

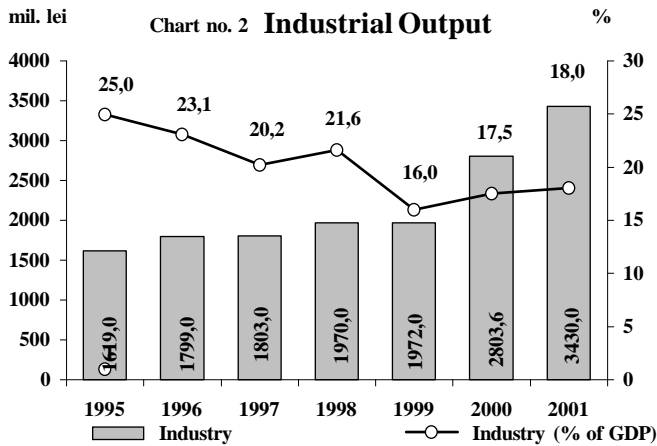
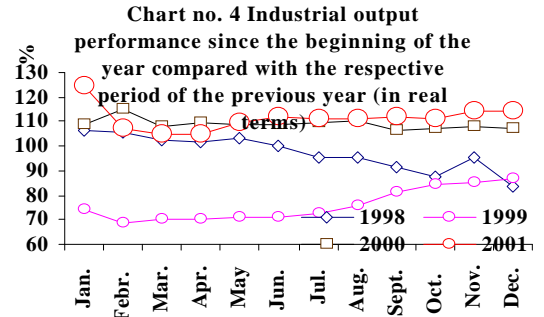
## Official and Shadow Industry in the Republic of Moldova

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Industry is the foundation of the economy, regardless of the country, organizational form, and underlying principles. The sustainable development of any economy is impossible without the development of an adequate industry in the country. Territorial, natural, and social particularities determine the development of specific sectors of industry.

The Republic of Moldova is a predominantly agricultural country, and therefore the industrial sectors closer to agricultural production, its processing and storage, have developed.

The Moldovan industry has an important share of Gross Domestic Product (GDP), but as chart 1 shows, its share of value added has been falling year on year. It is only in 1999 – 2001 that we see stabilization and improvement of the situation. In the developed countries, industry is responsible for up to 80,0% of value added, whereas in Moldova that figure is only 16,0 – 18,0%.



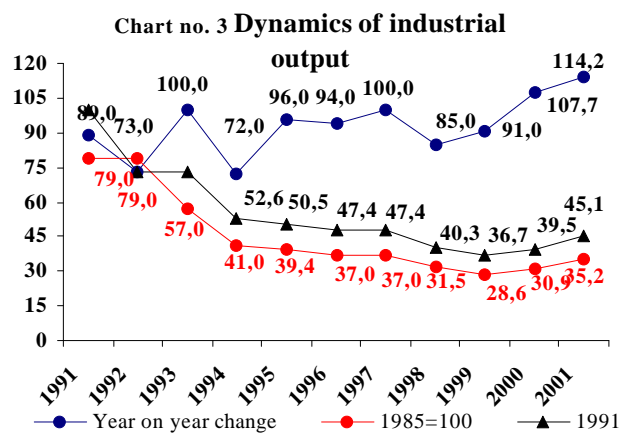
Industrial output in value terms is growing, but, as mentioned above, its share in Gross Domestic Product is falling. The most drastic fall in industrial share of Gross Domestic Product occurred in 1999, as a result of the financial crisis. Industry has now rebounded in Moldova and is at a level appropriate for the country's economic orientation.

Industrial output in value terms is interesting in terms of Gross Domestic Product structure, but this is only one side view. To get a more ample analysis, it is necessary analyze the physical volume of industrial output, or in other words, in comparable prices.

Chart 3 shows that Moldovan industry has grown significantly by 7, 7 and 14, 2 % in 2000 and 2001 respectively, at the previous year's average prices. However, the crisis years make themselves felt,

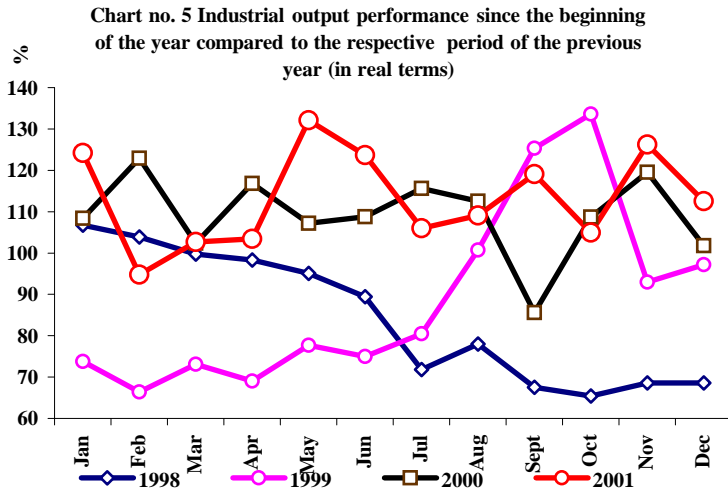
including 1999, when the physical volume of industrial output shrank by 15,0% compared with the previous year. Industrial output dynamics at previous year's average prices indicate that the most difficult period for the industrial sector may be over.

On the other hand, comparison with previous year's physical output does not give a full picture of the industry's development in the long run. If we take 1991 as a reference point, we can see that current industrial output is just 45,1%, the lowest ever level having been registered in 1999 – 36,7%. 1985 is often used as benchmark year for comparative analyses of macroeconomic indicator in Moldova. Industrial output in 2001 made up just 35,2% of the 1985 level. The above said highlights the fact that despite growing industrial output in value terms, its physical volume is less 2 or 3 time than in the peak years. The performance of industrial output in annual values represents only the generalized results of industrial sectors. Given the fact that Moldovan industry is dependant on agriculture, it is obvious that

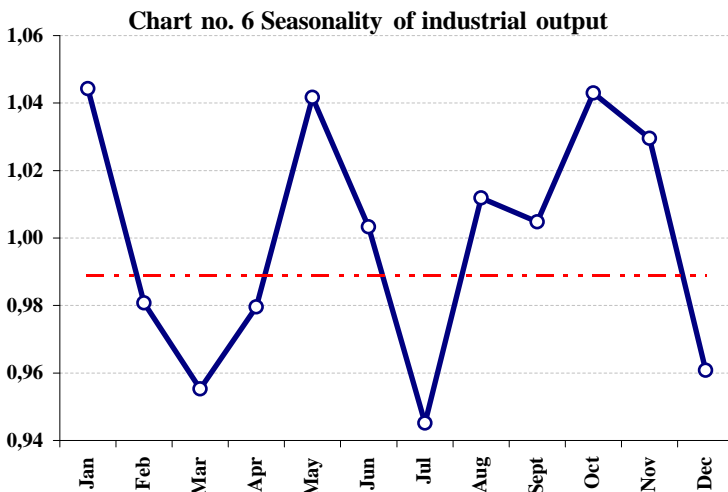


industrial output is prone to seasonal fluctuations related to the economic cycle in agriculture. Chart 4 provides proof of the seasonal nature by showing industrial performance since the start of the year in real terms (comparable prices). With the exception of 1999, industrial output performance has been similar.

