Ukraine plans to restructure its external debt to reduce the principal, delay the maturity date and possibly reduce interest on the debt. The depreciation of the Moldovan *lei* and of the Belorussian *rubel* has also led to a surge in debt relative to GDP in these countries. At the same time, Moldova maintained economic growth and relatively low fiscal deficits over the last several years, while public debt rose only slightly, to 31% from 30% of GDP. The concessionary terms of external lending also mean that annual debt service is comparatively low. At just over 25% of GDP, Belarus has the lowest public debt level out of the three countries, but

it faces USD 4 billion in foreign currency debt service in 2015. In part, Belarus was able to refinance external debt in 2015 with new loans from Russia.

Overall, the three countries have work to do on fiscal consolidation, in terms of ensuring that their public debt remains on a sustainable trajectory, and that populism in fiscal policy as well as in medium-term planning are reduced. They will have to do this in a challenging environment. Key partner economies (Russia, EU) are expected to be in recession or grow under 2% in 2015-2017. Ukraine's GDP is projected to fall from USD 180bn in 2013 to less than USD 90bn in 2015. Thus, Ukraine is currently in the middle of debt restructuring talks with holders of external commercial government debt. If these talks are successful, Ukraine will still have to ensure that its public finances are nearly balanced to keep debt sustainable. Belarus and Moldova have lower public debt but due to the small size of their domestic financial sectors and lacking access to global financial markets, they have limited options in raising commercial financing. As a result, they will also have to pick priorities for fiscal spending; attempt to reduce inefficiencies in public procurement; and raise revenues and work on expanding the tax base.

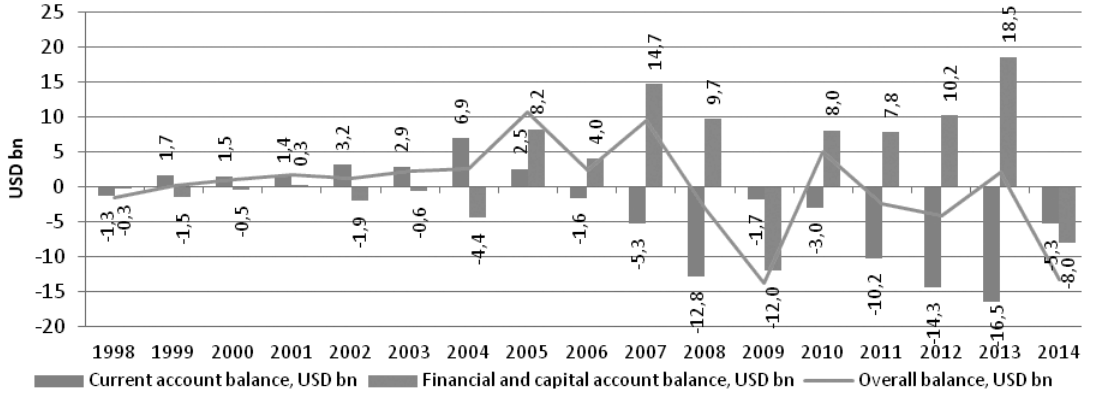
International trade and investments

Balance of payments

Over the analyzed period of 1998-2014, the balances of payments of Ukraine, Belarus and Moldova were predominantly characterized by negative current account balances and positive financial and capital account balances; however, the factors that influenced the dynamics underlying the respective figures differed from country to country. The recent common feature of all the BoPs in these countries is a significant deterioration of the situation in 2014, which led to negative overall balances in all of them. As a result, they now require external financing as well as the use of international reserves.

Ukraine. Current accounts are driven by the negative balance of trade in merchandise, which could not be counterbalanced by the positive net exports of services. Primary and secondary income play a minor role in current accounts, and to some extent they balance each other, as the net outflow of primary income (return on production factors) is comparable in scope to the net inflow of secondary income (remittances). Financial accounts were positive during the recent years, which was a result of FDI and debt capital inflows. However, in 2014 the situation changed dramatically, as the current account deficit shrunk from USD 16.5bn in 2013 to USD 5.3bn, as imports contracted at a faster rate than exports. On the other hand, financial accounts went from a positive balance of USD 18.6bn in 2013 to a huge deficit of USD 8.4bn in 2014 (Figure 4). Such changes in the financial accounts were driven by a huge contraction in the rate of FDI inflow, as well as more limited access to external financing for banks and the real sector, whereas the government was able to attract significant financing from international partners and donors. Another downward pressure resulted from significant repayments through trade credits. As a result, the overall deficit in the balance of payments was USD 13.3bn; of this deficit, USD 12.2bn were funded by international reserves. Previously, the overall balance of payments had been positive until the world financial crisis, which allowed the National Bank of Ukraine to replenish its international reserves. Moreover, there was a period between 1999-2005 when the current account was in surplus, whereas the financial accounts exhibited negative results. Since 2008, deficits in the BoP have become more regular than surpluses. For example, in 2009 the overall deficit amounted to USD 13.7bn, in 2014 – as was previously mentioned – it dropped to USD 13.3bn. In the coming years, it is expected that the current account balance will become positive after 2016, whereas the financial account will do so already in 2015. As a result, the overall balance will become positive as of 2015. According to the IMF Extended Fund Facility, this will allow the National Bank of Ukraine to replenish its international reserves.

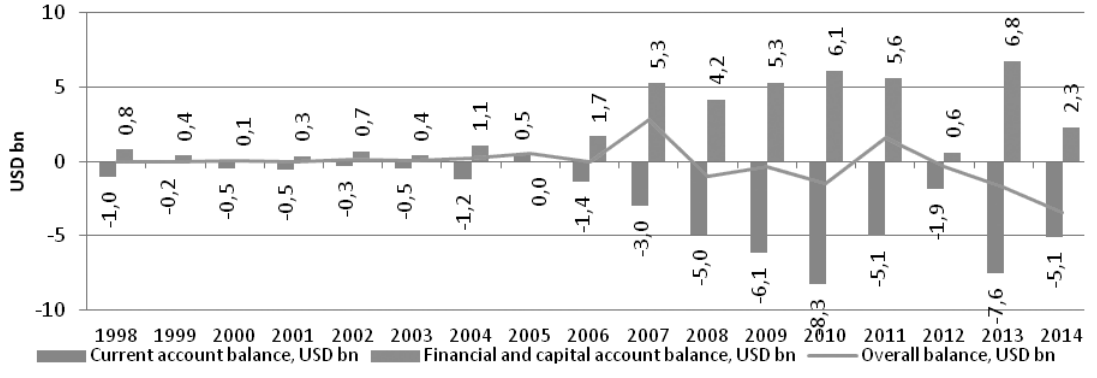
Figure 4. *Ukraine's Balance of Payments*



Source: National Bank of Ukraine

Belarus. Historically, Belarus current account was mainly negative as the positive balance in the trade of services failed to counterbalance the negative net exports of goods, which was in recent years accompanied by a net outflow of both primary and secondary income. The financial account was in surplus. The positive balance of the financial accounts was mainly driven by the net inflow of FDI into the Belarusian economy, as well as the net impact of loans and bonds. The real sector experienced a net inflow of debt financing, whereas banks borrowed internationally only in certain years; however, these inflows into the banking system significantly influenced the financial account surplus. The extent to which the financial account surplus was enough to cover the current account deficit varied, as the overall balance during the analyzed period ranged from net positive to net negative values, and also stood at zero in certain years. However, during the recent 2012-2014 period the overall balance was negative; moreover, the deficit narrowed (Figure 5). International reserves were one of the main sources for financing the deficit in the balance of payments. At the end of the 2000s, the reserves were accompanied by IMF loans, whereas in the 2010s external financing became actively used.

Figure 5. *Belarus' Balance of Payments*

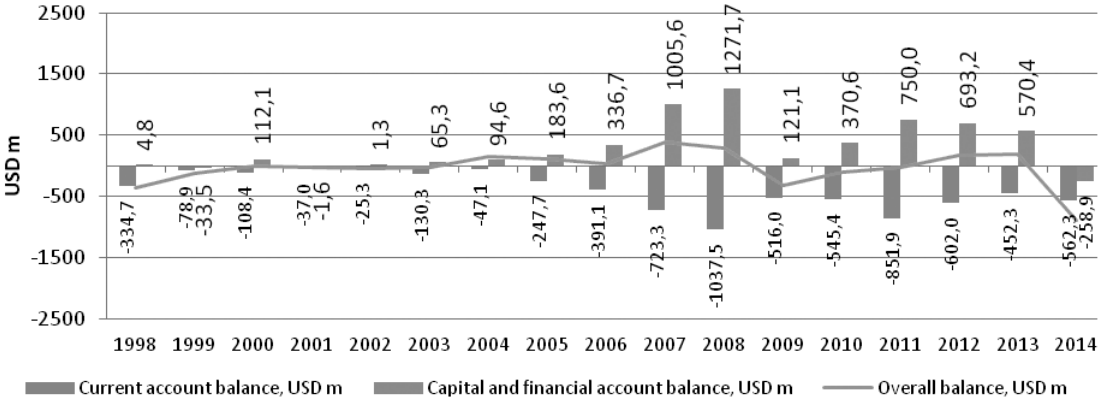


Source: National Bank of the Republic of Belarus

Moldova. During the period under analysis, the current account was negative as the inflow of remittances and workers' compensation, which play a more important role in the BoP of Belarus than in the case of the other two countries, failed to completely cover the negative balance of the trade in goods. The financial account was in surplus due to the net inflow of FDI as well as the positive balance of trade credits and lending to the real sector and banking. However, because of restricted access to external financing and the outflow of deposits from the banking system, the financial account surplus has contracted significantly in 2014, and fell into the negative domain

by USD 0.6bn (Figure 6). As a result, the overall balance in 2014 turned from positive USD 0.2bn a year ago to negative USD 0.9bn. The resulting deficit was financed by international reserves as well as external loans.

Figure 6. *Moldova's Balance of Payments*



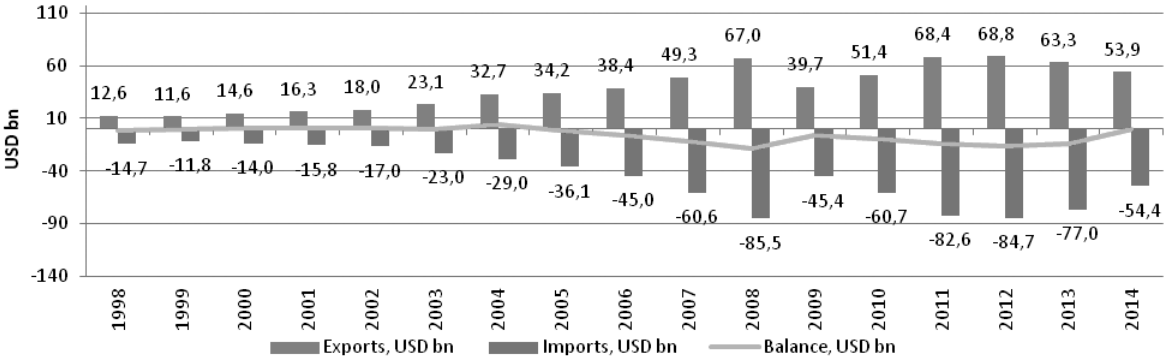
Source: National Bank of Moldova

Trade in goods

Overall, external trade in goods and services in Ukraine, Belarus and Moldova during the period 1998-2014 was characterized by a gradual expansion, which was interrupted by three episodes of contraction. The first episode occurred in 1998-1999 and was triggered by an economic crisis in the CIS region as a result of Russia's default. As Ukraine's and Moldova's economies contracted as well, the trade volumes of Belarus – whose economy was growing at the end of 90s – suffered from the economic crisis in its CIS trading partners. The second episode occurred in 2009 and was related to the world economic crisis and external and domestic factors emanating therefrom. Finally, the third episode happened in 2013-2014 and resulted from lower external demand in 2013, as well as the economic crisis in the region in 2014. Such developments in trade led to huge changes in the trade structure of Ukraine, Belarus and Moldova; however, the specific nature of these changes was different in each country. In Ukraine and Belarus, the machine building and energy sectors, which are defined as vulnerable sectors, are dependent on the Russian market, whereas in Moldova these sectors depend on the EU.

Ukraine. After falling trade turnover in 1998-1999 (by 13-14% yoy), which resulted in a greater negative impact on imports than exports, Ukraine's trade in goods expanded significantly between 2000 and 2008 (Figure 8). Exports of goods increased from USD 14.6 billion in 2000 to USD 67.0 billion in 2008, while imports of merchandise surged from USD 14.0 billion in 2000 to USD 85.5 billion in 2008. The second period of contraction in 2009 resulted in a 44% drop in the traded volume of merchandise; moreover, imports contracted more than exports. However, by 2011 exports had recovered to their pre-crisis levels of 2008, while imports were ultimately lower than their peak value in 2008. Finally, the third episode of contraction began in 2013 and was the result of lower external demand and economic stagnation, intensified by the prevailing political and economic crisis in 2014. As a result, over the past two years the total volume of external trade in goods contracted by almost 30%. Ukraine started with an export volume of USD 12.6 billion and an import volume of USD 14.7 billion in 1998, and it reached its peak export values in 2012 with USD 68.8 billion, and its top import values in 2008 with USD 85.5 billion. As of 2014, Ukraine exported USD 53.9 billion of goods and imported USD 54.4 billion.

Figure 7. *Ukraine's merchandise trade in 1998-2014, USD bn*

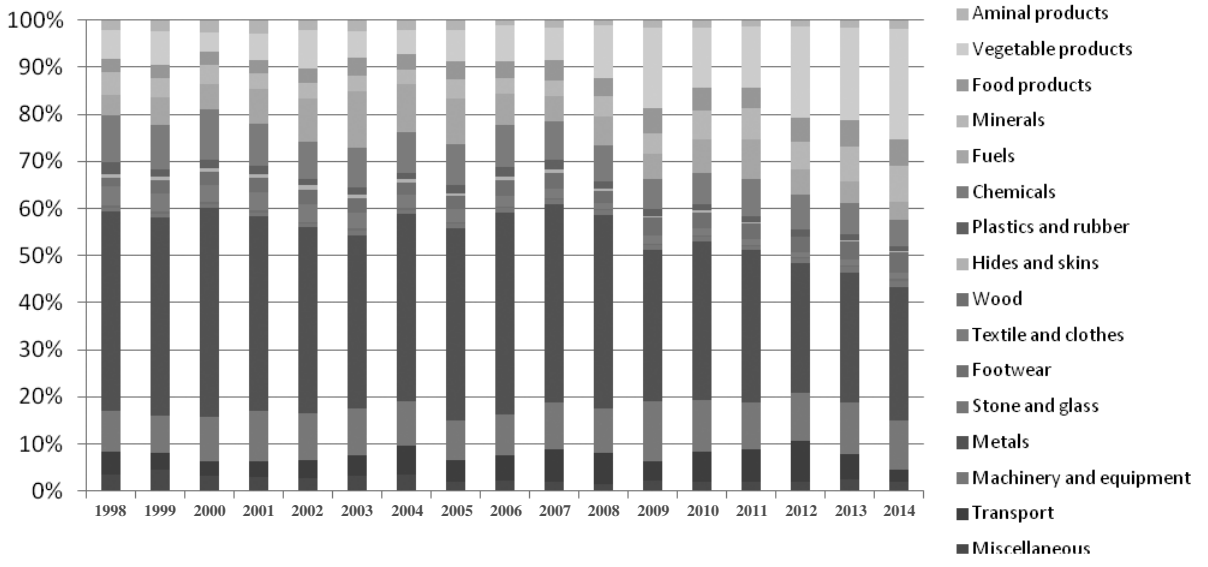


Source: State Statistics Services of Ukraine

For most of the period under investigation, Ukraine remained a net importer of goods; during 2000-2004, however, the fast expansion of exports led to a positive trade balance in the trade of goods. Trade in goods also accounted for a significant share of GDP, with an average value of 82.4% (78.7% in 2014) during the period 1998-2014, with imports slightly outweighing exports (43.0% vs. 39.4%, respectively).

Such developments in the dynamics of merchandise trade caused changes in both sectoral and geographical structure. The main trends in sectoral change included a decline in share of exports taken up by industry and a rising share of raw and processed food production. Thus, in the late 1990s metals accounted for 42% of the overall exports of goods, agricultural and food products for 11-12%, minerals for 10%, and machinery for 9%. By 2014 share of agrifood products had expanded to 31%, mainly due to vegetable products (especially cereals and oilseeds). Among exports of heavy industry produce, the share of metals decreased to 28.3%, the share of chemicals fell to 5.7%, but the share of machinery increased to 10.5%. At the same time, the share of mineral exports also expanded during the period analyzed, from 5.1% to 7.6%. Speaking about the structure of exports in terms of the level of processing involved in the production of export goods, Ukraine's merchandise exports are dominated by intermediate goods, but their share decreased from 55.8% in 1998 to 45.1% in 2013 (Figure 9).

Figure 8. *Ukraine's merchandise exports structure (HS classification)*



Source: State Statistics Services of Ukraine

Both sectoral and geographic diversification of exports are not unified across commodity groups. The most diversified export groups in terms of destinations were fresh food (3 major trading partners accounted for 24.6% of overall product group exports), basic manufactures (38.8%) and processed food (38.8%), while the least diversified were transport equipment (75.6%), non-electronic machinery (70.0%) and IT & consumer electronics (68.4%). Speaking about the commodity diversification of shipments, the most diversified export groups were miscellaneous products (3 major exporting commodities accounted for 15.9% of this commodity group's exports), clothing (18.1%) and non-electronic equipment (22.4%), whereas the most concentrated exports were unclassified products (99.7%), fresh food (75.1%) and IT & consumer electronics (65.9%) (Table 8).

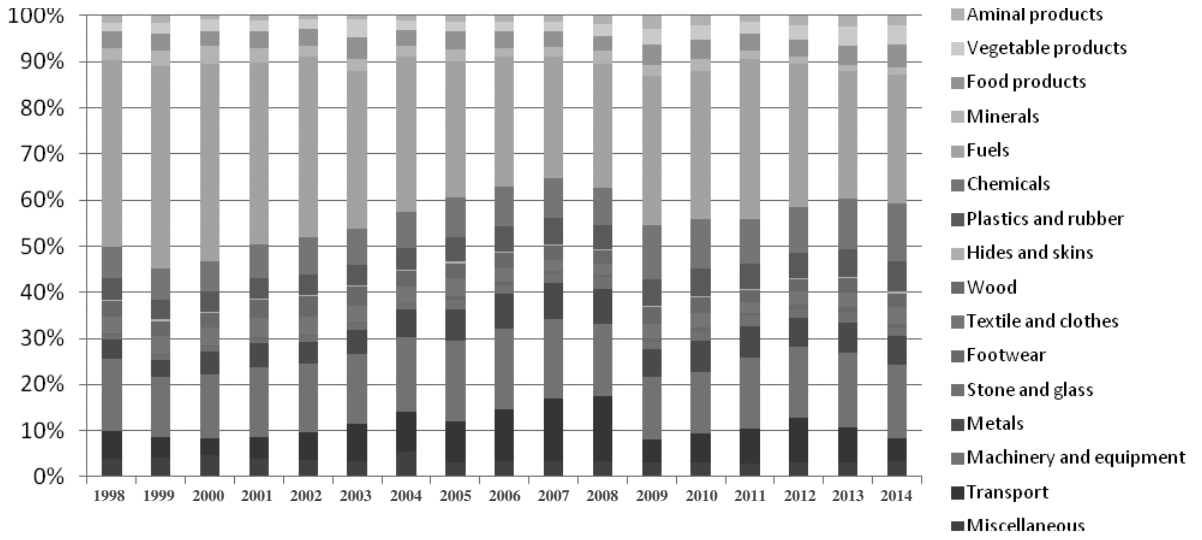
Table 8. *Sectoral distribution and diversification of Ukraine's exports of goods in 2013*

Sector	Average share of sector in country's exports 2009-2013	Sector's export growth in value (% per annum) 2009-2013	Share of top 3 detailed products (HS6) in sector's exports	Share of top 3 importing countries in sector's exports	Leading exported product HS6	Top 3 importing countries
Basic manufactures	30.8%	8.7%	29.0%	38.8%	720712 semi-finished products of iron or non-alloy steel	Russia; Turkey; Italy
Chemicals	7.3%	12.9%	42.0%	40.4%	310210 Urea	Russia; Turkey; USA
Clothing	1.0%	1.6%	18.1%	53.0%	620342 Mens/boys trousers and shorts	German; Russia; Hungary
Electronic components	3.6%	8.3%	58.1%	56.1%	854430 Ignition wirg sets&oth wirg sets usd in vehicles, aircraft	Russia; Hungary; Poland
Fresh food	11.4%	15.9%	75.1%	24.6%	100590 Maize (corn)	Egypt; Spain; Netherlands
IT & consumer electronics	1.0%	14.0%	65.9%	68.4%	852871 Reception apparatus for television	Russia; Hungary; India
Leather products	0.5%	1.3%	37.6%	61.1%	410411 Full grains, unsplit; grain splits	Italy; Poland; Romania
Minerals	13.5%	16.3%	52.8%	44.9%	260111 Iron ores &concentrates	China; Russia; Poland
Miscellaneous manufacturing	2.1%	13.2%	15.9%	65.1%	940360 Furniture, wooden	Italy; Poland; Belarus
Non-electronic machinery	6.0%	9.6%	22.4%	70.0%	841122 Turbo-propellers of a power exceeding 1100 KW	Russia; China; Kazakhstan
Processed food	11.6%	15.5%	53.8%	38.8%	151211 Sunflower-seed or safflower oil, crude	Russia; India; China
Textiles	0.3%	7.9%	26.0%	51.9%	630790 Made up articles, of textile materials	Russia; Belarus; Germany
Transport equipment	6.4%	20.5%	45.1%	75.6%	860610 Railway tank cars, not self-propelled	Russia; Kazakhstan; Belarus
Unclassified products	0.8%	6.5%	99.7%	61.6%	999999 Commodities not elsewhere specified	India; Thailand; Switzerland
Wood products	3.1%	13.0%	34.6%	50.1%	481420 Wallpaper,coated/covered on the face side with a decorated layer of plastics	Russia; Poland; Kazakhstan

Source: ITC Trade Competitiveness Map

The imports of goods during the period 1998-2014 were dominated by fuels, but their share in overall shipments decreased significantly from 40.5% in 1998 to 27.9% in 2014. The second product group by share in imports was machinery and equipment, which was almost unchanged over the period analyzed and remained close to 16%. Also, by 2014 plastics and rubber (6.7%), transports (4.9%) and food products (4.8%) had comparatively high shares as well. In contrast to exports, the imports of goods were dominated by consumer goods, accounting for more than half of all shipments (Figure 10).

Figure 9 *Ukraine's merchandise imports structure (HS classification)*



Source: State Statistics Services of Ukraine

Diversification was also not uniform among imported commodities. In terms of trading partners, the most diversified were fresh food (23.8%), processed food (38.6%) and chemicals (39.3%), while the most concentrated were minerals (80.5%), leather products (80.2%) and clothing (73.0%). Three major imported goods had the smallest share within sectoral imports for textiles (11.2%), basic manufactures (13.8%) and miscellaneous manufacturing (15.6%), but the least diversified were unclassified products (93.5%), minerals (80.8%) and IT & consumer electronics (60.2%) (Table 9).

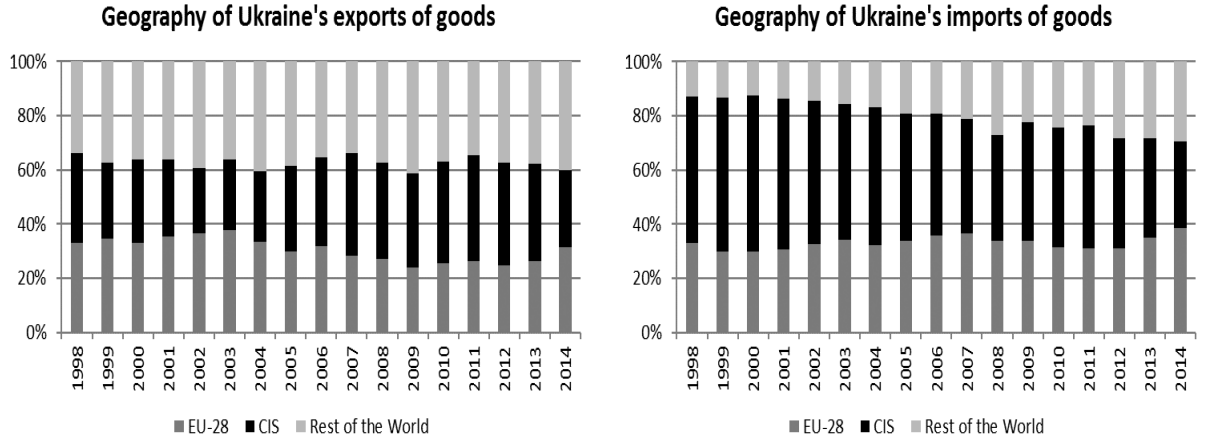
Table 9. *Sectoral diversification of Ukraine's imports of goods in 2013*

Sector	Average share of sector in country's exports 2009-2013	Sector's export growth in value (% per annum) 2009-2013	Share of top 3 detailed products (HS6) in sector's exports	Share of top 3 importing countries in sector's exports	Leading exported product HS6	Top 3 importing countries
Basic manufactures	7.9%	15.8%	13.8%	58.9%	722540 Flat rolled products	Russia; China; Poland
Chemicals	15.1%	13.0%	21.4%	39.3%	300490 Medicaments	Russia; Germany; China
Clothing	1.1%	19.5%	17.3%	73.0%	620342 Mens/boys trousers and shorts	China; Turkey; Bangladesh
Electronic components	4.5%	25.7%	25.6%	51.2%	854140 Photosensitive semiconductor device,	China; Germany; Russia
Fresh food	5.5%	14.3%	17.5%	23.8%	080300 Bananas including plantains	Turkey; Brazil; Germany
IT & consumer electronics	2.4%	27.5%	60.2%	67.4%	851712 Telephones for cellular networks mobile telephones	China; Russia; Viet Nam
Leather products	0.9%	27.1%	49.4%	80.2%	640299 Footwear	China; Italy; Viet Nam
Minerals	33.2%	9.4%	80.8%	80.5%	271121 Natural gas in gaseous state	Russia; Belarus; Lithuania
Miscellaneous manufacturing	3.6%	14.8%	15.6%	46.9%	950300 Tricycles, scooters, pedal cars and similar wheeled toys	China; Germany; Russia
Non-electronic machinery	8.5%	15.9%	17.6%	47.7%	840130 Fuel elements (cartridges), non-irradiated, for nuclear reactors	Russia; Germany; China
Processed food	3.8%	13.5%	20.2%	38.6%	210690 Food preparations	Russia; Germany; Poland
Textiles	1.6%	13.2%	11.2%	50.0%	540772 Woven fabrics	China; Turkey; Germany
Transport equipment	6.9%	28.2%	39.9%	40.8%	870323 Automobiles with spark-ignition engine	Germany; Russia; Japan
Unclassified products	1.5%	4.5%	93.5%	63.7%	710813 Gold non-monetary	Switzerland; Netherlands; UK
Wood products	2.7%	9.2%	25.5%	50.6%	481840 Sanitary articles of paper	Russia; Poland; Germany

Source: ITC Trade Competitiveness Map

The geographic structure of exports changed in 2014 in favor of the European Union. The EU became the most important trading partner in terms of both exports and imports, replacing Russia, which had previously been in the dominant position (however, the EU had already been the main importer of Ukrainian goods in 2000-2004) (Figure 11). As of 2014, the EU-28 accounted for 31.5% of merchandise exports and 38.7% of imports; the corresponding shares of Russia were 18.2% and 23.3%, respectively. It is expected that the DCFTA between Ukraine and the EU-28 will allow for deepening bilateral trade. Speaking about trade between Ukraine and the countries of the Visegrad Group, its importance increased as trade with the EU expanded; this was true even in cases when the absolute value of shipments decreased. Thus, exports to the V4 decreased by 1.5% in 2014, but their share of the overall export volume increased to 10.4% (9.0% in 2013). The same was true for the import side – the value of Ukrainian imports originating in the V4 decreased by 20.9% in 2014, but its share increased by 1.1 percentage points to 10.4%.

Figure 10. *Ukraine's trade by country groups, 1998-2014*



Source: UN ComTrade, State Statistics Services of Ukraine

The vulnerability of the machine building and energy sectors from an international trade perspective manifests itself in a significant exposure to international markets, especially the Russian one. During the recent years, the share of the Russian market in Ukrainian machinery exports averaged 52%. These volumes corresponded to almost 20% of Ukraine's machine-building output.[4] However, the importance of the Russian market is gradually declining as traditional supply chains become weaker. In 2014, Russia accounted for 44% of total Ukrainian machine exports, but due to trade and political tensions with Russia, the trade volume between the two countries decreased by 41%. On the other hand, Ukraine's domestic production encountered new competition in the form of EU products, which accounted for 43.4% of imported machinery and transport equipment. An analysis of the Trade Performance Index by the International Trade Centre[5] shows that as compared to other export items, Ukraine's machine building is relatively competitive in the world markets. These gains mainly depend on demand in major trading partners, which played a crucial role in 2014 as demand dropped in Russia – the key market for the industry; this significantly undermined the competitiveness of Ukrainian producers and had a negative impact on overall export levels. Speaking about the energy sector, during the recent years almost 70% of fuels came from Russia. However, in 2014, because of trade and political tensions between Russia and Ukraine, Ukraine launched reverse supplies of natural gas from the European Union

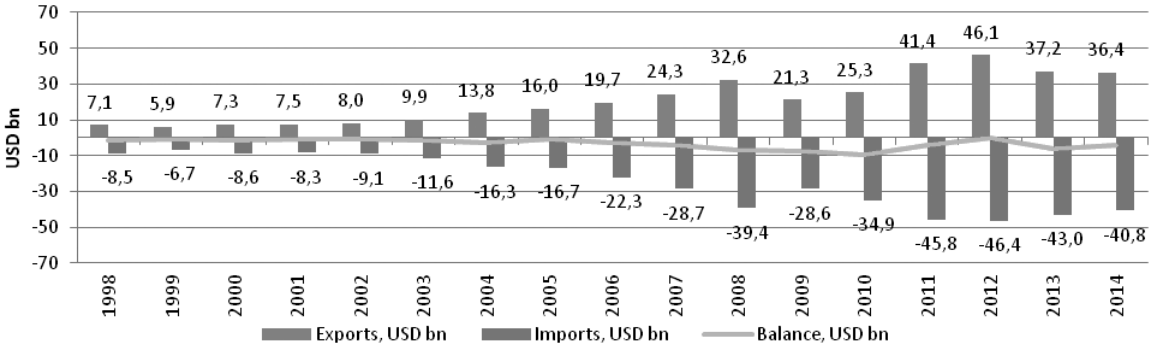
[4] Movchan Veronika, Ricardo Giucci and Mykola Ryzhenkov (2014) Ukrainian exports to Russia: Sector and regional exposure, IER/GAG Technical Note 03, May 2014 - http://www.ier.com.ua/files//publications/Policy_Briefing_Series/TN_03_2014_en.pdf
[5] http://legacy.intracen.org/appli1/tradecom/TPIC.aspx

(mainly from Slovakia, Hungary and Germany) and Norway. Also, Ukraine decreased imports of crude and refined oil from Russia and increased imports of refined oil from Belarus (which also originates in Russia, however). As a result, imports of energy materials from Russia contracted by 53%, and their share decreased to 45% in 2014 and continues to drop in 2015. Energy imports from Russia were the main contributors in the drop of overall merchandise imports in 2014.

Belarus. During 1998-2013, Belarus remained a net importer of goods and its trade volume expanded. Exports of goods increased from USD 7.1 billion in 1998 to USD 46.1 billion in 2012, but subsequently fell to USD 36.4 billion in 2014. The same situation occurred with the imports of goods, which expanded from USD 8.5 billion in 1998 to USD 46.3 billion in 2012, but then declined to USD 40.8 billion in 2014.

The trends in Belarus' merchandise trade followed the previously described three episodes of trade contraction. During the first one in 1998-1999, exports and imports contracted almost by 30% and 32%, respectively, over a two-year period. Subsequently, it took four years for the volume of external trade to recover to pre-contraction levels. Unlike the previous episode in trade contraction, the second instance of dropping merchandise trade was characterized by a faster pace of contraction in exports relative to the decline in imports. Thus, exports dropped by 34.6%, whereas imports fell by 27.5%. Recovery was also faster – two years later, in 2011, Belarus already exported and imported even more than it did before 1999. Finally, the third episode is ongoing, as in 2013 both exports and imports started contracting once again, and this trend continued in 2014. In total, during the most recent two years exports of goods contracted by 21%, while imports dropped by 12% (Figure 12).

Figure 11. *Belarus' merchandise trade in 1998-2014, USD bn*

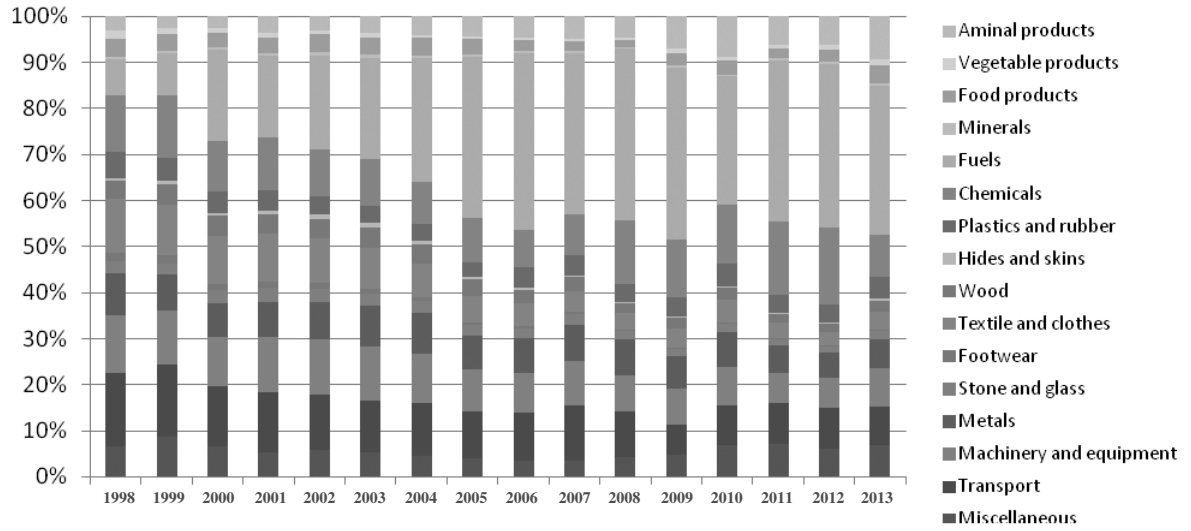


Source: National Statistical Service of the Republic of Belarus

Among the three countries analyzed in this report, Belarus is the most open economy. During the period 1998-2013, its external trade in goods accounted for 120.4% of GDP (111.9% in 2013) on average; its exports during this time equaled 55.8% of GDP, and imports amounted to 64.6%.

Between 1998 and 2013 the structure of merchandise exports also changed, both in terms of the goods being exported and the export destinations. Sectoral structure changed in a way that production of light and heavy industries lost their previous level of importance, while the share of fuels and foodstuffs in the structure of exports increased. In 1998, the main export items were transport vehicles (15.8% of total merchandise trade), machinery and equipment (12.7%), chemicals (12.4%), metals (9.1%) and fuels (7.8%). By 2013, the structure of exports had become less differentiated as the share of fuels increased significantly (to 32.4%), while the importance of other major export groups decreased. At the same time, the share of raw and processed food increased from 8.7% in 1998 to 14.5% in 2013 (Figure 13). Looking at these developments from another perspective, the structure of Belarusian exports is dominated by consumer goods; moreover, their importance is increasing – in 2013 they accounted for half of all Belarusian external sales.

Figure 12. *Belarus' merchandise exports structure (HS classification)*



Source: UN ComTrade

The most diversified export groups are miscellaneous manufacturing (19.4%), textiles (22.2%) and basic manufactures (24.7%), while the highest dependence on trading partners is reported for unclassified products (99.9%), minerals (93.5%) and IT & consumer electronics (65.3%). Chemicals, wood products and minerals are reported to be the most diversified in terms of product variety (47.5%, 60.3% and 62.3%, respectively). However, the least diversified are unclassified products (99.7%), fresh food (94.4%) and clothing (91.5%) (Table 10).

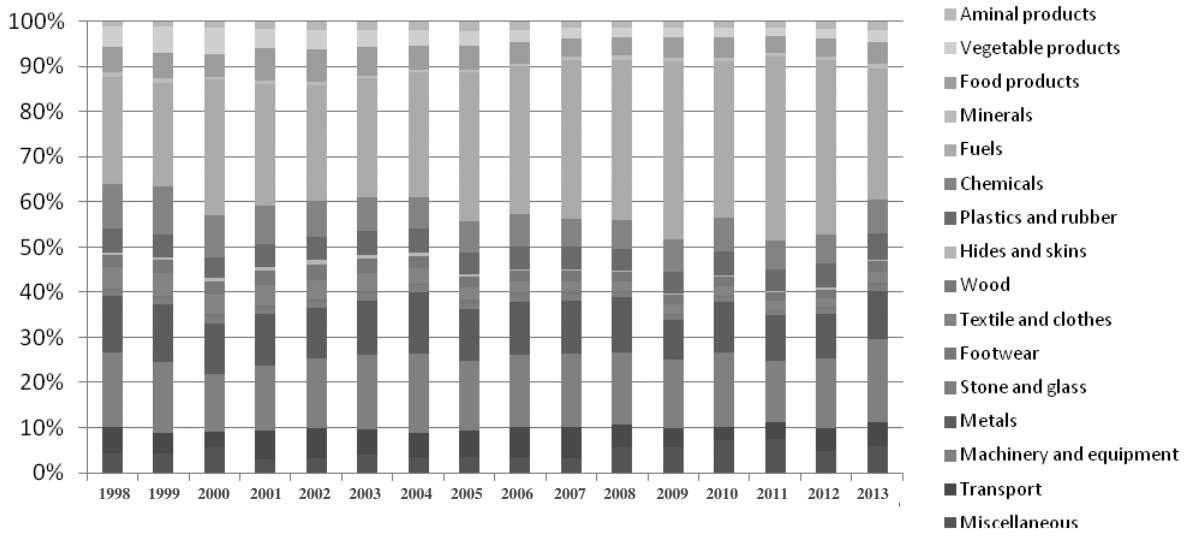
Table 10. *Sectoral diversification of Belarus' exports of goods in 2013*

Sector	Average share of sector in country's exports 2009-2013	Sector's export growth in value (% per annum) 2009-2013	Share of top 3 detailed products (HS6) in sector's exports	Share of top 3 importing countries in sector's exports	Leading exported product HS6	Top 3 importing countries
Basic manufactures	7.5%	14.5%	24.7%	69.6%	721420 Concrete reinforcing bars and rods	Russia; Germany; Lithuania
Chemicals	17.6%	9.2%	50.7%	47.5%	310420 Potassium chloride	Russia; Brazil; China
Clothing	1.4%	13.6%	29.9%	91.5%	621210 Brassieres	Russia; Ukraine; Lithuania
Electronic components	2.8%	10.1%	33.8%	85.6%	841810 Combined refrigerator-freezers	Russia; Ukraine; Kazakhstan
Fresh food	3.1%	23.1%	46.0%	94.9%	020120 Bovine cuts bone in	Russia; Kazakhstan; Finland
IT & consumer electronics	0.3%	40.2%	65.3%	91.3%	852872 Reception apparatus for television	Russia; Viet Nam; Lithuania
Leather products	0.2%	19.1%	45.1%	76.6%	410411 Full grains splits	Russia; Lithuania; Poland
Minerals	34.3%	11.7%	93.5%	62.3%	271019 Other petroleum oils and preparations	Netherlands; Ukraine; Germany
Miscellaneous manufacturing	3.7%	16.8%	19.4%	85.2%	940360 Furniture, wooden	Russia; Kazakhstan; Germany
Non-electronic machinery	6.5%	15.9%	46.6%	81.9%	870190 Wheeled tractors	Russia; Ukraine; Kazakhstan
Processed food	8.2%	23.9%	31.7%	89.8%	040690 Cheese	Russia; Lithuania; Kazakhstan
Textiles	1.9%	12.8%	22.2%	79.4%	540233 Textured yarn of polyester filaments	Russia; Ukraine; Germany
Transport equipment	5.9%	27.0%	52.8%	84.3%	870423 Diesel powered trucks	Russia; Turkmenistan; Kazakhstan
Unclassified products	4.0%	35.8%	99.9%	99.7%	999999 Commodities not elsewhere specified	Russia; Not Specified Areas; Kazakhstan
Wood products	1.9%	19.8%	33.7%	60.3%	440710 Lumber	Russia; Poland; Germany

Source: ITC Trade Competitiveness Map

The structure of merchandise imports in Belarus did not change significantly during the period analyzed. Fuels and machinery remained two major product groups among imported goods, and in fact their share of all imports increased (from to 23.8% to 29.2% and from 16.3% to 18.4%, respectively). The remaining key import items, including chemicals, metals and transport vehicles, slightly lost in terms of their importance in imports (Figure 14). An analysis of the structure of imports based on UNCTAD's classification shows that while in the late 1990s Belarus' merchandise imports were dominated by intermediate and consumer goods, at the beginning of the 2010s, they are almost evenly distributed between raw materials, intermediate, consumer and capital goods; however, consumer goods retain a slight superiority.

Figure 13. *Belarus' merchandise imports structure (HS classification)*



Source: UN ComTrade

The imports of goods by Belarus are more diversified in terms of their sources than in their structure. The geographical distribution of imports was most diverse in the cases of basic manufactures (11.0%), chemicals (11.4%) and non-electronic machinery (13.7%), whereas the geographic sources of unclassified products (99.9%), minerals (91.4%) and IT & consumer electronics (40.2%) tended to be least diverse. In terms of product diversification, we observe the best results for fresh food (36.1%), non-electronic machinery (49.6%) and miscellaneous manufacturing (52.4%), whereas the worst are reported for minerals (98.7%), unclassified products (98.6%) and leather products (80.5%) (Table 11).

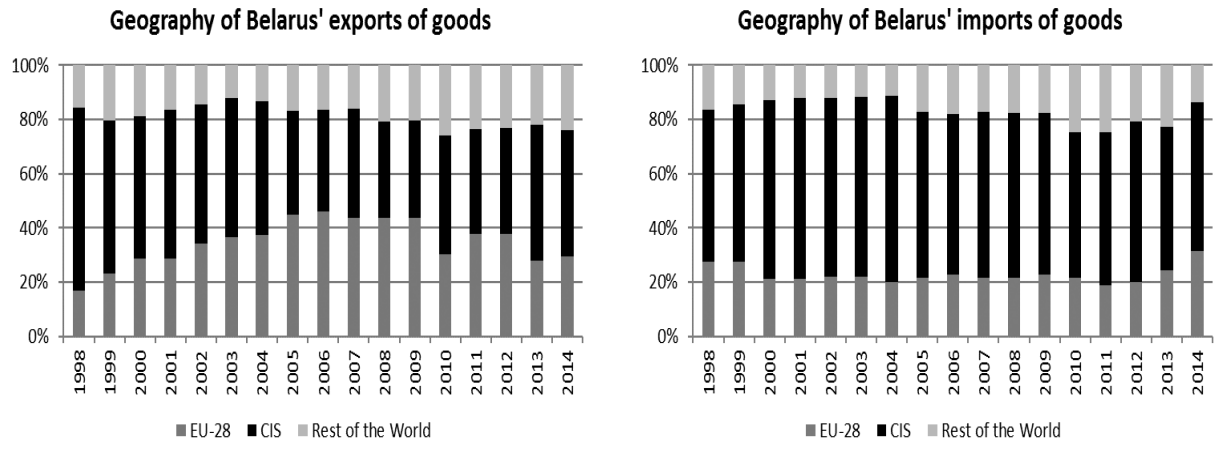
Table 11. *Sectoral diversification of Belarus' imports of goods in 2013*

Sector	Average share of sector in country's exports 2009-2013	Sector's export growth in value (% per annum) 2009-2013	Share of top 3 detailed products (HS6) in sector's exports	Share of top 3 importing countries in sector's exports	Leading exported product HS6	Top 3 importing countries
Basic manufactures	10.1%	17.0%	11.0%	73.9%	730890 Other structures and parts of structures	Russia; Ukraine; China
Chemicals	11.0%	13.7%	11.4%	55.3%	300490 Medicaments in dosage	Russia; Germany; Poland
Clothing	0.4%	29.2%	14.7%	65.7%	611020 Pullovers, cardigans	Russia; China; Bangladesh
Electronic components	3.2%	18.0%	21.6%	64.5%	854449 Electric conductors	Russia; China; Germany
Fresh food	3.8%	18.2%	18.1%	36.1%	020329 Swine cuts	Poland; Russia; Norway
IT & consumer electronics	2.2%	32.2%	40.2%	73.8%	851712 Telephones for cellular networks mobile telephones	China; Russia; Czech Republic
Leather products	0.6%	23.1%	34.4%	80.5%	640391 Footwear	China; Russia; Poland
Minerals	38.3%	3.0%	91.4%	98.7%	270900 Petroleum oils	Russia; Ukraine; Poland
Miscellaneous manufacturing	3.2%	16.1%	14.1%	52.4%	901890 Instruments and appliances used in medical or veterinary sciences	Russia; China; Germany
Non-electronic machinery	10.5%	12.4%	13.7%	49.6%	840820 Engines, diesel	Russia; Germany; Italy
Processed food	4.7%	12.8%	24.7%	64.2%	230400 Soya-bean oil-cake	Russia; Ukraine; Argentina
Textiles	1.4%	12.0%	14.6%	58.5%	540219 High-tenacity filament yarn of nylon	Russia; Turkey; China
Transport equipment	4.2%	18.3%	30.7%	55.8%	870323 Other vehicles with spark-ignition engine	Russia; Germany; China
Unclassified products	4.0%	5.2%	99.9%	98.6%	999999 Commodities not elsewhere specified	Not Specified Areas; Russia; Netherlands
Wood products	1.7%	12.8%	25.2%	72.3%	441011 Waferboard	Russia; Poland; Ukraine

Source: ITC Trade Competitiveness Map

CIS countries remained the main export destinations and import sources for Belarus in the period 1998-2014; however, their importance was gradually decreasing. Thus, the share of the CIS countries in Belarus' exports decreased from 67.5% to 46.3%, whereas for imports the share of CIS region decreased from 56.3% to 55.0%. However, the 2000s were the period when the share of CIS countries was even lower in terms of exports, while it was higher for imports. At the same time, the period analyzed also saw a reorientation of Belarus' exports to the EU markets: the share of the European Union increased from 17.0% in 1998 to 29.6% in 2014. Despite such a change in the structure of exports, the importance of the EU in the import structure decreased from 27.5% in 1998 to 23.2% in 2014 (Figure 15). The share of Visegrad Group countries was not high to begin with. Moreover, the V4 countries gradually lost their importance in Belarus' exports (from 6.8% in 2008 to 3.1% in 2014), but became more significant in terms of imports – their share increased from 4.7% in 2008 to 5.5% in 2014.

Figure 14. *Belarus trade by country groups, 1998-2014*

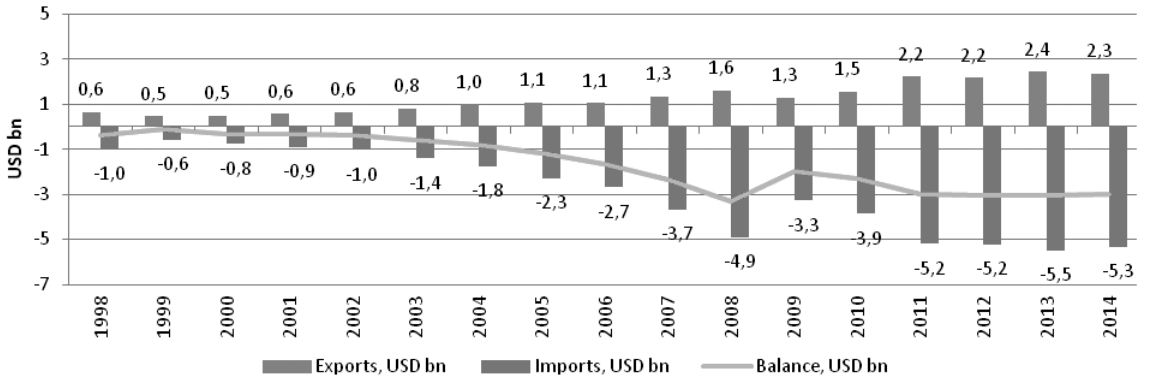


Source: UN ComTrade, National Statistical Service of the Republic of Belarus

The vulnerability of Belarusian machine building results from the high level of its exports' dependence on the Russian market, as almost 75% of machinery and electrical equipment exports go to Russia, whereas for transport equipment this figure is 65%. An analysis of the Trade Performance Index reveals that major gains came from the geographic specialization of Belarusian machine building, as well as from product specialization. As they are mainly dependent on one country and trading relations with that country, these gains are fragile. At the same time, the impact of rising competitiveness also manifests itself in IT & Consumer electronics. An even higher dependence on the Russian market prevails in the energy sector, where Russia supplies 95% of fuels. At the same time, the products of Belarus' energy industry are mainly allocated to the EU market, which accounted for 59% of sectoral exports in 2014 (and 87.2% in 2008). Thus, in the sphere of energy, Belarus is dependent on both suppliers of raw materials as well as key export markets.

Moldova. Just as Ukraine and Belarus, Moldova was also a net importer during the period analyzed. As its trade expanded, the trade deficit also increased due to the faster pace in the growth of imports growth. The decline in trade in 1998-1999 resulted in a drop in the total volume of trade by almost one half. Subsequently, Moldova's external trade began to expand gradually from USD 0.5 billion in 1999 to USD 1.6 billion in 2008 in the case of exports, and from USD 0.6 billion in 1999 to USD 4.9 billion in 2008 in the case of imports. Subsequently, the volume of Moldova's external trade dropped by almost 30% due to the financial crisis, and this included a 33% reduction in the country's imports and a 19% drop in its exports. However, in 2011 Moldova's trade recovered to pre-crisis levels and continued to expand until 2014, when trade dropped by 3% as a result of lower demand in key trading partner countries due to the economic and political crisis (Figure 16).

Figure 15. *Moldova's merchandise trade, 1998-2014*

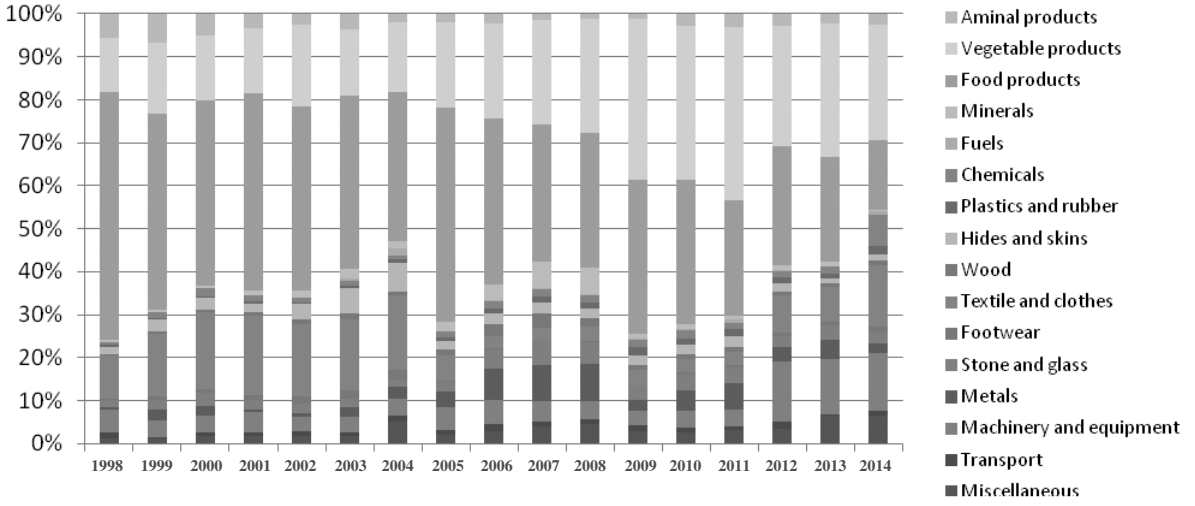


Source: National Bureau of Statistics of the Republic of Moldova

Moldova's economy is more open than Ukraine's but less so than Belarus' economy. On average, total merchandise turnover amounted to 101.6% of GDP during the period analyzed (it stood at 99.4% in 2014), with exports accounting for 33.3% and imports for 68.3%.

The structure of exports underwent changes in this period: in 1998, raw and processed food had accounted for 75.8% of total merchandise exports, but their share had decreased to 45.5% by 2014. At the same time, exports of textile and clothes increased from 10.0% to 14.1%, machinery and equipment surged from 5.2% to 13.2%, and the importance of chemicals increased from 0.8% of total merchandise exports in 1998 to 7.2% in 2014 (Figure 17). According to the UNCTAD classification, Moldova's exports of goods are dominated by consumer goods (48.5%) and raw materials (37.8%); during the period analyzed, there was a shift from the former to the latter.

Figure 16. *Moldova's merchandise exports structure (HS classification)*



Source: UN ComTrade, National Bureau of Statistics of the Republic of Moldova

Moldova's exports are more diversified by trading partners than by goods. The geographically most diversified export groups are clothing (13.7%), non-electronic machinery (31.3%) and transport equipment (35.1%), while the least diversified groups are unclassified products (96.4%), electronic components (88.1%) and minerals (71.3%). In terms of the diversification of goods, the lowest level of dependence on 3 major exported commodities within a group is observed for fresh food (39.6%), processed food (40.3%) and IT & consumer electronics (43.3%) (Table 12).

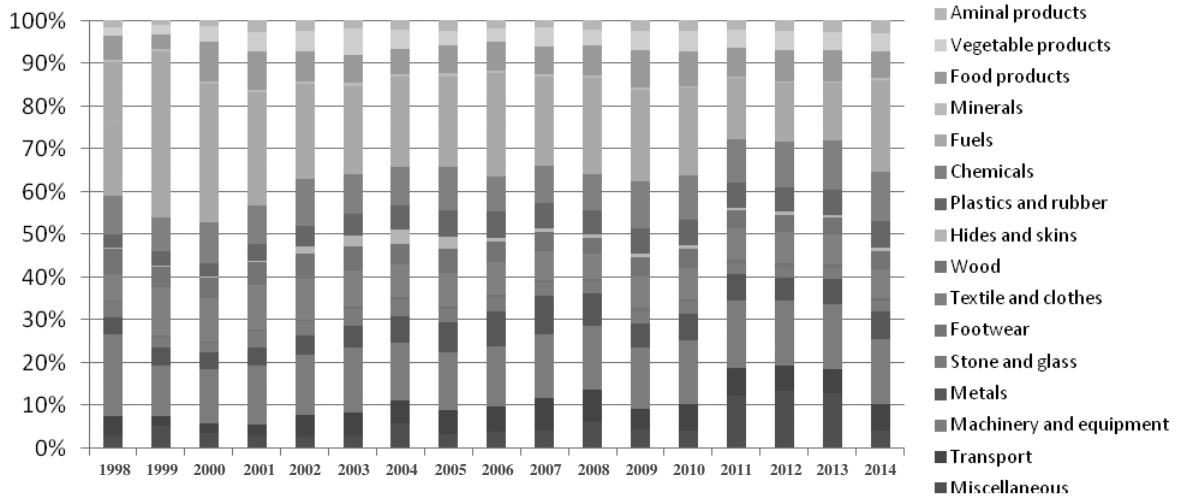
Table 12. *Sectoral diversification of Moldova's exports of goods*

Sector	Average share of sector in country's exports 2009-2013	Sector's export growth in value (% per annum) 2009-2013	Share of top 3 detailed products (HS6) in sector's exports	Share of top 3 importing countries in sector's exports	Leading exported product HS6	Top 3 importing countries
Basic manufactures	4.1%	26.0%	62.9%	68.7%	701090 Other containers of glass	Russia; Romania; Turkey
Chemicals	7.0%	30.4%	65.7%	87.5%	300490 Medicaments in dosage	Russia; Ukraine; Uzbekistan
Clothing	13.0%	3.5%	13.7%	69.4%	610443 Womens/girls dresses	Italy; United Kingdom; Turkey
Electronic components	8.3%	23.0%	88.1%	97.8%	854420 Co-axial cable	Romania; Russia; Italy
Fresh food	22.3%	18.3%	54.1%	39.6%	120600 Sunflower seeds	Russia; Turkey; Switzerland
IT & consumer electronics	0.3%	3.3%	69.6%	43.3%	851762 Machines for the reception, conversion and transmission or regeneration of voice	Russia; France; Bulgaria
Leather products	2.9%	6.1%	63.9%	87.0%	640399 Footwear	Italy; Romania; Russia
Minerals	3.5%	45.2%	71.3%	68.9%	720449 Ferrous waste and scrap	Turkey; Bulgaria; Germany
Miscellaneous manufacturing	7.0%	30.1%	51.2%	54.3%	940190 Parts of seats	Russia; Poland; Germany
Non-electronic machinery	3.6%	22.3%	31.3%	78.9%	841370 Centrifugal pumps	Russia; Ukraine; Romania
Processed food	21.0%	8.0%	44.6%	40.3%	220421 Grape wines	Russia; Belarus; Ukraine
Textiles	3.3%	24.3%	46.9%	81.6%	570242 Carpets of man-made textile	Russia; Romania; Turkey
Transport equipment	1.9%	36.4%	35.1%	72.9%	870899 Motor vehicle parts	Russia; Ukraine; Cyprus
Unclassified products	0.0%	21.3%	96.4%	99.2%	710812 Gold in unwrought forms non-monetary	Turkey; Ukraine; Romania
Wood products	1.1%	39.3%	54.3%	72.2%	481840 Sanitary articles of paper	Russia; Lithuania; Romania

Source: ITC Trade Competitiveness Map

Moldova's imports of goods are dominated by fuels, but their share dropped significantly from 31.2% in 1998 to 21.4% in 2014. The second most important group is machinery and equipment, whose share also decreased from 19.1% in 1998 to 15.1% in 2014. Chemicals, textile and clothes and metals increased their share as a percentage of total imports, while the relevance of wood products decreased (Figure 18). According to the UNCTAD classification, Moldovan merchandise imports are dominated by consumer goods.

Figure 17. *Moldova's merchandise imports structure (HS classification)*



Source: UN ComTrade, National Bureau of Statistics of the Republic of Moldova

As well as exports, imports are more diversified geographically than in terms of goods. The top trading partners have the lowest share in the imports of miscellaneous manufacturing (12.7%), basic manufactures (14.6%) and non-electronic machinery (14.6%), while they have the highest share of imports when it comes to unclassified products (99.9%), minerals (88.1%) and electronic components (42.8%). In terms of the diversification of goods, the most successful products are chemicals (29.8%), fresh foods (32.1%) and miscellaneous manufacturing (40.1%), while the least successful ones are unclassified products (99.4%), minerals (74.7%) and leather products (71.6%) (Table 13).

