February 2012

Pharmaceutical industry in Romania

Main developments and the impact on the society and economy

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Executive summary

The pharmaceutical supply chain increased markedly in the past decade across all segments, contributing with over 1% to GDP formation (2010). Starting with the second half of 2007, the pharmaceutical market entered in a stagnation period of almost 3 years. The reasons for these dynamics are mainly related to the negative effects of the economic downturn on the healthcare sector's financial resources and to the regulatory measures that transferred a significant part of the healthcare financing towards the pharmaceutical supply chain and especially towards producers.

The onset of the economic crisis in late 2008 unveiled a large structural deficit in the public healthcare sector and as a consequence the National Health Fund extended payment deadlines, starting with October 2009, on prescription based drugs from 60 to 210 days and for drugs covered by the national health programs from 30 to 120 days. In practice however payment terms have exceeded 300 days, thereby generating significant amounts of arrears. In effect, this represented a form of forced financing imposed by the government on the pharmaceutical producers. With over EUR 1 bn of outstanding claims[1] towards the National Health Fund, as of June 2011, the pharmaceutical industry has become one of the biggest creditors of the Romanian government.

So far the pharmaceutical manufacturers have internalized the opportunity costs related to extended payment terms; hence there were no social or economic spillover effects. However if arrears persist and the pharmaceutical producers are not able to cover the related opportunity costs, there is a risk that at some point in the near future the pharmaceutical industry will start reducing the supply of drugs. This would have an immediate major social impact, but would also trigger additional economic losses based on the pharmaceutical industry's linkages with other sectors of the economy.

The Directive 7/2011 of the European Parliament and Council of the European Union on combating late payments in commercial transactions will force Romanian authorities to reduce average claim collection period in the pharma industry by at least half of the current terms by 2013, as they have to reach 60 days at the beginning of 2013. To mitigate the budgetary impact of reducing payment terms in 2013 alone, the government should come forward with a sequenced reduction over the next one year and a half.

The rising past due debts of the National Health Fund towards the pharmaceutical industry has increased incentives for drug distributors to pursue parallel exports in order to improve their financial position. In Romania, the price of RX drugs has been historically set at the minimum level of the prices of RX drugs traded in a number of reference EU countries, thereby creating an opportunity for drug suppliers to exploit the price differences that arise. Distributors buy imported drugs at a (very) low price and re-export them to other markets at higher prices.

[1] Representing both debts within payment terms and overdue payments.

When practiced on a large scale, the parallel trade may result in a shortage of medicines for domestic use, with negative social and economic consequences. We estimate that parallel exports in Romania reached 17.1% of total domestic drug sales in 2010, or 18.4% of total drug imports. This percentage is set to increase dramatically is the Ministry of Health would impose an overhaul price revision in April 2012.

The Romanian government has been attempting to increase revenues to the public health insurance system over the last three years while leaving the current health contribution rates untouched. One of such attempts was a clawback tax aimed at curbing reimbursed drug consumption and recovering from producers and distributors part of the money stemming from market growth. The tax unveils the Government's assumption that drug producers are responsible for RX drugs unplanned/ unbudgeted market growth and ignores the policy and regulatory shortcomings underlying drug consumption and prescription behavior. The latest version of the tax, as of December 2011, introdu-ces a reference threshold for drug consum-ption and claws-back only the exceeding amount.

The producers or local branches of foreign manufacturers would pay the tax directly correlated with their market share and quarterly sales growth. The estimated quarterly average revenues from the clawback tax stand at around 135 mil lei, namely 8% of total consumption. It still maintains a number of drawbacks which impair mainly on the local producers or local branches of foreign manufacturers. The tax value of the new mechanism includes VAT & margins (of distributors and retailers), whereas the liability rests with the producers/ local branches only. Thus, the impact of the tax is significantly higher on producers/ local branches as percentage of their reimbursed sales. The new clawback tax clearly sends out a negative message to investors, by marking Romania as a business unfriendly regime for the pharmaceutical producers. Already the government earns through taxes paid by the pharma supply chain to the central and local budgets more than 20% of the total market value of RX drugs, or RON 1.7 bn (2010). Over the medium term the benefits of the tax to the govern-ment would be outweighed by the lost investment opportunities.

The clawback tax would most probably determine many local and foreign pharmaceutical producers to restructure their business in Ro-mania. The combined value added generated by these companies in Romania stood at RON 2.5 billion in 2010. The largest part of it (more than 95%) is spent in the domestic economy and goes to remunerating labor force, paying taxes or to financing research & development related expenses (e.g. clinical trials), media or screening & disease awareness campaigns, medical education addressed to healthcare professionals. Only a small fraction of the value added (less than 5%) represents net profit, accumulating to the shareholders. The claw-back tax will determine additional costs to the pharmaceutical producers amounting to almost 40% of the value added that they generate. The most likely reaction of the manufacturers to this hike in costs would be to cut investment related expenditures, which according to our estimations are comparable with the projected liabilities from the clawback tax.

Instead of focusing only on short term solutions to keep the public healthcare system alive (e.g. extension of payment terms, arrears, clawback tax), the public authorities should undertake broader measures aimed at overhauling both private and public healthcare sector. While it is beyond the scope of this study to come up with specific policy proposals in this direction, we aim to show the potential benefits that could be reaped over the medium to long term with adequate measures.

Latest healthcare expenditures as a percentage of GDP are close to the average of the past 15 years, indicating that public authorities undertook no significant measures to reform the healthcare system. Romania is losing on average close to 16 thousand active life years per 100 thousand population in a lifecycle, as measured by the disability adjusted life years indicator (DALY), as a result of diseases or injuries, placing it among the countries with the highest disease burden in Central and Eastern Europe (CEE). Non-communicable diseases accounted for 76% of total DALY. On the other hand, non-communicable diseases represent the focus area of the highly innovative pharmaceutical manufacturers. Through continuous research and innovation these companies are able to deliver medicines which allow patients with chronic diseases to live longer, healthier and more productive lives. While the concrete means to reduce DALY exist, it's up to the Government to come up with the right policies to increase population's access to innovative treatments.

The Romanian economy loses around EUR 18.6 bn (15% of 2010 GDP) of economic output over the medium to long term, as a result of the poor health condition of the population, as measured by DALY. If population health status in Romania would be at the EU average level, there would be a surplus in economic output of EUR 6.7 bn (6% of 2010 GDP), resulting from increased labor force participation and productivity. By increasing healthcare expenditures by 5 percentage points of GDP sequentially over the next 10 years, the health status of population in Romania could reach the EU average.

Summary

2.1. Industry structure

- The pharmaceutical supply chain increased markedly in the past decade across all segments, contributing with over 1% to GDP formation (2010).
- Domestic producers, although few, have expanded their production capacities, while at the same time major foreign pharmaceutical manufacturers have entered the Romanian market, either through acquisition of domestic players or through representative offices. Although an important number of drug producers are present on the Romanian market (184), the first 10 largest drug manufacturers by the volume of drugs sold control almost 60% of the market.
- The drug distribution market is limited to a relatively small number of players. Despite the difficulties faced by the pharmaceutical supply chain since the onset of the crisis in 2008, wholesalers have continued to invest to increase their storage capacities.
- Retail business expanded at a rapid pace in the precrisis years (between 2002 and 2007). Within the pharmaceutical supply chain, pharmacies account for the second largest contribution to GDP after drug manufacturers.

2.2. Sales dynamics

- Romanian pharmaceutical market increased by 25% CAGR between 2002 and 2007. Starting with the second half of 2007 the pharmaceutical market, expressed in EUR terms, entered in a stagnation period of almost 3 years (Chart 2.4). The reasons for these dynamics are mainly related to the negative effects of the economic downturn on the healthcare sector's financial resources.
- In the first half of 2011 the pharmaceutical market slowed down significantly, increasing by 2.9% yoy in EUR terms (3.6% yoy in RON terms).
- Prescription based (RX) drugs increased their market share in total retail sales of drugs from 79% in 2005 to 84% in 2011, amounting to an estimated value of EUR 1.9 bn. OTC drugs lost market share compared with RX drugs reaching total estimated sales of EUR 0.35 bn in 2011, equivalent to a market share of 16% of total retail sales.
- Highly innovative drugs account for over 70% of total value of drugs sold and only 25% of the volume of drugs sold. Generic drugs account for 30% of total market in value terms and 75% in volume terms. Cross-country data on generics market share in Europe suggest actually that generics in Romania have the fifth highest market shares in Europe, after Poland, Slovakia, Germany and Slovenia.
- Imports of pharmaceutical products represent the main source for domestic drug consumption. Differences in pricing of RX drugs that arise between countries have led to extensive parallel trade, especially for drug wholesalers.
- By making use of all publicly available statiscal data, we estimate the parallel export in Romania at 18.4% of total drug imports (2010).

2.3. Cost structure of pharmaceutical producers

- Pharmaceutical manufacturers, both domestic and foreign producers, generated a combined RON 2.5 bn value added in the Romanian economy in 2010.
- The largest part of the value added remains in the Romanian economy and goes to remunerate the main production inputs (labor, capital, government creditors and shareholders). Only a small fraction (5%), representing net profit, accumulates to the shareholders.

- The largest part of value added is spent on services acquired from third parties, amounting to over RON 800 million in 2010. Such services may include media or screening & disease awareness campaigns in association with medical services providers, medical education addressed to healthcare professionals, but also services related to R&D activities (e.g. clinical studies). In fact, we think that R&D activities account for an important part of third party costs.
- Excluding VAT, pharma producers contributed to the governments' revenues with over RON 400 million in 2010, representing social insurance, profit taxes and other regulatory taxes.
- R&D expenditures incurred by the highly innovative pharmaceutical producers are hard to estimate due to the lack of official data and heterogeneity of funding sources.
- Market estimations of R&D expenditures vary between tens of million euros and a couple of hundreds of million euros.
- It is in the interest of the pharmaceutical industry to take the necessary steps to increase public disclosure of R&D investments as this could improve the industry's public perception and could lead to a better positioning among foreign direct investors. Ultimately this would also be reflected in a better cooperation with public authorities
- Pharma industry[2] is a low risk sector, supporting the anti-cyclical behavior of the Romanian economy. The small contribution of the pharma industry to the overall value added does not allow this good leverage to generate major positive outcomes (i.e. reducing the amplitude of economic downturns). Creating conditions for a stronger development of the pharma industry in Romania would underpin the anti-cyclical buffers for the economy.
- Profitability in the pharma industry is heterogeneous across the supply chain. Net profit margin registered higher values compared with other economic sectors, while EBITDA margin hovered below the performances of the rest of the Romanian economy. One explanation is the lower level of indebtedness of the pharma companies.
- Insolvency risk across the pharma supply chain remains contained. The number of insolvencies in the pharma supply chain is not material, but the insolvency developments in the wholesale segment might put pressure on the industry if the trend continues.
- The government earns through taxes paid by the pharma industry to central and local budgets more than 20% of the total market value of RX drugs, or RON 1.7 bn (2010). If we take into account the new clawback tax that was introduced in 2011, total taxes paid by the industry will reach 30% of the prescription based drugs market.
- Romania is among the countries with the highest average claim collection period for the pharma industry. The official payment terms for RX drugs are 210 days, however in practice payment terms have exceeded 300 days throughout 2011. Collection period differs substantially according to the type of drugs (OTC or RX). The highest figures are registered for RX drugs, where payments from retailer to distributors range from 240 to 270 days and from distributors to producers range from 150 to 300 days.
- Although the pharma industry carries a large burden in terms of liquidity constraints due to material delay in cashing in its claims, companies form this industry do not fully translate such negative effects to the financial and trade partners.
- The financial activity of the pharma industry is below the average of the Romanian corporate sector. The pharma companies do not use bank loans in order to support their activities, but call for the shareholders support when in need for financing. The overall amount of loans[3] form the domestic credit institutions count for RON 1.46 billion (2010).
- Pharma industry is less risky comparing with the rest of the economy in terms of repaying the financial debts. The non-performing loans ratio is three times lower than the average of the economy.
- Despite having a modest contribution to economic activity, the pharmaceutical producers play a central role in the health supply chain. The intermediary consumption of pharmaceutical goods represents almost 1% of the total intermediary consumption in the Romanian economy (2008). In a ranking across 103 economic sectors, covering the whole economic activity, the innovative pharmaceutical industry is in the upper half of the distribution, on 34th place, by the level of output used as intermediary consumption in other industries.
- The increasing gap between demand for health services and public resources available to finance them, determines households to spend more out of their pocket, than would be normal based on the current level of insurance coverage.

[2] By pharma industry we mean the whole supply chain

[3] Based on companies' official financial statements reported to the Ministry of Finance

4.2. Health outcomes, health-
care expenditures and
economic performance

- The pharmaceutical producers are among the leading contributors to governments' revenues from taxes on products. Taxes on products - which include mainly value added tax, taxes and duties on imports and excises – charged on pharmaceutical goods account for 1.14% of total taxes on products collected at economy level. This means that the pharmaceutical industry is the 23rd largest contributor to the governments' tax revenues from a total of 103 economic sectors.
- Health and social assistance services are of systemic importance for the economy, as one of the most important sources of inter-industry demand and at the same time one of the largest employer.
- For every 1 RON change in final demand of drugs, total output in the economy changes by 1.15 RON. The multiplicative effect of final demand for drugs on total economic output is relatively reduced as the majority of drugs are imported, so that it does not generate a lot of inter-industry activity.
- Although not significant in absolute terms, the indirect impact of the final demand for drugs on employment is important in relative terms: for every 8 employees working in the pharmaceutical industry, 3 more employees work in other sectors of the economy supplying goods and services to the pharmaceutical industry.
- Final demand for health and social assistance services has a higher multiplicative effect on total output than the final demand for drugs: for every 1 RON spent on health and social assistance services the total economic output increases by RON 1.8.
- Governments' final expenditures account for the largest share of final demand of health and social assistance services. So, a change in government policy to spend more or reduce expenditures in this sector may have a significant impact on the whole economy.
- Inter-industry demand generated by the health and social assistance services ensures more than 100 thousand additional jobs in other sectors of the economy.
- The persistence of government's arrears towards the pharmaceutical sector can be equivalent in terms of consequences to a downward adjustment in final demand for health and social assistance services, which would have as an immediate effect a lower supply of drugs. As the effects propagate throughout the economy, additional losses would be generated.
- Romania has one of the lowest life expectancy from the region, explained on the one hand by the delayed start of the transition process but also by the fact that healthcare has not been a priority on government's public policy agenda after the '90
- Beginning with the late '90s the population health status in Romania started to slowly converge to the regional average, as economic growth made more resources available for healthcare. However with no structural reforms implemented, healthcare resources became scarce as the economy entered into recession in 2008/2009 and as a result the population health status deteriorated compared to the regional peers.
- Healthcare expenditures as a percentage of GDP are close to the average of the past 15 years, indicating that public authorities under-took no significant measures to reform the healthcare system.
- Romania looses on average close to 16 thousand active life years per 100 thousand population in a lifecycle (Disability adjusted life years – DALY), as a result of diseases or injuries, placing it among the countries with the highest disease burden in CEE.
- Non-communicable diseases accounted for 76% of total DALY. On the other hand, non- communicable diseases represent the focus area of the highly innovative pharmaceutical manufacturers. Through continuous research and innovation these companies are able to deliver medicines which allow patients with chronic diseases to live longer, healthier and more productive lives. So, the means to reduce DALY exist. The decision however lies with public authorities and depends to a large extent on the design and management of the public healthcare system.
- DALY due to communicable diseases is unusual high compared to the regional average, which is mainly caused by tuberculosis and respiratory infections. The efforts of public authorities from Romania to contain the impact of tuberculosis on population have been less efficient than elsewhere, as an evidence of the lack of structural reforms in the public healthcare system.
- The Romanian economy looses around EUR 18.6 bn (15% of 2010 GDP) of economic output over the medium to long term, as a result of the poor health condition of the population, as measured by DALY.

○ If population health status in Romania would be at the EU average level, there would be a surplus in economic output of EUR 6.7 bn (6% of 2010 GDP), resulting from increased labor force participation and productivity.

○ By increasing healthcare expenditures by 5 percentage points of GDP over the next 10 years, the health status of population in Romania could reach the EU average.

○ Major macroeconomic policies are underway, deriving from the EU new economic governance currently implemented, and a win-win outcome (public-private) calls for a pro-active involvement of the pharma industry

○ One important objective of the Europa 2020 Strategy is innovation and Romania committed to reach a level of 2 percent of GDP by 2020. The private sector is going to play the leading role, although its contribution to this direction has decreased during the previous years.

○ The financial resources the government intends to share for stimulating R&D are important, and the next EU budget (2014-2020) will put more emphasis on innovation spending.

○ There are mainly two policies related to the Europe 2020 strategy that might be followed by the pharma industry in order to reach a win-win solution with the authorities: (i) Stronger cooperation with authorities for better coordination between the R&D agenda of the public and private sector and (ii) supply incentives for a better public management of the unpaid debts to the private sector.

○ High external imbalances are not allowed in the EU anymore, and Romania should implement measures to keep the current account deficits to low levels.

○ Current economic growth model was not able to withstand adverse developments and need to be improved.

○ Higher value added from innovative high tech sectors is a must, pharma industry being able to play a major role in this direction

○ The pharma industry should consider the benefits of production in Romania, taking advantages from the public agenda to encourage and support high tech and innovative products and also to lobby the authorities to keep a sound fiscal policy in the medium and long term.

Introduction

The pharmaceutical industry witnessed important developments within the last years, across the entire supply chain. Many of such developments and their implications for the Romanian economy and society have not been thoroughly analyzed, because aggregate and structural information on the pharma industry is relatively sparse. Moreover, several important evolutions (like R&D activities, life improvement effects etc.) are scarcely documented, if documented at all.

The Romanian pharma industry, as one of the largest supplier of goods and services to the public sector, is facing important financial constraints, stemming from the public sector difficult financial position. Average collection period of drug suppliers' receivables towards public healthcare sector exceeds 300 days. These developments turn the pharma industry into one of the biggest creditors of the Romanian government. The persistence of these payment delays will have negative consequences across the whole pharma supply chain.

The aim of the study is to assess the main developments taking place within pharma industry, and to evaluate the impact of the pharma industry on the Romanian society and economy. A special focus is paid on the highly innovative pharmaceutical companies. The pharma industry performances and challenges are evaluated compared with peer groups, and the direct economic effects and externalities generated into the Romanian economy are estimated. The study uses a broad range of data sources, both quantitative and qualitative. One main piece of information comes from the companies' financial statement data (based on publicly available reports), the statistical data provided by the National Institute of Statistics and EUROSTAT.

The classification of companies into economic sectors is based on NACE Rev 2 codes. For the correct identification of the companies belonging to the pharma supply chain, an expert judgment approach is also employed. The benchmarking analysis is conducted on the main homogenous sectors, covering the whole Romanian non-financial economy.

The study is structured in five chapters. The first chapter is a global view on the Romanian pharma supply chain, targeting industry configuration, sales dynamics, and cost structure. A special focus is on R&D related costs. The second chapter assesses the main risks and opportunities identified into the pharma industry. Implications from the weak payment discipline in the Romanian economy are more broadly analyzed. Chapter three highlights some inputs on the socio-economics effects delivered by the pharma industry. Multiplication effects to the Romanian economy and economic impact of life saving drugs are computed.

Chapter four reviews possible future government policies pertaining to the pharma industry, from the perspectives of EU 2020 Strategy, external macroeconomic imbalances, and redesign of the Romanian economic growth model. The last chapter concludes the main findings of the study.

2. Global view on the Romanian pharma supply chain

2.1. Industry structure

The Romanian pharmaceutical supply chain has expanded markedly in past the decade across all segments. On the demand side, rapid economic growth, until 2008, generated the financial means that enabled some of the population needs for healthcare services to be met.
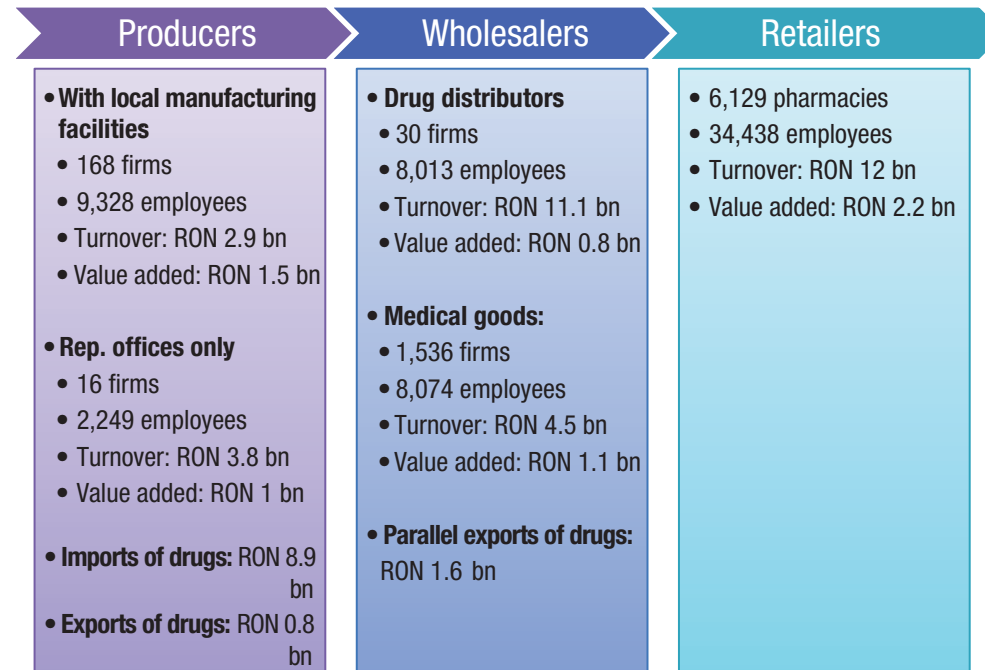
On the supply side, domestic producers, although few, have expanded their production capacities, while at the same time major foreign pharmaceutical manufacturers have entered the Romanian market, either through acquisition of domestic players or through representative offices. Wholesalers consolidated their market positions as business flows increased, while retailers witnessed a rapid expansion of their distribution network.

The combined contribution of the pharmaceutical supply chain to GDP formation was slightly above 1%, as of 2010. Few of the big foreign pharma manufacturers have developed production facilities in Romania.

The uncertainty regarding the regulatory and legislative environment, a fiscal framework which is not business supportive but also the existence of an under-financed public health sector, which generates large arrears towards the private sector, are among the specific factors deterring the major foreign pharmaceutical companies to invest in Romania.

The pharmaceutical supply chain increased markedly in the past decade across all segments, contributing with over 1% to GDP formation (2010).

Chart 2.1: Overview of the Romanian pharmaceutical supply chain (2010)

Producers	Wholesalers	Retailers
• **With local manufacturing facilities** • 168 firms • 9,328 employees • Turnover: RON 2.9 bn • Value added: RON 1.5 bn • **Rep. offices only** • 16 firms • 2,249 employees • Turnover: RON 3.8 bn • Value added: RON 1 bn • **Imports of drugs:** RON 8.9 bn • **Exports of drugs:** RON 0.8 bn	• **Drug distributors** • 30 firms • 8,013 employees • Turnover: RON 11.1 bn • Value added: RON 0.8 bn • **Medical goods:** • 1,536 firms • 8,074 employees • Turnover: RON 4.5 bn • Value added: RON 1.1 bn • **Parallel exports of drugs:** RON 1.6 bn	• 6,129 pharmacies • 34,438 employees • Turnover: RON 12 bn • Value added: RON 2.2 bn

Source: Ministry of Finance, MIND Research & Rating

First 10 drug manufacturers have a market share of almost 60%.

Chart 2.1 summarizes key facts of the Romanian pharmaceutical supply chain, along three main segments: producers, wholesalers and retailers. Drug producers include both companies which have local manufacturing facilities and representative offices of foreign drug manufacturers. In 2010, there were 168 drug producers in the first category generating cumulative sales of RON 2.9 bn, contributing with RON 1.5 bn to GDP formation and using a workforce of 9,328 employees. An important part of the drugs supplied by these companies is imported, while only a fraction of it is domestically produced. This is usually the case of foreign drug manufacturers which have developed some local production facilities. Representative offices act only as an interface between the mother company and domestic drug distributors. Most often their business is limited to medical education and promotion activities; thus, the imports of drugs do not always flow through their balance-sheets. This is why their financial statements do not fully reflect the size of the business that they are effectively intermediating. In 2010, there were 16 rep. offices of foreign drug producers in Romania that generated total sales of RON 3.8 bn and accumulating value added of close to RON 1 bn by employing 2,249 people. The majority of drugs sold on the Romanian market are intermediated by these rep. offices.

Although an important number of drug producers are present on the Romanian market (184), the first 10 largest drug manufacturers by the volume of drugs sold control almost 60% of the market (Chart 2.2). According to a report of the Romanian Competition Council[4], top 20 drug producers controlled 78% of the drug market in 2009. In the past years market concentration increased, mainly on the back of the mergers and acquisition activities that occurred at international level between some of the largest drug manufacturers. Most important transactions were the acquisition of Schering Plough by Merck & Co., that of Wyeth by Pfizer and that of Solvay by the Abbott Group. Also at national level Labormed acquired the product portfolio of Ozone in 2009.

[4] *2011, Report regarding the Romanian en gross distribution market investigation*

Chart 2.2: Top 10 drug producers by the value of drugs sold on the Romanian market

Drug producer	12 month sales ending:				% yoy growth	
	Jun -10		Jun -11			
	RON mn	% of total	RON mn	% of total		
Sanofi-Aventis (incl. Zentiva)	877.3	9.6	843.9	8.6	🔴	-3.8
Hofmann la Roche (not incl. Terapia cooperation)	835.9	9.2	838.9	8.6	🟡	0.4
Novartis (incl. Sandoz)	550.8	6.0	682.7	7.0	🟢	23.9
Pfizer (incl. Wyeth, but not cooperation with Actavis)	615.3	6.7	594.3	6.1	🔴	-3.4
GlaxoSmithKline (incl. Europharm)	557.1	6.1	591.9	6.0	🟢	6.2
Servier (incl. Egis)	477.1	5.2	486.3	5.0	🟢	1.9
Merck&Co (inclusiv Shering Plough)	422.3	4.6	454.7	4.6	🟢	7.7
AstraZeneca	337.7	3.7	403.4	4.1	🟢	19.5
Daiichi-Sankyo (incl Terapia Ranbaxy)	333.5	3.7	352.9	3.6	🟢	5.8
Abbott (incl. Solvay)	252.4	2.8	295.4	3.0	🟢	17.0
Other	3860	42.3	4256	43.4	🟢	10.3
Total	9119.4	100.0	9800.4	100.0	🟢	7.5

Source: Cegedim, MIND Research & Rating

Drug distribution market is limited to a relatively small number of players.

Despite the difficulties faced by the pharmaceutical supply chain since the onset of the crisis in 2008, wholesalers have continued to invest to increase their storage capacities.