An analysis of monthly industrial output performance shows a strong seasonality. However, despite the obtained results, there is some regularity in the behavior of this indicator.



October, and November are the main harvest months, and that's when raw material is abundant for the processing industry.



greater output and competition. However, in the case of the Republic of Moldova the situation differs from economic theory.

In order to get a clearer picture of the seasonality of monthly industrial output, it is obvious calculate the seasonality indicator. Chart 6 shows that the months of January, May, June, August, September, October, and November contribute most to industrial output growth. This can be easily explained in terms of the economic cycle in agriculture: January is the beginning of the year, and in order to minimize tax payments, enterprises often reduce output in December and transfer a significant share of output to the next calendar year; the months of May and June are when fruit and vegetables ripen, and need processing; August, September, October, and November are the main harvest months, and that's when raw material is abundant for the processing industry.

The above said means that industry in the Republic of Moldova has not yet adapted to the new rules of the game due to the transition process. This is not the case, though, and the following analysis proves that.

One important indicator of the development and normal functioning of any sector is the number of businesses in that sector and the number of profitable businesses. The number of industrial enterprises grew from 439 in January 1998 to 747 in December 2001, i.e. 1.7 times. On the one hand, an increasing number of enterprises is a positive factor, as it is a stimulus for

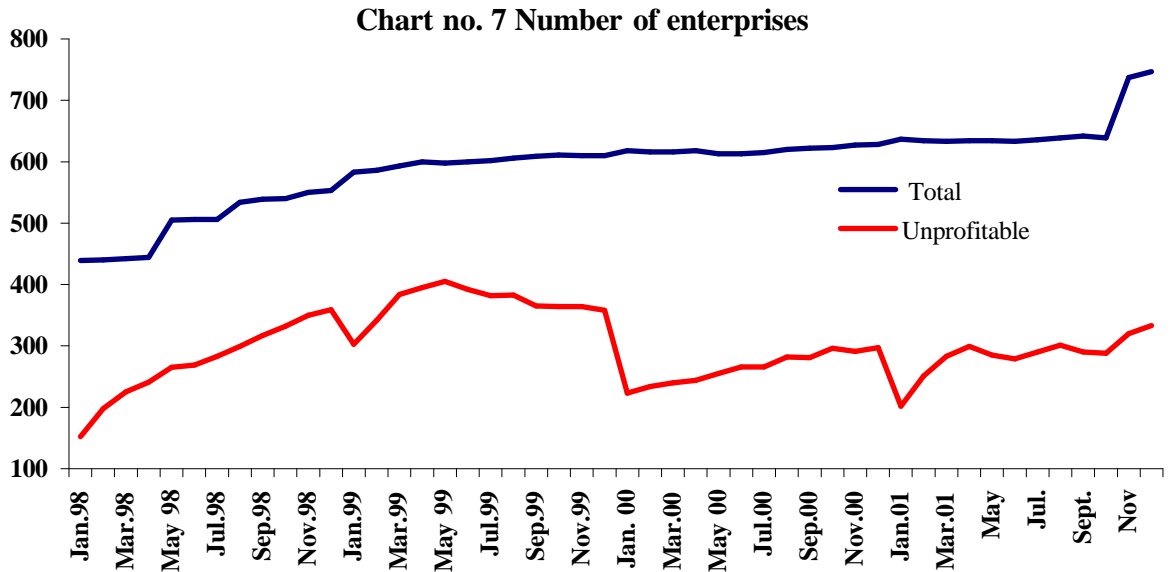
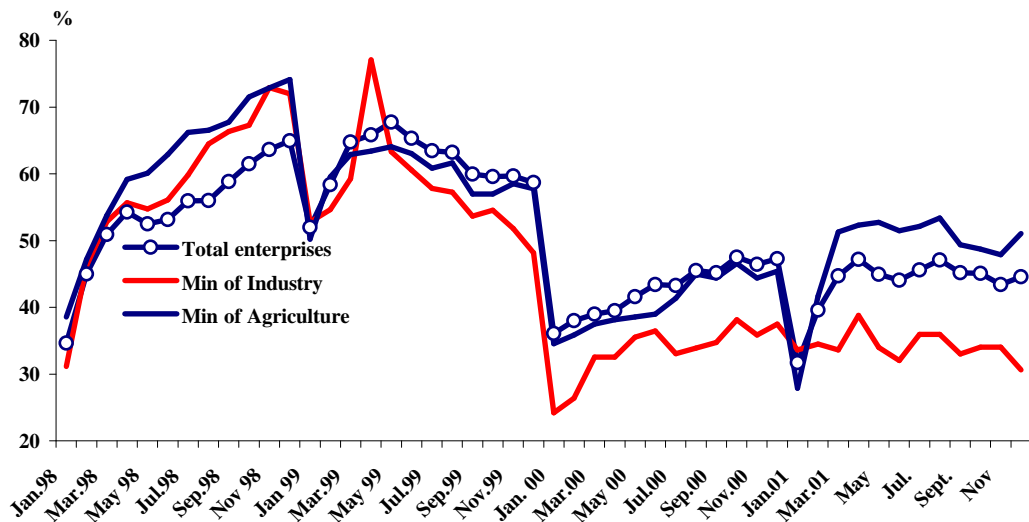


Chart 7 shows that the number of industrial enterprises is growing, but the number of unprofitable enterprises is growing at a faster pace. Between January 1998 and December 2001, the number of industrial enterprises grew 1.7 times, however that of unprofitable ones grew 2 fold, and Moldovan industry as a whole grew in real terms. This can be explained by the fact that some industrial enterprises deliberately decrease the physical volume of production, but besides them there are enterprises that follow legislation in force, and it's these enterprises that contribute most to industrial output growth.

**Chart no. 8 Share of unprofitable enterprises**



One proof of the deliberate decrease of industrial output and, respectively, of profitability is Chart 8, which shows that towards the end of the year, the share of unprofitable enterprises grows, and then falls with the beginning of the new calendar year. This is true for both Ministry of Industry subordinated enterprises, and those under the Ministry of Agriculture.

