

FORECASTING PRODUCTION OF DOMESTIC GOODS  
AND MAIN MACROECONOMIC INDICATORS

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*Managing both the modern state and the enterprises is impossible without forecasting and elaborating several development scenarios that would take into account the available resources and reflect the most likely results. The forecast has become a part of daily life and a fundamental tool for assessing development prospects. Therefore, the task of improving the economic-mathematical model for the development of forecasts is relevant, especially in modern conditions, when the national economy is subject to many factors, both external and internal. The main goal of the research is to forecast the production of domestic goods and the main macroeconomic indicators using the economic-mathematical model adapted by authors to the new conditions for the development of the Moldovan economy, considering that the share of the non-observed economy in 2016 is less than in the previous year, but remains significant. The main methods used in this study: the "input-output" method, econometric methods of research and forecasting, regression analysis, the method of analytical calculation, the method of mathematical modelling of economic processes. Using the adapted model and taking into account the processes established in the national economy, forecast interbranch balances for 2018 were developed in the division of goods, integrated into five branches of national economy, and forecasts of the main macroeconomic indicators for the Republic of Moldova were developed.*

**Keywords:** *input-output model, economic indicators, macroeconomic time series, forecasting, production, trade forecast, Republic of Moldova.*

*Gestionarea, atât a statului modern, cât și a întreprinderilor, este problematică fără elaborarea prognozelor și scenariilor de dezvoltare, care ar lua în calcul resursele disponibile și ar reflecta asupra celor mai potrivite rezultate. Prognoza a devenit o parte a vieții cotidiene și un instrument fundamental pentru evaluarea perspectivelor de dezvoltare. De aceea, sarcina îmbunătățirii modelului economico-matematic pentru elaborarea previziunilor este actuală, în special, în condițiile moderne, când economia națională este influențată de mulți factori atât externi, cât și interni. Scopul principal al cercetării este pronosticul producției autohtone și indicatorilor macroeconomici de bază, utilizând modelul economico-matematic adaptat de către autori la noile condiții de dezvoltare a economiei moldovenești, luând în calcul că ponderea economiei neobservate, din anul 2016, este mai mică în raport cu anul precedent, însă în continuare rămâne importantă. Principalele metode utilizate în acest studiu sunt: metoda „input-output”, metode econometrice de cercetare și prognozare, analiza regresională, metoda calculului analitic, metoda de modelare matematică a proceselor economice. Utilizând modelul adaptat și ținând cont de procesele stabilite în economia națională, au fost elaborate balanțele interramurale de prognoză pentru anul 2018 în diviziunea bunurilor, integrate în cinci ramuri ale economiei naționale, și au fost prognozați indicatorii macroeconomici de bază pentru Republica Moldova.*

**Cuvinte-cheie:** *modelul „întrări-ieșiri”, indicatori economici, serii de date macroeconomice, previziuni, producție, previziunea comerțului, Republica Moldova.*

*Управление, как современным государством, так и предприятием невозможно без прогнозирования и разработки нескольких сценариев развития, которые бы учитывали располагаемые ресурсы и отражали наиболее вероятные результаты. Прогнозирование прочно*

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вошло в повседневную жизнь и стало основополагающим инструментом оценки перспектив развития. Поэтому задача усовершенствовать экономико-математическую модель для разработки прогнозов актуальна особенно в современных условиях, когда национальная экономика подвержена многим факторам как внешним, так и внутренним. Основной целью исследования – прогноз производства отечественных товаров и основных макроэкономических показателей используя адаптированную авторами экономико-математическую модель к новым условиям развития молдавской экономики, учитывая, что доля ненаблюдаемой экономики в 2016 году хоть и меньше в сравнении с предыдущим годом, но всё-таки существенна. Основные методы, используемые в данном исследовании: метод «затраты-выпуск», эконометрические методы исследования и прогнозирования, регрессионный анализ, метод аналитического расчета, метод математического моделирования экономических процессов. С помощью адаптированной модели, учитывая установившиеся процессы в национальной экономики, были разработаны прогнозные межотраслевые балансы на 2018 год в разрезе товаров, сгруппированных в пять отраслей национальной экономики, а также были разработаны прогнозы основных макроэкономических показателей для Республики Молдова.

**Ключевые слова:** модель «затраты-выпуск», экономические показатели, макроэкономические временные ряды, прогнозирование, производство, прогноз торговли, Республика Молдова.

**JEL Classification:** C67, E10, E17, E23, F17.

**UDC:** 338.27

**Introduction.** The role of forecasting is increasing in modern conditions, especially in small open economies with a low standard of living and a large external debt. In these economies, not only the government, economic agents, but also households have to forecast consequences of their decisions, estimating incomes and expenditures, input and output.

Thus, it is necessary to improve the methodology for developing forecasts, to adapt the economic-mathematical model for forecasting the economy of the Republic of Moldova, taking into account macroeconomic policies and current trends. It is necessary to increase precision of forecasts because more exactness of prognosis will guarantee more effectiveness management at all levels of the economy: microeconomics, mesoeconomics and macroeconomics.

#### **Data sources and used methods**

The authors used Leontief's input-output model, which was constructed for country, as the basis for elaboration of an adapted model. The interbranch balance is a method of tabular analysis (input-output method) [9, p.17]. It describes flow of goods and services across all sectors of a national economy over a period of one year. An economic activity of the state should be divided into several branches or sectors [13]. In practice, their number can vary from several to thousands [10, p.2]. The model adapted by authors is described in more detail in articles [5, p.71] and [15, p.40].

The proposed economic-mathematical model [3, p.39] is based on the input-output model. It is adapted by authors according to The System of National Accounts and taking into reckoning the elements of the shadow economy. The input-output model was developed in the 20's of the XX century by the Nobel Laureate W.W. Leontief [2]. Identities of the adapted model represent equilibrium between resources and uses for five branches of national economy: agro-industrial, machine building, light industry, construction materials industry and heavy industry. These branches of the national economy „are interdependent both at the production stage and at the realization stage of goods and services” [8, p.569]. Statistical data series cover the period 1990-2016.

The interbranch balance allows the analysis of situation in the national economy and the level of development of the economy as a whole, also the analysis of contribution of each branch in the economic development [12]. In addition, the given model allows the analysis of relations between branches and their evolution in different phases of process of reproduction, the establishment of proportions between branches and the elaboration of the development scenarios [14, p.53].

At the global level, the input-output model was first used in 1995 by the Organization for Economic Cooperation and Development (OECD) [5, p.70]. The model of interbranch balance characterizes the relationships between branches of economy [11]. Analysis based on these balances allows to properly assess possibilities and to formulate the basic goals for the planned period and allows the assessment of the shadow economy [4, p.51].

### Obtained results and discussions

In the process of elaborating the forecast for 2018 it was taken into account that the economy will recover, the local entrepreneurs will be supported, the basic rate will be reduced, the share of the Non-Observed Economy in GDP will be also reduced, favourable conditions will be created to attract foreign capital and for the promotion of domestic goods on foreign markets.

#### Agro-industrial

The development of agro-industrial branch of national economy (AI) depends to a large extent on the situation created in agriculture. Analyzing data on agricultural production for 2010-2016, it is necessary to note that some positive trends are observed, excluding the years 2012 and 2015 when the climatic conditions were unfavourable.