Wholesalers of pharmaceutical products include both drug distributors and wholesalers of medical goods. For the purpose of this study we will focus on drug distributors. The drug distribution market is limited to a relatively small number of players. In 2010, there were 30 active drug wholesalers generating sales of RON 11.1 bn and value added of only RON 0.8 bn using a total workforce of 8,013 employees.

In order to be able to activate as a distributor, companies have to ensure adequate drug storage and transportation facilities. According to the National Drug Agency, at national level there are currently around 350 warehousing units available for the distribution of drugs, most of which (over 95%) are owned by only 30 large distributors. Despite the financial difficulties faced by the pharmaceutical supply chain since the onset of the economic crisis in 2008, drug wholesalers have continued to invest to increase their storage capacities, which have grown by more than 15% between 2008 and 2010. The Competition Council report on pharma industry classifies drug distributors into three categories based on their storage capacity: (i) very large (3 companies) – storage capacity in excess of 10,000 sqm, (ii) large (8 companies) – storage capacity between 5,000 and 10,000 sqm, (iii) medium sized (13 companies) – storage capacity between 1,000 and 5,000 sqm and (iv) small (6 companies) – with a storage capacity below 1,000 sqm.

Chart 2.3: Top 10 drug distributors by turnover (2010)

- RON mln

Distributors	Turnover	Net profit
MEDIPLUS EXIM S.R.L.	2,330	37
FARMEXPERT D.C.I. S.A.	1,527	54
POLISANO S.R.L.	1,044	38
FILDAS TRADING S.R.L.	925	37
EUROPHARM HOLDING S.A.	921	8
FARMEXIM S.A.	842	19
A.D.M. FARM S.R.L.	736	13
ACTAVIS S.R.L.	414	(8)
ROPHARMA S.A.	352	11
PHARMAFARM S.A.	330	(13)
Other	1,719	(32)
Total	**11,142**	**163**

Note: with green very large distributors, with orange large distributors and with violet medium sized distributors. Relad Pharma is missing from the top as it entered insolvency procedure at the end of 2010 and consequently it did not file its financial statements to the Ministry of Finance for year 2010. The insolvency was mainly the result of the 300+ days payment terms policy on subsidised drugs.

Source: Ministry of Finance, MIND Research & Rating

Retail business has expanded at a rapid pace in the precrisis years. Within the pharmaceutical supply chain, it accounts for the second largest contribution to GDP after drug manufacturers.

The wholesalers' main business activity is represented by the distribution of drugs authorized by the National Drug Agency. This business segment accounts for over 90% of their business activity. Parapharmaceuticals, i.e. medicines derived from natural sources, accounted for less than 10% of their sales.

The retail business of pharmaceutical products has expanded at rapid pace in the precrisis years. In 2010, pharmacies generated a total value added of RON 2.2 bn close to level produced by drug manufacturers. The distribution networks of pharmacies employ a workforce of 34,438 people, representing mostly skilled workers.

The increase in demand for pharmaceutical products coupled with price hikes[5] in the prescription drug segment was the main driver for the positive performance of retail over the past years. Also, the transfer of drugs within National Health Programs, which were previously sold only in hospital pharmacies, to retail pharmacies boosted the latters' sales as well (e.g. oral anti-diabetics and insulines, oncology, post-transplant or HIV/AIDS drugs).

[5] Price hikes were the result of exchange rate depreciation

2.2. Sales dynamics

During the precrisis period, between 2002 and 2007, the Romanian pharmaceutical market witnessed a period of sustained growth, 25% compounded annual growth rate (CAGR), stimulated by the rapid economic growth which determined an increase in both public and private financial resources. Starting with the second half of 2007 the pharmaceutical market, expressed in EUR terms, entered in a stagnation period of almost 3 years (Chart 2.4). The reasons for these dynamics are mainly related to the negative effects of the economic downturn on the healthcare sector's financial resources. The deterioration in healthcare sector's legal framework also contributed to this outcome. Expressed in RON terms, drug sales remained on an upward trend between 2007 and 2009, due to the sharp depreciation of the exchange rate. In 2010, sales of pharmaceutical products reentered on an upward trend, increasing by 19.6% yoy, inspite of relatively unchanged volumes (Chart 2.5).

In the first half of 2011 the pharmaceutical market slowed down significantly, increasing by 2.9% yoy in EUR terms (3.6% yoy in RON terms), according to research company Cegedim. The growth forecast for the whole year of 2011 remains in the low single digits (4.8% yoy in RON terms), according to the same source. There is a risk however that drug sales would post an even lower growth rate if government arrears to the pharma companies persist or if the new clawback tax will be enforced starting with Q4 2011.

Chart 2.3: Top 10 drug distributors by turnover (2010)
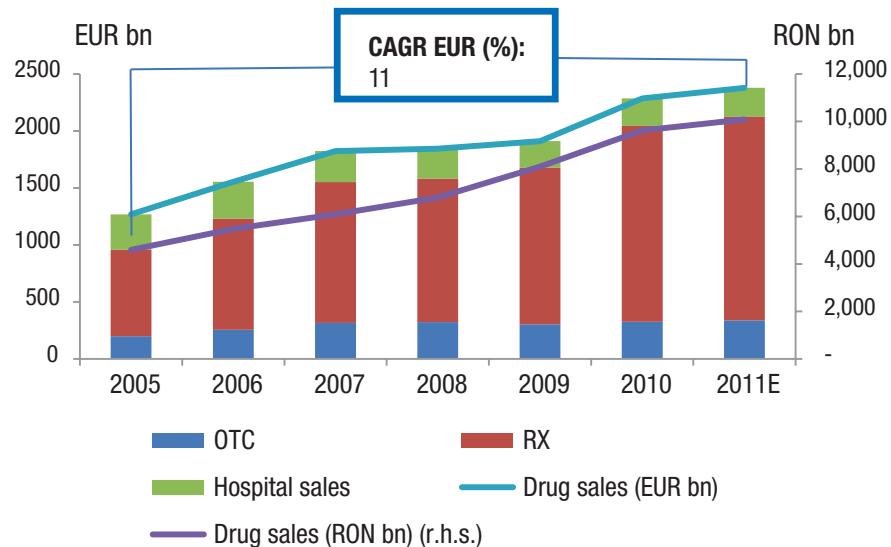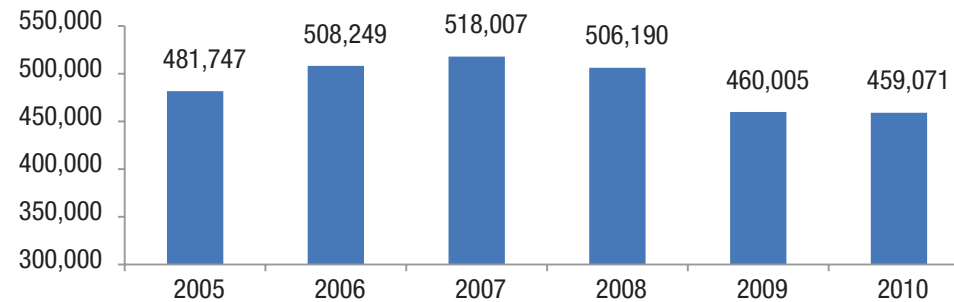

Source: Cegedim

Prescription based (RX) drugs increased their market share in total retail sales of drugs from 79% in 2005 to 84% in 2011, amounting to an estimated value of EUR 1.9 bn. Taking into account the hospitals' sales of drugs, RX drugs hold a lower market share of 75%. Leading sales of RX drugs are generated by antibiotics and alimentary tract medicines.

The perspectives of an overhaul of the public healthcare sector could lead to a lower market share of RX drugs in the coming years, as health insurance benefit packages would be reduced.

OTC drugs lost market share compared with RX drugs reaching total estimated sales of EUR 0.35 bn in2011, equivalent to a market share of 16% of total retail sales. Cold and flu drugs (14%), analgesics (13%) together with vitamin and minerals (11%) had the highest contribution to the total OTC drug sales.

Chart 2.5: Volume of drugs sold (thousand units)

Source: Roland Berger analysis, Intellinews Romania Pharmaceutical Report

Chart 2.6: Structure of drug sales by therapeutic areas (%), 12 month ending June 2011

Therapeutic area	%	% yoy
Cardiovascular system	18	2.8
Antineoplastic and immunomodulating agents	17	9.8
Alimentary tract	14	6.6
Nervous system	13	12.1
General anti-infectives systemic	10	5.2
Respiratory system	8	16.4
Musculo-skeletal system	6	2.4
Other	15	7.4
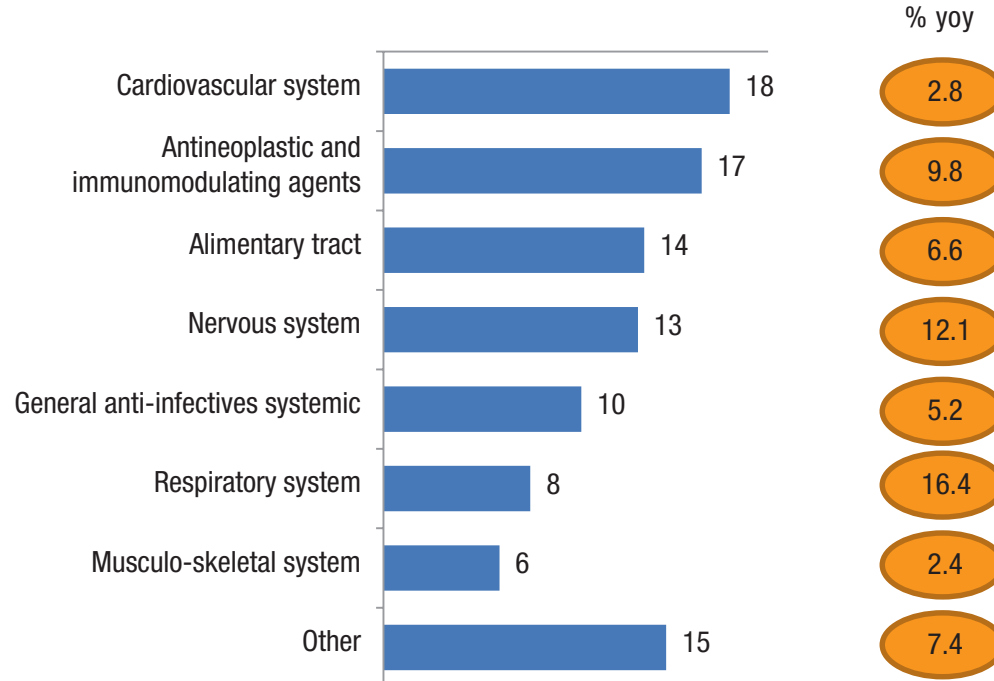
Source: Cegedim, MIND Research & Rating

Highly innovative drugs[6] account for over 70% of the total value of the drugs sold and only 25% of the volume of drugs sold. On the other hand, generic drugs account for 30% of total market in value terms and 75% in volume terms. It has been argued many times in the publi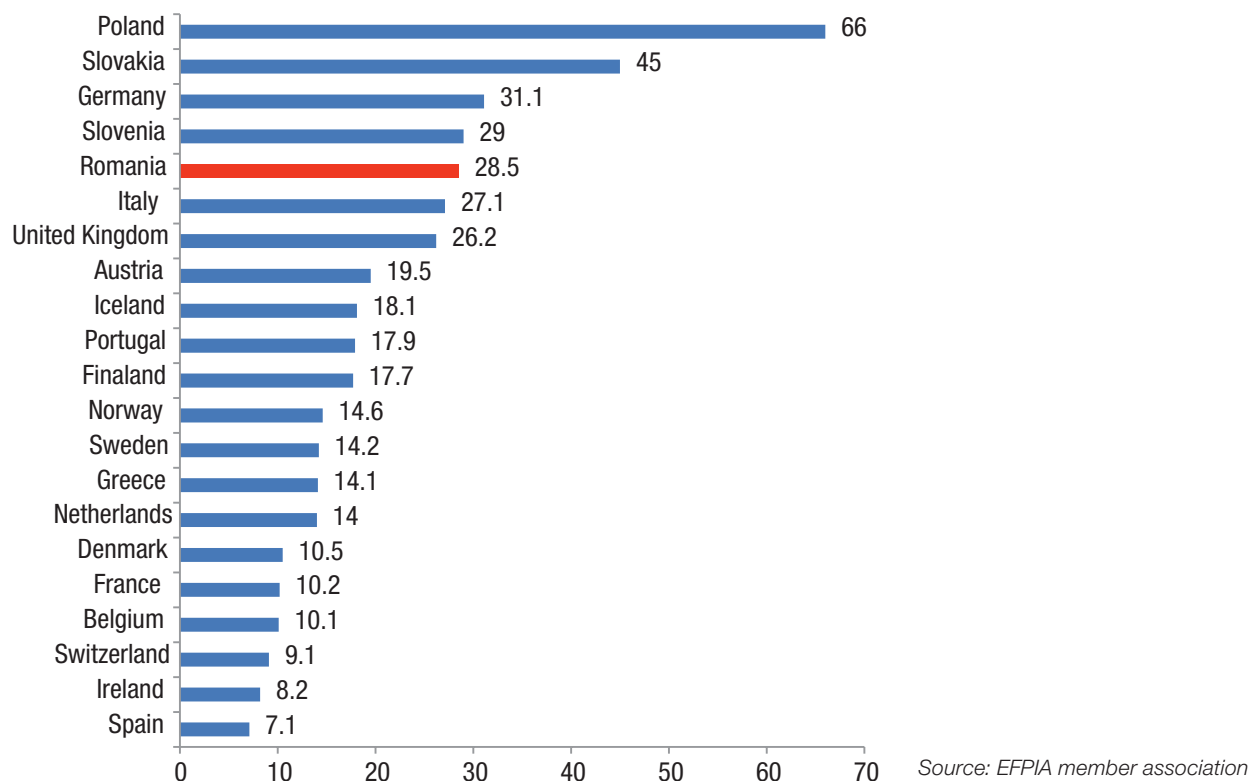c space that in Romania generics have a low penetration rate which makes the financing of the healthcare sector unsustainable. However, cross-country data on generics market share in Europe suggest actually that generics in Romania have the fifth highest market shares in Europe, after Poland, Slovakia, Germany and Slovenia (Chart 2.7). The market share of generics depends to a large extent on market access conditions for new medicines in each country. Low levels of generic penetration are usually associated with poor pricing conditions for innovative medicines. According to 2010

EFPIA Report on pharmaceutical industry in Europe, the market share of generics is significantly lower in price-controlled environments than in unrestricted ones, except in new EU Member States with historically low levels of intellectual property protection.

Chart 2.7: Share accounted for by generics in pharmaceutical market sales value (at ex-factory prices) - 2008

Country	Value
Poland	66
Slovakia	45
Germany	31.1
Slovenia	29
Romania	28.5
Italy	27.1
United Kingdom	26.2
Austria	19.5
Iceland	18.1
Portugal	17.9
Finaland	17.7
Norway	14.6
Sweden	14.2
Greece	14.1
Netherlands	14
Denmark	10.5
France	10.2
Belgium	10.1
Switzerland	9.1
Ireland	8.2
Spain	7.1

Source: EFPIA member association

As outlined earlier, imports of pharmaceutical products represent the main source for domestic drug consumption. In 2010 drug imports amounted to EUR 2.1 bn. The main trading partners for imports of pharmaceutical products are Hungary (16%), Germany (15%), Switzerland (12%) and France (11%). At the same time, exports accounted for only EUR 590 million with the largest markets being Russia (13%), United Kingdom (11%), France (6%) and Bulgaria (5%). However, the dynamics of exports outpaced by far that of imports in the past years. Between 2007 and 2010, exports rose almost 7 times while imports increased by 1.5 times. Unfortunately these developments were not mainly a consequence of increased domestic production capacities of pharmaceutical products but rather the result of parallel exports phenomenon.

[6] *Drugs with an active patent*

The pharmaceutical industry is one of the most highly regulated industries in the world, with prices of prescription based medicines being set by the public authorities. However, the differences in pricing of RX drugs that arise between countries may lead under certain circumstances to lucrative parallel trade opportunities especially for wholesalers. In Romania, the price of RX drugs has been historically set at the minimum level of the prices of RX drugs traded in a number of reference EU countries. The sharp depreciation of the exchange rate starting with the second half of 2007 and the delay of public authorities in transferring the FX shock into retail prices determined a significant compression of profit margins along the pharma supply chain. The most impacted were wholesalers and retailers of pharmaceutical products. Adding to the financial pressure was the onset of the financial and economic crisis which, over time, decreased revenues in the public healthcare sector and led to the accumulation of significant amounts of arrears towards the pharmaceutical suppliers. All these developments increased the incentives for wholesalers but also for retailers of pharmaceutical products to pursue parallel exports. By doing this, drug suppliers are effectively capitalizing on the price differences that exist between various markets. In the Romanian case, distributors buy imported drugs at a (very) low price and re-export them to other markets at higher prices. When practiced at a large scale, the parallel trade may result in a shortage of medicines for domestic use, with negative social and economic consequences.

Chart 2.8: Dynamics of drugs' exports and imports
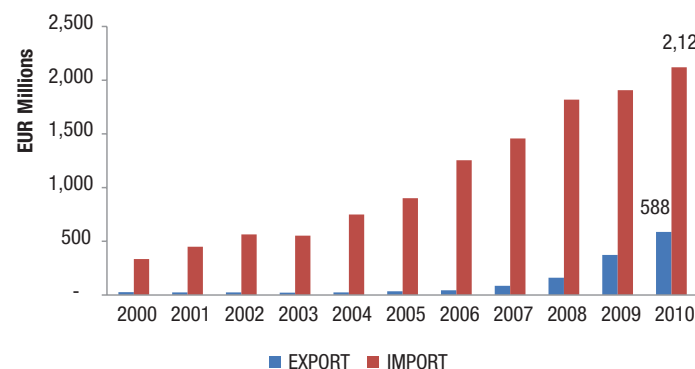
Source: Eurostat, MIND Research & Rating

Chart 2.9: Parallel exports in Romania vs parallel imports in developed EU countries (% domestic pharmacy sales)
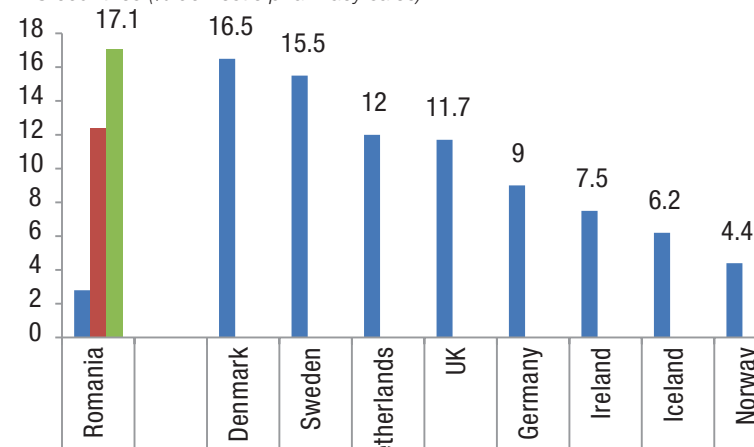
Source: Eurostat, MIND Research & Rating

Currently, there is no official estimate of parallel exports in Romania. Market estimates of parallel exports range between 10% to 20% of total pharmaceutical sales in 2010. By making use of all publicly available statistical data, we come up for the first time with a quantitatively based estimate of parallel exports. We employ an exhaustive approach, by analyzing production and exports of every domestic pharmaceutical manufacturer, based on the financial statements filed to the Ministry of Finance between 2007 and 2010 by these companies. The results are then correlated with aggregated figures on imports and exports of pharmaceutical products from Eurostat to obtain the value of parallel exports.

Following the above mentioned methodology, we discover that parallel exports in Romania reached 17.1% of total domestic drug sales in 2010, or 18.4% of total drug imports (Chart 2.9). Distributors from Denmark, Sweden, Netherlands or UK benefit the most from the parallel trade with emerging markets where prices of medicines are significantly lower. This benefits neither social security nor patients and deprives the industry of additional resources to fund R&D activities. Parallel trade in EU was estimated by EFPIA to amount to EUR 4.4 bn (value at ex-factory prices) in 2008 alone.

2.3. Cost structure of pharmaceutical producers

Pharmaceutical producers generated a combined RON 2.5 bn value added in the Romanian economy...

...which is spent to a large extent in the Romanian economy while only a fraction of it gets back to foreign shareholders through net profit.

In this section we aim to outline how the value added generated in the Romanian economy by both domestic and foreign pharmaceutical manufacturers is split among the main production inputs and how it has developed over time. Also a special focus will be paid to R&D activities of highly innovative pharmaceutical companies in Romania and why it is important for public authorities to take measures aimed at stimulating innovation and attracting R&D funds.
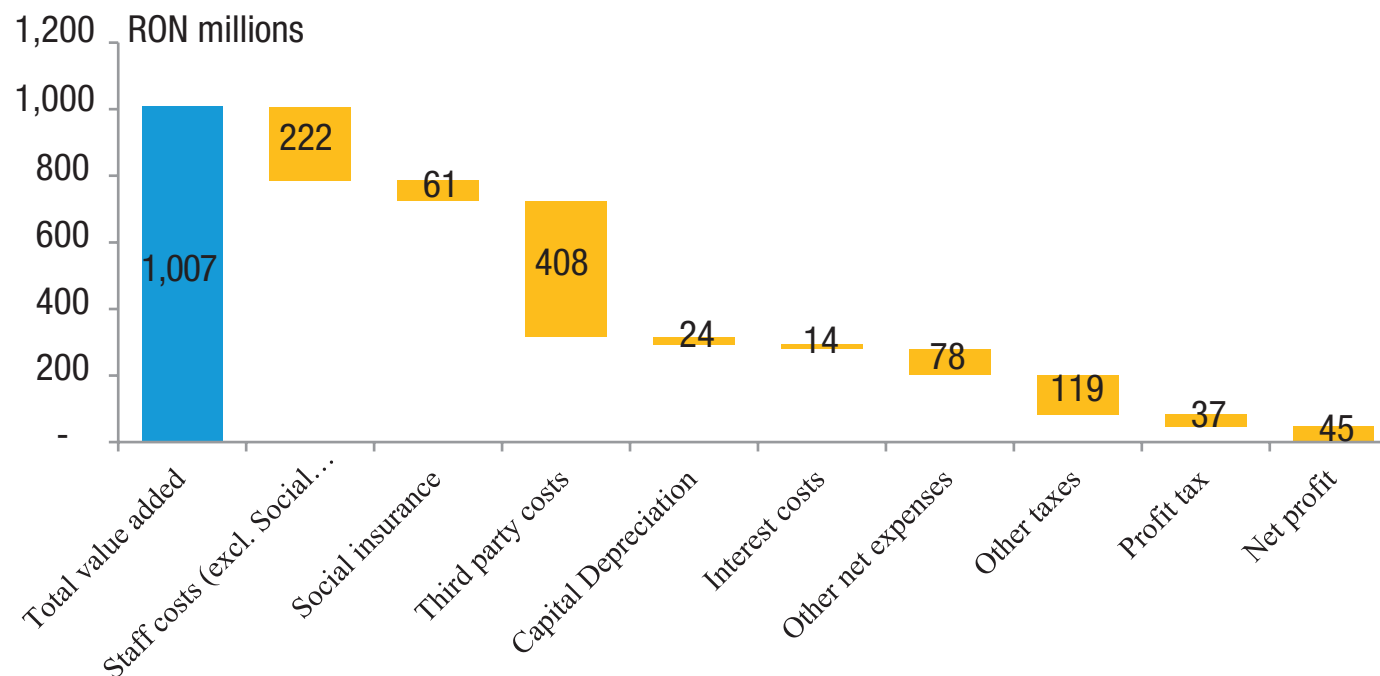
Pharmaceutical producers, both companies with production facilities and rep. offices, generated a combined RON 2.5 bn value added in the Romanian economy in 2010 (Chart 2.10 and 2.11). Between 2005 and 2010, value added created by these companies increased in nominal terms by a cumulated rate of 109%, which translates into a CAGR of 16%. The most dynamic segment in terms of value added creation has been that of the rep. offices, which managed to increase more than 4 times, from RON 244 million in 2005 to RON 1 bn in 2010.

The largest part of the value added generated by rep. offices remains in the Romanian economy. It is from the value added that a company remunerates the production inputs (labor, capital, creditors, shareholders and government). In this specific case, from a total value added of RON 1 bn, the largest part (95%) is spent in the domestic economy and only a small fraction (5%), representing the net profit, accumulates to the shareholders. Staff costs account for 28% of total value added (RON 282 million), which is split between gross wages, 22%, (RON 222 million) and social insurance 6% (RON 61 million). The largest part of value added is spent on services acquired from third parties 40% (RON 408 million).

Such services may include media or screening & disease awareness campaigns in association with medical services providers, medical education addressed to healthcare professionals, but also services related to R&D activities (e.g. clinical studies). In fact, we think that R&D activities account for an important part of third party costs incurred by the foreign pharmaceutical manufacturers. Costs with R&D activities may include payments to doctors or hospitals for ongoing clinical studies managed by the pharmaceutical producer or alternatively payments to clinical research organisations (CRO). Depreciation and amortization costs are insignificant (2% of total value added), as rep. offices have not made important investments in fixed assets. The low financial indebtedness of rep. offices has kept interest costs at a low level at almost 1% of total value added. Profit tax and other taxes accounted for more than 15% of total value added (RON 156 million).

Value added created by foreign pharmaceutical manufacturers is distributed preponderantly among services acquired from third parties, which includes R&D expenditures, and labor costs.

Chart 2.10: Destinations of value added by production inputs in case of foreign pharmaceutical manufacturers (2010)*

RON millions

1,200

1,000

800

600

400

200

-

| | | | | | | | | | |
| Total value added | Staff costs (excl. Social... | Social insurance | Third party costs | Capital Depreciation | Interest costs | Other net expenses | Other taxes | Profit tax | Net profit |

1,007   222   61   408   24   14   78   119   37   45

** includes all foreign pharmaceutical manufacturers without production facilities in Romania which are incorporated as Romanian legal entities.
 Roche Romania is also excluded from the sample as its contribution to total value added was close to 0 and it booked a significant loss in 2010, which would have distorted the aggregated statistics.*

Source: Ministry of Finance, MIND Research & Rating

Pharmaceutical manufacturers with domestic production facilities generated total value added of RON 1.5 bn in 2010, up 60% in nominal terms compared with 2005. The structure of the value added by production inputs is similar to that of rep. office (Chart 2.11). The only notable difference is at depreciation and amortization costs. In this case companies have invested in manufacturing facilities and consequently they are recouping their initial outlays through amortization costs. In 2010 such costs amounted to almost 13% of total value added. The fact that profit tax is higher than the aggregated net profit generated by these companies reflects the highly negative skewness of the profitability distribution. Many pharmaceutical producers operate with negative profit margins, so that they are not liable for the profit tax.