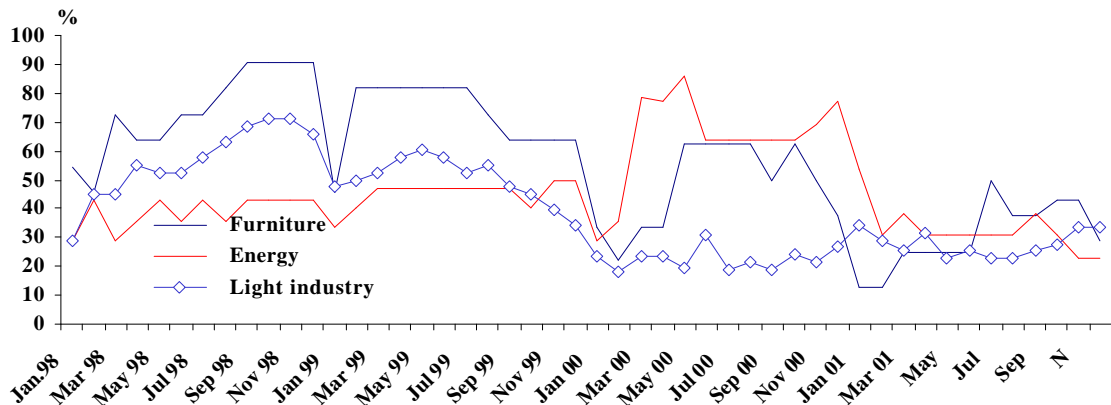
Concurrently, a steep fall in the number of unprofitable enterprises can be observed since January 2000. This is most likely due to a better monitoring of electricity used by industrial enterprises, imported raw material, and exports. With the reduction of the share of unprofitable enterprises under the Ministry of

Industry, there was a similar decrease under the Ministry of Agriculture, but not to the same extent. As chart 8 shows, after January 2000, there are more unprofitable enterprises left under the Ministry of Agriculture. To conclude: the Ministry of Agriculture and certain enterprises under its auspices are currently more attractive to shadow economic activity.

An analysis at the ministry level enables one to focus attention on shadow economic activity. However, in order to specify the core areas where the law is being broken, one needs to carry out similar analyses at the sector level in both ministries.

Unprofitable enterprises under the Ministry of Industry have the highest share in the following sectors – energy, sugar, and furniture. Chart 9 shows that the sectors also follow the tendency of diminishing the output, and reducing profitability. The number of enterprises in the energy sector is small due to the natural monopoly, and this sector can therefore be overlooked in terms of hidden output, but it is more likely that some consumers pay for electricity and heat in cash, and those amounts are written off as losses. This is just one of the ways in which shadow economic activity can flourish in this sector. Apart from this, according to some estimates, 20,0 to 50,0 % of the total produced electricity is being stolen in the Republic of Moldova. However, since January 2000, there has been a rapid fall in the share of unprofitable enterprises in the energy sector, which obviously diminishes the possibilities for shadow economic activity.

**Chart no. 9 Share of unprofitable enterprises under the Ministry of Industry**



Furniture manufacturing provides several opportunities for shadow economic activity, as it is quite difficult to trace the entry of raw materials and sales of finished products. This is shown among other things by the high share of unprofitable enterprises. Economically, it is absolutely irrational for an enterprise to work without a profit and make losses for years on end. The only explanation can be that these enterprises are hiding revenues, and are not fully registering output.

The share of unprofitable enterprises in light industry between 1998 and 2001 has been below that of the previous two sectors, but as it produces a significant share of the output under the Ministry of Industry, the volume of hidden output and undeclared revenues is higher in absolute terms.

The above said means that the Ministry of Industry has already overcome the problem of unprofitable enterprises, but that is not to say that shadow economic activity at those enterprises has been stamped out to the same extent. In most cases it had to be transformed and took other forms.

A detailed analysis of industrial sectors and activities allows focusing attention on certain sectors and even enterprises, when determining and assessing the extent of shadow economic activities. But apart from that, it is necessary to identify more precisely, by type of ownership, the enterprises that engage in shadow economic activity.

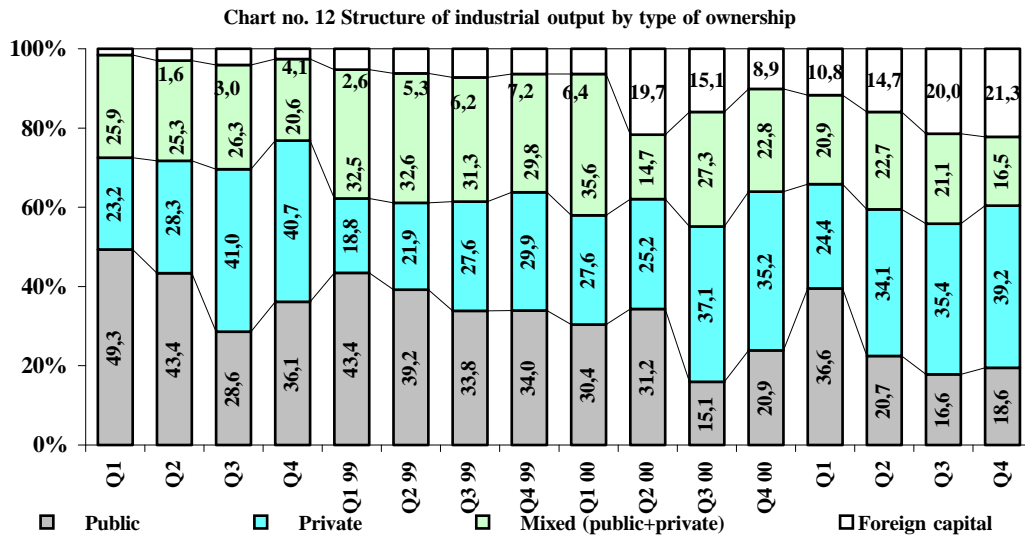
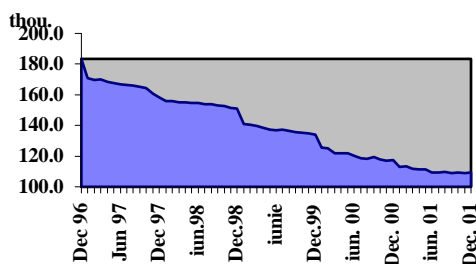


Chart 12 shows that economic reform achieved some success in the Republic of Moldova, as shown by the gradual reduction of the share of public enterprises in the total industrial output. The share of public enterprises fell from 49,3% in the 1<sup>st</sup> quarter of 1998 to 18,6% in Q4 of 2001. Concurrently, the share of private, mixed (public + private), and foreign owned enterprises went up. The highest increase occurred in the number of foreign owned enterprises. The share of the output these enterprises produced went up from 1,6% in the first quarter of 1998 to 21,3% in the 4<sup>th</sup> quarter of 2001. The inflow of foreign capital into the Moldovan industry bears several positive aspects:

1. attraction of new investment for the renewal of fixed assets;
2. building of a base for the development and sustainable growth of the industry;
3. creating market economy conditions for domestic enterprises, thus forcing them to implement new technologies and management methods to maintain production and market share;
4. creating a positive image of the Republic of Moldova for new foreign investors.