Thus, in 2016, compared with 2010, the production volume of fruit, berries and sunflower increased by 1.8 times, but sugar beet and potatoes decreased by 20% and 23% respectively. There have been changes in the food industry: the volume of unfermented tobacco production has decreased considerably – by about 9 times, strong national beverages (-56.2%), canned vegetables and fruits (-31%), cognac (-18.9%), whole milk products (-6.5%) and sugar (-3.2%). Meanwhile, meat production increased by 1.9 times, confectionery products by 1.8 times, combined fodder by 33%, vegetable oil, beef and poultry by 31%, sausages by 1.24 times, butter by 1.4 times and ethyl alcohol by 1.15. Regarding the amount of grapes and vegetables in 2016 we can say that grapes have grown by 1.28 times, but vegetables have decreased by 14% compared to 2010.

If we analyze the volume of agricultural production in 2016, we can see that this year was favourable for agricultural production, the global harvest increased for the following crops: cereals by 34% (2,954,2 thousand tons), sunflower by 39% (673 thousand tons), fruit and berries by 18% (572 thousand tons), sugar beet by 24% (664.8 thousand tons), vegetables by 19% (293.3 thousand tons), grapes by 3% (615 thousand tons) compared to the previous year. At the same time, in the previous year was harvested less: tobacco with -19.2% (0.9 thousand tons), milk with -1% (627.5 thousand tons).

One of the consequences of the agrarian reform carried out in the Republic is the modification of the structure of the agricultural land in favour of the creeping crops, although these crops give a small harvest. This is explained by the shorter return period for the made investments than for multiannual crops.

The main causes of the decrease in the production volume of plant crops are the insufficiency of the technical-material basis and the influence of meteorological conditions. In addition, the large share of small households and their low financial provision does not allow development of the large-scale production.

As a result, without a proper support oriented towards the development of the technical-material basis, the agriculture of the Republic will remain at a low level of development. The programs elaborated in the last years for the development of some agricultural branches require large investments and strict observance of the conditions for realization. Under conditions of unstable financing and lack of high investment, positive external outcomes can be expected only in the future.

According to preliminary estimates prepared by the National Bureau of Statistics in 2017, agricultural production (in all categories of households) reached the level of 108.6%, the vegetal production increased by 13.1%, and the livestock production decreased by 2.1% in comparison with 2016. The average productivity in the Republic this year increased almost on all agricultural crops, namely: cereal grains by 13.6%, sunflower by 11.8%, field vegetables by 6.3%, tobacco by 34.6% grapes by 16%, fruits, nuts and grapes by 30.1%. At the same time, potato production fell by 3.8%.

According to preliminary data in 2017, sunflower seed were harvested in the amount of 800 thousand tons, fruits and berries – 659 thousand tons, vegetables – 308 thousand tons, potatoes – 197 thousand tons, unfermented tobacco – 1 thousand ton, cereals – 3342 thousand tons and grapes – 675 thousand tons.

The good harvest led to an increase in production in the first 9 months of 2017: grape wines – by 16.1%, beer by 20%, cognac – by 71.2%, sparkling wine by 29.1%, meat by 20%, flour by 8.4% compared to the same period of the previous year, only liqueurs decreased – by 17.1%, and milk – by 5.25%.

These and other factors have conditioned trends in forecasting indices of agricultural production volume. From the forecast balance for 2018 it can be seen that the animal sector will focus mainly on meeting the domestic needs of the Republic. 57.8 kg of meat (live weight), 145.7 kg of milk, 190 pieces of eggs and 32.4 kg of sugar per capita will be produced. Of the volume of 205 thousand tons of meat produced in the living mass, about 65.8% will be sold on the unorganized market, and the rest will be processed at the processing enterprises. Approximately 35% of the produced milk will be sold on the non-organized market, eggs – 50.2% and sugar – 19% respectively.

Production of 2,850 thousand tons of cereals will provide 803.3 kg per capita, which will satisfy the domestic needs and allow to export a volume of 36.2% of the whole grain harvest. The volume of sugar beet production in 2018 will allow 115 thousand tons of sugar to be produced, out of which 73.2% will be exported. According to the forecast in 2018, 125 thousand tons of vegetable oil will be produced and 62.4 thousand tons of vegetable oil will be exported, as well as 398.2 thousand tons of sunflower seeds (50% and 60.3% – respectively).

From the predicted volumes of vegetables (315 thousand tons), fruits (568 thousand tons) and grapes (615 thousand tons) 135.3 thousand tons of vegetables, 121.8 thousand tons of fruits, 267,5 thousand tons of grapes will be industrially processed. As a result, 82 thousand tons of canned fruits and vegetables, 14.1 mil. tons of grapes wine, 780 thousand tons of sparkling wine, 750 thousand tons of cognac. For export, 88% of the volume of canned vegetables and fruits, 98.5% of grape wines, 60% of cognac and 23% of sparkling wines are expected.

The production of fermented tobacco is expected to amount to 1.35 thousand tons, of which 0.2 thousand tons will be exported. 2.2 billion cigars and cigarettes will be produced from the remaining quantity (including the volume of imported tobacco), but only 0.5 billion pieces will be exported, due to the loss of outlets.

The development of the AI manufacturing industries and the increase in production volume depend to a large extent on the level of insurance of companies with the raw material in the required quantity and high quality. A special role in achieving this goal is the improvement of the supply system, its provision with the necessary material and financial resources, the interest of the agricultural producers in the increase of the production volume for the industrial processing.

A large share in the produced and exported production structure of the manufacturing industry of AI continues to be attributed to the following branches: *wine, cans, sugar, vegetable oil, tobacco*.

*The wine branch* holds the main role in the stable development of the economy and the export potential of the Republic. For the forecast period, it is foreseen to increase production volumes and budget revenues from wine-producing enterprises if the Russian market is restored and other sales markets will be found.

*The canning industry* is expected to produce about 82 thousand tons of production, of which 88% will be exported. The largest volume of this branch, which is used for domestic consumption, will be sold on the unorganized market. A factor that underpins the development of this branch is the lack of interest of agricultural producers in the marketing of production for its industrial processing. Small purchase prices for vegetables and fruits proposed by industrial enterprises do not allow the costs to be covered and require a reduction in the production volume or the finding of another way for marketing of production.

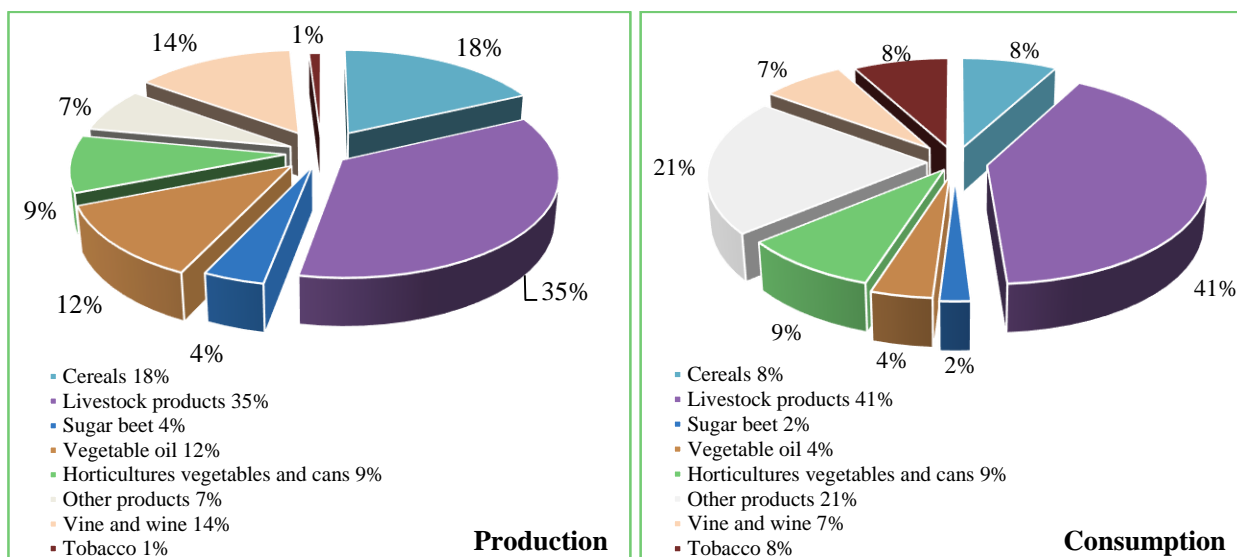
*The sugar branch* also faces problems related to raw material insurance. Most of the production will be used for domestic consumption and only 73.2 thousand tons are expected for export. Such a proportion confirms an unfavourable situation that continues to exist on the external market for this product. The high production price, introduction of high import tariffs on Moldovan sugar in neighbouring countries make it uncompetitive. Thus, the branch can be transformed from an exporting one into a branch that will produce only for the domestic market.

