Box 1. Price-cost margins in the real sector

The inflation rate is directly influenced by the manner in which economic agents (especially retailers and consumer goods producers) set their price-cost margins. This is why central banks concern themselves with margins, all the more so as the literature documents the connection between their evolution and business cycle stages. In theory, however, it is possible to put forward arguments for both mechanisms conducive to a pro-cyclical behaviour of margins and mechanisms triggering a counter-cyclical pattern. Under the circumstances, it is not *a priori* clear whether during a period marked by excess aggregate demand, such as that seen by the domestic economy over the last two years, the economic agents' margin policy helps alleviate inflationary pressures associated with the rise in production factor costs or boosts them.

Apart from going through a boom period, the Romanian economy has recently seen a step-up in competition across the trade sector – particularly amid the expansion of modern trade networks –, carrying the potential to affect the path of inflation via the margin policy. Similarly, however, the manner in which the stronger competition has reflected in the evolution of inflation is difficult to assess using only economic theory.

This analysis discusses a series of mechanisms on which firms can set their margin policy, with a focus on the two factors previously mentioned – the demand conditions and the competitive environment. At the same time, the analysis includes an empirical exercise to illustrate how margins changed in the Romanian economy over the last years, while providing a few coordinates for the influences that induced this evolution.

Setting margins: theoretical mechanisms

Perhaps the best-known theoretical result regarding a firm's decision on selling prices and, implicitly, margins stresses the importance of the competitive environment. In a perfect competition market, in order to maximise its profits, a firm must produce up to a level where the selling price equals the marginal cost of the last unit produced, unlike a monopolistic firm, for which it is more advantageous to charge a price higher than the marginal cost. Based on these considerations, fiercer market competition is expected to dampen firms' margins; conversely, lower competition would push them up. Nevertheless, structural effects can change the direction of influence of the factor in question; specifically, the step-up in competition to the point where the firms reporting lower margins exit the market could trigger a rise in the margin at sectoral level.

The same theoretical framework shows how the spread between the selling price and the marginal cost depends on demand elasticity in monopolistic competition markets: a weaker response of demand to a hike in prices allows for higher margins. As a matter of fact, firms generally aim to differentiate their products to make them more difficult to replace (which renders demand for such products more inelastic).

Producing high quality products is one of the differentiation strategies, possibly supported by investment in research and development.

At the same time, however, the sensitivity of demand to prices can be influenced also by factors exogenous to the firm, such as business cycle stages. Thus, in the boom periods, consumers are somehow more relaxed about their own finances, which is why it is in the firms' interest to take advantage of the economic expansions to increase their margins. Nevertheless, given that in such periods costs tend to increase in their turn, driven by the stronger pressure on production factors, economic agents will be able to raise their margins only if cost rigidity exceeds price rigidity.

Moreover, it is possible that, in a context of strong demand, firms may not even seek to increase margins. Thus, if economic agents have in view a longer time horizon, that covers the entire business cycle, they can come to realise that a possible pick-up in margins during the boom period will cause the erosion of the market share, with a negative impact on the firm's longer-term profit that exceeds the short-term beneficial impact. When demand rises, these agents will keep their margins unchanged, or even diminish them, if they reach the conclusion that they should capitalise on the higher demand and improve their market position.

Therefore, even if economic theory shows some influences from the competitive environment or the stage of the business cycle on the evolution of margins, there is no consensus about the direction of their action.

Empirical evidence on the trajectory and drivers of margins

Of the two drivers mentioned before, it was the evolution of the domestic economy's position within the business cycle that stood out over the last years – the output gap entered an upward trend starting 2014, returning to positive territory during 2016, while, at present, excess demand ranges between 2 and 3 percent. The local economy features wages that are more rigid than prices (Iordache and Pandioniu, 2014), which indicates that firms can lift up their margins when demand increases. It is not, however, *a priori* clear, based on the theoretical mechanism previously discussed, whether firms would actually resort to such a change in an attempt to obtain short-term profits or, on the contrary, they aim to consolidate their market share by keeping margins steady or even diminishing them.

Another phenomenon seen by the economy in the past years, this time with implications for the competitive environment, was the expansion of large retailers, which spurred competition in this sector. In the same way, however, the impact of this phenomenon on the evolution of margins is *ex ante* not clear.