In the context of shadow economic activities, it is quite difficult to divide enterprises according to their contribution to those activities. All enterprises, regardless of their type of ownership, can engage in underground economic activities, albeit using different methods. Public enterprises can understate and hide taxable revenues, and the main source for understating is theft or sales of products at prices below costs. The private ones use false contracts, or ones that include an unrealistically small price, thus understating profits, and often posting losses over a number of years. Mixed enterprises (private + public) can use combined methods, taking advantage of their type of ownership. Foreign capital, once in the country, can be drawn not just by production, but also by money laundering opportunities, using affiliated firms abroad in a number of ways. One characteristic example is the import of outdated equipment, to be installed at Moldovan enterprises. The value of such equipment is zero for the foreign investors, but it is imported to Moldova as investment, and by taking advantage of active legislation investors are granted fiscal incentives and earn considerable revenues.

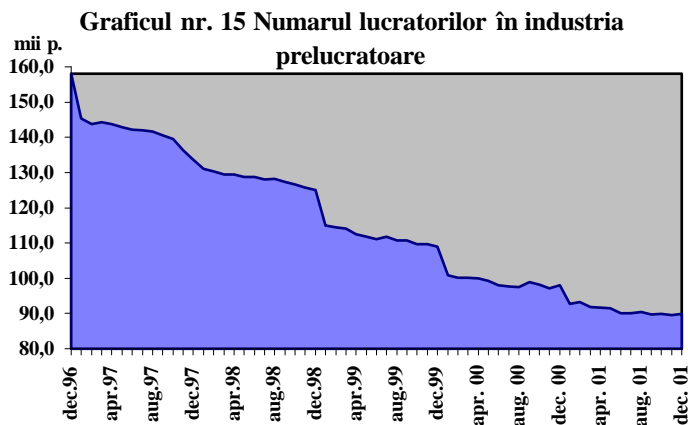
**Chart no. 13 Number of workers in industry**



The development of an economy is largely dependent on qualified personnel. Its lack is a factor that can diminish the effect of other positive factors, such as structural reforms, capital investment, fiscal incentives, or state development policies. Moldovan industry has

come across the problem of human resources as it was going through the transition process towards a market economy. The economic crisis was accompanied by the loss of jobs, and many industrial workers retired or changed qualification. Current output growth in industry is stimulating the reverse process, alas not to the same extent. It is also worth mentioning, though, that not all workers have completely left industrial work. Most qualified workers engaged in shadow economic activity. In order to evaluate and assess the extent of shadow economic activity in Moldovan industry, it is necessary to analyze the dynamics of the number of workers in industry.

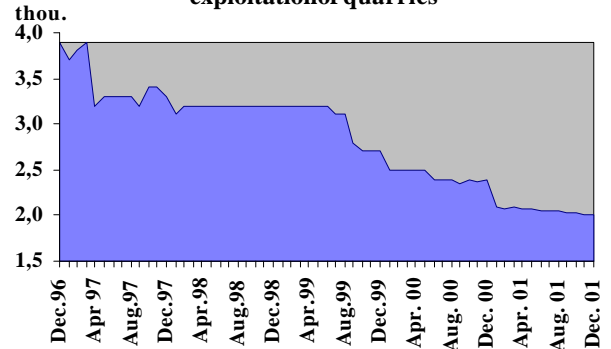
The maximum number of workers ever employed by Moldovan industry was 183.5 thousand (December 1996). Between 1997 and 2001 the number of workers employed in industry fell by 40,5 % and reached 109.2 thousand workers. Respectively, 74.3 thousand workers left industry (chart no. 13; blue colour shows workers employed, grey shows workers laid off).



sector to engage in shadow economic activity using their professional skills. It is this sector that generates most undeclared revenues.

The number of workers in power, gas, and water utilities, compared to the other two sectors, has stayed at the same level. Staff numbers fell from 22.7 to 17.3 thousand people, or just 24,0%. This is explained by the fact that all the enterprises in this sector are natural monopolies, and the state will prevent them from going bankrupt. The reduction of staff numbers was the result of structural reforms applied to this sector, and implementation of new management methods. It is also worth mentioning that this sector does not provide opportunities for individual activity,

**Chart no. 14 Number of workers in exploitation of quarries**

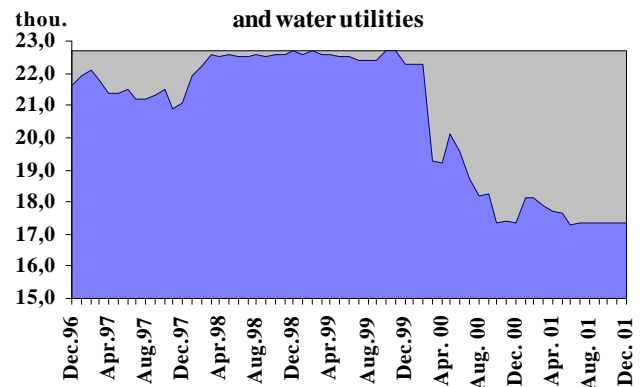


observed in the exploitation of quarries, but to a greater extent. The number of workers fell from 3.9 to 2.0 thousand workers between December 1996 and December 2001. The specifics of this sector of industry does not really allow for shadow economic activity, and therefore it would be safe to assume that all those laid off from quarry exploitation have moved to other sectors.

The same trend was observed in the processing industry, but to a greater extent. The number of workers fell from 158.0 to 89.9 thousand workers between December 1996 and December 2001. The specifics of this sector of industry does not really allow for shadow economic activity, and therefore it would be safe to assume that all those laid off from quarry exploitation have moved to other sectors.

The number of workers in the processing industry fell between December 1996 and December 2001 by 43.0% from 158.0 to 89.9 thousand workers. This sector provides opportunities for people who leave the

**Chart no. 16 Number of workers in power, gas, and water utilities**



thus rendering shadow economic activity at individual level is impossible. It can be asserted with a great degree of certainty that all those laid off have changed qualifications.

The above mentioned suggests the conclusion that only workers in the processing industry can, to some extent, engage in shadow economic activity at individual or small venture level. To estimate and assess the size of the shadow economy in industry using staff numbers, only workers laid off from the processing industry will be used.

The industry of the Republic of Moldova is of interest for shadow economic activity, but because of the need for equipment and skilled workers, these activities are not as widespread as in agriculture, sales, and services. Of the shadow economic activities present in industry, the most common are understatement of revenues, undeclared output, and sales of products at prices below costs.