*The vegetable oil and fats branch* will increase the production volume to 125 thousand tons, of which 50% will be exported. On the domestic market, as before, the consumption of vegetable oil will be mainly satisfied by the unorganized market (47.4%).

*The tobacco branch* is oriented towards the domestic market and export of production. It is expected to export about 23% of tobacco products and 9% of fermented tobacco, unfermented tobacco is mainly used in production consumption and 48% is exported. It should be noted, however, that export opportunities are only real when tobacco producers will actively promote themselves on the foreign market.

The analysis of export-import volumes in the Republic shows that in recent years the share of imported AI production is increasing and the share of AI production exported in the total volume is decreasing. **Thus, in 1996, agro-industrial's share amounted for 73.5% of exports, and in 2016 – 46.2%, in imports in 1994 it constituted – 7.6% and in 2016 – 15.2%.** *This confirms the increase of the role of other branches in export. The increase in import quota of AI production signals that it is necessary to take measures to protect the internal market.*

The indices predicted in the input-output balance model show that in the structure of AI production (figure 1) the largest share belongs to the livestock – 35%, followed by the cereal – 18%, wine-vineyard – 14%, vegetable oil – 12%.

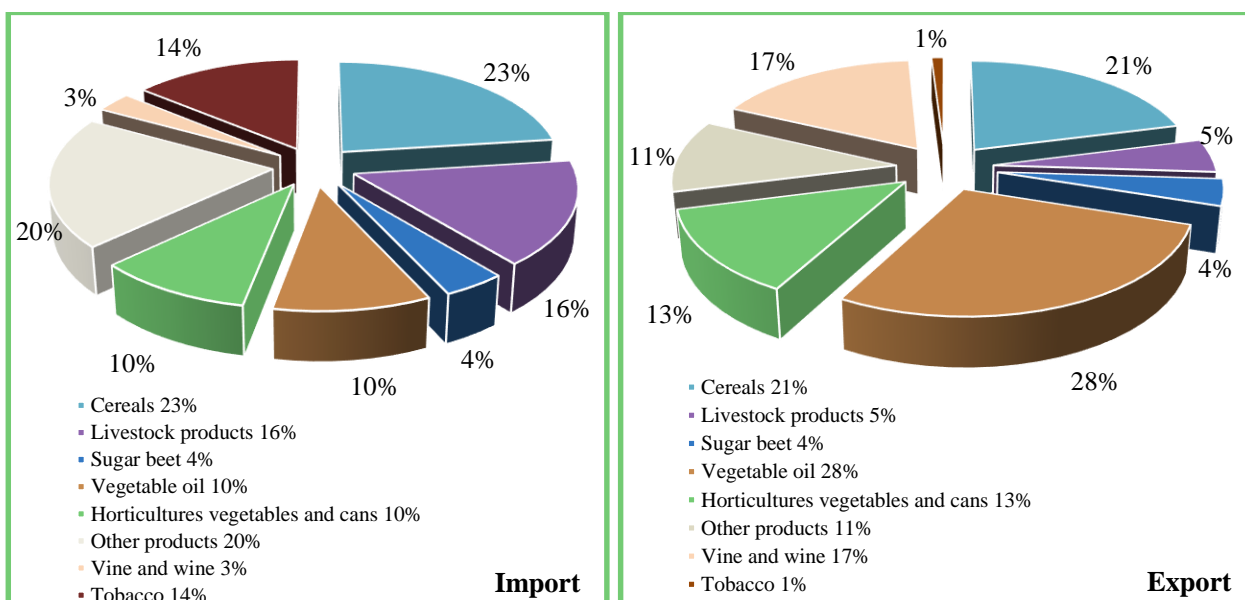


**Figure 1. Structure of production and consumption in 2018 according to the data of forecast interbranch balances**

Source: elaborated by the author based on own calculations.

The weight of the horticulture, vegetables and canned in the consumption production structure is estimated to be 9%, followed by the cereal and tobacco – 8% each, wine-growing – 7%.

It is expected in the structure of imports of agro-industrial commodities (figure 2), the largest share will belong to the cereal – 23%, the livestock – 16%, tobacco and its products – 14% and vegetable oil – 10%. At the same time, it is estimated that vegetable oil will hold a leading position in the export structure, having a share of 28%, the wine-growing – 17%, cereals – 21%, and horticulture, vegetables and canned – 13%.



**Figure 2. Structure of import and export in 2018 according to the data of forecast interbranch balances**

Source: elaborated by the author based on own calculations.

The final indices in the input-output balance model of the AI show that the cost of total production in 2018 will amount to 54,830.7 million MDL, including the agricultural sector output – 29,615.4 million MDL. The cost of imported AI production is expected to be 8,749.9 million MDL (i.e. 463.84 million USD), and the cost of the AI export production is estimated at 20,934.87 million MDL (or 1,110 million USD).

The final consumption is estimated at 42,888 MDL (i.e. 2,274.02 million USD), including the agricultural sector production – 11,889.7 million MDL (i.e. 630.4 million USD) representing 27.7%. Out of final consumption production, the retail production will amount to 19,232.4 million MDL and on the non-organized market – 24,191.7 million MDL or 55.7%. At the same time, the cost of production used for intermediate consumption will amount to 20,399.32 million MDL.

Revenues in the state budget from the given branch of national economy will be in the form of excises – 2,085.6 million MDL and VAT – 6,640.2 million MDL.

### **Machine building industry**

The machine building industry in the years preceding the reform occupied an important place in the national economy. In 1990, the weight of this branch in the Republic as a whole was about 21% of total industry, while in 2016 it was about 2.16%.

Since 2007, a number of major products in the analyzed branch of national economy have not been produced in the Republic of Moldova, such as: trailers, tractors, TV sets, washing machines, etc., due to the loss of the sales markets. Now, in the machine building industry there are produced a lot of machines and equipment in relatively small quantities.

Production of woodworking machines and centrifugal pumps in recent years has shown a negative trend. Thus, in 2016 only 28 pieces of woodworking machinery and tools were produced. Although this figure is 2.5 times higher than in the previous year, it should be noted that in 2012 it was produced 2.8 times more and in 2006 even 7.9 times more than in 2016. The production of centrifugal pumps decreases every year, constituting only 219 units in 2016, which is 4.2 times less than in the previous year and 15 times less than in 2006.

The production of non-portable personal computers in recent years was characterized by a negative dynamics, accounting for 5369 pieces in 2016, thus decreasing by 14.7% compared to 2014. At the same time, the production of electric anti-theft devices and other television and radio receivers after an essential reduction in 2015 by 48% and 20% respectively, increased in 2016. Thus, the production of other television and radio receivers reached the level of 2014, constituting 6895 pieces, and the production of anti-theft electric appliances constituted 5369 pieces in 2016, increasing 16 times compared to the previous year.