Chart 2.11: Destinations of value added by production inputs in case of domestic pharmaceutical manufacturers* (2010)
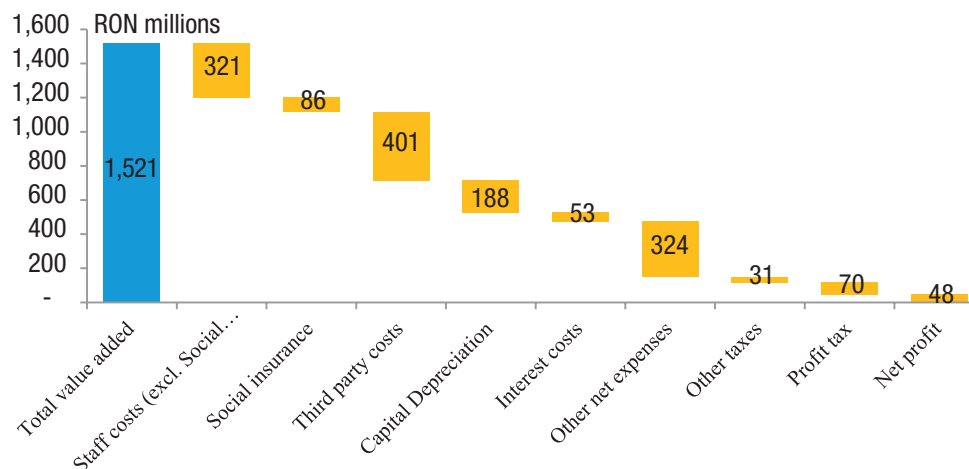
RON millions

Total value added: 1,521
Staff costs (excl. Social...): 321
Social insurance: 86
Third party costs: 401
Capital Depreciation: 188
Interest costs: 53
Other net expenses: 324
Other taxes: 31
Profit tax: 70
Net profit: 48

* includes all pharmaceutical manufacturers, foreign or domestic owned, with production facilities in Romania.
Source: Ministry of Finance, MIND Research & Rating

R&D expenditures incurred by the highly innovative pharmaceutical producers are hard to estimate due to the lack of official data and heterogeneity of funding sources.

Market estimations of R&D expenditures vary between tens of million euros and a couple of hundreds of million euros.

It is hard to quantify the total amount of R&D expenditures incurred by the highly innovative pharmaceutical companies in Romania. There are many reasons for this situation. First of all, public authorities (National Drug Agency and Ministry of Health) collect information about clinical trials carried out in Romania, however they do not centralize such information into a database. Moreover the information collected by authorities does not contain data on the total effective cost of a clinical trial (payments to doctors, hospitals, investments in equipments etc.), but rather an estimative cost of the research per patient.

Secondly, trying to track funding sources of clinical trials is also a difficult process. There are many channels through which clinical trials are funded. One possibility is for the financing to be provided by the foreign pharmaceutical manufacturers through its local branches. In this case such expenditures do appear on their financial statements. The financial statements filed by the Romanian companies to the Ministry of Finance are in a simplified format, which does not provide sufficient details in order to specifically identify R&D related expenditures. In the profit & loss statement of pharmaceutical manufacturers incorporated as Romanian legal entities, R&D expenditures are included together with other cost items in "Third parties costs" item. As outlined earlier, third parties costs of pharmaceutical manufacturers amounted to RON 800 million[7] in 2010. Between 2004 and 2008, third party costs increased by more than 2 times (Chart 2.12).

According to EFPIA, pharmaceutical manufacturers from Romania reported cumulated R&D expenditures of EUR 30 million in 2008. At the same time, EFPIA members reported total R&D investments in Europe of EUR 27 bn. The biggest recipient countries of R&D were UK (EUR 5.4 bn), Germany (EUR 4.8 bn) and Switzerland (EUR 3.5 bn).

[7] Including both Rep. offices and pharmaceutical manufactuers with domestic production facilities. This figure excludes third party costs incurred by Roche Romania

Chart 2.12: Dynamics of third party costs of pharmaceutical producers incorporated as Romanian legal entities
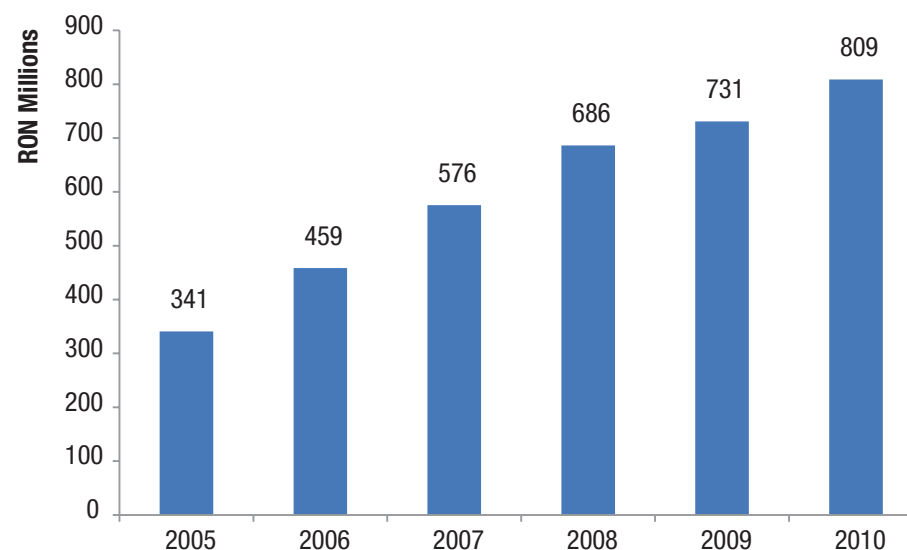
* includes all pharmaceutical manufacturers, foreign or domestic owned, with production facilities in Romania or rep. offices.
Source: Ministry of Finance, MIND Research & Rating

It is in the interest of the pharmaceutical industry to take the necessary steps to increase public disclosure of R&D investments as this could improve the industry's public perception and could lead to a better positioning among foreign direct investors.

In case of Romania (but also in case of other emerging European countries), EFPIA figures might underestimate the real R&D investments pursued by the highly innovative pharmaceutical producers. This is due to the fact that many clinical trials in Romania are financed directly from the headquarters, the local branches being not always involved in this process. Consequently, the figures for R&D expenditures that local branches report to EFPIA are significantly lower than the real ones.

Most clinical trials are managed by specialized companies called contract research organization or clinical research organization (CRO). A CRO is a service organization that provides support to the pharmaceutical and biotechnology industries in form of pharmaceutical research services (for both drugs and medical devices). So, tracking the operational activities of CROs registered in Romania might provide an indication of the magnitude of R&D investments. Chart 2.13 presents the turnover of the most important CROs operating in Romania. The cumulated turnover of these companies amounted to RON 113 million in 2010. This figure is close to the R&D figure reported by EFPIA. However, most R&D related expenditures are made directly from CROs' headquarters and are not visible in the balance-sheets of the local CROs branches.

On the other hand, qualitative estimates of industry experts[8] place R&D expenditures in pharmaceutical industry somewhere between EUR 100 and 300 million annually. Although this figure may seem too high in comparison with the official statistics on total R&D expenditure in the economy (EUR 600 million in 2011), it might reflect better the situation of R&D investments. Statistical data sources on R&D expenditures in Romania are scarce and cover only partially the phenomenon. In this context, it could be in the interest of the pharmaceutical industry to take the necessary steps to increase public disclosure of R&D investments as this could improve the industry's public perception and could lead to a better positioning among foreign direct investors.

Ultimately this would also be reflected in a better cooperation with public authorities (see details in Chapter 5).

[8] Based on interviews with representatives from ARPIM member companies

Chart 2.13: Turnover of top CROs operating in the Romanian economy

CRO Name	Turnover (RON mln)					
	2005	2006	2007	2008	2009	2010
Quintiles	…	…	…	…	15.5	…
Parexel	18.9	30.1	25.1	40.0	51.3	56.1
PPD	1.2	0.4…		2.7 …		17.1
PSI	6.0	6.5	9.8	15.3	16.1	17.4
Covance	…	…	…	…	6.7	7.8
Kendle		8.9				
Icon	…	…	…	…	10.0	13.1
Premiere Research	0.4	1.0	1.6	1.6	1.4	1.7
Total	**26**	**47**	**36**	**60**	**101**	**113**

Source: Ministry of Finance, MIND Research & Rating

3. Performance and risk in the pharma industry

3.1. Developments in the pharma economic activity

The share of gross value added (GVA) produced by the pharma industry is relatively small compared with the overall economy, and is relatively constant during the last six years. The share of GVA from the pharma companies in the total GVA delivered by the Romanian non-financial companies was 1.67 percent in 2010, and the indicator ranged from 1.45 percent to 1.76 percent during 2005-2010. The aggregate GVA produced by the pharma industry stands for RON 6.6 billion (December 2010), more than double compared with the 2005 figures. The developments of the sub-sectors of the pharma industry highlight some changes in structure. The most dynamic sub-sector is foreign pharma manufacturer, who managed a four-time increase in the GVA during 2005-2010 (nominal terms value). The second position in dynamics goes to retail pharma, who has also taken the leader position since 2007 in terms of aggregate figures for GVA (Chart 3.1). The value added produce by these companies was RON 2.1 billion in 2010. On the other end of the top position laid companies from drug distributor only. These firms generated RON 0.8 billion in 2010, up to 20 percent compared with 2005 performance (nominal terms value, suggesting a decrease in real terms).
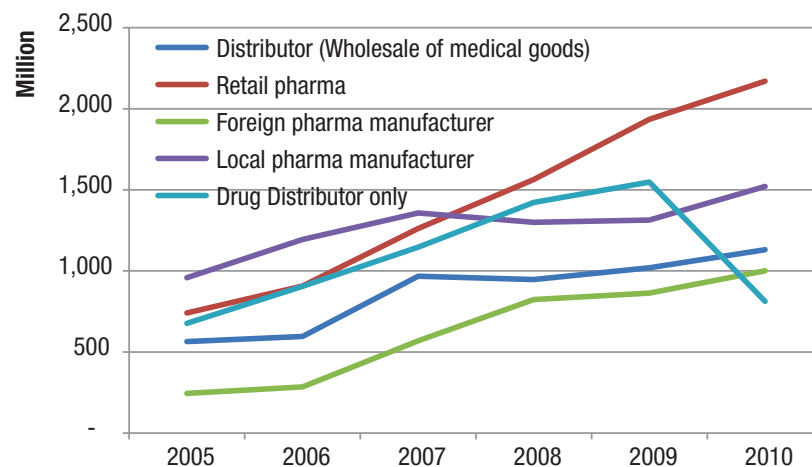
The pharma industry delivers a small contribution to the value added of the Romanian economy.

Retail pharma has the largest contribution to the value added, while foreign pharma manufacturer registered the highest dynamic during 2005–2010.

Chart 3.1. Gross value added dynamics of the pharma industry sub-sectors (RON million)

Source: Ministry of Public Finance, MIND Research & Rating

Pharma industry is a low risk sector, supporting the anti - cyclical behavior of the Romanian economy.

The pharma industry in Romania is a low risk sector (as economic theory suggests), playing a role in reducing the amplitude of the Romanian business cycle. This conclusion was reached by dividing the Romanian economy into three risk categories (high risk, medium risk, and low risk), according to the sensitivity of an economic sector activity to the business cycle. On the other hand, the small contribution of the pharma industry to the overall value added does not allow this good leverage to generate major positive outcomes. Creating conditions for a stronger development of the pharma industry in Romania would also underpin the anti-cyclical buffers for the economy.

Table 3.1. Profitability indicators (2010)*

| Sector	EBITDA margin (%)	EBIT margin (%)	Net profit margin (%)	EBIT/ interest expense
Distributor (wholesale of medical goods)	9.0	7.0	5.0	10.57
Retail pharma	6.0	5.0	5.0	10.24
Foreign pharma manufacturer	5.0	4.0	2.0	8.75
Local pharma manufacturer	22.0	18.0	5.0	18.66
Drug distributor only	3.0	3.0	1.0	4.16
Agriculture	14.0	7.0	3.0	2.92
Industry	12.0	5.0	2.0	3.94
Construction	10.0	4.0	-2.0	1.06
Trade	4.0	2.0	1.0	2.45
Services	15.0	6.0	1.0	2.32

* figures computed in a fixed sample approach (i.e. were included only the companies who remained into the sa sector of the pharma industry or the Romanian economy for the entire period of 2005-2010)

Source: Ministry of Public Finance, MIND Research & Rating

Pharma industry displayed a mixed picture regarding profitability. Net profit margin[9] registered higher values compared with other economic sectors, while EBITDA margin hovered below the performances of the rest of the Romanian economy (Table 3.1). One explanation is the lower level of indebtedness of the pharma companies (together with very comfortable EBIT/interest expense ratios supporting further indebtedness) and the lower stock of fixed assets.

Chart 3.2. Profitability of the pharma companies
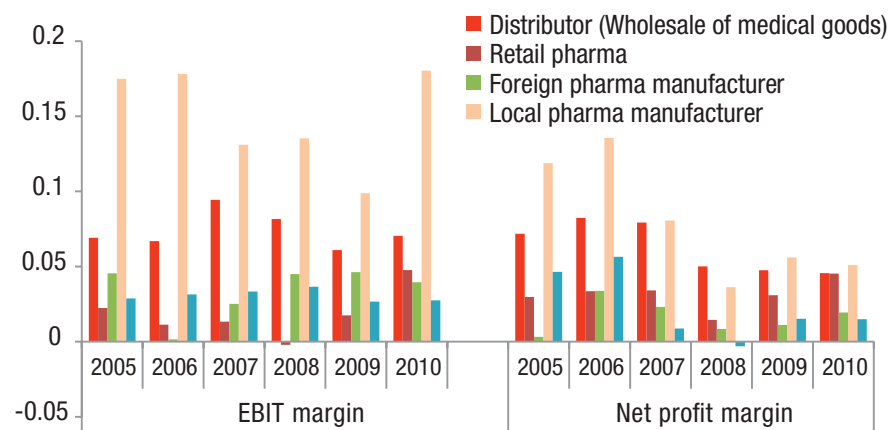
Source: Ministry of Public Finance, MIND Research & Rating

The activities within the pharma industry are heterogeneous in terms of profitability. On the top level of profitability are the companies from local pharma manufacturer sub-sector. Their current operations profitability (EBITDA margin) registered 22 percent in 2010, well above other Romanian sectors (Table 3.1). This is another piece of evidence underpinning more foreign direct investments into this field (see also details into Chapter 5), including the option for the foreign pharma manufacturer to turn into local pharma manufacturer. Note however, that the profitability of foreign pharma manufacturers refers to the local business only, which in most cases does not include production facilities. Also, the high profitability of local pharma manufacturers might be explained by the larger proportion of OTC drugs in their portfolio, as compared to the foreign pharma manufacturers.

Companies from retail pharma and drug distributor only witnessed higher difficulties in getting good profits from their activity, whatever the business cycle phase would be (Chart 3.2). The highly regulated nature of the industry – i.e. minimum price, distribution margins – but also structural problems within the public healthcare sector are explanations for this outcome.

[9] *Net profit margin = (net income)/sales*
EBIT margin = (earnings before interest and tax)/sales
EBITDA margin = (earnings before interest, tax, depreciation and amortization)/sales

Table 3.1: Developments in insolvencies (number of insolvencies per 100 active companies*)

Sector	2007	2008	2009	2010	2010				2011	
					Q1	Q2	Q3	Q4	Q1	Q2
Total economy	1.9	2.5	3	3.6	1	0.9	0.6	1	1	0.9
Manufacture of chemicals and chemical products	2.9	2.8	4.5	3.7	1	0.8	0.5	1.4	0.7	0.5
Manufacture of basic pharmaceutical products, pharmaceutical preparations	1.6	1	0	1.7	1.1	0	0.6	0	0.6	0.6
Manufacturing of PC and other optical and electronic products	1	1.3	1.7	1.7	0.8	0.4	0.2	0.4	0.5	0.5
Electrical equipment	0.5	0.7	1.1	1.1	0.2	0.6	0.1	0.2	0.2	0.6
Retail Pharma	0.6	1.1	2.1	2	0.6	0.5	0.4	0.5	0.5	0.5
Retail cosmetics	0.7	1.1	1.7	3	0.7	0.5	0.8	1	1	1.1
Retail automotive	1.1	1.5	2.4	3	0.9	0.9	0.5	0.7	0.8	0.7
Wholesale cosmetics	1.5	1.9	2.6	2.2	0.3	0.6	0.4	0.9	0.6	1.6
Wholesale pharma	1.3	1.6	1.4	2.1	0.7	0.4	0.3	0.6	0.4	0.4
Wholesale chemicals	0	0	0.2	0	0	0	0	0	0.1	0.2
Telecommunications	0	0	0.1	0.2	0.1	0.2	0	0	0.1	0
IT and information services	0.2	0.5	0.6	0.8	0.1	0.3	0.1	0.3	0.3	0.2

* We define "active companies" those companies that filled in their financial statements (balance sheets and P&L) a sent them to the authorities (Romanian Trade Register or Ministry of Public Finance), according to the le requirements

Source: Ministry of Public Finance, Romanian Trade Register, MIND Research & Rating

The number of insolvencies is not material, but the insolvency developments in the wholesale pharma might put pressure on the industry if the trend continues.

Pharma companies employ around 1.5 percent of the total Romanian non-financial companies…

…with retail pharma accounting for the largest share, and the foreign pharma manufacturer registering the largest increase in the number of employees.

Good profitability and strong prospects in economic activity of the pharma industry shielded relatively well the companies from this field against the risks associated with business failure. The risk of insolvency is lower compared with other economic sectors, but some developments should be closer monitored.

The insolvency dynamics within the Romanian economy gained steam in the last years, due also to the crisis consequences. The insolvencies have not reached critical values (in terms of number), and there is no such risk, at least in the short run. The number of insolvencies per 100 active companies increased from 1.9 to 2.3 during 2007-2010 (Table 3.1), and the H1/2011 values highlight a normal stance of cleaning up of the non-viable entities from the economy. According to the National Bank of Romania analysis, the companies facing insolvency play a relatively minor role in the real sector given that they (i) hold roughly 3.7 percent of total payrolls of non-financial corporations (December 2010), (ii) account for 2.1 percent of the value added of non-financial corporations (December 2010), and (iii) take about 2.4 percent of Romania's exports and imports in 2010 and 2.3 percent of those reported in Q1/2011.

The most affected companies by insolvency in H1/2011 are from: manufacture of leather and related products, wholesale metal industry and wholesale agriculture (3.1 insolvencies per 100 companies). The contagion to pharma industry is low, because companies from such sectors hardly interact with companies from pharma.

In terms of number of insolvencies, the pharma industry is well below the national and the developments from H1/2011 highlights a decrease in this type of failure compared with H1/2010 figures (for instance, the number of insolvencies per 100 companies decrease in wholesale pharma from 1.1 to 0.8, H1/2010-H1/2011, while the figures for retail pharma show a change from 1.1 to 1.0 during the same interval).
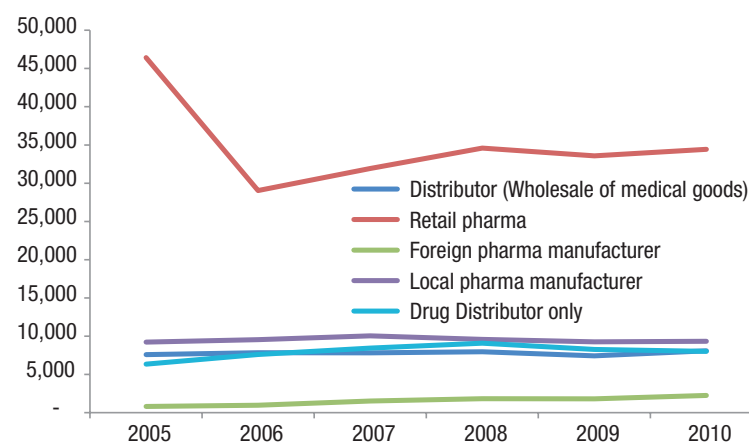
Chart 3.3. Share of turnover of insolvent companies in total sector turnover (percent)
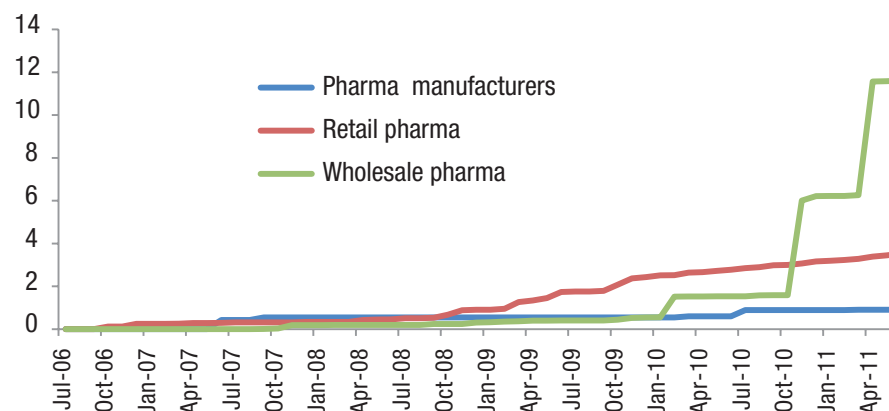
Source: Ministry of Public Finance, Romanian Trade Register, MIND Research & Rating

The number of insolvencies is not material, but the insolvency developments in the wholesale pharma might put pressure on the industry if the trend continues around 1.5 percent of the total Romanian non-financial companies...

Although the number of insolvencies is not material, the insolvency developments might generate systemic risks to specific sub-sectors of the pharma industry. While the outstanding insolvent companies acting into pharma manufacturers and retail pharma sub-sectors do not affect the overall turnover in these industries, the developments in wholesale pharma might deliver systemic risks. The share of turnover of the insolvent companies in total turnover of the wholesale pharma reached almost 12 percent in June 2011, from below 1 percent in June 2009 (Chart 3.3). The main contributor to this outcome has been the opening of the insolvency procedure against Relad International, one of the largest drug distributor.

Chart 3.4. Number of employees in the sub-sectors of the pharma industry

Source: Ministry of Public Finance, Romanian Trade Register, MIND Research & Rating

Another important buffer against rising risks of business failure in the pharma industry is the higher level of labor competitiveness. Labor market of the pharma industry accounts for a small share in total Romanian companies labor force. The number of pharma companies' employees account for 62,100 in 2010, representing 1.52 percent of the total employees registered with the Romanian non-financial companies. This percent hovered from 1.3 to 1.7 during 2005-2010.

*Chart 3.5. Labor productivity (value added/no of employees, RON)**
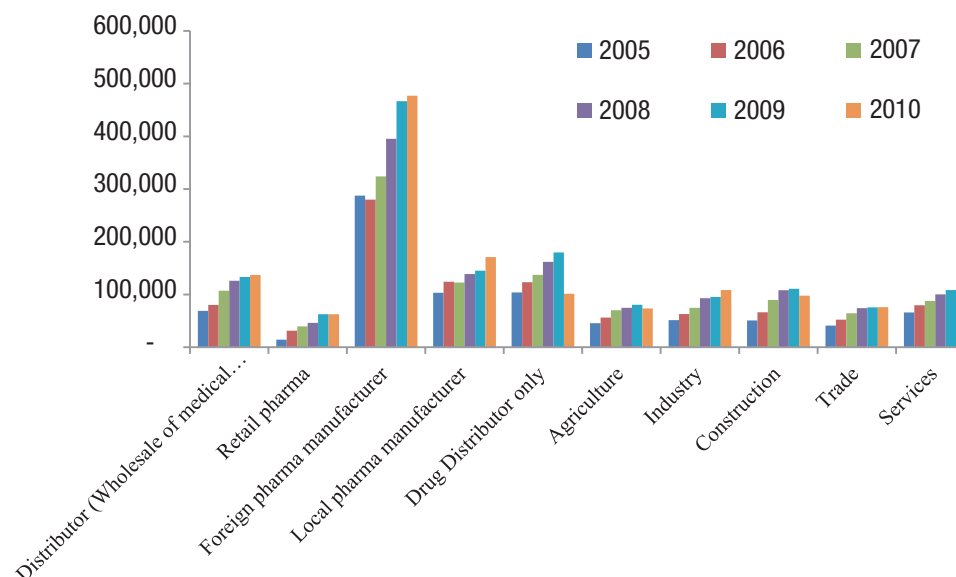
* figures computed for a fixed sample (i.e. were included only the companies who remained into the same sub-sector
the pharma industry or of the economic sectors for the entire period during 2005-2010) Source: Ministry of Public Finance, MIND Research & Rating

At the sub-sectorial levels of the pharma industry, the retail pharma account for the largest share of employees, but also for the highest volatility during 2005-2010 (Chart 3.4). Foreign pharma manufacturer engaged in the largest increase in the number of employees (tripled during 2005-2010), while the local pharma manufacturer embarked in a conservative approach, whatever the stage of the business cycle. The same characteristics go for the costs related with labor force. All the sub-sectors of the pharma industry registered real terms increase in these costs during 2005-2010, but with different intensities. Companies from foreign pharma manufacturer are on top of increases, while local pharma managed to preserve the costs with staff from 2007 to 2010 (Chart 3.4).

The highest costs with staff per employee are in the foreign pharma manufacturer, followed by local pharma manufacturer and drug distribution only. These costs per employee overpass the average within all the major economic sectors (agriculture, industry, construction, trade and services). The higher costs are justified by higher labor productivity (computed as value added produced per worker). In the top of labor productivity from pharma industry laid companies from foreign pharma manufacturer (annual productivity per employee is RON 477,000 in 2010). This productivity continuously up-trended during 2005-2010 (Chart 3.5). All other sub-sectors of the pharma industry witnessed increases in labor productivity during the same period, with the exception of drug distributor only (that registered a slowdown in 2010 due to an important decrease in value added, concomitant with a mild increase in number of employees).