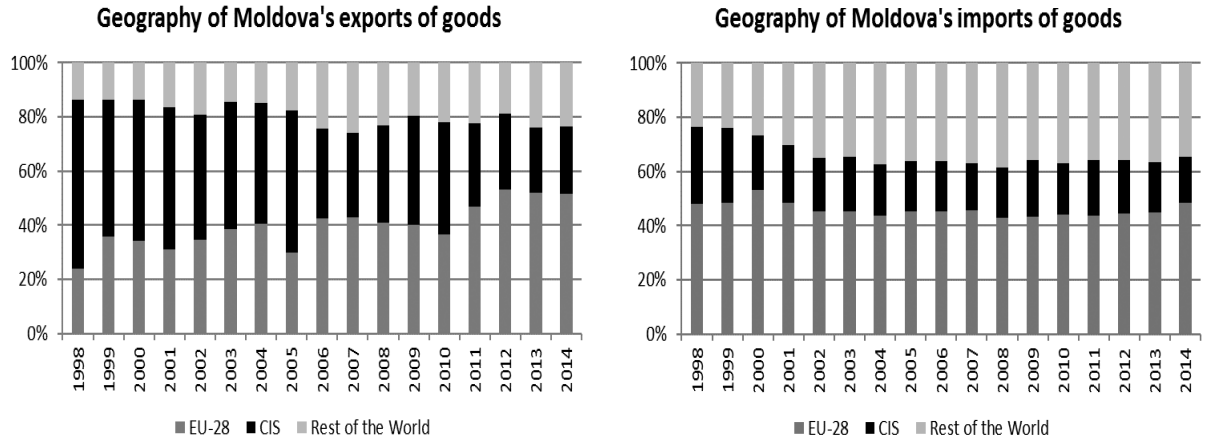
Table 13. *Sectoral diversification of Moldova's imports of goods*

Sector	Average share of sector in country's exports 2009-2013	Sector's export growth in value (% per annum) 2009-2013	Share of top 3 detailed products (HS6) in sector's exports	Share of top 3 importing countries in sector's exports	Leading exported product HS6	Top 3 importing countries
Basic manufactures	8.0%	13.6%	14.6%	51.2%	690890 Glazed ceramics	Ukraine; Romania; China
Chemicals	15.1%	14.3%	28.4%	29.8%	300490 Medicaments in dosage	Germany; Turkey; Russia
Clothing	1.9%	8.5%	36.0%	59.5%	611790 Parts of garments	Turkey; China; Italy
Electronic components	6.1%	15.3%	42.8%	45.6%	854449 Electric conductors	Austria; China; Germany
Fresh food	5.6%	12.8%	15.0%	32.1%	020714 Fowls	Turkey; Ukraine; Greece
IT & consumer electronics	3.2%	8.0%	42.7%	69.0%	851712 Telephones for cellular networks mobile telephones	China; Russia; Germany
Leather products	1.2%	9.5%	29.4%	71.6%	640399 Footwear	Italy; China; Turkey
Minerals	16.3%	1.8%	88.1%	74.7%	271019 Other petroleum oils and preparations	Romania; Russia; Belarus
Miscellaneous manufacturing	6.5%	10.5%	12.7%	40.1%	940360 Furniture, wooden	China; Romania; Italy
Non-electronic machinery	6.2%	21.7%	14.6%	42.3%	870190 Wheeled tractors	Germany; Italy; China
Processed food	8.8%	10.2%	24.1%	58.5%	240220 Cigarettes containing tobacco	Ukraine; Russia; Belarus
Textiles	5.2%	13.9%	20.5%	56.7%	600410 Knitted or crocheted fabrics	Turkey; Italy; China
Transport equipment	5.2%	16.0%	35.1%	44.0%	870323 Other vehicles with spark-ignition engine	Germany; Romania; Turkey
Unclassified products	6.3%	218.9%	99.9%	99.4%	999999 Commodities not elsewhere specified	Russia; Ukraine; Germany
Wood products	3.7%	11.6%	34.2%	49.4%	481840 Sanitary articles of paper,	Ukraine; Romania; Poland

Source: ITC Trade Competitiveness Map

Finally, as of the end of 2014, Moldova seems to be the most exposed to the EU market, which is structurally dominant in Moldova's exports and imports alike. During the entirety of the analyzed period, the EU was the most important source in Moldova's imports, accounting for 43-48% of total shipments (48.3% in 2014), followed by the CIS region with 18-28% (27.3% in 2014). In terms of exports, the EU's share gradually increased from 24.1% in 1998 (at that time, CIS accounted for 62.5% of total exports) to 53.3% in 2014 (32.5% for CIS) (Figure 19). The importance of the Visegrad Group countries for Moldova's trade has slightly increased – V4's share in exports increased from 4.8% to 5.6%, while in imports it went up from 5.8% to 6.2%.

Figure 18. *Moldova foreign trade by country groups, 1998-2014*



Source: UN ComTrade, National Bureau of Statistics of the Republic of Moldova

Compared to Ukraine and Belarus, Moldova's machine building and energy sectors both depend on the EU. The share of the EU in exports of machinery and transport equipment in 2014 was 83%, and continued to rise thereafter (in 2009 it had stood at 48%). At the same time, the import of machinery from the EU was also important and accounted for 55%. Also, compared to machine building in Ukraine and Belarus, Moldova's machine building also experiences competitiveness effects. The European Union is the main export and import market for Moldova's energy sector – in 2014, 73% of energy imports originated from the EU, while 99% of energy exports are delivered to the EU.

Access to markets

Compared to Belarus, Ukraine and Moldova impose lower levels of tariff protections. Belarus protects the markets of both agricultural and non-agricultural goods. Average tariff protections (MFN tariff rate) in Ukraine in 2014 stood at 3.1% (8.7% for agricultural goods, 2.7% for non-agricultural goods). In Moldova, this indicator was 2.9% (13.2% for agrifood, 2.1% for non-agrifood). Belarus' average MFN tariff in 2014 was several times higher – 9.2% in total, with 22.1% for agricultural goods and 8.4% for non-agricultural goods.

Ukraine and Moldova are members of the WTO, while Belarus is not. Nevertheless, Russia's obligations emanating from the Customs Union also affect Belarus. Ukraine, Belarus and Moldova are all members of bilateral FTAs in the CIS region, and they are also parties to a general multilateral CIS FTA; moreover, Belarus is a member of the Customs Union between Russia, Belarus, Kazakhstan, Armenia and the Kyrgyz Republic. Ukraine and Moldova have signed DCFTAs with the EU. Moldova launched a provisional application as of September 1, 2014, while Ukraine, because of economic and political pressure by Russia, postponed the implementation of its obligations to January 1, 2016.

Ukraine. Ukraine has been a WTO member since 16 May 2008, which provides is with easier access to the markets of all WTO members. It also party to a number of effective FTAs, however. Ukraine is subject to a broad liberalization of trade in goods as within the CIS it is party to both bilateral (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Uzbekistan) and multilateral FTAs (CIS FTA-2011, preceded by CIS FTA-1994). In the 2000s, Ukraine started negotiations with European countries. Since the 2000s, Ukraine has engaged in trade liberalization efforts with respect to its European trade relations. Ukraine signed an FTA with Macedonia on January 18, 2001 (trade in goods), and it did the same

on June 24, 2010 with the EFTA states (goods and services, plus three special agreements on agriculture), and on November 18, 2011 with Montenegro (goods and services). In 2008 Ukraine launched negotiations with the EU on creating a deep and comprehensive free trade area (DCFTA) as an integral part of the Association Agreement. The corresponding agreement was signed on July 27, 2014. However, due to Russian pressure its provisional implementation by Ukraine was postponed until January 1, 2016, though the EU started unilateral implementation by granting Ukraine autonomous trade preferences beginning in May 2014; this was extended in November 2014 to cover the entire year 2015. Ukraine is also engaged in negotiations on establishing FTAs with Turkey, Canada, Serbia, Singapore, etc.

Belarus. Belarus is a member of the Customs Union between Russia, Belarus, Kazakhstan, Armenia and the Kyrgyz Republic; this implies that the members are part of a joint customs territory. Also, Belarus is a member of a number of bilateral free trade agreements within the CIS (Azerbaijan, Armenia, Kyrgyz Republic, Tajikistan, Kazakhstan, Moldova, Russia, Uzbekistan, Turkmenistan and Ukraine), and is also party to multilateral free trade agreements (CISFTA, 1994; CISFTA, 2011). As a member of the Customs Union, Belarus is also engaged in trade liberalization negotiations with Serbia, Montenegro, EFTA, New Zealand and Vietnam.[6]

Moldova. Moldova has been a WTO member since July 26, 2001. It is also party to a number of effective free trade agreements. As a CIS country, Moldova has bilateral FTAs with other CIS members (for example, Ukraine, Kyrgyz Republic, Armenia) as well as multilateral FTAs within the CIS (CIS FTA, 1994; CIS FTA, 2011). Also, Moldova joined a free trade area within the Stability Pact for South Eastern Europe concluded in 2004 (SSE-FTA). Later, SSE-FTA was merged with CEFTA, a trade agreement between non-EU countries in South Eastern Europe. As of mid-2013, CEFTA's members included Albania, Bosnia and Herzegovina, Macedonia, Montenegro, Serbia, Kosovo and Moldova, which joined this agreement on January 1, 2014. On June 27, 2014, Moldova signed an Association Agreement with the EU, which includes provisions on a deep and comprehensive free trade area (DCFTA). The provisional application of the AA/DCFTA began on September 1, 2014. However, Moldova had liberalized access to the European market even earlier, as in 2008 the EU granted it autonomous trade preferences[7] and unilaterally opened its market to Moldovan goods. Currently, as a result of joining the DCFTA with the EU, Moldova experiences trade disputes with Russia, since in response the latter imposed MFN rates for a number of tariff lines. Finally, recently, in September 2014, Moldova concluded an FTA with Turkey.[8]

Foreign direct investments

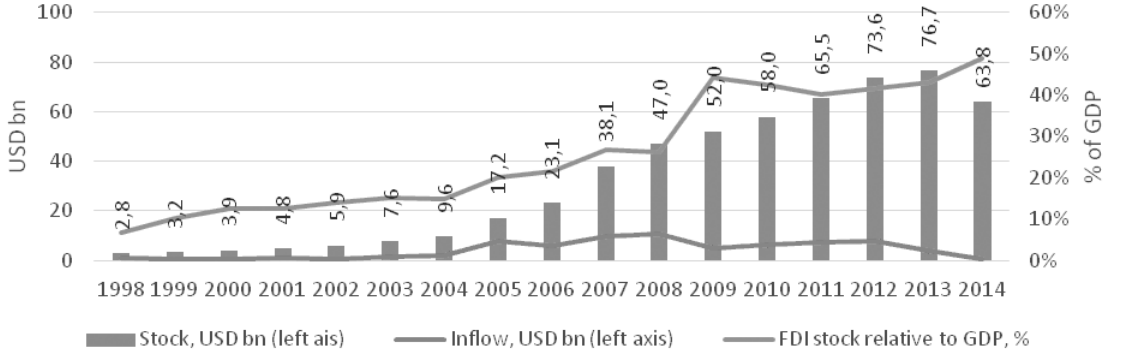
All three countries received considerably more in FDI than they invested in the rest of the world. Inflows of foreign direct investments have intensified since the mid-2000s. The recent economic crisis in the region lead to a significant contraction in the influx of investments, while currency depreciation led to a devaluation of the existing FDI stock. Though FDI in Ukraine and Belarus were affected significantly, investment attractiveness and investment activity did not change significantly. The EU is the main source of FDI in Ukraine and Moldova; Belarus depends on investments from CIS countries.

Ukraine. FDI inflows were weak until the second half of the 2000s. However, after the political changes in 2004-05, the inflow of foreign direct investments increased. Whereas between 1998 and 2004 the total sock of FDI in Ukraine increased from USD 2.8bn to USD 7.6bn, during the following decade a tenfold expansion occurred. As a result, as of 2013 the overall stock of direct

[6] http://mfa.gov.by/export/traderegimes/
[7] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02008R0055-20140220&qid=1417785407402&from=EN
[8] http://www.regnum.ru/news/polit/1846542.html

investments to the Ukrainian economy was estimated to amount to USD 76.7bn (43.1% of GDP) (Figure 20). However, due to the political and economic crisis in 2014, the investment attractiveness of Ukraine dropped significantly, and thus last year only USD 0.4bn were invested in Ukraine, mainly in the context of refinancing foreign-owned banks – no significant investments were made in the real sector. Moreover, due to the depreciation of the hryvnia by one-third, the overall stock of FDI decreased to USD 63.8bn, that is 48.8% of GDP.

Figure 19. *Inward FDI to Ukraine, 1998-2014*

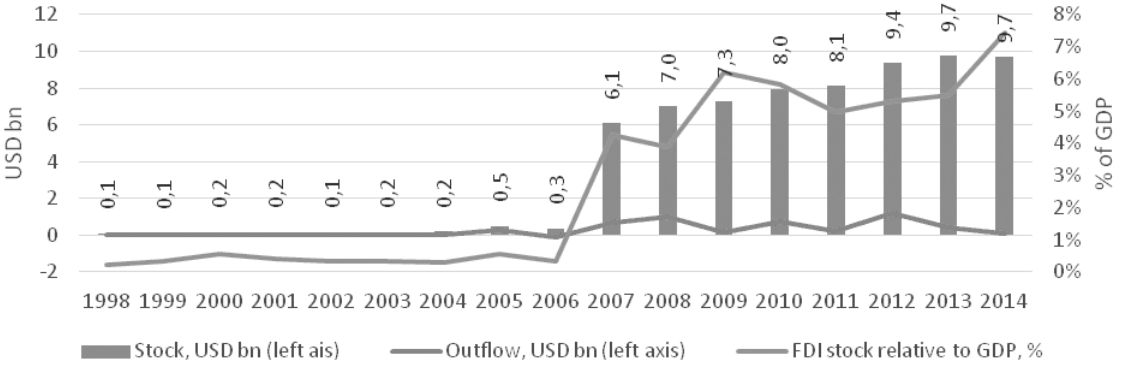


Source: World Investment Report 2015[9]

As of the end of 2014, almost 77% of the FDI stock in Ukraine originated in the EU, mainly from Cyprus (29.9%), Germany (12.5%) and the Netherlands (11.5%). Ukrainian FDI in Cyprus mainly consists of offshore money, which is afterwards reinvested in Ukraine. The share of Russia was 5.9%. The largest chunk of the FDI stock was invested in manufacturing (27.4%), financial and insurance services (25.1%) and wholesale and retail trade (13.1%).

Ukraine is less active in terms of investing abroad than foreign countries are in investing in Ukraine. There was a surge in outgoing investments in 2007, when in one year outward FDI increased from USD 0.3bn to USD 6.1bn. This surge was attributed to a huge flow of capital to Cyprus, into offshore accounts, which was likely part of a tax evasion strategy. In 2013, Ukraine's outward FDI stock reached UDS 9.7bn (5.5% of GDP). Because of the economic crisis, Ukrainian foreign investments contracted fourfold (USD 0.1bn) in 2014. As a result, the total stock of outward FDI remained virtually unchanged (USD 9.7bn or 7.4% GDP) (Figure 21).

Figure 20 *Outward FDI from Ukraine, 1998-2014*



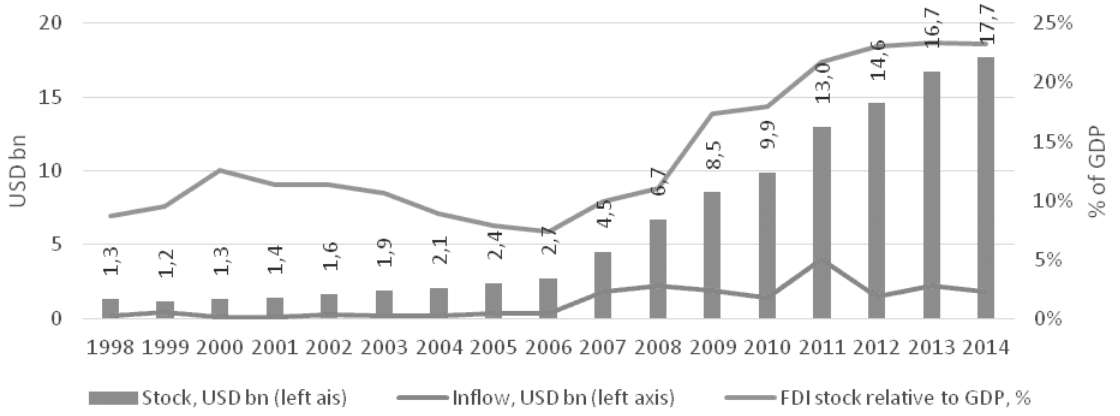
Source: World Investment Report 2015

[9] World Investment Report 2015 (2015), *United Nations on Trade and Development*. June 2015

The geography of Ukraine's outward FDI shows few signs of differentiation; as of 2014, 93.8% of FDI were allocated to the EU, mainly to Cyprus (91.6%). The share of Russia was 1.3%. The distribution of Ukrainian FDI among various economic sectors reflects their offshore nature: 85.5% were invested in professional services, 8.9% in financial and insurance services.

Belarus. FDI activity in Belarus has surged since the second half of the 2000s. While between 1998-2006 inward stock increased gradually, merely rising from USD 1.3bn to USD 2.7bn, in the following it increased form USD 4.5bn to USD 16.7bn (23.3%) in the period 2007-2013. In 2014, the inflow of FDI decreased by USD 0.4bn and, as a result, an additional USD 1.8bn were invested in the Belarusian economy (Figure 22). As for the sources of inward FDI, in the beginning of 2014, 59.8% of the FDI stock had originated in CIS countries, whereas 28.3% came from the EU. The relatively low ratio of FDI stock to GDP indicates that there is an unused FDI potential and a corresponding dependence on internal sources of investments.

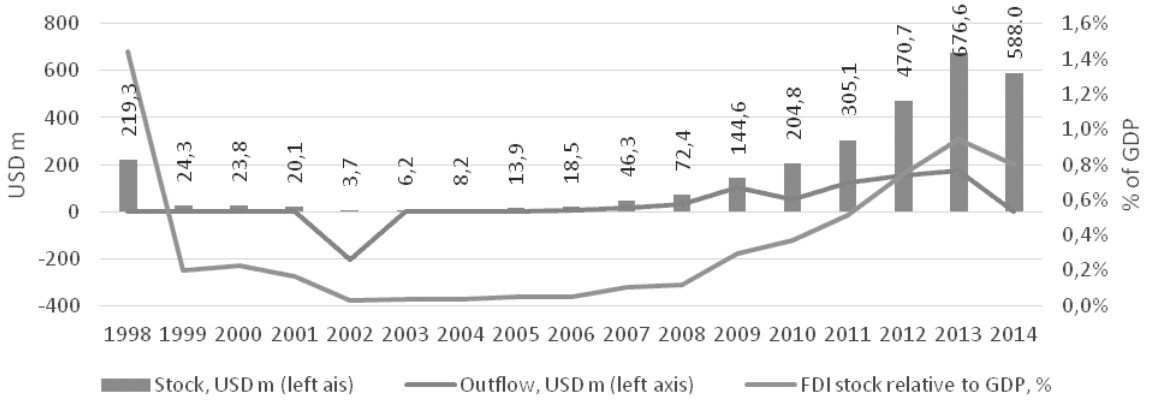
Figure 21. *Inward FDI to Belarus, 1998-2014*



Source: World Investment Report 2015

In the early 2000s, outward FDI activity amounted to a few millions annually. However, investment activity has intensified since 2007 – outward FDI stock increased from USD 46.3m in 2007 to USD 676.6m in 2013 (0.9% of GDP). Due to the economic crisis in the CIS region, outward investments by Belarus stopped in 2014 (Figure 23). As of the beginning of 2014, 85.9% of outward FDI were invested in CIS countries. The share of the EU was significantly lower, amounting to 9.1% of all FDI stock.

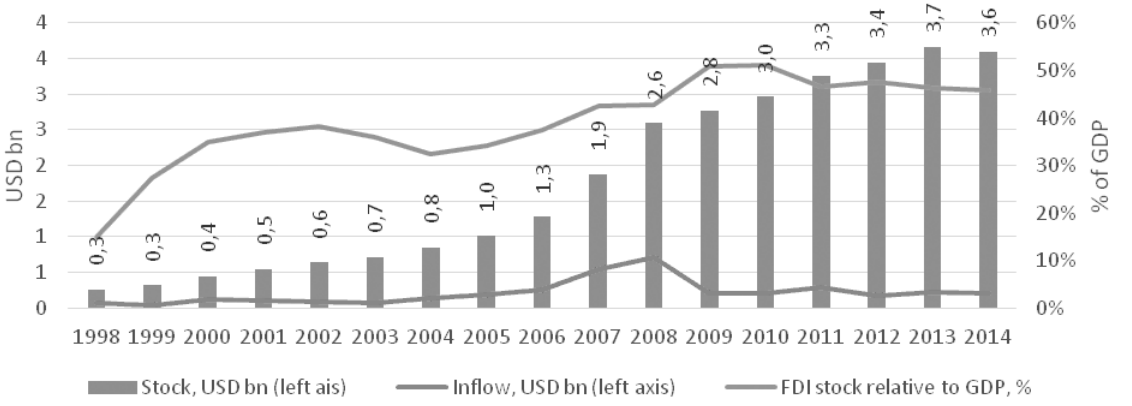
Figure 22. *Outward FDI from Belarus, 1998-2014*



Source: World Investment Report 2015

Moldova. The inward stock of foreign direct investments gradually increased from USD 0.3bn in 2000 to USD 3.7bn in 2013 (46.2% of GDP). In 2014, the inflow of FDI did not change significantly as compared to the previous years, and it amounted to approximately USD 0.2bn. The depreciation of the national currency, the lei, lead to a lower foreign currency equivalent in the value of investments, and thus the inward FDI stock decreased to USD 3.6bn (Figure 24). As of 2005, the main sectors in Moldova that received FDI were electricity, gas and water (33.0%), wholesale and retail trade (16.9%) as well as financial and insurance services (10.7%). The main sources of inward FDI to Moldova are the EU countries, especially the Netherlands, Germany, United Kingdom, Spain, Slovenia, Austria, France and Cyprus.

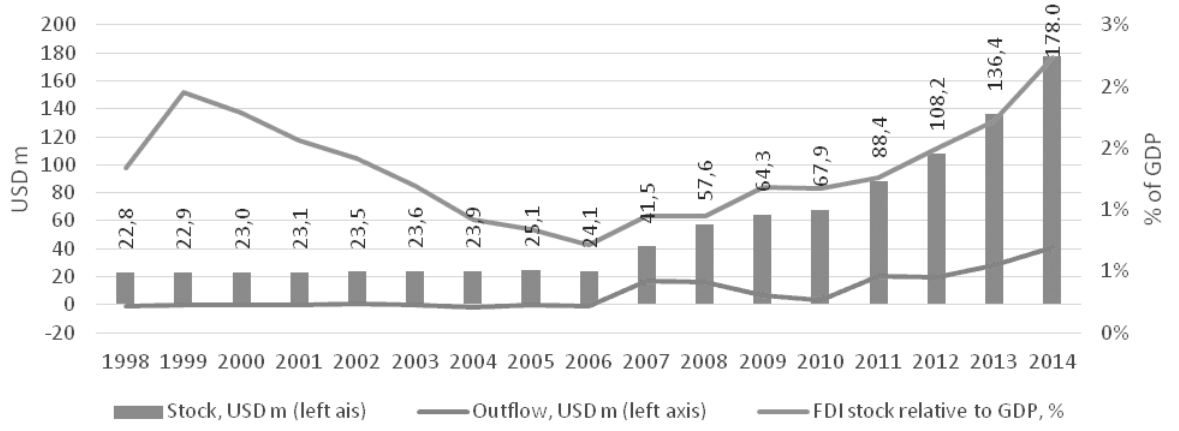
Figure 23 *Inward FDI to Moldova, 1998-2014*



Source: World Investment Report 2015

Since 2007, there has been a rise in outward FDI flows, too. Between 1998 and 2006, the overall stock of outward FDI varied between USD 23-25m, while outflows were negligible. However, between 2007-2013 Moldova intensified its investment activities and outward FDI stock increased from USD 41.5 m in 2007 to USD 178.0m in 2013 (1.7% of GDP) (Figure 25). The main destinations of Moldova's FDI activity are the Russian Federation and Romania.

Figure 24 *Outward FDI from Moldova, 1998-2014*



Source: World Investment Report 2015

Monetary and exchange rate policies

Before the global financial and economic crisis of 2008-2009, exchange rates were the anchors of monetary policy in all three countries. Central banks intervened in the market as necessary to manage exchange rates, and monetary policy operations were subordinated to exchange rate policy.

Before 2009, the National Bank of Moldova (BNM) intervened significantly in the interbank market to limit appreciation of the lei, and in 2009 the BNM intervened in the opposite direction, that is to slow the depreciation of the lei. Still, it claimed that the exchange rate remained a floating one. Eventually, in 2010, the BNM introduced inflation targeting with the support of the IMF, and reduced interventions in the foreign currency market. It had some success in anchoring inflation. Inflation outcomes were quite close to inflation targets, and inflation stabilized around 5%. Although the BNM was helped by the downward trend in global commodity prices and the low inflation levels of its trading partners, this was still a significant achievement given the small size of the Moldovan economy and the high share of tradable goods. Since demand for liquidity from banks was low, the BNM has mostly relied on reserve requirements and Certificate of Deposit (CD) sales for conducting monetary policy. The BNM also continued to intervene in the foreign exchange market. This is understandable given the high level of dollarization of Moldova's economy and the country's significant dependence on imports. As a result of this dependence, a substantial portion of the exchange rate depreciation also manifested itself in consumer prices. In Ukraine, the National bank of Ukraine (NBU) abandoned the dollar peg of the hryvnia in late 2008; the hryvnia was allowed to lose over 30% of its value. However, *de facto* the peg was reinstated in early 2009, although this was not formally announced. The NBU maintained it with relative success for almost 5 years until February 2014. In 2010 and 2011, capital inflows recovered and international reserves reached pre-crisis levels. At the same time, the IMF program went off-track and capital inflows decreased. This resulted in several attacks on the peg in 2011, 2012 and 2013, but ultimately the NBU was able to uphold it. This came at a price. The NBU had to spend almost half of its reserves on debt repayments (after Ukraine completely lost access to global markets in the middle of 2013) and interventions to keep the exchange rate fixed. The NBU also had to use administrative measures to support the exchange rate, such as mandatory sales of export receipts and restrictions on foreign currency purchases paid in cash. In the beginning of 2014, the peg was unsustainable and probably would have failed within 12-18 months even if there had been no change in government.

However, instability in the country and the loss of a large portion of export revenues forced the NBU to abandon the peg in February 2014. In 2014, the NBU went all out to limit depreciation of the *hryvnia* by implementing very strict administrative measures to boost the supply of foreign currency and limit demand. Still, it did not have sufficient reserves to prevent overshooting in the depreciation of the hryvnia, and the administrative measures taken were not enough to limit the hryvnia's slide. As a result, the hryvnia lost 50% of its value against the US dollar in 2014, and another quarter over the first two months of 2015. The hryvnia depreciated less against the currencies of Ukraine's main trading partners; on average its value against the currencies fell by about a third. The same happened to the euro, the rubel and the currencies of other trading partners vis-à-vis the US dollar. Nevertheless, the impact of depreciation on inflation was pretty devastating. The NBU will likely keep managing the exchange rate but will maintain its flexibility.

On the monetary policy side, the NBU was formally given the mandate to maintain price stability in 2010, as part of the preparations for inflation targeting under the IMF program. By the end of 2013, a combination of economic downturn, stable exchange rate and decreasing commodity prices helped bring inflation down close to zero. At the same time, the NBU's monetary policy operations were focused on supporting the exchange rate peg.

Still, between 2010-2013 the NBU made some progress in the technical preparations for inflation targeting, and in 2014 preparations were stepped up under the new IMF program. For example, the NBU streamlined reserve requirements, abandoning its previous focus on supporting the *hryvnia*'s peg to the US dollar, and expanding CD issuance with interest rates tied to the headline policy rate. This may lead to a closer tie between the policy rate and the bank deposit and lending rate. The NBU also implemented institutional changes that were necessary for inflation targeting. Nevertheless, if military action in Ukraine continues, inflation targeting will be very hard to maintain. The depreciation of the hryvnia led to a consumer inflation level of 35% in February 2015. This is likely to rise further in response to hikes in utility prices.

The recent depreciation episode confirmed that fluctuations in the exchange rate have a strong impact on inflation, though the weak economy concealed this impact to some extent. The recession led to wage restraint and a freeze in social payments, thus easing the inflation pressure stemming from depreciation. While the peg prevailed, and the exchange rate was fixed and had limited influence on inflation, government decisions on raising social standards seemed to be one of the main drivers of inflation. Increases in the minimum wage, in public sector wages and in pensions led to rises in the purchasing power of low income households and increased labor costs. Large parts of the labor force are covered by trade union collective agreements that make wage increases contingent on increases in the minimum wage. At the same time, bank lending has a limited impact on inflation, as consumer lending is predominantly directed at imported goods (TVs, cars, smart phones, PCs, etc.) and the share of fixed asset investment funded by bank loans has always been low. At the same time, the extremely high interest rates for *hryvnia* deposits (a result of reorienting banks towards internal funding and the imposition of restrictions on foreign currency lending) attracted a lot of household savings, which might have had some impact on countering the inflationary pressure. However, these savings likely replaced foreign currency savings (demand for cash dollars and dollar deposits went down).

Until 2009 the Belarusian central bank (NBRB) formally adhered to the exchange rate peg and announced a central rate and band for exchange rate fluctuations. In 2009, the NBRB announced a move to a foreign currency basket containing Russian rubles, US dollars and euros, and devalued the Belarusian *ruble* in response to the crisis. In 2010 and in early 2011, external shocks (i.e. unfavorable terms of trade through the rise of oil and gas prices and a simultaneous drop in the prices for key export products, forced the NBRB to defend the peg, and administrative restrictions were introduced leading to multiple parallel exchange rates. In 2011, the NBRB abandoned administrative measures and allowed large-scale devaluation; it also announced a move to a managed exchange rate. De facto, it has developed a crawling peg over the last years.

The role of monetary policy in Belarus is limited as state-owned banks control a large share of the banking sector, and loan issuance is dominated by directed loans, where the state requires banks to grant loans to companies that need funding as part of their state-approved operating plans. The growth in the money supply resulting from directed loans and wage targets (previously expressed in dollars), which are semi-mandatory throughout the economy, have a major influence on inflation in Belarus. In response to recent pressure on the *rubel,* the NBRB introduced administrative measures (e.g. a restrictive tax on foreign currency purchases) and allowed the national currency to weaken due to limited reserves. In 2015, the NBRB acted in response to the recent regional economic crisis by reducing administrative burdens and reintroducing the peg of the *rubel* to a foreign currency basket. Furthermore, the NBRB announced a future move to monetary targeting.

Overall, the three economies share their previous attachment to exchange rate anchoring and are all moving towards a managed exchange rate. Moldova seems to have made more progress in moving from a dollar peg to a more flexible monetary policy, while Belarus remains attached to the exchange rate peg despite significant fluctuations in exchange rates over the last years. There is also significant room for improving the effectiveness of the three central banks' monetary policy operations.

Economic outlook

On account of continued pressure on industrial production emanating from the ongoing conflict in the East (including the disruption of production/logistics chains), the IER expects Ukrainian GDP to fall by around 9% (also as a result of the disruption of production/logistics chains). High inflation (which may reach 50% in December 2015) and slowly growing nominal wages mean that domestic demand will remain very low. The IER expects the Ukrainian economy to stabilize in mid-2015 and bounce back slightly in late 2015 and 2016. As the basic conditions underlying the forecast continue to apply (prolonged military conflict but no escalation), an economic recovery is not expected.

According to forecasts by IFIs (World Bank, IMF, etc.) and local think tanks, GDP is expected to fall in Belarus and Moldova in 2015. For Belarus, the IMF expects GDP to fall by 2.3%, while the local think tank IPM expects a GDP drop of 3.5%. In Moldova, forecasters (EBRD, IMF, Expert-grup, government) expect GDP to fall by 1-2% in 2015, although economic output surprisingly grew in the first quarter of 2015. The projected recession primarily reflects spillovers from key trading partners: Russia and Ukraine.

The three countries face similar risks: fallout from the war in Ukraine, economic downturn in Russia (induced by sanctions and low oil prices), low commodity prices and exposure to the economic performance of the Eurozone. They must all adjust to external shocks that already resulted in a sharp depreciation of national currencies, and now they have to deal with balance sheet effects, high inflation, dips in domestic demand because of the lower purchasing power of households and reduced affordability of imported investment goods (maybe to a lesser degree in Belarus). This implies some tough choices for the governments involved, though the situation may be eased by external support, such as existing aid programs for Ukraine. On the bright side, the successful resolution of hostilities in Ukraine could provide a boost to all three economies.

Looking at the longer-term growth prospects, the IMF forecasts predict that in Ukraine, Moldova and Belarus an annual economic growth of up to 4% is attainable in the years 2017-2020 (IMF, 2015). This estimate is based on the assumption that comprehensive reforms will be implemented and that the three countries will reduce their vulnerabilities and exposure to adverse external shocks. Still, it's quite likely that growth will be below the projected level if potential risks end up being realized. This makes the implementation of reform measures even more crucial than at any time up to this point.

Recommendations for institutional reforms

At the moment of writing, among the three countries investigated Ukraine at the very least is plunging into deep macroeconomic instability, and the other two countries are likely to be adversely affected as well, the end of the Russian-Ukrainian territorial dispute is the first necessary step to take if one is to even contemplate regional recovery. However badly needed, this subject is beyond the scope of the present paper, which is why we proceed to lay out the necessary measures in the sphere of economic policy.

Among the measures that are necessary in the near-term, stabilizing domestic markets and laying the ground for the resurgence of consumer and investor confidence seem to be of utmost importance. Given that the year 2014/2015 resulted in a full-scale balance of payments crisis in all three economies, draining their reserves and limiting their monetary and exchange policy options, something clearly needs to change. There is some confusion as to what exact policies should be followed. Some, for example the IMF, advocate fully flexible exchange rate regimes. Moldova already embarked on this path with some success. Others in the meanwhile point to the necessity of a hard peg and argue that monetary policy should be given up altogether, suggesting that this is a more feasible solution in times of deep instability and low trust in the domestic currency and domestic financial institutions (Dabrowski 2015). One thing that is clear is that the intermediate

monetary regimes have proved to be unable to guarantee market confidence and have been too costly for the countries in question.

Overall, the three countries are now badly dependant on *ad-hoc* external financing. In order to reduce this dependence, they have work to do on fiscal consolidation in order to keep public debt on a sustainable trajectory, on reducing populism in fiscal policy as well as on medium-term planning. These are particularly relevant in the case of Ukraine and Belarus. The elimination of directed lending (Belarus), subsidized utility tariffs and carefree pension payments are just a few examples of measures that should be implemented in no time.

There is a lot to do in the sphere of banking sector reform, with a view towards reducing the vulnerabilities of banks to shocks and creating conditions for the remonetization of the economies (this last item is particularly relevant for Ukraine).

The vast privileges granted in whichever form to Ukrainian and Belarusian companies need to be abandoned. They constitute excessive burdens on public finances and cause a delay in the badly needed modernization of production and the potential reorientation of exports.

Finally, corruption and red tape are very widespread, especially in Ukraine and Belarus, creating all sorts of constraints for investment and loss of budget revenues. Measures to reduce red tape are therefore of the utmost importance.

Finally, it is worth underlining the extent to which the countries in question continued to follow a divergent growth path as compared to the new EU member states, especially after 2008-2009. This is necessary in order to explain why the experience of the Visegrad countries cannot be applied in a mechanical way to the situation of the three countries discussed here. Firstly, since the EP countries struggle with significantly greater structural problems and a greater exposure to external financing, they were harder hit by the global financial crisis than the Visegrad states. Correspondingly, their optimal policy responses would have to be more far-reaching than those of the new EU countries. The Visegrad states, on average, followed the EU's joint policy actions of upholding the benefits of the Single Market while ensuring fiscal sustainability. They also had better financial supervision. Their trade and financial links with the external world remained in place. As a result, the global financial crisis caused their GDPs to contract,[10] but it did not undermine their long-term growth trends.

As this report shows, the situation in Belarus, Moldova and Ukraine has been strikingly different. Not only did the global financial crisis bring more serious challenges and the need for deeper interventions, but it has also been mismanaged. Combined with the adverse external situation, this has exacerbated the sources of growth. As a result, the economies in question found themselves in a fragile situation, with a substantial dependence on external financing. The choices faced by the policy makers in these countries are significantly more extreme than any of the policy options faced by the Visegrad states.

However, the new EU member countries, including the Visegrad group, have accumulated vast experience in many economic policy areas. For the reasons outlined above, these cannot be applied in a mechanical way in the EP area. Nevertheless, there is substantial technical knowledge that could prove helpful while embarking on unpopular but badly needed reforms. The examples of areas where the transfer of knowledge from the Visegrad states may be beneficial comprises assistance in implementing tax reforms, including a much needed reform of the state tax authority in Ukraine; assistance in tackling corruption and red tape (since the Visegrad countries have markedly improved their corruption rankings throughout the 1990s and 2000s); adapting the education system to the needs of the labor market; and improving the quality of domestic product certification bodies in order to boost the competitiveness of their own industries abroad. Their unique knowledge of some of the EP countries' practicalities – which the countries further to the West do not necessarily know – places the Visegrad states in a good position to supplement any EU level technical initiatives with measures aimed at either the local level or the non-government sector.

[10] With Poland being the exception.

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Statistical Appendix

Table 14. *Indices of industrial production in Belarus, annual changes, 2005-2014*

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014[1)]
Total industry	110	111.2	108.6	111.3	96.9	111.7	109.1	105.8	95.1	101.9
of which:										
Mining and quarrying	106.5	103.1	101.6	101.1	103.1	109.8	103.1	98.3	99.5	141.7
Manufacturing	111.6	112.5	110	112.2	97.3	111.5	110.8	106.5	94.6	100.4
Manufacturing of food products, including beverages and tobacco	113	109.5	103.1	111.1	104.9	110.7	108.7	104.5	101.7	98.2
Manufacture of textiles and wearing apparel	106.6	104	104.8	104.6	90.3	113.5	106.8	101.4	97.3	100.1
Manufacture of leather, products of leather and footwear	104.1	103.3	99.1	100.5	95.4	112.8	106.8	101.9	99.1	90.8
Manufacture of wood and products of wood	107.1	101.6	110.1	107.2	86.4	112.2	108.2	98.2	108.7	106.6
Manufacture of paper and pulp. Publishing	116.1	104	107	107.8	93.2	116.8	109.8	98.4	92.3	111.4
Manufacture of coke, oil products and nuclear materials	109.4	129	101.4	115.9	107.8	88.7	118.1	109	79.1	108.5
Manufacture of chemicals and chemical products	105.3	104.1	109	114.5	118.5	130.5	103.2	119.9	82.2	125.3
Manufacture of rubber and plastic products	123.2	116.9	122.8	120.6	94	123.3	105	108.9	101.6	86.8
Manufacture of other non-metallic mineral products	111.3	118.7	111	115.7	94.4	112.4	100.6	97.3	103.6	96.4
Manufacture of basic metals and fabricated metal products	111.6	115.4	112.8	114.4	90.5	122.2	105.5	105	94.2	101.2
Manufacture of machinery and equipment	119.3	111.1	117	115.1	88.1	116.7	112.3	101.3	97.3	80.2
Manufacture of electrical machinery, electronic and optical equipment	109.3	115.4	107.2	114	77.9	127	112.7	108.2	105.6	91
Manufacture of motor vehicles and equipment	113	116.4	113.3	109.6	57.2	119.4	133.1	115.6	94.7	78.7
Manufacturing n.e.c.	109.4	112	115.4	123.1	86.6	114.6	108.9	101.2	102.1	101.8
Electricity, gas and water supply	98.9	101.6	97.7	104	90.6	114.5	93.3	100.1	100.8	102.7

note: in percent of the previous year; 1) provisional data
source: National Statistical Committee of the Republic of Belarus at http://belstat.gov.by

Table 15. *Indices of industrial production in Moldova, annual changes, 2006-2013*

	2006	2007	2008	2009	2010	2011	2012	2013
Total industry	95.2	98.7	101.5	78.9	109.3	109.5	98.1	106.8
of which:								
Mining and quarrying	124.3	104.5	104.8	70.6	107.1	127.6	98	122.2
Manufacturing industry	93.5	98.2	101.1	77.2	111	111.6	98.5	107.9
Manufacture of food products and beverages	81.6	92.2	109	82.4	112.1	106.8	101.3	106.3
Production, processing and preserving of meat and meat products	109.8	130.1	103	82.8	108.8	113.7	115.6	103
Processing and preserving of fruits and vegetables	106.5	108.5	94.5	77	107.5	130.6	83	113.7
Manufacture of dairy products	98.2	103.6	106.5	90.6	109.1	102.1	107.3	108.9
Manufacture of products of flour-milling industry, of starches and starch products	106.5	89.3	110.4	84.5	91.9	98.3	87.9	121.8
Manufacture of prepared animal feeds	102.6	94.2	114.2	175.1	134.8	127.7	127	141.2
Manufacture of bread and pastry products	106.4	110.9	109.4	93.9	105.3	107.6	99.4	104.9
Manufacture of sugar	111.7	49.8	177.5	36.9	237.1	84.2	90.6	173.6
Manufacture of cocoa, chocolate and sugar confectionery	99.9	116.6	108.3	92.9	102.2	104.9	100.7	108.7
Manufacture of distilled alcoholic drinks	64.1	78.1	105.9	79.2	108.6	123.3	101.8	119.6
Manufacture of wine	50.9	71.3	124.5	79	112.8	102.3	101.7	92.6
Production of mineral water and freshener beverages	114.4	128.5	87.5	92	124	105.1	102.5	92.5
Manufacture of tobacco products	78.2	92.6	86.2	116.2	127.5	91.3	79.9	80.6
Manufacture of textiles	121.2	109.9	92.2	75.1	98.8	146.2	97.9	101.3
Manufacture of wearing apparel; dressing and dyeing of furs	104	96	88.4	85.2	109.4	114.7	77.4	98.1
Manufacture of leather, leather products and manufacture of footwear	103.2	103.7	103.3	58.1	117	108	87.2	97.6
Manufacture of suitcases, handbags and other articles of leather haberdashery	93.9	101.7	103.3	71.1	125.4	117.8	92.5	89.4
Manufacture of footwear	102.4	102.6	101.6	57.4	116.2	103.9	84.9	101.5
Manufacture of wood and wood products	104.1	87.3	123.8	66.7	97.4	113.5	88.4	90.3
Manufacture of paper and paperboard	89.5	116.7	72	73.6	112.4	105.8	84.5	94.7
Publishing, printing and reproduction of informational materials	90.4	93.4	94	73.8	99.7	103.2	89	83.9
Chemical industry	112.3	09.3	109.1	92.2	116	91.3	105.1	119
Manufacture of medicaments and pharmaceutical products	120.1	109.8	109.9	94.7	112.7	74.9	119.9	164.7
Manufacture of soap, detergents, cleaning and polishing preparations, perfumes and toilet preparations	87.2	121.6	86.2	73	119.2	98.6	98.6	114
Manufacture of rubber and plastic products	124.4	104.5	101	72.8	101	104.6	95.1	98.1
Manufacture of other non-metallic mineral products	112.1	107.2	95.2	61.3	108.6	107.7	100.9	121.9
Manufacture of glass and glass products	94.9	93.7	96.8	74.5	115.8	110.8	84.7	133.3
Manufacture of tiles and bricks in baked clay	102.1	98.9	96.7	79.8	94.3	105.2	65.2	125.7
Manufacture of articles of concrete, gypsum and cement	112.3	94.1	88	49.4	113.2	106.7	109.8	118.6
Cutting, shaping and finishing of stone	145.1	141.4	102	67.4	116.1	79.9	105.8	126.7
Metallurgical industry	121.8	102.7	129.3	76.1	111.9	102.6	81.4	129.9
Manufacture of fabricated metal products, except machinery and equipment	117.2	107.3	93	69.5	98.7	111.1	87.3	95.1
Manufacture of machinery and equipment	101.2	100.4	97.1	61.9	124.1	118	102	88.2
Manufacture of agricultural machinery	93.8	98.4	82.1	69	112.7	103.7	84.7	76
Manufacture of machine tools	129.4	125.9	81.3	26.4	69.7	183.5	68.9	37.5
Manufacture of electrical machinery and apparatus	103.2	81.8	170.2	108.1	97	143.2	133.4	131.1

	2006	2007	2008	2009	2010	2011	2012	2013
Manufacture of equipment and apparatus for radio, television and communication	94.9	113.1	91.3	101.2	96.9	50.1	114.2	107.2
Manufacture of medical, precision, optical instruments	173.9	128.6	97.8	49.3	130.5	135.6	119.3	114.5
Manufacture of furniture	106.5	110.9	101.1	75.4	105.3	111.5	96.4	105
Manufacture of jewellery	104.8	137.1	72.8	52.7	71.6	58.4	67.3	15.9
Electricity and heat, gas and water supply	105	99.6	98.6	93.2	100.6	96.1	95.4	95.7
Production and distribution of electricity and heat, gas, steam and hot water supply	105.7	99.4	98.7	95	101.3	96.8	94.8	95.7
Production and distribution of electricity	105.5	103.6	99.6	97.4	101	97	95.2	97
Manufacture and distribution of gaseous fuels	103.1	92.2	94.6	74.8	102.9	92.9	93.8	99.5
Steam and hot water supply	108.2	89.4	98.6	103.2	100.9	98.9	94.9	92.1
Collection, purification and distribution of water	100.5	101.3	97.9	81	95.5	91.4	99.4	101.5

Note: in percent of previous year
Source: National Bureau of Statistics of the Republic of Moldova at http://www.statistica.md

Table 16. *Indices of industrial production in Ukraine, annual changes, 2011-2015*

	2011	2012	2013	2014	2015
	January-December	January-December	January-December	January-December	January December
Industry	108	99.3	95.7	89.9	78.7
Mining and manufacturing	108.7	99	95.2	89.3	77.8
Mining and quarrying	106.7	101.5	100.8	86.3	75.9
Mining of coal and lignite	113.7	104.5	97.6	69.5	48.1
Extraction of crude petroleum and natural gas	97.2	101	96.3	98.3	94.3
Mining of metal ores	103.2	101.2	104.6	93.4	88.3
Other mining and quarrying	123.7	90.5	103	95.6	84.5
Quarrying of stone, sand and clay	127	92.4	100.4	100.4	80.2
Mining and quarrying n.e.c.	..	..	118	71.9	106.2
Manufacturing	109.7	98	92.7	90.7	78.9
Production of foodstuffs, beverages and tobacco products	103.2	100.8	95	102.5	88.1
Manufacture of food products	106.9	101.7	96.4	104.6	89.2
Processing and preserving of meat and production of meat products	106.9	104.4	110.5	100.5	91.5
Processing and preserving of fish, crustaceans and molluscs	91.3	112.6	105.1	98.7	78.7
Processing and preserving of fruit and vegetables	112.9	105.4	99.8	102.9	89.5
Manufacture of vegetable and animal oils and fats	104.7	110.4	92.6	121.5	89.5
Manufacture of dairy products	94.1	104	100.5	100.1	94
Manufacture of grain mill products, starches and starch products	101.4	103.4	96.7	100.6	92.7
Manufacture of grain mill products	99.5	104.4	102	100.5	89.7
Manufacture of bakery and farinaceous products	100.2	100	96.5	89.5	80.2
Manufacture of bread; manufacture of fresh pastry goods and cakes	99.6	97.8	93.6	93.5	82.6
Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes	99.7	104.3	100.8	82	72.8
Manufacture of other food products	118	93.6	85.5	110.8	88.3
Manufacture of sugar	143.1	82	58.9	166.8	191.6
Manufacture of cocoa, chocolate and sugar confectionery	97.5	97.6	100.5	76.2	72.8
Processing of tea and coffee	110.5	125.9	110.7	106.1	96.7

	2011	2012	2013	2014	2015
	January-December	January-December	January-December	January-December	January December
Manufacture of condiments and seasonings	101.4	98.5	98.6	93.1	81.7
Manufacture of other food products n.e.c.	123.8	107.2	119.6	112.6	92.4
Manufacture of beverages	94.4	98	90.8	91.7	79.7
Distilling, rectifying and blending of spirits	90	97.4	84.3	93.7	97
Manufacture of wine from grape	70.4	77.3	94.3	97.1	149
Manufacture of soft drinks; production of mineral waters and other bottled waters	95.7	102.3	93.1	93.9	80.1
Manufacture of tobacco products	93.5	98.5	91.8	104.5	89.3
Textile industry, sewing of clothes, leather, leather articles and other materials	106.7	94.1	94.1	98.6	83.7
Manufacture of textiles	115.2	105	93.4	103.9	86.9
Weaving of textiles	..	..	85.4	98.1	100.9
Manufacture of other textiles	..	..	95.9	104.5	81.1
Manufacture of wearing apparel	103.9	93.1	95.2	102	87.2
Manufacture of wearing apparel, except fur apparel	..	..	96.3	95.6	86.7
Manufacture of leather and related products	105.3	85.9	92.7	84	70.4
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery and harness; dressing and dyeing of fur	105.8	81.9	113.2	81.4	64.4
Tanning and dressing of leather; dressing and dyeing of fur	97.6	82.6	115.4	77.5	63
Manufacture of footwear	105	88	82.6	85.7	74
Manufacture of products of wood, manufacture of paper and printing	107.4	101	102.7	96	82.5
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	118.7	99.1	100.7	103	97.9
Sawmilling and planing of wood	..	..	93.7	104.2	113.6
Manufacture of products of wood, cork, straw and plaiting materials	..	..	104.6	102.4	90.3
Manufacture of paper and paper products	100.7	104.9	105.2	94.3	82.1
Manufacture of pulp, paper and paperboard	106.3	100.5	102.1	93.3	88.8
Manufacture of articles of paper and paperboard	99.7	105.8	105.7	94.5	80.8
Printing and reproduction of recorded media	108.6	93	98.3	87.1	54.1
Manufacture of coke and refined petroleum products	96.4	81.6	89.2	78.7	45.9
Manufacture of coke oven products	105.3	96.6	92.9	78.1	48.5
Manufacture of refined petroleum products	83.5	54.1	77.3	81.2	38.6
Manufacture of chemicals and chemical products	128	96	80.7	85.8	78.4
Manufacture of basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms	139.9	88.2	69.4	76.3	82.7
Manufacture of paints, varnishes and similar coatings, printing ink and mastics	103.9	97.4	94.6	92.7	74.2
Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	104.2	110	109.2	97.8	91.8
Manufacture of basic pharmaceutical products and pharmaceutical preparations	98.6	107.3	111.8	101.9	92.2
Manufacture of rubber and plastic products, manufacture of other non-metallic mineral products	113.4	93.8	97.4	91.2	87.4
Manufacture of rubber and plastic products	109.5	98.2	99.5	90.8	71.8
Manufacture of rubber products	89.6	92.9	103.4	84.7	22.3
Manufacture of plastics products	113.8	99.1	98.9	91.8	81.5

	2011	2012	2013	2014	2015
	January-December	January-December	January-December	January-December	January December
Manufacture of other non-metallic mineral products	115.2	91.9	96.3	91.5	95.7
Manufacture of glass and glass products	113.9	93	92.5	89.6	81.7
Manufacture of refractory products	100.6	76.4	102.2	90	76.7
Manufacture of clay building materials	117.6	95.6	96.4	92.6	101.3
Manufacture of ceramic tiles and flags	116.4	102.9	94.5	86.3	87.7
Manufacture of bricks, tiles and construction products, in baked clay	119.5	84.2	100	103.9	183.1
Manufacture of other porcelain and ceramic products	116.4	104.7	97.2	94.8	98.1
Manufacture of cement, lime and plaster	105.6	94.4	94.9	92.3	92.7
Manufacture of articles of concrete, cement and plaster	122.6	91.6	96.3	94.1	115.3
Manufacture of abrasive products and non-metallic mineral products n.e.c.	111.8	93.9	103.4	77.9	99
Manufacture of basic metals, manufacture of fabricated metal products, except machinery and equipment	111	96.5	94.7	85.5	81.1
Manufacture of basic metals	109.9	95.9	94.4	85.3	81.7
Manufacture of basic iron and steel and of ferro-alloys	107.5	97.3	99.3	85.6	80
Manufacture of tubes, pipes, hollow profiles and related fittings, of steel	125.5	91.7	80.8	88.5	96.7
Manufacture of other products of first processing of steel	105	94	85.4	85.2	65.7
Manufacture of basic precious and other non-ferrous metals	102.8	95.5	95.8	86.6	95
Manufacture of fabricated metal products, except machinery and equipment	115.1	98.8	95.8	86.1	78.4
Manufacture of structural metal products	..	..	87	71.8	65.8
Manufacture of tanks, reservoirs and containers of metal	..	..	91.2	82.8	80.9
Forging, pressing, stamping and roll-forming of metal; powder metallurgy	..	..	81.7	54.9	46.9
Treatment and coating of metals; machining	..	..	101	90.8	83.7
Manufacture of other fabricated metal products	..	..	100.4	91.3	73.8
Engineering, except repair and installation of machinery and equipment	115.4	96.7	86.4	79.4	67.5
Manufacture of computer, electronic and optical products	102.4	89.7	86	77.9	49.6
Manufacture of consumer electronics	..	..	98.5	71.6	32.9
Manufacture of irradiation, electromedical and electrotherapeutic equipment	..	..	35	44.2	61.3
Manufacture of electrical equipment	125.8	88.6	91.1	100.9	74.8
Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus	139	80.4	98.9	116.5	72.3
Manufacture of electric motors, generators and transformers	77.5	117	107.6	114.2	78.2
Manufacture of electricity distribution and control apparatus	313.7	54.6	85.8	120.9	65
Manufacture of batteries and accumulators	..	..	93	55.8	33.5
Manufacture of wiring and wiring devices	129.7	101.3	74.1	86.5	87.6
Manufacture of electric lighting equipment	..	..	97.4	87.8	77.5
Manufacture of domestic appliances	112.5	88.6	91	84.4	124.4
Manufacture of other electrical equipment	..	..	69.4	101	124.3
Manufacture of machinery and equipment n.e.c.	109.9	97.3	93.5	88.7	69.1
Manufacture of general-purpose machinery	99.9	99.9	109.6	87.6	71.8
Manufacture of other general-purpose machinery	..	..	86.3	97	70.5
Manufacture of agricultural and forestry machinery	138.7	81.9	87.6	86.8	82.5

	2011	2012	2013	2014	2015
	January-December	January-December	January-December	January-December	January December
Manufacture of metal forming machinery and machine tools	101.8	108.2	62.3	75.6	95.8
Manufacture of other special-purpose machinery	99.1	99.9	84.3	86.6	57.9
Manufacture of machinery for metallurgy	88.7	100.4	84.9	93.2	52
Manufacture of machinery for mining, quarrying and construction	123.7	107.5	81.8	82	46.6
Manufacture of machinery for food, beverage and tobacco processing	125.3	173.5	81.5	74.4	92.1
Manufacture of motor vehicles, trailers and semi-trailers and other transport equipment	119.1	100.4	79.8	64.3	66.1
Manufacture of motor vehicles, trailers and semi-trailers	122	87.7	89.3	90.3	107
Manufacture of motor vehicles	132	75.3	68.3	54.2	20.8
Manufacture of parts and accessories for motor vehicles	118.8	90.1	93.3	96.5	118.7
Manufacture of other transport equipment	118.6	102.6	78.4	59.9	57.6
Manufacture of railway locomotives and rolling stock	125.5	100.6	65.5	37.3	14.3
Manufacture of furniture and other manufacturing, repair and installation of machinery and equipment	114.3	108.1	90.9	93	73.4
Manufacture of furniture	123.5	98.2	102.8	98.4	74.6
Other manufacturing	..	..	94.7	91.5	76.8
Manufacture of jewellery, bijouterie and related articles	..	..	..	59.5	62.2
Manufacture of medical and dental instruments and supplies	..	..	..	88.1	56.6
Repair and installation of machinery and equipment	114.9	115.5	..	91.9	72.5
Electricity, gas, steam and air conditioning supply	103.1	100.9	98.6	93.4	82.8
Electric power generation, transmission and distribution	103.4	101.4	..	93.9	83.5
Production of electricity	105.6	102.8	..	93.7	81.2
Distribution of electricity	99.6	98.7	..	94.4	88.2
Manufacture of gas; distribution of gaseous fuels through mains	99.5	95.4	..	87.5	76.9

Note: data excludes territories of the Autonomous Republic of Crimea and the city of Sevastopol
Source: State Statistics Service of Ukraine at http://www.ukrstat.gov.ua/

Machine Industry Report

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List of abbreviations

GDP	Gross Domestic Products
NACE codes	Nomenclature of Economic Activities
WTO	World Trade Organization
TFP	Total Factor Productivity
FDI	Foreign Direct Investment
SWOT	tables/analysis – Strengths, Weaknesses, Opportunities, Threats tables/analysis
LHS	Left Hand Scale
RHS	Right Hand Scale
SOEs	State-owned enterprises
USSR (SSR)	Union of Soviet Socialist Republics
p.p.	percentage points
CIS	Commonwealth of Independent States
CEE	Central and Eastern Europe
MNF	Most Favorable Nations
FEZs	Free Economic Zones
EBRD	European Bank for Reconstruction and Development
MOI	Ministry of industry
JSCs	Joint Stock Companies
EU	European Union
FINNs	Former Privatization Investment Funds
OECD	Organization for Economic Co-operation and Development
R&D	Research and development
EEU	Eurasian Economic Union
SO	Strengths, Opportunities
WT	Weaknesses, Threats
ST	Strengths, Threats
WO	Weaknesses, Opportunities
DCFTA	Deep and Comprehensive Free Trade Area
SME	Small and Medium Enterprises
V4	Visegrad Four (Visegrad Countries)

Executive summary

The machine building sectors in Belarus, Ukraine, and Moldova are to a significant extent shaped by the heritage of the Soviet period. In the present report we tried to find out what has changed over the last 15-20 years in the machine building sectors of the three selected countries, and what positive results or missed opportunities have emerged as a result of country-specific decisions. We have concluded based on our review that machinery can be considered to be a more vulnerable sector of the economy in Belarus and Ukraine, while it is less vulnerable in Moldova.