The production of transformers with voltage of  $\leq 16$  kVA, electric conductors and apparatus for filtering liquids after an increase registered in 2015 was reduced in 2016 by 5.7% (amounting for 11039.7 thousand units), 4.1% (10508.3 thousand units) and 26.8% (151.3 thousand units) respectively.

Conversely, the following product groups: other water heaters and thermoplan heaters; electric grids, grills and electric furnaces; as well as lifts, conveyors, transporters registered an increase in production in 2016, constituting 1278 units (thus increasing by 12.4% compared to the previous year), 1858 pieces (9.5%) and 1180 pieces (18 times) respectively.

Orthopedics and fractures apparatus showed a decrease in production volume in 2015 (by 3.7%), followed by an increase of 9.5% in the following year, constituting 174.2 thousand units. The opposite is observed in the dynamics of medical, surgical, dental or veterinary furniture production, which in 2016 amounted to 19.1 tons, which is by 32.8% less than in the previous year.

The repair of machinery and equipment was in the volume of 319.9 million MDL in 2016, thus increasing by 9.9% compared to the previous year. At the same time, it should be noted that the volume of maintenance and repair services of medical instruments and apparatus; the installation of electronic and industrial equipment decreased in 2016 by 0.4% (47.2 million MDL), 32.6% (45.9 million MDL) and 31.9% (89 million MDL) respectively.

In addition, the production of jewellery was included in this branch of national economy, which is characterized by an unstable character. Thus, if in 2010 jewellery was produced in the amount of 15500 thousand MDL, after an insignificant reduction, there was an increase in the years 2014-2015. In 2016 jewellery production worthed 20314 thousand MDL, which is by 26% less than in the previous year, but at the same time by 31% more than in 2010.

The volume of gold and silverware articles and their precious metal parts is characterized by a negative trend in recent years, decreasing by 49.2% in 2016, making it equal to 21.5 kg.

Research of statistical data for the first 11 months of 2017 shows that there has been an increase in the production volume of the given branch of national economy. Manufacture of machinery, equipment and tools increased by 5%, manufacture of electrical equipment by 36.6%, manufacture of motor vehicles, trailers and semi-trailers – by 9.2%. At the same time, the manufacture of computers and electronic and optical products decreased by 8.4% and the repair, maintenance and installation of machinery and

equipment by 11.3%.

According to the developed forecasts, the production volume in 2018 of the given branch of national economy will increase compared to the previous year for almost all types of products. The production of woodworking machines will increase by 6.7% compared to 2010 and by 33% compared to the previous year. The production of centrifugal pumps will decrease by 5.6 times compared to 2010 but compared to the previous year – it will increase by 20%. At the same time, the volume of jewellery production has decreased 2.1 times compared to 2010, and by 2.74 times compared to the previous year.

Some of the industry's products in recent years have lost their places on both external and internal markets and others are no longer produced because businesses have gone bankrupt. Although a number of products are no longer produced in the country, the authors have used them in drafting the interbranch balances because they are imported and consumed in the Republic.

A part of the products is aimed for both export and domestic production. According to the elaborated forecasts, 21.3% of the elevators, transporters, conveyors will be exported in 2018; 47.6% apparatus for filtering liquids; 94% plows and disc harrows; 57% machines and apparatus for sorting, mixing.

Although some products are produced in the Republic, the products are still imported to meet domestic needs. Thus, the estimated imports of some products are: 8.76 thousand tractors, 152.78 thousand TV sets, 53.19 thousand washing machines and jewellery worth 325 million MDL. It is expected to import cars in volume of 4,940 pieces.

Analyzing the final results of the forecasting balance for the production of this branch of national economy, it is necessary to mention that the volume of production will amount to 4,435,7 million MDL, production in the amount of 20,312,8 million MDL (or 1077 million USD) will be imported and exports will account for 2,229.8 million MDL (118.2 million USD), retail goods will be sold in the amount of 64,706.7 million MDL (on the organized market – about 72.7%) and goods will be sold on the non-organized market in the amount of 24,336,4 million MDL (about 27.3%).

Based on the activity of the machine building industry in the state budget, payments will be made in the amount of 932.7 million MDL in the form of excises and 1015.1 million MDL in the form of VAT.

### **Light industry**

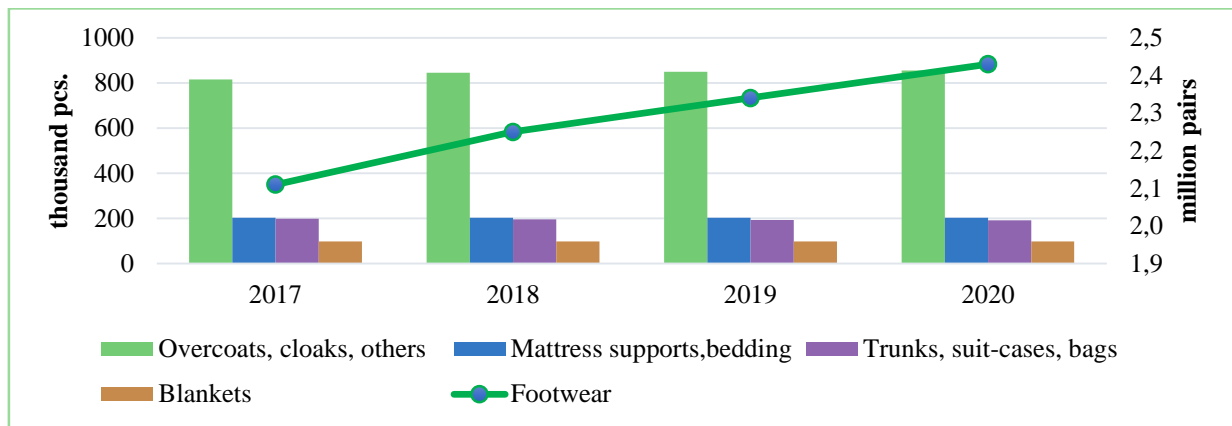
The light domestic industry has production capacities. The evolution of this branch reflects the general trend of the development of the national economy. The light industry has great advantages. These are the relatively high turnover of circulating assets, the opportunity to create a large number of workplaces. Many light industry enterprises mainly manufactured goods using the raw of clients [6, p.163]. Among the largest importers of services can be named: Germany and Italy.

Manufactured goods from the domestic raw material are exported to Romania, the USA, United Kingdom, Poland, Austria, etc. At the same time, the above-mentioned goods are also delivered to the Commonwealth of Independent States (CIS) countries. The analysis of export demonstrates that export of the goods made from customer's raw material is higher than export of the commodity made from domestic raw material. This particularity was taken into account by the author in the elaboration of forecast interbranch balances for the light industry.

The forecast for the production of light industry goods for the years 2018-2020 was made using the EViews package. The dynamic of light industry products for the forecast period 2018-2020 is shown in figure 3.

It is necessary to mention that the situation created by the structural changes within the European Union, of course, will also bring changes on the Moldovan market. For this reason, enterprises have to increase the volume of products made from its own raw material for its delivery both on previously lost foreign markets (CIS countries) and on new markets, especially on the market of European Union.