### The methodology for assessing shadow activity in the industry of the Republic of Moldova

This section covers quantitative methods for estimating and assessing shadow activities in industry. The discussed methods are based on the experience of both developed and transition economies. All the methods have been adjusted to the particular conditions of the Republic of Moldova, and are to some extent different from the methods used and applied in other countries.

The calculation of the share and size of the shadow economy in the industry of a transition economy is an outstanding and quite difficult problem. A significant share of shadow activities in the domestic economy determines current situation. However, the difficulty is the result of a lack of specific and accurate information on the shadow economy, and the reluctance of economic agents to provide real data tax purposes.

Most developed countries use indirect methods to calculate the size and share of their shadow economies. Indirect methods use known estimates and indicators, the accuracy of which is beyond doubt.

Indirect methods based on the experience of developed countries, and adjusted to the particular conditions of the Republic of Moldova, will be used to assess the size and value of the Moldovan shadow economy.

The first method used to estimate the volume and value of shadow activities in industry is based on the assumption that unprofitable industrial enterprises cannot post losses for years on end. Generally, their profitability should be at the same level as that of other enterprises in the sector. Therefore, it is possible to determine the output per profitable enterprise, and multiplying that by the total number of enterprises will yield the total industrial output. In mathematical form, this method can be given as follows:

$$V_t = (V_{ind} / N_{prof}) * N_t \quad (1)$$

Where:  $V_t$  – total industrial output;

$V_{ind}$  – officially registered industrial output;

$N_{prof}$  – number of profitable enterprises;

$N_t$  – total number of enterprises.

This formula has a high degree of approximation. In order to obtain results with a higher level of credibility, it is necessary to carry out these calculations for each sector separately. In that case, formula (1) becomes:

$$V_t = \sum [(V_{ind}^i / N_{prof}^i) * N_t^i] \quad (2)$$

where:  $V_t$  – total industrial output;

$V_{ind}^i$  – officially registered industrial output in a certain sector;

$N_{prof}^i$  – number of profitable enterprises in a certain sector;

$N_t^i$  – total number of enterprises in a certain sector.

A common method for determining the size of the shadow economy is the method based on the consumption of electricity. The amount of produced power is known with a certain degree of accuracy. Given the specifics of this product, it is obvious that the amount produced equals the amount consumed. Statistical data shows the amount used by the public, or in other final consumption. The difference between the amount of power produced and the amount consumed by end users will equal the amount of electricity channelled towards production (equation no. 3)

$$El_{Pr} = El_T - El_P \quad (3)$$

where:  $El_{Pr}$  – electricity used in production over a certain period;

$El_T$  – total electricity produced over a certain period;

$El_P$  – electricity used by the public (final consumption) over a certain period.

The next step is the calculation of the share of electricity costs in the total production costs. Knowing this indicator, it is possible to estimate the amount of undeclared output over a certain period using the following formula:

$$VPT = El_{Pr} \div k \quad (4)$$

where:  $VPT$  – total output;

$k$  – electricity expenditure coefficient in total production costs.

The volume of shadow economic activities in industry can also be estimated using number of staff. This method is based on the assumption that the employees who have been laid off officially are engaged in the shadow economy. A parallel assumption is that the productivity of workers employed in the shadow economy equals that of the ones employed in the official economy. These assumptions are particularly safe to make about the workers employed in industry, because most of them are skilled, and have undergone special professional training. It must also be mentioned that a significant share of fixed assets, equipment, tools, etc. have either been privatized at residual value, depreciated at an accelerated pace and written off the firm's balance, or simply stolen. It is this equipment and fixed assets that are used in shadow industrial activity.

In order to determine and assess the volume of shadow economic activities in industry using the number of laid off employees, it is necessary to first determine the number of workers laid off from industry (equation no. 5).

$$N_{ret} = N_{max} - N_{t1} \quad (5)$$

Where:  $N_{ret}$  – number of workers laid off from official industry;

$N_{max}$  – maximum number of workers employed in industry;

$N_{t1}$  – number of employed in industry at time  $t_1$ .

By calculating the number of employees laid off from the official industry at the end of the year we can get a clear picture of the flow of personnel towards the shadow economy. It is also possible to perform these calculations separately for each industrial sector.

The next step is finding the volume of shadow economic activities in industry, which can be done using two methods. The first method is based on calculating industrial output, as share of Gross Domestic Product, produced over one year by an employee in the official industry. In other words, we calculate the contribution of an employee in the official industry towards the Gross Domestic Product. Multiplying this contribution by the number of workers laid off from industry will yield shadow output in industry. By comparing shadow industrial output with the officially registered output, we get the share of shadow industry in the official industry. In this case, shadow output can be calculated using the following equation:

$$VI_{shad} = (VI_{of} / N_{of}) * N_{ret} \quad (6)$$

where:  $VI_{shad}$  – volume of shadow industry;

$VI_{of}$  – volume of official industry;

$N_{of}$  – number of workers officially employed in industry;

$N_{ret}$  – number of workers laid off from official industry.



Another method uses the productivity of an employee in industry. Multiplying the productivity by the number of people laid off from official industry yields industrial output produced by the shadow industry, and comparing that with the official output will yield the share of the shadow industry in the official one.

$$VI_{\text{shad}} = Pr_{\text{of}} * N_{\text{ret}} \quad (7)$$

where:  $VI_{\text{shad}}$  – shadow industry output;

$N_{\text{ret}}$  – number of workers laid off from official industry;

$Pr_{\text{of}}$  – productivity of a worker employed in industry.

Data of the Statistics Department of the Republic of Moldova shows that in 2000 – 2001, industrial output grew both in current prices, and in previous year's average prices. Profitable enterprises contributed most to increase output. The share of unprofitable enterprises has been quite high over a number of years. It can be assumed that in reality unprofitable enterprises activate at the same output level as profitable ones, and should there be full declaration of all transactions, will bring a similar contribution. Taking this assumption on board, real growth of Moldovan industrial output in physical and value terms can be estimated.

#### Calculation of the volume and share of shadow activities in the industry of the Republic of Moldova

This section attempts to calculate and estimate the output and share of unregistered activities in the industry of the Republic of Moldova, using methods discussed and analyzed previously.

When applying the method based on the number of unprofitable enterprises, it is necessary first to determine the number of profitable and unprofitable enterprises. Determining the industrial output produced by a profitable enterprise will allow assessing the industrial output produced by unprofitable enterprises. It is necessary to keep in mind that unprofitable enterprises nevertheless produce some output, but suffer losses. Analysing the national economy in general, and the main trends in terms of tax evasion and other breaches of the active commercial law, it is possible to assume that about half the output produced by loss-making enterprises is channelled as undeclared industrial output. The results of the calculations are given in table 1.

Table 1. Calculation of undeclared industrial output using the method of loss-making enterprises.