Belarus, Moldova, and Ukraine are still in the process of implementing structural adjustment in the economy to transition from a Soviet-type market model to a free market-based model, although the pace is different in each of these countries. This transition period includes a structural move from more labor-intensive and technologically simpler products to more advanced industries and products, a development that gradually shifts these industries towards becoming engineering-based industries. In 2013, industry accounted for 41.9% of Belarusian GDP, a figure that is reflective of its relatively high share of GDP over the last 25 years. Industry in Ukraine and Moldova substantially shrank from shares of 50.5% and 33.3% of GDP, in 1991 to 26.2% and 17.1% of GDP, respectively, in 2013. The role of machinery in the economies of these countries has also been changing. As of 2013, machinery has been providing relatively more value added in Belarus (4.6%) compared to Ukraine (2%) and Moldova (0.8%). The machine building sectors in Belarus and Ukraine take up a significant share of the total employment of these countries, while in Moldova this ratio is considerably lower. However, the level of investment in the machine-building sector in Belarus and Ukraine is low, while in Moldova it absorbs a higher share of investments as compared to its share in value added. In terms of its contribution to exports, the machine building sector accounts for a relatively higher share of total exports in Moldova, which indicates that exported machinery products offer a comparatively higher value added than in Belarus and Ukraine.

In Belarus, industry is based on large state-owned post-Soviet enterprises including machine building giants like MAZ (trucks), MTZ (tractors), BELAZ (heavy-weight trucks), and a few others. Despite the fact that there have been some positive moments (for example, large investment projects and massive investments to reduce the energy intensity of machine building production, etc.), Belarus' machine building sector currently finds itself in a rather difficult situation and requires reforms. Large enterprises have worn-out assets, investments are used inefficiently, the quality of products changes slowly, and price competitiveness remains dependent on the exchange rate of the national currency. The country's critical dependence on Russia because of the high share of imported components and fossil fuels, and because of the vast share of machinery exports that are purchased by Russia (almost three-quarters of the products produced by the Belarusian machine building sector are exported to Russia), reflects the depths of the structural problems of the Belarusian economy and the absence of institutional reforms over the last 25 years. As a result, after Russia's accession to the WTO, and the subsequent massive devaluation of the Russian ruble in 2014, Belarusian machinery output dropped by 20% in the same year.

In Ukraine, the most developed subsectors of machinery are railway machine building, heavy machine building, and machine building for agriculture. In order to reduce the distance between the producing company and the supplier of raw materials, these industries are mostly dependent

on domestic raw materials located in Eastern Ukraine. The level of productivity in machine building is only two-thirds of the national average, indicating a capital and technology deficit. This suggests that there are problems with international competitiveness. Despite the fact that the exports of the Ukrainian machine building sector are more diversified than those of their Belarusian counterparts, the level of Ukrainian export diversification is nevertheless relatively low, and Russia remains an essential target for exports (more than half of the goods produced by the Ukrainian machine building sector were exported to Russia in 2013). Considering the current political conflict between Ukraine and Russia, a possible loss of access to the Russian market would hit a majority of subsectors very hard. The figures for 2014 show that the machinery sector overall has shrunk by over 20%, while most subsectors that export to Russia, like railway machine building, have dropped by over 60%.

In Moldova, machinery has undergone significant transformations as a result of privatization and changes in output structure. By 2001, 93% of the machine building sector's output was produced by non-state enterprises, and 90% of workers in the machine building sector were employed in the private sector. Currently, Moldova can be described as a supplier of raw materials and components, and Western companies have shown a growing interest in the production of components in Moldova. The machine building sector has become more significant in Moldova's industrial production since 2001, and there is an increased focus on the machine building sector as an engine of industrial growth. Today, Moldovan investments in fixed machinery assets are mostly directed towards the manufacturing of fabricated metal products and equipment, as well as the production of electrical machinery and apparatuses. At the same time, Moldova has made significant strides in terms of diversifying its exports. Back in 1998 Moldova had a low level of export diversification (77.2% of its exports went to the CIS market). By 2013, the dependence on the CIS markets had been reduced to 27.5%, and dependence on the Russian market in particular was relatively low (21.3% of the exports of the Moldovan machine building sector were sold to Russia in 2013). At the same time, however, the Russian factor emerged as an issue of ownership n Moldova, as Russian businesses tend to control strategic enterprises in the metallurgy and machine building sectors on both sides of the Dniester River, though especially on the left bank.

Governmental policies on machinery differ in the three countries. In Belarus, they take various forms of economic stimuli, subsidies (hidden and open), soft budget constraints, and preferential lending rates that benefit companies in the machine building sector directly and indirectly. This often results in the inefficient allocation of resources and reduces the incentives for companies to introduce new technologies and innovations. In Ukraine and Moldova, the level of governmental interference is significantly lower than in Belarus, and is currently moving towards providing tax incentives in different forms, including the use of free economic zones. There are also issues related to corporate governance. In Belarus, the majority of enterprises are state-owned, which leads to a situation wherein all critical aspects of the operations of enterprises, including their choice of factors of production, and the targeted levels of output and distribution, are directly or indirectly affected by governmental policies. The situation is different in Ukraine and Moldova: the leading enterprises in the machine building sector have been privatized and are often controlled by local business groups. The state of corporate relations in Ukraine and Moldova is characterized by a low level of corporate culture, a discrepancy between the existing corporate governance practices, and globally accepted principles of corporate relations, as well as poor strategic management.

As evidenced by the experience of the Visegrad countries (Czech Republic, Hungary, Poland, and Slovakia), industrial structural changes obviously need highly coordinated efforts by central and local authorities. In the Visegrad Region such efforts were accompanied by economic policy transformations; improvements in business climate and the quality of governance, i.e. price liberalization; opening the markets; increased transparency in privatization (regardless of whether it was rapid or gradual); creating an SME-friendly business environment; development of the banking sectors; as well as institutional development, including efforts at greater protection of property

rights and the elimination of corruption. At the company level, machinery development in the V4 countries was driven by a focus on specific market segments and by FDIs provided by strategic investors. Flexible and innovative SMEs in the V4 succeeded thanks to either unique and specialized products or their flexible response to the needs of foreign investors.

Even if we assume that the experiences of V4 countries on the one hand, and of Belarus, Moldova, and Ukraine on the other hand, largely do not lend themselves to a direct comparison, there are some common features in their respective developments. Firstly, improvements in corporate governance (also including the elimination of state intervention in the case of Belarus) are among the key priorities. The practical application of the OECD's corporate governance principles may serve as a tool for achieving better accountability and improved relationship with investors, spurring investments into technologically advanced assets. Secondly, investment incentives should be targeting both local businesses and foreign investors with a better tax system, a better educated workforce and a good transport infrastructure rather than tax holidays, duty free zones, or other political promises. Finally, smooth cooperation with investors at every level (government, municipality, company) and the requisite institutional capacities are also among the decisive factors in the case of both, the V4 as well as the CIS countries. Nevertheless, given the differing levels of sectoral development among the Eastern partners, differentiation between the recipient countries is an important skill in terms of experience transfer. These countries and enterprises display a wide range of structural characteristics, and hence sometimes individual approaches may provide a better basis for experience transfer than national ones.

Introduction and definition of machine industry

The machine building sectors[1] in Belarus, Ukraine, and Moldova are to a significant extent shaped by the legacy of the Soviet period. In Soviet times, the economy was managed based on the command principle, and significant amounts of money and energy were allocated to the construction of large industrial plants. The machine building sector was one of the engines of economic growth in these countries [22]. The Soviet Union collapsed over 20 years ago and from then on the abovementioned countries had to manage their industrial plants by themselves . Producing quality machinery products turned into a challenge, while selling those products became even more challenging. In this report we made an attempt to estimate the success of such efforts and to assess the current state of the machine building sectors in these countries.

Despite their common history, the comparative analysis of these three countries is rather problematic due to the differences in the definitions of the concept of machine industry in the relevant literature and because of numerous differences between national statistics during the period of transition since 1991. One of the goals of this paper was to assemble comparative data from official statistical sources such as the National Bureau of Statistics of the Republic of Moldova, the National Statistical Committee of the Republic of Belarus, and the State Statistics Service of Ukraine. The Statistical Yearbooks of the three countries were also used for this work. While writing the report, the authors faced the problem of classifying changes in the industries of each country from the 1990s up to the present moment. Moreover, even the prevailing classification of the industries varies among the countries involved, and they each have some specific characteristics. For example, Ukraine and Moldova use a more detailed classification of their machine building sectors, while the Ukrainian "Input-Output" table is nigh impossible to use because of its poorly detailed classification. Considering the above, the authors fully realize that it is difficult to provide a full statistical comparison of the three countries.

[1] The report uses different, synonymous and interchangeable names for the machine building sector: “machine industry”, “machine building” as well as “machinery.”

The strategic approach of the paper is to use the NACE codes of the machine building sector, including the subsectors presented in Table 1. However, due to the fact that Belarus, Ukraine, and Moldova have only recently began to transition to NACE-like codes, extensive work had to be done to complete the database for the period of the last 9-10 years at least.

Table 1. *NACE codes used for definition of machinery*

(HS Code)	Harmonized System Codes
84	Nuclear reactors, boilers, machinery and mechanical appliances, computers
85	Electrical machinery and equipment and parts, telecommunications equipment, sound recorders, television recorders
86	Railway or tramway locomotives, rolling stock, track fixtures and fittings, signals
87	Vehicles other than railway or tramway or tramway rolling stock
88	Aircraft and spacecraft and parts thereof
89	Ships, boats and floating structures

Source: Statistical Classification of Economic Activities in the European Community (http://ec.europa.eu/eurostat/ramon/nomenclatures/)

We used NACE codes 26-30 to define what subcategories of industry are included in the machine building industries in Belarus, Moldova, and Ukraine. Despite some national practices, we excluded subsectors 24 (Manufacture of basic metals) and 25 (Manufacture of fabricated metal products, except machinery and equipment) from the basic definition due to the facts that a) though Ukraine's metallurgy sector is one of the core economic sectors in terms of production and exports, it is nevertheless not part of the topic of the current report, and b) in Belarus and Moldova subsectors 24 and 25 were quite often presented as a single industry, which effectively would have prevented us from excluding subsector 24 (manufacture of basic metals) from the analysis.

We used the Harmonized System Codes (Table 2) classification – which is available in the UN Comtrade Database – for analyzing export developments and patterns in the machine building sector.

Table 2. *Harmonized System Codes*

Code No.	NACE code description
26	Manufacture of computer, electronic and optical products
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment n.e.c.
29	Manufacture of motor vehicles, trailers and semi-trailers
30	Manufacture of other transport equipment

Source: UN Comtrade Database (http://comtrade.un.org/)

Box 1: EU / V4 classification of the machine industry sector

The Statistical Classification of Economic Activities (NACE) is the industry standard classification system used in the European Union. The current version is the second revision and was adopted by Regulation (EC) No 1893/2006. It is the European implementation of the United Nations' classification "ISIC" Rev. 4. However, in today's world it is difficult to fit it exactly into the statistical records. A car for example basically belongs into NACE 29 – Manufacture of motor vehicles. But a car is not just the result of mechanical engineering. The average car is made up of about 1,800 – 2,200 separate parts. This includes some large components, such as the engine, which is inserted as a unit during the production process, but also contains thousands of individual pieces. Toyota, for example, has stated that a single car the company produces consists of about 30,000 parts, counting every part down to the smallest screws. And the parts are made of very different materials, so some could be counted as products of the textile industry (seats) or of the plastics industry. Furthermore, new and emerging industries are combining some traditional sectors of the economy. The new materials sector (such as composites) is one such example.

Even in the EU and V4, each country defines the machine building sector (or, as it is most commonly referred to: the engineering industry) differently, using different NACE items. In Slovakia, for example, the engineering industry comprises these 4 NACE sectors:
NACE 25 – manufacture of metal products and fabricated metal products, except for machinery and equipment;
NACE 28 – manufacture of machinery and equipment, n. e. c.;
NACE 29 – manufacture of motor vehicles, trailers, and semitrailers;
NACE 30 – manufacture of other transport equipment;
– but not electrotechnical industry:
NACE 26 manufacturing of computer, electronic, and optic products;
NACE 27 manufacturing of electric equipment.

Numerous papers try to try to identify the prevailing challenges that affect machinery development in these three countries, and many suggest appropriate measures to tackle them. Limited competitiveness, worn-out capital assets, and the low diversification of export markets are the most frequently mentioned characteristics in economic literature to describe the machine building sectors in these countries.

D. Saha (et al., 2014) showed that among all Ukrainian sectors, the machine building sector is most exposed to the Russian market, with 32% of output being exported to Russia [7]. Due to the current political tensions between Ukraine and Russia, the authors refer to the potential losses of the machine building sector if Russian demand were to contract, which would hit the sector hard. Taking into account the likelihood of such a scenario, the authors identified three strategic options that the Ukrainian government might choose from: laissez-faire, conservation, and modernization.

A recent paper by V. Movchan (et al., 2014) tries to quantify the total exposure of Ukraine to the Russian market, as well as the exposure at a sectoral and regional level. The authors found that the manufacture of machinery and equipment sector features the highest level of exposure, with 22% of its output being shipped to Russia [20]. Metallurgy and metal processing ranks fourth in terms of exposure to Russia, with a high but manageable exposure level of 14%. The authors also raised the problems of trade restrictions in entering the Russian market, and underlined the importance of the Ukrainian authorities continuing their efforts to normalize trade relations with Russia, as well to re-orient their exports from Russia to other destinations.

Deloitte and InvestUkraine present an overview of the machine building industry, including an analysis of economic attractiveness, comparative characteristics, and undiscovered opportunities [29].

I Fadieieva (2013) presents an analysis of the current state of corporate governance in Ukrainian mechanical engineering, highlighting the main problems and features of actual corporate governance [30].

K. Kurilionak (et al., 2000) estimated potential gains and losses for various Belarusian industries if the country were to join the World Trade Organization (WTO). Their results showed that potential losses for the machine building sector exceed export gains from improved market access [21].

J. C. Cuaresma (et al., 2012) provides an in-depth analysis of firm growth and its drivers in the context of the machine building industry in Belarus. Their results indicate a significant degree of inefficient resource allocation in state-run firms. The findings suggest that total factor productivity (TFP) in non-state-owned Belarusian machine building firms exceeds the corresponding level of productivity in state-owned enterprises. Moreover, during the observation period 2005-2010, the difference in TFP levels between state- and non-state-owned firms has increased [4]. The authors showed that labor hoarding and soft budget constraints (overinvestment or unproductive investments) play a particularly important role in explaining differences in performance between these two groups of firms.

E. Favaro (et al., 2012) focused on state-owned enterprises in Belarus, especially in the machine building sector, and highlighted the importance of the Russian market for this sector [1].

M. Akulava (2011) analyzed the impact of foreign direct investment on economic performance, using the Belarusian industrial aggregated panel data for the 2002-2009 period. The results thus obtained showed that the distribution of foreign capital across the various sectors of the economy determines the impact of FDI on economic performance. In Belarus, FDI has no positive impact on machinery and is negative for black metallurgy [27].

The abovementioned papers studied the vulnerability of the machine building sectors in Ukraine and/or Belarus. Nevertheless, none of the papers performed a comparative analysis of the vulnerability of machinery in the aforementioned countries.

The overall goal of the report is to compare the respective vulnerability of the machine building sector in Belarus, Moldova, and Ukraine. A vulnerability check involves an analysis of the main macro parameters (such as the contribution of the machine building sector to GDP; its share of exports; its export diversification; as well as employment and investments in the sector) as well as an analysis of country specific institutional parameters combined with micro-level case-studies from machinery companies in the three countries.

The specific objectives of the report are thus the following:

a) to present a comparative analysis of the main machinery trends in Belarus, Moldova, and Ukraine;
b) to identify major common opportunities and crucial common problems in the development of the machine building sectors in the three countries;
c) to describe institutional features of the development of machinery based on micro-level data and case-studies;
d) to assess applicable Visegrad experience with respect to machinery development.

Box 2: Development challenges of the machine building sector in the V4 countries

The key problems in the transition of these sectors stem from the "nature" of the machine building industry. It is characterized by these factors:

- **High manufacturing intensity and high investment need**
  - a sizeable share of value added must be spent on research and development (R&D) to be able to compete in the global markets;
  - predominantly small-batch and single-item production – adapting products to customer needs;
  - high qualification requirements for staff & high labor costs + staff needs continuous training;
  - large and relatively complex communication requirements between manufacturing, engineering, and design departments.
  - the market for products is mostly global, and swift technological innovation leads to the continuous renewal of products and to changes in patterns of use.
- On the other hand, the sector features high productivity and the **machine industry has significant potential for further growth and expansion.**

Current challenges in the V4:

- **Loss of skilled labor,** especially the resulting shortage of engineers and highly-skilled personnel in advanced technologies;
- **Diminished access to credit** from financial institutions, especially venture capital e.g. for R&I;
- Progress is required with respect to the energy supply infrastructure, as well as for the energy efficiency of buildings, transport networks, and industrial production – energy demanding sector **/ highly vulnerable to changes in energy policy;**
- **Investments in research and development (R&D)** are crucial and the development of smart technologies is important, but none of the V4 countries invest much into R&D;
- The V4 economies are now at a stage where they gradually **lose the advantage of price competitiveness,** especially in the manufacturing industry. This recent development is the result of an increase in the costs of labor, energy, and services, and is also amplified by the increasing attractiveness of the conditions for locating certain types of activities in developing countries. The intensity of FDI inflow into the V4 has decreased significantly in recent years, even if there have been some major deals(e.g. Jaguar/LandRover recently announced an investment in Slovakia);
- **Unfair global competition** caused by **non-compliant goods** is affecting the competitiveness of this sector. "Theft" of know-how is also a major challenge. Access to state aid and EU funds are also a challenge with respect to fair competition;
- Growing **environmental costs** related to increasing pressure on the environmental aspects of production;
- External costs related **to policy changes** – the instability of the regulatory framework and the administrative burden associated with complying with the regulatory rules, such as standardization, certification, etc.;
- Low level of **entrepreneurship** and inadequate performance of the endogenous entrepreneurial sector in the V4 countries is closely connected to the high **dependence** of the V4 countries' economic development on the activities of foreign-owned companies that use the V4 countries as a manufacturing base;
- Lack of **cooperation and value added chains** among local based companies, especially SMEs.

Following the abovementioned objectives, the structure of the study is as follows. Chapter 1, which is entitled "Comparative analysis of the machine industry trends in the three countries", presents the review of the general performance of the machine building sectors in Belarus, Ukraine, and Moldova, including the past and current conditions under which these operate. Chapter 1 is divided into four subchapters and discusses the most important developments regarding machinery, such as changes in industrial specialization patterns, export and import patterns, investments, and human capital in machine industry. There is also a special focus in Chapter 1 on the Russian Federation as the main destination market and the source of raw materials in these the three countries. Chapter 2 is entitled "Institutional analysis based on micro-level data and case studies", and it moves from the macro to the micro level to illustrate the institutional strengths and weaknesses of machinery development based on micro-level data and case-studies from the three countries. Chapter 2 is broken down into three parts: an analysis of institutional regulations and economic policy, a review of ownership issues and corporate governance practices, and a review of past and

present reforms and innovations. Chapter 2 is concluded by SWOT tables for each of the countries discussed in order to structure the information obtained. The SWOT analysis includes draft strategies for the development of the machine industry in Belarus, Ukraine, and Moldova. Finally, a summary and a vulnerability check conclude the previous parts of the report and answer the question regarding the vulnerability of the machinery sector in the countries thus reviewed.

Comparative analysis of main machinery trends in the three countries

Manufacturing is the core of the real economy. The planes we fly, the cars we drive, the cell phones and computers we use are all products of the manufacturing sector, specifically machine building. Machinery is usually a capital-intensive sector of the economy that provides comparatively high value added and know-how that make our lives easier and more comfortable. The machine building sectors of Belarus, Ukraine and Moldova are to a large extent a legacy of Soviet times. In the current chapter we seek to answer the question if the machine building sectors in Belarus, Moldova, and Ukraine are indeed among the key sectors of the respective national economies today, and we also wish to ascertain how far their positions have changed over last 15-20 years. We are interested in both external (contribution to GDP, contribution to exports, export diversification, share of employment in this sector as a percentage of total employment) and internal industry processes and patterns (productivity, wages, efficiency, investments, assets, financial results).

Belarus, Moldova, and Ukraine are still in the process of performing the structural adjustments which are necessary to transform their economies from Soviet-type systems to market-based economies, although the pace is different in each of these countries. This transition period includes a structural shift from more labor-intensive and technologically simpler products to more advanced industries and products, as well as engineering-based industries. In 1991 these countries were heavily industrialized as industry produced 50% of GDP in Belarus, 50.5% in Ukraine, and 33.3% in Moldova. By 2013, the role of industry in the overall economy had fallen modestly in Belarus (to 41.9% of GDP), while it shrank substantially in the case of Ukraine (to 26.2% of GDP in 2013) and Moldova (to 17.1% of GDP in 2013). The role of machinery in the economy of these countries has also been changing. As compared to 2005, Belarusian machinery has declined in terms of output, employment, and exports, while its contribution to the country's GDP has also fallen but remains the highest among the three countries (Table 3). In Ukraine, the industry's declining performance between 2005 and 2013 has resulted in a decrease in its contribution to GDP, along with falling output and employment; nevertheless, the industry's share of exports has risen over the same period. The role of machinery in Moldova's overall industry has increased since the early 2000s, which has manifested itself in expanding output and soaring exports, and a higher share of GDP in 2013 when compared to 2005. As of 2013, machinery has been providing relatively more value added in Belarus (4.6%) than in Ukraine (2%) or Moldova (0.8%).

Table 3. *Main indicators of the machine building industry in Belarus, Ukraine, and Moldova*

	Belarus		Ukraine		Moldova	
	2005	**2013**	**2005**	**2013**	**2005**	**2013**
Industry value added, % of GDP	44.0	41.9	32.3	26.2	16.3	17.1
Machine building value added, % of GDP	6.7**	4.6**	3.3*	2.0*	0.6*	0.8*
Machine building output relative to GDP,%,	18.9	16.2	13.5	9.2	1.9	2.2
Machine building output, % of industry	19.0	18.1	12.7	9.7	3.4	5.6
Employment in machine building sector, % of industry employment	29.2	25.8	22.6	17.2	9.7	8.4
Export of machine building sector to total export of all HS commodities, %	19.3	18.2	13.1	16.3	5.6	14.9

* Calculated based on World Bank data on manufacturing value added, % of GDP and share of machinery in manufacturing output
** Calculated from data provided in Input-Output tables: value added in machinery is the sum of gross output minus the value of intermediate inputs used in production for industries 26-30, classified as machinery
Sources:
World Bank – World Development Indicators
National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)
State Statistics Service of Ukraine http://www.ukrstat.gov.ua/).
National Bureau of Statistics of the Republic of Moldova (http://www.statistica.md/index.php?l=ru)

The different strategies of industrial transformation in Belarus, Moldova, and Ukraine are also illustrated by the fact that machinery products offer comparatively higher export value added in Moldova than in Belarus and Ukraine. The machine building sector accounts for a relatively higher share of all exports in Moldova (14.9%) than the contribution of machinery to the country's GDP or its share of industry. The role of Moldovan machinery exports is very similar to the corresponding figures of Ukraine and Belarus, even as the sector's output and share of employment is considerably lower in Moldova than in the other two countries.

The following text analyzes these countries in detail and intends to show what the differences are in their output, exports, employment, and investments, and why these differences exist. Each country will be divided into subsectors. Table 4 shows which machinery products are crucial in each country in terms of production and exports.[2]

[2] With respect to production, commodities are not ranked, while for export the list is ranked by diminishing export value in each product group

Table 4. *Key commodities of the machine building sector in Belarus, Moldova and Ukraine*

Belarus	Ukraine	Moldova
Production		
✓ Tractors ✓ Buses ✓ Metal cutting machines ✓ Lorries (inc. dump trucks) ✓ Trolleybuses ✓ Feed harvest combines ✓ Bicycles ✓ Household refrigerators and freezers ✓ TVs ✓ Household washing machines	✓ Trailers and semi-trailers for the transport of other goods ✓ Machine-tools ✓ Refrigerating or freezing equipment ✓ Cranes ✓ Tractors ✓ Cars ✓ Lorries	✓ Electrical Equipment; ✓ Pumps (hydraulic, electrical pumps); ✓ Food & beverage equipment; ✓ Tractors;[3] ✓ Cutting tools; ✓ Trailer and semi-trailers (also for agricultural use); ✓ Bicycles;[4]
Export		
1. Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof (agricultural machinery, tractors and truck tractors, trucks, spare parts and accessories for automobiles and tractors) 2. Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof 3. Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles	1. Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof 2. Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles 3. Railway or tramway locomotives, rolling-stock and parts thereof; railway or tramway track fixtures and fittings and parts thereof; mechanical (including electro-mechanical) traffic signaling equipment of all kinds	1. Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles 2. Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof 3. Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof

Source:
National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)
State Statistics Service of Ukraine http://www.ukrstat.gov.ua/).
National Bureau of Statistics of the Republic of Moldova (http://www.statistica.md/index.php?l=ru)

[3] CKDs (Knocked-Down kits) of Belarus tractors from the Bobruisk tractor plant.
[4] CKDs (Knocked-Down kits) of bicycles for the EU market.

Box 3: The machine industry sector in the EU

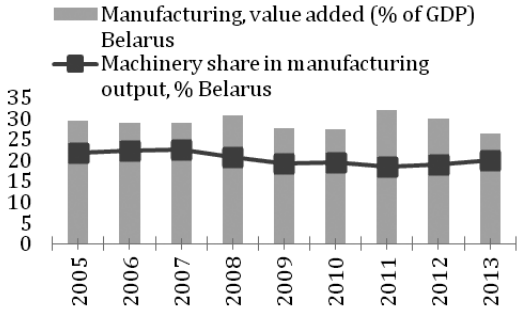
The engineering industry is the largest industrial branch in the EU, with a turnover of over €1,825 billion in 2014. The industry accounts for over a quarter of manufacturing output and a third of the EU's manufactured exports.
Automotive industry: The automotive industry employs approximately 12 million people. Manufacturing accounts for three million of these 12 million jobs, sales and maintenance account for another 4.3 million, and transport for 4.8 million. The automotive sector accounts for 4% of European GDP.
Mechanical Engineering: 3 million people are employed in this sector in the EU and it has a 9.5% share of all the production in EU manufacturing industries. EU is the world's largest producer and exporter of machinery with an estimated 36% share of the world market.
Aeronautics: Ca. 500,000 jobs and a turnover of close to EUR 140 billion. The EU is a world leader in the production of civil aircraft, including helicopters, aircraft engines, parts and components, but the industry is highly concentrated in terms of geography (United Kingdom, France, Germany, Italy, Spain, Poland, and Sweden) and the small number of enterprises it comprises.
Electrical and Electronic Engineering industries: EEI produces a wide range of products, ranging from consumer products to turbines, trains, power grids, and power stations. EEI's gross output is ca. EUR 703.3 billion, representing 9.6% of all EU manufacturing gross output. At the same time, the EU is the largest electrical engineering market, followed by the USA and Japan.
Ships and Maritime Equipment Industry: Employs more than 500,000 people and has an average annual turnover of around EUR 72 billion. It is made up of around 300 shipyards, 80% of which can be considered to be 'small to medium' (building ships of 60-150mt). Marine Equipment Manufacturing is made up of around 7,500 companies.
Defense industries: Directly employs about 400,000 people and has a turnover of EUR 96 billion annually. It comprises over 1,350 companies, mostly SMEs.
Source: European Commission (2016). Available at http://ec.europa.eu/growth/sectors/index_en.htm (Accessed on 01/25/2016)

Changes in machinery specialization patterns by output

Changes in the contribution of machinery to GDP and the role of these specialized industries in the total industry of the three countries discussed here indicate that machinery has seen its role in industry and manufacturing decline in Belarus and Ukraine, while it has been gaining in importance in Moldova. This happened in parallel with the process of gradual change in industrial specialization in Belarus and Ukraine: despite massive output, machinery has been losing productivity, which has also resulted in a drop of its share of value added and exports.[5] According to figures 1-3, the outputs of the machine building sectors of Belarus, Ukraine, and Moldova have been following different trajectories: output has been declining in Ukraine and Belarus, while it has been on the rise in Moldova. Trends in the share of machinery as a percentage of manufacturing output indicate that structural changes in the machine building industry went deeper in Moldova, while these changes were rather modest in Belarus and Ukraine.

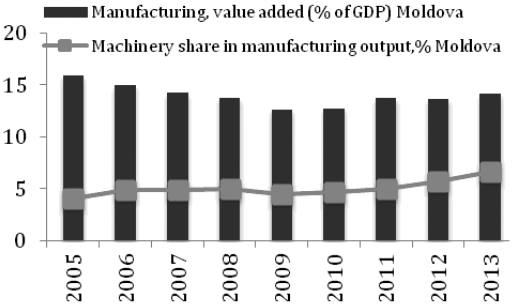
[5] In the case of Ukraine, the export share in 2005 was at the lowest level at any time during the last 12 years (13.1%), and remained virtually the same in 2014 (13.2%). See the section analyzing export behavior in Chapter I.

Figure 1. *Machinery output (% of manufacturing) and manufacturing value added (% of GDP) in Belarus, 2005-2013*



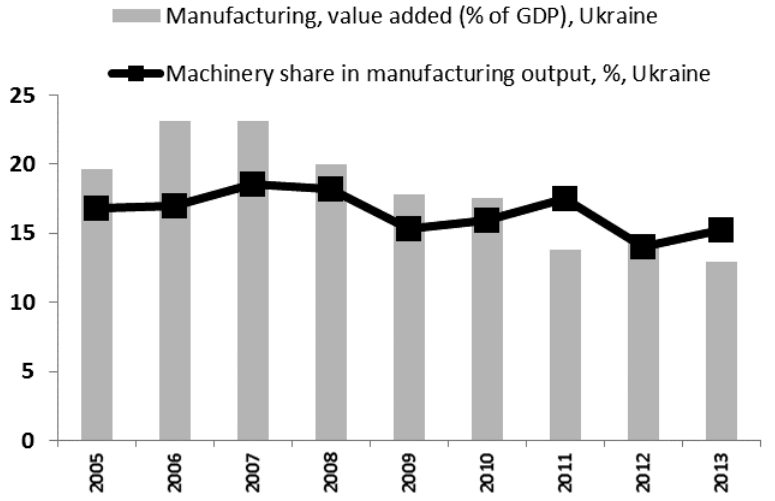
Source: World Bank, National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)

Figure 2. *Machinery output (% of manufacturing) and manufacturing value added (% of GDP) in Moldova, 2005-2013*



Source: World Bank, National Bureau of Statistics of the Republic of Moldova

Figure 3. *Machinery output (% of manufacturing) and manufacturing value added (% of GDP) in Ukraine, 2005-2013*



Source: World Bank, State Statistics Service of Ukraine (http://www.ukrstat.gov.ua/)

In Belarus, machinery output has been fluctuating around 20% of manufacturing with a slight drop after the 2009 global crisis. However, the GDP contribution of manufacturing in Belarus has been declining since 2011, which suggests that machinery value added has also been declining. There is an evident downward trend in machinery output in Ukraine, which has been accompanied by a rapid decline of value added in the sector and in manufacturing in general. The only positive signal in the case of Ukraine is that machinery output has been more stable than the production of other subsectors of manufacturing. The situation is completely different in Moldova. The machine building sector in Moldova has been gradually recovering its previous output and has reclaimed its importance for the manufacturing industry, with a slight decline during the global crisis years of 2009-2010. The most promising indication of growing value added in machine building in Moldova is that the output share of manufacturing has been growing faster than the contribution of manufacturing to GDP.

Box 4: Machine industry in the V4 – importance & transformations

Machine industry is a very important sector in the V4 countries, with a long tradition and a high share of GDP, output and exports.

Table: *Main economic characteristics of the machine industry in the V4 countries*

	Czech Republic		Hungary		Poland		Slovakia	
	2005	**2013**	**2005**	**2013**	**2005**	**2013**	**2005**	**2013**
Industry value added, % of GDP	28.1	27.9	22.1	22.0	22.1	22.1	26.3	22.9
Machine building value added, % of GDP	8.0	9.8	7.7	8.5	3.5	n/a	5.1	6.5
Machine building output relative to GDP, %	32.3	41.0	36.5	37.9	14.6	n/a	30.1	45.2
Machine building value added, % of total industry	28.5	35.1	34.8	38.5	16.0	n/a	19.6	28.6
Employment in machine building sector, % of employment in industry	27.9	32.1	29.6	34.3	19.4	17.8	23.9	29.3
Export of machine building sector of total export of all HS commodities, %	51.2	55.0	62.0	53.0	39.6	38.4	44.9	57.9

Source: Eurostat, 2015.

During socialist times, machine industry was linked to a significant extent to the defense industry, especially in Czechoslovakia. Already in the mid-70's some companies have shifted some of their defense production to other sectors, mostly to the production of agricultural and/or food-processing machines and vehicles such as tractors.

Generally, the first years after the collapse of socialism were the hardest for the machine industry. In Slovakia, machine industry production fell by 30% between 1990-1993. Especially major companies had to reduce the number of their employees, and in many cases the state industry reform programs did not work.

There is also group of companies (especially in the Czech Republic) that survived transition thanks to their extensive tradition and their importance (which manifested itself in special attention by the government or in finding important global investors during the process of transition). This was the case with the Czech company SKODA Transportation, for example, which was originally established in 1859. It survived and is successful owing to the diversification of its product range, which includes a wide variety of industrial products, including railway vehicles and vehicles for urban mass transportation (subway trains, low-floor trams, trolleybuses, etc.). Another example is the Slovakian company Tatravagónka Poprad, which was established in 1922 and is the only manufacturer of railway freight wagons and bogies in Slovakia, and is also among the biggest producers in Europe with respect to the aforementioned products. The company still enjoys a very strong position in the markets of the former Soviet Republics, but it is also very successful in the EU and has acquired other companies, to wit Fabryka Wagónow Gniewczyna (Poland) in 2009, Bratstvo Subotica (Serbia) in 2011, and 100% of the shares of the German company ELH Eisenbahnlaufwerke Halle GmbH & Co. KG, Landsberg in 2012.

Four general types of successful transition scenarios can be identified at the level of companies:

1) A big company that may be either traditional or of recent vintage – survives as a major company mostly thanks to massive government support in its restructuring and the diversification of its production. It produces a wide range of products or has several subsidiaries that specialize in a selected segment of the market. In some cases, they are still to some extent dependent on public investments/orders (defense industry, public transport vehicles, etc.);
2) A big company that is fragmented into several smaller companies, only few of which survive through smart specialization or by finding strong investors (mostly FDI) who invest money into the modernization of their production and in opening new markets for them;
3) SMEs that have a unique product in the market, strongly specialize on some market niche, and are able to compete globally (one example is SPINEA Pre ov in Slovakia, the only European producer of high precision gearboxes, which relies on a unique construction based on its own patented principle; or the Czech company SOR Lichvaby, which completely changed its production from agricultural technologies, such as feeding vehicles, fodder turners, silo unloaders, small mountain tractors, etc., to the production of buses, trolleys, and electric buses);
4) Big companies or SMEs that are able to adapt to the needs of huge automotive investors in Central Europe and became their suppliers. In many cases (especially in Slovakia), they are acquired by strong (typically foreign) investors that modernize their production and promote the attainment of international certificates and better management.

Box 5: "Rebirth" of the machine industry thanks to the automotive industry

The Slovak economy is heavily focused on industry, especially on industrial production with medium-high technology. Approximately 4.5% of the labor force in the EU27 work in industrial production involving medium-high technology, whereas in Slovakia this share is 8.1%. With respect to this particular type of industry, Slovakia is the third most specialized economy in the EU. Almost 65% of the related production in Slovakia stems from motor vehicles and their spare parts. Nowhere else in the EU 27 do we observe such a high share of production based on medium-high technologies.

Table: *Selected statistics defining some sectors of industry in Slovakia – focusing on machine industry development*

	Revenues s (million EUR)		Share of total industrial revenue%	Share of exports in%	Share of employment in%	Average wage in EUR	
NACE	**2004**	**2010**	**2010**	**2010**	**2010**	**2004**	**2010**
5-35 Industry total	48 396	67 484	100.0	100.0	100.0	561	795
24-25	7 276	8 409	12.7	13.0	14.8	612	797
26	1 792	6 816	13.6	26.1	5.8	532	754
27	2 098	2 364	4.4		7.5	492	768
28	1 932	2 630	4.7	8.8	9.5	581	845
29-30	8 614	13 902	28.1	23.6	17.8	632	889

Source: Statistical Office of the Slovak Republic.

The rebirth of machine building in Slovakia is closely connected to foreign direct investments in the automotive sector. Huge investments by Volkswagen (the first factory in Slovakia, established already in 1991), Peugeot-Citroen (2003), and Kia-Hyundai (2004) turned Slovakia into the "car-producing nation." Slovakia produces the highest numbers of cars per 1,000 inhabitants in the world. In 2014 this number was 183 cars per 1,000 inhabitants, the Czech Republic came second with 118 cars, South Korea was third with 82 cars. Hungary was in the 11th place with 23 cars produced per 1,000 inhabitants, while Poland produced 12 cars per 1,000 inhabitants in 2014.

As for the numbers of cars produced, in 2013, 987,718 cars were produced in Slovakia, 1,132,931 in the Czech Republic; 222,400 in Hungary; 583,258 in Poland; 166,428 in Austria, and 50,449 in Ukraine. The total number of cars produced globally was 87,299,993.

The automotive sector in Slovakia directly employs 80,000 employees (compared to 22,000 in 1993) and indirectly creates another 120,000 jobs in over 316 Tier 1 companies in Slovakia (suppliers). Forty percent of the suppliers of these three car producers are located in Slovakia, 60% of car parts are imported. The sector represents 35% of Slovakia's total industrial exports €17 billion) and creates €2.5 billion of added value annually. By comparison, the automotive industry in the Czech Republic directly employs 150,000 employees and represents 20% of the country's manufacturing output. The car factories located in the Czech Republic are Skoda Mladá Boleslav (Volkswagen Group), TPCA Kolín (Toyota, Peugeot, Citroen), and Hyundai Nosovice. However, the Czech Republic also has a long tradition of producing trucks (TATRA Koprivnice, AVIA Praha – Cakovice) and public transport vehicles (KAROSA-IRISBUS, SOR, IVECO, Skoda Plzen, CKD Praha).

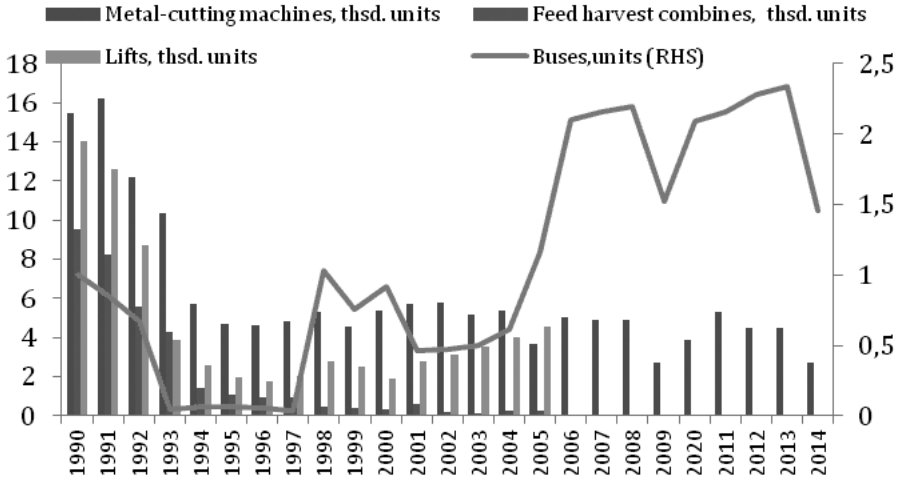
In Hungary, the car industry has not played a distinguished role, neither early in the transition process nor today (though its importance did grow after the late 1990s as new Suzuki, Audi, and Mercedes factories were built). The once successful company IKARUS was established already in 1895 as a coach factory, went on to become a car producer and has been producing buses since 1927. The company failed to transform effectively in the 1990s and lost its positions in the international market. By 1973 Ikarus had become the world's fourth largest manufacturer of buses. Irisbus, a French-Italian investing group invested in the company in 1999, but in 2006 it sold Ikarus Bus to Hungary's M?szertechnika group, which introduced new buses, for example the new Ikarus V187 in 2010. Since 2014 the company has also started to produce Ikarus-Skoda trolleybuses. The buses are produced in Székesfehérvár (Hungary), the engines come from the Czech Republic. However, the machine industry success stories in Hungary are typically linked to electrical equipments, electronics, and devices – companies like Flextronics, Electrolux, GE-Tungsram, Orion, Nokia and others.

Belarus

Machine building has been historically one of the sectors of specialization of the Belarusian economy and is quantitatively one of the most important industrial sectors in terms of employment and production. During Soviet times, administrative decisions were taken to place the most vital and most powerful machine building plants in the territory of what was then the former Soviet Socialist Republic of Belarus. Among the reasons were the qualified labor force there and the fairly well-developed road infrastructure. But such decisions had a significant strategic disadvantage for Belarus: Production was based on imported raw materials and components from other republics of the Soviet Union. Moreover, the main scientific and research bases were located in Russia, which resulted in the fact that a substantial share of research and innovations were sent to Russia [22]. As a result of this situation the country became a so-called "assembly shop" of Soviet industry. In the Soviet (command and control) economy, demand was guaranteed regardless of the quality of the product offered.

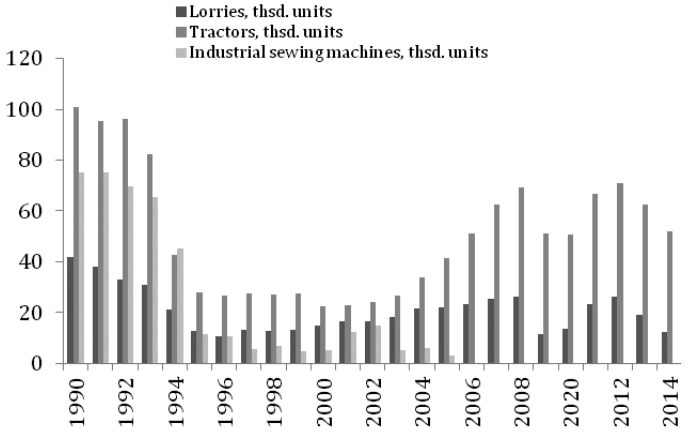
After the collapse of the Soviet Union, the production of many kinds of goods declined significantly due to the fact that the Belarusian machine building sector had specialized in the production of unsophisticated low-price products for the captive Soviet market, and particularly for Russia as the biggest Soviet and post-Soviet market. In 1990, the manufacture of machinery and metallurgical industry sectors accounted for 34.2% of all industrial output. By 1995 their share had dropped to 23.3% [9]. Due to the facts that i) Belarus' machine plants had to start performing independent marketing and contractual activities, ii) their products were of insufficient quality because of low-level innovation capacities, and iii) there was a rapid depreciation of fixed capital in key machine building factories, the share of the sector continued to fall in the 1990s. Figures 4 and 5 depict the production dynamics of key commodities produced by the machine building sector in Belarus between 1990-2014. These show that the years 2011-2012 were the peak years. Capacity utilization of key commodities indicates that machinery has partially recovered from the global crisis of 2009, but has been diminishing in a slow and gradual trend since 2012 (Figure 6).

Figure 4. *Production of selected commodities in Belarus, 1990-2014, thsd. units (LHS), units (RHS)*



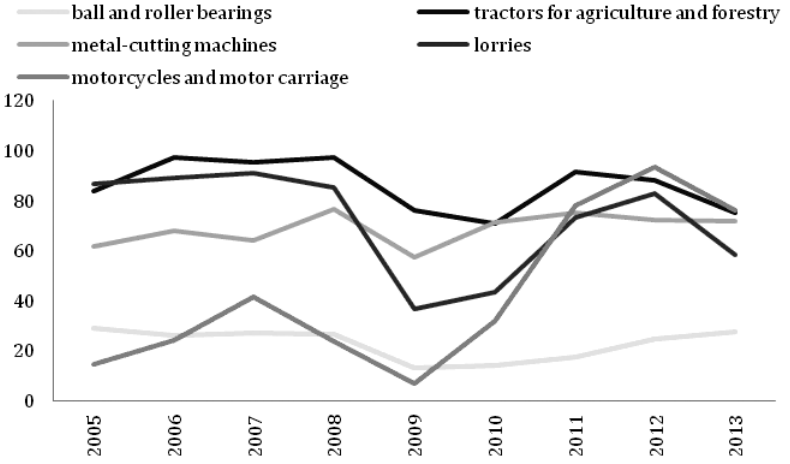
Source: National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)

Figure 5. *Production of selected commodities in Belarus, 1990-2014, thsd. units*



Source: National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)

Figure 6. *Capacity utilization in Belarus, 2005-2013, %*



Source: National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)

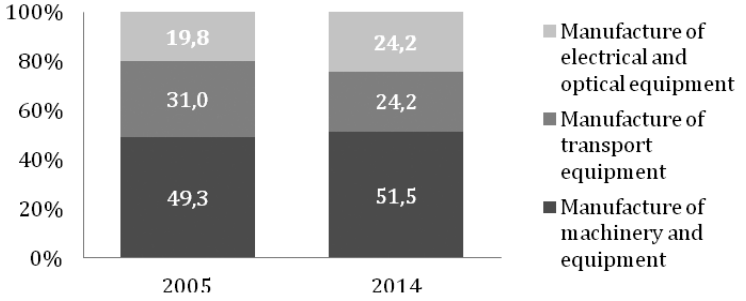
Some of Belarus machine companies were close to recovering their previous levels of production in the 2000s, mostly thanks to administrative support from the Belarusian government. Producing Soviet-type machines for the captive Russian market negatively influenced the business culture of such firms because they were not sufficiently familiar with the competition, offered poor after sale service quality and paid little attention to innovation or cutting costs [1]. In most cases, administrative measures taken by the Belarusian government proved most vital for the recovery of production in the 2000s, due to the following reasons: i) the sector has always been one of the major employers in the country, and the privatization and restructuring of this industry would have resulted in high social costs; ii) large industrial plants have been huge exporters and sources of foreign currency for the Belarusian economy, making them relatively important for macroeconomic reasons. Subsidized loans from state-owned banks and direct negotiations between the Belarusian government and the Russian Federation or Russian regions[6] made it possible for Belarusian machinery giants to expand their presence in the Russian market [42]. As far as advances are concerned, one might point to some improvements in quality (for instance the introduction of international quality certificates, such as the ISO 9001 in the early 2000s), the development of

[6] For instance, in 2011-2012 Russia's biggest bank "Sberbank" issued over $600 million in subsidized loans to Russian regions to finance the procurement of Belarusian machinery items after the Belarusian and Russian governments agreed on a corresponding deal (see http://www.belta.by/economics/view/sberbank-rf-lgotno-prokreditoval-postavki-belorusskoj-tehniki-v-rossiju-na-summu-svyshe-600-mln.-97375-2012)

new products (in passenger transportation, for example) and some energy intensity improvements. For example, in the production of heavy trucks, by 2014 energy consumption per unit had dropped to almost a third of the 2005 level; in tractor manufacturing, it fell by a rate of 1.6. In the macroeconomic measure of toe per of $2,000 PPP, Belarus' energy intensity level is 15-20% below the average of the post-Soviet states, though it almost twice as high as the OECD average [24].

As the result of government support programs, machinery structure in Belarus has remained almost unchanged. Today, the production of machinery and equipment remains the focal point of the machine building sector in Belarus, producing more than half of the sector's total output (Figure 7). Manufacture of transport vehicle equipment dropped from a 31% share in the sector in 2005 to 24.2% in 2013. Output of electrical and optical equipment climbed to a 24.2% share of machinery output in 2013.

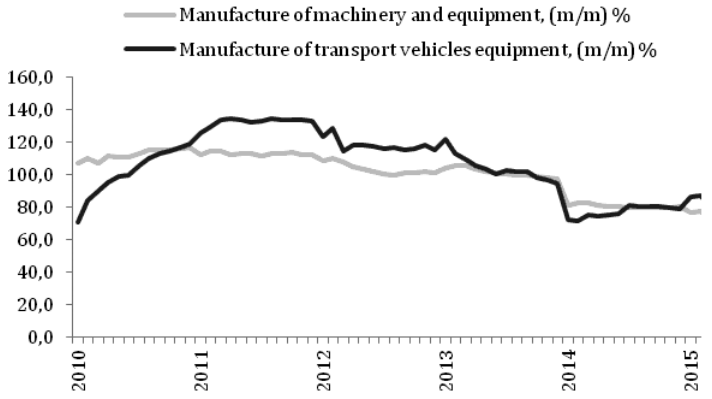
Figure 7. *Machinery output structure in Belarus, 2005 and 2013, %*



Source: National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)

Today, Belarus' machine building sector finds itself in a very difficult position and requires new reforms. Huge investments in the sector have been used inefficiently and large enterprises still have worn-out capital assets, the quality of goods changes slowly, and price competitiveness remains highly dependent on the exchange rate of the national currency [40, 42]. There is a critical level of dependence on Russia on account of the high share of imported components and fossil fuels, as well as the high share of exports going to Russia. These reflect the general structural problems of the Belarusian economy and the absence of institutional reforms over the last 25 years [41]. As a result, after Russia joined the WTO and the Russian ruble was devalued substantially in 2014, Belarusian machinery output dropped by 20% in the same year and has continued to shrink in 2015 (Figure 8).

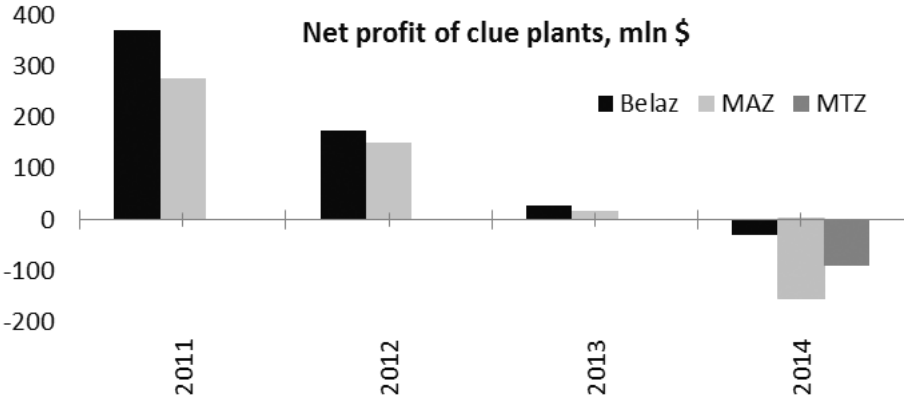
Figure 8. *Manufacture of machinery and equipment and manufacture of transport vehicles equipment in Belarus, 2010 – 2015, m/m, %*



Source: National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)

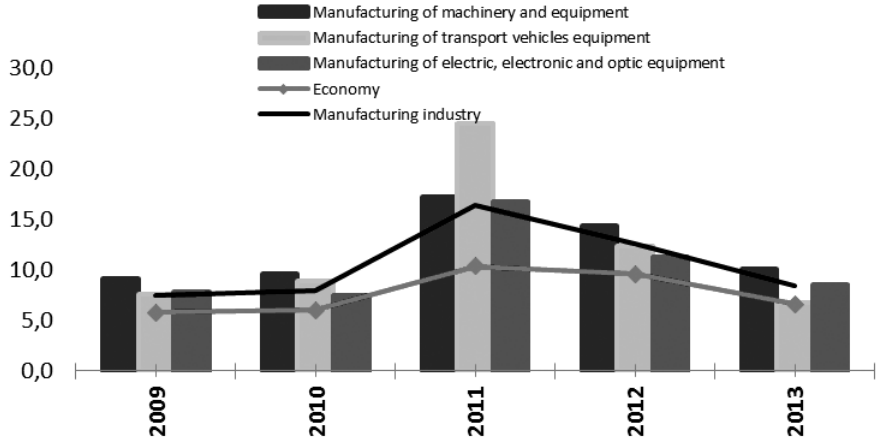
The financial results of machine producers confirm the critical state of machinery in Belarus. Net profits at the three major machinery companies (Belaz, MAZ and MTZ – Figure 9) have been declining significantly over the last years, and they morphed into steep losses in 2014. The return on sales indicator has also been following a downward trajectory since 2011, dropping near the level of 2009, the year when output dropped most precipitously in the wake of the world financial and economic crisis (Figure 10).

Figure 9. *Net profit of major plants in Belarus, 2011-2014, million $*



Source: National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)

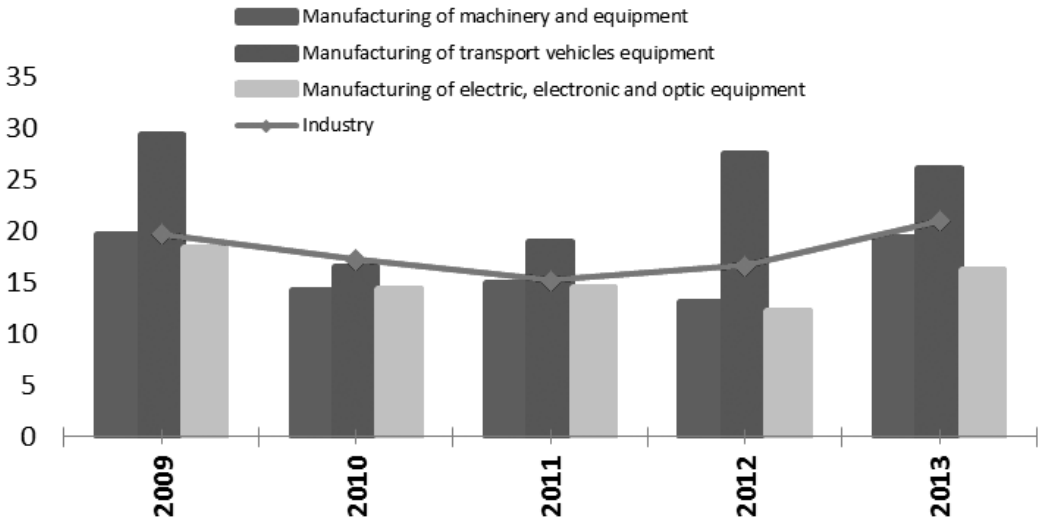
Figure 10. *Return on sales in the machine building sector in Belarus, 2009-2013, %*



Source: National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)

At the same time, the share of unprofitable machinery enterprises (Figure 11) is also near the level of the 2008-2009 crisis. The number of unprofitable companies in the subsector of transport vehicles and equipment is even higher than the average figure in the manufacturing industry overall, which indicates the critical state of this particular subsector.

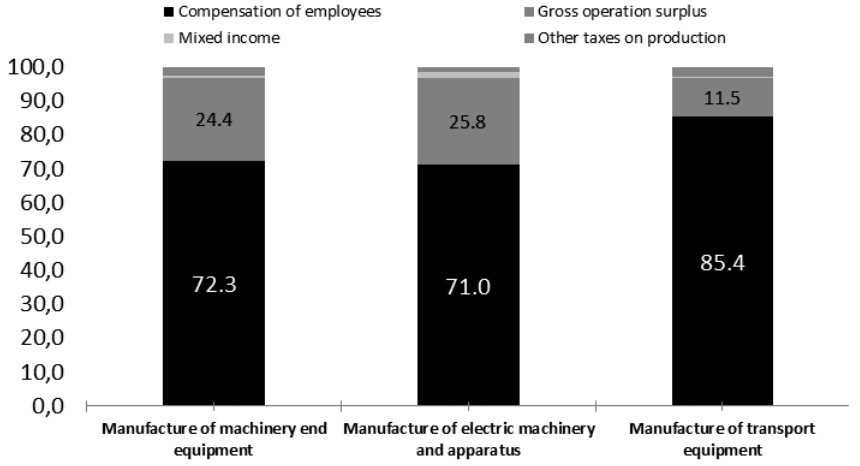
Figure 11. *Share of unprofitable enterprises in the machine building sector in Belarus, 2011-2014, %*



Source: National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)

Excessive employment and the wage burden also constitute significant problems for the machinery sector in Belarus. Most of the machinery output is produced by large state-owned enterprises (SOEs), which enjoy privileged access to low-cost financing from state subsidy programs, often at a level of interest that is lower than inflation. Combined with administrative wage targeting at SOEs, this increases the share of labor in machinery products and contributes to its lacking export competitiveness. This is especially true in the case of the transport equipment subsector (Figure 12).

Figure 12. *Added value of the machine building sector in Belarus by incomes, 2013, %*



Source: National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)

To summarize, there is currently significant need for restructuring the machine building sector in Belarus. Sinking output, bad financial results, and excessive employment result in the diminished competitiveness of machinery products in terms of quality and prices, both domestically and abroad. Slow demand in the Russian market and an overvaluation of the Belarusian ruble may yield dramatic results in 2015 and beyond. New reforms are needed to change the status quo.

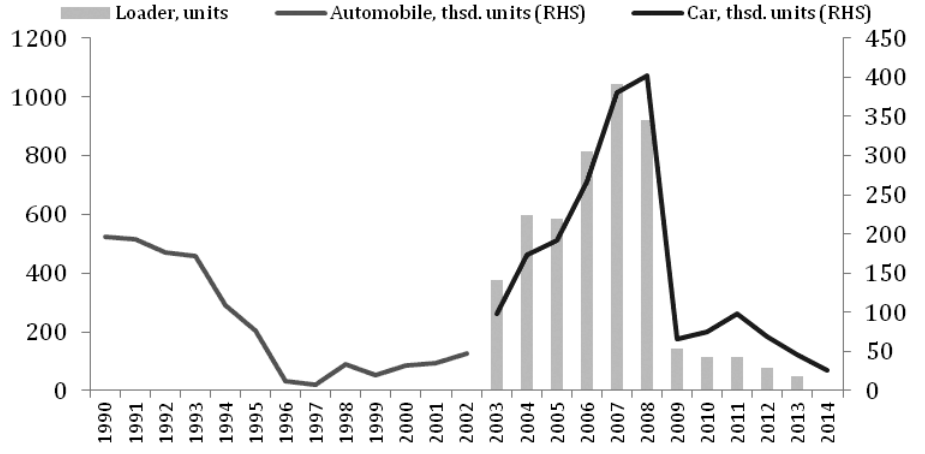
Ukraine

The Soviet Union left an impressive legacy for Ukraine, but in the 1990s machinery experienced a significant slump. During Soviet times, Ukraine was one of the key producers of energy and metallurgy equipment, machine tools, agricultural equipment, and railway cars in the USSR. In some of the subsectors, like specialized types of combine rotor excavators, Ukraine retained a monopoly in the market. Ukraine's comparative advantage was the presence of significant natural resources (mainly iron ore) for machinery production [5]. The more technologically advanced machinery sectors at that time included rocket industry, space industry, aviation industry, and mechanical engineering. The share of machine building in the output of the Ukrainian SSR in 1990 was below 30%, while its share of industrial employment was 35%.[7]

In the 1990s, after the fall of the USSR, economic collapse, problems with the supply of components from other post-Soviet countries, as well as changes in ownership structure pushed Ukraine's machinery into a decade-long slump. Large-scale privatization launched in 1995 triggered a process whereby private investors were competing for the acquisition of previously state-held machine production assets at significantly below market prices. By 1999, the specific situation of Ukrainian privatization resulted in a push for equity accumulation by investment funds and trusts, but this led to poor management and a lack of incentives for investments and technological recovery [44]. Also, the existence of enormous reserves of raw materials seems to contribute to the conservation of the status quo in machinery structure and discourages a transition to the production of more high-tech products.