The government earns pharma industry to central and local budgets more than 20% of the total market value of RX drugs.
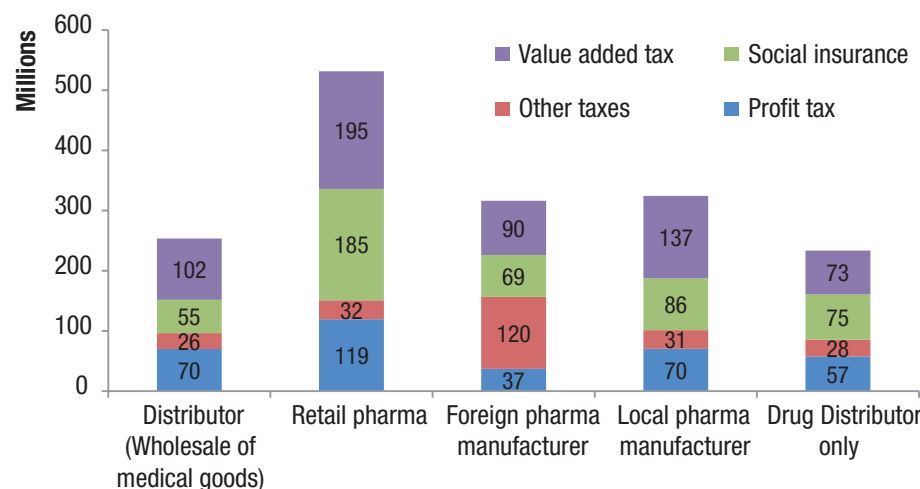
Chart 3.6. Pharma industry's payments to the central and local budgets*

Legend:
- Distributor (Wholesale of medical goods)
- Retail pharma
- Foreign pharma manufacturer
- Local pharma manufacturer
- Drug Distributor only
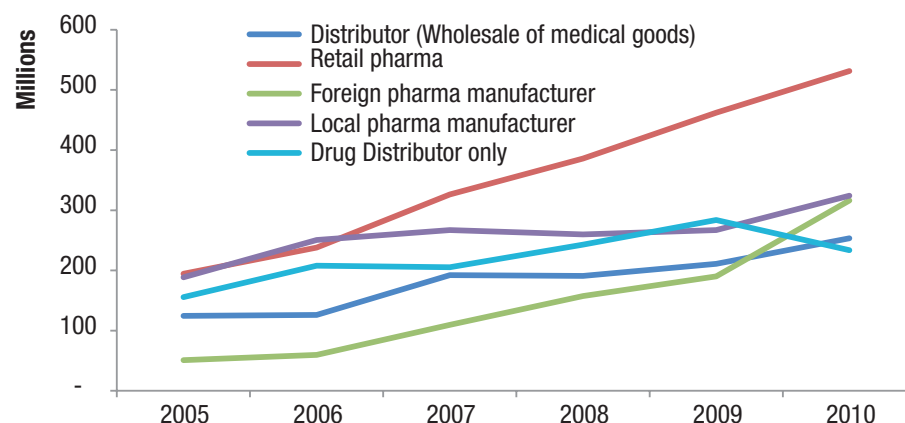
* *Costs related to VAT, social insurance, profit tax and other taxes.*
Source: Ministry of Public Finance, MIND Research & Rating

Pharma industry's contribution to the overall central and local budgets amounted to RON 1.7 bn in 2010, approximately 20% of the total value of drugs sold on the market. The fiscal contribution for pharma industry increased by 132 percent during 2005-2010 (Chart 3.6), while for the overall non- financial companies the hike was of 77 percent (nominal terms, same interval).

Chart 3.7. Structure of the fiscal contribution of the pharma industry (2010)

Source: Ministry of Public Finance, MIND Research & Rating

The largest payer to the central and local budgets is retail pharma (almost one third of total pharma industry payments to these destina-tions in 2010). The foreign pharma manufacturer registered the largest increase in fiscal obligations (six times during 2005-2010, nominal terms), due to a material development of their activities. Payments related to VAT are the most important elements burdening the pharma industry budgets, while the social insurance ranks the second position in many cases (Chart 3.7).

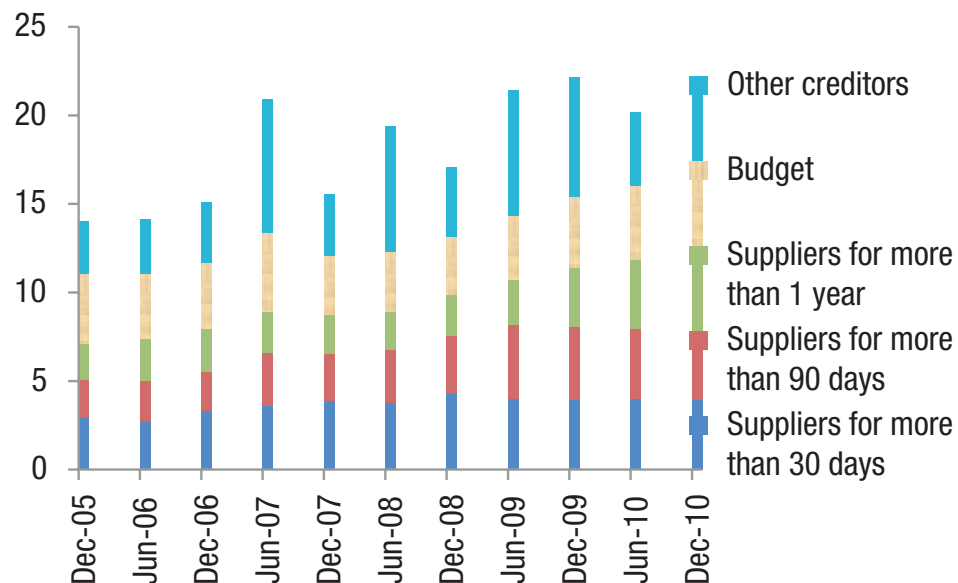# 3.2. Implications from the weak payment discipline in the Romanian economy

Payment discipline in the Romanian economy has deteriorated during the last years, but there are important differences across economic sectors, companies' dimensions, ownership, etc. Weak payment discipline is not a generalized characteristic of the Romanian economy. From almost 100,000 companies with overdue payments to their suppliers (December 2010), the first 1,000 counted for almost 60 percent of the total defaulted payments (of which state owned companies gathered an important share). From almost 41,000 companies with major payment incidents (January 2010 – June 2011), the first 50 acknowledged almost 20 percent of the total defaulted amounts (according to NBR figures).

The overdue payments in the Romanian economy soared by 28 percent from the beginning of the crisis (December 2008 – December 2010), exceeding EUR 20 billion (in December 2010, Chart 3.8). However, the crisis might explain only a fraction of the dynamic related to overdue payments. Large increase in weak payment discipline was noticed throughout the economic cycle, whatever its phases (boom or bust, Chart 3.8).

Chart 3.8. Overdue payments in the Romanian economy (EUR billion equivalent)

Source: Ministry of Public Finance, MIND Research & Rating

Public authorities play also a role in deteriorating the payment discipline in the Romanian economy. The general government overdue payments to suppliers amounted to almost RON 4 billion as of December 2010. Of that amount, 40% was delivered by local governments and another 40% by the National Health Insurance House. Further on, the government arrears[10] to non-financial companies represented RON 1.12 billion (December 2010), on a downward path; of the total more than 80% was carried by the local governments. On the other hand, non-financial companies do not pay in due time their bills to the public authorities, as well (the overdue payments to the government are RON 20.5 billion, June 2010). The majority of such defaults are delivered by the state-owned enterprises.

The average claim collection period increased to 102 days (December 2010), the micro-companies being the most affected.

Chart 3.9. Average claim collection period in the Romanian economy (number of days)
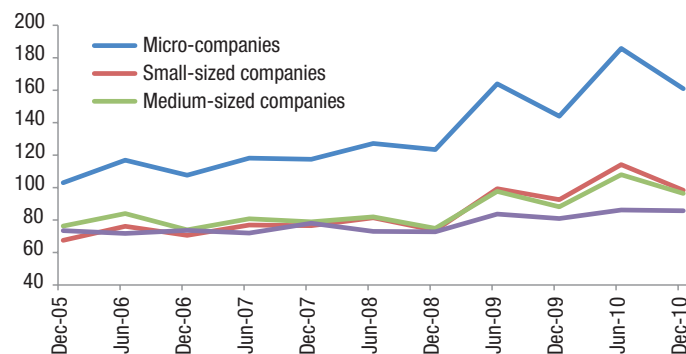
Source: Ministry of Public Finance, MIND Research & Rating

Pharma industry suffers from considerable higher average claim collection period than the rest of the economy, with a fading away of the hetero-geneity between the pharma segments.

The average claim collection period increased with almost 25 percent during December 2008 – December 2010, from 82 days to 102 days. Micro-companies were the most affected (the average claim collection period increased to 186 days, December 2010), Chart 3.9. The new credit arrangements with the IMF and EU, as well as the latest changes in the legislation, would improve payment discipline in the economy. It is envisaged (i) a comprehensive reform of the state-owned enterprises, (ii) a decrease in the arrears generated by the authorities, (iii) timely payment of the state financial obligations, etc

All the pharma segments currently register higher average claim collection period compared with the economy, or with the main economic sectors (i.e. agriculture, industry, construction, trade and services). The largest liquidity constraints stemming from high claim collection period is with companies acting as drug distributor only (224 days, Chart 3.10).

Chart 3.10. Average claim collection period in the pharma industry* (number of days)

[10] Overdue payments older than 90 days.
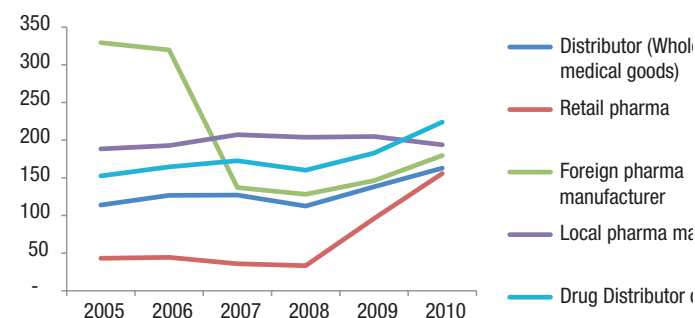
* Includes claims related to the whole portfolio of medical products sold (not only RX drugs)
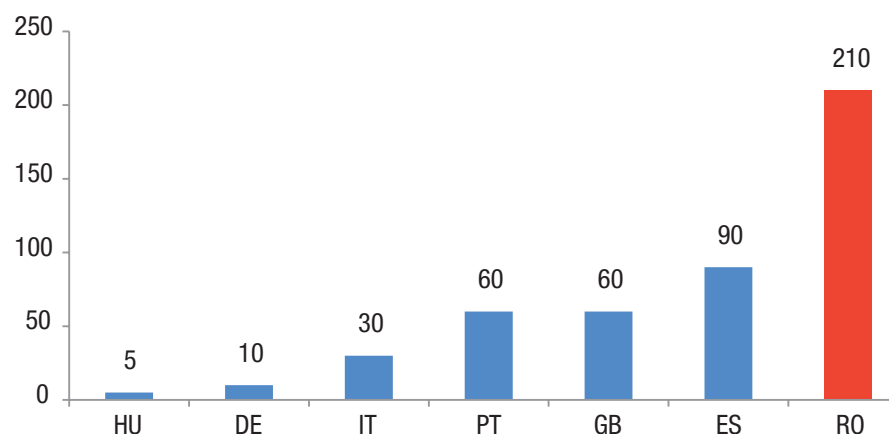*Source: Ministry of Public Finance, MIND Research & Rating*

Collection period differs substantially according to the type of drugs (OTC or RX). The highest figures are registered for RX drugs, where payments from retailer to distributors range from 240 to 270 days and from distributors to producers range from 150 to 300 days.

European comparisons highlight that the Romanian companies from the pharma industry act in an environment with average claim collection period considerably higher as other countries (Chart 3.11). The official payment terms for RX drugs are 210 days, however in practice payment terms have exceeded 300 days throughout 2011. The National Health Fund extended payment deadlines on RX drugs in October 2009 from 60 to 210 days and for drugs covered by the national health programs from 30 days to 120 days. This was mainly the result of the structural deficit of the public healthcare sector which became visible, as the economic and financial crisis set in, and emergency measures had to be put in place to keep the system going.

Chart 3.11: Average claim collection period in the pharma industry in selected countries, 2010 (number of days), related to portfolio of RX drugs

Although the pharma industry carries a large burden in terms of liquidity constraints due to material delay in cashing in its claims, these companies do not fully translate such negative effects to the financial and trade partners.

Source: NHF, National Association of Pharmacists

The collection period of receivables from the National Health Fund is set to improve by 2013. Directive 7/2011 of the European Parliament and Council of the European Union on combating late payments in commercial transactions requires public authorities of the member states to cut payment terms to suppliers to no more than 60 days from invoice receipt; in the health sector this period can be extended up to 90 days (of which 30 days for service acceptance or invoice verification). The Directive is to be enforced in national legislations by March 2013. Romania will have to comply too, which entails average claim collection in the pharma industry is set to decrease by at least half of the current terms. To assuage the budgetary impact of reducing payment terms in 2013 alone[11], the government should come forward with a sequenced reduction over the next one year and a half.

Although the pharma industry carries a large burden in terms of liquidity constraints due to material delay in cashing in its claims, companies do not translate in full power these negative effects to the financial and trade partners. Pharma industry has a small contribution to the overall arrears in the economy. The outstanding stock of arrears owed by the pharma industry to the rest of the economy is RON 2.62 billion (December 2010), representing 2.78 percent of the total arrears generated by the non- financial companies.

The bulk of these arrears generated by the pharma industry are with their own suppliers (92 percent of the total arrears, equivalent of RON 2.41 billion, December 2010). The financial obligations to the public authorities (state or local budgets) are usually paid in due time. The arrears to social insurance, special funds, budget, state budget or local budget are modest (RON 0.18 billion).

[11] *If payment terms would be cut from the current 210 and 120 day norms to 90 days, the immediate impact on Health Budget expenditure is tantamount to at least RON 1.4 billion (EUR 300 million), i.e. 4 month consumption of RX drugs and one month for national health programs drugs.*
The calculations assume the term reduction would not be converted into overdue payments.

Chart 3.12: Dynamics of arrears generated by sub-sectors of the pharma industry (RON million)
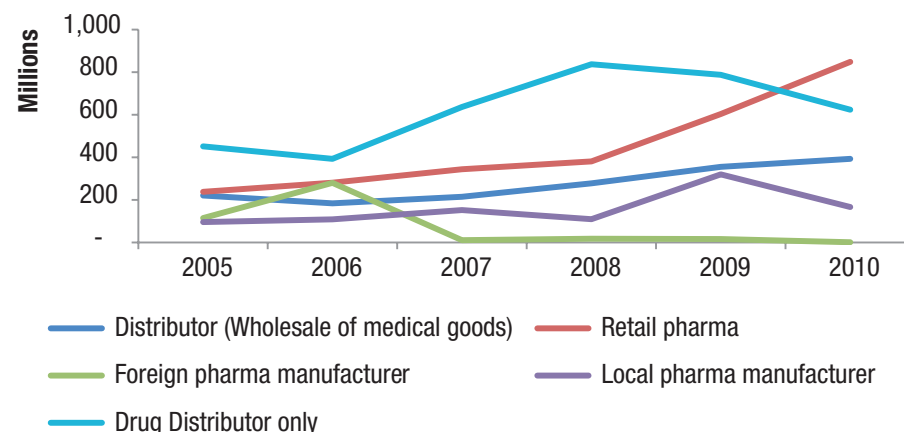
The arrears generated by the pharma industry is mainly with its own suppliers (92 percent), the financial obligations to the authorities usually being settled in time.

Note: This chart was built using a fixed sample approach (i.e. were included only the companies who remained into the same sub-sector of the pharma industry for the entire period of 2005-2010).

Source: Ministry of Public Finance, MIND Research & Rating

The pace of growth for the arrears generated by the pharma industry is lower than the average pace of arrears growth within the economy. The rate of increase was of 60 percent during 2005-2010 (in nominal terms), for the first case, while the average of the economy registered a value of 84 percent (the same interval). At sub-sector level of the pharma industry, companies display a mixed behavior. The best performance in terms of arrears is with foreign pharma manufacturer (the outstanding overdue payments decreased from RON 114 million to RON 1.3 million during 2005-2010). On the opposite corner lay retail pharma companies. Their arrears increased 3.5 times during 2005-2010, from RON 238 million to RON 848 million (Chart 3.12).

3.3. Financial pharma activities

The financial activity of the pharma industry is below the average of the Romanian corporate sector. The pharma companies do not use bank loans in order to support their activities, but call for the shareholders support when in need for financing. The overall amount of loans form the domestic credit institutions count for RON 1.46 billion (1.2 percent of the total loans granted by Romanian banks to non-financial companies, December 2010), and is on a downward trend. The amount is with 25 percent smaller than December 2009 figures.

The link of the pharma industry with the domestic financial system is lower than the average financial intermediation in the economy. The support from the shareholders substitutes the financing from banks.

Chart 3.13: Share of bank loans into total assets, by sub-sectors of the pharma industry (%)

Note: This chart was built using a fixed sample approach (i.e. were included only the companies who remained into the same sub-sector of the pharma industry for the entire period of 2005-2010).

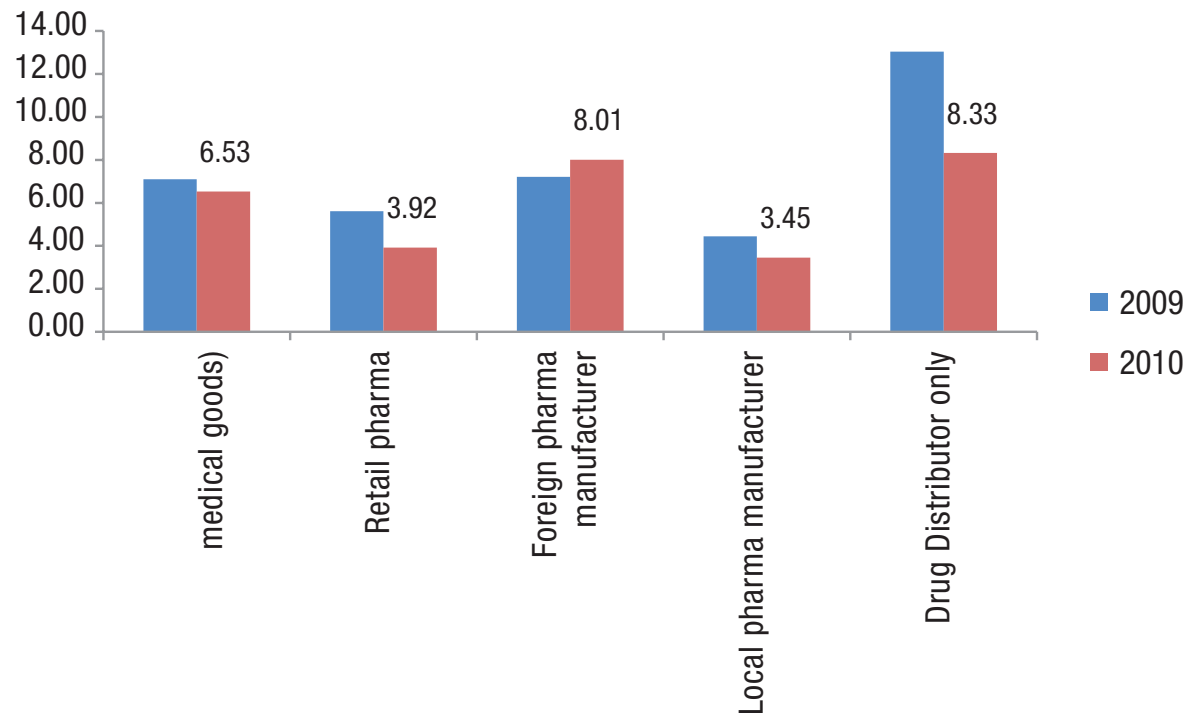*Source: Ministry of Public Finance, MIND Research & Rating*

The volume of loans from the external financial creditors is also subdued (RON 0.64 billion, representing 2.1 percent of the total external loans granted to Romanian non-financial companies, December 2010), but reflects an important hike from the previous year (RON 0.31 billion, December 2009).

The maturity structure of the pharma industry indebtedness highlights a bias towards short term horizons. The share of short term banking debt is 65 percent (December 2010). This type of financing is more pronounced from the domestic banks (71 percent of the banking loans delivered by the domestic credit institutions, compared with 51 percent in case of the foreign banks).

Chart 3.14: Structure of financial indebtedness, by sub-sectors of the pharma industry and maturity
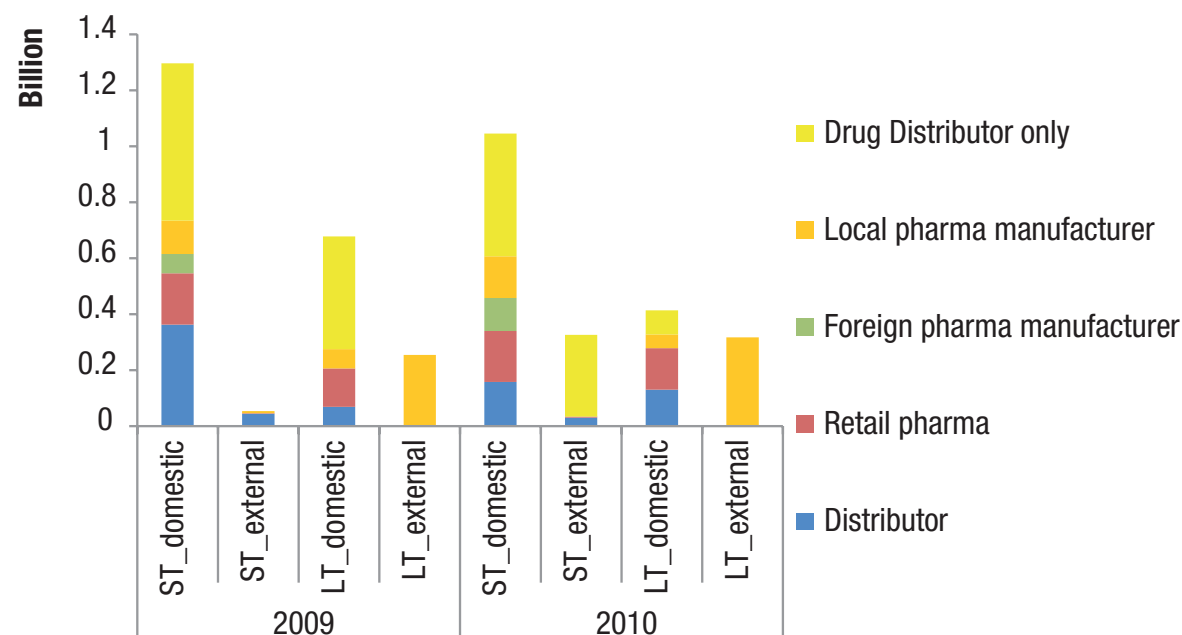
For the local banks, companies from drug distributor only sector count the most in terms of financing. These firms register more than 50 percent of the total lending activity with the domestic banks (56 percent in 2009 and 55 percent in 2010). The second position goes to local pharma manufacturers (27 percent in 2009 and 20 percent in 2010 from the total domestic lending to pharma industry). These companies are also important for long term external creditors.

Pharma industry is less risky comparing with the rest of the economy in terms of repaying the financial debts. The non-performing loans ratio (NPL), reported by the companies in their financial statements, stood at 1.19 the percent, while the overall companies from the economy deliver NPLs of 3.71 percent (December 2010). The pace of deterioration of the ability to service de financial debt is also lower for the pharma industry (NPL increased from 1.14 percent to 1.19 percent, 2009 compared with 2010, while the outlook for the entire economy displayed a hike in NPL from 2.03 percent to 3.71 percent, same interval).

Pharma industry is less risky comparing with the rest of the economy in terms of repaying the financial debts. The non-performing loans ratio is three times lower than the average of the economy.

The less risky sub-sectors of the pharma industry are drug distributor only and local pharma manufacturer (NPL under 1 percent, December 2010), while the other extreme is allocated for distributors (wholesale of medical goods), Chart 3.15.

Chart 3.15: Non performing loans*, by sub-sectors of the pharma industry and the main sectors of the economy
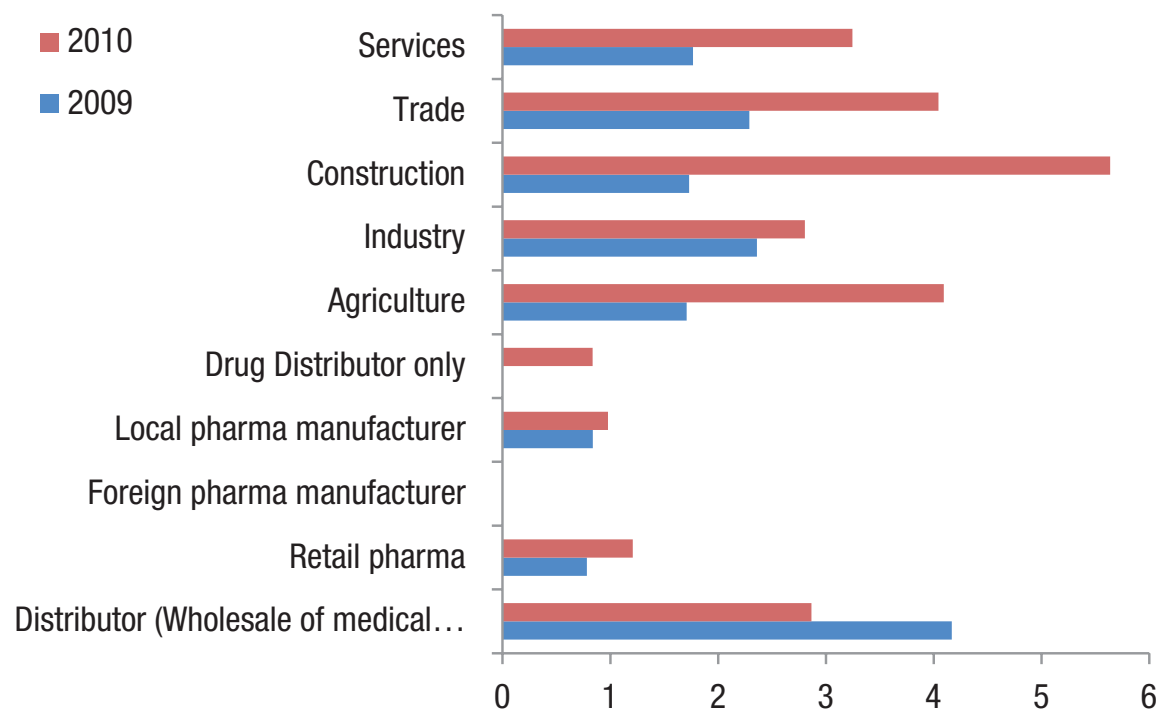
* Non performing loans are calculated as a ratio between total companies arrears (principal and interest) to financial creditors, and the outstanding amount of loans from domestic and external financial creditors

Source: Ministry of Public Finance, MIND Research & Rating

4. Socio-economic effects of health sector

4.1 Economic impact

The economic impact of the health sector on the Romanian economy is assessed through an input-output analysis and covers the direct and indirect effects of both pharmaceutical industry and health services sector on GDP formation and utilisation, **budgetary revenues, employment** and trade **balance**.

The direct effects. The pharmaceutical industry plays a central role in the health supply chain, despite having a relatively modest contribution to the economic activity (GDP), by providing the key inputs, i.e. drugs, for the health services sector. The intermediary consumption of pharmaceutical goods represents almost 1% of the total intermediary consumption in the Romanian economy (2008). In a ranking across 103 economic sectors, covering the whole economic activity, the innovative pharmaceutical industry is in the upper half of the distribution, on 34th place, by the level of output used as intermediary consumption in other industries.

Despite having a modest contribution to economic activity, the pharmaceutical industry plays a central role in the health supply chain.