	1998	1999	2000	2001	Average
INDUSTRIAL OUTPUT, MILLIONS. MDL	5981.9	7190.8	8167.7	10348	
Number of loss-making enterprises	194	252	331	414	
Industrial output at 1 profitable enterprise, millions. MDL	30.8	28.5	24.7	25.0	
Number of loss-making enterprises	359	358	297	333	
Industrial output produced by loss-making enterprises, millions. MDL	5534.8	5107.8	3664.4	4161.7	
Share of undeclared output in total industrial output, %	92.5	71.0	44.9	40.2	62.2
Total industrial output, millions. MDL	11516.7	12298.6	11832.1	14509.7	

The above table shows that undeclared industrial output reached its peak as share of total industrial output in 1998 and 1999. This can be explained by the fact that these are the years of the financial and economic crisis in Moldova, and it was more convenient for enterprises not to register output, so as to diminish the tax base. A relative improvement occurred in 2000 and 2001, when there was a drop in the share of undeclared output in the total industrial output. On average, undeclared industrial output between

1998 and 2001 made up 62.2%. This level corresponds to the dynamics of the national economy and the current economic situation.

The results obtained by assessing the undeclared industrial output based on the number of loss-making enterprises may seem wrong. In order to gain precision of calculations, and to prove that the results are accurate, the respective calculations will be performed for each separate ministry. The methodology of the calculations will be similar to the previous one. The results are contained in table 2.

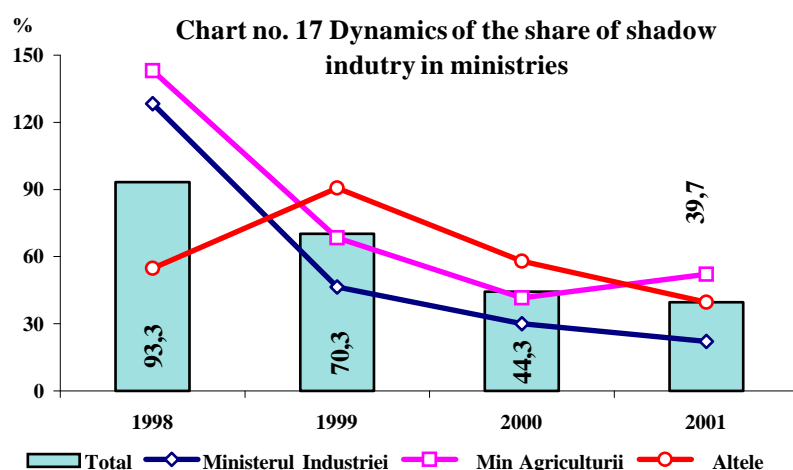
Table 2. Calculation of undeclared industrial output by ministry, using the number of unprofitable enterprises.

	1998	1999	2000	2001	Average
Ministry of Industry (profitable)	30	57	75	68	
Industrial output in the respective sector, millions. MDL	1025.0	1776.5	2050.7	1949.7	
Industrial output per enterprise in the respective sector, millions. MDL	34.2	31.2	27.3	28.7	
Ministry of Industry (loss-making)	77	53	45	30	
Undeclared industrial output in the sector, millions. MDL	1315	826	615	430	
Share of undeclared output in total, %	128.33	<b>46.49</b>	<b>30.00</b>	22.06	56.72
Ministry of Agriculture (profitable)	58	109	137	116	
Industrial output in the respective sector, millions. MDL	1758.4	3060.3	3310.6	2799.4	
Industrial output per enterprise in the respective sector, millions. MDL	30.3	28.1	24.2	24.1	
Ministry of Agriculture (loss-making)	166	149	114	121	
Undeclared industrial output in the sector, millions. MDL	2516	2092	1377	1460	
Share of undeclared output in total, %	<b>143.10</b>	68.35	41.61	52.16	76.30
Other (profitable)	106	86	119	230	
Industrial output in the respective sector, millions. MDL	3198.5	2354.0	2806.4	5598.9	
Industrial output per enterprise in the respective sector, millions. MDL	30.2	27.4	23.6	24.3	
Other (loss-making)	116	156	138	182	
Undeclared industrial output in the sector, millions. MDL	1750	2135	1627	2215	
Share of undeclared output in total, %	54.72	90.70	57.98	39.57	60.74
Total industrial output, millions. MDL	5981.9	7190.8	8167.7	10348.0	
Total undeclared industrial output, millions. MDL	5581.9	5052.6	3619.9	4105.3	
Share of undeclared output in total, %	93.3	70.3	44.3	39.7	61.89

An analysis of the results contained in table 2 shows that enterprises under the Ministry of Agriculture post the highest rate of undeclared industrial output, which has been between 143,1 and 52,2%, and an average of 76,3 %. This can be explained by the fact that industrial enterprises under the ministry of Agriculture have more opportunities than those under other ministries, because it is possible to show misleading information of the amount of raw material processed, etc. Concurrently, the skill level of the staff at these enterprises is below that of employees at enterprises under other ministries.

The share of undeclared industrial output at enterprises under the Ministry of Industry and others has been at comparable average of between 56,7 and 60,7%. Generally, according to calculations performed by the ministries, undeclared industrial output made up 61,89% of the total industrial output. Chart 17 shows that between 1998 and 2001 undeclared industrial output under the various ministries fell year on year. The share of undeclared industrial output in the total industrial output fell from 93,3 in 1998 to 39,7% in 2001. This has been a positive development, and proves the fact that the state is pursuing the right economic policies in industry. It is also worth mentioning that falling share of undeclared output in industry is an achievement of the supervisory bodies.

One of the most common methods of determining and assessing shadow economic activities is the



method based on electricity consumption. This indirect method carries a high degree of accuracy, because electricity is a product that cannot be stored, and the entire output is either used, or exported. Data on the amount of electricity produced, the amount of electricity used by the public (final consumption), the share of electricity expenditures in the total production costs, and the official production levels have been used in these

calculations. The results on the estimated undeclared output are presented in table 3.

Table 3. Estimation of shadow economy using power consumption levels

	1995	1996	1997	1998	1999	2000	2001	Average
Electricity produced, millions. MDL	617.1	658.4	786.3	936.3	911.4	1026.2	1266.4	
<b>Electricity used by the public (consumption)</b>								
millions. MDL	82.4	101.2	154.5	182.2	195.4	200.7	245.7	
Remaining electricity millions. MDL	534.7	557.2	631.7	754.1	716.0	825.5	1020.7	
Share of expenditures for electricity in total costs, %	0.07	0.08	0.07	0.08	0.07	0.07	0.07	
Total output millions. MDL	7638.9	7429.0	9024.9	9426.4	9944.4	11626.8	14581.3	12312.9
Official output millions. MDL	4265.2	4690.4	5889.4	5981.9	7190.8	8167.7	10348.0	
Undeclared output millions. MDL	3373.7	2738.6	3135.5	3444.5	2753.6	3459.1	4233.3	2690.0
Share of undeclared industrial output in the official one, %	79.1	58.4	53.2	57.6	38.3	42.4	40.9	52.8

Source: Department of Statistics of the Republic of Moldova

Data contained in table 3 shows that the share of undeclared output in the total output between 1995 and 2001 has been between 40,9 and 79,1 %, at an average of 52,8 %. These results are in line with the results of the first method. Note the dynamics of the share of undeclared industrial output in the total output during the years – between 1995 and 1998 the share was falling gradually, which was a positive sign, but with the economic crisis of 1999 came an increase in shadow economic activity, with it reaching the level of 42,4 %. The situation became relatively balanced in 2001 – the share of undeclared industrial output fell by 1.3 percentage points.