In the 2000s machine producing companies were recovering quickly, but the global financial crisis hit the sector severely (Figures 13-14). Among the key reasons for the recovery were rapidly growing internal demand combined with favorable external conditions that increased demand for Ukrainian exports [29]. For example, the production of agricultural machinery in Ukraine increased significantly because of the fast development of the agricultural sector and because foreign investors had acquired stakes in local production sites. However, the quality of domestically produced equipment and machines barely improved, while the product range had not changed much [29]. As a result, there was a significant reduction in manufacturing and machinery production in 2009 because of the global crisis, which led to a collapse in domestic investments in fixed assets. Since then, machinery has been following a new downward trajectory with few signs of recovery.

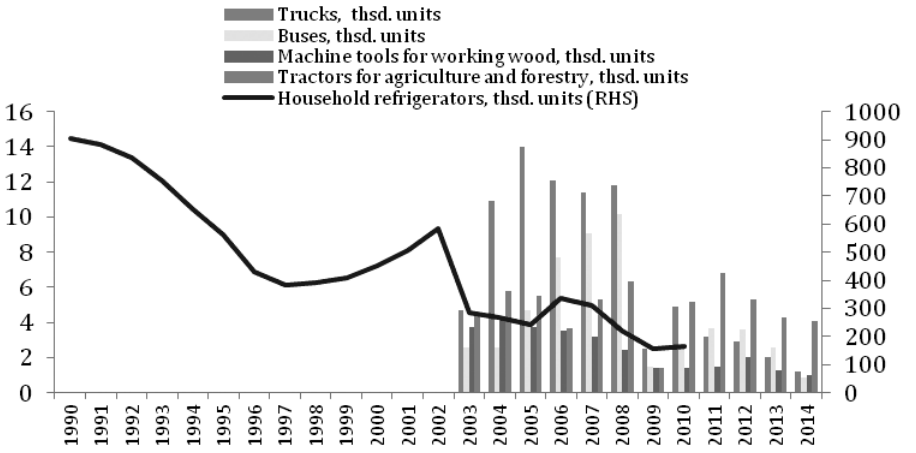
Figure 13. *Production of selected commodities in Ukraine, 1990-2014, units (LHS), thsd. units; (RHS)*



Source: State Statistics Service of Ukraine (http://www.ukrstat.gov.ua/)

[7] According to the 1996 Ukraine Statistical Yearbook.

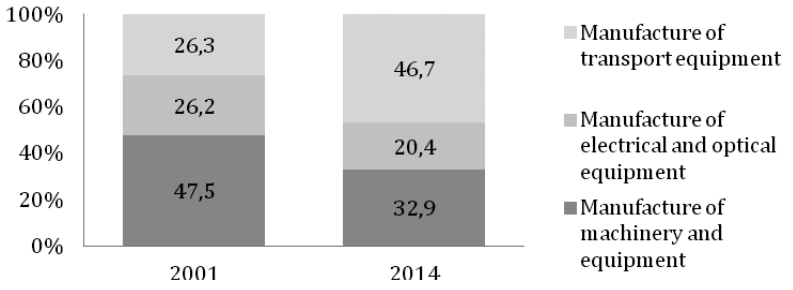
Figure 14. *Production of selected commodities in Ukraine, 1990-2014, thsd. units*



Source: State Statistics Service of Ukraine (http://www.ukrstat.gov.ua/)

As a result of the transformation processes, the structure of machinery in Ukraine has changed significantly, with the transport equipment subsector producing half of all machinery output (Figure 15). The different pace of growth between 2001 and 2008 in some subsectors as compared to others, and a post-2009 decline of the three machinery subsectors, resulted in relatively better development of the transport equipment manufacturing subsector compared to the subsectors of manufacturing of electrical and optical equipment and machinery and equipment. In terms of output, transport equipment presently predominates in the structure of the sector, while the subsectors manufacturing of electrical and optical equipment and machinery and equipment saw their relative share of output diminish between 2001 and 2014.

Figure 15. *Machinery output structure in Ukraine, 2001 and 2014, %*



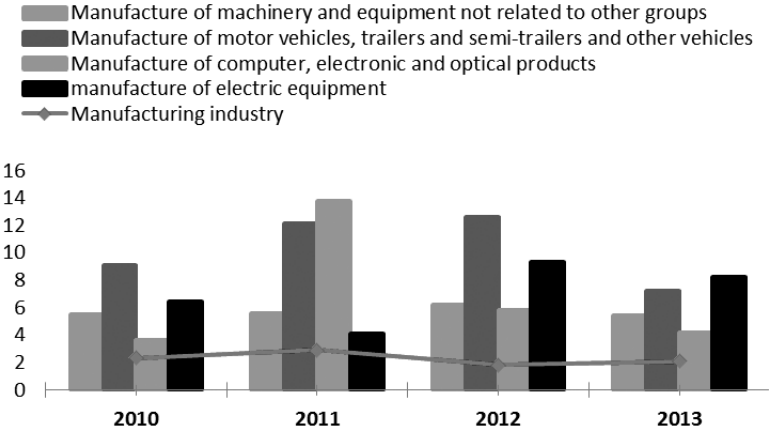
Source: State Statistics Service of Ukraine (http://www.ukrstat.gov.ua/)

Today, the most developed sub-industries of the machine building sector in Ukraine are dependent on domestic raw materials and are located in the East of Ukraine in order to reduce the distance between production companies and the supplier of raw materials (mainly, steel) [29] (see Figure 1 in the statistical appendix). The sub-industries referred to above are railway machine building, heavy machine building and machine building for agriculture.

The average depreciation rate of fixed assets is close to 70%, but some sub-industries report even higher numbers [29]. A considerable share of Ukrainian enterprises still have Soviet era equipment and their technology, too, is from the same era [6]. For example, in the "Machine building for agriculture" sub-industry, between 70% and 90% of the domestic machine park of agricultural machinery is fully depreciated or obsolete. As a result, productivity in machine building is only two-thirds of the national average, which is an indication of capital and technology deficits, and also suggests problems with international competitiveness [7]. Results for 2014 illustrate that machinery overall has shrunk by over 20%, while some subsectors (mostly those oriented towards the Russian market, like railway machine building) have dropped by over 60%.

The financial results of machinery companies remain in the positive domain and indicate that profits have not been reinvested into acquiring new technologies, modern equipment, and know-how (Figure 16).

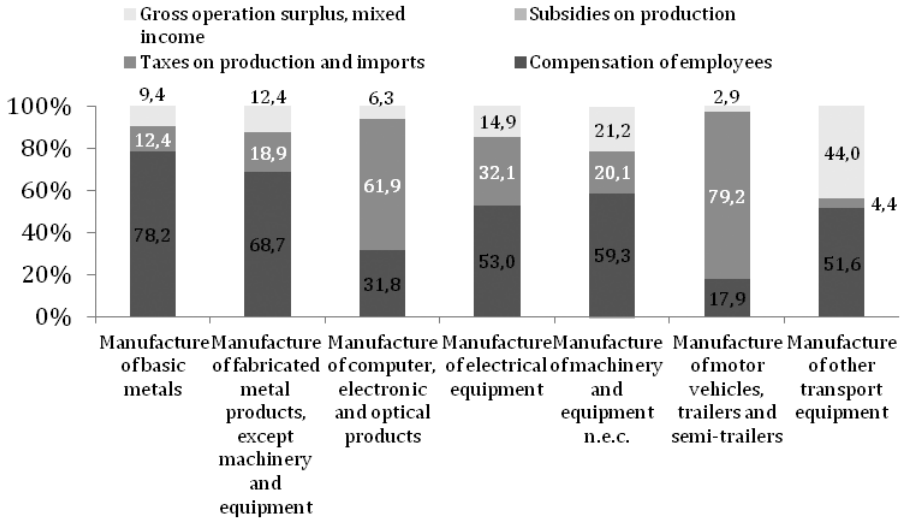
Figure 16. *Profitability in the Ukrainian machine building, 2010-2013, %*



Source: State Statistics Service of Ukraine (http://www.ukrstat.gov.ua/)

Statistical data on value added calculated by income in Ukraine's machinery subsectors indicate that companies do generate operational surpluses, but their levels differ substantially across subsectors (Figure 17). Employee compensation also varies, but, unlike in Belarus, it does not impose a wage burden on the industry. Imported components provide major value added in the case of the manufacture of computers, electronic and optical products, and motor vehicles.

Figure 17. *Added value of the machine building sector calculated by income in Ukraine, 2013, %*



Source: State Statistics Service of Ukraine (http://www.ukrstat.gov.ua/)

Low productivity and the low level of technological progress make Ukrainian machinery sensitive to energy price increases, which undermines the competitiveness of Ukrainian machinery producers. Between 1991-1995 Ukraine's economy energy intensity grew by 30%, then stabilized in the period 1995-1999, while between 2000-2005 energy intensity dropped by 40% [26]. As of 2012, it is about 45% more energy efficient than it was in 1990, based on IEA open source data. The existing improvements in energy intensity have not resulted from sectoral shifts in the economy but from technological improvements in individual sectors [26]. For instance, according to the energy balance of Ukraine, in 2014 energy consumption in industry fell by 60% as compared to 2007, while energy consumption in the machine building sector fell by a factor of 2.1 in the same

period.[8] However, there is a need for further reductions in energy intensity in the various sectors of industry, including machinery, in order to be competitive in domestic and foreign markets. Underinvestment in new technologies and energy-saving contribute to the fact that significant segments of the agricultural machines and metallurgy and mining subsectors mainly produced for the domestic market [29].

Box 6: "Smart Specialization" and the future of machine industry in the V4

The EU's current approach to increasing the competitiveness of the EU economy is based on the so-called Smart Specialization or RIS3 program, which is a strategic approach to economic development through targeted support for research and innovation. It involves a process of developing a vision, identifying where the greatest strategic potential lies, developing multi-stakeholder governance mechanisms and using smart policies to maximize the knowledge-based development potential of a region, regardless of whether it is strong or weak, high-tech or low-tech. It is then followed up by financial instruments and national cohesion funds, which support innovation in the companies.

The following table presents decisions taken by the V4 countries about the sectors that will receive the highest levels of support in the following years. Machine building industry is the key priority in all V4 countries, which underlines the importance of the sector for the economies of the countries involved.

Table: *Areas of Economic Specialization in the V4*

Czech Republic	Hungary	Slovak Republic
Manufacture of means of transportation and equipment	Healthy society and well-being	Automotive and mechanical engineering industries
Mechanical engineering	Advanced technologies in vehicle and other machine industries	Consumer electronics and electrical equipment
Electronics and electrical engineering	Clean and renewable energies	ICT and Services
IT services and software	Sustainable environment (natural resource management, advanced environmental technologies)	Production and processing of iron and steel
Electricity production and distribution	Healthy local food (food processing)	Prospective area: Automation, Robotics and Digital Technology
Drugs and medical products and methand	Agricultural innovation	Prospective area: Processing and increasing the value of light metals their alloys
Prospective area: Natural resources, agriculture, and food	Horizontal area: ICT (info-communication technologies) & Services	Prospective area: Production and processing of plastics
	Horizontal area: Inclusive and sustainable society, viable environment	Prospective area: Creative industry
		Prospective area: Increasing the value of domestic raw material base

Source: RIS 3 of the V4 countries involved, 2014 and 2015.

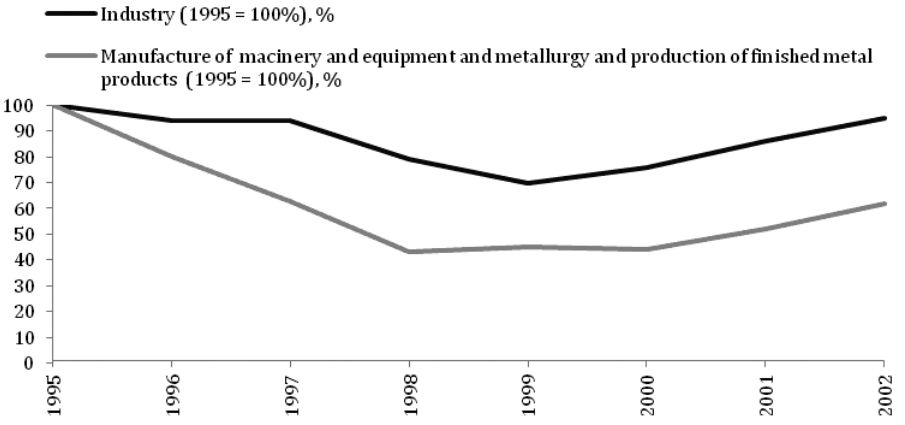
Summing up, machinery in Ukraine currently seems to find itself in the process of structural and technological adjustment. Problems with internal demand and instability in the external markets have lead to a significant decline in machinery production over the last decades. Good times in the 2000s have not led to the modernization of equipment or the introduction of innovations. Subsectors that rely on domestic raw materials produce the major part of machinery products and seem to lack an incentive to accelerate the transition to the production of more high-tech industrial products. Further proactive steps are needed both from machinery producers and the government in order to facilitate changes in the structure of the industry, in equipment modernization, and in the application of new technologies.

[8] In thousands tons of oil equivalent.

Moldova

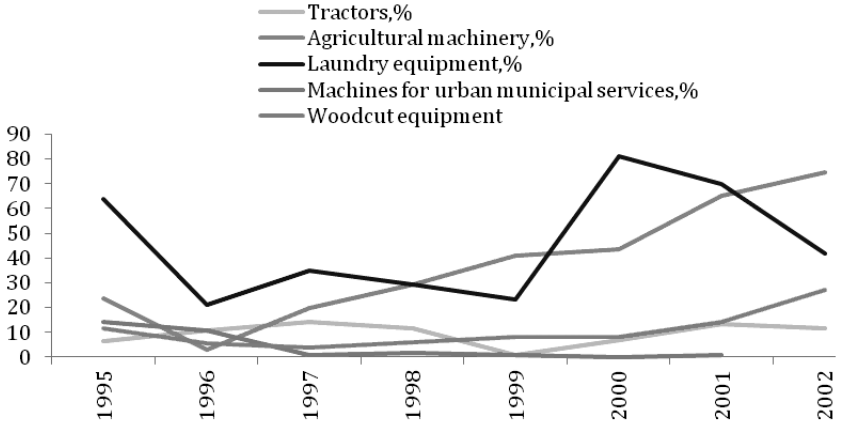
In Moldova, machinery has undergone significant transformation through privatization and changes in its output structure since the country became independent in 1991. The machine building sector in Moldova had been formed mainly in the 1960-1980s, during the time of the Moldovan Soviet Socialist Republic within the USSR. At the time it was primarily aimed at the development of the subsectors of agricultural machine building, and electronics and precise machine tools (later as a part of Soviet military industry) [45]. Throughout the 1990s, after the economic reforms were launched, there was a sharp decrease in Moldovan machinery production (Figure 18). As a result of coupon-based mass privatization, by 2001 93% of the machine building sector's output was produced by non-state enterprises, and 90% of the sector's workers were employed by private companies. Those numbers were higher than the average industry figures at that time, indicating the authorities' direct or indirect willingness to reform the sector. After privatization, the machine building sector registered only limited investment, which with few exceptions lead to a decline in the competitiveness of the sector. Some of the companies in the sector switched from producing parts for military equipment and parts for industrial giants in Russia to manufacturing household goods. Many companies went through bankruptcy procedures, stopped producing, and rented out their assets to other private companies. The capacity utilization of some commodities in Moldova between 1995-2002 reflects the recession in machine building in the 90s, and also shows the first signs of recovery in the early 2000s, specifically in agricultural machinery (Figure 19).

Figure 18. *Index of production in Moldova (1995 = 100), 1995-2002, %*



Source: National Bureau of Statistics of the Republic of Moldova (http://www.statistica.md/index.php?l=ru)

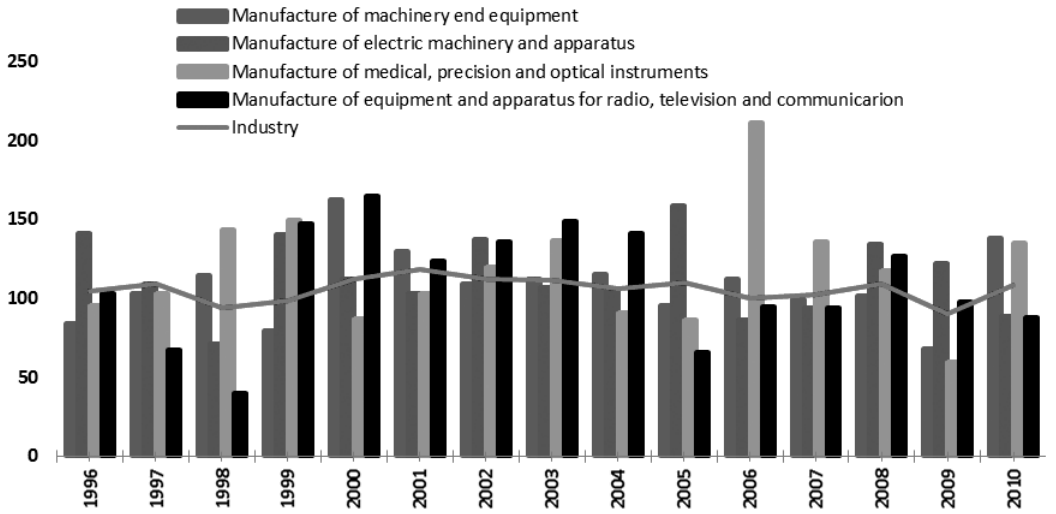
Figure 19. *Capacity utilization in Moldovan machinery, 1995-2002, %*



Source: National Bureau of Statistics of the Republic of Moldova (http://www.statistica.md/index.php?l=ru)

Machine building has achieved a more significant share of Moldovan industrial production since 2001, and there is an increased focus on the machine building sector as the engine of industrial growth in Moldova. Productivity growth in various machine building subsectors has exceeded the industry average in the 2000s (Figure 20). However, it seems rather difficult to pinpoint the key factor that was the main contributor of the growth of the machinery subsector during this time. Major investments by global automotive components producersin 2006, 2007, and 2010 were major drivers of growth. This resulted in sharp growth in the export figures of the electrical machinery and apparatus manufacturing subsectors, which jumped from $53.1 million in 2006 to $315.9 million in 2012. Figure 20 also depicts the negative impact of the 2008-2009 global financial crisis on Moldovan industry and machinery specifically. Industry productivity fell by 10% in 2009, while productivity in the manufacture of the medical, precision, and optical instruments subsector fell by 40%.

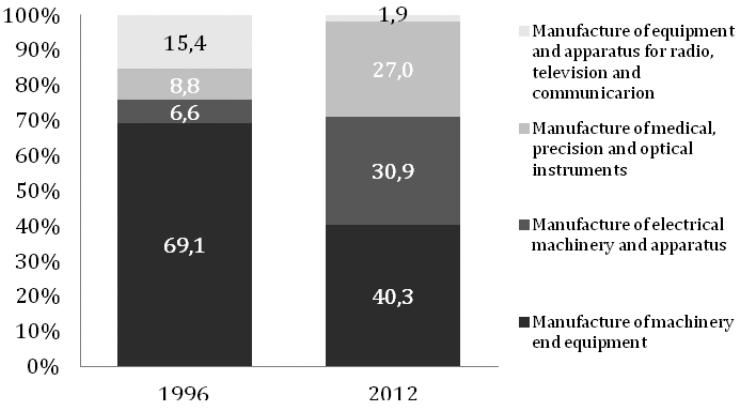
Figure 20. *Productivity growth in Moldova, 1996-2010, (y/y)%*



Source: National Bureau of Statistics of the Republic of Moldova (http://www.statistica.md/index.php?l=ru)

Deep reforms resulted in a transformation in the structure of the machinery sector, and pushed it towards a more balanced and technology-oriented output structure (Figure 21). The weight of the machinery and equipment subsector dropped from 70% to 40% of total output, while the subsectors manufacturing of medical, precision, and optical instruments and manufacture of electrical machinery and apparatus expanded to about 30% each.

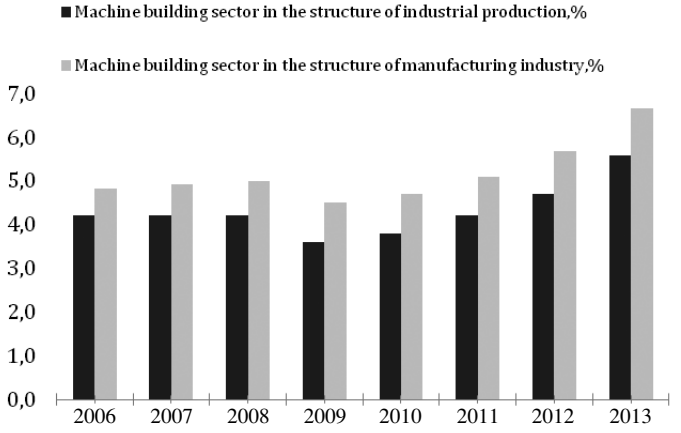
Figure 21. *Machinery output structure in Moldova, 1996 and 2012, %*



Source: National Bureau of Statistics of the Republic of Moldova (http://www.statistica.md/index.php?l=ru)

Since 2004, when Moldova joined the European Neighborhood Policy (ENP) and signed the Moldova-EU action plan in 2005, there has been a growing interest by European investors in Moldovan industry. After the EU – Moldova Association Agreement, including the Deep and Comprehensive Free Trade Area (DCFTA), was signed in 2014, Moldova became attractive for 2nd tier and 3rd tier suppliers of automotive components, as well as for the machine building sector [31]. Western companies are increasingly interested in the production of components, and also in outsourcing component production, assemblies, and machines. This is also apparent in the growing importance of machinery in both industry and manufacturing (Figure 22) in Moldova. As we will show later, Moldovan investments in fixed machinery assets are currently mostly directed towards the manufacture of electrical machinery and apparatuses. There is an increased interest in Moldova in the production of machinery components and tools based on licenses provided by Western companies (Italian and German companies are particularly active in these areas), which indicates that the country is turning into a component supplier for both Western and Eastern markets. Labor intensive production sites are attractive for foreign investment, as Moldova offers the most competitive labor costs in Europe, in competition with Ukraine [31].

Figure 22. *Share of machinery in industrial and manufacturing output in Moldova, 2006-2013, %*



Source: National Bureau of Statistics of the Republic of Moldova (http://www.statistica.md/index.php?l=ru)

Summing up, the machine building sector in Moldova has been contributing a growing share of industrial production since 2001. Compared with Belarus and Ukraine, the machine building sector in Moldova contributes far less to the country's GDP, but the sector has experienced a surge in its productivity and there is an increased focus on the machine building sector as an engine of industrial growth in Moldova. This indicates that the country's machinery has undergone deep structural changes and has managed to attract greenfield investments in the area of machinery components. Apparently, pragmatic economic policies, combined with the benefits of the country's geographical location, may attract new investments into the sector, which will serve to enhance machinery development and turn the country into an important regional player.

Box 7: V4 – lessons from the past 20 years – Case studies on increasing productivity and shifting focus on new emerging sectors of the economy

Case of **ZTS VVU Kosice,** Slovakia
Established in 1976, the state-owned company developed commercial vehicles, heavy hydraulic manipulators, transport and handling systems, special technologies (rear arms and engineering hardware on automotive carriages), forming machines, high-speed stamping press lines, and stationary gear units. It was incorporated into ZTS Martin (a previously mentioned defense company) in 1981. In 1990, the ZTS concern was broken up and on July 1, 1990, ZTS VVU Kosice was formed as an independent state enterprise. As part of this transformation process, ZTS VVU Kosice was turned into a joint-stock company and was privatized in the first wave of privatization in the years 1992-1993. Subsequently, the enterprise stabilized, its production program was retained and it developed specialized purpose extensions for vehicles, handling equipment, assemblies for the paper industry, and transport containers for nuclear energy.
The year 2004 marked an important milestone for the company, as it then became a supplier of robotic devices for positioning cryo-magnets in the Large Hadron Collider at CERN in Geneva, Switzerland. The company is still in Slovakian hands, and its success hinges on its ability to adapt its production to customer needs and to specialize in meeting these specific needs. The company continues to enjoy a strong position in the defense industry, but after 1993 it was able to shift its production first to robot systems for nuclear plants, and later to the production of service & security robots. Currently the company is already involved in EU research in the area of smart mobility and ambient assisted living, developing the Personal Intelligent City Accessible Vehicle System (PICAV) and the Freight Urban Robotic Vehicle (FURBOT). These could yield another new production program in the near future.

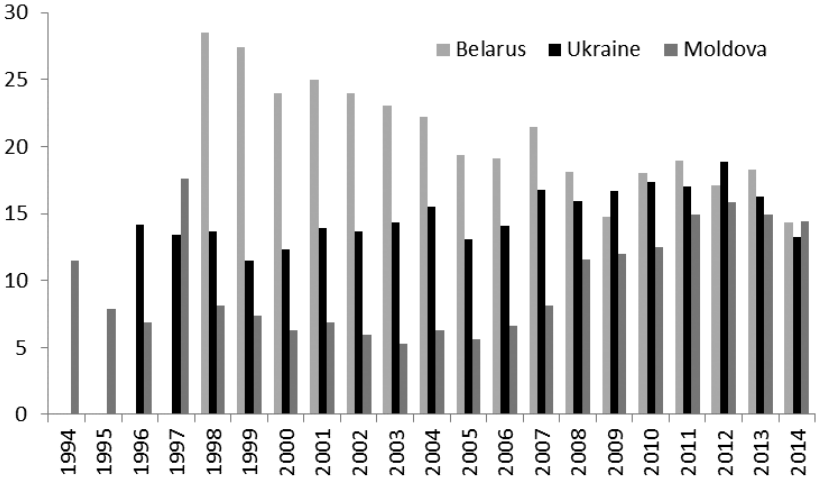
Case of **SPINEA Presov,** Slovakia
The SPINEA company is a modern Slovak engineering company, engaged in the development, manufacturing, and sale of high-precision reduction gears, which are sold under the trademark TwinSpin. The impetus for the establishment of the company was the invention of a Slovak engineer in 1994. TwinSpin high precision reduction gears are serially manufactured based on an international patent. The company's products are suitable for mechanical and robotic applications of different kind. They are widely used in automation and industrial robotics, in the field of machine tools manufacturing, in navigation and camera equipments, medical systems, and in many other fields.
The company is growing rapidly thanks to the unique invention. It has only two major competitors in the world (one is located in the US, and another is in Japan). It exports its products worldwide and cooperates with such companies as KUKA, ABB, COMAU, RR Robotica, BMW, and many others. The company is an example of a success story, even though it is located in Eastern Slovakia, the poorest region in the Slovak Republic. The foundation of the company was also based on the tradition of robot development that began at the VUKOV Pre ov factory in the 1980s – which was a state-owned R&D and production company at the time. Unfortunately, VUKOV had to lay off a lot of staff (it employed over 1,200 engineers in the 1980s) in 1991, when the company was transformed into a state-owned joint stock company. In 2005 it received a capital injection and the company was strengthened through a restructuring of its ownership and the arrival of a new owner. Since then the VUKOV company has been growing again.

Case of **Pata Ltd.,** Hungary
Established as a family-owned venture in a small Hungarian village (Fajsz) in 1988, the company specializes in manufacturing automotive body parts. The history of the company is the success story of a Suzuki supplier that has established itself as the most important domestic supplier of the Japanese automotive company's Hungarian subsidiary. Its success is based on continuous technological development, learning, and upgrading. Initially the company specialized in manufacturing parts for farming machinery. It signed its first supplier contract with Suzuki in 1992. Since then, its development has become an exemplification of the notion that supplier firms can grow jointly with their contractors if they adopt a long-term strategy and make sure to keep up with the ever-increasing requirements. Initially, Pata had supplied eight components, but by 2015 the number of product categories it supplied to Suzuki amounted to 170. Pata's turnover was €8.7 million in 2015: about 15 times higher than its sales volume in 2000. Currently, the company has 99 employees. This rapid development necessitated a continuous reinvestment of its earnings: It has invested in capacity expansion, process upgrading, and intangible assets (Kaizen, quality certificates).
The example of this company is especially instructive because of the role of technology-based upgrading: In an industry characterized by rapid technological change, the diffusion of advanced manufacturing solutions, automation, cyber-physical systems and ever-stricter regulations, a small Hungarian company managed to keep up the pace, grow, and increase quality and productivity, all the while it installed the most up-to-date robotic solutions (such as robotic welding) and expanded its product/activity mix (including assembly and design).

Export & import patterns

According to the UN Comtrade Database, the machine building sector's share of total exports has risen in Moldova, lost some of its importance in Belarus, and has been fluctuating in Ukraine (Figure 23). Though the trends in their machinery exports were different, their ratio has been converging around the same share of the total exports in all three countries. In 2014, the share of exports provided by the machine building sector relative to total exports was just below 15% for all three countries.

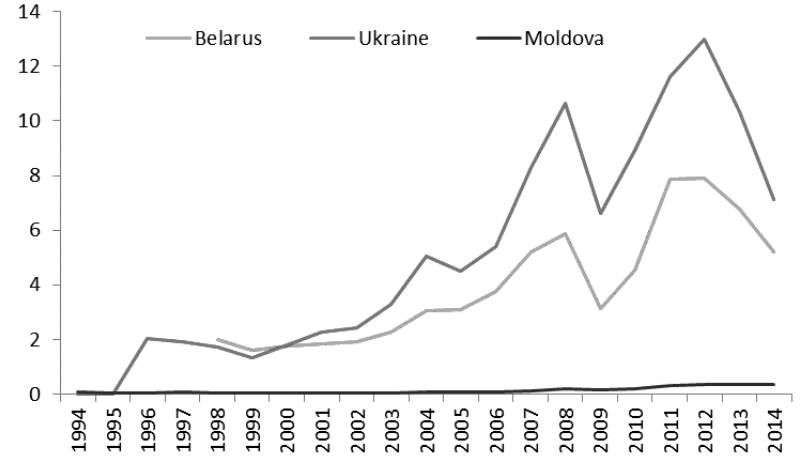
Figure 23. *The share of machine building in the total exports of Belarus, Ukraine, and Moldova 1994-2014,%*



Source: UN Comtrade Database (http://comtrade.un.org/)

In terms of absolute values, as of 2014 machinery exports in Belarus had grown two and a half-fold since 1998, while in Ukraine the corresponding figure is 3.5 times the value in 1996, and in Moldova it has grown five-fold as compared to 1994 (Figure 24, Table 14 in the statistical annex).

Figure 24. *Exports of the machine building sector in Belarus, Ukraine, and Moldova 1994-2014, bn. USD*



Source: UN Comtrade Database (http://comtrade.un.org/)

Belarus has maintained the lowest level of export diversification. Ukraine's dependence on Russia and the CIS has increased over the last years, while Moldova has substantially reduced the level of its Eastern machinery exports. Table 5 presents changes in the levels of export diversification over the last 15 years. It has changed only slightly in Belarus: in 1998, 86.4% of commodities produced by the machine building sector were sold in the CIS market, while 76.4% were exported to Russia. By 2013, export to the CIS market had increased to 90.6%, while during the same period the

importance of the Russian market decreased by 3 p.p. (73.4%). In 1998 Moldova had the lowest level of export diversification (77.2% of its exports went to the CIS market). Nonetheless, by 2013 year this number has dropped significantly to 27.5%. The data indicate that Moldova's dependence on the Russian market has been relatively low (from 32.8% in 1998 to 21.3% in 2013). In Ukraine, the level of diversification of machinery exports to the CIS has slightly increased (61.2% to 62.8%), while dependence on the Russian market has increased by 8 p.p. (43.9% to 51.9%) since 1998.

Table 5. *Export diversification in Belarus, Moldova, and Ukraine, 1998 and 2013*

(HS Code)			Russian Federation	CIS + Ukraine+ Turkmenistan	World
Machine building sector	1998	Belarus	76.4	86.4	100
		Ukraine	43.9	61.2	100
		Moldova	32.8	77.2	100
	2013	Belarus	73.4	90.6	100
		Ukraine	51.9	62.8	100
		Moldova	21.3	27.5	100

Source: UN Comtrade Database (http://comtrade.un.org/)

According to Moody's report, Belarus, Ukraine, and Moldova are massively dependent on Russia as a result of a combination of factors, to wit export dependence, FDI dependence, and dependence on remittances. The risk map (Table 6) shows that Belarus' high level of dependence on Russia is explained by the huge share of its export going to Russia, while in the case of Moldova the high level of dependence on Russia is mostly explained by the high value of remittances. For Ukraine, it is explained by a combination of these factors.

Table 6. *Risk map of dependence on Russia*

Country	Degree of dependence on Russia	Export to GDP (2013),%	FDI to GDP (2013),%	Remittances (2013) to GDP,%
Belarus	25.2	23.5	1.2	0.6
Ukraine	10.6	8.4	0.3	1.9
Moldova	24.5	7.9	0.5	16.0

Source: Moody's (https://www.moodys.com/)

	more than 10% GDP
	5-10% GDP
	less than 5% GDP

Box 8: V4 exports – value, main destinations, and experience with shifting the destination market from the former USSR to the EU/wider world

All V4 countries are currently economies in which foreign trade mainly intra-EU trade plays a pre-eminent role. This can be attributed to developments in the past two decades and is the result of the massive expansion of both, the exports and imports of V4 countries. The value of the region's exports of goods and services relative to their GDP has roughly doubled since 1993. In the case of the Czech Republic and Slovakia, this significant increase has been achieved despite a relatively high baseline value; even in the 1990s, exports accounted for about half of their GDP. Hungary, which, like Poland, had a lower level of exports relative to GDP in the 1990s, has been able to almost quadruple its exports of goods and services relative to GDP.

Figure: *V4 Countries' Exports (Percentage of GDP)*

Country/ Year	Czech Republic	Hungary	Poland	Slovakia
2015	74	82	40	86
1993	40	23	21	55

Source of data: CIA, The World Factbook

Decline in machinery production as a result of structural changes has caused a drop in the share of engineering products in the exports of V4 countries, mainly in the 1990s. Recently, the commodity structure of the merchandise trade of V4 countries has been dominated by trade in machine industry products and other processed industrial products.

Exports – main commodities (2012, CIA World Factbook and UNCTAD):
Czech Republic – machinery and transport equipment: 54.6%; fuels and chemicals 9%; raw materials 5%
Hungary – machinery and equipment: 53.5%; other manufacturing: 31.2%; food products: 8.7%; raw materials: 3.4%; fuels and electricity: 3.9%
Poland – machinery and transport equipment: 37.8%; intermediate manufactured goods: 23.7%; miscellaneous manufactured goods: 17.1%; food and live animals: 7.6%
Slovakia – vehicles and related parts: 27%; machinery and electrical equipment: 20%; nuclear reactors and furnaces: 12%; iron and steel 4%; mineral oils and fuels: 5%

After the collapse of the Eastern bloc, the trade ties of the V4 countries gradually shifted towards the West. The total export data for all transition countries without the former USSR show that while in 1989 40.4% of their exports went to other countries of the Eastern bloc (and 24.4% to the USSR) and 41.0% to the West, in 1999 it was just 18.8% to the former Soviet-led block (4.7% to the former USSR) and 75.5% to the West. Eurostat's calculation for 2002 show that the value of V4 machine industry product exports to Russia was only 4.51% of the value of V4 machine industry exports to the EU15.
The main export partners of the V4 include Germany, Austria, UK, France, Italy, and other EU markets. The German market serves both as a V4 final market and as a gateway to the outside world, as some V4 goods are only completed in Germany and are then relabeled as "Made in Germany" to be exported to non-EU markets. Of course there are significant mutual trade links between the countries of the V4 region. Even prior to their accession to the EU, the trade between V4 countries was substantial.

Belarus

Weak export diversification remains the key problem for the export of Belarusian machinery industry products. In fact, the situation has not changed much since Soviet times due to the fact that Belarusian machine building enterprises have been able to produce and sell low value added products and export them to Russia and other CIS countries [1]. Without institutional reforms and change in the country's geopolitical agenda, this share is expected to remain high on account of the fact that Belarusian machinery products are currently tariff free in Russia and the rest of the Eurasian Economic Union.

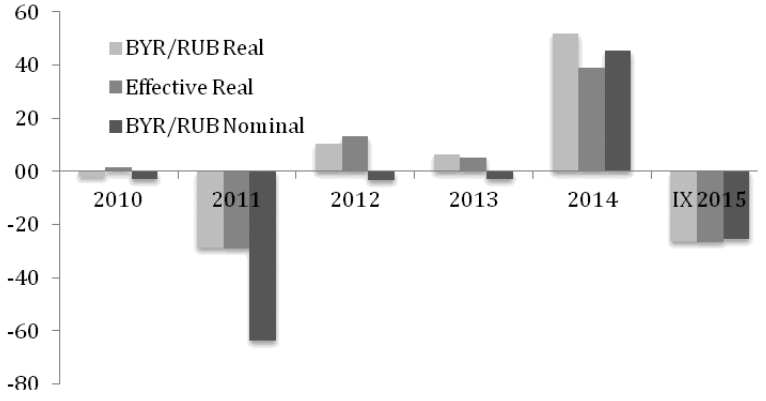
The Belarusian machine building industry is deeply integrated with Russia via a supply chain network and energy subsidies. With respect to the machine building sector, the economies of the two countries are highly integrated as much as 85% of the production volume is related in different

forms to Russian counterparts [S16][2]. Currently, about 800 Russian companies are in a manufacturing cooperation with Belarusian partners, which are based on a common history during Soviet times. Apart from historical links stemming from a common supply chain with Russia, an important channel of Russian influence over the Belarusian machine building sector is the privileged access to underpriced Russian energy supply. Energy-intensive Belarusian machinery giants receive the lowest gas price in the region, close to Russian domestic prices.[9] Calculations have shown that the average level of Russian energy subsidies over the last two decades amounted to roughly 15% of Belarus' annual GDP [32]. However, it has been dropping over the last years.

The massive dependence of machinery exports on the Russian Federation has a negative impact on Belarusian machinery output, since any production or consumption slowdown in Russia is felt in Belarus. On the demand side, the Russian market is marked by high income elasticity of demand for quality equipment [1]. This explains why Belarusian machinery has lost market share in Russia, as the Belarusian machine building sector was not able to compete in terms of quality. In the heavy truck segment, Belarus' sales to Russia were stagnant for the second half of the 2000s, despite the fact that the Russian market for heavy trucks was growing at an average rate of 11% annually between 2000 and 2008 [1]. Demand for more sophisticated products in Russia has increased recently, fueled by imports of Western-made high quality products.

On the supply side, the competitiveness of Belarusian machinery products in Russia and worldwide remains highly dependent on the exchange rate of the national currency. Inefficient use of investments, excessive employment, and the low quality of goods make large machine building enterprises in Belarus dependent on price competitiveness achieved through the low exchange rate of their national currency. Over the last decade, the nominal exchange rate of the Belarusian ruble has been falling steadily, and the currency has undergone three significant devaluations over the last five years in 2009, 2011, and 2015 (see Figure 25 as an example for BYR/RUB exchange rate). However, in 2012-2014, the real exchange rate of the Belarusian ruble (both the real effective and the real rate for Russian ruble) has gone up (Figure 25). This has resulted in a reduction of the number of key machinery product items exported in recent years (Figures 26-27).

Figure 25. *Changes in the exchange rate of the Belarusian ruble, 2010-2015, December/December ("-" devaluation, "+" appreciation), %*



Source: National Bank of the Republic of Belarus (http://www.nbrb.by/)

The combined effect of changes in supply and demand has been a sharp decline in the market share of Belarusian machinery and transport in the total imports of Russia and other countries over the last years. For example, with a market share of 24% in 2010, Minsk Tractor Plant (MTZ) was the market leader in the Ukrainian tractor market. But after 2010 MTZ began to lose its leading position to its competitors John Deere and CASE [28]. Exports of lorries and tractors have been

[9] According to intergovernmental agreements between Belarus and the Russian Federation.

falling since 2013, indicating that there has been a significant decline in the competitiveness of the industry (Figures 26-27).

Figure 26. *Change in the export of tractors by Belarus, 2010-2015, (y/y), %*

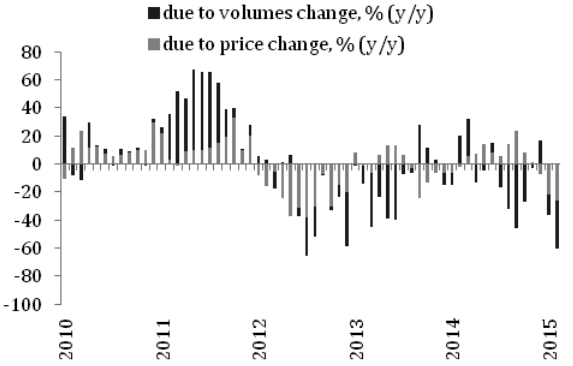
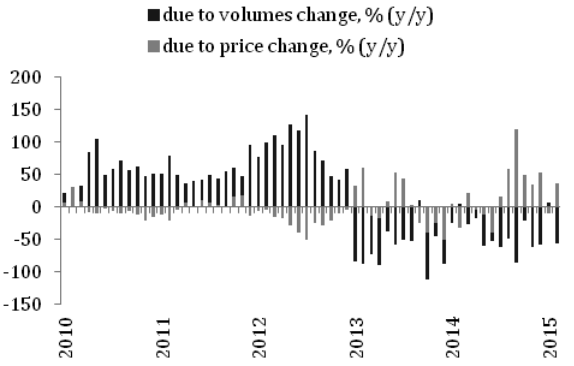


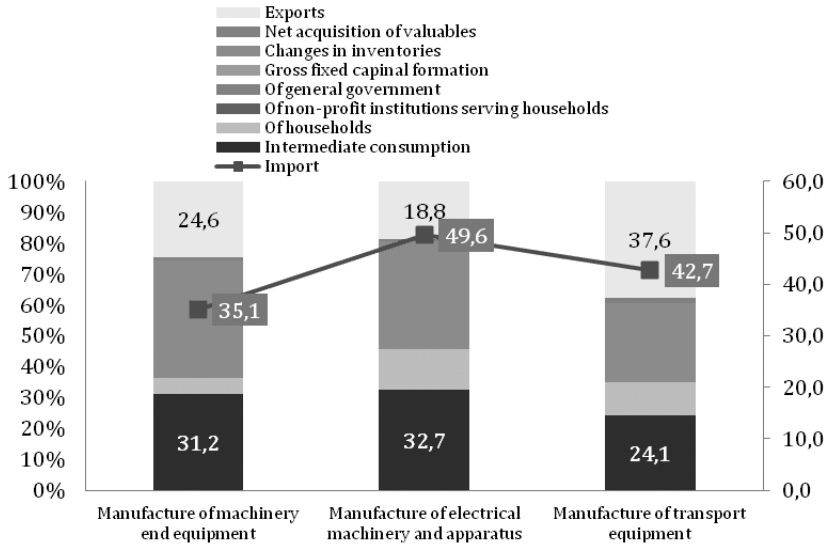
Figure 27. *Change in the export of lorries by Belarus, 2010-2015, (y/y), %*



Source: National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)

The high level of imported components is another problem for the Belarusian machine building sector, rendering it even more vulnerable. On average, roughly 40% of the supplies needed by the machine building sector stem from imports, both from the West and from the CIS (final and intermediate, Figure 28). Import components have the highest share in the manufacture of electrical machinery and apparatus.

Figure 28. *Added value of the machine building sector by method of final use in Belarus, 2013,%*



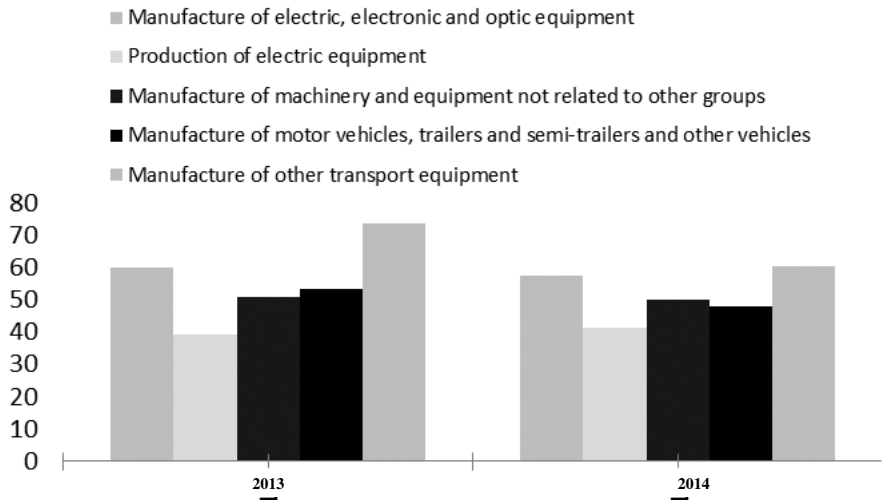
Source: National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)

Low export diversification, the relatively low quality of products, and problems with external demand caused Belarus' machinery and equipment sector to lose export market share. The high ratio of imported components increases the external risks for domestic producers. The weight of the Russia factor has practically not changed over the last two decades. The Russian Federation remains the main importer of Belarusian products and the supplier of its energy needs at a relatively low price.

Ukraine

In Ukraine, the key export machinery products are railway cars, locomotives, turbines, and engines [29]. A significant portion of exports goes to the CEE, the Middle East, Africa, China, and India. Figure 29 shows that 40% to 50% of new orders are foreign orders, but in 2014 this share has slightly decreased. At the same time the capacities of some enterprises were fully tied up by foreign orders. But only few players sell machines globally [29].

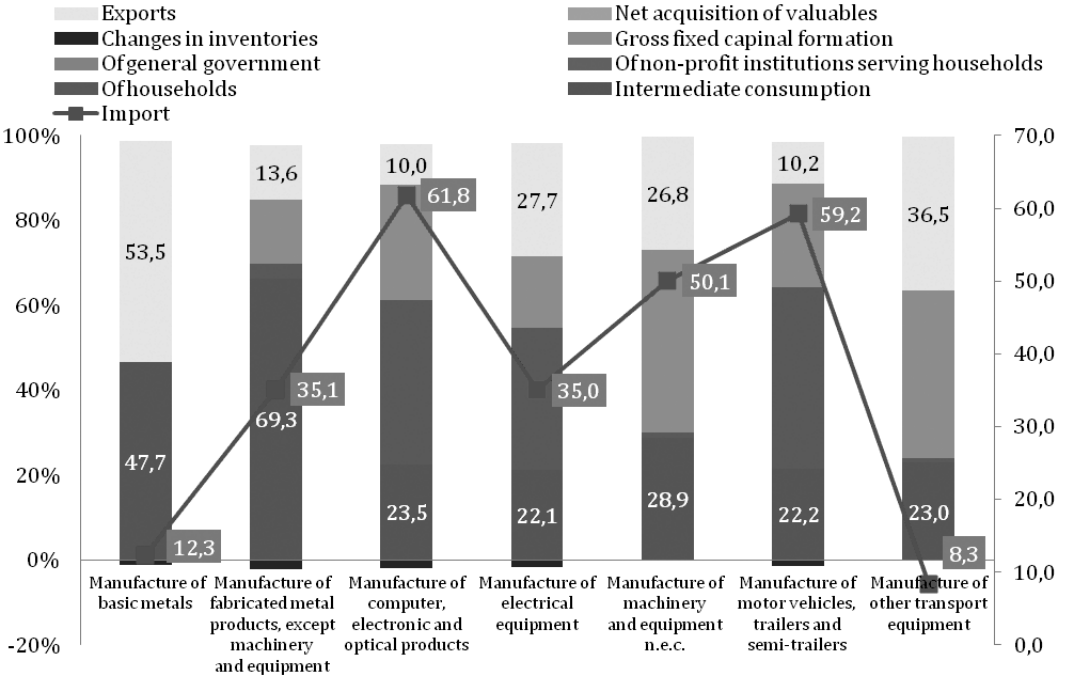
Figure 29. *The share of foreign orders as a percentage of the total volume of new orders in Ukraine, 2013-2014,%*



Source: State Statistics Service of Ukraine http://www.ukrstat.gov.ua/).

The "Input-Output" table shows that in terms of supplies, the most import-dependent subsectors are manufacture of computer, electronic, and optical products (61.8% of supplies are imported) and manufacture of motor vehicles, trailers, and semi-trailers (59.2% of supplies are imported). Manufacture of other transport equipment (8.3%) is least dependent on imports in covering its supplies. More then 36% of the output of this subsector is exported.

Figure 30. *Added value of machine building sector by method of final use in Ukraine, 2013, %*



Source: State Statistics Service of Ukraine (http://www.ukrstat.gov.ua/)

Following the country's WTO accession in 2008, import duties on Ukrainian products, including machinery products, were reduced by the member countries of the WTO to the level extended to most favorable nations (MFN). However, the expected export boom has not materialized yet [46]. Trade liberalization has led to increased competition in the Ukrainian internal market and has also laid bare the low international competitiveness of Ukrainian products. Apparently, the Ukrainian trade balance has experienced fast growth over the past decade. Besides, the year of Ukraine's accession to the WTO coincided with the global crisis, which was followed by a domestic political and economic crisis in 2014-2015. These developments make it impossible to adequately assess the consequences of WTO accession for machinery and the economy in general.

Despite the fact that the exports of the Ukrainian machine building sector are more diversified than those of the corresponding Belarusian subsector, the Russian factor is still crucial in Ukraine, too, specially if one takes into account the current situation in Eastern Ukraine and the political tensions with Russia. Before the collapse of the Soviet Union, exports of machinery and equipment from Ukraine to Russia were 2.7 times higher than exports from Belarus. In 1999, the value of Belarusian exports to Russia was twice as high as the value of Ukrainian exports. However, since 2000 the gap has been gradually shrinking [23].

The total share of machine building sector output exported to Russia decreased by 7 p.p. from 51.9% in 2013 to 44.3% in 2014 (Table 7). Ukraine mostly sent commodities from two sections to Russia: 86 (railway or tramway locomotives, rolling stock, track fixtures and fittings, signals) and 84 (nuclear reactors, boilers, machinery and mechanical appliances, computers).

Table 7. *Ukrainian exports to Russia*

(HS Code)		Russian Federation	World
84	2013	57.9	100
	2014	56.4	100
85	2013	35.1	100
	2014	25.1	100
86	2013	70.8	100
	2014	71.7	100
87	2013	51.1	100
	2014	44.0	100
88	2013	14.5	100
	2014	29.4	100
89	2013	25.2	100
	2014	4.6	100
Machine building sector	2013	51.9	100
	2014	44.3	100

Source: UN Comtrade Database (http://comtrade.un.org/)

The significance of the Russian market largely stems from the historical economic ties between the two countries. Good knowledge of trade partners, shared production standards, and customized products usually make such long-standing trade relations mutually beneficial, and it is thus sensible for both parties to maintain these ties. At the micro-level of subsectors and enterprises, the Russian factor is sometimes crucial. For example, 62% of Ukrainian heavy machine building exports go to Russia. Prior to the Ukrainian-Russian conflict, the Luganskteplovoz company used to sell around 94% of its locomotives to Russia, while less than 1% went to Kazakhstan and roughly 5% to other countries [29].

A possible loss of access to the Russian market would hit the sector hard, as export diversification and productivity are low in most subsectors. A relevant calculation suggests that a complete loss of machine building exports to Russia would directly reduce Ukrainian GDP by 1.1% compared

to the baseline of 2012 [7]. Most imports from Ukraine will be readily replaceable by imports from other countries or domestic Russian production, although possibly at higher prices.

To summarize, despite the fact that some leading players have been negotiating export deliveries to new markets in Asia and Africa, which will increase the geographical diversification of sales and boost long-term growth, the level of diversification in Ukraine's machinery exports continues to remain relatively low. Taking into account the high share of Russia in the export of machinery products, the fact that a significant part of Ukraine's machinery is located in Eastern Ukraine, as well as the current political and economic tensions between Ukraine and Russia, the Russian factor appears to have emerged as the most crucial problem for Ukraine in the coming years.

Moldova

Moldovan machinery exports stagnated during the first decade of post-Soviet independence (1991-2001), but over the last ten years exports grew five-fold, reaching a record high in the country's history. Export data confirms that ownership changes in the machinery sector in Moldova in the 1990s paved the way for the subsequent expansion of exports. There are clearly two different trends in machinery export development: stagnation in the 1990s and early 2000s, and fast growth since 2003. The new ownership structure and the promotion of free economic zones [12] allowed for especially rapid growth in 2008 (63%). Poor external conditions interrupted growth in 2009, but the slump was followed by even faster growth in 2011 (74%). Despite the global crisis of 2008-2009, the share of Moldovan machinery in total exports kept increasing over that period, indicating that machinery products enjoyed a relatively strong position among all export items.

WTO accession in 2001 also contributed to the growth of Moldovan exports. Moldova joined the WTO on the terms that apply to a developed country, with a transitional period of just four years. To do that, the Moldovan government almost fully opened the country's market. In addition, Moldova joined most of the optional sectoral initiatives, with the exception of the initiatives relating to alcohol. Joining the WTO led to an increasing import dependence of the Moldovan economy, but over the years of WTO membership total foreign trade has grown five-fold [46].

Moldova has made significant improvements in machinery export diversification. Back in 1998, Moldova used to have a low level of export diversification (77.2% of its exports went to the CIS market). By 2013, CIS dependence had dropped to 27.5%. The country's dependence on the Russian market, specifically, is also relatively low: 21.3% of Moldovan machine building exports were sold to Russia in 2013 (down from 32.8% in 1998).

However, the role of the Russian factor in Moldova merits a discussion with regard to the issue of ownership. Russian or Russia-related businesses own substantial stakes in enterprises in the metallurgy and machine building sectors on the both sides of the Dniester River, with an especially major impact on the left bank of the river [11]. Russia tops the list of countries that have FDI stock in Moldova, and Russians are also the top investors in each sector of the economy except for banking. The total stock of Russian investment exceeds $200 million [47]. Nevertheless, the share of CIS countries in the total stock of equity capital FDI drops to 11.2%, far behind the EU countries' 52.1% share [47]. Earlier acquisitions of privatized Moldovan state enterprise by Russian investors resulted in limited technology transfer and know-how for specific industrial companies. Some companies went bankrupt and others are struggling to survive by investing their own capital into modernizing their businesses and looking for market diversification. In recent years, ca. 35% of the exports of Moldova's troubled Eastern rayons – the Transnistria region – were oriented towards the EU, while 40% went to Moldova and 15% to the Russian Federation [55].

Box 9: Export growth of the machine industry in the Czech Republic

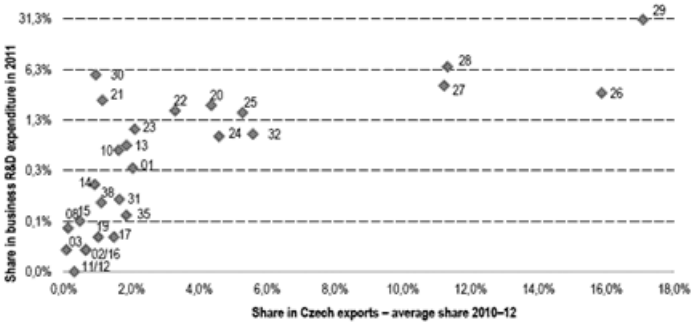
Export specialization of the Czech Republic

Table: SITC 2 classes with the highest share in Czech exports Export item		**Share of Czech exports (%)**	
Code	**Title**	**2002-2004**	**2011-2013**
78	Road vehicles	15.53	17.75
77	Electrical machinery, apparatus & appliances n.e.s.	10.20	9.31
75	Office machines & automatic data processing equip.	5.79	7.42
74	General industrial machinery & equipment, and parts	6.61	6.82
76	Telecommunications & sound recording apparatus	3.65	5.52
89	Manufactures of metal, n.e.s.	5.58	4.85
69	Miscellaneous manufactured articles, n.e.s.	4.20	4.82
67	Iron and steel	4.34	3.52
71	Power generating machinery and equipment	3.03	2.92
62	Rubber manufactures, n.e.s.	3.16	2.46
72	Machinery specialized for particular industries	2.29	2.37
82	Furniture and parts thereof	2.51	1.61
35	Electric current	0.66	1.48

Source: RIS3 – Czech Republic (2014).

The main drivers of Czech exports are the (i) automotive (SITC 78), (ii) electrical engineering and electronics (SITC 75, 76, and 77), and (iii) mechanical engineering (SITC 71, 72, and 74) industries. Items within the metal-working industry (SITC 69) and metallurgical industry (SITC 67) also have a significant share of exports. The extent and export power of the latter two industrial areas provides a strong background for the mechanical engineering, automotive, and electrical engineering industries. Especially the automotive industry – as a sophisticated customer – increases the transnational competitiveness of these traditional industrial areas, which also control a large share of employment. As a result, the dominant automotive, electrical engineering and mechanical engineering industries represent – to a large extent – the drivers of the internal restructuring of other traditional industrial areas. At the same time, they support exports from related areas, e.g. SITC 62 "Rubber manufactures, n.e.s.", which is largely the result of the high concentration of tire manufacturers (not only for vehicles).

Chart: *NACE sections by their share in Czech exports and business R&D expenditure, 2010-2012*



Source: RIS3 – Czech Republic (2014).

The Chart confirms the dominant role in exports of the automotive (NACE 29), electronics (NACE 26), mechanical engineering (NACE 28), and electrical engineering (NACE 27) industries. With respect to its share of business R&D expenditure, the automotive industry dominates the domestic economy, accounting for about one-third (30.6%) of R&D expenditure in the corporate sector. On the other hand, this position is largely attributable to Skoda Auto a.s., the biggest Czech exporter, which significantly contributes to total R&D spending. It is followed by mechanical engineering with a 7% share in business R&D expenditure, and manufacture of other transport equipment (5.3%). The combined share of the electrical engineering and electronics industries in business R&D expenditure amounts to 6.7%.

Investments in the machine building industry

The data illustrate different trends in total machinery investments between 2000-2013 (Figures 31-33). There is the downward trend of machinery investments in Belarus, an upward trend in Moldova machinery investments, and a rather fluctuating trend in the volume of investments going into the machine building sector in Ukraine.

Comparing the respective shares of machinery in manufacturing industry output and in investments, there is evidence of underinvestment in the machine building sectors of Belarus and Ukraine, while there are intense machinery investments in Moldova. In the case of Belarus, the gap between investment and output share has been increasing, which indicates that more investments are needed to maintain the high share of machinery in industrial production overall. In Ukraine, the gap has vanished in 2012-2013, which could be related to increased investment intensity after signing long-term contracts with the good export markets of Russia and Kazakhstan [29]. Investment intensity is much higher in Moldova, which goes a long way towards explaining growth in Moldovan machinery output and exports.