Chart 4.1: Share of pharmaceutical industry in total economy (%)

Inputs
- Intermediary consumption from other… — 0.19 — 68
- GDP — 0.33 — 68
- Gross earnings — 0.25 — 65
- Taxes on products — 1.14 — 23
- Imports — 2.23 — 13

Outputs
- Intermediary consumption to other… — 0.92 — 34
- Final consumption expenditures — 1.13 — 22
- Government expenditure
- GFCF
- Exports — 0.09 — 67

Rankout of 103 economic sectors

■ 2005 ■ 2006 ■ 2007 ■ 2008
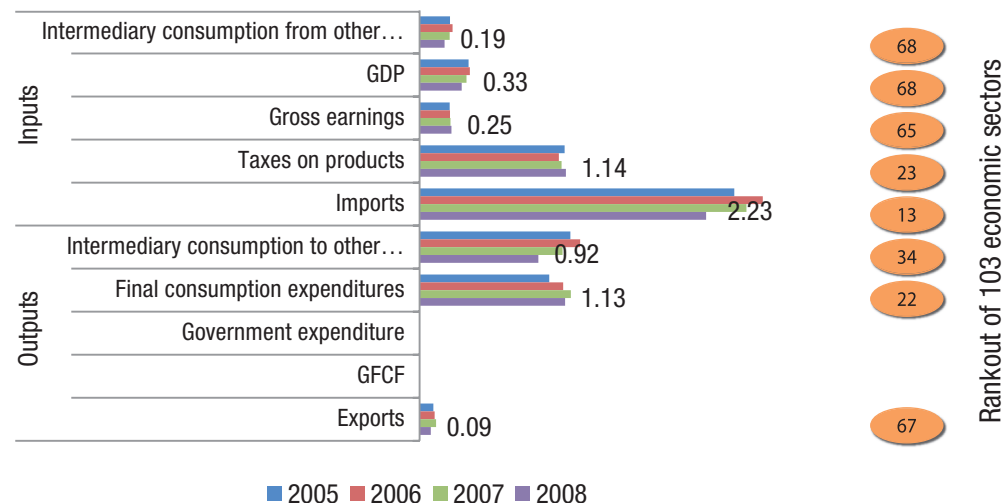
At the same time, the final consumption of pharmaceutical goods represents more than 1% of total final consumption expenditure (households and government combined), ranking on the 22nd position out of 103 economic sectors. The final consumption of pharmaceutical goods accounts only for expenditures made by households on partially or non-reimbursable drugs (for the portion that is

non-reimbursable) and does not include the governments' purchases of drugs – within the input-output tables, the government expenditures on pharmaceutical goods are reflected in the overall public expenses with health and social assistance services.

Thus, pharmaceutical goods account for more than 1.4% of households' final consumption expenditures. In the average consumer basket of a typical Romanian household, which is taken into consideration when estimating the inflation rate, pharmaceutical goods have a share of 2.5% (2010). The difference between the share of drugs in households' final consumption expenditure and that calculated based on the average consumer basket is mainly related to the universe of coverage, with the latter excluding some categories of households' expenditures (e.g. real estate transactions).

The increasing gap between demand for health services and public resources available to finance them, determines households to spend more out of their pocket, than would be normal based on the current level of insurance coverage.

The share of pharmaceutical expenditures in households' consumption basket is determined mainly by the level of coverage of health expenditures by the government, through national health insurance systems, but is influenced also by other factors such as the overall level of development of the economy or the health status of the population. A higher level of public coverage should be caeteris paribus associated with a lower share of households' expenditures on pharmaceutical goods. In Romania however, the share of households' expenditures on pharmaceutical products in HICP[12] basket is twice the European average while the public contribution to the total health expenditure is one of the highest. This outcome is explained by the increasing gap between the demand for health services and the availability of public resources to finance them. So, the population has to spend more out of their pockets to meet their health needs, given the constant underfunding and inefficiency of the public healthcare system from the past 20 years.

Chart 4.2: Households expenditures on pharmaceutical products vs public coverage of health expenditures

■ Households expenditures on pharmaceutical goods (weight in HICP basket) (2010)

▬ General government expenditures on health (% total health expenditure) (2009) (r.h.s.)
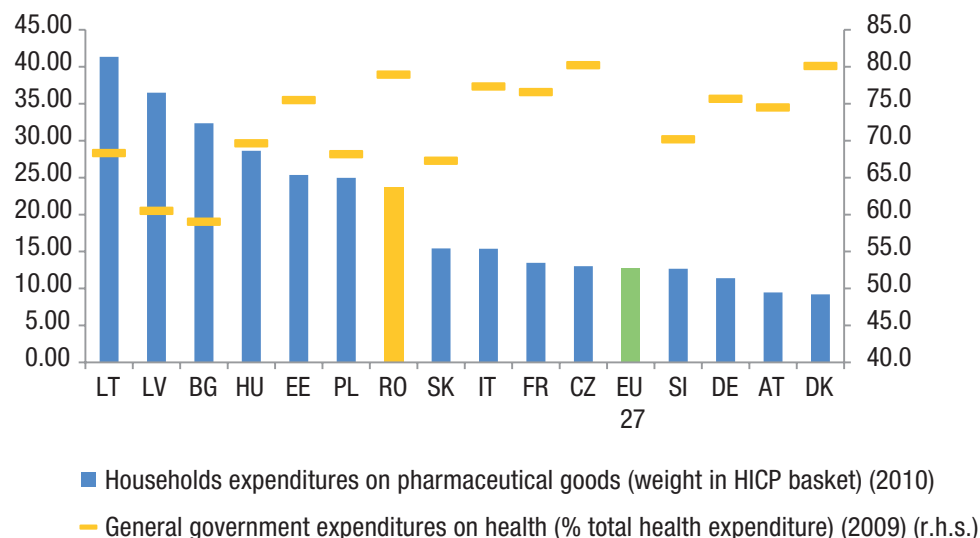
Source: Eurostat, WHO, MIND Research & Rating

The direct contribution of pharmaceutical industry to GDP formation and employment is relatively modest, as most of the pharmaceutical goods are imported, while only few of the large pharmaceutical manufacturers have production in facilities in Romania. Thus, the overall contribution to GDP of the pharmaceutical industry stands at 0.33%, while the contribution to employees' total gross earnings accounts for only 0.25% (2008).
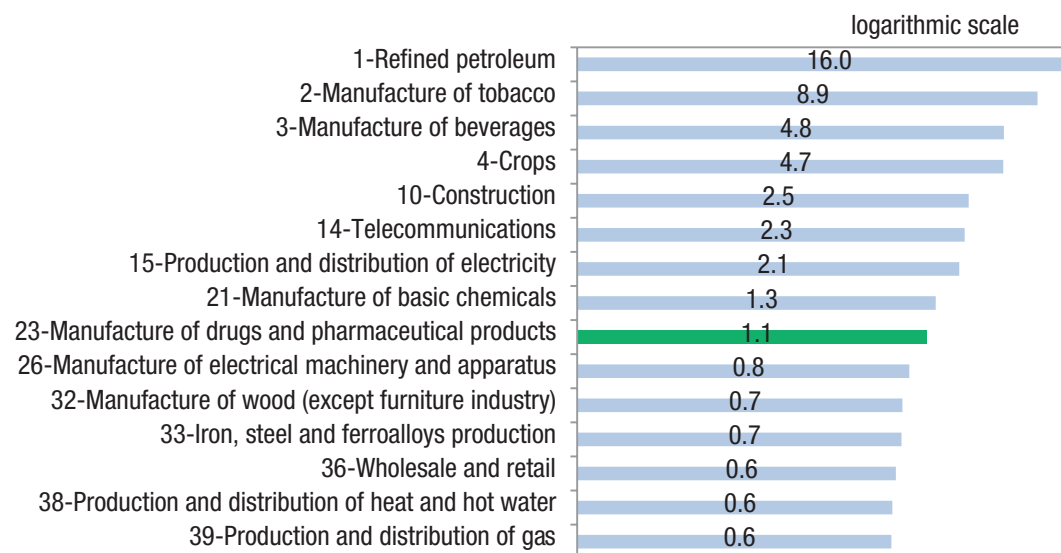
[12] *Harmonised Consumper Price Index (HCPI) is the inflation measure used by ECB*

However, the large volume of drug imports generates important tax revenues for the budget. Taxes on products - which include mainly value added tax, taxes and duties on imports and excises – charged on pharmaceutical goods account for 1.14% of total taxes on products collected at economy level. This means that the pharmaceutical industry is the 23rd largest contributor to the governments' tax revenues from a total of 103 economic sectors.

The top three industries that have the highest contribution to the budget's tax revenues produce excisable goods (oil, tobacco and beverages), whereas for the rest of the sectors the bulk of taxes on products is generated from the value added tax. The pharmaceutical industry generates higher tax revenues on products than other much larger industries, such as metalurgic industry, wood industry, wholesale and retail, water and heating and gas industry.

Chart 4.3: Taxes on products collected from selected economic sectors (% of total taxes) (2008)

logarithmic scale

Sector	Value
1-Refined petroleum	16.0
2-Manufacture of tobacco	8.9
3-Manufacture of beverages	4.8
4-Crops	4.7
10-Construction	2.5
14-Telecommunications	2.3
15-Production and distribution of electricity	2.1
21-Manufacture of basic chemicals	1.3
23-Manufacture of drugs and pharmaceutical products	1.1
26-Manufacture of electrical machinery and apparatus	0.8
32-Manufacture of wood (except furniture industry)	0.7
33-Iron, steel and ferroalloys production	0.7
36-Wholesale and retail	0.6
38-Production and distribution of heat and hot water	0.6
39-Production and distribution of gas	0.6

Note: the number before the sector name stands for the rank of that sector in the distribution of taxes on products by 103 economic sectors
Source: National Institute of Statistics, MIND Research & Rating

Health and social assistance services sector represents one of the most important sources of inter-industry demand for the whole economy. It absorbs 2.9% of total intermediary consumption, being the 10th largest economic sector, out of 103, in terms of inter-industry demand (2008). Among the most important inputs from other industries used in health and social assistance services are drugs, textile products, other social services, energy, food or telecommunications.

The contribution of health and social assistance services to GDP formation is also significant, 2.74%, as it is one of the largest labor intensive sectors in the economy (2008). Gross earnings of employees from health and social assistance services accounted for 5.1% of total gross earnings in the economy.

The largest part of health and social assistance services are provided free of charge to the population, being financed by the government through the central and local budgets and public health insurance system. Government expenditures on such services, which include mainly wages paid to employees from this sector and acquisition of drugs, accounted for almost 25% of government's final consumption expenditure.
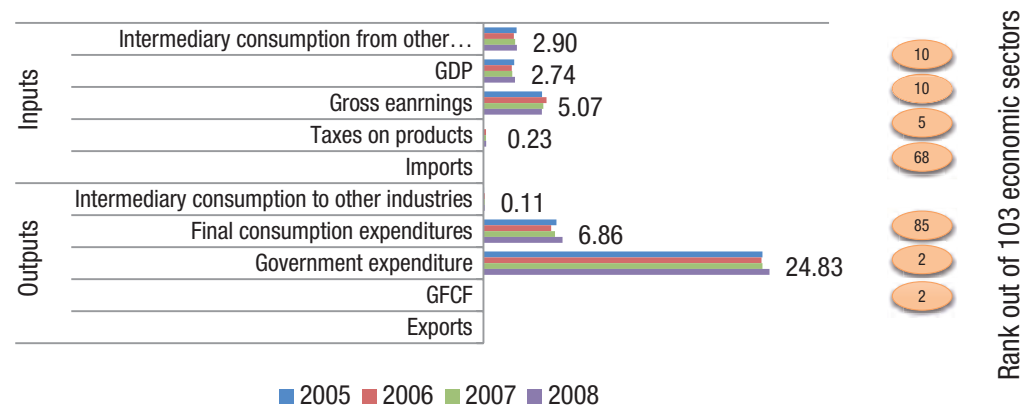
Source: National Institute of Statistics, MIND Research & Rating

The indirect effects. The pharmaceutical industry has a greater impact on the overall economy than implied by the direct effects only. In order to meet the final demand for pharmaceutical goods, producers, besides relying on imports, interact also with other economic sectors, thereby generating additional inter-industry demand which ultimately translates into more value added, taxes and employment for the economy.

For every 1 RON change in final demand of drugs, total output in the economy changes by 1.15 RON.

The simple **output multiplier** provides an initial assessment of the magnitude of the indirect effect. It quantifies the monetary impact of a unit change in final demand of goods or services produced by a specific industry on the overall production of the economy.
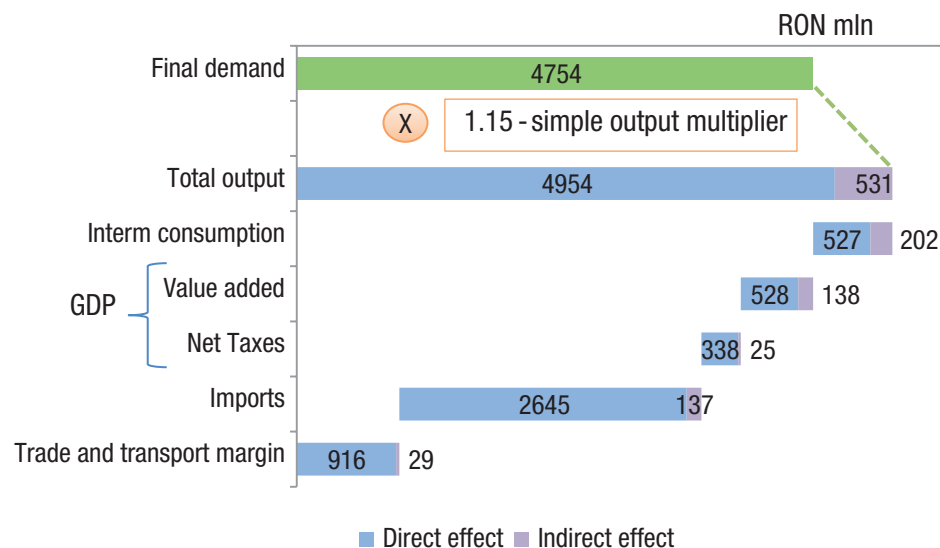
The input-output model is opened with respect to households, which are assumed to be disconnected from the interrelated productive sectors (i.e. exogenous). In this case, the final demand for pharmaceutical drugs is composed of household consumption of partially or non-reimbursable drugs (for the part that is non-reimbursable), change in inventories and exports; reimbursed drugs are reflected separately, in the government's overall expenditure on health and social assistance services.

Final demand for pharmaceutical drugs generated a simple multiplicative effect of 1.15 on the overall economic output. Based on 2008 data, this means, that exports and households' purchases of drugs which amounted to RON 4.8 bn, determined a total economic output of RON 5.5 bn. Most of this output is produced by the pharmaceutical industry, 90% (direct effect), the remaining 10% being generated by the rest of industries which interact with the pharmaceutical industry (indirect effect).

Chart 4.5 highlights the split between direct and indirect effect for the main production inputs. Intermediary consumption accounted for 13% of total output, or RON 729 million, out of which only 72% represented intermediary consumption in the pharmaceutical industry. The remaining 28%, or RON 202 million, is the indirect effect, representing the amount of additional intermediary consumption generated by other industries in order to meet the pharmaceutical industry's demand for resources. GDP had a share of 19% of total output, or RON 1 bn. Out of this, the supplementary GDP generated by other industries interacting with the pharmaceutical industry amounted to RON 138 million. The largest part of total output is represented by imports of pharmaceutical goods, which have a very small multiplicative effect on the economy, as they do not stimulate inter-industry relationships or create additional value added and employment. Total imports valued at RON 2.8 bn were required in order to meet the final demand of drugs.

The multiplicative effect of final demand for drugs on total economic output is relatively reduced as the majority of drugs are imported, so that it does not generate a lot of inter-industry activity.

Chart 4.5: Simple multiplicative effect of final demand for drugs (2008)

RON mln

Final demand	4754

X   1.15 - simple output multiplier

Total output	4954	531
Interm consumption	527	202
GDP { Value added	528	138
Net Taxes	338	25
Imports	2645	137
Trade and transport margin	916	29

■ Direct effect ■ Indirect effect

Note: Trade and transport margin represents the additional amount of money paid by the final purchaser of pharmaceutical goods for retail and wholesale services as well as for transport services
Source: National Institute of Statistics, MIND Research & Rating

The dynamics of the simple output multiplier for the pharmaceutical industry reveals a slight downshift from 2007 onwards (Chart 4.6). The increase in imports of pharmaceutical goods, that was favored also by the discharge of custom duties on intra EU trade as Romania became a member of European Union, has decreased the pharmaceutical industry's interactions with other domestic economic sectors, resulting in a decline of the multiplicative effect.

Chart 4.6: Dynamics of simple output multiplier for pharmaceutical industry
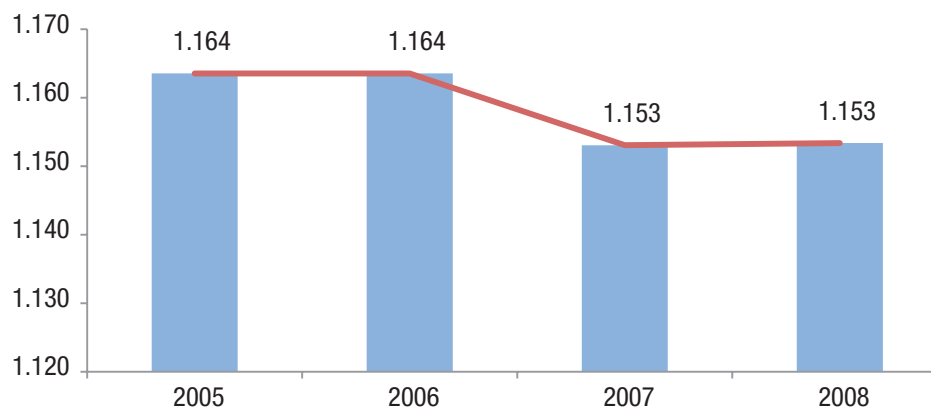
	2005	2006	2007	2008
	1.164	1.164	1.153	1.153

Source: National Institute of Statistics, MIND Research & Rating

In terms of labor inputs, the pharmaceutical industry needed 7,783 employees (direct effect) in order to meet the final demand for drugs (as of year 2008). An additional of 3,000 more jobs (indirect effect) were required in other sectors of the economy, with whom the pharmaceutical industry interacted. Most of these jobs were concentrated in the textile industry (386), other transport services (226), social services (203), general company services (191), glass industry (150), supply of water and related sewerage services (125) and financial services (111). Although in absolute terms the total level of employment (direct and indirect effect) generated in the economy by the pharmaceutical industry is not substantial, the indirect impact is significant in relative terms: for every 8 employees working in the pharmaceutical industry, 3 more employees work in other sectors of the economy supplying intermediate goods and services to the pharmaceutical industry. This has important implications for economic policies pursued by public authorities, which should focus more on stimulating the development of the domestic pharmaceutical industry. It would not only decrease macroeconomic imbalances, by reducing the reliance on imports, but it will also have a positive leverage effect on the labor market.

Chart 4.7: Simple multiplicative effect of final demand for drugs on labor force (2008)
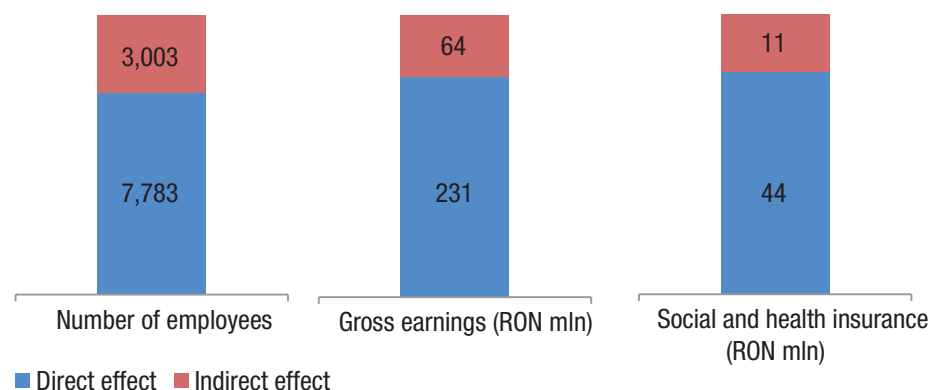
Source: National Institute of Statistics, MIND Research & Rating

We have analyzed so far the impact of the final demand for drugs on total economic output. As outlined earlier, the final demand for drugs includes only exports and households purchases of partially-reimbursed or non-reimbursable drugs. Next, we turn to assess the impact of final demand for health and social assistance services on total economic output.

The final demand for health and social assistance services is composed mainly from (i) government's expenditures on wages of employees working in the public health and social assistance sector and on acquisition of pharmaceutical goods (75%) and (ii) households' direct purchases of private health and social assistance services (25%) (2008).

Final demand for health and social assistance services has a much larger multiplicative effect on overall economic output than compared to the final demand of drugs. In 2008, public and private health and social assistance services supplied to households amounted to RON 29 bn, generating a total economic output of RON 52 bn. This implies a simple output multiplier of 1.8 as compared to 1.15 in the pharmaceutical industry.
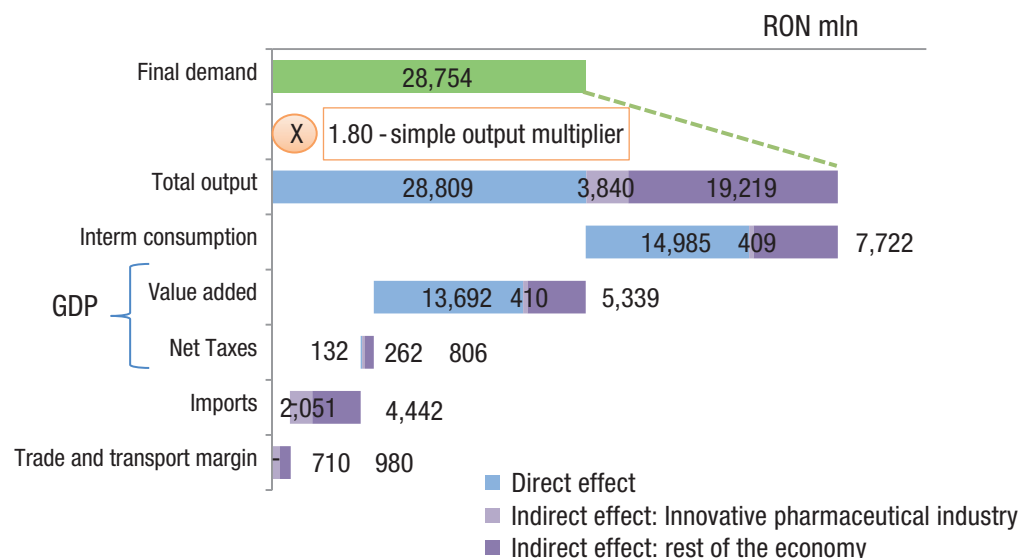
Public and private institutions supplying health and social assistance services to population require inputs from a diverse range of economic sectors, from manufacturing industries to trade and services sector, thereby stimulating the whole economic activity.

Inter-industry demand generated by health and social assistance sector (direct effect) amounted to almost RON 15 bn in 2008. The main suppliers of goods and services come from pharmaceutical industry, textile industry, social services and other transports. For instance, the pharmaceutical industry supplied drugs amounting to RON 3.7 bn to the health services sector (2008); these drugs are used for the treatments that households receive in public or private hospitals and clinics. In turn, the suppliers of the health and social assistance services sector need inputs from other economic sectors in order to produce the required goods and services. The additional inter-industry demand generated by these suppliers (indirect effect) stood at RON 8.1 bn, out of which RON 400 million represented intermediary consumption of the pharmaceutical industry.

The contribution of the health and social assistance sector to GDP formation, both direct and indirect effects, amounted to RON 21 bn, or 4% of GDP (2008). Gross value added produced directly in the health and social assistance sector, which includes mainly wages to employees in the public health sector, accounted for most of this contribution (66%). The additional GDP generated in the economy from the interaction of the health and social assistance sector with other sectors of the economy stood at RON 6.8 bn, or 1.3% of GDP, out of which the pharmaceutical industry accounted for RON 410 million.

The industries, supplying intermediary goods to the health and social assistance sector, relied to a large extent on imports. In 2008, such imports amounted to RON 6.5 bn. Imports of drugs, used in hospitals and clinics, accounted for the largest share, 31% or RON 2 bn. Other major import categories include textile products (16%), chemical products (7%), oil (5%), gas (4%) and medical equipment (2.4%).

Chart 4.8: Simple multiplicative effect of final demand for health and social assistance services (2008)

RON mln

Final demand	28,754
	X 1.80 - simple output multiplier
Total output	28,809 3,840 19,219
Interm consumption	14,985 409 7,722
Value added (GDP)	13,692 410 5,339
Net Taxes (GDP)	132 262 806
Imports	2,051 4,442
Trade and transport margin	710 980

■ Direct effect
■ Indirect effect: Innovative pharmaceutical industry
■ Indirect effect: rest of the economy

Source: National Institute of Statistics, MIND Research & Rating

The interconnectivity of the health and social assistance services sector with other industries increased slightly in the past years, resulting in a higher (simple) output multiplier. The development of the private health sector in the past years has contributed positively to the amplifications of interactions with the rest of the economy.

Chart 4.9: Dynamics of simple output multiplier for health and social assistance sector
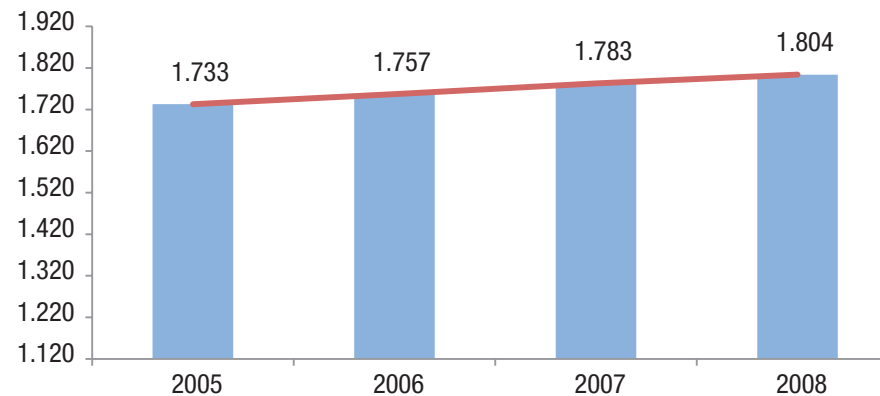
Inter-industry demand generated by the health and social assistance services ensures more than 100 thousand additional jobs in other sectors of the economy.

The health and social assistance sector is one of the largest employers in the Romanian economy. This is also the reason why it has such an important contribution to GDP. Most of the value added created in this sector represents compensation of labor force. As of 2008, there were roughly 444 thousand employees working in health and social assistance services, most of which were employed in the public sector. By interacting with other industries, the health and social assistance services ensure an additional 124 thousand jobs throughout the economy. For instance, around 6 thousand employees were required in 2008 in the pharmaceutical industry to ensure the production and supply of drugs to the health services sector. The overall gross earnings of employees working either directly or indirectly to meet the population's needs of health and social assistance services represent 6.5% of total gross earnings in the economy, or RON 11.5 bn.