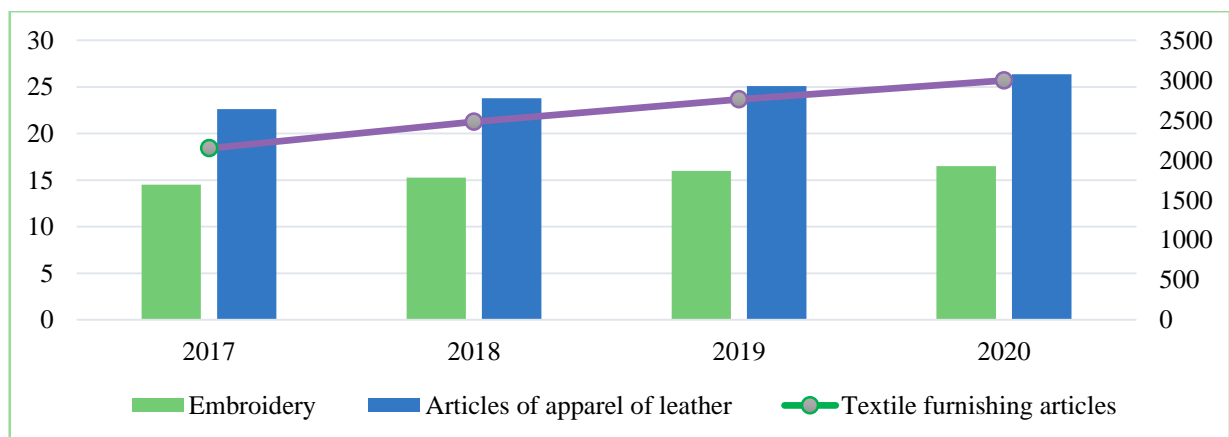
Light industry could become a catalyst for the economic rebirth of the Republic of Moldova. As a priority, practically all types of activity are accepted, but with a clear orientation towards market requirements. Moldovan exports to the European Union countries have increased in recent years. Regretfully, exports of finished goods have decreased considerably, but exports of services have increased. Among the countries of the European Union, we distinguish Italy and Germany as the biggest trading partners.



**Figure 3. Dynamics of some light industry commodities in the forecast period 2017-2020, in physical terms**

Source: Elaborated by the author based on own calculations.

In elaboration of forecast interbranch balances, it was taken into account that the large share of the total export of light industry to Western countries is services. It is worth noting that companies are currently operating in the conditions of insufficient current assets and the fact that banks offer loans with a high interest rate, which is bigger than the rate of profitability. Light industry enterprises require capital investments for their technical re-engineering, the implementation of high-tech technologies and, as a result, the increase in the competitiveness of indigenous goods. The analysis of the light industry's production volume dynamics has shown that the following goods will have the most significant increases: textile furnishing articles, embroidery in the piece, in strips or in motifs (figure 4).



**Figure 4. Dynamics of some light industry goods in the forecast period 2017-2020, mil. MDL**

Source: Elaborated by the author based on own calculations.

The output of the light industry will amount to 8,342.37 million MDL in 2018. The volume of import will reach the level of 7,843.86 million MDL (or 415.9 million USD), the export volume will be equal to 6,417.28 million MDL (or 340.26 million USD), the intermediate consumption – 5,950.96 million MDL, the retail trade - 2,441.92 million MDL, the realization on the unorganized market – 2,809.91 million MDL. It is worth noting that the difference between resources and uses is the changes in inventories.

The light industry will make payments in the state budget in the amount of 1,067.06 million MDL in the form of Value-Added Tax (VAT) in 2018.

#### **Construction materials industry**

In Moldova, there are raw materials and production capacities for consolidating and developing the extractive industry and production of building materials, especially cement, cutting, shaping and finishing of stone, clay, concrete, lime, and plaster. This branch of national economy has growth potential, the demand for its production is slowly increasing, but the large enterprises of this industry are not fully utilizing the production capacity. For example, plants producing reinforced concrete products have a higher capacity

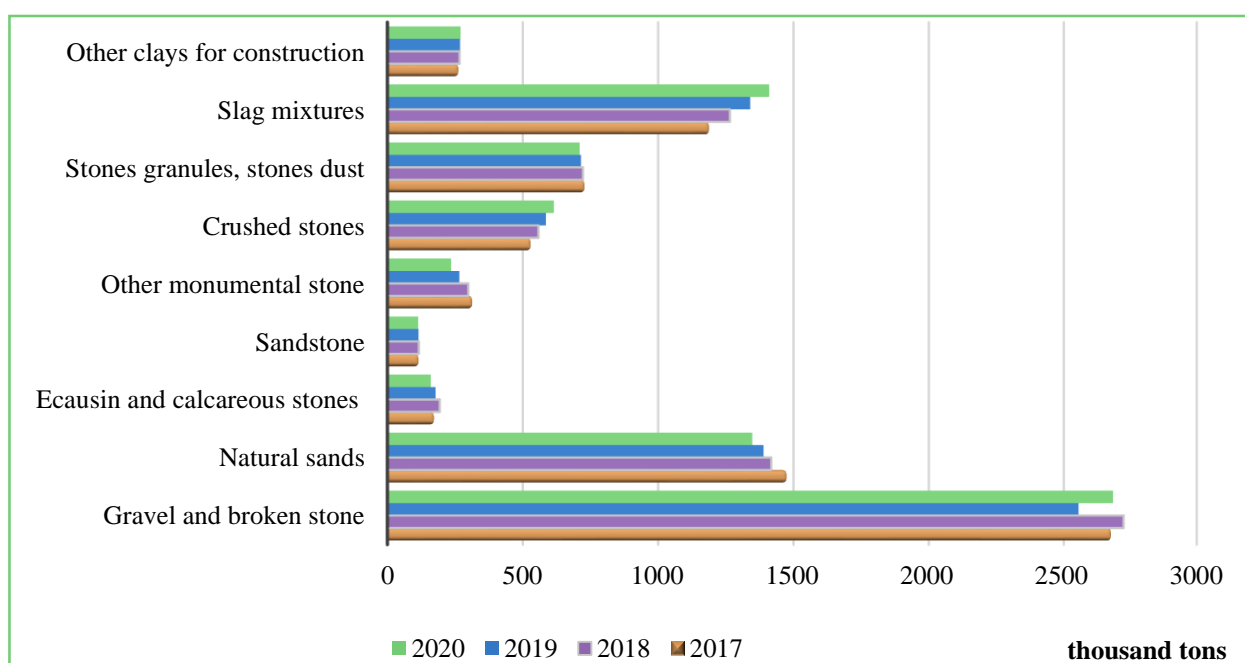


than their production volume; these enterprises do not feel the lack of raw material. The reason for the situation described is the low level of disposable income of the population and the dynamics of the price level (increase in prices).

Continued price increases and population exodus do not seem to affect the dynamics of the construction market. However, high prices for new apartments, low purchasing power of the population and high interest rates for loans will have a negative impact on the evolution of both the construction industry and the construction materials industry.

The analysis of natural-value interbranch balances developed for the construction materials industry of the Republic of Moldova revealed that 65% of the volume of the necessary building materials is covered by the domestic production. Metal, glass, wood and wood products, plastic products, linoleum, electrotechnical articles are imported into the Republic of Moldova. The total value of imported building materials annually exceeds one billion lei. Experts believe that the optimal ratio between the volume of domestic and imported building materials should be 4:1.

The elaboration of forecast interbranch balances for 2018 shows that the production volume of  $\frac{3}{4}$  types of activities will increase compared to 2017: manufacture of cement, concrete – by 15.4%; prefabricated elements of cement – by 14.4%; ecaussine and calcareous stones – by 11%; slag mixtures – by 6.3%; crushed stones – 5% (figure 5 and 6).