This is one of the most reliable methods for the assessment of the share of shadow economic activities. However, there is a drawback because the volume of electricity used by the public cannot be separated from that used for production, because some small industrial enterprises are not registered, and the electricity they consume is qualified as final consumption by the public. In order to fix that, every user would have to be checked, which is all but impossible.

One method that carries a high degree of accuracy is based in the number of employees employed. The advantage of this method is based on the nature of human society – everyone specializes in a certain area, giving up a profession, and taking up another one requires time and considerable financial resources. The current economic situation in the Republic of Moldova does not allow employees to change qualifications quickly as they wish. It is this fact that will serve as basis for the assessment of undeclared industrial output.

In order to determine the shadow industrial output it is first necessary to determine the number of employees in and laid off from industry. Having calculated industrial output per employee it is possible to determine the industrial output produced by employees laid off from official industry. 1996 will be used as the base year for determining the number of employees retired from industry. The results of the calculations are presented in table 4.

Table 4. Calculation of the volume and share of undeclared industrial output using the number of employees.

	Dec.97	Dec.98	Dec.99	Dec. 00	Dec. 01	Average
Industrial output	5981.9	5981.9	5981.9	5981.9	5981.9	
Number of workers in industry, thou. pers.	158.1	151.0	134.0	117.3	109.2	
Industrial output per worker, thou. MDL	37.8	39.6	44.6	51.0	54.8	
Number of workers dismissed thou. pers.	58.7	62.8	66.2	69.7	74.3	
Undeclared industrial output,	2221.0	2487.8	2955.2	3554.5	4067.2	
Share of shadow industry, %	37.1	41.6	49.4	59.4	68.0	51.1

The results of the calculations contained in table 4 show that undeclared industrial output grew from 37,1 to 68,0% between 1997 and 2001, with an average of 51,1%. On the one hand, this is in line with the discussed approach, and the share of undeclared industrial output determined using other approaches, on the other hand, though, the dynamics of the obtained results is contradictory to that obtained using other methods. The main difference occurs in the dynamics of the share of shadow industry – according to the methods discussed above, the maximum level occurred in 1997-1998, whereas the results arrived at using the staff numbers point to a peak in 2001. The main drawback of this method is that it doesn't take into account the structure of employees by sector, because it is not every industrial sector that workers can engage in shadow activities in. In order to fix that, undeclared industrial output will be calculated using of employees number by sector.

First, the number of employees retired from every sector will be determined – processing industry, energy, and quarry exploitation. Concurrently, the ratio of employees laid off from the sector that engage in shadow activities in that sector will be determined. This data will allow determining the share of industrial output for each sector. Table 5 contains the numbers of workers laid off from different sectors of industry.

Table 5. Number of workers laid from the official economy.(thou.pers.)

	1997	1998	1999	2000	2001
total laid off	58.7	62.8	66.2	69.7	133.7
- quarry exploitation	0.6	0.7	1.2	1.5	1.9
- processing industry	57.6	63.2	65.7	63.9	127.5
- electricity, gas and water	0.5	-1.1	-0.7	4.3	4.3

This table shows that the number of those laid off is growing year on year. Processing industry is dominant, having lost 127.5 thousand workers in 2001. An analysis of the employees retired by sector shows that not every sector provides opportunities for workers to engage in the shadow economy because of sector particularities. As the table shows, there was an increase in the number of workers in the electricity, water, and gas utilities in 1998 and 1999. In light of this, and due to the specifics of the sector that does not provide opportunities for individual unregistered activity, this sector will not be included in the calculations of undeclared industrial output. The retirement coefficient for quarry exploitation and processing industry will be set at 0.5 and 1.0 respectively. This data in hand, it is possible to calculate the volume and share of undeclared industrial output in each sector. The results of the calculations are contained in table 6.

Table 6. Share of undeclared industrial output in different sectors.

	1997	1998	1999	2000	2001	Average
<b>- quarry exploitation, thou. pers.</b>	0.6	0.7	1.2	1.5	1.9	
- output per worker, thou. MDL	17.3	16.2	20.9	25.8	34.1	
- undeclared output, mill. MDL	10.4	11.3	25.1	39.1	64.8	
- share, %	9.1	10.9	22.2	31.7	47.5	24.3
- processing industry	57.6	63.2	65.7	63.9	127.5	
- output per worker	33.4	32.3	42.9	66.1	76.6	
- undeclared output, millions MDL	1921.0	2043.3	2816.8	4224.1	9767.2	
- share,%	43.1	50.5	60.3	65.2	141.9	72.2

This table shows that the share of undeclared industrial output follows the same trend as that in table 5. This can be explained by the fact that the number of employees is falling continuously, and the share of those who have moved to the shadow economy of the respective sector is not accurately known.

The results obtained using these different methods can be leveled by using an average or weighted average. The results of the calculations concerning the share of undeclared industrial output using different methods are given in table 7.

Table 7. Share of industrial output using different methods. %

	1998	1999	2000	2001	average
Unprofitable enterprises	92.5	71.0	44.9	40.2	62.2
Unprofitable enterprises by sector	93.3	70.3	44.3	39.7	61.9
Power consumption	57.6	38.3	42.4	40.9	44.8
Workers	41.6	49.4	59.4	68.0	51.1
Workers by sector	30.7	41.3	48.5	94.7	48.3

The data given in the table prove that results need to be adjusted, because the share of industrial output not only varies from method to method, but also has different dynamics. Averages will be used to

adjust results, as it is done in the developed countries. The most frequently used averages for this type of adjustment are the simple average and weighted average. The weighted average will be applied to the methods of power consumption and unprofitable enterprises. The weight ratios were distributed as follows: power consumption method – 0.5, unprofitable enterprises method – 0.35, and the retired employees method – 0.15.

Table 8. Adjustment of industrial output share.