Chart 4.10: Multiplicative effect of final demand for health and social assistance services on labor force (2008) (RON millions, if not otherwise specified)
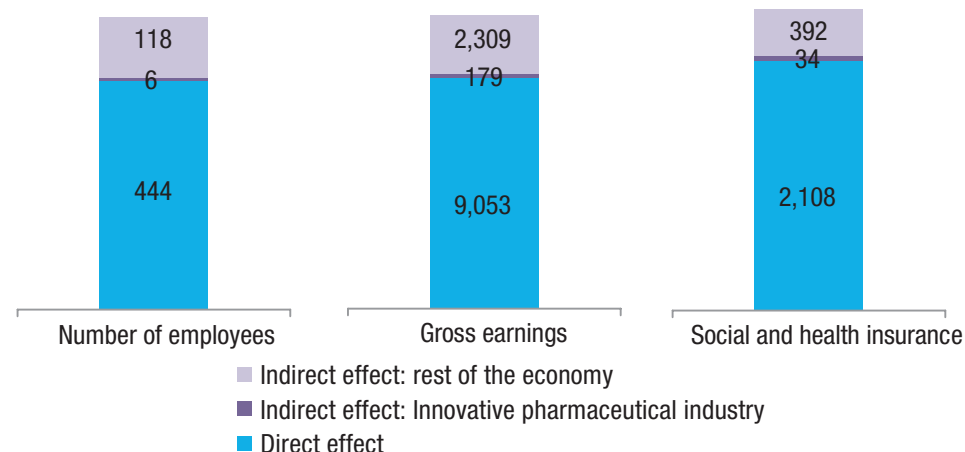
Standardising the 2008 figures and assuming that the technical coefficients of the input-output matrix remain unchanged, the following conclusions can be drawn:

For every RON 1 billion change[13] in final demand of drugs and of health and social assistance services,

◦ **Total output[14] in the economy changes by RON 1.7 bn, with a multiplicative effect[15] of 1.7;**

◦ **Interindustry activity** (intermediary consumption) **is adjusting by RON 0.7 bn, with a multiplicative effect of 1.54;**

◦ **Gross value added changes by RON 0.6 bn, with a multiplicative effect of 1.4;**

◦ **Net taxes on products** – e.g. VAT, excises and other duties – **change by RON 46 million, with a multiplicative effect of 3.3;**

◦ **Total imports of goods and services vary by 0.28 bn, with a multiplicative effect of 3.5;**

◦ **Total number of employees[16] will fluctuate by up[17] to 17 thousand, gross earnings by up to RON 0.35 bn and health and social insurance contributions by up to RON 80 million. The corresponding multiplicative effect on the number of employees is 1.28.**

The variation in final demand can occur for example as a result of a change in government's policy on healthcare sector, by allocating additional funds or cutting on public healthcare expenditures. The existence of (government) arrears can also be equivalent in terms of consequences to a (negative) change in final demand. For example, one of the current structural issues of the Romanian public finances, that emerged as the economic and financial crisis set on and public revenues decreased sharply, is the persistent deficit in the public healthcare sector. The government's immediate solution to this problem was to increase payment terms on contracted pharmaceutical goods to almost 1 year. Eventually these outstanding payments have transformed into arrears as the government was unable to settle the contracts at maturity. In effect, these arrears represent a form of forced financing imposed by the government on the pharmaceutical producers. So long as the pharmaceutical producers are willing and able to accept the role of creditor and to internalise the opportunity costs related to the arrears there are no spillover effects in the economy – pharmaceutical producers continue to interact with other sectors of the economy in order to produce drugs. However if these arrears persist and the pharmaceutical producers would not be able to cover the related opportunity costs, there is a risk that the pharmaceutical industry would adjust downward its output (i.e. lower supply of drugs). Apart from the major social impact of such an event, the effects of the output reduction would propagate throughout the economy, based on inter-industry linkages, triggering additional losses.

The next step in quantifying the effects of pharmaceutical industry on the economy is to analyse **output elasticities**. So far we have looked only at the nominal impact (output multiplier). However in order to compensate for differences in industry size and be able to compare the multiplicative effects across industries, output elasticities instead of output multipliers have to be used. Output elasticities quantify the impact in percentage points of a 1% change in final demand of a given sector on total output in the economy. Furthermore the output elasticities can be decomposed into elasticities of production inputs (e.g. value added, employment, taxes, imports etc.).

The persistence of government's arrears towards the pharmaceutical sector can be equivalent in terms of consequences to a downward adjustment in final demand for health and social assistance services, which would have as an immediate effect a lower supply of drugs.
As the effects propagate throughout the economy, additional losses would be generated.

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[13] *In order to preserve the proportions between the pharmaceutical industry and the health and social assistance sector, we assume that 14% of this change comes from the final demand of drugs and 86% from the final demand of health and social assistance services.*

[14] *Total output is composed of intermediary consumption, GDP (value added and net taxes) and imports.*
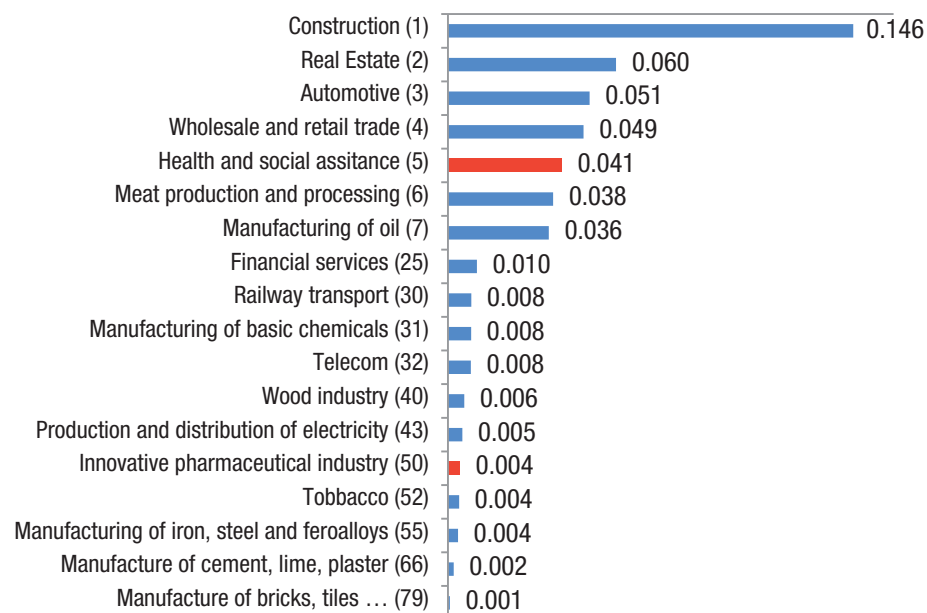
[15] *Ratio of total effect (direct and indirect) to direct effect*

[16] *We assume that the change in final demand impacts only the number of employees and not the average wage.*

[17] *Employment usually exhibits more rigidity than other production inputs, so a change in demand will determine in reality a fluctuation of employment lower than that implied by the input-output model.*

In the figure below is listed a selection of economic sectors and their total output elasticities. Construction sector has the highest output to final demand elasticity, as it interacts with a wide range of industries in order to meet the final demand. In this case a 1% change in final demand of construction services generates a 0.146% change in total output of the economy. Health and social assistance services have the 5th largest output to final demand elasticity out of 103 economic sectors. The pharmaceutical industry is in the middle of the distribution, on the 50th position, and has an output to final demand elaticity close to that of the wood industry or to that of the energy sector (electricity production), but is ahead of tobbacco industry, metallurgic industry or construction materials sector.

Chart 4.11: Output to final demand elasticities in selected economic sectors (%) (2008)

Sector	Value
Construction (1)	0.146
Real Estate (2)	0.060
Automotive (3)	0.051
Wholesale and retail trade (4)	0.049
Health and social assitance (5)	0.041
Meat production and processing (6)	0.038
Manufacturing of oil (7)	0.036
Financial services (25)	0.010
Railway transport (30)	0.008
Manufacturing of basic chemicals (31)	0.008
Telecom (32)	0.008
Wood industry (40)	0.006
Production and distribution of electricity (43)	0.005
Innovative pharmaceutical industry (50)	0.004
Tobbacco (52)	0.004
Manufacturing of iron, steel and feroalloys (55)	0.004
Manufacture of cement, lime, plaster (66)	0.002
Manufacture of bricks, tiles … (79)	0.001

Note: the number between brackets following the sector name indicates the rank of that sector in a distribution of output elasticities across 103 economic sectors

Source: National Institute of Statistics, MIND Research & Rating

The next step is to analyse the contribution of production inputs to the output elasticities. Specifically we want to see how much of the percentage change in total output in the economy as a result of a 1% change in final demand of a specific sector is due to a change in intermediary consumption, GDP, imports or transport and trade margin.

More than half (51%) of the percentage change in total output in the economy that is triggered by a 1% change in final demand of **drugs** is due to imports and only 19% of it represents value added (GDP) (Chart 4.12). In case of **health and social assistance services**, GDP and intermmediary consumption have a much higher contribution, 40% and 45% respectively, to the overall change in economic output.

Chart 4.12: Decomposition of output to final demand elasticities by main production inputs (%) (2008)

pharmaceutical industry

- ■ Intermediary consumption
- ■ GDP
- ■ Imports
- ■ Transport and trade margin

Health and social assistance

Outer ring: 13, 19, 51, 40, 45
Inner ring: 17, 13, 3
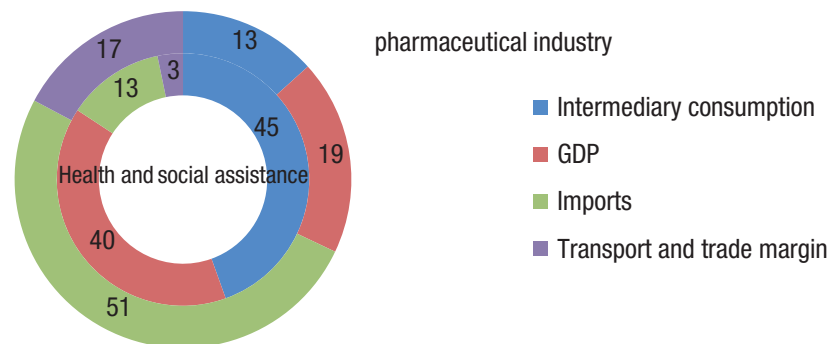
Source: National Institute of Statistics, MIND Research & Rating

If we look at GDP to final demand elasticities[18], we can observe slight changes in the classification of industries as compared to the rank of industries by output to final demand elasticities, depending on whether an industry uses more domestically manufactured or more imported intermediary goods as inputs. Health and social assitance services rank on the 7th position while pharmaceutical industry is on the 52nd position out of 103 industries.

Chart 4.13: GDP to final demand elaticities in selected economic sectors (%) (2008)

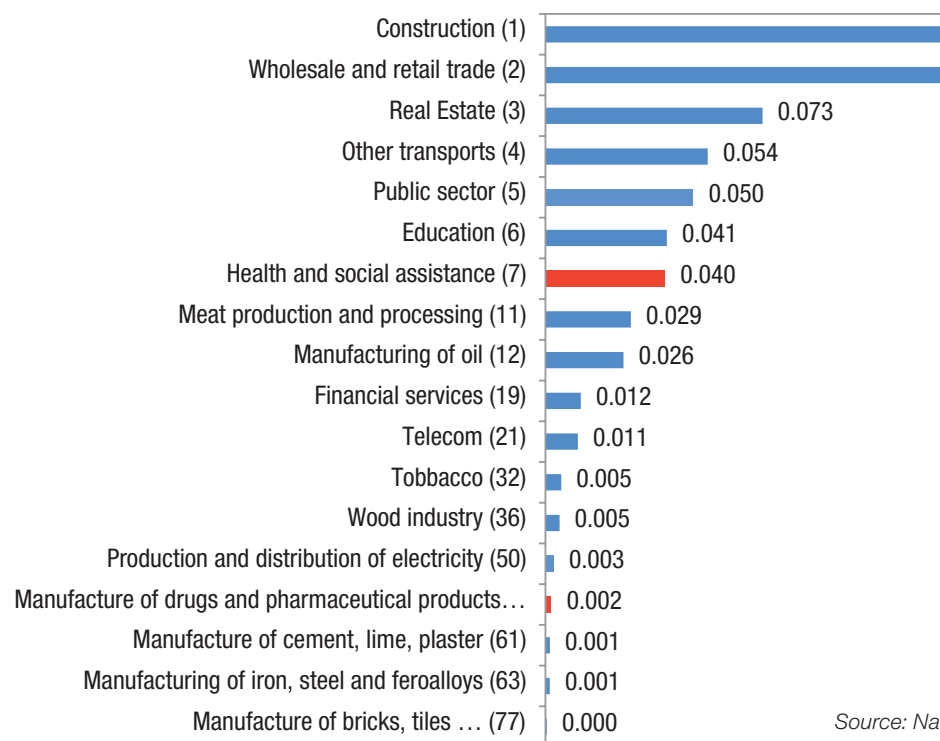| Sector	Value
Construction (1)	
Wholesale and retail trade (2)	
Real Estate (3)	0.073
Other transports (4)	0.054
Public sector (5)	0.050
Education (6)	0.041
Health and social assistance (7)	0.040
Meat production and processing (11)	0.029
Manufacturing of oil (12)	0.026
Financial services (19)	0.012
Telecom (21)	0.011
Tobbacco (32)	0.005
Wood industry (36)	0.005
Production and distribution of electricity (50)	0.003
Manufacture of drugs and pharmaceutical products…	0.002
Manufacture of cement, lime, plaster (61)	0.001
Manufacturing of iron, steel and feroalloys (63)	0.001
Manufacture of bricks, tiles … (77)	0.000

[18] *Percentage change in GDP due to a 1% change in final demand of a specific sector.*

Source: National Institute of Statistics, MIND Research & Rating

4.2. Health outcomes, healthcare expenditures and economic performance

This section investigates the relationship between health and economic development and evaluates the extent to which economic policies in the Romanian healthcare sector can affect health outcomes and ultimately contribute to an improvement in living standards.
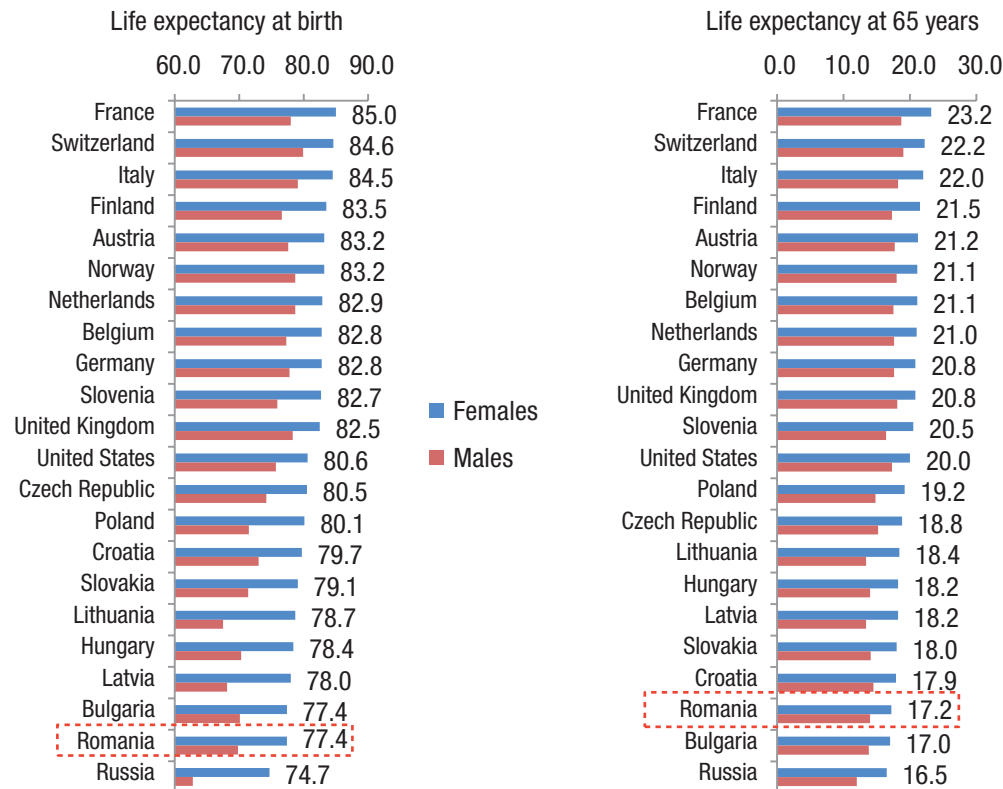
Health is a key factor of social and economic welfare. Good health leads to increased labor force participation and productivity in the long run, therefore being one of the main drivers of long term economic growth. Health outcomes are determined by a wide range of factors, from lifestyle and cultural habits to economic development, access to innovative treatment, healthcare resources and public policies. The latter two factors are of major importance in determining long term health outcomes. The level and efficiency of healthcare resources, which depend primarily on the quality of the public policies pursued, determine the extent to which health outcomes can be improved.

According to WHO definition, health can be defined in broad terms as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity". The most widely used summary indicator of population health status is life expectancy, which measures the average number of additional life years that a person is expected to live if the age-specific death rates are considered to remain unchanged throughout the person's remaining lifetime.

In Romania life expectancy is among the lowest from a peer group of emerging market countries (Chart 4.14), with life expectancy at birth around 77.4 years for females and 69.8 years for males, compared to an average of 79.2 and 71.2 years respectively in CEE countries (2009). At the same time life expectancy at 65 years in Romania stood at 17.2 years for females and 14 years for males, below the CEE average of 18.4 and 14.5 years respectively.

Looking at the dynamics of life expectancy in CEE countries in the past 50 years, we can see that the time period corresponding to the communist regime, up to the '90s, brought no improvement in the population health status (Chart 4.15). In fact, in Romania life expectancy at birth entered on an uptrend towards the end of the '90s, much later than in case of other CEE countries. The explanations for these developments are twofold. On the one hand, Romania witnessed a worse breed of communism than other CEE countries and, on the other hand, during the first years of transition to market economy, healthcare has not been a priority on government's public policy agenda. So, in '97 the gap between average life expectancy in CEE countries (excl. Romania) and life expectancy in Romania reached a maximum, 3.36 years. Between '97 and 2007, health status of population in Romania started to gradually improve, recouping part of this gap. However, as we shall see later on this section, this improvement in population health status has not been the consequence of better and more efficient healthcare policies, but rather the natural result of a period of prolonged economic growth which brought more resources to the public budget and implicitly to the public healthcare sector. Starting with year 2008 onwards, as the Romanian economy entered into recession, the dynamics of life expectancy in Romania underperformed the regional average.

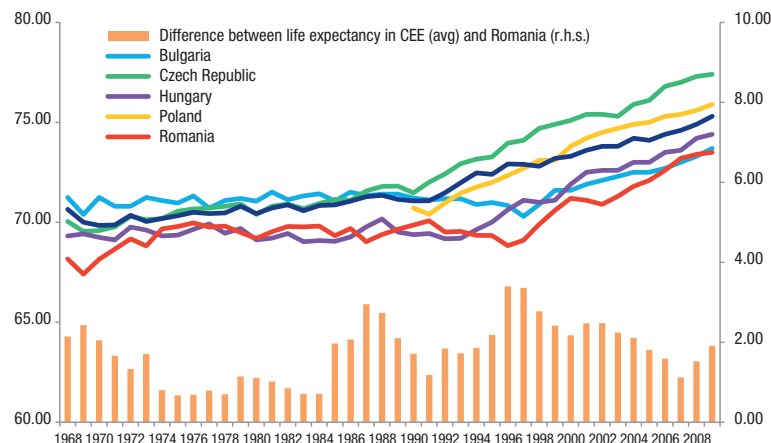*Romania has one of the lowest life expectancy from the region, explained on the one hand by the delayed start of the transition process but also by the fact that healthcare has not been a priority on government's public policy agenda after the '90.*

Chart 4.14: Life expectancy in Romania vs selected countries (years) (2009)

Life expectancy at birth

Country	Value
France	85.0
Switzerland	84.6
Italy	84.5
Finland	83.5
Austria	83.2
Norway	83.2
Netherlands	82.9
Belgium	82.8
Germany	82.8
Slovenia	82.7
United Kingdom	82.5
United States	80.6
Czech Republic	80.5
Poland	80.1
Croatia	79.7
Slovakia	79.1
Lithuania	78.7
Hungary	78.4
Latvia	78.0
Bulgaria	77.4
Romania	77.4
Russia	74.7

■ Females
■ Males

Life expectancy at 65 years

Country	Value
France	23.2
Switzerland	22.2
Italy	22.0
Finland	21.5
Austria	21.2
Norway	21.1
Belgium	21.1
Netherlands	21.0
Germany	20.8
United Kingdom	20.8
Slovenia	20.5
United States	20.0
Poland	19.2
Czech Republic	18.8
Lithuania	18.4
Hungary	18.2
Latvia	18.2
Slovakia	18.0
Croatia	17.9
Romania	17.2
Bulgaria	17.0
Russia	16.5

Source: Eurostat, adapted from Young and Wilkie

Chart 4.15: Long term developments of life expectancy (years) in CEE countries

■ Difference between life expectancy in CEE (avg) and Romania (r.h.s.)
— Bulgaria
— Czech Republic
— Hungary
— Poland
— Romania

Source: Eurostat, MIND Research & Rating

Beginning with the late '90s the population health status in Romania started to slowly converge to the regional average, as economic growth-made more resources available for healthcare. However with no structural reforms implemented, healthcare resources became scarce as the economy entered into recession in 2008/2009 and as a result the population health status deteriorated compared to the regional peers.

Economic growth is a major determinant for long term health outcomes especially in case of developing economies. Higher income facilitates access to better healthcare, education, nutrition and housing, all of which contribute over time to improved health outcomes (Young and Wilkie, Jourmand et al 2008). This relationship is stronger in case of emerging market economies, where an increase in general income levels will have a higher impact on health outcomes than in case of developed countries. The relationship works also in the opposite direction, a better health contributing in the long run to increased income levels, through labor force participation and productivity.

In the past 15 years the Romanian economy witnessed a rapid convergence process, which was sustained by inflows of foreign capitals (especially from 2005 onwards when capital account was liberalised) (Chart 4.16). Real GDP per capita increased by a cumulative rate of 56% over this time period. At the same time life expectancy in Romania increased by 6%, or 4.16 years. Despite these developments, currently, the health status of the population in Romania remains one of the poorest in Europe.

One of the reasons for this outcome has been the lack of public initiative during the past decade to take necessary measures to reform the healthcare sector. Whereas in other CEE countries (Poland, Slovakia, Slovenia, Estonia) healthcare resources as percentage of GDP have increased in the past years, indicating that public authorities are considering healthcare to be a top priority for long term economic growth, in Romania total healthcare expenditures (stemming from both private and public sector) as percentage of GDP have remained relatively constant since year 2000 at around 5.4% of GDP (Chart 4.17).

Chart 4.16: Economic growth and life expectancy
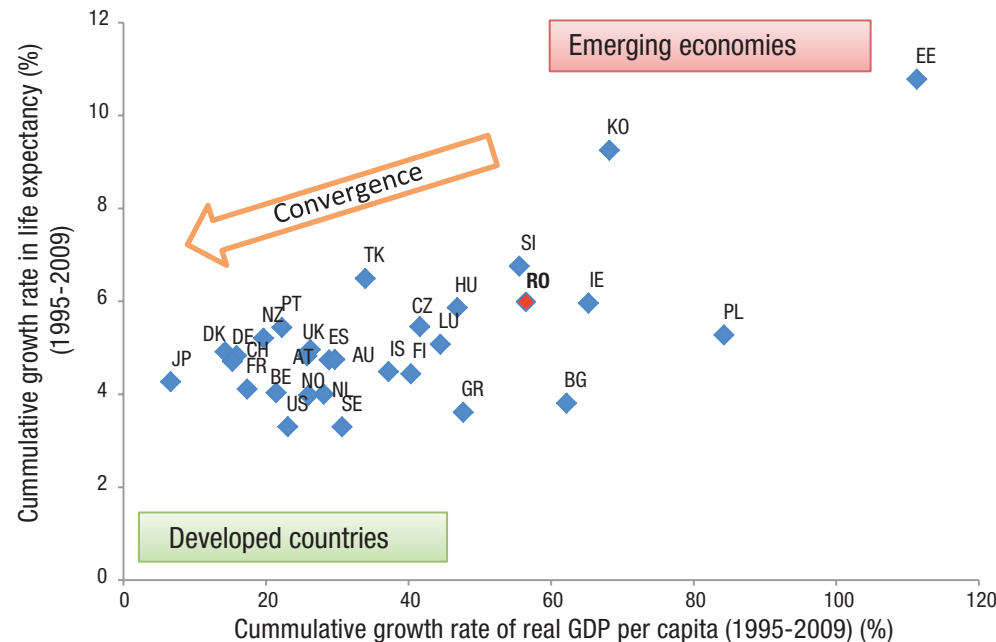
Source: WHO, Eurostat, MIND Research & Rating

Chart 4.17: Dynamics of total healthcare expenditure (% of GDP) between 1995 and 2009

Values shown on chart: US 14.3, FR 10.7, DE 10.5, CH 10.6, DK 9.0, SE 8.8, NO 9.1, FI 8.1, IT 8.2, UK 7.7, SI 8.2, SK 6.9, HR 7.4, CZ 6.9, BG 6.4, HU 7.4, PL 6.1, EE 5.6, LT 6.1, LV 6.2, RO 5.0

Healthcare expenditures as a percentage of GDP are close to the average of the past 15 years, indicating that public authorities undertook no significant measures to reform the healthcare system.
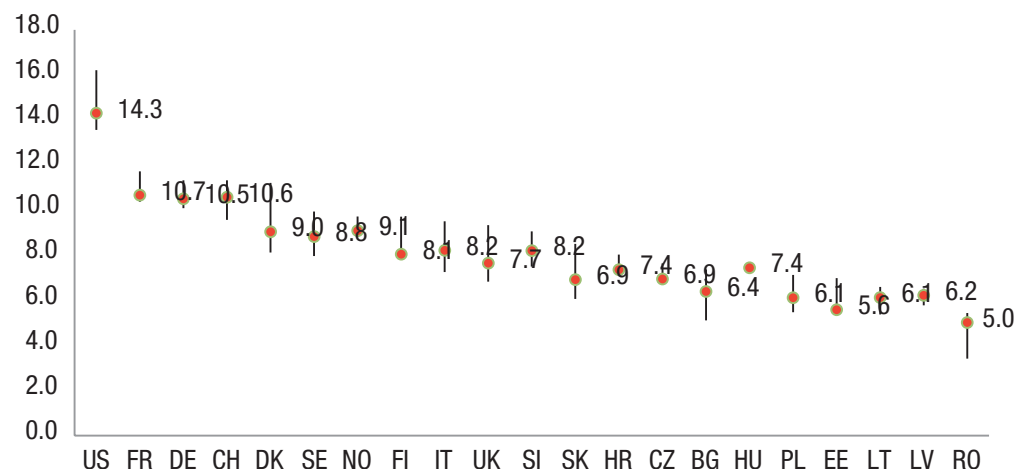
*Note:
for each country the **lowest point on the bar** represents total healthcare expenditure as % of GDP in 1995, the highest point on the bar represents the value of healthcare expenditures as % of GDP in 2009 **while the red bullet is the average for the 1995-2009 period**.*
Interpretation: *in case of Romania healthcare expenditure as percentage of GDP in 2009 was close to the average of the past 15 years, which is an indication of the fact that public authorities undertook no real measures to improve the financing of the healthcare sector.*

Source: WHO, MIND Research & Rating

One of the main drawbacks of life expectancy as an indicator of population health status is its failure to account for quality of life, burden of disease, injury or disability. The Disability-Adjusted Life Year (DALY) indicator, developed by the World Health Organisation, provides a measure of healthy life years lost by virtue of being in states of poor health or disability. It combines in one measure the time lived with disability and the time lost due to premature mortality. One DALY can be thought of as one lost year of 'healthy' life. In effect DALY measures the gap between the current population health status and an ideal situation where the entire population lives to an advanced age free of any disease or disability.