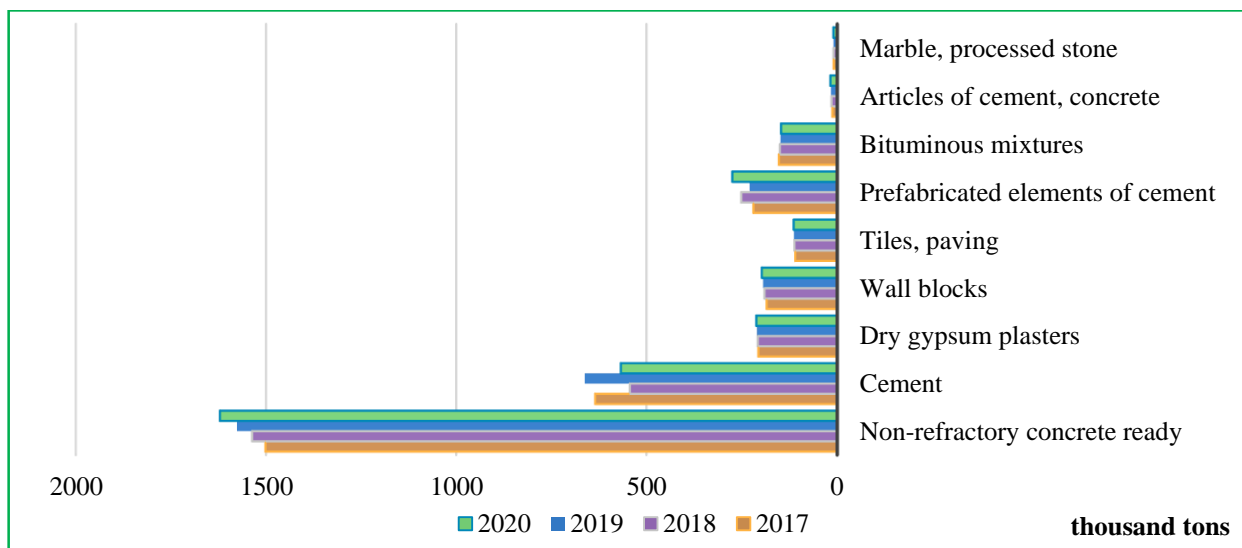
**Figure 5. Dynamics of the volume of extraction of stones, sand and clay in the forecast period 2017-2020**

*Source: Elaborated by the author based on own calculations.*

In 2018 the production volume of the main types of products included in the building materials industry will be 4,849.16 million MDL, the import volume will reach the level of 1,144.07 million MDL (or 60.66 million USD), the export volume will be 293.54 million MDL (or 15.56 million USD). Based on the activity of the construction materials industry, in the budget of the Republic will be made payments in the amount of 969.67 million MDL in the form of VAT.

Analyzing the evolution of the building materials industry and the elaboration of forecasts have shown that this branch of national economy has development opportunities. Supporting the construction materials industry will result in higher payments to the state budget. In the case of the import of construction materials, only the taxes collected by the customs service are paid into the state budget. Nevertheless, the optimal activity of this industry will give a number of advantages:

- will create new jobs for citizens of the Republic of Moldova, finally will rise the employment rate,
- will increase budget allocations due to the growth in volume of taxes and duties collected: an income tax, a transport vehicle tax, a property tax, social insurance, medical insurance, etc.



**Figure 6. Dynamics of some construction materials industry commodities in the forecast period 2017-2020**

Source: Elaborated by the author based on own calculations.

It is indisputable that capital investment is needed in the building materials industry to avoid a substantial reduction in construction due to lack of materials. At the present, this branch of national economy develops based on its own financial resources. Investors are not in a hurry to allocate fund, because Construction materials industry needs a too huge amount of capital, and the return of the invested capital requires a long reimbursement period.

The strong points of this industry:

- the tendency to increase the production volume of basic goods of the branch,
- the high potential for diversification of goods,
- increased production volume of goods with high added value.

Weaknesses:

- the low level of attracted foreign direct investment in this sector,
- the high degree of physical and moral depreciation of fixed assets;
- the low solvency of the population.

The improvement and development of this construction materials industry depends very much on the state of the national economy as a whole. With the increase in the living standard of the population, the volume of construction will increase too and, therefore, the construction materials industry will develop.

#### *Heavy industry*

The heavy industry comprises the following types of activities: woodworking; manufacture of wood and cork products except furniture, manufacture of articles of straw and plaiting materials; manufacture of chemical substances and chemical products; manufacture of other non-metallic mineral products; metallurgical industry; furniture manufacturing; production and supply of electric and thermal energy, gas, hot water and air conditioning.

For 2016 according to the analyzed data, the given activities had different evolutions, such as: wood processing, wood and cork products except furniture; the manufacture of articles made of straw and other woven vegetable materials accounted for the largest increase in industrial production volume by 50.2% more than in the previous year, followed by the furniture and manufacture of chemical substances and chemical products activities which had increased by 27.5% and 17.2% respectively. However, in the given branch of national economy there are activities that have had reductions in the volume of industrial production, namely: production and supply of electric and thermal energy, gas, hot water and air conditioning had 1% reductions, production of other non-metallic mineral products had a 9% reduction and the metallurgy industry marked a 10.6% reduction.

By analyzing the economic goods examined within the heavy industry in 2016, we note that compared to 2015, the highest increases in production were recorded by school notebooks +104.6%, synthetic detergents +60.3%, drugs +16.76% and furniture manufacturing +16.1%. On the other hand, the production

of a range of products has been reduced, namely: production of canning -32.9%, production of timber -14.2%, production of new bottles -4.54% and production of electricity -3.5%.

The year 2017 according to the National Bureau of Statistics for the period January-November compared to the previous year brings deviations of the economic activities. There are increases in woodworking, manufacture of wood and cork products, except furniture; manufacture of articles of straw and plaiting materials +10.9%, manufacture of basic pharmaceutical products and pharmaceutical preparations +8.5%, metallurgy +6.8%, production of other non-metallic mineral products +2.3% and manufacture of furniture +1.2%. At the same time, significant reductions were recorded in production and supply of electric and thermal energy, gas, hot water and air conditioning -0.7%.

For the year 2018 according to the forecast, the volume of production will increase for most of the analyzed products. Thus, the volume of production of agglomerated boards will increase by 42.86%, industrial wood by 20%, synthetic detergents by 10.51%, timber by 8.83%. Increases of up to one percent will be recorded for electricity +0.41%, drug production +0.28% and furniture +0.26%. Decreases in production volume are forecasted for the production of cans -3.25%, thermal energy -0.31%, new bottles -0.91%. The other types of production analyzed within this industry will be imported. Laminated ferrous metals are expected to be imported in the amount of 201.5 thousand tons, of which about 5% will be exported while the rest will be used in the country. Non-ferrous laminated metals will be imported in the amount of 13.8 thousand tons, of which about 50% will be exported.

As a result of the carried out forecast and increased demand on the market, the import volume of fertilizers is expected to reach 106.4 thousand tons or by 3.1% more compared to 2017. For the same period, the volume of imports of chemicals will amount for 6.1 thousand tons, by 6.6% more than in 2017. According to the forecast, the import volume of synthetic detergents will be 37.5 thousand tons. From the total volume of detergents imported and produced, 30.7% will be sold through the organized trade in the country, 44.9% through the unorganized market, and 23.1% will be exported. For 2018, the import of industrial wood is expected in a volume of 165.2 thousand m<sup>3</sup>. Out of the total volume of imported and produced industrial wood, 21.3% will go on the organized market, 24% on the non-organized market, 53.3% in production, and the rest will be exported.