Figure 31. *Investment in and output of the machine building sector relative to total manufacturing industry in Belarus, 2000-2013,%*

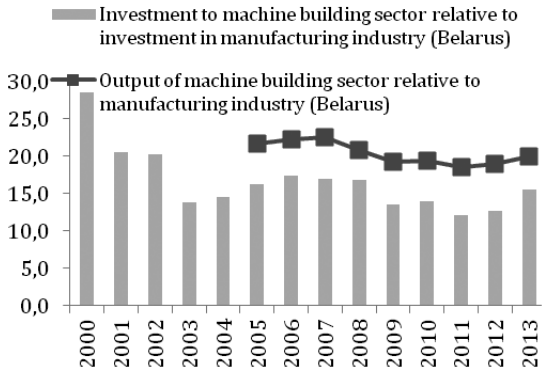
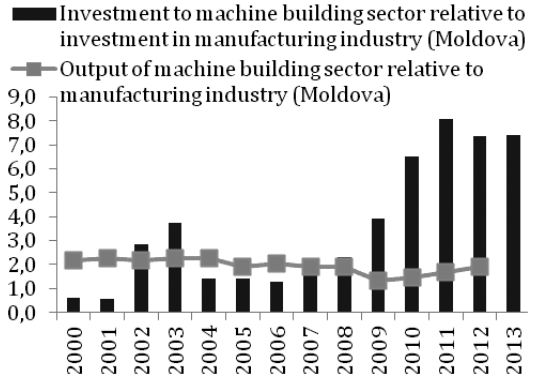
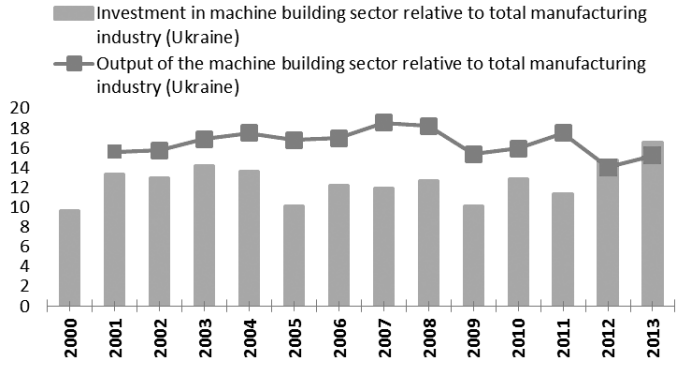


Figure 32. *Investment in and output of the machine building sector relative to total manufacturing industry in Moldova, 2000-2013,%*



Source: National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)
National Bureau of Statistics of the Republic of Moldova (http://www.statistica.md/index.php?l=ru)

Figure 33. *Investment in and output of the machine building sector relative to the values of the entire manufacturing industry in Ukraine, 2000-2013, %*

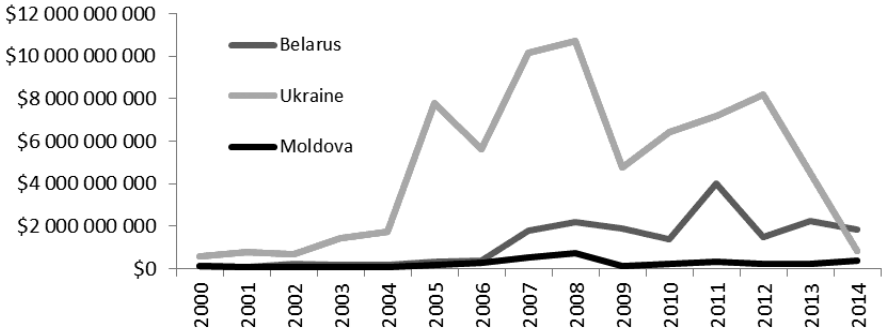


Source: State Statistics Service of Ukraine (http://www.ukrstat.gov.ua/)

Foreign direct investment (FDI) intensity evolved differently over time in Belarus, Ukraine, and Moldova (Figure 34). In transition countries, FDI is perceived as an important source for accumulating assets (physical, organizational, market access) and capabilities. In post-Soviet countries, the level of domestic savings and investments is rather low and insufficient for stable economic growth, that is why the importance of attracting FDI increases [27]. As the biggest

economy among the three countries, Ukraine has been attracting the highest amount of FDI, especially between 2005-2013. However, an economic downturn and an unstable political situation have caused FDI inflows to drop dramatically in 2014. The intensity of foreign investments in Belarus started to grow in 2007, spurred by major privatization deals with Russia.[10] FDI inflow in Moldova was seriously affected by the global economic and financial crisis in 2009, but a recovery took place between 2010-2014. However, in terms of the size of FDI stock relative to GDP, in 2014 Ukraine and Moldova attained ratios of 48% and 44% of GDP, respectively, while Belarus' ratio only stood at 23%.

Figure 34. *FDI inflows in Belarus, Ukraine, and Moldova, 2000-2014, m USD*



Source: World Bank's World Development Indicators

The role of FDI in the development of the machinery sectors differs in these three countries. Integration into multinational value chains, which leads to higher investment intensity and improved modernization processes, only seems to be prominently present in Moldova, it is less frequent in Ukraine and Belarus. Previous empirical studies have shown that in the manufacturing sectors of the economy, firms with foreign capital perform better in the region than domestic companies [see 51, 52, 53]. Based on national statistics and case studies, machinery remains an important destination sector for FDI in all three countries, as it generates substantial export flows. However, only in Moldova are investments in the machine building sector associated with large and sustainable greenfields and substantial equity flows from multinational companies.

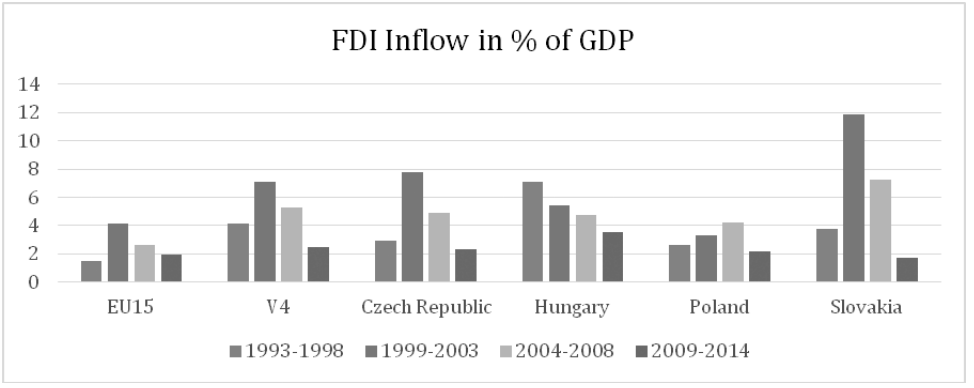
As a result, investments seem to influence innovation capacities differently in these three countries. In Belarus and Ukraine, investment effectiveness is affected by low levels of capacity utilization, reduced productivity, a high share of imported machinery aggregates, and a high degree of dependence on the Russian Federation. In Moldova, higher investment activity in machinery enhances the development of knowledge-based subsectors, like electrical machinery manufacture. As Moldova offers one of the lowest labor rates, investment in electrical machinery manufacture is expected to grow further, also taking into account the new projects that have been announced. However, each country should be reviewed in detail to examine the specifics of investment effectiveness.

[10] First of all, Belarus sold its gas transmission pipeline system to the Russian Gazprom corporation for $5 billioln WHAT? between 2007-2011.

Box 10: The role of FDI in the V4 machine industry

Prior to the EU accession of the V4 countries, the level of FDI inflow and FDI stock in these countries hinged on their ability to create a stable, favorable, and encouraging environment for foreign investors, on the promptness of economic reforms as well as the speed with which individual V4 countries complied during the pre-accession period with the requirement of openness to international capital movements. Under Article 56 of the Treaty on European Union, there was a timetable for the gradual liberalization of capital flows, which was drafted and applied separately in each of the V4 countries. While the Czech Republic had begun de-regulating capital transactions as early as 1995, Hungary, Poland, and Slovakia were liberalizing capital flows gradually, practically until their EU accession. Another accelerating factor with regard to the de-regulation of capital were the V4 countries' efforts to become members of the OECD. The approach that these states took to privatizing state assets during the transition period also played a decisive role in influencing volumes of FDI inflow. Thus, while Hungary implemented privatization by directly selling assets to foreign investors, Slovakia in the1990s preferred to leave former state enterprises in the hands of domestic owners. Nevertheless, FDI inflows received a major boost by the inclusion of the V4 countries in the group of states that acceded to the EU in 2004. In the context of V4 countries overall, the highest levels of FDI inflow occurred in the final years of the pre-accession period (1999-2003), mainly due to the massive increase of FDI in Slovakia and the Czech Republic. After 2009 there was a considerable drop in FDI inflow in all V4 countries (1.7-fold decline on average) – Slovakia experienced the steepest drop (a factor of 3.2), while Hungary was subjected to the mildest (a factor of 1.2).

Figure: *FDI Inflow in V4 Countries (Percentage of GDP)*



Source: FDI Statistics Database, UNCTAD

The relocation of industries (not only) from old EU members to the newly accepted member states was most striking in the case of the automotive industry, which emerged as a dominant industry in the V4 countries. In the early 1990s, the existing automotive industry capacities in the Czech Republic, Slovakia, and Poland were privatized and acquired by Volkswagen and Fiat. Hungary became a popular greenfield investment destination in the mid 1990s. During the late 1990s and early 2000s, FDI inflow in the automotive industry was dominated by greenfield investments, while investment incentives played an ever increasing role as the offers of mutually competing V4 states were usually similar. Approximately 75% of V4 automotive assembly plants and suppliers are now located within a 200km radius centered on the border between the Czech Republic, Slovakia, and Poland.

Belarus

In Belarus, a significant share of machinery investments come from state-directed lending programs. The Belarusian authorities have actively relied on a variety of state programs and measures for developing priority sectors in the economy, and this effort included the machinery sector, which has plenty of major state-owned enterprises. Most of the programs have been sustained by credit from state-owned commercial banks. Lending involves a combination of various types of public sector subsidies, such as earmarked funding provided by the public sector to commercial banks, subsidized interest rates, and government guarantees [48]. There are also direct subsidies for particular projects or individual companies.

Directed lending programs hamper the efficient use of capital in the targeted sectors and negatively influence management practices in participating state-owned enterprises (SOEs). Large-scale lending at below-market rates promotes inefficiency and the misallocation of resources in the economy [48]. Misallocation often leads to reduced investment efficiency. Directed lending programs with subsidized interest rates do not create incentives for the managers of SOEs to ensure the efficient allocation of capital to the most profitable projects, and in fact they erode the culture of investment. Directed lending programs have also interfered with the development of a sound risk management culture, precluding the proper pricing and efficient allocation of money in accordance with risk.

FDI flowing into Belarus' machinery could positively affect the sector due to new technologies, new markets, and improvements in strategic management and operations. However, the positive impact of FDI emerges slowly, if at all. The presence of foreign capital in the Belarusian machine building industry is rather limited because the sector is mostly composed of large state-owned enterprises and holdings. Foreign investment in the industry predominantly manifests itself in the creation of joint enterprises with Belarusian companies[11] and only rarely in the form of greenfields.[12] Privatization of state machine building enterprises is also a rare occurrence [39].

However, studies find that FDI has a positive impact on machine building industry output in Belarus. The reason is that this mostly export-oriented sector forces producers and investors to spend some of their assets on renovation in order to remain competitive [27]. This calls for launching a new modernization policy for the machine building sector in Belarus, which would combine restructuring with a partial sell-off of machine building SOEs to foreign investors. In any case, the role of foreign direct investments in the Belarusian economy is one of the burning issues nowadays.

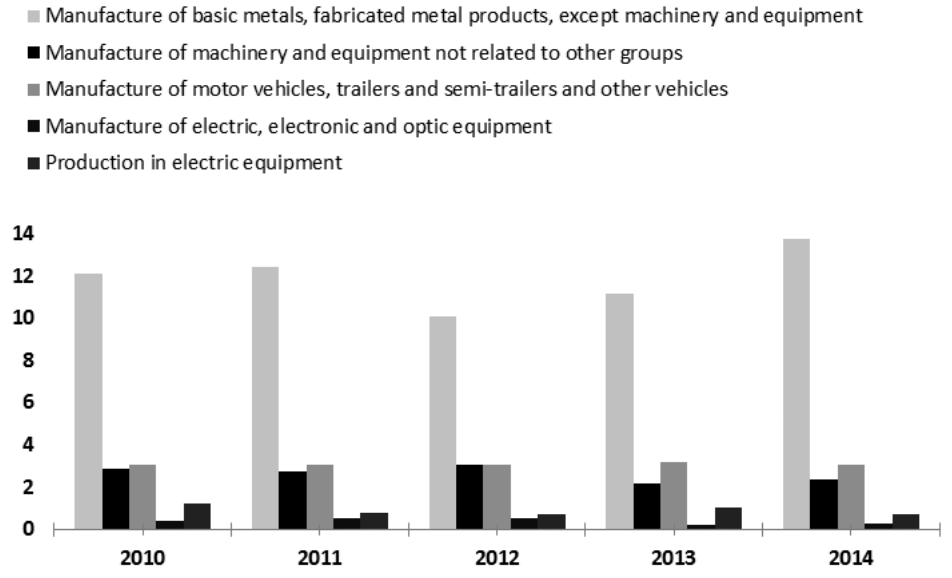
Ukraine

There is evidence that investments in Ukrainian industry are primarily flowing into resource-intensive industries, like metallurgy (Figure 35). The amount of investments flowing into the basic and fabricated metals industry exceeds the investments received by machine building subsectors by several orders of magnitude. In machinery, the highest share of investments goes to vehicle production companies. The subsector "production of machinery and equipment, not related to other groups," which includes companies in heavy machine building, railway machine building, as well as agricultural machine building, holds the second place. Manufacture of knowledge-intensive products like electronic, optic, and electric equipment are relatively insignificant in terms of investment flows.

[11] For instance, Minsk automobile plant (MAZ) has a joint venture with the German truck producer MAN.

[12] The latest example is “Stadtler Belarus”: Initially, there was a joint venture between Stadtler Rail AG (60% share) and Bekommunmash Holding (40% share) to build a brand new facility for producing railway vehicles worth $50 million. Two years afterlater, Stadtler Rail AG performed a buyout of the company for about $10 million.

Figure 35. *The share of subsectors in industry capital investments in Ukraine, 2010-2014, %*



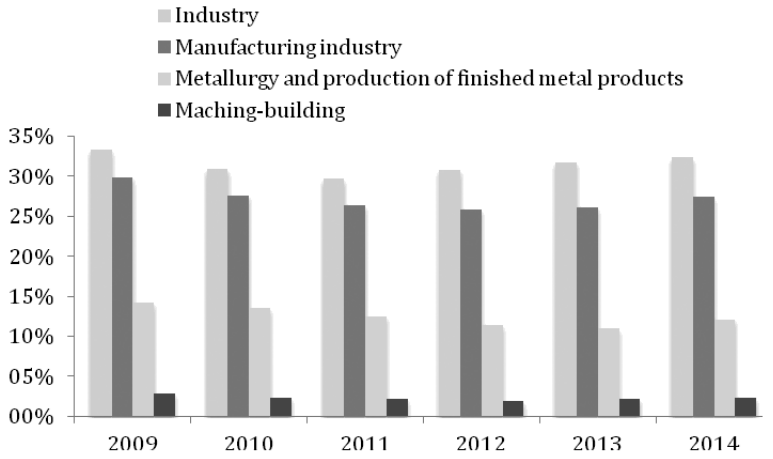
Source: State Statistics Service of Ukraine (http://www.ukrstat.gov.ua/)

One possible explanation for underinvestment in machinery may be related to the weak culture of corporate governance in the country's industry, which stems from certain specific aspects of the transition process. Leading market players are mainly controlled by local and Russian business groups, while only a few companies are state-owned [29]. As Andrey Movchan, Director of the Economic Policy Program of Carnegie Moscow argues,[13] Russian-style corporate development relies on a strategy of "cash-flow" maximization rather than "equity" development. Even though the shares of some Ukrainian machinery giants such as Kryukiv Car, Stahanov Car, Luhanskteplovoz, and Motor Sich are actively traded on the national stock exchange, corporate development may take years and needs stimuli to achieve change.

FDI statistics also show that machinery remains relatively underinvested in Ukraine, as it attracts roughly 7% of all industry investments. Compared to metallurgy and manufacturing of fabricated metals, machine building is 5.5 times less likely to receive foreign investment. In terms of the distribution of FDI stocks among manufacturing sectors, machine building ranks only fourth (metallurgy dominates, followed by food, beverages, and tobacco; oil processing, chemicals, rubber, and plastics). This makes Ukraine a special case with respect to the distribution of FDI when compared to the sectoral structure in other Eastern European countries, since Ukraine has attracted comparatively less FDI into export-oriented industries. In particular, the main targets of FDI in Ukraine are not machine building and the chemical industry (which are the most important subsectors in both Poland and Romania) but metallurgy and food processing. Finally, the high share of FDI in the Ukrainian financial sector means that shareholder loans account for about 14% of the total reported FDI stock [54]. As a result, the share of machinery in total FDI stock has diminished from 2.8% in 2009 to 2.2% in 2014 (Figure 36).

[13] For further details see http://carnegie.ru/commentary/experts/?fa=1057

Figure 36. *FDI (paid in capital) in Ukraine, shares in total FDI stock, 2009-2014,%*



Source: State Statistics Service of Ukraine (http://www.ukrstat.gov.ua/)

The main sources of FDI flowing into Ukraine are Cyprus (30% of total stock), Germany (16.6%), the Netherlands (10%), the Russian Federation (6%), Austria (5.5%), and Great Britain (4.7%). In industry, the most active investors are from Germany ($5 billion), Cyprus ($3.3 billion), and the Netherlands ($1.9 billion). In machinery, foreign interest is manifest in both greenfields and brownfields. For example, investments in machine building for agriculture take the forms of new plants, purchases of company shares, and debt financing [29]. However, the pre-dominant position of Cyprus as a source of FDI raises doubts about the quality and actual origin of such investments. First, Cyprus-based investment inflows are often linked to Russian or local oligarchs or their businesses, and are quite often the results of tax evasion or tax avoidance. Second, as experts from the German Advisory Group in Ukraine believe, FDI originating from Cyprus points to the presence of "round-tripping" funds that were previously withdrawn from Ukraine (or perhaps other CIS countries, e.g. Russia), and are now channeled to Ukraine via Cyprus. The presence of "round tripping" is also supported by a glance at Ukraine's outward FDI stock, where Cyprus commands an impressive share of 92%[14] [54].

The underinvestment in Ukraine's machinery explains the intense depreciation rate of fixed assets, which equals about 70%. Underinvestment also leads to the slow adoption of contemporary technologies and to lagging modernization in the fixed assets of machine building companies. Taking into account output decline and low export diversification, the modernization prospects of Ukraine's machine building sector are uncertain at best.

Moldova

Foreign investments in Moldova were directed into the financial, wholesale and retail, manufacturing industry, energy, transport, and communication sectors. FDI intensity has contributed to changes in the structure of the Moldovan economy [33]. According to data provided by the National Bank of Moldova, as of mid-2015 manufacturing industry accounted for 22.3% of FDI stock in Moldova. The top five investing countries (not counting investments in the financial sector) are Russia, the Netherlands, Italy, the US, and Cyprus. WTO accession had a positive impact on FDI flows. Statistical data on foreign direct investment shows significant growth: FDI increased seven-fold between 2002 and 2008 [46].

[14] Of course, Cypriot FDI in Ukraine and Ukrainian FDI in Cyprus are not comparable in absolute terms, with the latter being much lower asas the latter is much lower since most outflows are probably not officially recorded.

Free economic zones (FEZs) and industrial parks have emerged as major factors in attracting investment to Moldova. There are currently seven free economic zones and six industrial parks in Moldova. By the end of 2013, total investment into FEZs amounted to roughly $200 million [12]. Large industrial investors include Draexlmaier (Germany, wire harnesses), the Lear Corporation (USA, automotive seating, car seat covers), Gebauer&Griller (Austria, wires and cables), Euro Yarns (Belgium, synthetic fibers), LaTrivinetaCavi (Italy, wires and cables), Ceccato Production, and Eastsord Production (both from Italy, machinery-building components). FEZs employ about 7,000 people in total [12]. Since 2010, industrial parks are being actively developed as instruments to promote export and industrial potential. Nevertheless, thus far industrial parks have registered less investment activity by international companies than FEZs.

Reinvestments have become an important source of innovation. According to the Moldovan Statistical Office, investments in fixed assets are relatively high in the manufacture of electrical machinery and apparatus subsector, where foreign investors tend to be very active.

FDI in Moldova appears to force changes in the ownership structure of Moldovan industry and mitigates the impact of the Russian factor, since Russian businesses control several strategic enterprises in the metallurgy and machine building subsectors [11]. The share of active Russian businesses has been decreasing, especially since the signing of the Association Agreement between the EU and Moldova in 2014. Apart from the electrical machinery and apparatus subsector, machine building also registers increasing investments and outsourcing opportunities from EU companies. FDI into the Moldovan machine building sector seems to have paved a definite path for the country's inclusion into global value chains.

Box 11: "The FDI battle" – the case of the Jaguar Land Rover investment in Slovakia

In 2015 Jaguar Land Rover decided to invest £1.1 billion (ca. €1.4 billion) into a new car factory in Nitra, Slovakia. The company will create 2,800 jobs – directly. The first cars will be produced in 2018, and in the first phase the plant is expected to produce 150,000 vehicles. It will produce lightweight luxury vehicles; the British media have speculated that the product manufactured will be the next generation Land Rover. The contract between Jaguar Land Rover and the Slovakian Government was signed on December 11, 2015. It is the largest investment in Europe in the last seven years.

The company had performed analyses of several possible factory sites in Europe, the United States, and Mexico in 2014. In early 2015 the shortlist included Mexico, Poland, and Slovakia. Official talks with Slovakia commenced in February 2015. The final "battle" was between Poland and Slovakia, and in August 2015 unofficial sources claimed that Slovakia had come out on top.

Poland opposed the Slovakian policy of offering massive state incentives for investment and refused to continue to compete with Slovakia in that regard. The Slovakian government approved a subsidy to the tune of €130 million for tangible and intangible assets provided by the carmaker. The subsidy amounts to 9% of the total investment volume. This amount is also the ceiling that the Slovakian government can offer investors as an investment incentive for the particular region and type of investment. The Act on the Rules for Investment Incentives and State Aid rules, which has been approved by the European Commission, specifies the maximum level of aid that may be allotted to investments in each region. For Western Slovakia and the Nitra area, the maximum level of state aid cannot exceed 25% of the investment value. However, if the total investment volume exceeds €50 million, then the level of subsidies that may be awarded must be reduced based on a formula set by the European Commission. Furthermore, in the case of the Nitra site the Slovak government also cannot grant a contribution to the creation of new jobs. It may only grant a tax relief or offer the investor state or municipal property at a discounted price.

It must also be added, however, that the amount of public funds to support this project will exceed the currently set amount. Thus the state will perform road construction to connect the industrial site to the R1 expressway, which is estimated to cost about €10 million.

But Jaguar Land Rover's final decision was not only based on government subsidies. Tough the average hourly wage in Polish industry is 8.50 euros, while in Slovakia it is 10 euros, the latter is still only half of the expected labor costs in the UK. Moreover, Slovakia is also a member of the Euro Zone, which eliminates risks stemming from currency exchange. The official announcement of the car-company also referred to a strong network of suppliers and good logistics infrastructure. CEO Mr. Ralf Dieter Speth said that "Slovakia is well established in the automotive market and has a good reputation globally for high-quality production."

Human capital in machinery

In Belarus, Moldova, and Ukraine there has been a trend of continuous reductions in the number of employees in the machine building sector, even as the respective industries remain among the largest employers in these economies. This suggests that the period of transition from more labor-intensive and technologically simpler products to more advanced products is still ongoing in all the three countries. Such a transition also requires intensive investments into human capital, since a skilled labor force is a key factor in machinery development and in productivity gains. Investment in human capital is one of the components of a successful transition to the production of higher value-added machinery.

Among the key assets of Belarus, Ukraine, and Moldova are the skilled labor force and the high level of technical education in these countries. In Belarus there are universities and colleges for training the specialists needed in the machine building sector. The Belarusian National Technical University is one of the largest and most famous. According to the industry overview posted on the website of the Italian Industrial Chamber of Commerce in Ukraine, one of advantages of the Ukrainian machine building sector is its qualified labor force. About 10,000 students graduate each year from machine building-related departments of Ukrainian universities and colleges [29]. There are many universities where students receive the education they need for working in the machine building industry. The following occupy leading positions among the country's technical institutions: the Taras Shevchenko National University of Kyiv, the National Technical University of Ukraine, also known as the "Kyiv Polytechnic Institute", the Donetsk National Technical University and the National Technical University of Ukraine, also known as the "Lviv Polytechnic Institute" [29]. Moldova maintains a strong industrial emphasis in its system of higher education (e.g. the Technical University of Moldova in Chisinau, polytechnic, technical and technology colleges in Chisinau and Balti, as well as vocational schools). In 2013 the Balti State University Alecu Russo launched a training program in partnership with Draexlmaier, which specializes on "Engineering and management in automobile construction." In partnership with Galati University (also known as "Dunarea de Jos"), Cahul State University trains students in specialized technical fields. Technical education continuously improves by adapting the curricula and fields of specialization[31].

Box 12: Using the university's R&D potential for business (ideas to market)

Case study: the **University of Zilina** (UNIZA) and the **CEIT Group** , Zilna, Slovakia

The history of the University of Zilina (UNIZA) began on September 1, 1953, when the University of Railway Transport was founded by slicing off a division from the Czech Technical University in Prague. Currently it has approximately 9,000 students who are studying at one of seven faculties: Faculty of Operation and Economics of Transport and Communications, Faculty of Mechanical Engineering, Faculty of Electrical Engineering, Faculty of Civil Engineering, Faculty of Management Science & Informatics, Faculty of Special Engineering, and Faculty of Humanities.
In 1997 the University established the Slovak Productivity Center jointly with the Ministry of Economy and the Federation of Employers' Associations of Slovakia. The Center specializes on research in the area of lean manufacturing and digital enterprise. The year 2005 saw the creation of the first spin-off, SLCP Consulting, Ltd. The company focuses on the processes of innovation, education, and improving business processes. The second spin-off, CEIT SK, Ltd. was created in 2007 and focuses on product and technological innovation. Another special spin-off, CEIT-KE, Ltd., was created in 2010, with a focus on biomedicine. In 2011, the CEIT Group was created with a main focus on these areas:

- Process innovation – optimizing the workplace and increase its efficiency, improve processes in terms of production, logistics, and enterprise systems;
- Technical innovations – from design concept to production of the first series of products, workplace design and technological units, including verification and optimization based on simulation;
- Digital Factory – provide space to optimize workplaces, processes, and systems already in the stage of their development – in the digital environment without the existence of a real system or intervention in the real system;
- Industrial automation – designing and modeling the flexible, reliable, and economic production of cells, workplaces, and operations. Implementation of industrial automation and robotics in factories.
- Biomedical Engineering – research into new diagnostic methods in invasive implantology. Providing design, production, and diagnostics implants – particularly in the head area and the maxillo-facial region. They specialize in research on implant materials, solutions, and sophisticated computer analysis of the dimensional and mechanical properties, the proposal for a new methodology for the production of implants in terms of clinical applications.

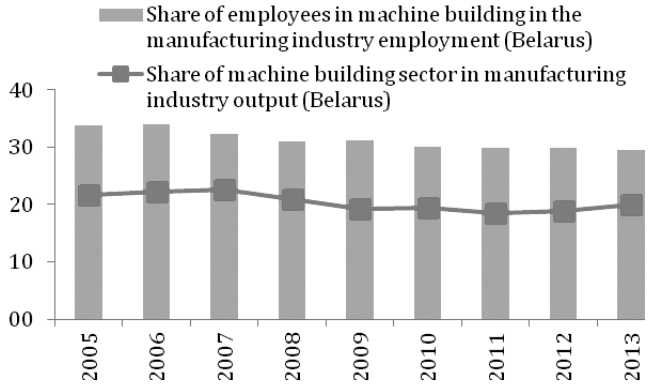
CEIT and UNIZA are not just using joint human capital for their joint research, but also have several joint laboratories, combining private and public resources for research and production. In 2015 CEIT Technical Innovation, another spin-off established in 2013, was estimated to be the 261st fastest growing technological company in the Europe, Middle East, and Africa in the Technology Fast 500 TM ranking organized by Deloitte.

Belarus

Despite a downward trend in employment, machinery remains a highly labor-intensive sector of the economy. The number of employees in machinery has dropped by over 15,000 persons (9.5%) since 2010. Today, around 30% of manufacturing industry workers in Belarus are employed in machine building, even thought its share of manufacturing output is only about 20% (Figure 37). However, this gap has been modestly shrinking in recent years.

Overemployment remains an important issue for the Belarusian machine building sector. According to World Bank estimates, overemployment in state-owned-companies in Belarusian industry may reach 25% [49]. As most of the machinery enterprises in Belarus are state-owned, overemployment in the sector creates a financial burden for machine producers and influences their financial results.

Figure 37. *The machine building sector's share of employment and output in the Belarusian manufacturing industry, 2005-2013, %*



Source: National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)

Figures 38-40 indicate that in recent years real wages in machinery subsectors grew faster than productivity. Excessive labor costs hinder growth, both in the industry specifically and the economy in general. Recent research done by CASE Belarus shows that a 1% increase in real unit labor costs in Belarus has lead to 0.28% fall in the country's GDP [50].

Figure 38. *Real wages and productivity change in the manufacturing of machines and equipment subsector in Belarus between 2006-2013, (y/y), %*

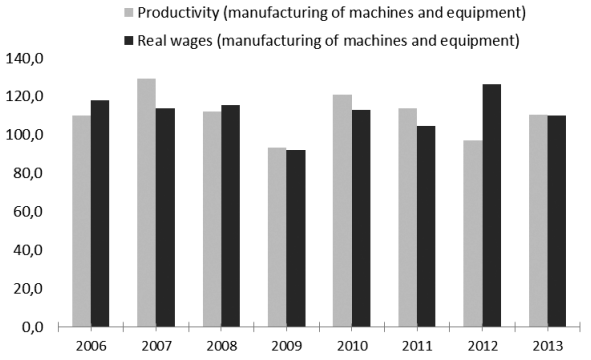
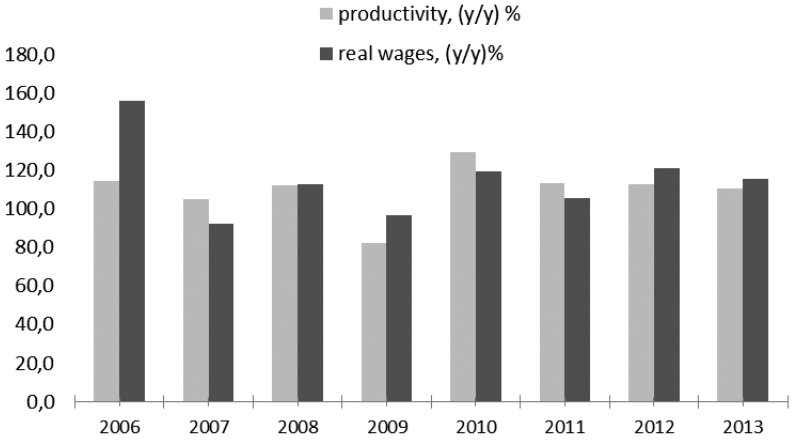


Figure 39. *Real wages and productivity in the manufacturing of transport vehicle equipment in Belarus between 2006-2013, (y/y), %, (y/y), %*

Source: National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)

Figure 40. *Real wages and productivity change in the manufacturing of electrical, electronic, and optical equipment subsector in Belarus between 2006-2013, (y/y), %*



Source: National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)

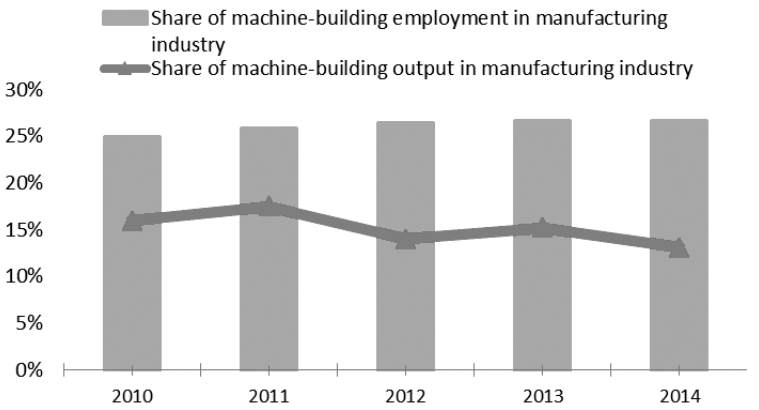
The existing employment policy in Belarus provides few stimuli for human capital innovation in companies. Due to the fact that the majority of machine building enterprises are state-owned, the Belarusian government has a significant influence over human capital development policy in the industry, including the wage policy, working time, as well as education and trainings. Under such conditions, employers and employees do not have sufficient incentive for intensive investments into human capital that lead to productivity increases.

Ukraine

The number of employees in the Ukrainian machine building sector has fallen by roughly 48,000 (11%) since 2010. But the reduction in machinery is slower than in the general industry or in the manufacturing industry in general, and as a result the sector has made modest (2 percentage points) gains in terms of its relative share of manufacturing employment (Figure 41).

Machine building in Ukraine remains labor-intensive and this intensity has been growing over the last 5 years. In 2013, machine building companies employed 27% of all manufacturing industry workers, even as they produced less than half that ratio (13.1%) of manufacturing output. Moreover, Ukraine's machinery is still in a process of structural adjustment, and its output and trade structure are in the process of being downgraded to produce more labor-intensive and technologically simpler products.

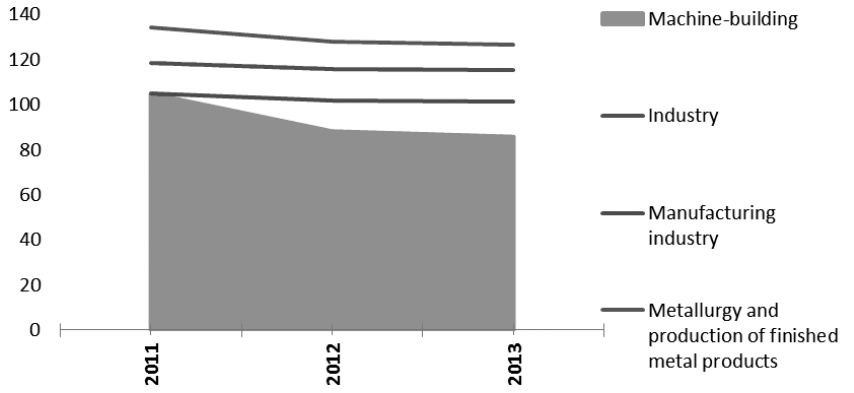
Figure 41. *Share of employment and output of machinery in the Ukrainian manufacturing industry between 2010-2014, %*



Source: State Statistics Service of Ukraine (http://www.ukrstat.gov.ua/)

Unlike in Belarus, wages in the Ukrainian machinery subsector are not state-subsidized and remain lower than the average wages in the economy. Work remuneration in machine building is lower than the industry and manufacturing industry average, and significantly lower than in metallurgy, the leader in terms of nominal payroll numbers (Figure 42).

Figure 42. *Average monthly nominal wages of employees in Ukraine,% of economy average, 2011-2013*



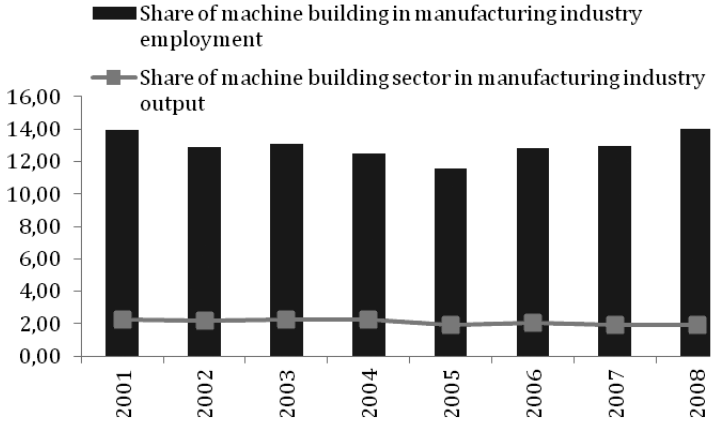
Source: State Statistics Service of Ukraine (http://www.ukrstat.gov.ua/)

Given the situation of significant labor intensity and below average wages in machinery in Ukraine, investments into human capital at the micro-level seem to be rather limited. A good engineering education is obviously not enough for technological advancement and better productivity. The collapse of the economy, high unemployment, and social tensions in Eastern Ukraine will contribute to the persistence of the current status quo, unless changes are initiated at the central government level and are then also consistently implemented.

Moldova

Around 6.58% of industry employees in Moldova are currently employed in the machine building sector. This indicator has been continuously growing in recent years. The machine building sector is also labor intensive, just like in Belarus and Ukraine. Since 2006, the majority of investments and new jobs were added in the subsectors electrical machinery and equipment, as well as components.

Figure 43. *Share of machine building in manufacturing industry employment and output in Moldova, 2001-2008, %*



Source: National Bureau of Statistics of the Republic of Moldova (http://www.statistica.md/index.php?l=ru)

Traditional employers in Moldova include companies producing electrical machinery and equipment, as well as their components; pump design and construction companies (even though these remain competitive in the CIS market, they have failed to penetrate the EU market); agricultural machines and equipment (their shareholders are local companies which are continuously investing in new equipment and product enhancement, and are also applying for CE certification in order to penetrate the EU market); and most recently the machine building for automotive

industry subsector (for example, the manufacturing of seat frames for Van Hool buses, metal parts for Volvo and Caterpillar, etc.).

There is evidence of close cooperation between Moldovan universities and industrial producers. The share of employees with higher education in industry has gradually increased from 11.2% in 2000 to 21% in 2014.

One of the advantages of employment in Moldova is the low cost of labor sometimes claimed to be among the lowest in the region , which ensures cost-effective operations. Contrary to other Eastern European countries, Moldova's unit labor cost is stable and only increases slowly [31].

The machine building sectors in Belarus, Ukraine, and Moldova are to a large extent a legacy of Soviet times, and, correspondingly, they have retained a significant role in industry. The three countries still find themselves in the process of structural adjustment as they transition from a Soviet-type industry to a market-based one, although the pace of transformation is different in each country. During the transition period, machinery in Belarus, Moldova, and Ukraine has been evolving from labor-intensive production of technologically simple products to capital-intensive machinery that produces more sophisticated products with relatively high value added and know-how content. Moldova appears to have the fastest track record in this process of transition, while Belarus and Ukraine lag behind, as their machinery remains more labor-intensive and underinvested. Machinery export data show that the machine building sector accounts for a relatively higher share of total exports in Moldova, which also indicates that exported machinery products produced in Moldova boast a comparatively higher value added than those manufactured in Belarus and Ukraine.

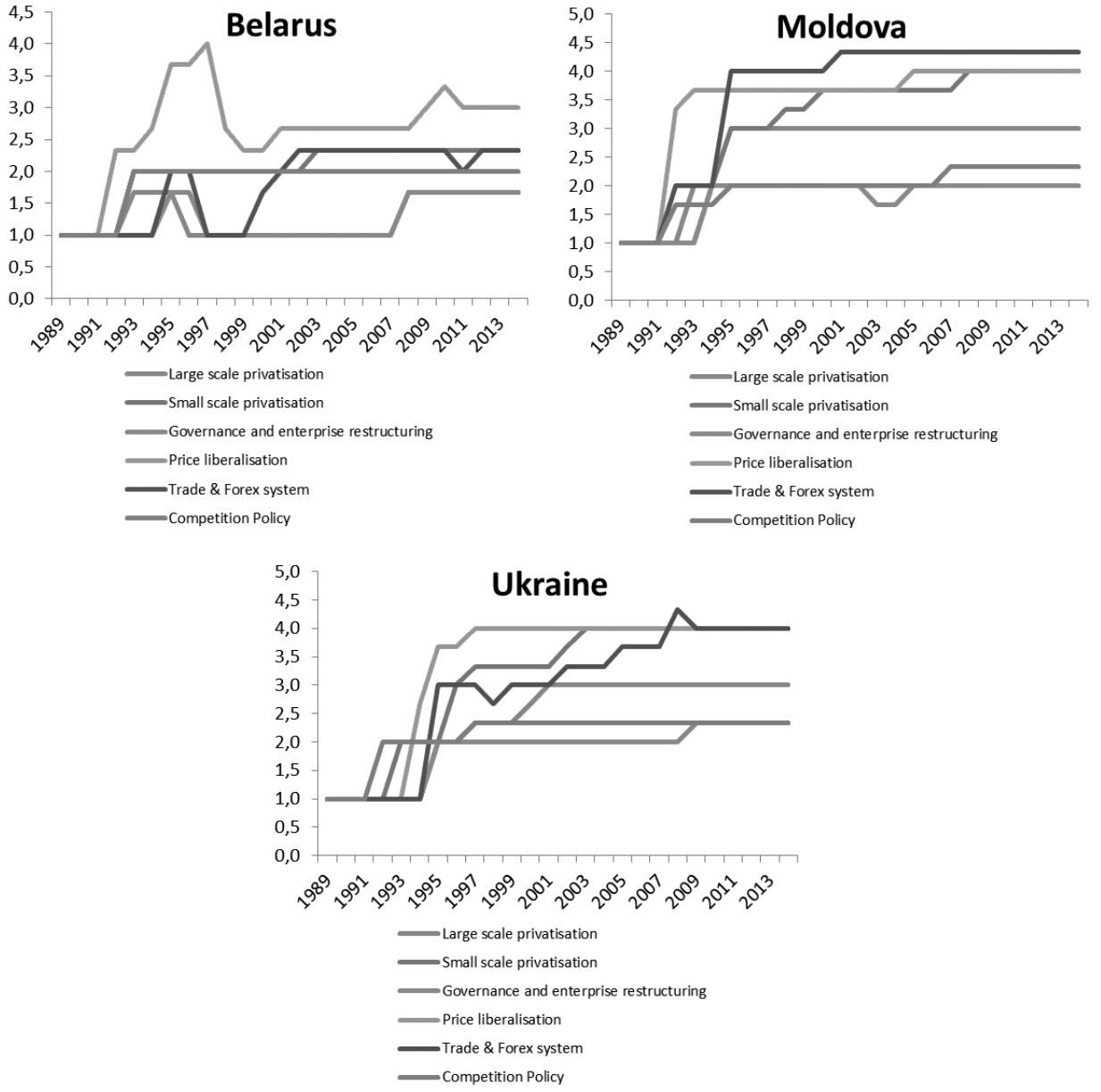
The key vulnerability factors that apply to both Belarus and Ukraine are low capacity utilization, weak export diversification (including a high dependence on the Russian market), the relatively low quality of products, outdated equipment and technology, and resource intensive production. For Belarus, machinery-related issues are the dominant positions of state-owned large producers, excessive employment, and the high level of imported components in high-tech subsectors. In Ukraine, machinery remains highly dependent on Russia, and is characterized by high power consumption and a rather weak corporate culture. Unlike in Belarus and Ukraine, machinery in Moldova is transforming into a supplier of components with a focus on electrical machinery and apparatuses. It also boasts a significantly improved level of export diversification. However, the Moldovan machine building sector is highly concentrated in free economic zones and industrial parks. The industry on the left bank of the river Nistru is more of dependent on Russian or pro-Russian business, though the share of exports going to the EU is constantly growing.

Institutional analysis based on micro-level data and case-studies

Institutional analysis is used to identify possible constraints within the machine building sector in Belarus, Moldova, and Ukraine, in its subsectors and in companies that significantly influence sector performance. Chapter II also explains the differences in machine sector development across the three countries. The different pace of reforms in Belarus, Ukraine, and Moldova since independence in 1991, and the different models these countries have pursued, have contributed to different structural transformations of their economies, including the underlying industrial

specifics. As the EBRD Transition Indicators[15] (Figure 44) show, Belarus remains the least advanced in all six components of transition reforms. Moldova has fully opened up its economy to foreign trade, and has almost completed the process of small scale privatization and price liberalization. Ukraine has also advanced in price liberalization, trade reform, as well as small scale privatization. However, all three countries show poor performance as for governance and enterprise restructuring and competition policy as those indicators range between low levels of 1.7 and 2.2 for the three countries.

Figure 44. *EBRD Transition Indicators for Belarus, Moldova, and Ukraine*



Energy subsidies, macroeconomic policy, ownership issues, and the quality of corporate governance are some of the issues that will be considered in this chapter. The chapter will conclude by presenting SWOT tables for machinery in Belarus, Moldova, and Ukraine as a summary of the institutional analysis together with conclusions from the comparative analysis in the previous chapter.

[15] The measurement scale for the indicators ranges from 1 to 4+, where 1 represents little or no change from a rigid centrally planned economy and 4+ represents the standards of an industrialized market economy [ebrd.com].

Institutional regulation/economic policy

The governmental system for regulating the machine building industry in Belarus, Moldova, and Ukraine has changed significantly since the Soviet period, and today the respective systems in these countries each have their own distinguishing features. In the 1980s there were dedicated ministries to regulate the machine building sector. Among them were the ministries of Heavy Machine Building Industry, Medium Machine Building Industry, Automobile, Tractors, and Agriculture Machine Industry, etc. Today, machinery in Ukraine is generally regulated by the Ukrainian Cabinet of Ministers and the Ministry of Economic Development and Trade. In Moldova it is generally regulated by the Moldovan Cabinet of Ministers and the Ministry of the Economy. In Belarus it is regulated by the Council of Ministers, the Ministry of Industry (MOI), and the Ministry of the Economy. In Belarus the MOI is the main governmental body that coordinates and regulates the activities of industrial enterprises in which that state has any kind of ownership stake. As of 2011, 164 joint stock companies (JSCs) and 85 fully state-owned enterprises were subject to the Ministry's economic governance [1].

There are no special laws regulating the machine building industry in Belarus, Moldova, and Ukraine. However, laws aimed at stimulating these industries are often used in the legislative practice of these countries. For example, in Belarus there are so-called Rulings of the President of the Republic, which are sometimes partially classified documents that are not made fully available to the public.[16] In Ukraine, one should mention the laws like "On the stimulation of the development of native machine building for the purposes of agricultural complex", "On measures of state support for the shipbuilding industry in Ukraine", and "On the development of the aircraft industry", which determine the basic policies for governmental support in these subsectors. Moldova has used legal acts to set governmental action towards the development of machinery. This includes the acts on free economic zones and on industrial parks, which set tax rates and incentives for the residents of these zones/parks.

Following both global practice and common sense, machine building companies in these three countries do not require special licenses for production. Special licenses are obligatory only for the production of rockets, space crafts and their spare parts, and other weapon-related products. However, it is obligatory and sometimes quite costly to obtain certain permits from the authorities related to such issues as labor, fire, sanitation, and ecological safety, which are required in order to operate these businesses.

Governmental regulations on machinery manifest themselves through different forms of economic stimulus, subsidies (hidden and open), soft budget constraints, and provision of preferential lending. Enterprises in the machine building sector benefit directly and indirectly from such conditions. It is rather difficult to identify all subsidy instruments along the value chain, what we can do, however, is to compare the key support instruments in the three countries.

[16] The recent Ruling No. 284, which was signed by the President on June 29, 2015, is a case in point. It contains measures involving financial support for the state-owned machinery giants “Minsk Tractor Plant (MTZ)” and “GomSelMash.” Accoriding to the ruling, MTZ will be able to issue corporate bonds worth $150 million and will receive tax exemptions to cover its losses in 2014. GomSelMash in turn will receive a preferential loan worth roughly $425 million from the Ministry of Finance in Belarus. Parts of the ruling are not available for public review (see http://news.tut.by/economics/454262.html)

Table 8. *Government support instruments in Belarus, Moldova, and Ukraine*

Subsidy instruments	Belarus	Ukraine	Moldova
Energy subsidies	YES Assuming that Belarus receives Russian energy subsidies for over two decdes, and attains a comparatively high level of energy intensity in machinery, then the machine building sector receives substantial benefits through the underlying Russian subsidies.	NO After the escalation of the geopolitical conflict between the two countries, Russia increased the prices of oil and gas for Ukraine. Today Ukraine receives energy resources from Russia and the EU at global prices.	NO Moldova receives oil and gas from Russia at a price that reflects global prices.
Export subsidies	YES There are preferential conditions for exporters in Belarus. Due to the fact that most machine building companies are exporters, they have access to export subsidies. Companies can get export credit from banks or loans from the budget. Enterprises also secure themselves against export risks by using government insurance companies [34]. The most important document regulating export support is Presidential Decree № 534 of August 25, 2006 "On the promotion of exports of goods (works, services)."	NO There is no evidence of direct export support for Ukrainian machine building companies.	NO There is no evidence of direct export support for Moldovan machine building companies.
Policy of import substitution	YES Policy of import substitution is widely used by the government in Belarus, including active support of local producers in the machine building sector[17]	YES Import substitution policy is currently used in the agricultural machinery and solar energy (panels) subsectors. But it is rather narrow in practice.	NO There is no evidence of import substitution policies in Moldova.
Protectionist policies	YES Protectionism is commonly used in Belarus[18]	NO There is no evidence of protectionist policies in Ukraine as it is the member of WTO.	NO There is no evidence of protectionist policies in Moldova
Preferential access to credit	YES An expansive credit policy and soft monetary policy have been at the core of the Belarusian macroeconomic model. State-owned companies have direct access to credit under preferential conditions. See examples in Chapter 1.	YES The Ukrainian economy used to feature state-backed loans [35]. Currently preferential credit policies are used to subsidize the aircraft industry. State guarantees for loans are also used in a few industrial sectors (defense, nuclear).	YES Currently there is some preferential access to credits with lower interest rates for certain programs financed by international donors.
Low interest rates	YES A substantial level of support has been provided through the state-owned banking sector. This also includes interest rate compensation to make export products and domestic consumer electronic goods more attainable for customers [14].	NO Ukraine used to support local producers of agricultural vehicles and machines, including the partial compensation of the interest they paid on loans [29]. But they seem to have abandoned this practice for the time being. aircraft industry. State guarantees for loans are also used in a few industrial sectors (defense, nuclear).	YES Low interest rates are applied to support big projects financed with funds provided by international donors.tional donors.

[17] Starting in 2009, Russia's biggest car producer "VAZ" has significantly reduced its imports of components from Belarus-based companies like BATE Borisov, "Avtogydrousilitel" Grodno, and "BelKart." Those state-owned companies took part in the import substitution program for components, which was initiated by the Belarusian government using financial, organizational, and technical measures. The whole package of measures allowed those companies to increase their sales and to gradually recover from the crisis [14].

[18] The macroeconomic policy of stimulating internal demand was widely used in Belarus between 2011-2015. However, to a significant extent it was based on protectionism, which limited competition and further distorted the country's macroeconomic balance [41, 50].

Subsidy instruments	Belarus	Ukraine	Moldova
Tax benefits	YES Tax benefits for state-owned machinery producers have been widely used by the government in Belarus. This distorts competition in the sector for both local and foreign machine-builders. There are also special economic zones in Belarus, including newly created industrial parks (the Belarusian-Chinese industrial park, for instance).	YES Some machine building enterprises (space, aircraft subsectors) are seen as priority areas for economic policy and are expected to receive tax benefits [19]. Ukraine has made some modest use of the practice of special economic zones, and has implemented direct tax benefits in that context.	YES Tax benefits in Moldova are provided through the creation of free economic zones.
SOE	YES Almost all large enterprises in the Belarusian machine building sector are state-owned or controlled by the government[19]	YES State-owned companies in Ukraine remain only in strategic subsectors of machinery like aircraft building, defense machinery, and nuclear technology.	NO There are only few SOEs in Moldova, and the government intends to privatize these, too, in the near future.Tax benefits in Moldova are provided through the creation of free economic zones.
Other forms of government support	YES Current instruments of support are: a) Government support for machinery sometimes takes an implicit form and is not readily apparent due to the fact that enterprises in the machine building sector are mostly organized as vertical networks. Vertical integration of machinery production serves to ensure the better governance of state-owned enterprises [9]. b) Leasing mechanisms have been used as a support mechanism for the domestic machine building sector during the time of crisis[14].[20] c) The Belarusian government often determines marketing and export policy with a view towards the interests of the largest enterprises in the machine building sector.[21]	YES The following are among the recent forms of government support programs in Ukraine: a) State guarantees and state insurance for exporters. b) State acquisition of new railcars. c) Partial compensation of the costs of domestically produced agricultural machinery. d) The acquisition of domestic agricultural machinery and equipment under a national financial lease program [29].	YES Government support can be used in the FEZs and, in limited forms, in the Industrial Parks.

Source: Based on all available sources

As is apparent in Table 8, of the three selected countries Belarus uses the widest range of potential instruments. In Ukraine, there has been a reduction in the number of subsidies and state programs, although the Ukrainian government still uses a relatively higher number of support mechanisms compared to Moldova. Moldova seems to have most European-type system of government support for machinery, based on free economic zones and without any kind of hidden channels.

[19] A finished product of a firm within a vertically integrated conglomerate is an intermediate product for another member of the conglomerate. Its price is thus often not subject to a clear market benchmark. According to procurement law, a tender is not required if the procurement of intermediary products is performeed within a vertically integrated chain. Similarly, according to certain laws, the prices of internally traded goods and services are based on rigid unit costs rather than on market reference prices. Prices cannot be lower than a predetermined unit cost estimate, which is typically based on the existing cost structure of the enterprise. As such, enterprises with higher excess labor are able to pass on these excess labor costs and other inefficiencies along the vertically integrated supply chain. These sources of potential inefficiency are very difficult to offset [1].

[20] The state-owned leasing company "Promagroleasing" was created in Belarus to support industrial producers operating in both domestic and foreign markets. The company offered a 5-year lease for buying costly equipment at a low rate of interest.

[21] Starting in 2009, Russia's biggest car producer "VAZ" has significantly reduced its imports of components from Belarus-based companies like BATE Borisov, "Avtogydrousilitel" Grodno, "BelKart." Those state-owned companies took part in the import substitution program for components, which was initiated by the Belarusian government using financial, organizational, and technical measures. The whole package of measures allowed those companies to increase their sales and to gradually recover from the crisis [14].

Government support often results in the inefficient allocation of resources and reduces the incentives for companies to introduce new technologies and innovations, as was discussed in the context of Belarus in the previous chapter. Moreover, any financial support, be it implicit or explicit, results in a burden on the budget. The volume of government support always depends on what kind of fiscal policy is used in the given country, of course, and on the availability of sufficient funds in the state budget for a particular year.

"BelKart." Those state-owned companies took part in the import substitution program for components, which was initiated by the Belarusian government using financial, organizational, and technical measures. The whole package of measures allowed those companies to increase their sales and to gradually recover from the crisis [14].

Box 13: V4 Institutional regulation/economic policy

There are no specific governmental regulations concerning the machine industry in the V4 countries, especially since the EU accession. Specific tax benefits and other forms of governmental support mainly relate to FDI. We assume that in most cases investors first look at the V4 countries as a general region or cluster, and then analyze country-specific conditions, factors, features, and policies.

- A skilled and abundant labor force is commonly understood as an important factor in attracting FDI in manufacturing. Over the last two decades, the percentage of those in the general population of the V4 who are aged 15-64 and have at least upper secondary education ranged between 70% to 85%. Research by the PricewaterhouseCoopers Automotive Institute shows that in comparison with the EU15, the labor cost advantage of V4 countries in manufacturing will remain significant for several decades to come (PricewaterhouseCoopers 2007).
- With regard to the level of transport infrastructure, the most developed country in the region is the Czech Republic, followed by Hungary and Slovakia. With the exception of the Southern Polish regions, which are competing for strategic manufacturing investments, Poland is the least developed V4 country when it comes to (motorways and railways) transport infrastructure.
- In terms of taxation, the V4 countries have occupied an interesting position in the Paying Taxes Ranking as published in the framework the World Bank Group's Doing Business project. All of these countries derive a significant competitive advantage from their tax systems and from the changes they have enacted in these systems. The Paying Taxes 2016 report shows that in terms of taxation, as of late the most attractive V4 country has been Poland (Overall Paying Taxes 2016 Ranking: 58), followed by Slovakia (73), Hungary (95), and Czech Republic (122).
- *Investment incentives* represent an important competitive tool, especially in a situation when investment sites offered by candidate countries and other conditions are on par with those offered by V4 countries. The EU sets an upper ceiling for the total amount of incentives that may be granted to an investor in the motor vehicle industry. This may not exceed 15% of the total investment value. The European Commission has to approve the amount of investment incentives proposed by the member state's government to a strategic investor. In order for an incentive to be exempt from the 15% rule as a so-called indirect incentive, it has to qualify as a public good. The nature of the investment agreement itself can also be part of the bidding, since the EU authority only approves the total value of incentives offered rather than the agreement itself. Apart from EU constraints, each V4 country also has its own rules for the provision of investment incentives. The general reasons for adopting national rules for the provision of investment incentives include increased transparency and credibility towards foreign investors – negotiations without any general guidelines limiting state aid are not acceptable politically, and they are also problematic with regard to the potential fiscal effects of incentives. Nevertheless, despite the detailed incentive schemes, V4 countries usually allow for the special treatment of strategically important investors, which gives governments flexibility in negotiations with significant investors.

Ownership issues and corporate governance

Almost all large enterprises in the Belarusian machine building sector are state-owned (SOE) or controlled by the government. According to official statistics, roughly 85% belong to the private sector (Table 9), but in fact the government controls a majority of corporatized large machine building plants and interferes substantially with their operations. The corporatization of Belarusian machine building plants by transforming SOEs into joint stock companies occurred in the late 2000s as a

preliminary step in the process of privatization, but ultimately it did not yield real private ownership nor did it improve the level of corporate governance. The process of privatization in Belarus currently proceeds as follows. First, a unitary state enterprise (owned by the state) is transformed into an open joint stock company (JSC). Initially, all of the shares are still owned by the state. After corporatization, however, there is a possibility that a portion or all of the assets will be sold to a private investor. However, in most cases the corporatization process (as the first step of privatization) only implies a formal change all economic decisions remain in the hands of the government [37]. In theory, corporatization implies that SOEs are subject to the same laws that govern private corporations, and thus such a step substantially improves transparency by separating the accounts of the enterprise from those of the ministry. In practice, however, the experience of Belarus and several other countries shows that corporatization is not a sufficient condition for insulating public enterprises from government interference or soft budget constraints [1]. Under such conditions, all critical aspects of an enterprise's operations, including the choice of factors of production, output, and distribution, are affected directly and indirectly by government policies at the central, ministerial, or local levels. Numerous legislative acts by the government or by the competent ministry specify key aspects of corporation operation – management of reserves, use of investment funds, and efficient use of spare parts. For example, the Belarusian Ministry of Industry (MOI) has a special committee to oversee the efficient use of energy and other material supplies used by enterprises under its jurisdiction. Another rule specifies input norms for various production technologies, the purpose of which is to ensure the efficient use of resources in the production process. Formally, the state follows a decentralized management model, where firms are controlled by the ministry that is responsible for the policy area under which they products fall. Even so, in practice there are significant overlaps between the responsibilities of various ministries, with the result that they frequently interfere with one another in their control activities [1].