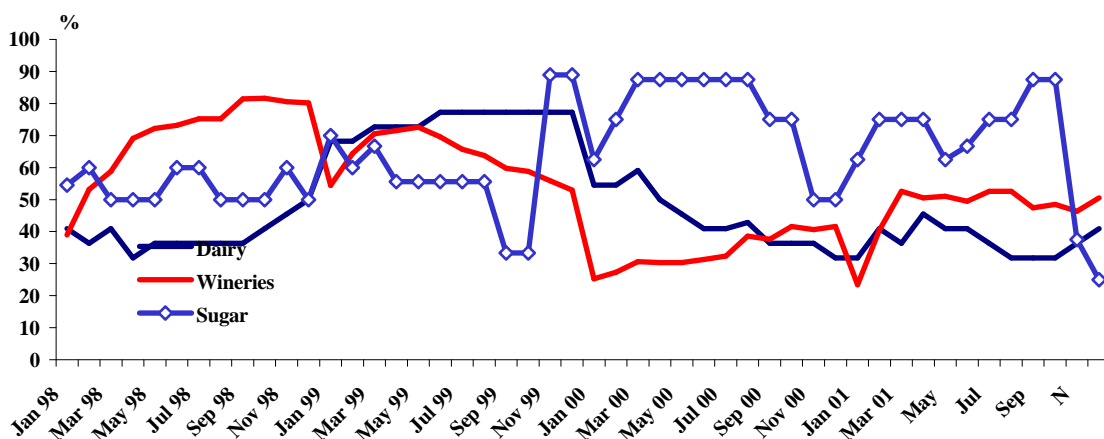
	1998	1999	2000	2001	average
Arithmetic average	63.9	52.9	48.9	49.7	53.9
Weighted average	65.8	50.2	44.2	48.7	52.2

The data given in table 8 shows homogeneity of results and their consistency in terms of dynamics.

The results obtained using all the discussed and analyzed methods show that the undeclared industrial output in the Republic of Moldova makes up 50,0-55,0% of the officially registered industrial output. The situation in industry is in line with the general development of the economy. The prevention or elimination of shadow activities in all the sectors of the national economy requires the engagement of all the state's branches of power. Generally, the methods for the prevention and elimination of shadow activities in Moldovan industry are similar to these suggested for agriculture (see article "Official and shadow agriculture in the Republic of Moldova").

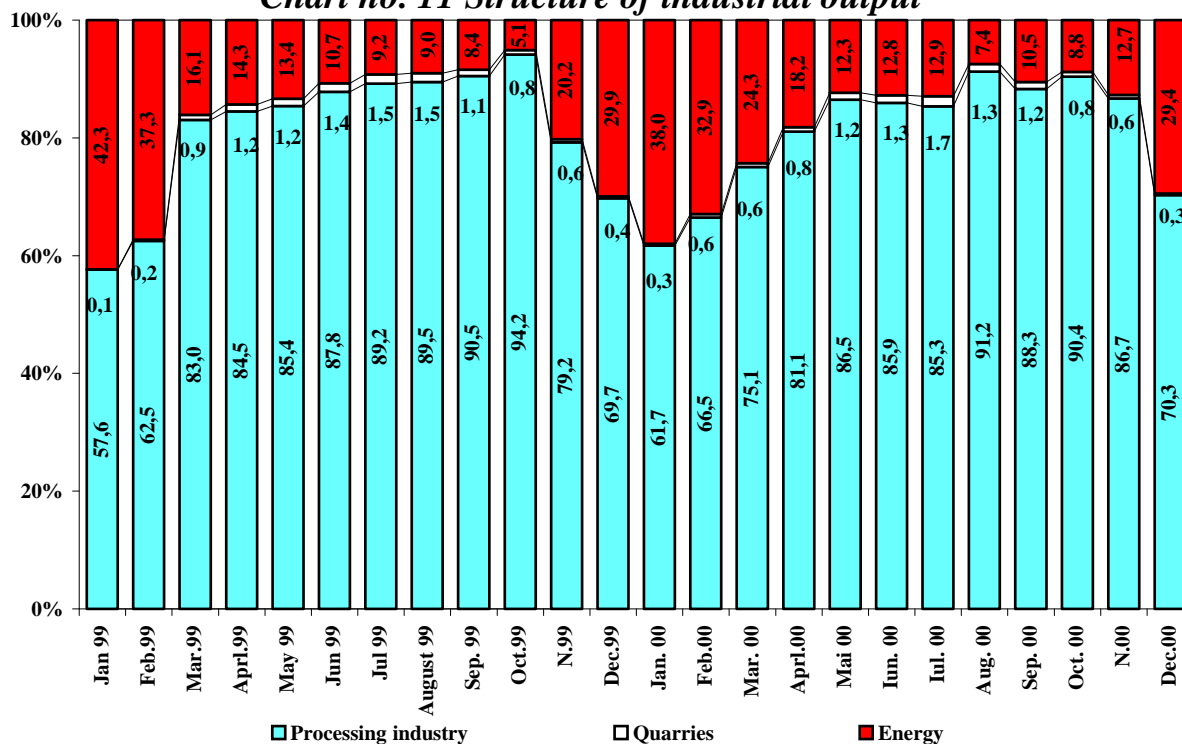
All the methods used to determine undeclared industrial output are quite approximate, as the lack of information and the limited level of credibility of the officially published data does not allow estimating the extent of shadow activities with a greater degree of accuracy. Obviously, the methods used and results obtained are subject to discussion, however this paper attempted to provide an alternative estimate of the undeclared industrial output in the Republic of Moldova, free from any political dimension or influence. The identification of individuals or political parties responsible for the degradation of industry and the encouragement of shadow activities requires a deeper research, which is different from the aim of this paper.

Chart no. 10 Share of unprofitable enterprises under the Ministry of Agriculture



Industrial enterprises under the Ministry of Agriculture have increased opportunities for understating and hiding revenues. As chart 10 shows, the share of unprofitable enterprises in the listed sectors is higher than in the case of the Ministry of Industry. However, note that the sugar refineries suffer because of blocked exports to Ukraine and Romania. The share of unprofitable enterprises under the Ministry of Agriculture has the same dynamics as that of industrial enterprises in general.

Chart no. 11 Structure of industrial output



Apart from an analysis by ministry, Moldovan industry can be analyzed in terms of activities. In this respect, industrial enterprises are divided into three groups: processing industry, exploitation of quarries, and energy. Chart 11 shows the seasonal structure of Moldovan industry. The share of processing industry falls in the winter months, and then goes up in summer and autumn. The relatively constant character of quarry

exploitation shows the stability of this sector and that it is not significantly exposed to seasonal factors. The energy sector's dynamics are the reverse of the processing industry, which makes sense, as the consumption of electricity and heat goes up in autumn and winter. It has also been observed that processing industry makes up 60 to 90 per cent of industrial output throughout the year. Given the aforementioned opportunities for understating and hiding revenues, and other underground activities, one comes to the conclusion that the processing industry is dominant. It is this sector that will draw the most attention in the analysis and assessment of activities of the shadow economy.

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