Timber production in 2018 is forecast to reach 13.8 thousand m<sup>3</sup>, and another 9.52 thousand m<sup>3</sup> will be imported. Out of total production and import, 39.1% will be sold on the organized market, 6.4% will be exported and the remaining 65.2% will be used in the production process. The import of furniture is expected to be in the amount of 15.2 million MDL, while production – in the amount of 1252.4 million MDL. Out of the total, 82.5% will be sold on the organized market, 15.3% will be distributed on the non-organized market, and 1.2% will be exported.

In 2018, the volume of bottles production will be about 210.8 million pieces. It is worth mentioning that in the same year there will remain a considerable stock of the previous year – about 15.15 million pieces. Import is forecasted at 40.8 million units, and exports will account for 66% of all goods. 3.1% will be marketed on the non-organized market and 30.7% will be used in production. The production of canned packaging will be 95.7 million pieces, while the import will be around 15.4 million pieces. Of the total, 48.9% will be used for production purposes, 32.4% for export purposes and 18.2% for the non-organized market.

Forecast of energy resources for 2018 in the Republic of Moldova

For 2017 we estimate that the local market will need about 4566.1 million kw / h, out of which about 889.6 million kw / h will be produced in the Republic of Moldova, and the rest will be imported predominantly from the left bank of the Dniester River. In 2018, the electricity demand on the local market will increase by about 2.5% compared to the previous year and account for about 5592 million kW/h, while the trends of import and production will remain practically at the same level.

In the Republic of Moldova in 2016, 1824.66 thousand Gcal of thermal energy were produced, mainly destined for the consumption of the population. For the year 2017, the production of thermal energy is estimated at about 1793.6 thousand Gcal as a result of a 1.7% reduction in production compared to 2016 and in 2018 this indicator will decrease insignificantly by about 0.35% and will be about 1787.4 thousand Gcal. The resources necessary for the production of thermal energy are fully imported. Thus, if in 2016 the import of coal constituted 100.06 thousand tons, then for 2017 a total import of 110.63 thousand tons is forecasted, and in 2018 – 113.8 thousand tons.

Trends in recent years of massive construction of new residential blocks that are not subject to centralized heating, but rather their own natural gas heating systems indicate that in 2017 natural gas imports

will increase by 2.4% compared to the previous year, and in 2018 – by 2.9% compared to the same year. For the years 2017 and 2018 no major changes are expected in the import of gasoline and diesel fuel. Thus, by the end of this year, gasoline imports will decrease by 6.4% and diesel fuel will increase by 1.3%. For 2018, it is estimated that gasoline will drop by 4.6% compared to 2016 and diesel imports will increase by 3.3% regarding the same year.

*Estimate of forecasting the main macroeconomic indicators*

From the beginning, the authors carried out quantitative research in economics [1], and then using the adapted model have forecasted the main macroeconomic indicators. “The current period of development of the national economy of the Republic of Moldova is marked by macroeconomic imbalance, with an increase in the price level and consequently by an increase of the inflation rate, with the increase of the export of services and the decrease of the export of goods with high added value” [7, p.155].

The analysis of Gross Domestic Product (GDP) in 2013-2016 showed that in the period under review there was a slow growth trend except in 2015. The cause of insignificant diminution is due to the drought in 2015. As a result, the volume of agricultural production decreased by 13.4% and the export decreased by 15.9%.

The unfavourable climatic conditions in 2015 caused a set of negative consequences, apart from those mentioned, there was a considerable decrease in the dynamics of imports, the volume of which decreased by about 25%. Other negative effects could be found in inflation rate dynamics and exchange rate dynamics. The preliminary estimate for 2017 of GDP shows that this index will reach the level of 150.4 billion MDL. According to the authors' calculations, in 2018 the GDP in the Republic of Moldova will reach 165.9 billion MDL, i.e. it will increase in real terms by 4.1% compared to the previous year (table 1).

**Table 1**

**Dynamics of main macroeconomic indicators for the Republic of Moldova**

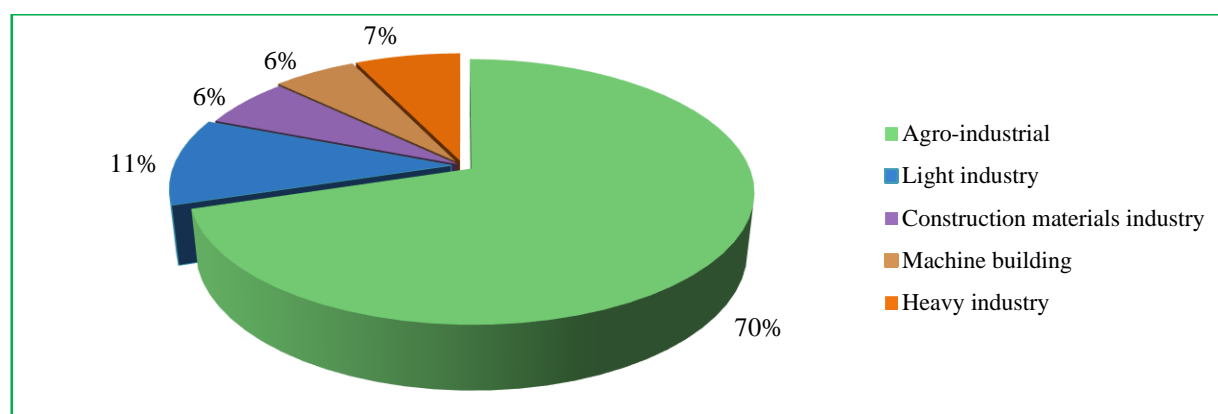
	2014	2015	2016	2017 preliminary	2018 forecast
<b>Nominal GDP (million MDL)</b>	112049.6	122562.7	134937.1	150369.3	165926.5
<b>GDP in % to previous year (comparable prices)</b>	104.8	99.6	104.5	104.5	104.1
<b>Nominal GDP per capita (MDL)</b>	31506	34485	37990	42361	46766
<b>Volume indices of industrial production, previous year = 100</b>	107.3	100.6	100.9	103.4	104.0
<b>Volume indices of agricultural production, previous year = 100</b>	108.6	86.6	118.8	108.6	105.0
<b>Exports (million USD)</b>	2339.5	1966.8	2045.3	2425.1	2570.6
<b>in % to previous year</b>	96.3	84.1	104.0	118.6	106.0
<b>Imports (million USD)</b>	5317.0	3986.8	4020.4	4831.4	5058.5
<b>in % to previous year</b>	96.8	75.0	100.8	120.2	104.7
<b>Balance of Trade (million USD)</b>	-2977.5	-2020.0	-1975.1	-2406.3	-2487.9
<b>Level of imports coverage by exports (%)</b>	44.0	49.3	50.9	50.2	50.8
<b>Number of population (thousand persons)</b>	3556	3554	3552	3550	3548
<b>Consumer Price Index (average per year; previous year = 100)</b>	105.1	109.7	106.4	106.6	106.0
<b>Average annual exchange rate (MDL/USD)</b>	14.04	18.82	19.92	18.49	18.00

Source: Elaborated by the authors based on the data of the National Bureau of Statistics [online]. [accessed on 20.03.2018] Available: <http://statbank.statistica.md> and based on the data of authors' adapted model of natural-value interbranch balances.

In 2018 according to the forecast interbranch balances it is planned that the volume of industrial production in comparable prices will increase by 4.0% compared to the previous year and the volume of agricultural production in real terms will increase by 5% compared to the previous year. Exports increased by 18.6% in 2017 and imports – by 20.2% compared to the same period of the previous year. According

to the forecast model for 2018, the export and import will amount to 2,570.6 million USD and 5,058.5 million USD. Level of imports coverage by exports will reach 50.2% in 2017 and 50.8% in 2018. The trade deficit will amount to 2,406.3 million USD in 2017 and 2,487.9 million USD in 2018.