Table 9. *Types of ownership in Belarus (as % of output), 2013*

	Manufacture of machinery and equipment	Manufacture of transport equipment	Manufacture of electrical, electronic and optical equipment
Total	**100**	**100**	**100**
State	35.0	3.7	9.5
National	34.6	3.7	9.3
Municipal	0.5	-	0.2
Private (including primarily corporatized)	63.8	95.3	86.0
Foreign	1.2	1.0	4.5

Source: National Statistical Committee of the Republic of Belarus (http://belstat.gov.by/)

Most machine building enterprises in Belarus are organized as vertical conglomerates controlled by the government (Ministry of Industry). This structure conceals the economic inefficiency that manifests itself predominantly in the form of cross-subsidizing unprofitable firms (see Box No. 5 above). Moreover, SOEs in the Belarusian machine building industry are less productive than private enterprises because of inefficient resource allocation. The total factor productivity (TFP) of firms that do not report to a government ministry substantially exceeds the corresponding figures of their state-controlled counterparts [4]. Moreover, managing companies of vertical conglomerates with lower capacity utilization tend to experience higher increases in their employee figures [3]. This results in excess employment and requires large amounts of money for salaries (see Figure 17). As a result, Belarusian machine building enterprises become less competitive in both domestic and international markets. However, there are signs that the Belarusian government understands the existing problems with the management of state-owned machinery companies.

There is a promise that vertical systems will be reformed in near future, and that ownership functions exercised by the government will be separated from management functions. Also, the elimination of overlapping responsibilities between various ministries is expected. But thus far these are only promises, and no real plans have been publicly presented yet.

During the transition period that followed the collapse of the Soviet Union, Ukrainian enterprises were privatized and corporatized. Stock corporations have emerged as the most common form of business organization, and corporate ownership is the most common form of ownership in the machine building sector today.[30]. The specific features of Ukrainian privatization have led to a situation in which the leading machine building enterprises are mainly controlled by local and Russian (or pro-Russian) business groups, while there are only few state-owned enterprises among the top players: Zorya-mashproekt, Turboatom, Artem, and Antonov [29].

The current state of corporate governance in Ukraine is characterized by a low level of corporate culture, a discrepancy between the existing corporate governance practices, and generally accepted principles of corporate relations, poor and inadequate legislation, and weak protections for small shareholders [15]. A significant deficit with respect to corporate relations in the engineering sector in Ukraine is the almost complete absence of committees on the supervisory boards, even though Ukrainian and international principles of corporate governance imply that such structures should exist, and also recommend the existence of corporate secretaries on the supervisory boards [30]. Solving this problem is very important for the machine building sector and in fact for industry overall because better conditions will improve competition, efficiency, the attractiveness of investment opportunities, the development of the stock market, and will ultimately boost national wealth. The most effective form of corporate governance in Ukraine prevails at enterprises owned by foreign investors, specifically those where the share of foreign capital is no less than 30%. However, local corporate managers rarely trying to attract external financing by selling their shares [30].

Corporate governance in Ukrainian companies is regulated by a number of legal acts, including the Act on Companies (the core regulatory instrument), the Civil Code, the Economic Activity Code, privatization programs, etc. But still, many aspects of corporate governance are not covered by legal regulations and, according to international surveys, Ukrainian laws are among the least compliant with international standards of corporate governance regulation [16].

There is also the issue of small shareholders in Ukraine, which is similar to that of other countries with transition economies. In particular, there is an issue of employee ownership. Employees, as a rule, are not involved in corporate control. Their shares are either controlled by managers, or are mitigated and form an amorphous structure of stockholdings. As a result, the activity of small shareholders-employees is traditionally low, and their interests are mainly focused on various payouts.

In Moldova, the structure of corporate ownership was changed by the mass privatization program of the mid-1990s. Mass privatization was followed by a wave of consolidation and struggle for control at many Moldovan companies. These have resulted in control being distributed among a variety of owners, including the former privatization investment funds (FINNs), management, and new local investors [45]. At those companies where consolidation was associated with conflicting interests competing for strategic control, a variety of corporate governance abuses were used to gain the upper hand, including share dilutions and inadequate notifications of shareholder meetings [38]. As a result, key enterprises are now controlled by local business groups, while foreign strategic investors are only present to a smaller degree. After the privatization process, the majority of former industrial giants became uncompetitive and many companies resorted to renting out industrial and office premises as their main business activity. Strategic investors prefer to invest in start-ups rather than taking over existing manufacturing plants.

EBRD and World Bank indicators show that the domestic transposition of the OECD Principles of Corporate Governance, which lay down the rights of shareholders and the rules concerning their equitable treatment, the role of stakeholders in corporate governance, the rules on disclosure and

transparency, and the responsibility of the board, remains inadequate in Moldova. Among the key corporate governance issues that are still on the agenda in Moldova today are the adoption of legal requirements for shareholders to disclose their beneficial ownership and control positions, removing the authority of boards to increase capital without shareholder approval, establishing clear rules concerning the liability and duties of board members, requiring annual independent audits for joint stock companies, and the protection of small shareholders' rights [38].

Among the positive changes in the three countries one should note the existence of associations and member-based organizations which aim to contribute to the development of the machine building industry, to further the protection of members' interests, as well as to lobby for legislative proposals and other activities. The "Belarusian Scientific and Industrial Association," the "Republican Association of Industrial Enterprises," and the "Belarusian Chamber of Commerce" are among such organizations in Belarus. In Moldova the Employers Association of the Manufacturing Industry and the "Chamber of Commerce" are key players. In Ukraine there are several important organizations, such as the "Ukrainian League of Industrialists and Entrepreneurs," "Ukragromash," the "International Machine Building Union," the "Association of Technologists and Machine Building Specialists of Ukraine," and the "League of Ukrainian Machine Builders". They aim to represent and protect members' interests in relations with state and local authorities, and other institutions and organizations, as well as during dispute resolutions in courts of any authority or jurisdiction.

Box 14: V4 Ownership issues and corporate governance

After several waves of privatization in the 1990s, the vast majority of companies in the V4 machine industry sector are privately owned. Only few state-owned companies remain in the V4 countries, mainly in the energy and resources, consumer business, and transportation sectors. Since the V4 countries are members of the OECD, they are required to domestically implement the OECD Principles of Corporate Governance. The recently published OECD Corporate Governance Factbook shows several considerable differences between V4 countries when it comes to the rights of shareholders and key ownership functions, and institutional, legal, and regulatory frameworks.

As a matter of corporate ownership structures, most of the listed companies in any V4 country have a controlling shareholder, which means they are deemed to have a concentrated ownership structure. Specific corporate structures that differ from the previously mentioned structure can be found in Hungary and Poland. In the case of Hungary (where one finds both concentrated and dispersed ownership structures among listed companies), the average size of the free-float is about 47%, and a third of all listed companies are controlled by a majority shareholder. In Poland, 30-60% of shares belong to the controlling shareholders and 15-20% are held by pension funds or investment funds.

Companies with concentrated ownership structures may be more likely to engender horizontal agency problems that arise between controlling and minority shareholders, while vertical agency problems – which arise between managers and shareholders – may be mitigated. In general, in the V4 countries there is traditionally very little opposition to the management's position on resolutions at corporate meetings. The relatively low level of average dissent during the discussions of resolutions at annual general meeting is the highest in Hungary (4.51%) and Poland (4.15%), while it is much lower in the Czech Republic (0.68%) and Slovakia (0.06%).

In addressing issues of corporate governance, all V4 countries have applied corporate governance standards in company law and security law. In the Czech Republic the key regulatory framework consists of two laws, specifically the Business Corporations Act and the Capital Market Undertakings Act. The Hungarian jurisdiction uses the Civil Code and the Act on the Capital Market.

The main public regulator of corporate governance in Poland is the Polish Financial Supervision Authority. In Slovakia corporate governance is supervised by the Ministry of Finance. In the Czech Republic and Hungary, the role of the main public regulator is played by the respective national banks. The implementation mechanisms of domestic corporate governance codes and principles vary slightly among the V4 countries.

Innovation-driven reforms

The analysis of the machine building sectors in Belarus, Ukraine, and Moldova carried out in this report indicates the existence of a technological gap between companies in Belarus, Ukraine, Moldova, and the V4 countries. Closing the gap requires a broad restructuring program, up-front investments, transfer of innovation and "know how". The share of expenditure spent on research and development in the industrial sector is very low. In Belarus, for example, where the machinery sector has experienced the highest level of investment among the three countries analyzed here, 65.5% of expenditures described as spending on technological innovations in 2010 were spent on purchases of new equipment, 21.4% were spent on research and development, while only 0.4% were spent on the acquisition of new technologies [2]. Sometimes the problem in these countries is complicated by the fact that managers of large enterprises have little incentive to innovate, sometimes they do not want to innovate at all, and at other times they believe that innovation has actually been acquired successfully.

All three countries employ government-initiated programs to promote the development of industry in general and of the machine building sector in particular. In Belarus, there is "The program for the development of industry in the Republic of Belarus until 2020"; "The state scientific and technical program "Development of the machine building industry between 2011-2015"; a program between Russia and Belarus that provides the framework for the production of category Euro-4 diesel engines, and "The program for the development of the Russian car industry until 2030," which was adopted jointly adopted by the Ministry of Industry and Trade of the Russian Federation and the Ministry of Industry of the Republic of Belarus, which set up a joint working group for the development of the machine building sector. In Ukraine there is "The Industrial Development Program of Ukraine," but currently the program does not offer any funding. Its goal is to encourage and support the activities of enterprises to improve the technical level of production. Among other things, they propose various kinds of tax incentives in order to carry out large-scale projects aimed at modernizing of production facilities. They also seek to help in developing an innovative infrastructure, establishing industrial parks and developing their network. The most important program in Moldova today is the "Strategy for the development of industry until 2015," which is still a timely strategy. These programs are hugely important because many enterprises either do not produce enough profits for investments (Belarus), do not want to reinvest profits (Ukraine), or have only limited access to external funding (Moldova), which leads to suspend any efforts aimed at expanding and modernizing their production, and leads them to stick with their highly worn fixed assets. The issue needs to be addressed with properly integrated government support programs.

As a result of the Soviet traditions of technical education, Belarus, Moldova, and Ukraine have well-educated and well-qualified employees in machinery. Huge machine building companies (BelaAZ, MTZ, and MAZ in Belarus; Azovmash, Motor Sich, Mining Machines, Turboatom, Dniprovagonmash in Ukraine) have their own R&D departments, which are active in developing products and training staff. Still, the technological level of the sector requires significant R&D expenditures and innovations. There are strong domestic scientific institutes and organizations that work to develop new technologies and train highly skilled staff. In Belarus these are the National Academy of Sciences, the Belarusian National Technical University, etc. In Ukraine these include, among others, the Physical-and-Technological Institute of Metals and Alloys, the G. Pysarenko Special Design and Technology Bureau Institute for the Problems of Strength of the National Academy of Science of Ukraine, the Paton Electric Welding Institute of the National Academy of Science of Ukraine. In Moldova these are the Technical University of Moldova, the Technical College, which is part of the university, and the Academy of Sciences of Moldova and its specialized institutes for technology transfer and research. In all three countries, the abovementioned institutions also seek to foster cooperation between scientists, experts, and representatives of industrial

enterprises from various different countries, as well as the arrangement of scientific seminars and conferences dedicated to machine building.

Box 15: International cooperation and clustering – opportunity for SMEs, but also for big companies (creating value added chains for global markets)

Case: **Cluster for automation technologies and robotics,** Kosice, Slovak Republic
The Cluster for Automation Technologies and Robotics (Cluster AT+R) was established in Kosice in 2010. The cluster founders – six innovative manufacturing companies, as well as the research centers at the Technical University in Kosice and the University of Zilina, supported by the Self-Governing Regions of Presov and Kosice, provide the development of research, training, manufacturing, and supply capacities in the field of automation and robotics technology. The AT+R cluster already established three joint research centers: the Center of Mechatronics, the Center of Robotics and Modules, and the Center of Automated Production Systems. All of them have several laboratories that are available to cluster members and are used for joint projects.

Case: **Aviation Valley** in southeastern Poland
The Aviation Valley Association was launched on April 11, 2003, as a non-profit organization. It was set up as a means of furthering the rapid development and growth of the aerospace industry in southeastern Poland. Significant funding for the Association has been provided by Pratt & Whitney, a world leader in the design, manufacture, and service of aircraft engines, space propulsion systems, and industrial gas turbines. The Aviation Valley Association currently represents 125 companies in the region. The long-term objective of the Aviation Valley Association is to transform southeastern Poland into one of Europe's leading aerospace regions, which would be able to provide a diverse cross-section of products and services for the most demanding clients.

Hírös Supplier Cluster in central Hungary
Established in 2008 in the South Great Plain region (Kecskemét), the cluster specializes in machinery, electronics, and automotive industries. Its mission is to enhance the collaboration of regional companies, regional science centers, and R&D services providers, and to promote the innovation-based upgrading of the region's economy. A further objective is to facilitate the integration of regional SMEs into global value chains and make them capable of becoming suppliers to multinational companies. As of the end of 2013, the cluster became an accredited innovation cluster (AIC), and is entitled to submit tender applications to support programs designated specifically for AICs.
Coordinated by the Chamber of Industry and Commerce of Bács-Kiskun County (the cluster manager), Hírös cluster currently has 25 members including local subsidiaries of flagship multinational and domestic-owned, rapidly developing companies companies, regional education centers, engineering offices, consultancy firms, and R&D services providers and banks.

SWOT analysis of machine building sectors in the countries analyzed

We use SWOT analysis to summarize the results of our comparative analysis of the main machinery trends in Belarus, Moldova, and Ukraine, and of our institutional analysis of the developments in these countries. The SWOT analysis will help to summarize these countries' weaknesses and strengths, the common problems for and opportunities of their machine building sectors. We will consider each country individually in order to identify the key country-specific points. This approach makes it possible to define the current situation of machinery in Belarus, Ukraine, and Moldova, as well as to propose key directions and strategies for machinery development, drawing on their opportunities and strengths, and to overcome the weaknesses and threats that machinery faces in these countries.

Table 10. – *SWOT analysis of machinery in Belarus*

			Strengths (S)	***Weaknesses (W)***
		Internal Factors / ***External Factors***	-Access to preferential financing mechanisms -Well-educated staff -Own research base and deep cooperation with national research institutes -Renowned machinery history and goodwill towards Belarusian machinery products in the region	-Low capacity utilization -High level of imported components -Outdated equipment and technology -Labor-intensive production -Overemployment -Relatively low quality of products -High volume of finished product stocks -Low export diversification -High level of government interference in strategic management -Lack of innovation incentives for top management -Vertical organization of huge state-owned companies into holdings
Belarus	***Opportunities (O)***	-Comparatively low energy costs -Preferable export conditions to the large market of the Eurasian Economic Union (EEU) and specifically Russia -Zero-tariff import of ore and components from the countries of the Eurasian Economic Union and specifically Russia -Strong technical education in the country -Strong machinery lobbying circles in the government	*1. SO Strategies* **a) More efficient utilization of investments** **b) Increasing share of high value added and engineering products** Both strategies aim to improve the competitive positions of Belarusian machinery producers in the EEU market and to diversify the range of products available for export. Both could be used to utilize the sector's education potential	*3. WO Strategies* **a) Quality improvement and price reduction** **b) Improving corporate governance and eliminating state intervention** This approach could be used to unload existing stocks and to ensure a better position in the EEU market as the producer of "cheap but reliable machinery products." Improving corporate governance in line with the relevant OECD principles, in both state-owned and private companies, would ensure the sustainability of this approach.
	Threats (T)	-High importance for the economy in terms of share in GDP -Social vulnerability due to high number of employees -Decreasing export volumes -Decreasing share in the country's exports -High level of dependence on Russia -Increasing dependence on the CIS market -Lack of national iron ore resources -Excessive number of state subsidy instruments	*2. ST Strategies* **a) More efficient utilization of investments** **b) Development of machinery components** A combination of the two strategies is needed to diversify the sector's export and import risks. The development of components could yield improvements in trade balance and export diversification. This, in turn, could mitigate the vulnerability of the sector in Belarus.	*4. WT Strategies* **a) Structural change in machinery through privatization (partial or full)** **b) Improving corporate governance and eliminating state intervention** This constitutes the most radical approach for machinery reform in Belarus. Changes in ownership and in the structure of the sector, along with improvements in the quality of management, would allow for attracting foreign investors and technologies, increasing productivity, and cutting cost, which would in turn contribute to improved product quality, launching new products, and expanding into new markets.

It seems that currently the Belarusian government has been implementing the first set of SO strategies by using mainly administrative instruments in order to exploit sector strengths and external opportunities. At the same time, the government appears to pay less attention to threats and ignores all kinds of weaknesses. Addressing these would be necessary to change the core situation in the sector. To overcome the difficulties that Belarusian machinery faces today, the WT strategies in Belarus appear vital. The government might directly apply the scenario set out in the WT strategies (the ideal scenario), or move gradually by using the ST and WO approaches.

Table 11. – *SWOT analysis of machinery in Ukraine*

			Strengths (S)	***Weaknesses (W)***
		Internal Factors / ***External Factors***	-Convenient geographic location close to ore sources and metallurgical plants -Wide range of machine building products -Competitive price of domestic machine building products compared to world prices -Relatively low labor costs -Well-educated staff -Own research base and deep cooperation with national research institutes -Long machinery history and ties with key clients in the region	-Labor and energy intensive production -Low export diversification -High level of imported components in high-tech sectors -Low consumer quality and competitiveness of domestic machine building products -Outdated equipment and technology, along with high depreciation rate of fixed assets -Slow application of contemporary technologies and slow modernization of the fixed assets of machine building companies -Inefficiency of management (imperfect, complicated, hierarchical and generally ineffective management structure) -Slow application of global standards in corporate governance
Ukraine	***Opportunities (O)***	-Developed metallurgy industry in combination with significant reserves of raw materials that are sufficient to cover the needs of production -Access to European markets within the framework of the DCFTA agreement -Recent marketing successes in Africa and Asia -Significant potential of national technological research -Strong technological education -Broad national market - Migration of EU machine building companies to Eastern Europe	*1. SO Strategies* **a) Increasing share of high value added and engineering products** **b) Expanding access to world markets** SO strategies are used to optimize the structure of Ukrainian machinery exports in order to open up new markets and expand existing ones. More advanced products will be also in demand in the wider local market.	*3. WO Strategies* **a) Improving corporate governance** **b) Assets modernization** Improving corporate governance based on the relevant OECD principles seems to be the core goal for WO strategies. As a priority, best corporate government practices should be enforced in the public companies actively traded at Ukrainian the stock exchange Better accountability and improved relationship with investors is expected to automatically contribute to the process of increasing investments in technologically advanced assets.
	Threats (T)	-Highly significant for the economy in terms of GDP share -Social vulnerability due to high number of employed -High level of dependency on Russia -Decreasing share in total exports over the last years -Ukrainian economic recession -Labor migration -Complex system of intellectual property rights protections -Lack of energy resources	*2. ST Strategies* **a) Increasing share of high value added and engineering products** **b) Increasing productivity in the sector** Increasing productivity and enhancing the output of higher value added products are the core steps that need to be performed during times of economic downturn and diminishing exports. These strategies contribute to export growth and create a foundation for sustainable output growth in the future.	*4. WT Strategies* **a) Improving corporate governance** **b) Increasing productivity in the sector** As in the case of the WO approach, the stimulation by the Ukrainian government of improvements in corporate governance seems to be the core of WT strategies. In combination with government efforts to promote increased productivity in the sector, this would contribute to attracting foreign investors and technologies, improved product quality, the launching of new products expansion into new markets.

Bearing in mind the economic recession in Ukraine, as well as political and economic tensions with Russia, it seems reasonable to launch comprehensive but sustainable reforms using the WT strategies. Improvements in the management of machinery companies in Ukraine is the area where the Ukrainian government's attention is most needed. However, there is also the need to stimulate productivity increases in the Ukrainian economy, including the machine building sector. These are rather radical efforts that require a targeted approach by the government but could contribute to sustainable economic growth in the future.

Table 12. – *SWOT analysis of machinery in Moldova*

			Strengths (S)	***Weaknesses (W)***
		Internal Factors / ***External Factors***	-Good export diversification -Relatively low labor costs -Well-educated staff -Cooperation with national research institutes	-Labor-intensive production -Low capacity utilization in local-owned companies -Weak protection of small shareholders -Low quality of local management - More investments are needed
Moldva	***Opportunities (O)***	-Better sector performance after deep structural change -Increasing share of the country's total exports -Increasing investments in the sector -Access to European markets within the framework of the DCFTA agreement -Interest from EU companies and investors -Strong technical education - Migration of EU machine building companies to Eastern Europe	*1. SO Strategies* **a) Stimulation of subsectors with high value added and engineering products** **b) Expanding access to the EU market** Greater access to the EU market seems to provide new opportunities for Moldovan machinery products. The further optimization of the structure of machinery by developing advanced products will boost machinery exports and utilize a greater share of the local labor force.	*3. WO Strategies* **a) Improving corporate governance** **b) Modernization of assets** Just as in the case of Ukraine, improving corporate governance based on the relevant OECD principles seems to be the core goal for WO strategies. It is necessary to enforce the principles of corporate governance at public companies in order to achieve greater accountability and better investor relations. This will contribute to increasing investments in technologically advanced assets.
	Threats (T)	-Concentration of machinery production in special economic zones -Russian factor in ownership -Labor migration -Lack of energy resources and iron ore -Narrow national market	**a) Targeted cooperation with European investors** Cooperation with EU investors seems to be the only reliable strategy for overcoming existing threats. This strategy is rather easy to implement for the Moldovan government and will contribute to Moldova's expansion into the EU market, increase productivity, and improve ownership structures and management quality. **b) Create new state incentive programs and improve the business environment.** Attract EU companies to relocate production to Moldova. Subsidies and incentives are necessary to manage tough competition from the region (subsidies offered for job creation in Serbia, Macedonia, etc., and for capital investment (equipment, buildings, etc.) in Romania. Also, the business environment needs to be improved all over the country to offer similar conditions as the ones that prevail in FEZs for all regions.	*4. WT Strategies* **a) Improving corporate governance and productivity and productivity improvement** **b) Stimulating small and medium-sized machinery producers** If we assume that principles of corporate governance are implemented as part of a strategy pursued by the government of Moldova, some targeted efforts at increasing productivity in the sector are needed to draw foreign investors and technologies into the economy. At the same times policies should aim to stimulate the creation of new businesses by providing opportunities for small and medium size machinery producers. This is the definite way to improve the quality of products, launch new products, and increase exports.

The best course for Moldova would seem to be a continuation of reforms with a targeted use of corporate governance best practices, in combination with stimulation for SMEs that are active in the machinery sector. These appear to be radical measures and are the best way to attract foreign capital into the economy and spur development in the sector and in the economy overall.

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Statistical annex

Table 13. *Exports of the machine building sector in Belarus, Ukraine, and Moldova, 1994-2014, bn. USD*

	Belarus	Ukraine	Moldova
1994			0.07
1995			0.06
1996		2.04	0.05
1997		1.91	0.10
1998	2,01	1.72	0.05
1999	1.62	1.33	0.03
2000	1.76	1.80	0.03
2001	1.86	2.26	0.04
2002	1.93	2.45	0.04
2003	2.30	3.30	0.04
2004	3.05	5.06	0.06
2005	3.09	4.49	0.06
2006	3.78	5.41	0.07
2007	5.20	8.28	0.11
2008	5.89	10.66	0.18
2009	3.15	6.61	0.15
2010	4.56	8.93	0.19
2011	7.86	11.61	0.33
2012	7.89	12.98	0.34
2013	6.79	10.31	0.36
2014	5.22	7.13	0.34

Source: UN Comtrade Database (http://comtrade.un.org/)

Table 14. *Export diversification by subsectors, 2013*

(HS Code)		Russian Federation	CIS + Ukraine+ Turkmenistan	World
84	Belarus	73.8		100
	Ukraine	57.9		100
	Moldova	65.2		100
85	Belarus	76.7		100
	Ukraine	35.1		100
	Moldova	2.9		100
86	Belarus	66.3		100
	Ukraine	70.8		100
	Moldova	51.9		100
87	Belarus	72.3		100
	Ukraine	51.1		100
	Moldova	59.0		100
88	Belarus	-		–
	Ukraine	14.5		100
	Moldova	0.3		100
89	Belarus	63.8		100
	Ukraine	25.2		100
	Moldova	72.7		100
Machine building sector	Belarus	73.4	90.6	100
	Ukraine	51.9	62.8	100
	Moldova	21.3	27.5	100

Source: UN Comtrade Database (http://comtrade.un.org/)

Energy Industry Report

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List of Abbreviations

CHP	Combined Heat and Power
CIS	Commonwealth of Independent States
DCFTA	Deep and Comprehensive Free Trade Agreement
EE	Energy Efficiency
EAP3	Belarus, Moldova, Ukraine
ESCO	Energy Service Companies
EU ETS	EU Emmission Trading System
IEA	International Energy Agency
IMF	International Monetary Fund
Mtoe	Million tonnes of oil equivalent
RES	Renewable Energy Sources
TPES	Total Primary Energy Supply
V4	Visegrad Four: Czech Republic, Hungary, Poland, Slovakia

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Executive Summary

(1) The EAP3 energy sectors have achieved a significant drop in energy intensity since the late 1990s. Total energy consumption fell by more than 10% between 1998 and 2013, despite high GDP growth rates. This was predominantly due to the rise in oil and gas prices and the incumbent efficiency potential. Despite major efforts, dedicated energy policies only had a moderate impact on efficiency gains.

(2) All the decrease in energy demand came from the oil and gas sectors. The demand for these products fell by more than 25% between 1998 and 2013. Substitution by nuclear, renewables, and especially coal was significant. This stands in marked contrast to aggregate V4 figures, where all fuels but coal have experienced an increase in their respective shares in TPES, or the EU28, where the growth of renewables relegated all other fuels to the background.

(3) High energy prices and intensity levels played a critical role in worsening macroeconomic balances in Moldova and Ukraine. Foreign account and fiscal deficits increased substantially prior to the 2008 crisis and contributed significantly to the accumulation of public debt and to the slow post-crisis recovery. Macro-stability still constitutes a definite constraint on energy imports, providing an additional incentive for energy efficiency and supply security. Belarus experienced more diverse pass-throughs of high energy prices, in many ways increasing the country's dependency on cheap inputs.

(4) At the same time, import dependence ratios between the V4 and the EAP3 had leveled off by the early 2010s. This was almost equally due to the increase in energy imports in the V4, in absolute terms, and the rising domestic production in the EAP3, primarily in relative terms (even in absolute terms, internal supply in the EAP3 has grown moderately). By 2013, self-sufficiency was around 62-67% in both cases, and since then self-sufficiency in the EAP3 has surpassed V4 levels.

(5) High GDP growth rates between 1998 and 2013 were essential in maintaining the robust trend in efficiency improvements. Average annual growth rates in the EAP3 countries were almost thrice the EU28 growth rate (4.4% vs. 1.5%) and also exceeded the V4 pace of growth (3.2%). On the regional level, growth was driven by the third sector. Maintaining robust economic growth is crucial for future intensity trends, too, and its role will increase as the incumbent saving potential inherited from the Soviet age declines. Without a moderate convergence in economic performance, the current efficiency improvement trend would likely become stuck at relatively low levels.

(6) Modernization patterns are strongly present in some segments. In many sectors EAP3 consumptions patterns followed the Western/V4 trajectory with a little time lag. Oil product demand in transportation and electricity demand in residential sectors grew similarly to the patterns observed in the V4. This incremental growth in demand improved efficiency indicators and is predominantly market-driven. This trend may lessen in the years to come, as it is related to motorization and the spread of consumer society patterns.

(7) Industrial and corporate efficiency gains had the biggest input on improving intensity trends between 1998 and 2013. Especially after 2007, industrial energy demand fell considerably, in particular in sectors with high gas/oil inputs. Unlike Ukraine and Moldova, Belarus was able to maintain its high industrial growth rates with stagnating energy demand almost exclusively thanks to sharply improving terms of trade. Nonetheless, this is an one-time benefit for the region, mainly stemming from the de-industrialization of high energy added-value sectors (in Ukraine) and favorable terms of trade (in Belarus). Further industrial efficiency improvements increasingly require additional structural drivers and largely depend on major institutional factors, like inflow of FDI into industry, macro-stability, and access to capital.

(8) Residential demand intensity indicators per capita in heating and cooking were roughly 10% and 30% higher than in the V4 and the EU28, respectively. No significant improvements can be observed in this subsector. Potential savings in the housing sector will be realized slowly or at high social/financial costs. The implications of consumer price distortions, primarily in Ukraine, are apparent in the statistics. Unlike the V4, and despite growing import prices, aggregate residential gas consumption has grown in the EAP3, primarily due to low Ukrainian internal price levels

(9) The heat and electricity generation sectors remain the single biggest efficiency reserve. Adaptation is under way, heat generation fell drastically primarily due to the decrease in industrial demand. The use of gas and oil product is decreasing. Some positive trends are at hand, but major modernization will be unavoidable in the years to come, and it will offer an opportunity to redesign the sector. Furthermore, the gradual replacement of heat-only generation by combined generation would be desirable in district heating. V4 experiences provide a valuable set of applicable policies, even if the situation of the two regions still differs in many segments.V4 experiences provide a valuable policy set, even if the situation still differs in many segments.

(10) Energy policies are at different stages of development in the EAP3 region. Energy policy mindsets are dominated by industrial logic, supply security and social affordability considerations, and supply management ambitions. Efficiency, climate policy, and demand management considerations, by contrast, are heavily underrepresented, even if their role has been growing. The experience transfer that Visegrad states provide should be differentiated to reflect the differences between the recipient EAP3 countries; such experience transfer should be provided very selectively and only if its implementation is guaranteed. The EAP3 region will continue to be capital-scarce and have weaker regulatory capabilities, while its price regimes will remain less transparent and less reliable than is typical for the V4 countries. Social affordability considerations will play a greater role in the EAP3 nations' energy policy than in the latter set of countries. The regional policy context will remain uncertain and constitute a bottleneck even for V4 experiences.

(11) The general attitude towards V4 energy policy experiences differs in the three EAP3 countries. Belarus has a Janus-faced energy landscape, in which diversification and efficiency policies are present, but at the same time cheap energy inputs constitute a major driver of growth. Government efficiency efforts are isolated rather than being part of a broader strategic approach, and they are not underpinned by structural drivers or regulatory activities. Nonetheless, the relatively centralized decision-making, the low number of stakeholders and clear ownership patterns offer a few unique opportunities for certain activities. In many regards, Belarus may provide a more favorable domestic context especially for residential efficiency projects than some other post-Soviet states.

(12) Moldova has created a relatively transparent price and regulatory regime, and a moderately favorable investment climate. It has considerable achievements both in the field of import diversification and interconnectivity. Moldovan energy markets are liberalized, even if they remain under-institutionalized and grapple with low levels of liquidity. Thus Moldovan energy policies can adopt a selected set of EU regulations and are capable of sending optimal signals to market stakeholders. Current regulatory experiences from the V4 are partly adaptable in the fields of EE and RES.

(13) Ukraine's energy track record is controversial due to a long history of price distortions and high levels of subsidies, accompanied by lack of investments and lack of clarity about energy policy priorities. The country is in a stage where energy demand has been declining steeply, primarily due to de-industrialization and macroeconomic imbalances. Consequently, the most important challenges are the creation and reinforcement of local regulatory and market institutions, the elimination of excessive subsidies and price distortions, and increasing the reliability of the investment climate. Furthermore, in Ukraine the maintenance of the current self-sufficiency policies will require increasing efforts in the years to come. Thus, the V4

experiences should focus more on shaping the country's energy policy profile, promoting local priorities and providing a basic outline for further activities.

(14) Shifting energy policy attention towards demand management is a key challenge for the years to come. Unlike the V4, where efficiency requirements conform to EU standards and the relevant obligations are distributed among market actors, the EAP3 countries address these issues through a dedicated central apparatus, based on an industrial logic. Organizations established for the purposes of achieving efficiency improvements are relatively weak and their activity is impeded by inter-ministerial conflicts. Nevertheless, this tradition is adequate in the local contexts, as long as it accompanied by some government-provided support schemes and success in adopting secondary legislation. Thus the key question is whether these entities will be left alone with the full responsibility for managing demand or receive sufficient governmental backing in discharging this responsibility. Efficiency should remain a government objective rather than a goal pursued by a single agency, and all related ministries and corporations should play a role in the process of achieving it.

(15) The refurbishment and replacement of old thermal plants in the generation sector of the three countries analyzed is a major task for the coming years. This may require a coordinated policy effort and cooperation between different sets of owners and actors. Volatility in demand, lack of long-term financing, and the presence of natural monopoly and oligopoly situations require a more serious regulatory framework in order to allow cost-benefit relations to work. The district heating sector poses the biggest challenge in this regard. As some Moldovan examples show, in certain cases a deliberate disconnection policy with a support regime may be an optimal choice, primarily in rural areas, if the housing stock makes it possible. A set of refurbishment actions (like metering, wall insulations) should precede plant and network reconstructions.

(16) Due to social affordability considerations, social/industrial subsidies will likely remain sizeable in these economies. Nevertheless, these countries face a key challenge in defining target groups more accurately and ensuring that subsidies are cost-reflective. Excessive subsidies may constitute potential hotbeds of rent-seeking practices, could endanger macro-stability and distort fuel choice at the micro level.

(17) RES policies will remain low-profile in the region. In light of the low level of business transparency, large-scale subsidy regimes are neither affordable nor advisable. Nonetheless, just as in the V4, biomass potential may be utilized in a financially meaningful way. Total biomass and waste consumption in the EAP3 countries was four times less than in the V4. Visegrad CHP alone used more biomass than the EAP3 states altogether. Thus, biomass except for biofuel production is a credible option in the residential segments. A mix of market creation, technological support, and simplified regulatory procedures may bring visible results even in the short-term.

(18) Self-sufficiency and import substitution are capital-intensive options. Despite major improvements in import reduction over the last decade, given the current scale of investments the prevailing level of self-sufficiency is not sustainable in the long run. Thus a reasonable import diversification in the oil, gas and electricity segments should be considered as a viable alternative to self-sufficiency, especially in Ukraine. An exclusive insistence on domestic supply options would derail sectoral investments and may lead to suboptimal capital allocation.

(19) The V4 countries and EU donors have implemented a significant number of efficiency projects at the municipal level. These projects usually include renovations of district heating systems, which involve, among other things, installations of boilers based on biomass fuels, reconstruction of municipal public lighting, also using modern LED technologies, or improving the energy efficiency of buildings and their insulation. These are funded by EU structural funds and through ENI. In order to facilitate more projects and to improve the capacity of Ukraine and Moldova to implement EU co-funded projects, the V4 can share with them their experience

in adapting national legislation to the EU's energy and climate policy, including when the regulatory framework for providing energy services, energy auditing, strategies for the renovation of buildings, financial mechanisms for implementing projects, and raising public awareness in the field of energy savings.

(20) Following the accession of Ukraine and Moldova to the Energy Community Treaty, their energy strategy documents identified integration into the energy market of the EU as a long-term priority. The only way for Ukraine and Moldova to implement this priority is by first gaining access to the emerging regional energy market in Central Europe, with respect both to natural gas and electricity. Promoting imports from the West may not only ease concerns about the supply of Russian energy, but may also help address the problem of underinvestment in local energy sectors. Thus V4 governments should consider the option of including Ukraine and Moldova in the work of the V4 High Level Group on Energy Security (V4 HLGES) as part of a V4 Plus formula. The V4 HLGES has emerged as a very efficient platform for achieving regional agreement on the development of priority interconnectors, which have significantly strengthened the security of gas supply in the region. As a result, they provide one of the physical foundations of the future regional energy market. Accordingly, Ukraine and Moldova should consider the possibility of applying for an observer status in the CZ-SK-HU-RO electricity market-coupling, as has Poland, for example. Although the gradual inclusion of Ukraine and Moldova in the creation of the regional Central European energy market is a long-term goal indeed, it should be viewed as a strategic framework for V4-EAP3 cooperation in the field of energy.

Introduction

Eastern European energy matters have expanded far beyond their previous policy boundaries in the last 15 years. They are now interconnected with a significant number of political, strategic, security, social, and macroeconomic issues, creating a complex environment for decision-making. Energy affected political decision-making processes through domestic residential prices, the distribution of wealth between various domestic groups and countries. Macroeconomic stability was challenged by high import prices, which led to huge deficits in the current account and fiscal balances. Sovereignty was perceived to be threatened primarily on account of the producers' leverage as a result of their supply dominance. The changing energy relations created a lot of new problems, and they did so rapidly and often unexpectedly. Energy policies had to manage these challenges in an environment fraught with massive uncertainty.

The situation in the former Soviet Union was of particular significance in this regard. These countries were severely affected by all the abovementioned aspects: their economies experienced a major external input price shock and often the deterioration in their of terms of trade. They had to face the rise of Putin's Russia, its shifting foreign policy ambitions, and its increased leverage in energy matters. The changing energy rents triggered fierce domestic conflicts among various groups of the local elites concerning the distribution of these incomes and access to cheap inputs. In the last 15 years, the rules of the game have changed drastically in the former Soviet Union, primarily in the three Eastern Partnership countries analyzed in this Report, namely Moldova, Ukraine, and Belarus (EAP3).

The 2009 gas crises showed that the existing stakeholders at the time were no longer able to contain their conflicts, and the problems between them may spill over in other regions. By 2015 it became obvious that post-Soviet energy issues require broader international attention and new international actors will have to enter the region. As of now, it goes without saying that the EU, IMF, World Bank, and ultimately Western nations have to actively track and influence regional developments. Energy was not the only but one of the major variables in this conceptual and political shift.

Nevertheless, due to the complex understanding of the issue of energy it became more difficult to determine the optimal goals and the instruments available. Many international actors were active in the energy sectors of these countries and provided expertise and assistance. Expectations regarding Western support vary according to their potential, motivations, and character. For NATO, until recently the EAP3 energy situation was considered more like a potential unconventional, soft security threat[1] that could potentially affect/weaken the responsive capabilities of the alliance in certain situations. For the IMF, the issue was a distinct aspect of a broader energy subsidy problem, and it was perceived as a source of macroeconomic vulnerability and of expensive and inefficient policies.[2] In the IMF's calculations, which relied on a broad definition of subsidies, Ukraine was ranked first globally in terms of total subsidies for energy products, while Moldova provided the lowest level of support in the CIS in 2013.[3] The International Energy Agency provided the most

[1] Andrew Monaghan: NATO and energy security after the Strasbourg-Kehl summit. NATO Defense College, 2009. Available at: http://fpc.org.uk/fsblob/1073.pdf (22.01.16)
[2] Benedict Clements et al.: Energy Subsidy Reform : Lessons and Implications: Lessons and Implications. IMF 2013.
[3] IMF, Fiscal Affairs Department: How Large are Global Energy Subsidies? June 29, 2015. Available at: http://www.imf.org/external/pubs/ft/survey/so/2015/NEW070215A.htm "country-level estimates" link (24.01.16)

comprehensive overview of energy policies in the countries concerned,[4] assessing the entire spectrum of the sector. In its reports it underlines not only the significance of efficiency, as the biggest potential for improving energy balances in the post-Soviet region, but also evaluates the policy-making process and the sector-specific investment climate. The World Bank, the EBRD, and some national donors (like SIDA, NEFCO, E5P, GIZ, etc.) also provide assistance and have valuable field experience with mixed results in these countries. The most favorable "would-be" target for efficiency projects is the district heating sector,[5] due to its high loss ratio, social relevance, and high visibility. Unfortunately, some of these projects were canceled or failed to yield the expected results, primarily due to the complex stakeholder problems in this particular field. These cases clearly show that despite the existence of positive precedents, applicability and local context are important variables in Western experience transfer.

Nonetheless, there is no doubt that among western partners, the European Union and its member states have the most at stake when it comes to EAP3 energy matters. The EU plays an important role as a norm-setter, as a regulator (primarily through the Energy Community and the DCFTAs in Moldova and Ukraine), as a partner in supply security management (gas reserve flows, gas transit), as a donor and assistance provider (ENPI, ENI), and sometimes as a mediator (winter deals between Ukraine and Russia in 2014 and 2015). However, unlike the institutions listed above, on account of its internal diversity the EU does not have a clear mission as to what it seeks to achieve through its EAP3 energy actions. Some authors argue that its activity is mainly reactive and cannot be fully understood without considering the interdependence between the EU and Russia.[6] Others even encourage this geopolitical discourse and would use the Union's regulatory leverage to counterbalance Russia in the EAP3 region.[7] Nonetheless, a significant portion of the relevant literature only regards the Russia-factor as the runner-up in terms of the process of policy approximation. They interpret the EU's activities in the EAP3 countries as an extension of its internal energy policies to new areas rather than an attempt at counterbalancing Russia's influence.[8] The EU's Eastern energy measures have not been clearly delineated and the quest for an optimal framework is continuously ongoing.

There is a common view that new EU members, especially Visegrad states (V4) can provide some guidance to the EAP3 in managing the energy problems of the latter, in other words that they can contribute to the EU's Eastern Policy with their past experience. Visegrad countries understandably feel more committed to these efforts on account of their physical proximity, its impact on their own security needs and foreign policies. They are also often perceived as actors that have real capabilities at their disposal to intervene more efficiently than others because of the Soviet legacy and the transition experience that they have in common with the EAP3 countries. These expectations seem to be justified in many subsectors, even if their actual role is often exaggerated and lacks solid statistical evidence.[9] Thus these countries are expected to provide some sort of added value in designing EAP3 energy assistance programs and to increasingly contribute to the process of convergence.

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[4] IEA: Eastern Europe, Caucasus and Central Asia. 2015. Available at: http://www.iea.org/bookshop/705-Eastern_Europe,_Caucasus_and_Central_Asia (24.01.16)

[5] Yadviga Semikolenova; Lauren Pierce; Denzel Hankinson: Modernization of the District Heating Systems in Ukraine: Heat Metering and Consumption-Based Billing. World Bank, Washinhgton D.C, 2012. p.15. Fan Zhang; Denzel Hankinson: Belarus Heat Tariff Reform and Social Impact Mitigation. World Bank, Washinhgton D.C, 2015.

[6] Nataliya Esakova: European Energy Security: Analysing the EU-Russia Energy Security Regime in Terms of Interdependence Theory. Springer, 2012.

[7] Keith C. Smith: Russia and European Energy Security – Divide and Dominate. CSIS, October 2008. Available at: http://csis.org/files/media/csis/pubs/081024_smith_russiaeuroenergy_web.pdf (22.01.16)

[8] Francis McGowan: Can the European Union's Market Liberalism Ensure Energy Security in a Time of 'Economic Nationalism'? In: Journal of Contemporary European Research, Vol. 4, No. 2, pp. 90-106; Heiko Prange-Gstöhl: Enlarging the EU's internal energy market: Why would third countries accept EU rule export? In: Energy Policy Volume 37, Issue 12, December 2009, Pages 5296–5303.

[9] Maybe it is enough to point out indicate, that despite solid improvements, in 2013 the EAP3 region's energy intensity per unit GDP (0.99 Mtoe/bln USD2005) in 2013 was twice as much high as than the corresponding figure in the V4 in 1990 (0.49). IEA statistics.

This Report aims to analyze and specify these assumptions. In Chapter 2, we provide a detailed comparative statistical overview of key long-term energy trends in the V4 and the EAP3. These trends rest on a large number of different, often external, drivers, such as market dynamics, prices, technological development, and social standards. Energy policies are often overrated in this regard. Market signals, if not distorted, can often provide the strongest incentive for efficiency improvements. The EAP3 as a region has performed surprisingly well in terms of energy efficiency, even if this is measured against a very low baseline. As the statistical analysis will show, both the V4 and the EAP3 intensity indicators per unit of GDP halved between 1990 and 2013. Nevertheless, the EAP3 region saved this amount primarily in the hydrocarbon sectors, in contrast to the V4, where intensity improvements came predominantly from the less efficient coal sectors. Nonetheless, in many respects the EAP3 had to go through a more rocky accommodation path than the V4 or the EU28, sometimes outperforming these subjects in terms of the improvement of its intensity indicators. The Chapter identifies the transformation and residential sectors as areas where potentially significant savings may still be realized. In the first area, i.e. transformation, policy-makers face a stakeholder problem and a problematic technological legacy, while the situation in the latter is mainly the result of past, and sometimes prevailing, price distortions.

In *Chapter 3* we briefly differentiate the EAP3 countries, their energy sectors and examine the role of different corporate, ownership, management, and political factors in the national energy consumption trends. Ukraine, Moldova, and especially Belarus followed different paths over the last 15 years, and the outcomes of their respective trajectories differed as well. While many focus on experience transfer from West to East, one should not forget the compatibilities within the EAP3 energy systems and the need for differentiating between these countries.

Energy policies with a special focus on energy efficiency will be analyzed in Chapter 4. Energy efficiency as a policy message from the V4 is somewhat bizarre, since none of these countries treat efficiency as a priorty in their respective strategies. Nonetheless, new EU members had to set a high number of national targets and had to implement many administrative measures as part of their accession processes, and as a result they have a clear legal commitment to implement these. The issue of efficiency is much "softer" in the EAP3, and these countries have only loose commitments resulting from their DCFTAs and the Energy Community and/or a free hand to determine their efforts.

Finally, in *Chapter 5* we examine the residential and the district heating sectors in more detail. These are policy-intensive fields, with high social sensitivity and political significance. Due to the technologically outworn thermal generation plants, there is a clear necessity for energy policy decision makers to intervene and gradually modernize these capacities. These actions will lock-in the future of the sector for decades to come, highlighting the need for smart, coordinated measures.

Statistical overview

The aim of this chapter is to provide a statistical background for the entire Report and underpin the policy recommendations with a more factual analysis. It compares and explains the Visegrad and EaP3 energy trends in the last two decades. We prioritized the impact of high energy (primarily oil and gas) prices on these economies from the various variables we explored. By 2011, the global oil price (in real terms) had exceeded its historic peak in the late 1970s. Natural gas and imported coal prices in Europe and in Asia Pacific increased fivefold between 1999 and the early 2010s. Nevertheless, though this was not the only issue affecting energy efficiency and energy policy in general, it was likely the most important non-incumbent issue. Accordingly, the time span of our analysis stretches from 1998 to 2013. As we lacked the capacity to analyze the entire period in question, we included statistical data only for the following six years: 1998, 2001, 2004, 2007, 2010, and 2013.

Even if the Report focuses on the V4 and EAP3 countries, at certain points in the study we included comparative data for the EU28 and Russia. It would be difficult to describe long-term tendencies without having a broader overview and setting some benchmarks. The EU28 data are used to demonstrate the energy intensity trends of the developed world in the given timeframe (in the EU28 both GDP and TPES (total primary energy supply) heavily rely on the EU15). Given its non-binding efficiency target, the wide variety of policies it pursues, and a competitive market pattern, the EU28 constitutes the "high-end" of Europe's energy efficiency trajectory. At the other end, Russia is used to present what may be referred to as a "low adaptation" path. Given its soft internal pricing and relatively weak efficiency efforts, Russia is often perceived to be maintaining its high-intensity trajectory. As the following chapter will show, many of these hypotheses seems to be justified, even if some distinctions should be made.

Visegrad and EAP3 pathes are usually perceived to be "somewhere between" these two benchmarks. The "Eastern end" of the EU still features some legacies of Socialist energy patterns but is in the process of catching up to the core EU countries in terms of policies, trends, and technology. The EAP3 region in particular is often perceived to have a post-Soviet consumption and industrial pattern with all the features of an importer country. In this chapter we also aim to show that even if most of these perceptions are correct, the picture is a bit more complex and more nuance is needed. The table below provides a brief insight into different models of adaptation to the changing external environment.

Table 1. *Selected energy-related indicators for some European countries, 1998-2013*

	EU28	V4	EAP3	Russia
GDP(2005)/capita in 1998 (000 USD)	25035.3	7279.8	1216.7	3275.5
TPES/GDP(2005) in 1998 (toe/000 USD)	0.14	0.38	2.11	1.21
Average annual GDP growth rate between 1998-2013, %	1.5	3.2	4.4	4.9
Average annual TPES growth rate between 1998-2013, %	-0.28	-0.03	-0.75	1.46

Source: IEA

Western European countries have mature consumer societies, low GDP growth, economies with low energy intensity, and some past experience of managing oil price hikes (e.g. after 1973). These countries also relied on relatively clear-cut patterns of energy demand prior to 1998, transparent pricing, efficient competition rules and a high variety of energy and industrial policy capabilities that they could utilize. Consequently, microeconomic adaptation was driven both by markets and policy actions. The former resulted in technological improvements and their swift introduction into the production chains, in the car industry or in electricity generation, for example. Policy actions have set some new priorities with a focus on creating more competitive patterns in some segments (like natural gas), and considerations involving efficiency and decarbonization became full-fledged vectors of policy action. No doubt, these policies represented the high water mark for efficiency management policies in Europe.

Further to the East, for the post-Socialist and post-Soviet countries this period marked their first encounter with high energy prices. These countries weathered the the 1970s under the Soviet Bucharest formula and pricing regimes, which helped them in allievating and substantially moderating the domestic impact of the international energy crisis. For the new EU-members, in particular the Visegrad countries, the rise in energy input prices constituted a headwind in their efforts to catch up to the West. Their GDP growth rates between 1998 and 2013 substantially exceeded those of the EU15. The patterns of Western consumer societies spread quickly across the region, resulting in a new wave of motorization and booming residential energy demand. Nevertheless, these countries still had efficiency reserves to be mobilized. Even if the low hanging fruits of efficiency gains, inherited from the heavy industrial segments of the Socialist era, had

been mostly "harvested" by 1998, the potential in energy generation, industry, and transportation was still significant. Industrial performance largely relied on multinational and foreign companies, stakeholders who can manage their energy bills effectively.

The complex economic landscape was further complicated at the policy level. Unlike in Western Europe, high energy prices also took their toll in macroeconomic and social regards. Between 2007 and 2011 the average trade balance of energy products in the EU10 was -4.5% of GDP in contrast to -2.8% in the EU15.[10] The share of utility bills in the disposable income of households was also roughly twice the customary Western figures. Russian supply security also became a major policy issue after the 2009 gas crisis. This led to a high variety of factors and a complex environment that affect Visegrad energy policies. While market trajectories pointed towards decreasing energy intensity in the overall economy, on the policy agenda the issue of energy efficiency was overshadowed by a high number of issues involving security and affordability. These achievements were mainly the result of microeconomic and market trends, while policy changes had only a limited impact on them.

Table 2. *Some systematic characteristics of the four European regions, 1998-2013*

European Union-28	Visegrad-4
Developed economies, relatively low growth potential; Post-industrial era, low energy intensity of GDP growth; Mature consumer societies, expensive energy is affordable; Capital-abundance in energy sectors, Western corporate culture; Emerging sectoral policies with high variety of targets;	Catching-up to the EU, relatively high growth potential; Huge inflow of Western FDI, production chains rapidly modernized; Emerging consumer societies, social affordability is an issue; Capital-sufficiency in conventional sectors, mixed corporate culture; Following EU sectoral policies with a delay, capability constraints;
Eastern Partnership countries-3	**Russia**
Strong growth with macroeconomic vulnerabilities; High share of industry in GDP with constant value chains, no significant FDI; Polarized societies, consumer patterns remain segmented; Capital-scarcity in energy sectors, few changes in their corporate strategies; Sectoral policies in development, huge inadequacies;	Robust growth partly due to raw material exports; Industry dominates, some improvements in value chains, low level FDI inflow; Highly polarized society, with robust consumption potential at the top; Capital-sufficiency varies between sectors, extractive corporate strategies; Strong verticality in sectoral policies with new priorities;

In the case of EAP3 countries the 2008 crisis was a more important watershed than for the others. Thus, the aggregated numbers between 1998 and 2013 do not reveal the full truth, and due to the good performance prior to 2008 they show a more favorable picture about the current trends. This is mainly due to the late, but much more stormy encounter with global energy prices after 2008. Increased energy import prices, and the Russian leverage that they engendered, were a major shock in several aspects. As we saw in the 1970s in the Third World, high input prices became a considerable threat to long term macroeconomic stability for low GDP/capita economies. Energy import bills emerged not only as microeconomic constraints for many industries, but also as a challenge in terms of financial sustainability at the national levels. Accordingly, high energy prices contributed considerably to the deceleration of growth and to increasing budget and foreign account deficits. Not independently from these trends, Russia's prominent role in energy supplies drove these countries into a corner: they had to choose between promoting social consolidation and preserving their perceived or real sovereignty. This established an increasingly political

[10] European Economy – Member States' Energy Dependence: An Indicator-Based Assessment. Occasional Papers 145. April 2013. Available at: http://ec.europa.eu/economy_finance/publications/occasional_paper/2013/pdf/ocp145_en.pdf (20.08.15.)

environment for energy policy. As a result, these countries attained visible achievements in terms of energy intensity, even if at a very high macroeconomic and social cost.

Russia remained a benchmark in terms of its combination of post-Soviet energy patterns and limited (and highly mixed) impact of global oil price increases on internal energy demand. Domestic price increases were relatively modest, high export prices established a favorable macroeconomic environment for much of the period. Policy actions in the field of efficiency were selective without a broader context and were often not supported by industrial and residential pricing. Nevertheless, Russia also provided a good example of incumbent efficiency potential. Energy intensity remained on an improving trajectory, primarily as a result of changing production assets, improvements in technology, and smarter corporate policies by foreign and domestic actors alike. Thus, the high levels of economic growth in Russia were accompanied by a slowly decreasing trend in energy intensity (Table 1).

We primarily relied on the statistical datasets of the International Energy Agency (IEA), and we will follow its classification and benchmarking. Where necessary, we also added price, GDP, and different stock data from other sources, and these were indicated accordingly. As we used only a limited number of years, in some particular cases we cross-checked calculations and trends against a bigger dataset, which was not always indicated in the text.

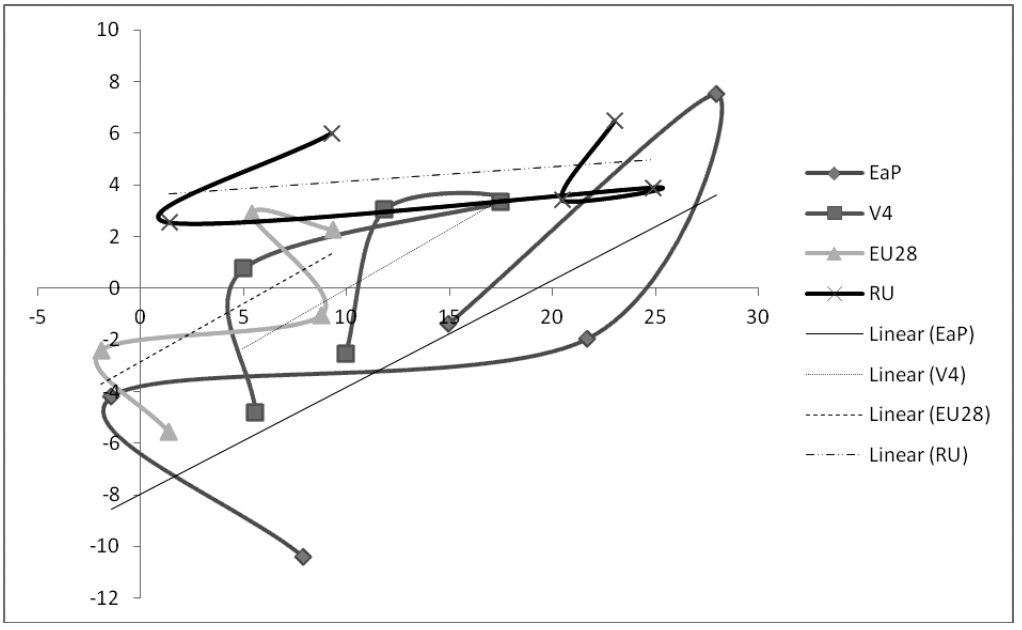
Energy trajectories in Europe: the four cases and the three drivers

Energy demand in the EU28 reached the level of 1985 in 2014, while the former Soviet countries' total consumption at that time was equal to the Soviet demand of 1976.[11] Maybe it would be accurate to say, that the century-long trend of ever increasing energy demand in wider Europe recently came to an end. Demography, GDP growth potential, industrial structure, efficiency and climate policy measures all point towards further drops in energy demand. Even if some particular factors were to change and trigger higher energy consumption in the future, it is unlikely that those would not be offset by other contravening factors. Europe seems to be doomed to a stagnation or even for gradual decrease in its TPES.

The decreasing trend in energy demand was accompanied by positive GDP growth rates. Figure 1 below shows the basic outline of these decreasing intensities in the four European country sets. As is apparent on the horizontal axis, economic growth was steady until 2007: in the post-Soviet region, tri-annual growth rates were between 15-27% in the first half of the 2000s. Nonetheless, growth rates dropped sharply everywhere in Europe between 2010 and 2013: the EU28 and the EAP3 experienced negative growth in the 2007-10 period. The vertical axis values suggest a more consistent downward trend in energy use. With the exception of Russia, between 2010 and 2013 energy consumption decreased substantially everywhere. In the EU28 and the EAP3 it had been declining since 2007 and 2004, respectively.

[11] BP Statistical Review of World Energy, 2015

Figure 1. *Relations between GDP (X) and energy demand (Y) growth in Europe, 1998-2013*



Source: IEA. Horizontal axis – change of GDP from the previous period, %; Vertical axis – change of TPES from the previous period, %. (Periods: 1998-2001-2004-2007-2010-2013). GDP is measured in constant 2005 USD prices.

Figure 1 also suggest a robust magnitude of efficiency improvements in Eastern European countries (except Russia). In the EAP3 countries, the respective trends in economic and energy demand were practically decoupled at certain times. As can be seen above, EAP3 countries were able to achieve relatively high growth rates even with minimal additional energy input in the early 2000s. Between 2010 and 2013, during the years of the major gas and oil price surge, they reduced their energy demand by more than 10% while they held on to positive growth rates. Given this magnitude, it is reasonable to assume that the EAP3 economies were more affected by the changing environment and/or had a greater domestic incumbent energy efficiency potential to draw on in these years.

The case of Russia renders the EAP3 trend even more emphatic: as Russia's industrial structure are similar to those found in the EAP3 countries, its economic growth was not accompanied by large scale decrease in its TPES. However, the following should not come as a surprise: given its energy exports and the steady rise of oil prices, Russia's domestic energy consumption is not necessarily strongly correlated with its economic growth. We observed positive efficiency trends in the EU28 and the V4, but this was far less pronounced. This phenomenon only underlines the conventional wisdom about economic convergence: higher national GDP/capita also assumes higher TPES/capita. One of the key questions of this Report is whether the EAP3 countries can boost these efficiency gains further and maintain a positive trajectory in this regard regardless of their economic performance.

The drivers of these improving efficiency trends differ in various parts of the continent. In the next few pages we will try to provide a basic list of the main drivers and develop some basic assumptions about their relevance in each of the European regions. In order to add more depth to the analysis and improve the transparency of the Report, we will focus on three basic interrelated drivers in our overview:

(1) incumbent efficiency potential, structural change, and technological development;
(2) external price signals, primarily increases in oil and gas import prices;
(3) domestic policy measures, especially at the state and municipal levels.

These three drivers do not cover all the major efficiency triggers in these economies. Energy demand trajectories were also heavily influenced by corporate policies, social patterns of energy use, and, most importantly, non-energy related factors of economic growth. Among the latter, the global financial crisis of 2008 and its impact will be highlighted in the discussion below. At the same time these three drivers constitute by far the most important factors of real and potential change. Looking at Table 2, we can identify some highlights regarding these drivers. The changing energy-mix in these four cases is even slightly more telling when it comes to the role of each driver.