Romania looses on average close to 16 thousand active life years per 100 thousand population in a lifecycle as a result of diseases or injuries, placing it among the countries with the highest disease burden in CEE.
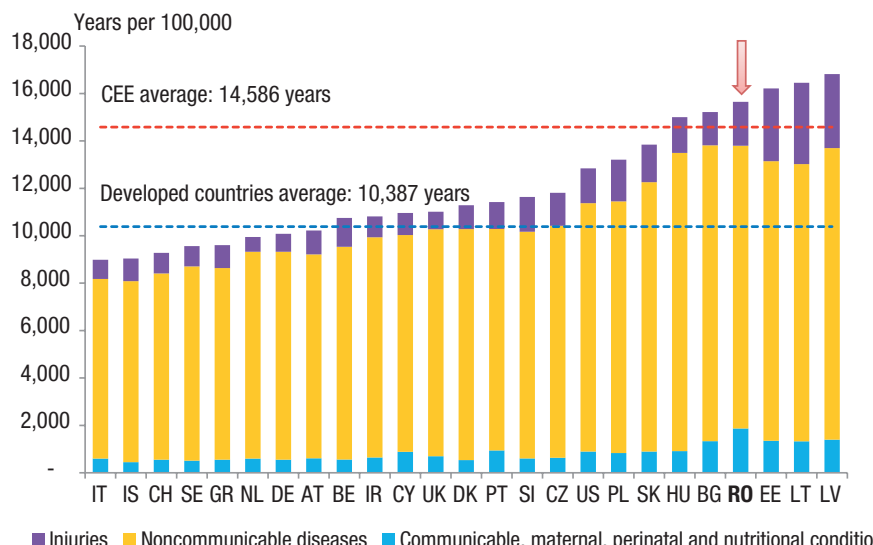
In 2004, Romania had one of the highest DALY per 100 thousand population among CEE countries, with 15,651 DALYs (Chart 4.18). At the same time the CEE average stood at 14,586 DALYs while the average for developed countries was significantly lower, at 10,387 DALYs. In structure, the main driver for DALY are non- communicable diseases, accounting for more than 80% of life years lost in developed economies and between 70%-80% in emerging economies. In Romania non-communicable diseases represented 76% of total DALY. Non-communicable diseases represent the focus area of the highly innovative pharmaceutical manufacturers. Through continuous research and innovation these companies are able to deliver medicines which allow patients with chronic diseases to live longer, healthier and more productive lives. So, the means to reduce DALY exist. The decision however lies with public authorities and depends to a large extent on the design and management of the public healthcare system.

Romania recorded an unusual high DALY due to communicable, maternal, perinatal and nutritional conditions, 12% of total DALY, placing it on the last position in EU. For comparison, the developed countries average stood at 6% while CEE countries average at 7%. The burden of these conditions on the population can be eased in the short and medium term, through adequate and effective prevention and treatment policies, with a higher success rate than in case of non-communicable diseases, as most of the communicable diseases can be nowadays effectively treated. So, in this context it is questionable why public authorities have not undertaken so far effective measures to contain communicable diseases at a level comparable to that of other CEE countries?

Chart 4.18: DALY in selected developed and emerging countries (2004)

Years per 100,000

CEE average: 14,586 years

Developed countries average: 10,387 years

IT IS CH SE GR NL DE AT BE IR CY UK DK PT SI CZ US PL SK HU BG **RO** EE LT LV

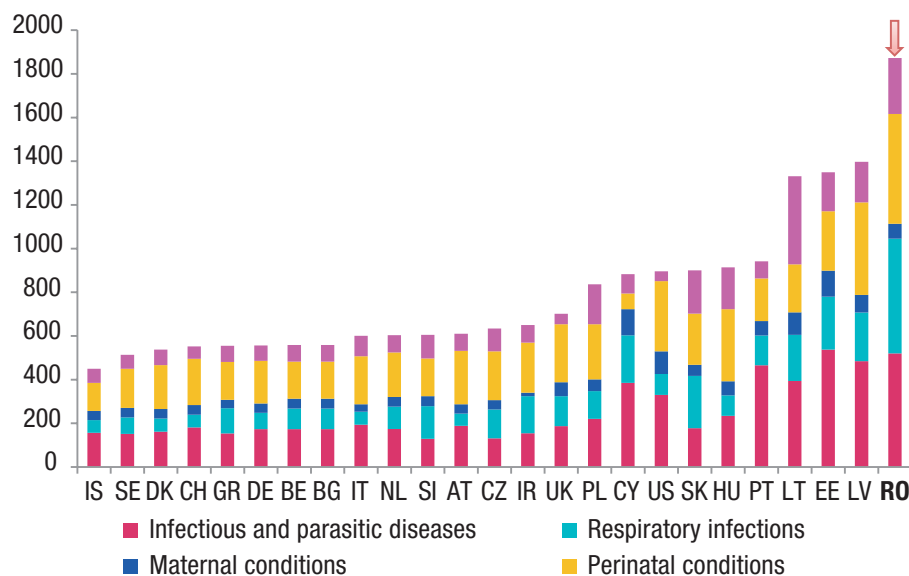Injuries   Noncommunicable diseases   Communicable, maternal, perinatal and nutritional conditions

*Note: DALYs are not widely available as time series across
countries, the latest point in time being as of year
2004*

Source: WHO, MIND Research & Rating

Tuberculosis and respiratory infections are the main causes for DALY due to communicable, maternal, perinatal and nutritional conditions in Romania, accounting for 39% of total life years lost. Perinatal conditions, such as neonatal infections or prematurity, have also a high incidence compared with other countries around us.

*Chart 4.19: DALY due to communicable, maternal, perinatal and nutritional conditions (2004)*

IS SE DK CH GR DE BE BG IT NL SI AT CZ IR UK PL CY US SK HU PT LT EE LV **RO**

Infectious and parasitic diseases   Respiratory infections
Maternal conditions   Perinatal conditions

Source: WHO, MIND Research & Rating

Not only is the prevalence of tuberculosis in Romania several times higher than in other CEE countries, but also the efforts of Romanian authorities over the past two decades to contain the impact of this disease on population have been less efficient than elsewhere. For instance, between 1990 and 2009 the prevalence of tuberculosis in Slovakia has been reduced by 78%, in Czech Republic by 65%, in Slovenia by 80%, in Poland by 65%, while in Romania it has decreased by only 36% (Chart 4.20).

Chart 4.20: Prevalence of tuberculosis per 100,000 population
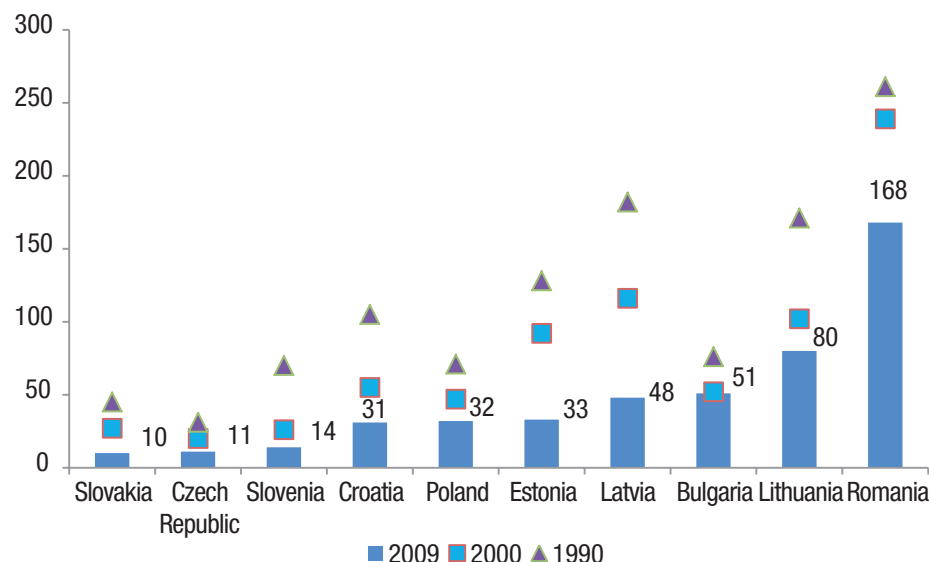
Source: WHO, MIND Research & Rating

So, in this context, it is important to have a clear idea of the impact of the disease burden on the long term economic growth potential. Reducing the impact of the disease burden on the economy should constitute the main objective of public healthcare policies.

DALY can be transformed into equivalent of economic output lost over the medium and long term. The economic value of one DALY can be proxied by GDP per capita. In other words, one year of active life lost over a lifecycle by an individual can be considered equivalent to one year lost of participation to economic activity, with all the implications deriving from it (lower production, income, taxes, consumption etc.).

In order to estimate the present value of economic output lost (OL) over the medium and long term due to total DALY, we need the projection of population along the average remaining lifecycle – P0 population in the base year, and p the long term growth rate of population – , GDP per capita in the base year, the medium to long term growth rate of GDP per capita (g), the required rate of return in the economy (r), and the fraction of total DALY (γ_κ) that is lost in a given year (k) out of the total years of remaining lifecycle (n). Put in mathematical terms, the relationship is:

$$OL = DALY \cdot \sum_{k=1}^{n} \frac{P_0 \cdot (1 + p)^k \cdot GDP \ per \ capita_0 \cdot (1 + g)^k \cdot \gamma_k}{(1 + r)^k}, where \sum_{k} \gamma_k = 1$$

If we assume for simplicity that the growth rate of GDP per capita is equal to the required rate of return in the economy and that the overall burden of disease (DALY) is equally spread along the remaining lifecycle ($\gamma_\kappa = 1/n$), then the formula from above colapses to:

$$OL = DALY \cdot P_0 \cdot GDP\ per\ capita_0 \cdot \frac{1}{n}\sum_{k=1}^{n}(1+p)^k$$

Given the current burden of disease on population, as measured by DALY, the Romanian economy looses around EUR 18.6 bn (15% of GDP) in economic output over the medium to long term when compared to the situation where the entire population has an ideal health status (DALY=0). However, a more realistic exercise is to evaluate the surplus in economic output that is determined by an improvement in population health status to a level similar to that of EU average. So, assuming that DALY (per 100 thousand population) in Romania converges from 15,651 years to the EU average, which is around 10,000 years, there will be, caeteris paribus, an increase in economic output of EUR 6.7 bn (6% of GDP).

Table 4.1: Estimation of economic output lost due to DALY in Romania

Variable	Estimated value
Life expectancy (2009)	74
Average population age (2010)	39
Remaining lifecycle (life expectancy - average population age)	35
Population (2010)	21,462,186
Long term population growth rate (%)	-0.3
GDP per capita (EUR) (2010)	5,700
DALY, per 100 thousand population (2004)	15,651
Fraction of total DALY lost in a given year out of remaining lifecycle	0.03
Present value of total output lost (2010) (EUR)	**18,620,949,722**
Present value of total output lost (2010) (% of 2010 GDP)	**15%**

Source: WHO, Eurostat, own estimations and calculations

The question which naturally arises now is what can be done by public authorities in order to decrease DALY and capitalise on additional economic output which would result from the improvement in population health status. While it is beyond the scope of this to analyse and discuss policy measures aimed at improving the financing of healthcare system in Romania, we come up with some general guidelines that should be taken into consideration when drafting public policies on healthcare.

Both quality and quantity of public healthcare expenditures matter in attaining an improvement in population health status. Countries which spend on average more on healthcare have in the long run better health outcomes than those economies with lower healthcare expenditures (Figure …). The relationship is more evident in the case of emerging countries which have underdeveloped healthcare systems and where a marginal increase in healthcare expenditures can make a big difference in population health status over time. Quality or efficiency of healthcare expenditure is also an important factor in determining health outcomes. There are countries which spend the same amount of money on healthcare, yet they have different results in terms of health outcomes.

While there is a wide range of factors which explain this difference, we think that the efficiency of healthcare expenditures is among the most important factor in case of developing countries.

If we quantify a linear relationship between DALY and long term healthcare expenditures (% of GDP) in case of emerging market economies we obtain the following results[19]

$$DALY_t = \underbrace{-1536.23}_{(-4.38)} \cdot \frac{1}{10} \sum_{j=t-10}^{t} HC_j + \underbrace{25494}_{(13.75)} \quad (R^2 = 22\%)$$

where HCj represents healthcare expenditures as a percentage of GDP in year t.

In terms of policy implications the above relationship implies that if the long term (10 years) average of healthcare expenditures as a percentage of GDP is increased by 1 percentage point this will improve population health status on average by 1500 DALY per 100 thousand population. This result assumes that the efficiency of healthcare expenditures is at the average from the sample of developing countries included in the estimation. Countries with a below average efficiency of healthcare expenditures will have to increase by more than 1 percentage point to attain to same results or alternatively take the necessary measures to improve their efficiency.

Chart 4.21: Healthcare expenditures vs DALY in selected developed and emerging markets
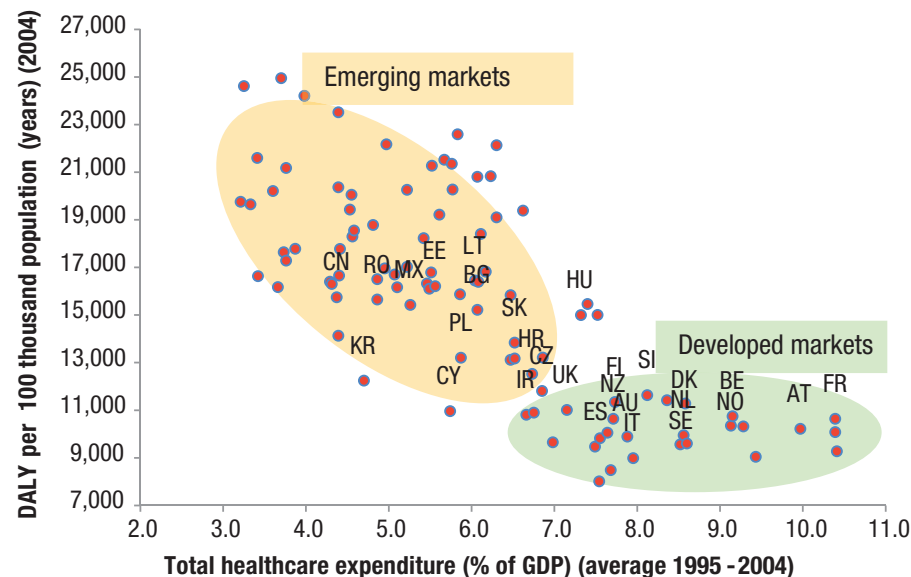
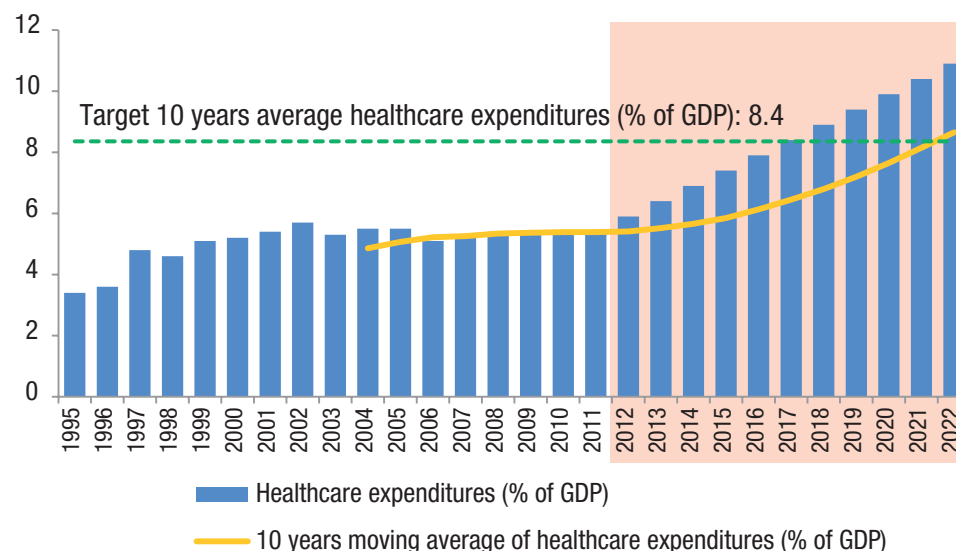
Source: WHO, own estimations and calculations

In case of Romania, in order to reach the average health status of population from developed countries, which is around 10000 DALY per 100 thousand population, the long term average of healthcare expenditures as a percentage of GDP has to increase by 3.5 percentage points. Compared with the 10 year average between 1995 and 2004, which was also used in the training sample for the model estimation, healthcare expenditures have increased on average by only 0.6 percentage points between 2005 and 2009. So if this trend continues, by 2014 DALY would decrease by only 1500 compared with the 2004 level of 15,651, which is still far from the 10000 DALY level in developed countries.

By increasing healthcare expenditures by 5 percentage points of GDP over the next 10 years, the health status of population in Romania could reach the EU average.

[19] *Figures in brackets represent the statistically significance of the coefficents. Both coefficients are statically significant.*

But what does a 3.5 percentage point increase in long term average healthcare expenditures mean? If we assume that healthcare expenditures will increase by 0.5 percentage points of GDP each year, it would take almost a decade from now (2011) on for the long term average to reach the target value of 8.4%. At that target value, the population health status in Romania, as measured by DALY should be at a level close to that of developed countries, according to our estimations. However if at the same time efforts are undertaken to improve the efficiency of healthcare expenditures, most probably it would take less time and resources to reach the developed countries health status.

As outlined earlier in this section, we estimate that this improvement in population health status would bring an additional 6% economic growth over the medium-long term at a total approximate cost of 5% of GDP (representing the sum of the required increases in healthcare expenditures).

Chart 4.22: Healthcare expenditures vs DALY in selected developed and emerging markets

Source: WHO, own estimations and calculations

5. Possible future government policies pertaining to the pharma industry

T his section highlights three major preoccupations of the government, which might have a strong impact on the pharma industry. These government streams of actions are part of the EU economic governance, and their timely implementation will be closely monitored by the European entities.

To encourage these government policies, the pharma industry might embark into two possible options: (i) a passive attitude, waiting for the government to come with measures and proposals, or (ii) a pro-active approach, acknowledging that macroeconomic issues have microeconomic implications and the private sector should care about and get involved (for its own benefit).

This chapter is built-up from the idea the second option is the best to follow. Three important subjects are touched (EU 2020 Strategy, external macroeconomic imbalances, and change in the Romanian economic growth model), having connections with the developments from the pharma industry. For each topic, the policies suggested to be carried out are selected from those delivering win- win outcomes for both the pharma industry and the government, in order to raise the chances of being implemented.

Major macroeconomic policies are underway, deriving from the EU new economic governance currently implemented, and a win-win outcome (public-private) calls for a pro-active involvement of the pharma industry.

5.1. EU 2020 Strategy

One important objective of the Europa 2020 Strategy is innovation…

…and Romania committed to reach a level of 2 percent of GDP by 2020.

Europe 2020 is the European Union growth strategy for the next years. The EU has set five objectives related to employment, innovation, education, social inclusion and climate/energy to be reached by 2020. Each Member State shall tailor its national policies in order to target these areas.

As mentioned above, the investment in innovation is an important tool within the EU 2020 strategy. A level of 3% of EU GDP in R&D should be reached by 2020. Combined public and private funds should be considered in order to grasp the specified threshold. The R&D policy should be refocused on major challenges of the EU society, where health sector is explicitly mentioned in the strategy papers.

Romanian authorities built their strategy for innovation and undertook achieve the targets in front of the European Commission (see, for instance, the National Reform Program, 2011-2013). Romania committed to reaching a level of 2 percent of GDP for public and private sector investment in RDI by 2020, along the following estimated trajectory:

Table 5.1. Projected trend for the investment in research, development and innovation (as percent of GDP)

	2011	2013	2015	2020
Public sources	0.33	0.60	0.80	1.00
Private sources	0.15	0.25	0.50	1.00
Total	0.48	0.85	1.30	2.00

Source: National Reform Programme, 2011-2013

The private sector involvement in achieving this main objective of EU 2020 strategy is important and up-trending. This objective might be difficult to meet, without adequate stimulus. The statistics underpin that the share of R&D expenditure delivered by the private sector (as percent of GDP) decreased in Romania (from 0.22 percent to 0.17 percent, 2003-2008, according to Eurostat), while the situation in the peer group (Poland, Hungary, Czech Republic and Bulgaria) is vice-versa. The pharma industry can play an important role in reaching the targets related to innovation, with a win-win outcome for both pharma industry and the authorities, if better coordination and strategies would be in place. Pharma industry might support in improving the Romanian innovation stance mainly into two inter-related directions: spending higher amounts for innovation, and employing a larger number of personnel involved in R&D.

The share of R&D personnel in the business enterprise sector (as a percentage of the economic active population) in Romania is low comparing to the EU-27 average (0.11 percent versus 0.54 percent in 2009), and decreasing in the last years (from 0.16 percent to 0.11 percent, 2005-2009, while in the peer group the dynamic is up-trending).

The pharma industry might benefit from the financial resources the government intends to spend for stimulating private sector investment in R&D. Authorities budgeted financial resources estimated for 2011-2013 value RON 2.65 billion. It is expected that during the same period, the structural funds with this destination would mount for EUR 369 million, while the private sector would bring RON 2250 million. Moreover, the proposals for the EU budget 2014-2020 envisage an important increase for the research, development and innovation. The European Commission plans a common strategic framework in the R&D which will have a volume of EUR 80 billion for the 2014-2020.

According to the National Reform Programme 2011-2013, the measures aimed at boosting private R&D investments relate to:

(i) developing companies R&D activities, by promoting the projects where the private companies bear minimum 50 percent of the project expenditures, waiving the certification of enterprises for their R&D activities, advising the enterprises on the implementation of the Norms regarding the tax incentives, etc.;

(ii) running analysis and regular consultation of innovative clusters enterprises to identify R&D areas of interest and competitiveness niches of Romanian economy, and to include the private sector opinions into the next national R&D plans;

(iii) developing the National Innovation Strategy, paying a special attention to the measures supporting the set-up innovative clusters oriented towards high technology areas and strategic sectors.

There are mainly two policies related to the Europe 2020 strategy that might be followed by the pharma industry in order to reach a win-win solution with the authorities:

(i) a stronger cooperation with the authorities in order for the objectives envisaged for the Europe 2020 strategy implementation to be fulfilled in the benefits of both parties. The pharma industry should take the initiative in relation with the authorities because: (a) the private sector it is expected to play the most dynamic role in reaching the objectives (see Table 5.1), and (b) the public sector acknowledged that the national R&D should reflect in a higher degree the private sector needs;

(ii) calling for swifter payment of the public authorities obligations to the pharma industry. In return, pharma industry would convey the related gains into higher R&D expenditures. Our roughly estimations exhibit a potential of RON 33 million from such proposal[20].

[20] Considering that the average collection period of the pharma industry claims from the public authorities (amounting to more than RON 1 bn) would decrease from 200 days to 30 days, and using an average cost of debt of 7 percent to compute for the opportunity costs of delayed cash inflows.

5.2. External macroeconomic imbalances

…and supply incentives for a better public management of the unpaid debts to the private sector.

High external imbalances are not allowed in the EU anymore, and Romania should implement measures to keep the current account deficits to low levels.

External macroeconomic imbalances were among principal vulnerabilities Romania displayed at the beginning of the crisis. The current account deficit felt to 4.5 percent of GDP in 2009 from a peak of 13.5 percent in 2007, and remained to a more sustainable value in 2010 (around 4.25 percent). Such adjustment was one of the largest among new EU member states. The collapse in global trade and the sharp contraction in the domestic demand contributed to the adjustment. Even with this severe adjustment of the current account deficit, the Romanian level is still among the highest in the EU.

One lesson of the recent crisis at the EU level is that the external macroeconomic imbalances should be kept under control, and the authorities should apply measures in order to keep the current account deficits at sustainable levels. The proposals for the new European package to increase economic governance in this direction aim to develop (i) an alert mechanism through a scoreboard, and (ii) excessive imbalance procedures, if the alert mechanism points to severe imbalances in a Member State.
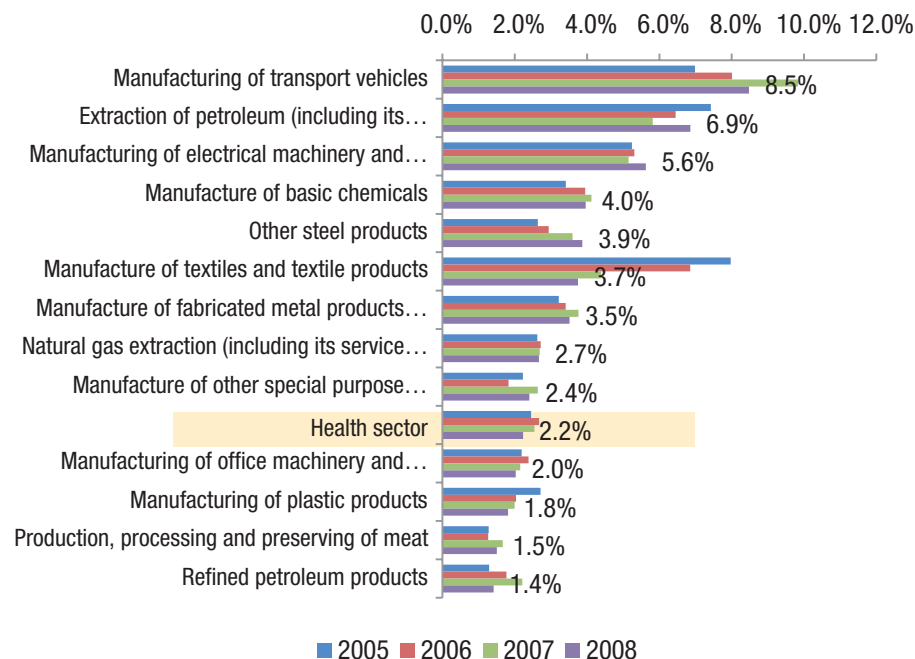
In such circumstances, specific recommendations to take corrective action within a specified deadline will be delivered to the Member State. Most likely, the threshold for the current account deficit that would call for close monitoring is going to range around 4-5 percent of the GDP. All the Member States should adopt measures in order to keep the situation on track. As a consequence, the past situation with important external imbalances should not be possible again in Romania: the external creditors would not allow it, and the new EU requirements would prevent it. Romanian authorities should implement measures to stave off such a development.