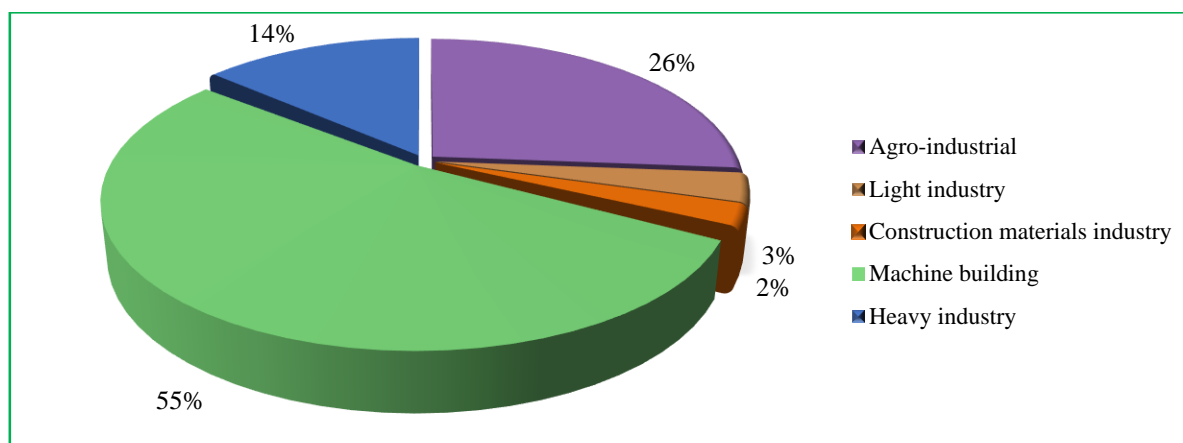
Average annual exchange rate for 2017 was estimated based on data from the National Bank of Moldova for the twelve months of the corresponding year. The exchange rate was 18.49 MDL/USD in 2017 and the average annual rate of inflation – 6.6%. According to the forecast, the exchange rate for 2018 will reach the level of 18.00 MDL/USD, and the average annual inflation rate – 6.0%. The structure of the production volume, consumption, exports and imports in the division of the branches of national economy for 2018 are given in figures 7-10.



**Figure 7. Structure of production volume, by branches of national economy, in 2018**

Source: Elaborated by the author based on own calculations.

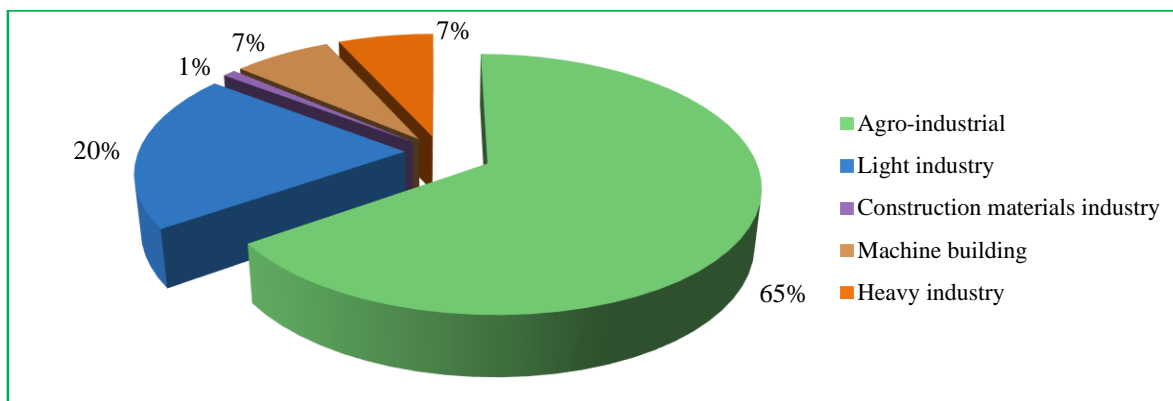
The Agro-Industry (AI) is the basic branch of the national economy of the Republic. The production volume of AI represents 70% of the total volume in the country (figure 7). AI meets 26% of the country's final consumption (figure 8), 65% of exports and 14% of imports (figure 9 and 10).



**Figure 8. Structure of consumption, by branches of national economy, in 2018**

Source: Elaborated by the author based on own calculations.

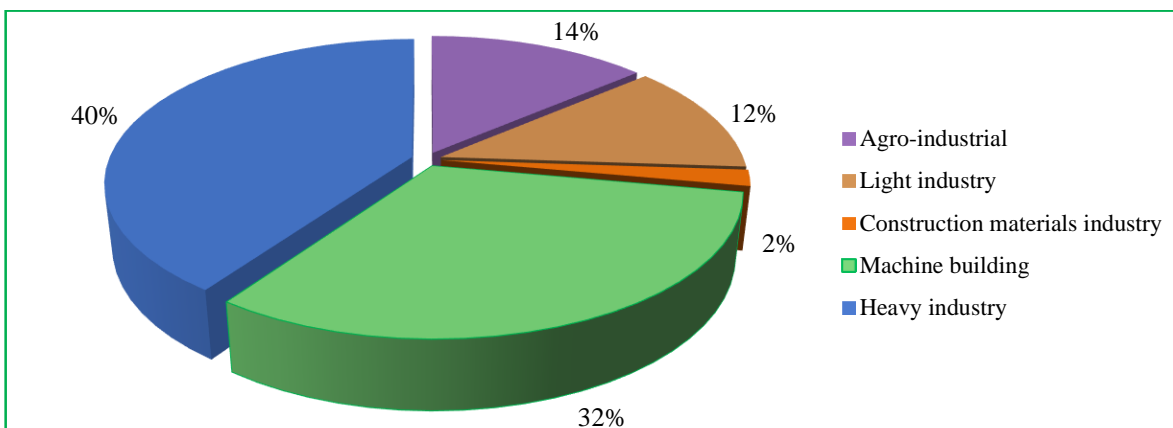
According to forecasting, the light industry will come at the second place in the structure of production volume in 2018. The share of this branch of national economy will be 11% (figure 7). In the structure of exports and imports, the share of light industry will be 20% and 12% correspondingly (figure 9 and 10).



**Figure 9. Structure of exports, by branches of national economy, in 2018**

Source: Elaborated by the author based on own calculations.

The Heavy Industry (HI) in the structure of production volume will be ranked third with a 7% share (figure 7). In the structure of the final consumption, the share of HI will be 14% (figure 8), in the structure of export and import of 7% and 40% respectively (figure 9 and 10).



**Figure 10. Structure of imports, by branches of national economy, in 2018**

Source: Elaborated by the author based on own calculations.

The construction materials industry and machine building industry will have a small share in the production volume structure, namely 6% each. The structure of the export is reflected in figure 9, which shows that the export potential of the Republic is mainly represented by the agro-industry (65%), light industry (20%) and share of other branches being insignificant.

Figure 10 reflects the structure of the import for 2018, which shows that the import of the products of heavy industry is – 40%, followed by machine building – 32%. The given structure of the import of goods cannot ensure economic growth. It is necessary to import such machines and technologies, which require smaller volumes of energy resources.

### Conclusions

For the development of the branches of national economy, it is necessary for the state to apply economic policies aimed at:

- ensuring the sustainable development of the national economy,
- inflation targeting,
- exchange rate stability,
- inflow of additional work force on the account of citizens of the Republic working abroad,
- development of a stable banking system,
- development of microfinance institutions,
- effective use of the potential of teachers to increase the quality of professional training,
- increasing the investment attractiveness of the Republic of Moldova.

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