The fact that demand for renewables in the EU28 passed the 10% threshold (indicated in the "other" line in the Table) around 2010 is a perfect demonstration of the magnitude of the common climate policy driver. Biofuels and waste were by far the biggest components of this growth, while combined solar, wind, and geothermal energy came in second. These achievements have been reached despite the decrease in total demand and they owe primarily to the EU's administrative measures and subsidies concerning sustainability, the 20% renewables target, and the introduction of the ETS. These trends were less dominant in the Visegrad region probably because of its lower renewables targets and were almost completely absent in the EAP3 countries and Russia (in Russia the biggest increase in renewables came from hydro energy).

Table 3. *Energy supply in selected European regions/countries, TPES, 1998 and 2013, ktoe, %*

	EU28				**V4**			
	1998		2013		1998		2013	
Coal	333044	19.7%	286390	17.6%	93601	52.0%	75162	41.9%
Crude oil and oil products	645121	38.1%	513092	31.6%	37149	20.6%	39340	21.9%
Natural gas	373242	22.0%	386740	23.8%	32637	18.1%	33077	18.4%
Nuclear	243190	14.4%	228612	14.1%	10055	5.6%	16203	9.0%
Other	99237	5.9%	209943	12.9%	6675	3.7%	15467	8.6%
Total	1694305	100.0%	1625632	100.0%	180117	100.0%	179306	100.0%
	EAP3				Russia			
	1998		2013		1998		2013	
Coal	39728	24.2%	42580	29.1%	110836	18.9%	108328	14.8%
Crude oil and oil products	26046	15.9%	17932	12.2%	120543	20.5%	160110	21.9%
Natural gas	75337	45.9%	58268	39.8%	310874	52.9%	395048	54.1%
Nuclear	19608	11.9%	21848	14.9%	27784	4.7%	45318	6.2%
Other	3383	2.1%	5862	4.0%	17914	3.0%	22086	3.0%
Total	164101	100.0%	146489	100.0%	587951	100.0%	730890	100.0%

Source: IEA

In the Visegrad region the drop in coal demand was the most visible factor. The replacement of coal with other fuels dominated in the last two decades. This is a long-term incumbent process, a general trend in the developed countries. The composition of coal savings is very similar in the EU28 and the V4: electricity generation, industrial, and residential use were equally affected. This suggests that an overarching trend prevails, namely the massive inflow of Western technology, which lessens the significance of local factors, like reserve depletion and the decommissioning of old power generation units in the Czech Republic or Poland. These effects were particularly strong in the Visegrad region, due to its high starting levels in the early 1990s, the rapid modernization of production chains, and changing residential preferences. The effects of climate policies and ETS are difficult to measure, but a review of the time series data, which goes back quite a while, shows

that their influence was rather limited. Unlike in the Visegrad region, in the EAP3 countries coal demand grew, likely as a result of the surge in oil prices and on account of the changing price and supply security conditions. Residential coal demand was on a similar track as the declining Western European and Visegrad trajectories, and the increase almost fully came from the power generation sector.[12] The same is true for Russia: coal almost fully disappeared from residential consumption, but maintained its role in industry.

The EAP3 energy-mix seems to reflect the effects of the hike in oil and gas prices, which was the major driver after 1998. Total hydrocarbon demand fell by roughly 25 Mtoe in 15 years, which suggests a drastic adaptation to the new price and security patterns. However, incumbent factors should not be underestimated either: between 1992 and 1998, in a depressed price environment, the total drop in gas and oil demand reached almost 66 Mtoe, falling from 166.7 to 101.4 Mtoe. Nevertheless, there is some evidence that helps to reveal the role of the oil price boom. The most conclusive argument concerns the decreasing share of hydrocarbons in the total energy-mix. In the 1990s, in the midst of economic collapse, their share was almost unchanged (63.2% in 1992 and 61.6% in 1998). By 2013, after 15 years of relative prosperity, their share had dropped to 47.8%, while the supply of other fuels even grew in absolute terms. Furthermore, as we will see below, domestic demand closely followed the trajectories of import prices. The "dark age" of hydrocarbons in the EAP3 region began after 2007 and especially after 2010, when local import prices sky-rocketed. The comparative overview also supports this statement in the Visegrad region, despite higher prices, hydrocarbon demand has not dropped at all, likely due to economic growth and coal reserves depletion.

It would be difficult to identify any of these drivers in the case of Russia. This owes in part to the absence of these drivers or their relatively weak impact. Due to its resource abundance, Russia could follow a high-intensity path without any particular demand for policy designs or competitive push to constrain the role of fuel inputs in its value chains. In some regards, it represents a "current policies and environment" scenario from the late 1990s, signaling an alternative development path in which internal prices remain low and scarcity does not arise. Nevertheless, this statement needs to be taken with a grain of salt, and one must consider many additional channels, primarily the direct and indirect role of increased domestic production and exports as one of the key drivers.

As these four examples show, the "top stories" in these regions and countries were rather different over the last 15 years. One needs to be careful with respect to make assertions concerning similarities and differences, since the underlying demand trajectories simultaneously conceal many unique factors and exhibit the imprints of some overarching tendencies. Furthermore, the impact of the same external effects can be rather different, depending on the recipients' economic and social relations. This comparison repeatedly underlines the fact that one cannot easily juxtapose the Visegrad region with the EaP3 countries; one must have a deep understanding of the context and keep in mind of the applicability of any solutions. Thus, the chapter will try to analyze the general context of the energy trends in the Visegrad and EaP3 regions to explore their common features.

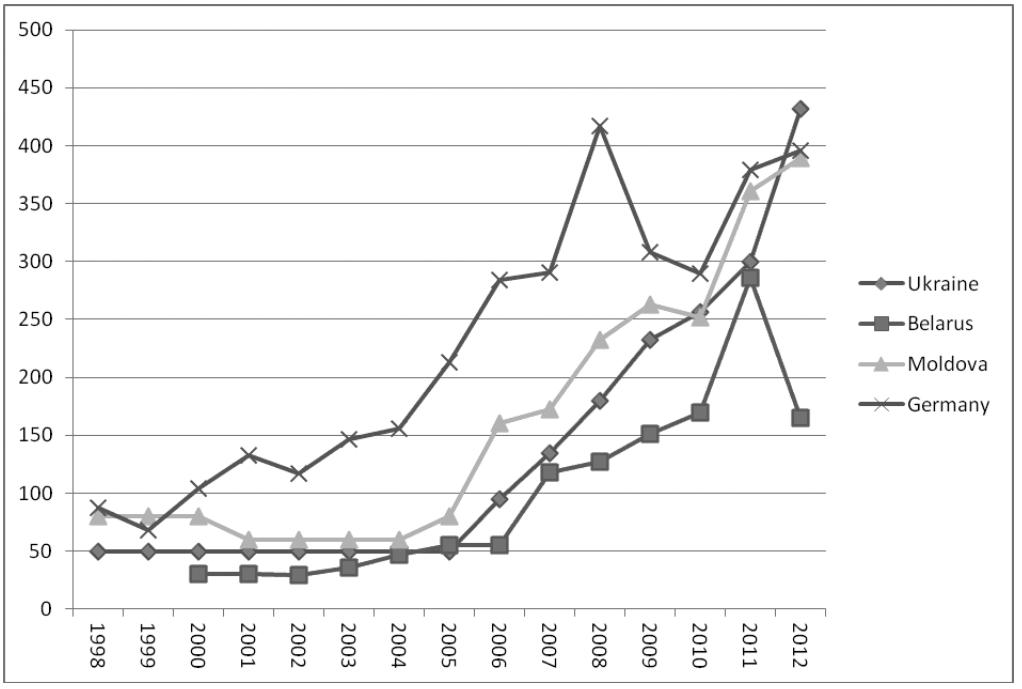
Fuel demand trends – on the stormy waters of global gas and oil prices

Oil and in particular natural gas issues were undoubtedly in the focus of energy policy debates during the last 15 years. As Figure 2 shows below, the rise of global oil and gas prices set in relatively late in the EAP3 region, and it affected these countries differently. As for natural gas prices, until the mid-2000s they did not follow the global trend and usually remained "soft", since payments

[12] In this Report we use the IEA statistical definition for the transformation sector. Nonetheless, in the statistical part we often focus only on the heat and electricity generation segments and the related power plants, and while we exclude other subsectors (like refineries and, other conversions). These definitions will be duly indicated in the text below.

to Gazprom were highly conditional. However, the transition to European price formulas and levels was completed by 2009 (except in Belarus), putting these countries under permanent Russian financial pressure. In the case of oil and oil products, data are somewhat unclear, primarily because of the Belarusian tolling schemes. The average export prices of Russian crude oil sold to CIS countries remained remarkably below the levels Russia charged to countries in the Far Abroad (in 2013, these figures were 53.5 USD/brl vs. 106.8 USD/brl, respectively[13]). But as the volumetric data suggest, the difference is mainly due to the Belarusian factor. Crude exports to Ukraine and other CIS countries gradually lost their significance and were replaced with oil product exports.

Figure 2. *Gas import border prices, 1998-2012, USD/000m3*

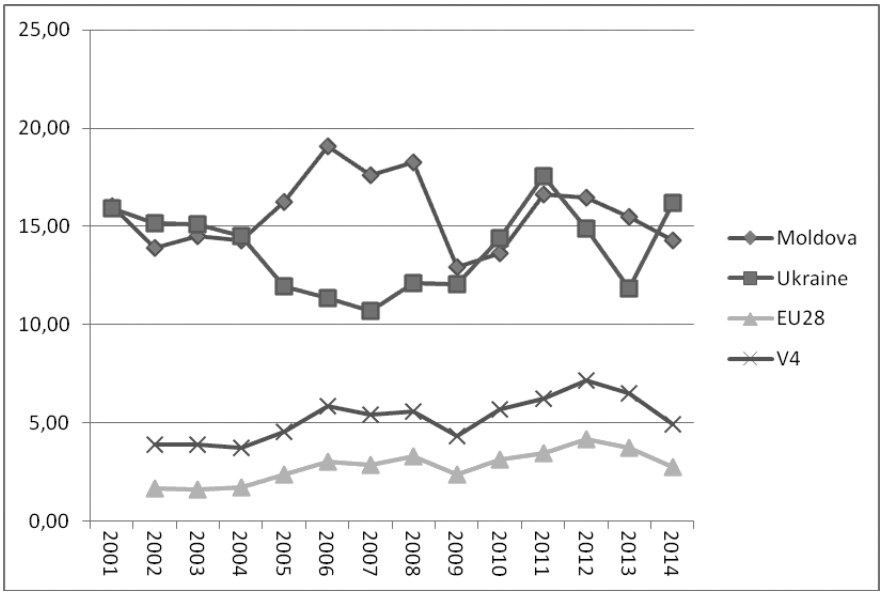


Source: Margarita M. Balmaceda (2013), p.40; Oxfordenergy; BAFA

At the same time, this price shock triggered a fast volumetric accommodation in Ukraine and Moldova. In Figure 3 we applied the SITC3 estimate (mineral fuels) to gas and oil imports. Even if hydrocarbon imports as a share of GDP were significantly higher than in the V4 and EU28, Ukraine and Moldova were able to keep these shares relatively stable. Despite the more gradual price increase in the V4 and the EU28, the share of their energy import bills as a percentage of GDP increased by 83.8% and 147.3% between 2002 and 2012, respectively. In Ukraine and Moldova, by contrast, the same aggregate indicators slightly decreased in the reference period.

[13] Russian Central Bank. Table: Экспорт Российской Федерации сырой нефти за 2000-2015 годы. Available at: http://cbr.ru/statistics/?PrtId=svs (12.19.2015)

Figure 3. *The share of mineral fuel imports (SITC3) in GDP, 2001-14,%*



Source: Eurostat, national statistics, for GDP data IMF WEO(2015) Database

The reduction in hydrocarbon demand came from different segments. As Figure 4 shows, the EAP3's demand for oil products in the transportation sector increased only by 12.3% in 15 years. At first look, this appears to be in sharp contrast with the V4 countries and to some extent with Russia, as both of these exhibited a massive increase in demand. However, fundamental data support the view that the trends in the transportation sector were parallel in the V4 and the EAP3. As for personal cars, the rate of increasing in their overall numbers in the two regions was comparable. For example, between 2000 and 2012 the number of personal cars increased approximately at the same speed in Hungary and Ukraine (a total of 26.2% increase in Hungary and up from 17 to 22 per 100 households in Ukraine[14]). The same is true for road freight transport both the V4 and the EAP3 countries showed a robust increase in this field.[15] It is reasonable to say that V4 and EAP3 followed the same trajectory in these segments, with a considerable time lag around 2000. Prosperity and fast motorization began around the late 1990s in the V4, while demand in the EAP3 fell sharply after the 1998 crisis and rebounded only in the mid-2000s.

The composition of Russian growth is different. Road freight transport did not play an important role, it grew only by 44% between 2003 and 2012. At the same time the stock of personal passenger cars doubled from 17.6 million in 1997 to 36.9 million in 2013.[16] Thus the more stable Russian oil demand in the transport segment likely stems from higher personal incomes and cheaper gasoline prices.[17] The spread of consumer society patterns were more sudden and more robust in Russia than in other regions of Eastern Europe.

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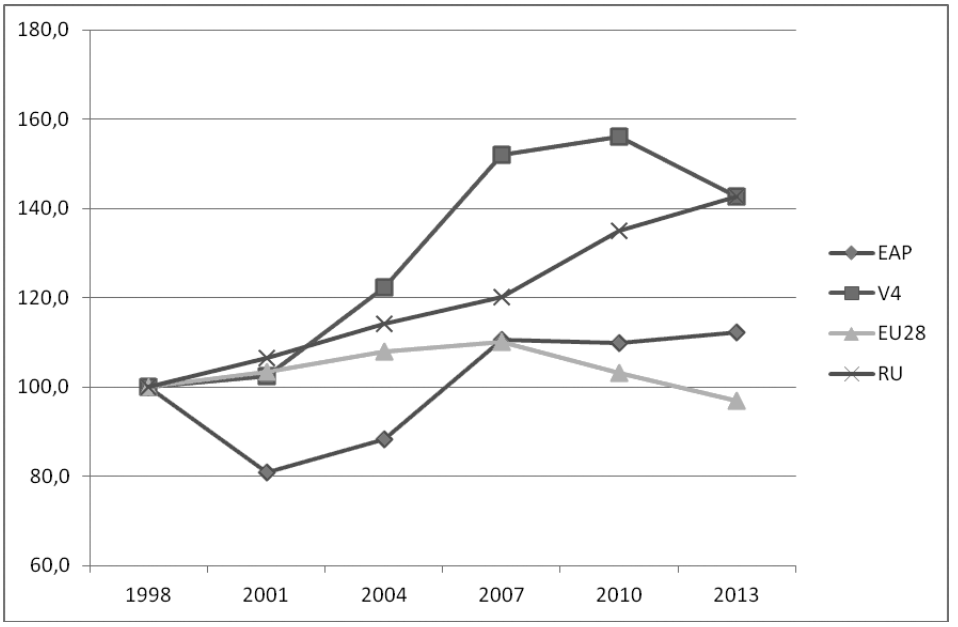
[14] Hungarian Statistical Office, Table 4.5. Transport, Available at: http://www.ksh.hu/docs/hun/xstadat/xstadat_hosszu/h_odme001.html (29.12.15.) and Statistical Service of Ukraine, Available at: http://ukrstat.org/uk/operativ/operativ2007/gdvdg_rik/dvdg_u/Ndtt2006_u.htm (29.12.15)

[15] Between 2003 and 2012, road freight transport in million tonne/-km increased from 6,793 to 42,905 in Ukraine and Moldova, and from 167,612 to 347,837 in the V4 states. Available at: http://knoema.com/ITF_GOODS_TRANSPORT/goods-transport (29.12.15)

[16] "Parkc of passenger cars in Russia has doubled for 15 years", Available at: http://www.rusautoconnect.com/en/novosti/53-news/135-parc-of-passenger-cars-in-russia-has-doubled-for-15-years.html (29.12.15)

[17] In 2012, 1 litre of gasoline cost 0.99 USD in Russia, 1.35 USD in Ukraine, and 1.87 USD in the V4 in 2012. Source: World Bank, Table: Pump price for gasoline (US$ per litre), Available at: http://data.worldbank.org/indicator/EP.PMP.SGAS.CD?page=2 (29.12.15)

Figure 4. *Oil product demand in transport, 1998-2013, 1998=100%*



Source: IEA

Nonetheless, most of the oil savings came from non-transportation demand (see Table 4). In 1998 transportation counted for less than half of total EAP3 oil demand, while in 2013 its share approached three-fourths. This trend is in line both with earlier developments in the post-Soviet region and global trends. Oil products practically disappeared from the EAP3 generation sector due to a roughly 90% drop (in 1998, approximately one-fourth of total oil product demand came from power and heat generation), and its consumption halved in other, industrial and residential sectors and in non-energy use. While with some exceptions we witness similar trends in the V4 countries, in Russia the trajectory was significantly different. Even if oil lost ground to other fuels in the Russian power and heat generation sector, oil products spread thorough the other segments: residential non-transportation demand doubled, non-energy use tripled. Most likely the increased fuel oil supply played a crucial role in this regard: its production has been growing as a result of more Russian refining, while its external markets have been shrinking because of stricter environmental regulation. Thus, the increasing use of oil products in Russia cannot be fully seen as a legacy of the past, there is a certain current inertia in this process.

Table 4. *The share of transportation in total oil demand in 1998 and 2013*

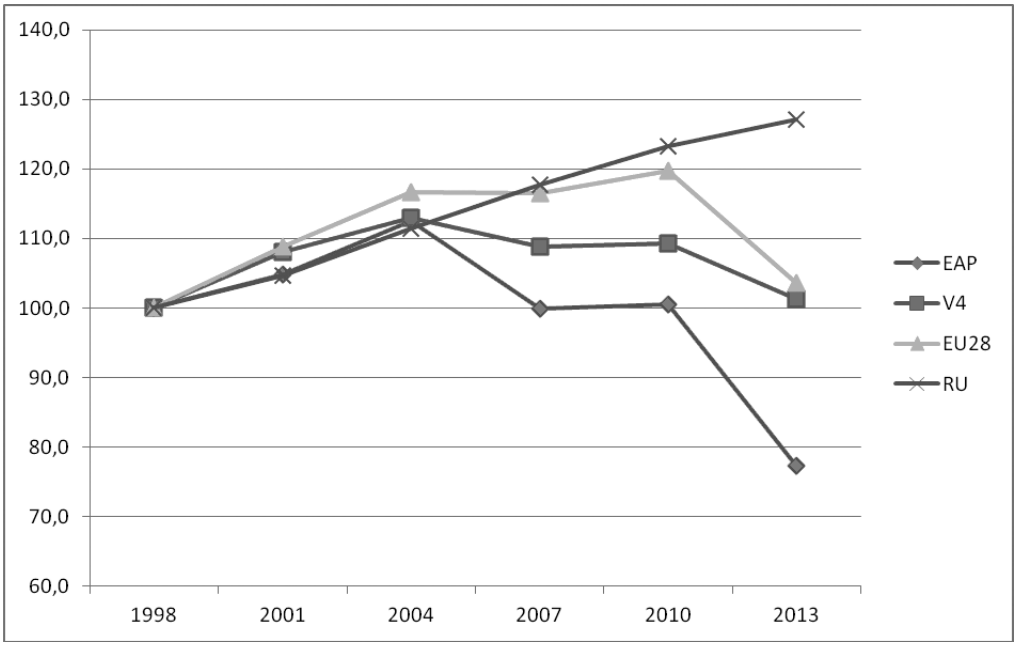
	France	V4	EAP3	Russia
1998	49.45%	46.35%	44.28%	34.58%
2013	55.49%	62.46%	72.25%	37.15%

Source: IEA

Natural gas was undoubtedly the top energy story of the last 15 years in Eastern Europe. It lies at the crossroads of all three main drivers. Given its surging price levels, which were in 2013 multiple times higher than the price at the beginning of our analysis, the huge efficiency potential, and the sensitivity to regulation and supply security concerns, gas demand trends best describe the quality of adaptation to the new environment. It is probably no surprise that gas markets performed very differently in these Eastern European regions. As can be seen in Figure 5, until 2004 European energy markets followed the same path: solid growth, growing gas demand, and moderate prices created a favorable environment for a balanced development. However, after the mid-2000s gas markets except the Russian became depressed due to a combination of weak growth, technological

change, and high prices. The trend was strong enough to offset the impacts of the impending buyers' market after 2008. The capability to substitute gas consumption became a strong indicator of adaptation.

Figure 5. *Gas demand in Europe, 1998-2013, %, 1998=100%*

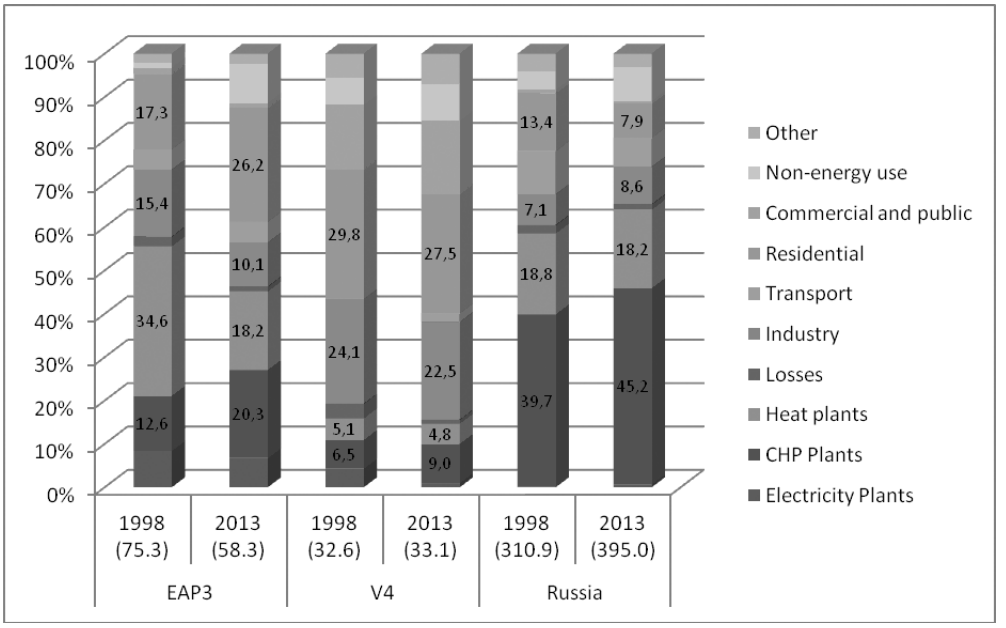


Source: IEA

As Figure 6 demonstrates below, the three post-Socialist markets can be characterized differently. In Russia, natural gas has continued its pre-2008 trajectory and total consumption grew by 27% in 15 years. It gained even more ground in the power generation segment and remained important for industry both as a fuel and a raw material. The basic reason is the relatively oversupplied Russian market, where price levels remained low in both the industrial and regulated segments. Thus for many companies natural gas has been a fuel of choice, a competitive and comfortable option. Visegrad gas markets practically stagnated and the composition of their demand remained stable. At the same time, the aggregate numbers obscure divergent national patterns. In resource-scarce, highly gasified economies, like Hungary, consumption collapsed in all demand segments. However, this decrease was offset by the depletion of coal reserves and growth in gas demand in other countries, like Poland.

EAP3 countries' gas markets were in turmoil. They suffered a 31.2% drop between 2004 and 2013, almost exclusively on account of Ukraine and Moldova. This also means that in less than a decade, Gazprom lost an export market equal to 80% of the Visegrad demand. The generation sector contributed the greatest slice to this drop, showing some signs of fundamental change. Heat plants alone contributed 15.4 Mtoe to this drop. Industry added another 5.7 Mtoe, culminating in the closure of many chemical and energy-intensive enterprises in Ukraine. Both fuel swaps and efficiency gains played an important role. Coal and residential gas demand rose moderately (by approximately 5 Mtoe) but heat demand decreased remarkably (also by 5 Mtoe). The expansion of CHP plants, sometimes at the expense of heat and electricity plants, was also an important incumbent efficiency factor everywhere in the region, primarily in Russia.

Figure 6. *Composition of gas consumption in Eastern Europe in 1998 and 2013 (total Mtoe), %*



Source: IEA

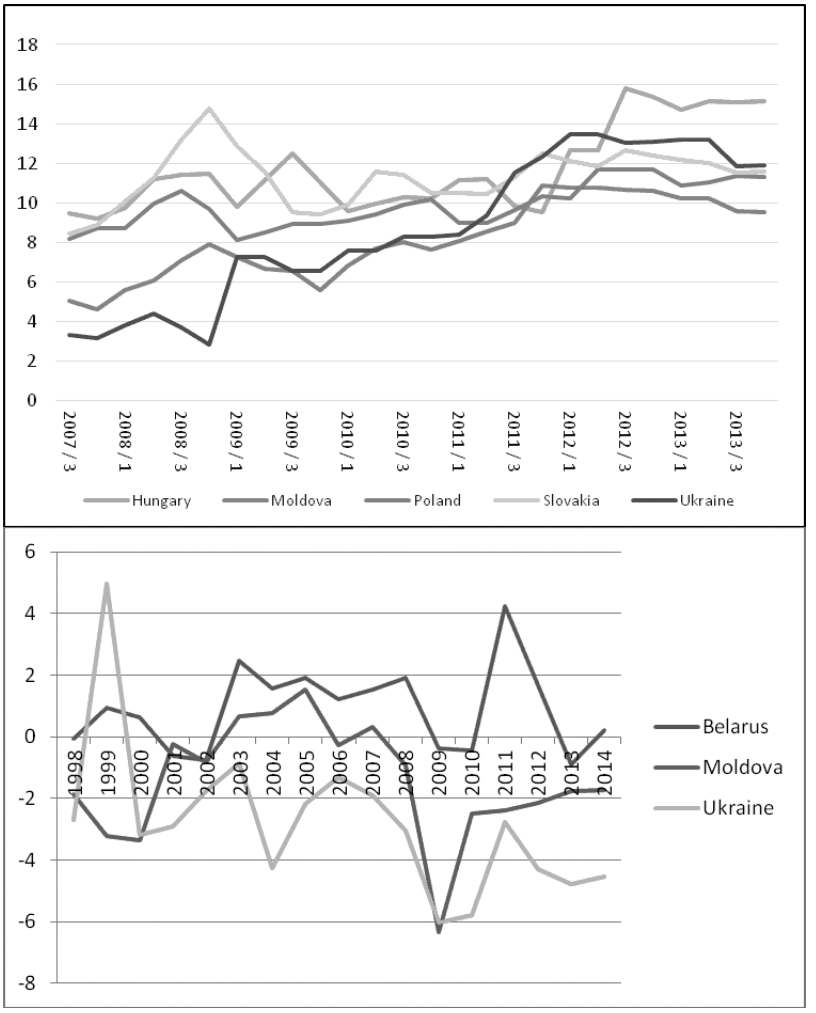
Domestic pricing trends partly explain this drop. As is apparent in Figure 7, Ukraine and Moldova went through a painful price adjustment process especially in the industrial and to a lesser extent in the non-residential sectors between 2007 and 2013. Industrial prices moved in tandem with average import costs, bankrupting many energy-intensive factories. With the exception of Ukraine, residential natural gas prices also followed this trend, though in a more hectic manner. Thus the main question here is not whether the demand for gas has declined, but at what macroeconomic price. Whether the producers were able to swap to other fuels, invested into more efficient technologies, or simply stopped production.

Figure 7. *Natural gas prices for natural gas in residential (above) and non-residential (below) sectors in selected Eastern European countries, EUR/GJ 2007-2013*

Source: ERRA

Besides the deteriorating microeconomic climate, high import prices also took a macroeconomic toll. The fiscal and current account implications of the adaptation can be seen below, in Figure 8. In addition to other factors, changes in terms of trade and booming energy prices are also likely to have contributed a considerable amount of growing current account deficits in all three countries. Consequently, high energy import prices evolved into a major source of macroeconomic vulnerability. In combination with other factors, they contributed to a series of currency crises in Belarus after 2008, and to a significant increase in the level of state debt in Ukraine. The situation was further exacerbated in Ukraine, where the government failed to raise gas and heat prices in the residential sector. In the late Yanukovich-period, the deficit of Naftogaz was greater than the deficit of the entire central budget. In these cases, domestic pricing remained a major transmission instrument between high input pricing and macroeconomic vulnerability, and indirectly also emerged as a trigger for a more accentuated role in energy security.

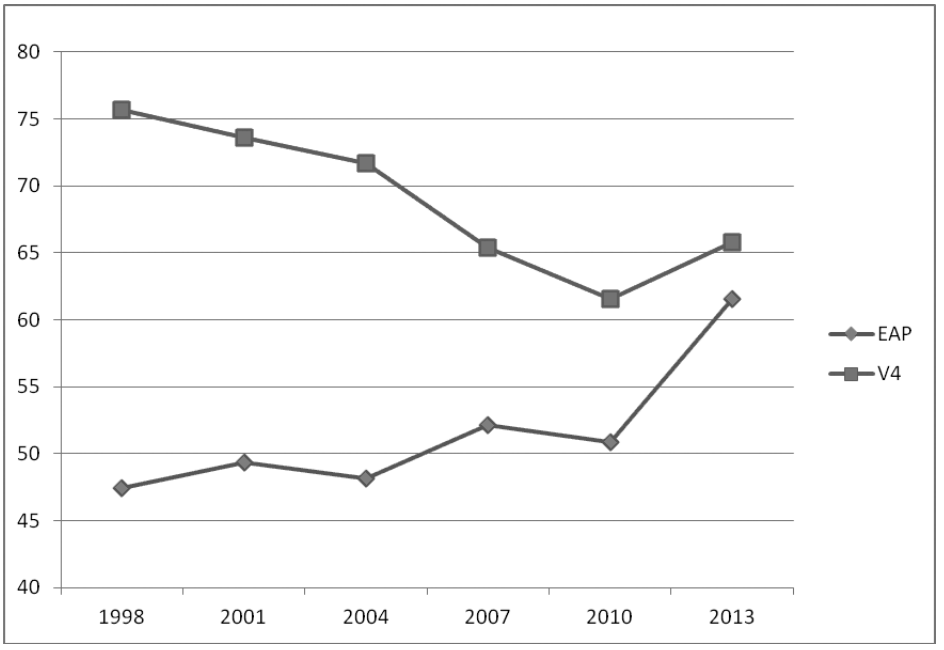
Figure 8. *Current account balances (above) and fiscal deficits (below) in the EAP3 countries, 1998-2014, % of GDP*



Source: IMF

Self-sufficiency trends, dominated by decreasing hydrocarbon demands, improve the general picture of macroeconomic implications. Due to the sizable drop in total demand, the EAP3's self-sufficiency ratio had grown by 14.14% to 61.59% by 2013 (Figure 9). In a countervailing development, due to decreasing domestic coal supply (and demand), the V4 became increasingly reliant on imports. Thus the self-sufficiency ratios practically leveled off in the V4 and the EAP3 by the end of the period under review. Nevertheless, the national trajectories illustrate the substantial volatility of these trends. Unlike Moldova and Ukraine, Belarus increased its gross imports by 56.2% in the last 15 years, mainly due to its tolling schemes and energy added-value production chains. In the V4 region, the Czech Republic, Slovakia, and to a lesser extent Hungary, were able to maintain their levels of self-sufficiency, the overall decline in the region's figures stemmed almost exclusively from Poland.

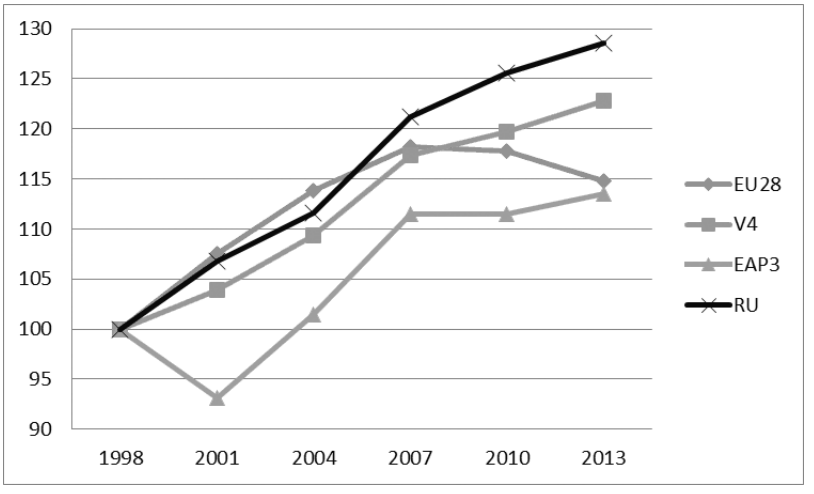
Figure 9. *Self-sufficiency in V4, EAP, 1998-2013, TPES%*



Source: IEA

Electricity demand trajectories show considerable similarities to the growing demand for oil products in all the four cases (Figure 10). This is an incumbent global trend that stems from technological development and is primarily driven by the expansion of services and household demand. As can be observed in Table 5, the relative share of industrial electricity demand has been shrinking everywhere, while in absolute terms it grew considerably in the V4 and in Russia, while decreased only modestly in the EAP3 and in the EU28. Thus, the drive comes primarily from residential and office demand. The new wave of consumption trends seemed to begin decelerating in the EU28 only recently, leaving considerable room for catching up in Eastern Europe. Computerization and the spread of electric appliances still have a solid potential in the V4 and EAP3 regions, even if the pace may be much lower in the years to come.[18]

Figure 10. *Electricity consumption in Europe, 1998-2013, 1998=100%*



Source: IEA

[18] If one takes access to internet access as an indicator for computerization, there were 83.75 internet subscriptions per 100 people in 2014 in France, 75.61 in the V4, and only 49.67 in the EAP3. World Bank Millennium Indicators, Available at: http://data.worldbank.org/indicator/IT.NET.USER.P2 (16.01.16)

Table 5. *The share of industrial electricity consumption in total electricity demand, 1998, 2013, %*

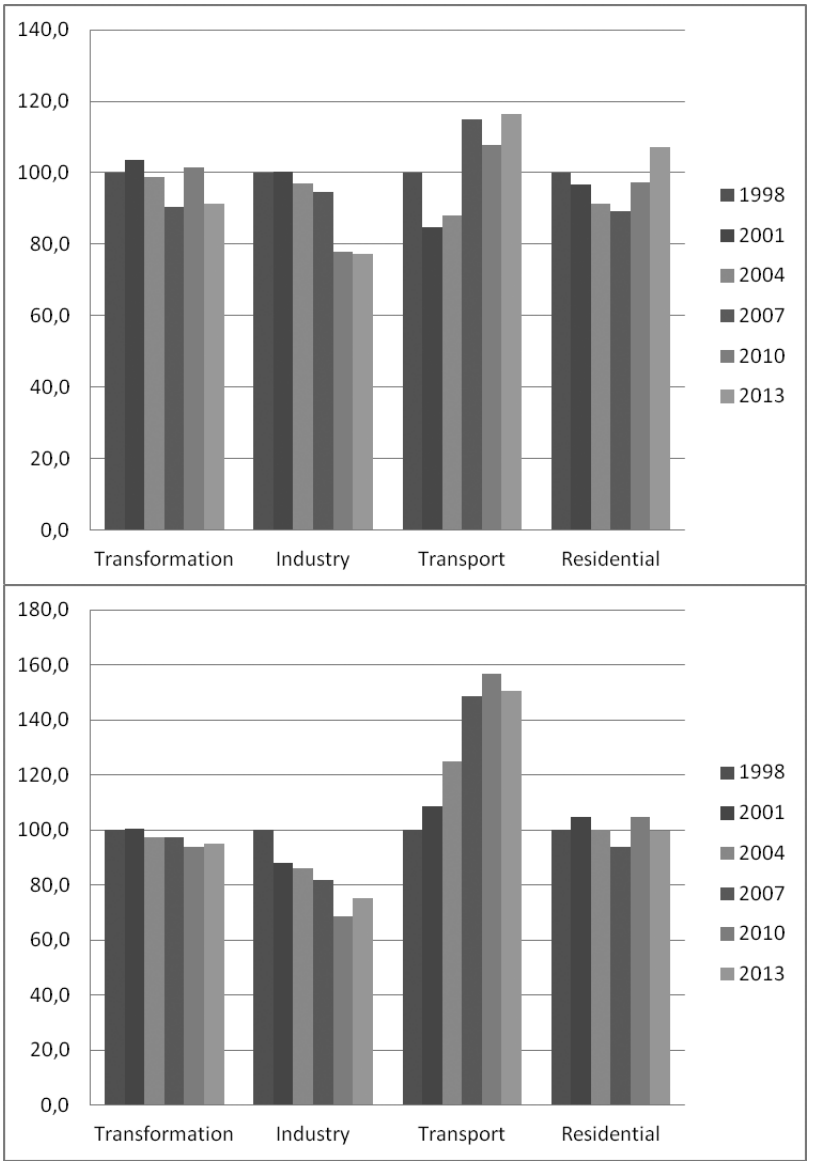
	EU28	V4	EAP3	Russia
1998	41.99%	40.97%	49.77%	48.94%
2013	36.05%	40.49%	42.33%	45.25%

Source: IEA

Sectoral efficiency relations

In order to have a better insight into efficiency relations in the two regions, it is crucial to review not only the energy mix, but also the sectoral level. Fuel swaps affect efficiency levels differently and cannot reveal some important interconnections. Thus, in the following subchapter we explore some aggregated consumption trends in the most sizeable demand segments.

Figure 11. *Sectoral/average energy intensity [TPESsect/TPES per unit GDP(2005)] in EAP3 (above) and V4 (below) countries, 1998-2013, 1998=100%*

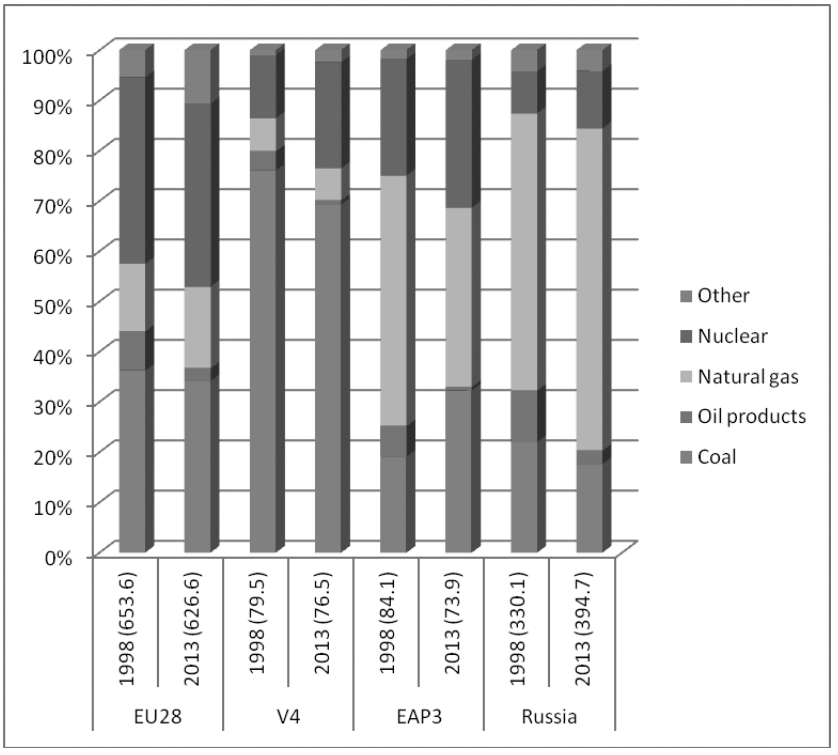


Source: IEA

As can be seen in Figure 11, the composition of energy intensity per unit GDP followed similar patterns in the EAP3 and the V4. Keeping the different GDP trajectories in mind, the transformation and residential sectors exhibit the most parallel features, while industrial demand and particularly transportation were obviously on different tracks. The policy implications are substantial, since usually the former two sectors are identified as potential fields for Visegrad experience transfer. The macro-statistical background suggests more similarities and fewer differences, but we have to take a look at the details to determine the underlying trends.

15 years in the generation sector is a medium-long period, it constitutes only between one half, one-third of the assets' life cycle. Thus, the changes in production and efficiency chains are relatively small, they only indicate certain shifts rather than paradigmatic turns in development. Figure 12 below demonstrates that the fundamental shifts in these four generation sectors were rather different and very much interconnected with the underlying drivers discussed at the beginning of the chapter. This means that the dominant trend in the V4 transformation sector was the retrenchment of coal and the swap to nuclear. In the EAP3 sectors, by contrast, decline in the hydrocarbon primarily natural gas consumption was the most visible factor, while the share of coal has increased.

Figure 12. *The fuel mix of electricity and heat generation in Europe, 1998, 2013, (total generation inputs in Mtoe), %*



Source: IEA

Looking at the generation plant composition in Table 6, the differences are relatively big. The gross efficiencies of plants are roughly in line with European levels, improvements may have come from fuel swaps and higher utilization rates (Russian data should be taken with some reservations). Nonetheless, these rough averages include the sizeable Ukrainian nuclear fleet and obscure most of the inefficiencies in other segments of the generation sector. Still, the heating sector remains the hotbed of inefficiencies in the region. Both macro-statistics and micro surveys[19] show that

[19] Yadviga Semikolenova; Lauren Pierce; Denzel Hankinson: Modernization of the District Heating Systems in Ukraine: Heat Metering and Consumption-Based Billing. World Bank, Washinhgton D.C, 2012. p.15. Fan Zhang; Denzel Hankinson: Belarus Heat Tariff Reform and Social Impact Mitigation. World Bank, Washinhgton D.C, 2015.

people opt for individual heating systems whenever they can, because of lower costs and the low level of public trust in maintenance and related companies (DH companies and Zheks). This further deteriorates the density of the network and increases the reportedly high losses in the system.[20] Furthermore, due to preferential tariffs, it has been a source of corrupt practices in certain periods and countries.

Table 6. *Plant-type composition of the electricity and heat generation sectors, 1998, 2013, %*

		Share in total generation		
		Electricity plants	CHP	Heat plants
EU28	1998	69.9%	25.1%	5.1%
	2013	65.6%	29.7%	4.9%
V4	1998	20.1%	64.1%	15.8%
	2013	20.9%	68.6%	10.5%
EAP3	1998	31.7%	18.5%	49.8%
	2013	42.5%	28.5%	29.0%
Russia	1998	10.3%	54.6%	35.0%
	2013	14.1%	59.1%	26.7%

Source: IEA

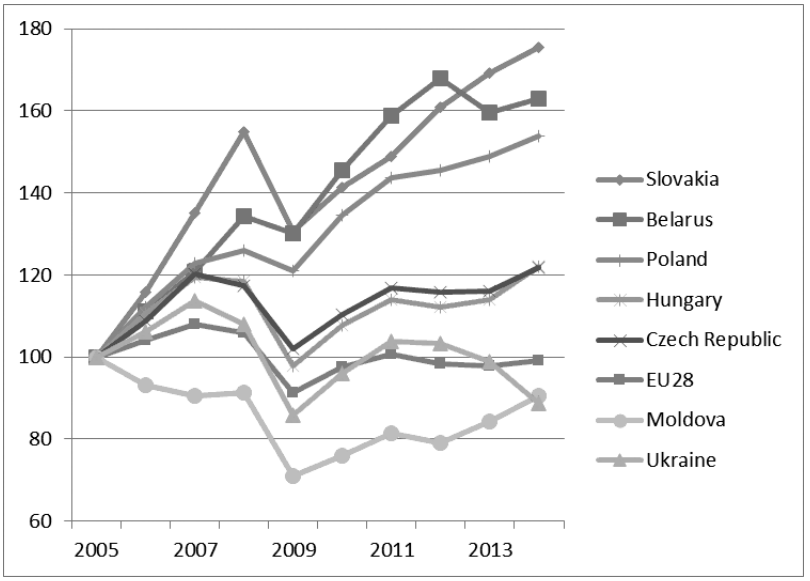
Despite the falling EAP3 heat production (-23.9% between 1998 and 2013), proportionally the losses in the network decreased even more, by 76.5%. Thus heat had a major ameliorating impact on the official loss ratio in the electricity and heat cycle, falling from 18.87% in 1998 to 10.34% in 2013 (in the V4 it grew from 6.85% to 7.34%). Nevertheless, in absolute terms reported electricity and heat network losses in the EAP3 systems were abnormally high in 1998, almost three times the total TPES level of Moldova. Thus, it is more likely that changing regulations, improved transparency standards, and less corrupt practices around the mid-2000s "contributed" to these statistical efficiency gains (a comparable amount of "transformation loss" emerged in the statistical category of "non-energy use"). Despite all these achievements, potential efficiency improvements still appear to be sizeable in the heat and gas sectors. Until now, industry had the bigger impact on the declining heat consumption, the residential system remains highly fragmented and technologically outdated.

A closer look at industrial intensity trends also reveals some factors on which the trajectories of the V4 and the EAP3 diverge. Intensity indicators have been gradually improving in the V4 region, reaching a 31.4% relative gain as compared to average intensity in 2010. Apart from the gradual decline in the share of total GDP produced by industry, this improvement comes primarily from the multinational value chains that dominate industrial output in the V4. On the contrary, industrial energy intensity improvements in the EAP3 remained relatively low until 2007. Among the explanatory factors, the favorable terms of trade (high export and low energy import prices) until the 2008 financial crisis played a dominant role. These boosted even the relatively high intensity production chains prior to the crisis. The situation had changed radically by 2010, and forced those sectors with high input costs to cease their production. This wave of de-industrialization resulted in some improvements in sectoral intensity. This process is directly corroborated by national output data for some energy intensive industries, and is indirectly supported by a 36.6% drop in non-energy (raw material) demand for fuels between 2007 and 2013 in the EAP3 region. Figure 13 also highlights the divergent industrial production performance trends in Belarus on the one

[20] According to IEA, in district heating systems more than half of the input fuel is wasted as it moves through the value chain. IEA: Ukraine 2012 – County Study. p. 51.

hand, and Ukraine and Moldova on the other. In addition to other explanatory factors (like easier access to the Russian market in the case of Belarus), differences in energy input prices must play a considerable role in this divergent development.

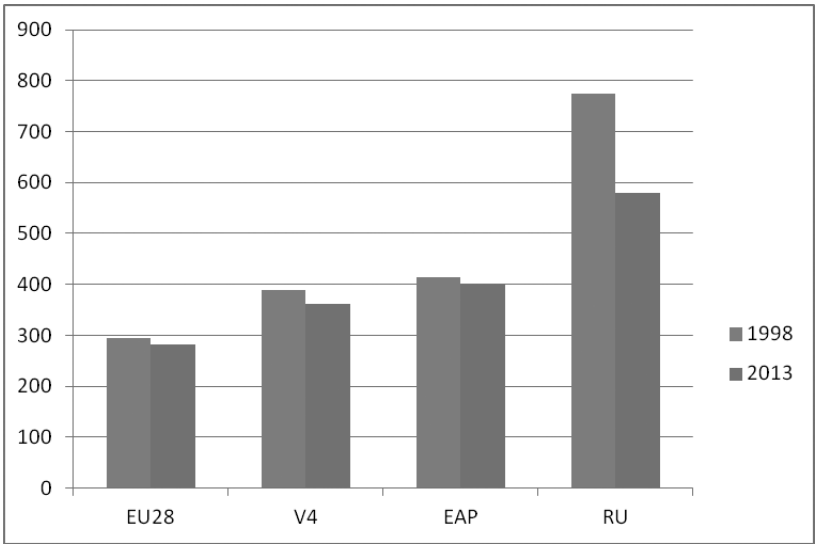
Figure 13. *Industrial output in some European countries, 2005-2014, 2005=100%*



Source: Eurostat, national statistics

Residential consumption has been long in the spotlight of external and internal attention. This is primarily due to its social and political significance, as well as its difficult technological structure It is usually perceived as a top priority issue on national agendas, even if there are no proper domestic capabilities to change the situation or to improve efficiency. Figure 14 below shows that improvements in the residential demand per person are tiny both in the V4 and the EAP3 regions. The Table does not include electricity and oil product consumption (this distorts especially the Russian data considerably), and consequently it focuses primarily on demand for consumption related to heating spaces and water, and for purposes of cooking. The gap between the EU28 and Eastern Europe is still substantial and hardly anything has been done to narrow it.

Figure 14. *Residential coal, gas, heat consumption in 1998 and 2013, ktoe/m people*



Source: IEA

Still, total residential demand constitutes only about 20% of TPES, even less if we exclude electricity. Consequently, one should be cautious about expecting large-scale energy savings or macroeconomic changes by attaining V4 efficiency levels in the EAP3 countries. Closing the roughly 10% gross (without taking into account specific factors like heating degree days) end-user efficiency gap between the V4 and the EAP3, or the 30% gap between the EU28 and the EAP3, the total TPES would decline only by approximately 2.5 and 7.5 Mtoe, respectively. These savings are becoming more and more significant as the total EAP3 TPES sinks. Nevertheless, due to the excessive total energy consumption in 2013 they constituted only 1.7% and 5.1% of the total TPES. Taking into account the complexity of these measures, their time-, capital- and policy-intensive nature, it is not surprising that authorities and energy policies focused on other fields to reduce demand.

Table 7. *The share of residential gas and heat demand in total gas and heat use in Europe, 1998, 2013, %*

	EU28	V4	EAP3	Russia
1998	34.62%	54.62%	30.90%	30.90%
2013	34.28%	46.49%	37.79%	12.80%

Source: IEA

The situation looks a bit different if one looks at the demand for gas and heat separately from coal demand. As Table 7 above shows, V4 households were able to decrease their gas and heat demand substantially (by 13.6% in absolute terms) between 1998 and 2013. This is a major achievement, since this trend goes against the general Visegrad trajectory of the declining share of coal consumption. Not surprisingly, this tendency started after 2004, parallel to the rising oil and gas price levels. Many households opted for coal and, to a lesser extent, biomass as a response. In the EAP3 countries we see an opposite trend: by 2013 residential gas and heat demand had grown by 3.9% in absolute terms. It is even more telling that the trend of slowly decreasing residential gas and heat consumption turned around after 2007. In the midst of gas price debates and booming import prices, the population decreased its coal demand and turned back to heating based on natural gas. This very much appears to be a result of misleading internal pricing. While industry turned to coal and other substitute fuels in the EAP3, raising the price levels of these alternatives, an increasing number of households opted for natural gas instead. This only aggravated the already severe subsidy and macroeconomic sustainability problems in the region, primarily in Ukraine.

Coping with post-Soviet inertia – comparing the EAP3 countries

The three EAP countries are often perceived as having opted for different energy development paths. Apart from their common Soviet legacy, they differ from one another in several respects: the composition of their energy mix, their levels of self-sufficiency, their GDP structure and the role of heavy industry therein, their foreign policy and energy relations with Russia, and the dominant ownership forms in the national economy (Table 8). Naturally, these broad differences also imply substantial variations in their national consumption patterns. In terms of economic growth, Belarus performed fairly well thanks to its sizeable heavy industry, its pronounced orientation towards Russia, and improvement in its terms of trade. In the meanwhile, Moldova was able to reduce its export dependency on Russia, and despite its worsening terms of trade it weathered the 2008 financial crisis and the subsequent period of booming oil prices relatively successfully. Ukraine had an intense debate about its volatile foreign economic orientation and experienced fierce domestic tensions during this period. Nonetheless, its high self-sufficiency ratio provided an important buffer in terms of external price shocks and their management.

Table 8. *Some basic indicators of the EAP3 countries*

	Belarus	Moldova	Ukraine
Share of industry in GDP in 2013, %	42.0	17.1	26.2
Share of merchandise trade in GDP in 2013, %	109.8	99.2	77.0
Share of Russia in total trade in 2012, %	47.4	20.0	29.3
Net barter terms of trade in 2013, 2000=100%	116.9	73.5	94.7
TPES/GDP in 2013, Mtoe/th. USD (2005)	0.59	0.76	1.19
Self-sufficiency in TPES in 2013, %	14.6	9.9	74.0

Source: World Bank, IEA, national statistics

Surprisingly, these differences have not left much of an obvious impact on the improvements of their intensity indicators. Table 9 below shows this ambivalent situation between 1998 and 2013. Despite their rather different energy intensity levels (the Moldovan economy was half as energy intensive than Ukraine in 2013) the three countries have achieved approximately the same level of improvement. These countries were able to improve their intensity levels at an even pace until the crisis of 2009, which hit Ukraine and Moldova hard. However, between 2010 and 2013 the intensity indicators leveled off, and today these countries need only half as much energy for a unit of GDP as in 1998.

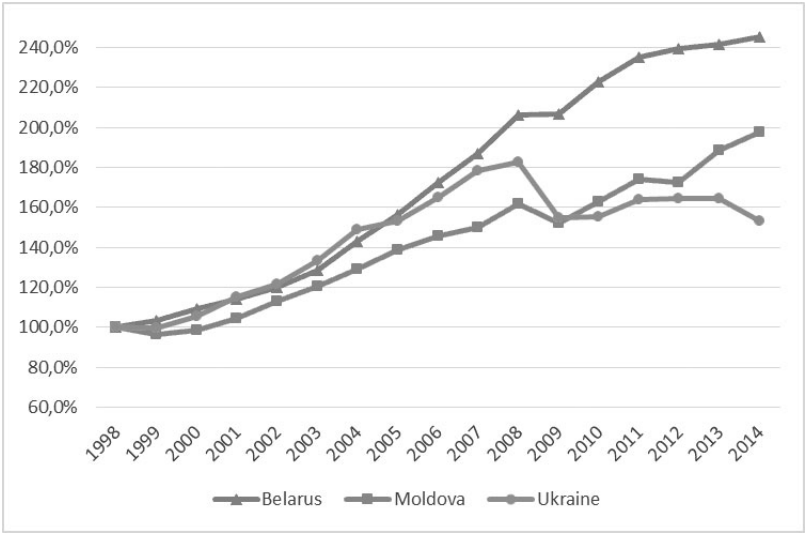
Table 9. *Efficiency trends in EAP3 countries, 1998-2013, TPES/GDP (2005), Mtoe/ths USD, 1998=100%*

	1998	2001	2004	2007	2010	2013
Belarus	100.0%	86.8%	75.2%	59.7%	49.6%	45.7%
Moldova	100.0%	81.9%	72.9%	62.7%	60.2%	45.8%
Ukraine	100.0%	85.5%	71.4%	58.1%	60.6%	49.4%

Source: IEA

It is only logical that the underlying stories are very different in the three cases. In Belarus, much of the improvement stemmed from the robust economic growth during the period. The 2008-2009 financial crisis had a relatively mild impact and economic performance boomed in the aftermath of the crisis. This process was led by industrial production, which outperformed other sectors. This growth was accompanied by a minimal increase in energy inputs (Table 10 and 11). In this regard, Belarus represents an industrial growth model in that is typical of a favorable global and national price environment. In contrast to the situation in Belarus, in Moldova and Ukraine both GDP and industrial production collapsed in 2009 (Figure 15). Moldova recovered quickly, but industrial production did not play an outstanding role in the recovery: its pace of expansion was similar to the growth of other segments of Moldova's economy. Energy efficiency improvements were achieved with only relative loss of growth potential. In Ukraine the crisis led to a severe drop in GDP, which was not followed by a recovery, and industrial output remained sluggish. Industrial energy consumption in Ukraine fell by 37.5% between 2004 and 2014, due to the closure of large segments of energy-intensive industries and stagnation in total industrial output. Thus, Ukraine after 2007 can be characterized as a stagnating economy with a painful structural industrial adaptation process.

Figure 15. *GDP trends in the EAP3 countries, 1998=100%*



Source: IMF

Table 10. *TPES in EAP3 countries, 1998-2013, 1998=100%*

	1998	2001	2004	2007	2010	2013
Belarus	100.0%	99.4%	107.9%	112.3%	110.8%	109.8%
Moldova	100.0%	85.4%	94.5%	94.0%	98.2%	85.9%
Ukraine	100.0%	98.8%	106.0%	102.7%	97.6%	85.6%

Source: IEA

Table 11. *Industrial production in the EAP3 countries, 2004-2013, 2004=100%*

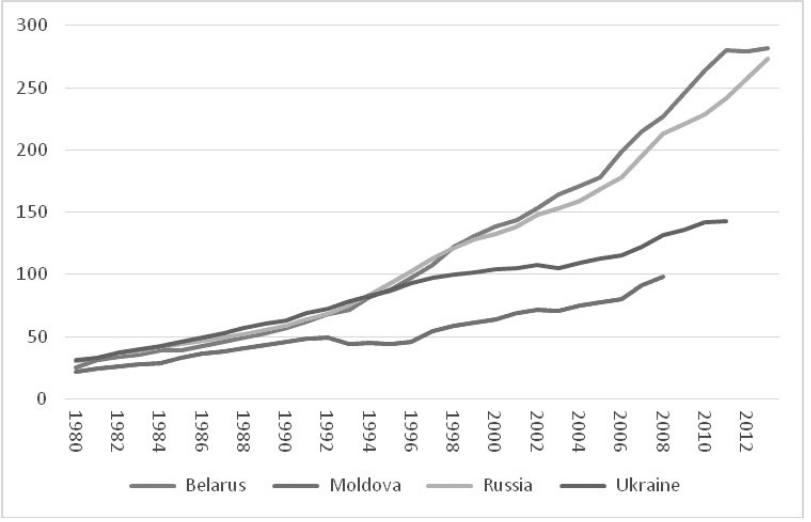
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Belarus	100.0	110.0	122.3	132.8	147.9	143.3	160.0	174.6	184.7	175.7
Moldova	100.0	106.3	99.0	96.3	97.0	75.4	80.7	86.7	84.0	89.7
Ukraine	100.0	103.1	109.5	117.3	111.4	88.5	99.1	107.0	106.5	101.9

Source: National statistics

It is difficult to ascertain the role of energy input prices on these divergent industrial output trajectories. In the case of oil refinement, the situation is rather obvious: this activity practically halted in Ukraine and Moldova, while it prospered in Belarus. Between 1998 and 2007 oil refinement in Belarus surged from 11.6 to 21.5 million tons, becoming the single largest item in the Belarusian energy balance. Due to the Belarusian refinery tolling scheme and lower import prices for domestic use, the country practically became a chain in the Russian rent distribution system. According to IMF estimates, oil price increases alone had a modest but positive direct contribution to growth, boosting it by up to 0.5% of the GDP.[21] The indirect effects of high energy prices, especially through the access to the Russian market, had an even bigger positive impact.

[21] IMF Country Report No. 15/136, Republic of Belarus, May 2015. p 8.

Figure 16. *The number of private passenger cars in the EAP3 countries and in Russia, per 1000 persons*



Source: CISSTAT

Table 12 presents some other sectors in Belarus and Ukraine that have a medium to high energy/raw material input need. The gap between the two outputs was much wider than that between the respective national averages. Ukrainian chemical and metal industries collapsed in 2008-09, and their recovery was much more sluggish after 2010. The Belarusian chemical and metal sectors weathered the crisis relatively well and boosted their performance when the input price gap increased again after 2010. Sectors with higher energy inputs generally outperformed other branches. This is another piece of compelling evidence that besides other factors, like export destinations and domestic economic relations, fuel input prices play a significant role in industrial output.