Even after severe adjustment that took place in the last years, Romania lays on the edge of the threshold that would call for further remedial actions in order to keep the current account deficits under control.

A sectorial analysis suggests that, while the total imports of goods and services declined by 17 percent in 2010 (from the peak reached in 2008), the imports of medicinal and pharmaceutical products registered no adjustment. On contrary. The imports of drugs continued to climb by 17 percent during the same period (2008-2010), and the trend is upward in the last decade.

The share of medicinal and pharmaceutical products imports in the total Romanian imports range around 4-5 percent in the last years, and the health sector is one of the major contributors to the external imbalances (rank 13 out of 105 economic sectors, in terms of share in total imports, in 2008), Chart 5.1.

Chart 5.1. Romanian imports in selected economic sectors (percent of total imports)

Source: National Institute of Statistics, MIND Research & Rating

Both developments (exports and imports of pharma products) are not sustainable at the macro level, and sooner or later the Romanian authorities should consider measures in order to preserve the external balance sustainability.

In order to adopt a pro-active attitude, the pharma industry should discuss with the authorities:

(i) solutions to increase the domestic production of medicinal and pharmaceutical products, in order to positively impact the external trade imbalance (see also Section 5.3. Redesign the Romanian economic growth model);

(ii) ways of decreasing the parallel export phenomenon, because it is not sustainable in the medium and long run, as it distorts the real developments in the pharma industry, and also may have negative consequences on the quality of the medical services.

5.3. Redesign the Romanian economic growth model

Romania registered before the crisis one of the highest economic growth rates in the EU, with an average growth of 6.8 percent during 2004-2008. However, the crisis manifested more dramatic comparing with the rest of the EU. The GDP decreased with more than 9 percent in two years (2009-2010), and the current economic growth perspective is below the peer group (1.5 percent in Romania, compared with 2.9 percent in the Central East European countries).

These are strong signs Romania needs to redesign its economic growth model. Past experience has shown that the expansion mainly based on consumption, not anchored in domestic production capacity and value added services, is not sustainable in the medium to long term. Romanian economy should shift from a price based to a non-price based competitiveness type of growth. This can only be achieved by supporting and promoting the development of economic sectors which incorporate a higher degree of technology and knowledge. In this context, the pharmaceutical industry, as a supplier of both high-end technology and knowledge to the Romanian economy, might play a role in the process of transition from a price (cost) competitive economy to a non-price competitive economy, based on innovation and creativity.
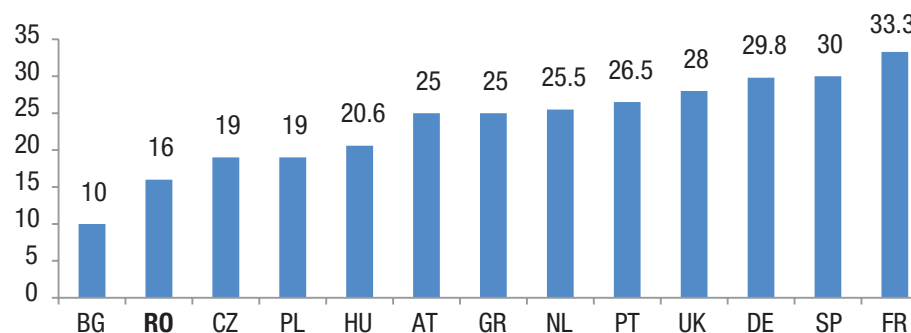
Table 5.2. Value added of the high tech industries, June 2010

High tech sectors of the Romanian economy	Value added (RON million)
Manufacture of basic pharmaceutical products and pharmaceutical preparations	1271.26
Manufacture of computer, electronic and optical products	2034.56
Manufacture of air and spacecraft and related machinery	294.03

Source: Ministry of Finance, MIND Research & Rating

High tech industries have a humble contribution to the total value added of the Romanian non-financial companies (1.1 percent in June 2010, in slight decrease from 1.3 percent in December 2005). Pharma industry delivers an important part to the total value added of the high tech industries (35 percent, 2010, Table 5.2). This contribution has been roughly stationary in the last 5 years.

Chart 5.2. Corporate income tax in selected EU countries, 2010

Source: European Commission

The solution to increase the share of the pharma manufacturing facilities in the Romanian economy would convey a win-win outcome to the parties: (i) the public authorities would support investment in innovative industries in order to improve the Romanian economy structure, whilst (ii) the private sector would benefit from such public agenda.

Corporate income tax is also a powerful instrument in such direction. Romania has one of the lowest corporate income taxes across the EU (Chart 52), and locating the pharma production from abroad in our country might bring substantial benefits. This process of relocating the pharma factories from the countries with higher corporate taxes to places more tax friendly is already a reality in the EU[21].

The friendly-tax opportunity most likely will live in the long run in Romania, while the taxes in many EU countries might be raised in order to rebalance the high public indebtedness of these countries.

Chart 5.3. Public debt evolution in the EU countries, 2000-2010
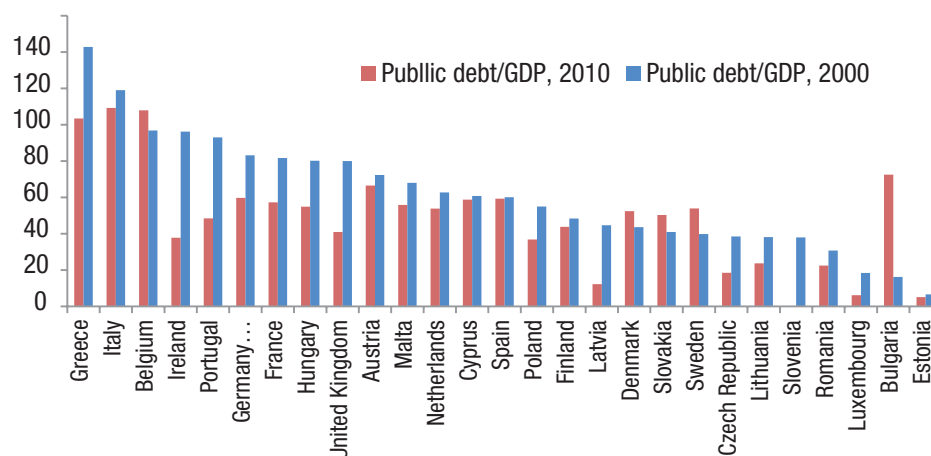
Source: Eurostat

During the last decade, the share of public debt to GDP increased substantially in many countries like Greece, UK, France, Italy, Portugal, Germany, Hungary, etc. (Chart 5.3). The current crisis underpinned that countries with high level of public indebtedness should embark in structural measures to reestablish the sustainability of the public finances. This would call for measures of cutting costs and raising taxes.

Romania has one of the lowest public debt to GDP across the EU, and should ripe the benefits from being able to maintain lower taxes to attract foreign investments. Unfortunately, recent measures undertaken by public authorities to impose additional taxes (clawback) on pharmaceutical manufacturers clearly show that the government does not perceive the pharmaceutical industry as a strategic investor (See Box 5.1.). Furthermore, the proposed structure of such taxes serves as a bad omen for the government's vision on improving the internal business environment and competitiveness.

Box 5.1. Public authorities attempts to curb drug consumption growth through a clawback tax on producers

The Romanian government has been attempting to increase revenues to the public health system over the last three years while leaving the current health contribution rates untouched. One of such attempts was a clawback tax aimed at curbing reimbursed drug consumption and recovering from producers or local branches of foreign manufacturers part of the money stemming from market growth.

[21] *This option of relocation in Romania of the production facilities deserves a special study, where to capture all the pros and cons, and to build the SWOT analysis.*

The tax unveils the Government's assumption that drug producers are responsible for RX drugs unplanned/ unbudgeted market growth and ignores the policy and regulatory shortcomings underlying drug consumption and prescription behavior.

The tax has been approved by law in 2009, but it did not yield any revenue until 2011 as a result of misconception and the National Health Insurance House's inability to improve flawed provisions.

In the meantime, drug consumption continued to grow, exceeding the Health Fund's capacity to fully reimburse pharmacy sales. Consequently, debt and arrears piled up in the Fund's books of accounts, whereas official payment terms were extended up to 7 months (210 days).

2009–2011 trends in debt and arrears of the Health Fund
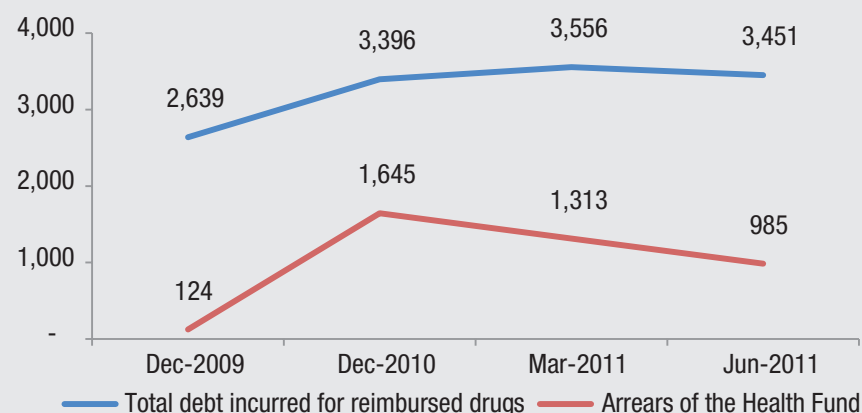
In autumn of 2011 the Government resumed work on the clawback tax and approved a different version. The new mechanism, which is currently under parliamentary debate and adoption procedures, has prompted wide protests from drug producers and distributors. The tax formula was structured so as to yield back to the state budget the value of all drug consumption exceeding the approved budgets. Hence, the governments would be able to claim back the whole difference between total consumption and allocated funds, regardless of the latter's value (and adequacy). The tax would be paid quarterly. The tax rate determined for the total drug market would be applicable to all liable companies regardless of their sales' trends. As mentioned, the producers went up in arms against the proposal and blamed it for a number of faults:

◦ Lack of predictability which impaired on the business plans. Producers would not know the approved budgets well in advance. Even if they did, undersized budgets would cause them to shoulder by themselves a high proportion of total consumption with no risk to the Health Fund. Also, national currency devaluation may artificially increase the value of consumption, since most drugs are imported.
◦ It prompts a market behavior from producers which falls short of the aim of checking consumption growth. The producers would scramble for growth rates above the national average and thus consumption would eventually increase.
◦ The tax lacks fairness towards market players with declining or below average growth sales.
◦ If approved budgets are underestimated, the tax would affect significantly more the producers of expensive drugs with high reimbursement rates; they would have to cover a disproportionately high rate of consumption.
◦ The tax would not qualify for tax deduction from profit tax or VAT.
◦ It marks a business unfriendly regime which is likely to hurt any future investments in Romanian economy.

Based on approved the budget for 2011 and estimated consumption we were able to determine that the clawback tax could yield around 230 mil lei in Q4 2011 alone, which is tantamount to 15% of total consumption.

Indicator	Mil. Lei
budget allocation Q4 2011	1,369
estimated consumption Q4 2011	1,600
estimated liability from clawback tax	230

As a result of industry criticisms and International Financial Institutions' concerns, the Government eventually decided to overhaul the proposed mechanism, as of December 2011[22]. The new formula introduces a reference threshold for drug consumption and claws-back only the exceeding amount. The producers or local branches of foreign manufacturers would pay the tax directly correlated with their market share and quarterly sales growth. The proposal has been put forward to the Parliament, which is set to debate and approve it instead of the previous mechanism. The estimated quarterly revenues from clawback tax stand at around 130 mil lei, namely 8% of total RX drugs' consumption. It still maintains a number of drawbacks which impair mainly on the local producers or local branches of foreign manufacturers. The tax value of the new mechanism includes VAT & margins (of distributors and retailers), whereas the tax liability rests with the producers/ local branches only. Thus, the impact of the tax is significantly higher on producers/ local branches as % of their reimbursed sales. Despite its lack of fairness towards the producers, the present proposal ensures more predictability for market players. Proceeds would be used to finance health expenditure.

Indicator	Mil. Lei
announced quarterly threshold for the clawback tax	1,425
estimated quarterly consumption (based on observed demand over the last three years)	1,560
average quarterly tax revenues*	135

*the actual clawback tax receipts would vary across quarters as consumption is uneven; hence, yearly dues might amount to less than RON 500 million.

[22] *Government Emergency Ordinance no 110/2011 on amendments to certain pieces of legislation in health and social protection.*

Annex 1: Methodological Notes

Input-Output Analysis – Theoretical Framework

The input-output analysis framework is the pioneer work of Professor Wassily Leontief, developed in the late 1930s, for which he also received the Nobel Prize in Economice Science in 1973. In a review of Leontief's work on input-output analysis, Baumol (2002) noted: "…His deepest theoretical work, however, deals with the structure of functional relationships [within an economy]. Leontief was motivated here by production analysis. The economy is a system that transforms resources into final goods and services, in which he considered whether it is possible to distinguish stages of a production process. In other words, can distinct sectors of activity be identified?"

The input-output framework relates the resources that are required for the production of a given sector with the uses of the same sector's final output (intermediary consumption and final demand). The framework identifies and describes the interdependencies that exist between the various industries of an economy as well as their relationships with the final consumer (i.e. household, government or foreign markets). One important feature of the input-output framework is the ability to conduct sensitivity analyses on particular industries of interest and to evaluate the resulting impact on the whole economy – e.g. the impact of a demand/ supply side shock for pharmaceutical goods on GDP, foreign trade, employment.

Table …: Example of a reduced form of input-output table

Source: Miller and Blair (2009)

The data required for input-output analysis is represented by the flows of products and services from each economic sector, considered as producer, to the rest of economy, considered as consumers (intermediary or final) (Table…). The columns in the below table contain the mix of inputs required by a given industry from other industries to produce its output. Consequently, information on rows describe how the output of a particular industry is distributed in the economy. The grey shaded area represents the intermediary consumption matrix, i.e. inter-industry exchanges needed. The final columns of the table labeled "Final Demand" represent acquisitions of final goods and services for domestic consumption, investment and/or export markets. The final rows of the input-output table labeled as "Value Added" record other production inputs, such as labor, depreciation of capital, indirect business taxes. Imports can be accounted for, either as an input to production by inserting a new row in the input-output table or by adjusting the export component column of the final demand.

Input-output analysis can be conducted virtually at any level of detail, provided that the required data is available. In describing the theoretical methodology behind the input-output framework we will assume that the economy can be categorized into n sectors (i.e. data regarding inputs and outputs for all of the n sectos is available).

If we denote the total production output of a given sector i by xi, the intermediary consumption from other sectors (outputs from sector i that are used by other sectors as inputs) by cij (j=1,n) and the final demand (composed of household purchases, government expenditures, private investments and sales on export markets) by di, then the following accounting relationship holds:

(1) $x_i = \sum_{j=1}^{n} c_{ij} + d_i$

Extrapolated for the whole economy, the equation can be written in matrix format as:

(2) $\boldsymbol{x} = \boldsymbol{C} + \boldsymbol{d}$

where,

$$\boldsymbol{x} = \begin{bmatrix} x_1 \\ \vdots \\ x_n \end{bmatrix}, \quad \boldsymbol{C} = \begin{bmatrix} c_{11} & & c_{1n} \\ \vdots & c_{ij} & \vdots \\ c_{n1} & \cdots & c_{nn} \end{bmatrix}, \boldsymbol{d} = \begin{bmatrix} d_1 \\ \vdots \\ d_n \end{bmatrix}$$

The above relationship illustrates how total production of sector i is distributed as output among other industries and final demand. At the same time the total production of sector j can be determined as the sum of its total inputs: (1) the intermediary consumption from other sectors (outputs from other sectors that are used by sector j as inputs), c_{ij} $(j=1,n)$, as well as other production inputs:

(3) $x_j = \sum_{i=1}^{n} c_{ij} + l_j + p_j + t_j + m_j,$

where, l_j represents compensation of employees in sector j, p_j stands for the profit of capital suppliers, t_j represents net taxes on products and m_j is the value of imports.

The central assumption of input-output analysis is that the intermediary consumption in a given sector depends entirely on the total output of that sector. The relationship between intermediary consumption and total output is considered fixed and determined by the technical coefficient. The technical coefficient represents the input needed from a specific industry per unit of output of a given sector:

$$(4) \quad a_{ij} = \frac{c_{ij}}{x_j}$$

Additionally, inputs are assumed to be used in fixed proportions. That is for a given sector i, the ratio of any two technical coefficients is constant. In reality the proportion of inputs required for a given product changes over time as new innovative technologies become available. However in the short and medium term technical coefficients can be reasonably assumed to be constant as technological progress is limited.

Relationship (2) can be rewritten by taking into consideration (4) as:

$$(5) \quad x = A \cdot x + d$$

where

$$A = \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & a_{ij} & \vdots \\ a_{n1} & \cdots & a_{nn} \end{bmatrix},$$

Solving for x in (5), using standard matrix algebra, yields the **fundamental equation of input-output analysis**:

$$(6) \quad x = (I - A)^{-1} \cdot d,$$

Where

$$I = \begin{bmatrix} 1 & \cdots & 0 \\ \vdots & 1 & \vdots \\ 0 & \cdots & 1 \end{bmatrix} \text{ is the identity matrix}$$

$L = (I - A)^{-1}$ is also known as the Leontief inverse or the total requirements matrix. The coefficients of the Leontief inverse matrix represent the first partial derivative of total output in sector i relative to the final demands for goods from sector j:

$$\frac{\partial x_i}{\partial d_i} = l_{ij}.$$

In other words the coefficients quantify by how much the production in sector i has to be increased if the demand for goods from sector j increases by one unit.

The input-output model, represented by (6), depends on the existence of an exogenous sector that is disconnected from the interrelated productive sectors. The exogenous sector is the final demand which is made up by households purchases, government expenditures, investments and exports. The extent to which households can be considered exogenous, i.e. disconnected from the productive sectors is debatable. On the one hand households earn income for their labor input into the production process.

On the other hand they spend their earnings on goods and services. The amount of their purchases depends on the amount of income which in turn is related to the output of each sector. Thus households could be considered also as endogenous in the input-output model. This implies that the final demand column of households and the labor input row is added to the intermediary consumption matrix. If the housholds are considered an endogenous sector than the input-output model (6) is said to be closed with respect to households, otherwise it is an open model.

The utility of input-output analysis resides in its capacity to assess the impact of changes in exogenous factors on the overall economy (total output, value added, income, employment). The impact is quantified through input-output multipliers. Output multipliers are sector specific and quantify the total output in all sectors of the economy that is required in order to satisfy a unit of demand in a given sector.

There are two types of multipliers: simple and total. Simple multipliers capture only direct and indirect (second-order) effects of a change in demand on the economy and are estimated from an input-output model that is open with respect to households. Total output multipliers capture additionally the induced effects, resulting from closing the input-output model with respect to households.

Simple output multipliers quantify the impact of a unit change in demand in sector j on total production output in the economy in an open model:

$$(7) m_s^j = e' \cdot L \cdot \Delta d(j) = \sum_{i=1}^{n} l_{ij}$$

where

$$e_{nx1} = \begin{bmatrix} 1 \\ \vdots \\ 1 \end{bmatrix}, \cdot \Delta d(j)_{nx1} = \begin{bmatrix} 0 \\ \vdots \\ 1_{jth\ observation} \\ \vdots \\ 0 \end{bmatrix}$$

$\Delta d(j)$ represents the change in final demand for goods and services produced by sector j by 1 unit.

Total output multipliers are estimated in the same way, the only difference being that the model is closed with respect to households.

In order to compensate for difference in industry size and make results comparable across sector, output elasticities are used instead of output multipliers.
Output elasticities quantify the impact in percentage points of a 1% change in final demand of goods and services produced by sector j on total economic ouput.

$$(8) oe_s^j = \frac{e' \cdot L \cdot d(j)}{e' \cdot x} = \frac{m_s^j \cdot d_j}{e' \cdot x} \qquad \text{where} \qquad d(j)_{nx1} = \begin{bmatrix} 0 \\ \vdots \\ d_j \\ \vdots \\ 0 \end{bmatrix}$$

Apart from quantifying the impact of changes in final demand on total economic output, multipliers can also be estimated to assess the impact on other production inputs (value added, labor income, taxes, imports). Such multipliers are estimated using the Leontief inverse and the information in the last rows of the input-output matrix, below the intermediary consumption rows (see Table …).

A simple multiplier which quantifies the impact of a unitary change in final demand of sector j on the production input p is estimated as:

$$(9) m_{s,p}^{j} = p \cdot L \cdot \Delta d(j) = \sum_{i=1}^{n} p_i \cdot l_{ij}$$

where,

$p_{1Xn} = [p_1 \ldots p_i \ldots p_n]$ represents the the vector of a specific production input – value added, labor income, taxes or imports – expressed relative to total output in each sector.

Output elasticities can be decomposed by production inputs. In this case, it can be estimated how much of a percentage change in total output of the economy, as a result of a 1% change in final demand of a specific sector, is due to intermediary consumption, GDP, imports etc:

$$(10) oe_{s,p}^{j} = \frac{p \cdot L \cdot d(j)}{e' \cdot x}$$

If we replace x in (10) by p we obtain production input elasticities, i.e. what is the percentage change in a production input at economy level as a result of a 1% change in final demand of a specific sector.

$$(10) oe_{s,p}^{j} = \frac{p \cdot L \cdot d(j)}{e' \cdot p}$$

Data description

The input-output analysis for the pharma sector is carried out using annual input-output tables published by the National Institute of Statistics. Due to the complexity of the information within input-output tables, compilation of data for a reference year takes approximately 3 years to be completed. So, the latest available data is as of 2008. Nevertheless, as the input-output analysis captures structural aspects of the economy that do not change materially from one year to another, the results inferred from historical data can be reasonably assumed to be valid today.

The tables record the value of intersector flows (intermediary consumption and final demand) of goods and services at current prices produced by 103 economic sectors, covering the whole economic activity in the Romanian economy. Within these tables, pharmaceutical goods and health services are evidenced separately as two distinct sectors.

The data for input-output model, which is open with respect to households is organised as in the table below:

	Uses of goods and services classified by 103 economic sectors	Final consumption expenditure, out of which:	-Households expenditure	-Government expenditure	Investments	Exports
Supply of goods and services classified by 103 economic sectors	Intermediary consumption matrix	Final demand				
Value added, out of which:	Other production inputs					
- Employee compensation						
Taxes on products						
Subsidies on products						

For an input-output model which is closed with respect to households data is organised in the following way – housholds expenditures' column and employee compensation row are added to the intermediary consumption matrix:

	Uses of goods and services classified by 103 economic sectors	Households expenditure	Final consumption expenditure, out of which:	-Government expenditure	Investments	Exports
Supply of goods and services classified by 103 economic sectors	Intermediary consumption matrix		Final demand			
Employee compensation						
Value added	Other production inputs					
Taxes on products						
Subsidies on products						

Table …: Classification of goods and services by NACE Rev 2

No	Classification of goods and services	No	Classification of goods and services
1	Crops	51	Manufacture of concrete, plaster and cement
2	Livestock	52	Cutting, shaping and finishing of stone
3	Other services	53	Manufacture of other non-metallic mineral products
4	Forestry and hunting	54	Iron, steel and ferroalloys production
5	Logging	55	Manufacture of tubes
6	Fisheries and fishing	56	Other steel products
7	Coal mining and preparation (including shale)	57	Precious metals production and other non-ferrous metals
8	Extraction of oil (including its related service activities)	58	Foundry
9	Extraction of natural gas (including its related service activities)	59	Manufacture of fabricated metal products and metal products
10	Mining of iron ores	60	Manufacture of machinery for the production and use of mechanical power
11	Mining of non-ferrous ores	61	Manufacture of other general purpose machinery
12	Mining for construction materials	62	Manufacture of agricultural and forestry machinery
13	Quarrying of sand and clay	63	Manufacture of machine tools
14	Mining of ores for chemical industry	64	Manufacture of other machinery for specific use
15	Extraction and preparation of salt	65	Manufacture of machinery and household apparatus
16	Extraction and preparation of other metallic ores	66	Manufacture of office machinery and computers
17	Production, processing and preserving of meat	67	Manufacture of electrical machinery and apparatus
18	Processing and preserving of fish and fish products	68	Manufacture of equipment, radio equipment, television and communication
19	Processing and preserving of fruit and vegetables	69	Medical equipment, precision and optical instruments, watches and clocks
20	Production of vegetable and animal oils and fats	70	Transport vehicles
21	Dairies	71	Shipbuilding and repair
22	Manufacture of grain mill products, starches and starch products	72	Production and repair of railway and rolling stock
23	Manufacture of prepared animal feeds	73	Construction and repair of aircraft
24	Manufacture of other food products	74	Production of motorcycles, bicycles and other vehicles
25	Manufacture of beverages	75	Manufacture of furniture
26	Manufacture of tobacco	76	Other manufacturing
27	Textiles and textile products	77	Production and distribution of electricity
28	Textile	78	Production and distribution of gas (methane extract excluded)
29	Manufacture of furs and leather garments	79	Production and distribution of heat and hot water
30	Leather and footwear	80	Collection, purification and distribution of water
31	Manufacture of wood (except furniture industry)	81	Construction
32	Pulp, paper and cardboard and other items	82	Wholesale and retail
33	Publishing, printing and reproduction of recorded media	83	Hotels
34	Coking	84	Restaurants
35	Refined petroleum	85	Transport via railways
36	Processing of nuclear fuel	86	Other transport
37	Manufacture of basic chemicals	87	Transport via pipelines
38	Manufacture of pesticides and other agrochemicals	88	Water transport (maritime, coastal, river)
		89	Air transport
		90	Supporting and auxiliary transport activities of travel agencies

39	Manufacture of paints and varnishes
40	Manufacture of drugs and pharmaceutical products
41	Manufacture of soaps, detergents and maintenance products, cosmetics
42	Manufacture of other chemical products
43	Manufacture of fibers and threads, synthetic or artificial
44	Manufacture of rubber
45	Production of plastic goods
46	Manufacture of glass and glass
47	Manufacture of Non-refractory ceramic and refractory
48	Manufacture of ceramic tiles and flags
49	Manufacture of bricks, tiles and other products
50	Manufacture of cement, lime, plaster

91	Activities of travel agencies and tourist assistance
92	Postal and courier activities
93	Telecommunications
94	Financial, banking and insurance
95	Real estate
96	Computer and related activities
97	Research - Development
98	Activities of architecture, engineering and other technical services
99	Other service activities for enterprises
100	Public administration and defense, compulsory social security
101	Education
102	Health and social
103	Other service activities, social and personal