Table 12. *Industrial output in certain selected branches in Belarus and Ukraine, 2007-13, 2007=100%*

		2007	2008	2009	2010	2011	2012	2013
manufacture of chemicals and chemical products	UA	100.0	91.7	69.1	84.0	103.9	100.0	80.7
	BY	100.0	114.5	135.7	177.1	182.7	219.1	180.1
manufacture of rubber and plastics products	UA	100.0	97.3	66.1	74.6	84.6	79.5	77.4
	BY	100.0	120.6	113.4	139.8	146.8	159.8	162.4
manufacture of basic metals and fabricated metal products	UA	100.0	88.6	63.1	72.7	80.7	77.8	73.6
	BY	100.0	114.4	103.5	126.5	133.5	140.1	132.0

Source: National statistics

Both export volumes and energy input data suggest that growth in the energy-intensive segments of the Belarusian industry stemmed from the improving terms of trade rather than from efficiency improvements. Unlike agriculture and machine industry, the Belarusian exports of major energy-intensive products stagnated in volumetric terms after the mid-2000s. The level of potash and fertilizers exports was volatile, but did not grow in volumetric terms between 2005 and 2013. Oil product exports were around 13.5 million tons both in 2005 and 2013, and except for 2012 they never exceeded 15.7 million annually. At the same time, industrial energy consumption decreased only slightly, by 6.9% between 2007 and 2013. All these data justify the assumption that improving terms of trade had by far the biggest role in boosting industrial growth after the mid-2000s. Structural factors, including improvements in efficiency through modernization and better organization, might also have played an important role, but their impact was not comparable to the changing global price environment or the impact of relatively cheap energy inputs from Russia.

In this regard, the Belarusian energy trajectory is Janus-faced. On the one hand Belarus officially strives for decreasing intensity factors and has been setting a high number of ambitious efficiency targets since the mid-2000s. According to the State Committee for Standardization, the funds spent on attaining energy savings increased by a factor of more than ten between 2001 and 2010, and their value reached 1.17 billion USD in 2010.[22] On the other hand, direct and indirect dependence on high oil prices had been growing substantially as a result of the terms of trade and, more importantly, on account of Russian input price concessions. These create a growing number of negative economic, trade, and political risks. Since 2014 many of the negative pass-throughs generated by the external environment have hit the Belarusian economy, worsening the already severely affected macroeconomic landscape. Energy today constitutes one of the main points of vulnerability for Belarus.

Ukraine and to lesser extent Moldova followed the Belarusian path well until the mid-2000s. Nevertheless, the complex political relationship with Russia hindered any large-scale economic arrangements in these cases. Ukraine and Moldova have been paying European energy prices since the late 2000s, their energy trade status is regarded as least preferred by Russia, and they may even be subjects to boycotts. As Table 8 shows, their terms of trade have deteriorated substantially, especially in the case of Moldova. There were some attempts to insulate some industries from the negative impact of these trade policies, such as the production of fertilizers by Dmytro Firtash in Ukraine, but most of these attempts have failed. Thus, in these two countries the negative impact of the global price environment was full-fledged and it triggered an intense process of adaptation.

In many ways Moldova was better prepared for these adjustments. The share of industry in the national GDP was much lower than in Ukraine, and per capita residential energy consumption was only 37.2% of the Ukrainian level in 1998, owing in part to the lower heating degree day levels. The series of price increases began well before the mid-2000s, allowing for a more gradual adaptation process. Unlike Ukraine, Moldova did not try to implement a massive subsidy regime in the residential gas and electricity sectors or in the tiny heavy-industrial segment. As can be seen in Table 13, the liberalization of utility prices resulted in a sharp increase of the share of housing costs in total household expenditure already in the late 1990s, which led to intense microeconomic reactions. As demonstrated in the Machine Industry Report, in Moldova Western FDI played a considerably greater role in triggering industrial growth and setting management benchmarks than in Belarus or Ukraine, resulting in a more sustainable energy demand trajectory for these segments.

Table 13. *The share of costs for housing and municipal services in total household expenditure*

	1996	1999	2002	2005	2008	2011	2012	2013
Belarus	4.9%	1.8%	6.3%	7.7%	5.4%	4.2%	3.1%	3.3%
Moldova	5.7%	14.7%	16.0%	17.6%	n.a.	n.a.	n.a.	n.a.
Russia	4.8%	4.2%	5.6%	7.0%	6.1%	7.4%	7.0%	6.7%
Ukraine	n.a.	7.7%	8.7%	6.6%	6.8%	8.1%	8.4%	n.a.

Source: CISSTAT

In many regards all these changes made Moldova a bit more resilient to price shocks than many other post-Soviet countries. Early and relatively extensive price liberalization in the residential sectors enhanced individual responses to market fluctuations. Between 2010 and 2013, industrial production in Moldova was able to grow faster than in Belarus, and in this time there was also a significant drop in sectoral energy consumption. Not surprisingly, the share of sectoral investments in GDP remained relatively high in international comparison, especially if the relatively small size of the Moldovan industry is taken into account. Moldova modernized some of its generation units primarily for security reasons, and has achieved a remarkable drop in its rate of network losses (Table 14).

[22] Energy Charter Secretariat, 2013: In-Depth Review of the Energy Effiency Policy of the Republic of Belarus, p73.

Table 14. *Investments into electricity, gas, steam and air conditioning supply, in % of GDP*

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Czech Republic	1.99	1.52	1.20	1.19	0.78	0.87	0.92	1.27	1.33	1.63	2.30	2.05	1.70	1.65	1.59
Hungary	1.36	1.02	0.99	1.16	0.99	0.84	0.83	0.71	0.73	0.87	0.90	0.96	0.58	0.52	0.44
Slovakia	2.66	2.35	1.62	1.45	1.16	1.33	2.68	4.82	1.79	2.09	2.18	2.71	2.41	1.41	2.35
Moldova	1.38	2.14	1.27	1.15	1.69	1.64	2.08	2.18	1.87	1.99	1.75	1.68	1.63	1.02	n.a.
Ukraine*	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.86	1.04	1.81	2.00	1.44

*Excluding the temporarily occupied territories, the Autonomous Republic of Crimea and the city of Sevastopol, for 2014 also excluding the part of the anti-terrorist operation
Source: Eurostat, national statistics

On the whole, energy policy in Moldova remained relatively depoliticized due to the lack of large-scale rent-seeking stakeholders with heavy-industry assets (like in Ukraine) and the lack of a dedicated political cooperation with Russia on energy prices (like in Belarus). In this situation, the conventional considerations of an importer country became dominant in the decision-making process. Thus issues like improving energy security, both in the gas and electricity sectors, and increasing energy efficiency all throughout the value chain, have emerged as priority factors in sectoral decision making, opening up cooperation opportunities with EU and other Western donors.

The patterns of Ukrainian adaptation to the energy price shock were more chaotic. Potentially, Ukraine could have chosen between a relatively energy-intensive development path through cooperation with Russia and securing favorable terms of trade on the one hand, or increasing self-sufficiency and relying on its abundant domestic resources, modernizing its sectoral assets, and triggering some efficiency improvements through moderate price increases on the other. In many respects, the choice between the two policy outputs was determined by considerations outside the sector, like foreign policy and domestic political processes. In this regard it is accurate to say that between 1998 and 2013 the Ukrainian energy discourse became highly politicized and less consistent.

Table 15. *Self-sufficiency in the EAP3 countries, 1998-2013, %*

	1998	2001	2004	2007	2010	2013
Belarus	12.9%	14.2%	13.2%	13.8%	14.4%	14.6%
Moldova	2.5%	3.3%	3.6%	3.3%	6.2%	9.9%
Ukraine	55.0%	56.9%	55.8%	61.0%	59.6%	74.0%

Source: IEA

As is apparent in Table 15 above, among the EAP3 countries Ukraine alone was able to increase significantly its self-sufficiency ratio which had been fairly high to begin with between 1998 and 2013. Roughly two-thirds of this improvement came from a decrease in total TPES, while one-third stemmed from domestic production increases, primarily of coal, but also of nuclear and natural gas. The increase in the levels of self-sufficiency was reasonable in economic terms, since most of the import reduction came from the oil and natural gas sectors. As developments after 2013 showed, these trends could have been sustained further, but only at the price of extraordinary social sacrifices. In contrast to Moldova and Belarus, enhanced self-sufficiency, both through efficiency improvements and a reliance on domestic resources, is a credible response in Ukraine. Nonetheless, self-sufficiency is a capital-intensive policy option. The most important questions are whether Ukraine can modernize its production assets, accumulate sufficient funds, and provide a complex institutional backup to sustain these achievements.

The bulk of the Ukrainian energy infrastructure was built in Soviet times: nuclear plants were built mainly in the 1980s, thermal plants predominantly between the 1950-70s, and the gas transmission network in the 1970s. Unlike Moldova, which has lost much of its generation capacity

due to the Transnistrian conflict, and Belarus, which has invested relatively extensively into new generation capacities and pipelines after 1991, outlays for infrastructure are significant in Ukraine. Consequently, investment liabilities in the generation sectors are huge: the average age of the thermal plant fleet is around 50 years,[23] and the bulk of the nuclear plants will be decommissioned by the 2030s. The problems are further aggravated by the lack of clarity regarding the future of the transit of Russian gas or the falling heat demand in the country. It is still unclear what the policy responses are to these investment challenges, from what sources, in which ownership forms, and in what regulatory framework these issues will be addressed.

This is particularly true for the nuclear sector. Ukraine is heavily reliant on the generation of nuclear power, which supplies about half of its total electricity demand. At the same time, 12 out of its 15 reactors are up for life extension and security improvement projects until 2020, and will have to be decommissioned by the first half of the 2030s. Thus generation capacity is the Achilles-heel of future self-sufficiency ambitions. It is likely that Ukraine will not be able to cope efficiently with the dearth of capitain its energy sector. Consequently, it will also have to reconsider its self-sufficiency ambitions and try to attain a diversified import portfolio in the long-term.

Energy policy overview

Since the mid-2000s, the evolution of energy policy has accelerated in both the V4 and EAP3 countries alike. New strategies, new actors, and new institutions emerged, each with their own distinct set of priorities. In parallel, considerations involving security of supply took the center stage in all these countries. Despite many years of rhetorical and political pronouncements since 1989-91, this was a new conceptual framework for sectoral policies, challenging the prevailing mindsets. Prior to the mid-2000s, energy policy was dominated by industrial policy considerations and supply management attitudes. At the beginning, this was a hostile environment for the idea to establish new, sometimes policy-intensive subsectors (like renewables) or for trying to address efficiency goals and manage energy demand. Supply security was increasingly understood in terms of the diversification of supply between existing subsectors, while the modernization of production patterns or limiting demand were less likely to be considered as options to attain supply security. These attitudes began to change recently, which has led to a significant diversification in the energy policy instruments.

In the chapter below we review the evolution of energy policies, with a special focus on energy efficiency (EE) and renewables (RES). In the V4, these policy frameworks are predominantly set by EU rules. The Visegrad countries assumed numerous obligations – even if often inflated ones – with respect to implementing a wide variety of policy measures in these fields. Policy measures adopted since 2004 show that, despite legal commitments, the shift from conventional sectoral policies to demand management and promoting the generation of renewable energy is relatively slow and sluggish. The EAP3 countries had a free hand in determining what efficiency efforts they took and in setting their renewable targets. As the analysis below shows, these countries have handled these issues differently in their national policies and have sometimes reached inconclusive results.

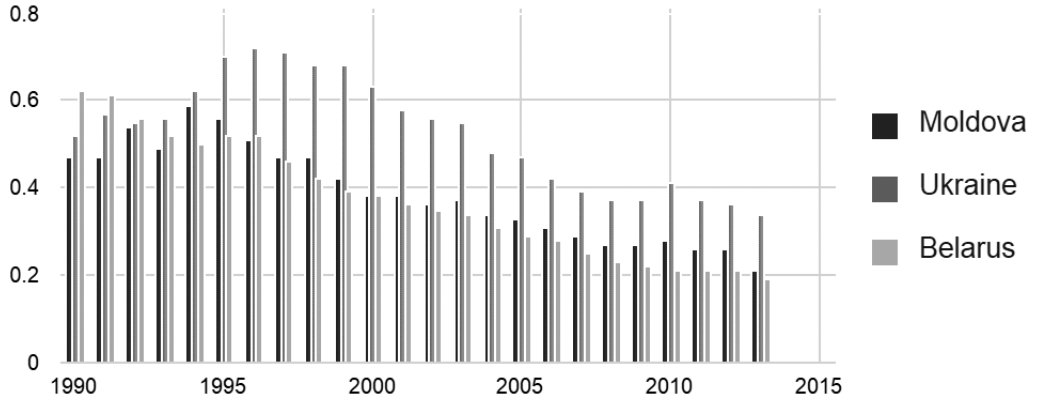
Since the mid-2000s, political pressure and rising energy prices have forced the energy-poor post-Soviet countries to adjust their energy policies to new priorities, such as energy efficiency (EE) and the growing role of renewable energy (RES), in order to reduce their dependence on imported sources of energy. Energy policies in Belarus, Ukraine, and Moldova have pursued the same goals: to enhance energy security and to increase energy efficiency. The methods for achieving

[23] Their average age was at 47 years in 2012. In: Ukraine – 2012: International Energy Agency. p169.

these goals were quite similar in the cases of Ukraine and Moldova, while they were slightly different in Belarus. The respective energy policy trajectories of these countries were mainly determined by the political vectors chosen by them, and these divergent trajectories were confirmed – more or less officially – once again in 2010, when Moldova and Ukraine[24] joined the Energy Community Treaty, while Belarus opted for the Eurasian Customs Union. As a result, the trajectory of Ukrainian and Moldovan energy policy developments was almost the same, especially after signing the Association Agreement with European Union in 2014, which established a political and economic association of these countries with the EU. Through these agreements, both countries committed to bringing their economic policies, legislation, and regulations in a broad range of areas, including energy, in line with the corresponding policies, legislation and regulations of the European Union. Even the legislative framework, which was initially the same in all countries as a result of a common model inherited from the Soviet period, was gradually reshaped to the specific needs and priorities of each country.

The main indicator measuring the energy performance of a national economy is the energy intensity of GDP. However, even this indicator is not sufficient to capture the actual level of energy efficiency, as the energy intensity of GDP can be easily influenced by structural changes in the economy and the different economic profiles of individual countries. A lack of detailed and reliable energy data by sector makes it difficult to measure changes in energy efficiency. Nevertheless, it may provide a general idea about the energy performance of the country in question.

Figure **17**. *Energy intensity (TPES/GDP(PPP)) (toe/1000 2005 USD)*



Source: IEA Energy Atlas

All three countries faced the need to gradually increase gas prices as Russian gas became more expensive. The most affected were Belarus and Moldova, where the share of gas from Russia dominates the TPES. Even Ukraine, which has its own production of natural gas unlike Moldova and Belarus – imports more than half of its domestic demand. This renders the country vulnerable and threatens its energy security (see Table 16). Nevertheless, this was not enough to stimulate energy efficiency improvements in Ukraine and Moldova until a few years ago.

[24] The Protocol on Accession of Ukraine to the Energy Community Treaty was signed in September 2010 and in 2011 Ukraine became the full member of the Energy Community

Table 16. *Macro energy indicators in Moldova, Belarus and Ukraine*

Indicators, 2013	Moldova	Belarus	Ukraine
Self-sufficiency, %	10	15	74
Total Primary Energy Supply (Mtoe)	3.07	27.28	116.14
Energy Intensity (TPES/GDP(PPP)) (toe/thousand 2005 USD)	0.21	0.19	0.34
TPES/population (toe per capita)	0.96	2.88	2.55
Share of gas in TPES (%)	68.4	55.5	35.1
Self-sufficiency of natural gas, %	0	1	38.8
Share of Industry in Total Final Consumption (%)	22	34	38

Source: IEA Statistics

An analysis of the evolution of energy intensity in the countries surveyed over a period of more than 20 years shows a continuous decline despite increasing industrial production volume in all three countries. This is explained by the – occasionally modest – efforts in these countries to reduce their energy consumption. Another explanation for the continuously decreasing energy intensity against the backdrop of a growing GDP is the structural change ongoing in these economies, where the service sector has gained a significant share of the economy and the most energy inefficient industrial enterprises have gone bankrupt.

The energy consumption in buildings, especially residential and public buildings, represents a significant share in the TPES of these countries. In light of increasing energy prices, energy policy has recently considered this sector as one of the most promising in terms of reducing energy consumption. In this context, Moldova has already adopted the law on energy performance of buildings which transposes the EU directive 2010/31/EC while Ukraine has drafted the law.

In terms of investments, Belarus started to invest massively in energy efficiency prior to Moldova and Ukraine. The authoritarian regime and the small share of privately owned enterprises limit the capabilities and sustainability of this sector. Nevertheless, public investments in energy efficiency are higher in Belarus than in Ukraine and Moldova.

Tariffs play an important role in stimulating energy efficiency, especially in countries with a market economy. Although the tariffs for electricity and gas were near cost recovery levels in the past years, the respective tariffs applicable to different customer categories remain misbalanced in Belarus and Ukraine. Another important issue are the debts of the energy companies, which affect the financial viability and the energy security of the countries concerned. Regulatory institutions, responsible tariff setting have different forms of subordination in the three countries. The regulatory role in Belarus is exercised by the Ministry of Economy, which lacks the autonomy to properly perform the regulatory functions with regard to state-owned energy companies.[25] In Ukraine and Moldova, there are dedicated autonomous agencies.

Energy efficiency plays an important role in the energy policy of all three countries, which is also reflected in the main national development documents, such as strategies and programs. The implementation of the policies on energy efficiency began earlier in Belarus than in other post-Soviet states, when the government created a Committee for Energy Efficiency and Control in 1993. In Ukraine, the first law on energy conservation was adopted in 1994, while in Moldova the first law on energy conservation was adopted only in 2000. In parallel with the policies on energy efficiency, renewable energy sources started to penetrate the energy markets in these countries. In their dedicated national policies, these countries set ambitious goals for renewable energy and primary source diversification. Belarus established a goal of attaining a 25% share of

[25] Belarus: Addressing challenges facing the energy sector, World Bank, June 2006. Available at: http://siteresources.worldbank.org/BELARUSEXTN/Resources/BelarusEnergyReview_July2006-full.pdf (29.05.16), Infrastructure Department Europe and Central Asia Region.

alternative and renewable sources in its primary energy mix by 2020, without any efficiency targets.[26] Moldova and Ukraine set both energy efficiency and renewable targets for the period until 2020.

Over time, the institutional and policy framework in energy efficiency has improved significantly, but its implementation remains challenging. In most cases, this problem owes to a lack of well-designed secondary legislation that sets out in detail the rules and procedures for sector governance while it also considers how to provide rule of law guarantees in the sector. In addition, legal acts appear to be amended regularly without subsequent changes being made to other related acts, leaving them vulnerable to multiple interpretations and shadow practices.[27] The attempts to create authorities responsible for EE and RES policies in horizontal, inter-ministerial coordination often fail to deliver the necessary results. Simultaneously, the responsibility issue remains acute, as these countries have a relatively low number of directives that mandate certain responsibilities for corporate stakeholders. Consequently, the implementation of administrative measures remain highly selective and there is no consistent separation of responsibilities between the actors in the sector.

The relatively low energy prices compared to EU average in the countries surveyed represent a drag on legal initiatives that promote energy efficiency. The most important explanation for this is the low number of bankable energy efficiency projects before 2010-2011, when the energy prices reached a peak in Ukraine and Moldova, though they were lower in Belarus. This is partly due to the absence of markets related to energy service companies (ESCO) in these countries. This may also owe to the fact that energy efficiency technologies come from countries where energy prices are higher, and energy efficiency is used as a tool for both increasing competitiveness and a way to reduce energy bills.

Despite the adoption of key primary legislation, the absence of secondary legislation, missing regulations, and sectoral norms often hinder the implementation of energy efficiency investments. The slow pace of the development of secondary legislation in Ukraine and Moldova was also criticized by the Energy Community Secretariat. By using the old Soviet Construction Codes and Regulations, which do not consider energy efficiency as an important criterion, the quality of the energy efficiency measures and huge investments become compromised. The financial assistance provided by the EU for investment projects comes with specific requirements regarding the standards to be applied. This makes the implementation process difficult, but at the same time it also pushes governments to be more active in the development of secondary legislation.

All three countries take a slightly different approach to the implementation of their energy efficiency policies because of differences in their respective macroeconomic profiles. Ukraine has the biggest energy efficiency potential in the industrial sector, especially in heavy industry, while Moldova and Belarus consider that energy efficiency in the building sector has the biggest potential for reducing energy consumption. From an energy security perspective, the replacement of imported energy sources with green energy production, especially biomass, could be a medium or long-term solution. The major share of natural gas in the country's energy balance is also an issue when the increase of the gas price affects the entire national economy. According to the Table 17, we observe a similar approach in terms of establishing targets in the case of Ukraine and Moldova, countries that are committed to the EU energy path and have adopted the same targets as the EU based on a top-down approach, while in case of Belarus the targets seem to be more realistic.

[26] Incentivising Renewables: The Baltics and Belarus, 2011, Clifford Chance. Available at: http://www.cliffordchance.com/briefings/2011/02/incentivising_renewablesthebalticsandbelarus.html (29.05.16)
[27] OECD/IEA report, 2015

Table 17. *A comparative table on energy targets*

Targets	Moldova	Belarus	Ukraine
Energy intensity of GDP	Reduction by 10% until 2020 compared to level of 2009	Reduction by 13% until 2020 compared to 2010 (from 426 to 370)	Reduction by 20% until 2020 compared to 2014
The efficiency of total primary energy use	Reduction by 20% until 2020 based on the reference year 2009	-	Reduction by 9% until 2020 based on the average of 2005-2009
The share of renewable energy sources in the total energy mix	17% by 2020	6% by 2020 and 8% by 2030	11% by 2020

Source: author's compilation

Moldova

The energy sector in Moldova has a similar development pathway as that observed in other post-Soviet countries. Energy efficiency and energy security have emerged as strategic priorities since the Republic of Moldova became independent. The first energy strategy was adopted in 1997 and it was replaced by other strategies in 2000, 2007, and 2013. Even though energy efficiency was reflected in some shape or form in other energy policy documents, the first actual law on energy conservation was adopted in 2000. Despite the administrative framework and numerous instruments to promote energy efficiency, no significant progress has been achieved over a period of 10 years. The year 2010 saw the adoption of the law on energy efficiency, which transposed Directive 2006/32/EC. Based on this law, the Energy Efficiency Agency and Energy Efficiency Fund were established and the National Energy Efficiency Program 2011-2020 was adopted. In order to implement the program, the National Energy Efficiency Action Plan was adopted for the period 2013-2015. With a much stronger commitment by Moldova, and generous support from international energy donor and funding institutions, significant and promising progress was achieved.

The key currently effective policy documents for promoting energy efficiency are:

- Law on renewable energy sources, 2007;
- Law on energy efficiency, 2010;
- Law on electricity, 2009;
- Law on natural gas, 2009;
- Law on energy performance of the buildings (in line with 2010/31/EU directive), 2014;
- Law on energy labeling, 2014;
- Energy strategy 2030, 2013.

The National Energy Efficiency Program 2011-2020 specifies the objectives of increasing the share of renewable energy sources in the total energy mix of Moldova from 6% in 2010 to 17% by 2020, and to increase the efficiency of total primary energy consumption by 20% until 2020, based on 2009 as the year of reference.

Analyzing the progress achieved by Moldova in terms of energy intensity, a relatively constant decrease was registered. Since 1996, energy intensity decreased from 0.51 toe/1000 2005 USD (PPP) to 0.21 toe/1000 2005 USD (PPP) in 2013. Compared to OECD energy intensity of 0.13 toe/1000 2005 USD (PPP) in 2013, the factor of difference between the two figures is 1.6.

Real financial support for energy efficiency began only in 2013, after the establishment of the Energy Efficiency Fund. Hundred million MDL were available for investments in 2012, and about 465.2 million MDL were planned for 2015.

Renewable energy sources are considered a viable method for enhancing the energy security of Moldova. Nevertheless, this sector did not achieve significant progress. Overall, capacities

totaling 2.02 MW of solar energy, 1.1 MW of wind energy, and 112.57 MW of biomass heating had been built by 2015. According to research performed on the subject, biomass has a huge potential in the production of heat energy. It could replace about 50% of natural gas imports from Russia.[28] However, the actual realization of this potential is slow due to various factors, such as: 1) political and institutional resistance; 2) relatively new market and technologies; 3) access to wood procured from illegal logging, etc.

Between 1997-2012 the price of electricity increased from 679 MDL/MWh to 2,245 MDL/MWh (average). The price of electricity increased steeply – by around 200% – after 2006. Natural gas prices have been rising steadily, resulting in a tariff increase from 454 MDL per 1,000m^3 in 1997 to 6,830 MDL per 1,000m^3 in 2015. Since 2006, natural gas prices has shown a steep increase of around 340%. The main reason for the significant increase in gas tariffs was the new agreement with Gazprom in 2006, which stipulated that by 2011 gas prices would be adjusted to the price level of EU consumers. With respect to the reflection of costs in the prices of gas and electricity paid by final consumers, both private and residential sectors are paying market price levels. The only difference is the residential sector's VAT exemption.

Belarus

Belarus began to focus on energy efficiency policy somewhat earlier than Moldova and Ukraine. The government created a Committee for Energy Efficiency and Control in 1993 (which was subsequently transformed into the Committee for Energy Efficiency and then, in 2006, became the Department of Energy Efficiency of the State Committee for Standardization of the Republic of Belarus). In 1998 the first Law on Energy Savings was adopted.

The key documents – in force at the end of 2015 – which support the development of energy efficiency policies are the following:

- Resolution № 1084 of the Council of Ministers of December 23, 2015 "On the concept of energy security of the Republic of Belarus";
- Law №239_3 of the Republic of Belarus of January 8, 2015 "On energy saving";
- Law № 204-3 of the Republic of Belarus of December 27, 2010 "On renewable energy sources";
- Directive № 3 of the President of the Republic of Belarus of June 14, 2007 "Economy and thrift – the main factors of the state's economic security";
- Presidential Decree № 550 of December 1, 2014 "On the most important parameters of socio-economic development of the Republic of Belarus for 2015";
- Resolution № 1238 of the Council of Ministers of December 24, 2014 "On indicators of socio-economic development of Belarus for 2015"; etc.

A number of programs were developed for the purpose of implementing the energy efficiency policies of the Republic of Belarus. These include the following:

- National Energy Saving Program for 2011-2015;
- National Program for the development of local and renewable energy for 2011-2015;
- State program for the construction of energy sources on local fuels in 2010-2015;
- State program in Belarus for the construction of hydroelectric power stations in 2011-2015;
- State program for the development of the Belarusian energy system until 2016.

[28] *Estimating the energy potential of biomass from agricultural crops at regional and rayon levels for 2009-2010* Study prepared by IDIS "Viitorul" under the Moldova Energy and Biomass Project funded by the European Union, co-funded and implemented by UNDP Moldova.

Analyzing the most relevant documents it can be observed that energy efficiency is a priority also from an energy security point of view. The Republican Energy Saving Program developed over the period 1996-2015 plays a central role in this regard. As it is presented in the table below, the government has significantly increased the amount of funds for all energy efficiency promotion programs. It is also important to point out the ambitious targets set out in the last program, according to which energy intensity should drop by 50% by 2015 compared to the 2005 level. To meet this goal, the government anticipates investments of 8.6 billion USD. However, this goal was not attained in 2015 (energy intensity fell only by 11.3% between 2010 and 2015). In the most recent edition of the Belarusian energy security concept for the period between 2015 and 2020, energy intensity is projected to drop only by 2.1%.

Table 18. *Investments into energy efficiency in Belarus, mln. USD*

National Program for Energy Savings	1996-2000	2001-2005	2005-2010	2011-2015
Investments, million USD	370.5	795.0	2,600	8,662[A20][29]

Source: Compilation from the Energy Efficiency Programs of Belarus Republic

The gas price increase imposed by Russia was a strong argument in favor of focusing on energy efficiency as one of the measures to enhance energy security and to mitigate the eventual impact of the price increase on the economy and the population. This was one of the reasons for increasing investments in the third energy saving program, from 795 million USD to 2,600 million USD, and to do the same in the fourth program, which saw its funding grow from 2,600 million USD to 8,660 million USD.

An analysis of the changes in GDP and energy intensity during the time when these programs were being implemented reveals that the economy's energy intensity was decreasing continuously, improving by a factor of about 2.7. Compared to Ukraine and Moldova, the Belarusian economy has made the most progress. Between 2001-2008, the average annual GDP growth was 8.3%. Growth slowed substantially due to the global economic crisis of 2008-2009: it dropped to 0.2% in 2009. Tight monetary and fiscal policies in late 2011 and throughout 2012 helped to restore macroeconomic stability in the country by 2013. The influence of the government over the economy, as well as administrative interventions in credit allocation and the widespread use of subsidies, played an important role in this process.[30] The country's close relationship with Russia, which was also officially reinforced by the creation of the Customs Union in 1995, needs to be highlighted here.

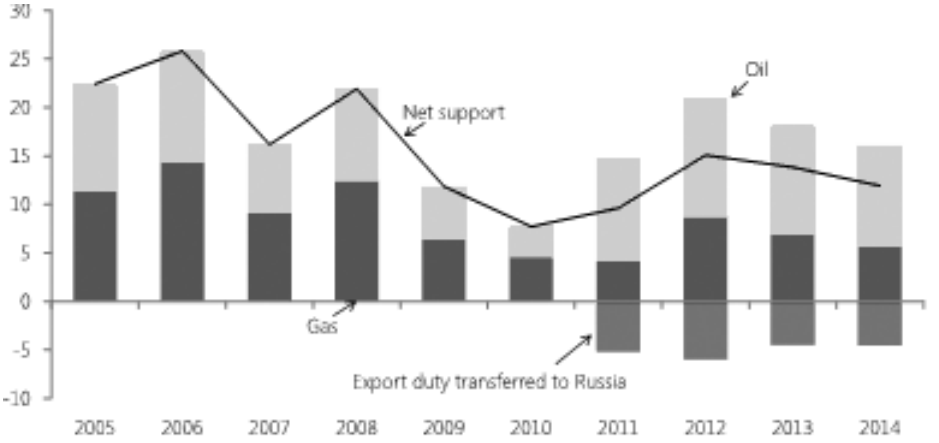
Despite the gradual gas price increases imposed by Russia in 2006, the overall change in price was much more modest in Belarus than in Moldova or Ukraine. In 2014, the average import price for gas was about 175 USD/1000m3 in Belarus, compared to 385 USD/1000m3 in Ukraine and 377 USD/1000m3 in Moldova. The preferential gas price for Belarus created an important competitive advantage for its economy as compared to Ukraine and Moldova. The annual level of Russian price support as a percentage of Belarusian GDP remained constant during the last two decades. Only in 2014 did the price support for Belarus, which results from discounted prices on gas and duty-free oil for Belarus' domestic needs, climb to over $6.2 billion or 8.1% of GDP.[31]

[29] ПОСТАНОВЛЕНИЕ СОВЕТА МИНИСТРОВ РЕСПУБЛИКИ БЕЛАРУСЬ 24 декабря 2010 г. № 1882 Об утверждении Республиканской программы энергосбережения на 2011–2015 годы

[30] Belarus ENERGY Sector: The Potential for Renewable Energy Sources and Energy Efficiency, 2014. Available at: https://ener2i.eu/page/34/attach/0_Belarus_Country_Report.pdf (29.05.16)

[31] Ales Alachnovic How Russia's Subsidies Save The Belarusian Economy, Ales Alachnovic, 26 August 2015, Available at: http://belarusdigest.com/story/how-russias-subsidies-save-belarusian-economy-23118 (29.05.16)

Figure 18. *Russian price support of energy trade to Belarus, % of GDP*



Source: http://eng.kef.research.by/webroot/delivery/files/english/KEFe2015_Bakker.pdf

The focus on public investments in energy efficiency, co-opting the private sector, is one of the weak points of Belarusian energy policy. Due to the absence of market conditions public investments are often not used in the most efficient way and are limited. On the other hand, raising energy prices to a justified, cost-reflective level is a precondition for making the private sector interested in investing in energy efficiency. Due to price acceptability, the level of dependence on energy imports has not changed over the last decades. At the same time, Belarus has demonstrated a capability to diversify its energy imports by importing oil from Venezuela and Azerbaijan between 2010-2012.[32]

Another way to enhance energy security is development of local RES. To this end, Belarus adopted the National Program for the Development of Local and Renewable Energy between 2011-2015. The most relevant achievement registered by the end of 2013 are the following:[33]

- 23 biogas plants with a total capacity of 24.33 MW;
- 24 solar power installations with a total capacity of 51.75 MW;
- 28 operating wind turbines with a total capacity of 6.57 MW;
- 100 geothermal installations with a total capacity of 5.5 MW).

Ukraine

The first law on energy conservation was adopted in Ukraine in 1994, the year that also saw the creation of a State Committee on Energy Conservation. Without adequate financing and political support, only modest progress was made over a period of about 10 years. In 2005 the State Committee on Energy Conservation was disbanded by a Decree of the President of Ukraine. In the same year by Presidential Decree ordered the creation of the National Agency of Ukraine for Efficient Usage of Energy Resources. The new government agency has broader responsibilities than the committee that preceded it. The National Agency was replaced by the State Agency on Energy Efficiency and Energy Savings (SAEE) in 2011.[34]

[32] Alexander Cajcyc Belarus To Diversify Away From Russian Oil Supplies,16 March 2010, Available at: http://belarusdigest.com/story/belarus-diversify-away-russian-oil-supplies-1891 (29.05.16)
[33] Belarus ENERGY Sector: The Potential for Renewable Energy Sources and Energy Efficiency, 2014
[34] Climate change legislation in Ukraine, The 2015 Global Climate Legislation Study. 2015. Available at: http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/05/Global_climate_legislation_study_20151.pdf (29.05.16)

The key energy policy documents on the subject of energy efficiency and energy security are:

- Law of Ukraine on Energy Conservation, 1994;
- Law of Ukraine on Electricity Industry, 1997;
- Law on Electricity Market, 2014;
- Law on the Natural Gas Market, 2015;
- Law of Ukraine on Alternative Types of Fuel, 2000;
- Law of Ukraine on Alternative Types of Energy Sources, 2003;
- Law of Ukraine on Combined Production of Heat and Electricity (Cogeneration) and Use of Waste Energy Potential, 2005;
- Law of Ukraine on Heat Supply, 2005;
- Energy Strategy of Ukraine 2030, 2013; etc.

The main national energy policy document is the 2030 Energy Strategy, the final draft of which was approved in February 2014. The main targets established by the strategy are: to reduce the energy intensity of GDP by 20% by 2016, as compared to the 2008 value; to reduce the energy intensity of GDP by 50% by 2030; to reduce electricity losses through power grids from 14.7% in 2005 to 8.2% by 2030.[35] In the revised strategy, energy efficiency and energy security have become a higher priority against the backdrop of the disputes with Russia concerning gas supply and gas price increases, which exceeded 400 USD/1000m3 in 2013.

The following programs and plans were drawn up to implement state policies on energy efficiency and energy security :

- State Target Economic Program on Energy Efficiency for the period 2010-1015;
- National Renewable Energy Action Plan up to 2020;
- National Energy Efficiency Action Plan up to 2020.

The implementation of the National Energy Efficiency Action Plan up to 2020 will be funded with a total amount of 1011.3 billion UAH, allocated from different sources.

Analyzing the evolution of Ukraine's energy intensity since 1996, we see a continuous decrease, except the period 2009-2010, the time of the global crisis. So starting in 1996 energy intensity decreased from 0.72 toe/1000 2005 USD (PPP) to 0.34 toe/1000 2005 USD (PPP) in 2013. Compared to the OECD's average energy intensity of 0.13 toe/1000 2005 USD (PPP) in 2013, the Ukrainian value is more than 2.5 times higher, and the implication is that Ukraine can be characterized as one of the most energy intensive countries globally. At the same time, this difference also reveals that there are vast reserves in terms of reducing the energy intensity of the Ukrainian economy. A reduction of the energy intensity by about 26% of the 2013 level hypothetically would be enough to put an end to Ukraine's dependence on imported energy sources. An alternative, but more expensive scenario would be to replace imported natural gas with biomass. REMAP 2030 revealed a biomass potential of 813 PJ[36] in 2013, the utilization of which could reduce imports by about 20%. Analysis of changes in the volume of industrial products sold between 2001-2013 (current prices) shows that this indicator grew more than six-fold during thus period, while at the same time energy intensity decreased 1.7 times which demonstrates a good performance.

RES are expected to contribute significantly to greater energy security in Ukraine. During the last four years, this sector has started to demonstrate significant progress. At the end of 2014, there

[35] Ibid.
[36] REMAP 2030 Renewable Energy National Energy Efficiency Action Plan Through 2020, Prospects for UkraineApril2015, Available at: https://www.irena.org/remap/IRENA_REmap_Ukraine_paper_2015.pdf (29.05.16)

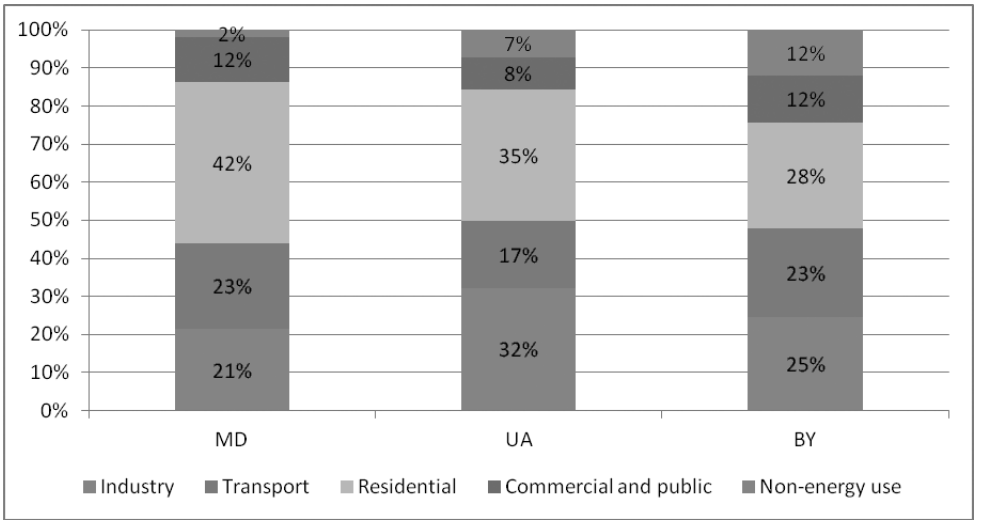
were power plants in operation with the capacity to generate[37] 497 MW wind, 818.9 MW solar and 49.1 MW of biomass (including biogas) energy.[38] The installed capacity of power plants generating heat from renewable energy sources amounts to 520 MW (as of October 2013).

A major barrier in stimulating households to conserve energy is the financial burden borne by the energy industry, which subsidizes the electricity consumption of the public and residential sectors. After numerous official declarations that at public and residential prices would be adjusted to reflect actual energy market prices, a new deadline, April 2017, was set in line with International Monetary Fund and World Bank obligations.[39] Residential prices for electricity and gas were increased substantially in 2015. This is a multi-step process and prices will reach cost-recovery levels of 2014 by 2017.

Residential energy efficiency and district heating

Residential sector has the biggest share in energy consumption in the EAP3 countries. In Moldova residential consumption constitutes 42%, in Ukraine 35% and in Belarus 28% of total demand, respectively. Industry ranks second in Belarus and Ukraine while in Moldova only third after transport. The diagram presented in Figure 19 reflects the composition of demand and the economic profile of the countries. In this regard residential sector is a major segment with significant efficiency potential.

Figure **19.** *Share of energy consumption per sectors in EAP3 countries in 2013, %*



Source: IEA

Natural gas is the main energy source used in the residential sector, it had a 26% share in EAP3 and 27% share in V4 countries according to IEA data for 2013. In the EU28 space heating is dominant accounting for 68 % of the total final energy household demand in Europe (Figure 20).[40] Only 11 % of the final energy demand comes from non-heating and cooling purposes. Space cooling is a relevant end-use category for certain countries in Europe, however, the overall share of the final energy demand in the European residential sector is negligible. Poland, Hungary and Slovakia have the highest shares of heating in total final consumption within OECD.

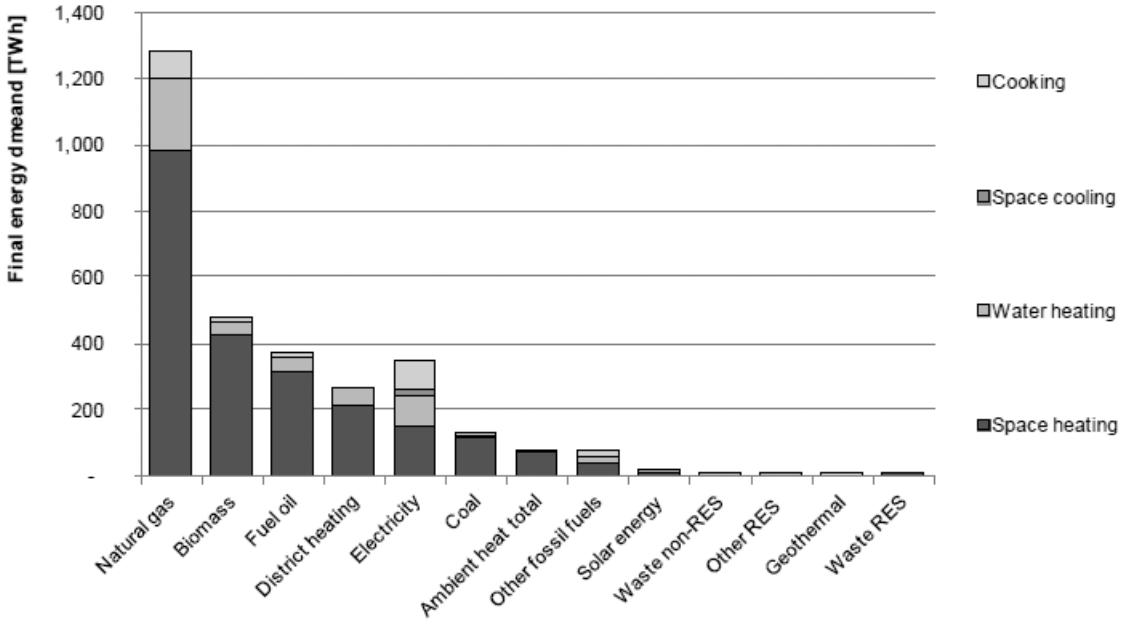
[37] Ibid.

[38] National Renewable Energy Action Plan (NREAP) 2020, Available at: https://www.energy-community.org/portal/page/portal/ENC_HOME/DOCS/3430146/067A653E3AF24F62E053C92FA8C06D31.PDF (29.05.16)

[39] Energy Community Country Brief, Spotlight on Ukraine, Issue 2, 13 November 2015

[40] Mapping and analyses of the current and future (2020-2030) heating/cooling fuel deployment (fossil/renewables), Work package 1: Final energy consumption for the year 2012. Available at: https://ec.europa.eu/energy/sites/ener/files/documents/Report%20WP1.pdf (16.05.16)

Figure 20. *Final energy demand by residential end-uses and energy carriers in EU 28*



The membership of Ukraine and Moldova in the Energy Community facilitates the interest of international investment institutions in energy efficiency projects including residential sector. A good example is the Residential Energy Efficiency Financing Facility provided by EBRD, offering funds up to €75 million to Ukraine and €35 million to Moldova. The financing instrument provided by EBRD has a high importance even if the results are not the desired ones. There are various barriers related to the high interest rates of the local banks, lack of experience in cooperation with home owners associations, low family incomes, inadequate public awareness of the benefits of EE projects, etc.

A common issue for all the three EAP3 and V4 countries are the Soviet-designed flat houses and/or the accompanied generation and district heating systems. District heating is a complex value chain, that can provide an efficient space heating solution if managed in a conscious, well-regulated way. Most of the EU15 countries have higher utilization of central heating than in Eastern Europe.[41] Some Nordic countries with 90-100% share of central heating within space heating are typical examples of good governance in these specific sectors. Nonetheless, this requires efficiency measures at every stage of the system: at house insulation and at end-user measures; at the level of the heat distribution network; and in particular in the generation sector. It is very telling that Nordic countries usually consume less heat per square meter/heating degree day due to better house insulation than some Southern or Visegrad members: i.e. an average Finnish flat requires 20% less heat than a Polish one. Distribution losses depend not only on the technical characteristics of the network, but also on its density. In Scandinavia disconnection is often administratively banned, thus the network can be planned with high certainty and less demand volatility. At last, high representation of combined heating in total generation provides high efficiency levels. It also enhances waste or RES utilization, which may provide some diversification benefits and less price volatility.

Unlike the Nordic countries, EAP3 and V4 states could not develop their CHP-DH regimes in a smooth, gradually extended way. Their systems were designed closely connected to Socialist industrial considerations. Plant closures and recession in the 1990s, privatization of the housing

[41] David Andrews; Anna Krook Riekkola; Evangelos Tzimas et al.: Background Report on EU-27 District Heating and Cooling Potentials, Barriers, Best Practice and Measures of Promotion, EC JRC, 2012. p29. Available at: https://setis.ec.europa.eu/sites/default/files/reports/Background-Report-on-EU-27-District-Heating-Cooling-Potentials-Barriers-Best-Practice-Measures-Promotion.pdf (29.05.16)

stock and the absence of modernization brought many further inefficiencies into the value chains. While in Sweden and Finland total heat consumption doubled between 1990 and 2014, in Poland and Ukraine its total (industrial and residential) consumption fell by two-thirds, in Hungary and Czech Republic demand halved in the same period. Thus, besides managing the original problems of low technical quality and low efficiency, these systems also need a considerable redesigning, optimization of their capacities. Consequently, it is reasonable to address the residential district heating systems in a holistic, dedicated way in the years to come.

The usual size of district heating operators or the number of supplied households (i.e. in Hungary 16%, in Ukraine 43% in 2011) varies heavily both within V4 and EAP3. The public image of district heating is relatively bad in most countries either because of high prices and/or unreliable services. Nonetheless, there is a high number of characteristic differences between V4 and EAP district heating systems. As Table 6 already indicated, in V4 heat production mainly comes from cogeneration. Heat-only plants still have significant shares in both regions, but aggregates for V4 are much lower than EAP3 proportions. EAP3 shares of heat-only plants remained three times bigger than in V4 both in 1998 and 2013. This is one of the major sources of higher intensity indicators and consequently higher costs in the sector. Combined systems are undisputedly more efficient than heat-only plants. The respective EU regulations (since 2004 when the EU Directive on Combined Heat and Power, 2004/8EC was accepted) and the accompanied reporting system and planning regime are important policy tools for the V4 countries.[42]

Second, the housing stock in many regards differs in the two regions: in V4 the Soviet-type block houses have a relatively smaller share in the total housing stock. According to Eurostat, the V4 shares of flat houses with 10 or more flats were between 26.8% in Hungary and 45% in Slovakia in 2011.In comparison: in all Baltic states these proportions were above 50%.[43] This opened the way for a faster modernization of the housing stock, metering and enhancement of individual regulation of heating in the Visegrad countries. Refurbishment of old housing stock is sometimes limited by technical factors, but the price liberalization and the relatively high cost of heat supply provides a major motivation even for larger household communities to limit demand. In the countryside, the relatively small unit size of housing blocks enhanced easier disconnection from the network, in some cases resulting in the final closure of inefficient systems and their substitution with house or individual heating. This partly explains the relatively high penetration rates for small-size CHP gas turbines as an alternative to medium-size, outdated plants in V4. In general, for the V4 countries the challenge of district heating modernization was less acute in terms of the whole energy policy landscape, even if the nature of problems were rather similar.

The management of district heating is a very policy-intensive field, in which a high level of differentiation is required. Practically every single plant differs, many stakeholders and ownership relations are involved, creating a complex environment for decision making. The low quality of the service and the lack of proper investment in the system caused massive disconnection of the consumers and switch to individual gas boilers, especially in multifamily houses. These lead to the bankruptcy of many centralised heating companies and the extension of related subsidy regimes. This trend was particularly strong both in V4 and EAP3, parallel to the construction of new housing in the 2000s and the rise in natural gas prices since 2003. Practically all countries introduced similar measures, lowering the tariffs or the related taxes and/or administratively regulating disconnections, in some cases practically banning it in order to demotivate consumers to switch from centralized system to individual heating systems. Different measures were implemented: the authorities imposed up to 20% payment of the bill for centralized heating system for apartments which have neighbor apartments connected to this system in Moldova. In Hungary

[42] The respective national reports can be found at: https://ec.europa.eu/energy/en/topics/energy-efficiency/cogeneration-heat-and-power

[43] Table „Distribution of population by degree of urbanisation, dwelling type and income group”

the VAT rate for district heating was lowered to 5% (the general VAT rate is 27%) and in multi-storey buildings 100% approval rate is necessary for disconnection, making it nearly impossible.

In the V4 countries the management of district heating was accompanied by other policy measures, primarily related to the fulfilment of the respective EU commitments. Both EU Directive on Combined Heat and Power (2004/8EC) and Directive on Renewable Energy played a certain role in this regard. Increasing cogeneration level remained a policy target, resulting in some support schemes, enhancing the instalment of small-scale generation gas engines and some medium-sized CHP units. In parallel, renewables and waste approached 8% in total CHP and heat-only generation by 2013. It is very telling, that V4 countries used more RES in CHP than the EAP3 countries altogether. If we add tariff policy to these measures, it is reasonable to say that V4 energy policies created a more diversified and reliable framework for district heating than in the EAP3. EU regulations constituted the main driver of change, even if implementation varies substantially from country to country.

Nonetheless, in the sphere of district heating, the potential impact of non-dedicated, nation-wide policies bring suboptimal results if not accompanied by differentiation on the regional or municipal levels. Price regulations are not the only factor in this regard. For example, in Ukraine the low residential gas prices prompted many households to disconnect, aggravating the implications of an already costly policy measure. At the same time early price liberalization in Moldova (Table 13) led to a drastic drop in the share of central-heated dwelling spaces from 89% in 1990 to 28.4% in 2007 (even if it increased again to 39.3% by 2013). In Belarus and Ukraine the similar shares in 2013 were 73.9% and 64.9% respectively. Many heating plants were mothballed or even closed down in Moldova, while individual responses to price increases became possible. Consequently, biomass and waste utilization grew rapidly in the final consumption after 2004 reaching 9% of the total and 26.7% of residential demand in 2013 (8.8% in Belarus, 4.2% in Ukraine). Nevertheless, the Moldovan case remains highly controversial: while it also enhanced more individual responses to domestic price fluctuations, it also resulted in lower district heating densities, aggravating the already existing problems in the subsector.

Looking at the significant liabilities and worn-out technical equipment through the EAP3 countries, in particular in Ukraine, the region has a chance to considerably redesign its generation landscape in the decade to come. It is important to make specific, case-by-case decisions: given the extremely old thermal generation and distribution assets, disconnection and fragmentation of the system can be a reasonable response in certain cases. In the case of Moldova or Poland, some countryside operators successfully stopped their production and changed to individual/block heating, creating a more reliable service. In some cases full modernization of the housing stock and successively the refurbishment of the network may provide lower tariffs in the medium term. Understandably the current deadlock, when operators insist on their activities but are not capable to renovate their production assets, is far from optimal. In this regard the two major challenges are the high number and diversity of actors and interests involved (households, DH operators and owners, municipality, state institutions, donor/investor) and the fragmentation of funds between too many systems. Usually investment funds if provided, are sufficient only for partial refurbishment of the system, preserving, sometimes even increasing inconsistencies in the network.

One of the major dilemmas these countries face is whether to refurbish the system or the housing stock first. Optimally the housing stock refurbishment with metering, insulation and replacement of windows and doors shall be the first step, since these measures can decrease the aggregate demand by 40%. Nevertheless, administrative capacities, funds, stakeholder situations and relatively low financing periods do not favor collective housing renovations. It is easier to modernize the DH system, even if once these investments have been made, the operator will be disincentivized in any further refurbishment and full savings will not be achieved. Furthermore, some V4 pilot projects show that complex renovations, despite their technically favorable characteristics, may end up in massive economic waste due to mismanagement and lack of coordination. The practical

compromise is often the partial renovation of the housing stock, introduction of (floor) metering, in some cases thermal insulation prior to DH modernizations.

The typical buildings with a high priority for energy rehabilitation are the buildings constructed during the Soviet period when no energy efficiency concerns were taken into account. The EAP3 housing stock constitutes a relatively unified picture with some dominant types of buildings. The following key types of multi-storey buildings are distinguished in Moldova, Ukraine and Belarus:

1. Panel buildings (1950s – 90s). This group represents old panel buildings, typical panel buildings made of reinforced concrete and ceramist concrete. All these buildings are constructed of relatively cheap materials, have from 3 to 22 floors with low ceilings (2.5-2.75 m).
2. Old brick buildings (middle of 1950s - 80s). The majority of these buildings were constructed in the Khrushchev-era. Officially, the period of their construction began in 1955 after the Decree of Soviet government "About Fight against Architectural Redundancies". Typical features of these buildings are thin walls, low ceilings (2.5 m), short durability period and extremely small internal area of apartments.
3. Modern brick buildings (after 1991). This type unites all brick buildings constructed after the fall of the Soviet Union. The height of ceiling increased to 3 m, number of floors is usually up to 30, and the internal area of apartments became bigger.
4. Buildings constructed mainly under Stalin (1920s - middle of 1950s). The majority of these buildings were constructed after the end of World War II. Key features of such constructions are high ceilings - 3-4m, thick brick walls, the number of floors varies from 2 to 13, there are usually 2-4 apartments per floor.

The majority of these buildings require refurbishment due to their age. Nonetheless, they are usually occupied by low income families, with no financial sources to improve the state of utility services systems and the building in general. In this situation special financing instruments have to be developed with participation of the local governments, financing institutions and dwellers/associations of owners. As the awareness and benefits of the energy refurbishment of the buildings are not well disseminated, pilot projects with high and visible impact will be necessary to achieve changes.

A common problem of all the above mentioned categories of buildings is the need of capital repairs. This is often not related to energy efficiency but to the general state of the building. This is one of the main reasons why the energy refurbishment projects are quite expensive. The typical energy refurbishment measures that can be applied to multi-storey buildings are indicated below.

Thermal insulation of exterior walls

For the thermal insulation of exterior walls using a thermal composite insulation system, the insulation material (polystyrene or mineral fiber boards, thickness > 10 cm) is attached to the walls and coated with a final layer. This method is widely employed in retrofit projects in Central Europe. The installation must be carried out according to national norms, installation guidelines and European standards.

Thermal insulation of top floor and basement

Thermal insulation of the top floor or technical level will be carried out using insulation boards. The insulation design should allow access to both the technical level and the basement. If the technical level is intended for housing technical equipment, the floor construction and insulation must be designed accordingly.

Replacement of old windows/doors
Old windows will be replaced by energy efficient windows, including windowsills. The installation must be carried out according to national norms, installation guidelines and European standards.

Refurbishment of the internal heating system
The existing 1-string heating system will be replaced with a 2-string heating system, including radiators, thermostatic valves, balancing valves, heat insulation of all pipes, etc. The thermostatic valve enables users to regulate the indoor temperature according to their actual needs.

Installation of a heat substation
Installation of a heat substation, usually in the basement of the building, will ensure the heat and domestic hot water at the required parameters. A maximum efficiency is obtained when the heating distribution system is redesigned from vertical to horizontal which will allow installation of individual meters per apartment or floors.

Refurbishment of the lighting system
Refurbishment of the lighting system requires replacing light bulbs and old fluorescent lamps with conventional ballasts with energy saving lighting systems and maintaining/adapting the existing lighting system (e.g. cleaning of bulbs, installation of reflectors, motion sensors, etc.).

Pilot projects and current experiences show other shortcomings, related to the applicability of Western practices. The applied technical solutions do not consider the sustainability of the projects (cheap materials, low quality work, no complex approach of applied measures). Local construction industries are often not capable of providing the required quality. Massive reconstruction would require a significant scale-up of knowledge and equipment on the corporation side. Since Western construction firms are underrepresented on local markets, this experience transfer might be difficult.

This problem is further aggravated, since the transposition of the secondary legislation according to EU directives (committed to be transposed by Ukraine and Moldova) is in delay. Therefore the old Soviet norms are still applied. This constitutes a problem both at the new dwellings and the refurbishment of the old ones. Nonetheless, the local development of EU standards shall take into account the standards of the existing housing stock.

Public procurement procedures do not consider energy efficiency criteria and are price-oriented, which is a concern regarding the quality of the project. This is often related to the low level and the fragmentation of funds.

Outlook

The conventional question in every experience transfer is whether donors can identify agents of change, players who are reform-minded and can cooperate in modernizing the system from within. The EU's Eastern policies often face these difficult challenges. With respect to the energy achievements of the V4, three major factors played decisive roles: the structural trends in the economy led by multinational corporations, the high involvement of foreign companies in local energy sectors and EU accession, its efficiency and energy-related acquis and the structural funds that accompany the latter. None of these factors are heavily present in the EAP3. To a considerable extent, the efficiency drivers in the EAP3 countries resulted from external factors and the adaptation was largely painful.

Consequently, the V4 does not offer a readily accessible set of experiences for the EAP3 countries. Despite all these differences, the Report demonstrated some fields of existing and potential cooperation. I would like to use the present Outlook to highlight some further potential

fields that may become more important in the years to come, and in which the V4 may provide some examples to follow for EU assistance. First, interconnectivity and single market policies form a major common interest. Until now, progress has been limited to natural gas sectors and was driven by supply security considerations. Nonetheless, as the EAP3 investment gaps in the transformation sectors are gradually being felt, the harmonization of the electricity markets will become increasingly important. This is not only a supply security measure for the EAP3. The alternative for electricity trade between the EU and the EAP3 is the extended utilization of outdated nuclear, coal, and fossil generation plants. The problem is already present in Belarus and Moldova, but the situation may turn out to be more acute in Ukraine after the 2020s. The V4 has all the forums, institutions, and interests to launch this process in time.

Second, as was shown in the Report, the heat, and in particular the district heat, sector will become a major topic in the years to come. Western support and local funds are not sufficient to perform a comprehensive renovation of building stocks, distribution, and generation plants. Consequently, some compromises will have to be found, stakeholder and coordination problems will have to be solved. V4 regulators, technical staff, and civil organizations have a broad set of experiences to manage these challenges and achieve good cost-benefit results amid relative capital-scarcity.

Third, as local governments introduce cost-reflective pricing and cut back their extensive price subsidy regimes, energy poverty and related social consequences will emerge. These countries will become increasingly less able to manage the consequences, causing a relatively large pauperization in urban areas and loss of access to electricity and heating for many rural families. The V4 countries face similar problems, especially after the oil and gas price hikes of the 2000s and the 2008 financial crisis. The local experiences of municipal governments and social organizations might be useful in these regards.

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