The empirical assessment of the mechanisms described first calls for an estimation of margins, which is approached in several ways in the literature – some based on macro data, some on micro data. This analysis uses financial and accounting

information provided by firms[1] and the margin is determined at firm level – based on the difference between the average selling price and the average production cost of the whole range of products – by approximating it by the profit ratio:

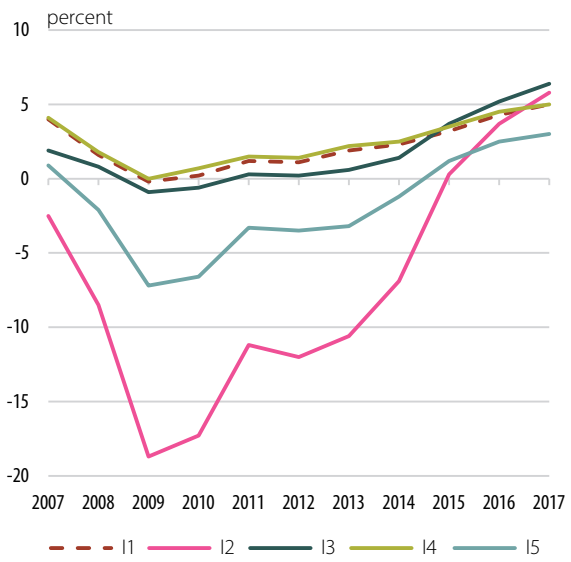
$$\text{Average price-cost margin (\%)} = \frac{\text{Average price-cost margin}}{\text{Price}} = \frac{\text{Price} - \text{Average cost}}{\text{Price}} = \frac{\text{Price} \cdot \text{Quantity} - \text{Average cost} \cdot \text{Quantity}}{\text{Pice} \cdot \text{Quantity}} \approx \frac{\text{Total income} - \text{Total expenses}}{\text{Total income}} = \frac{\text{Net profit}}{\text{Total income}}$$

Next, a similar relationship is used to define an economic sector overall or the entire economy:

$$\text{Average margin}^{\text{aggregate level}} (\%) \approx \frac{\text{Net profit}^{\text{aggregate level}}}{\text{Total income}^{\text{aggregate level}}}$$

where the numerator and denominator are calculated based on corresponding aggregations.

Chart A. Margins at aggregate level



Source: MPF, NBR calculations

The results obtained emphasise the rise in economy-wide margins in 2014-2017 (Chart A), the conclusion being supported not only by the evolution of the afore-mentioned indicator (I1), but also by the trajectory of the central tendency measures of the economy-wide distribution of percentage margins (the mean and median of the distribution – I2 and I3, respectively), and of the indicators obtained as the weighted average of individual margins, based on turnover (I4) and number of employees (I5).

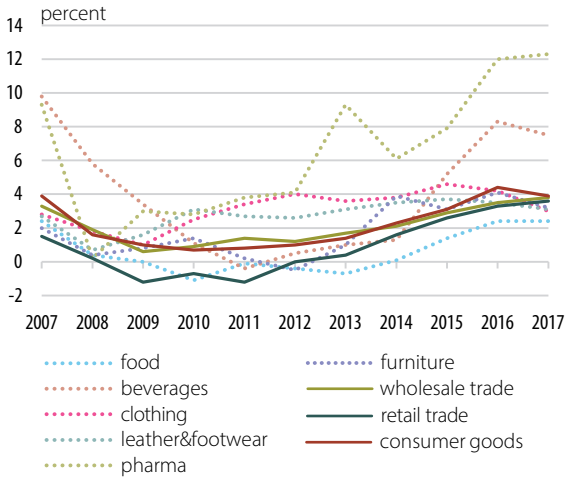
Highly relevant economic sectors, from the perspective of the inflation rate, namely the trade sector[2] and the consumer goods sector[3], also featured overall a pick-up in margins over the last years, beyond the heterogeneity that is specific to the margin policy of each economic sector (Chart B). However, in 2017, the improving trend in margins in the consumer goods industry seems to have come to a halt, among the subsectors driving this evolution counting: the light

1 The data cover the 2007-2017 period and refer to all economic sectors, except for the financial sector (section K in the NACE Classification), public services (sections O and P) and sectors mentioned in sections T and U (Activities of households as employers of domestic personnel, undifferentiated goods – and services – producing activities of households for own use; Activities of extraterritorial organisations and bodies). Data are provided by the Ministry of Public Finance. The observations corresponding to some reporting errors (for instance, negative expenses) or zero income were excluded from the population of firms, as no margin can be estimated. Moreover, a standard procedure was applied for removing outliers: starting from the distribution of margins and that of operating margins (at NACE division level, in a given year), only those observations corresponding to values ranging between the 5th and the 95th percentile were kept.

2 NACE divisions 46 and 47.

3 NACE divisions 11, 12, 14, 15, 18, 21 and 31, and NACE groups 10.1, 10.2, 10.3, 10.4, 10.5, 10.7, 10.8, 13.9, 20.4, 26.4, 26.7, 27.5, 30.9, 32.1, 32.2, 32.3, 32.4, 32.9.

Chart B. Margins* in consumer goods industry and trade



*) calculated by aggregating income and expenses at sectoral level

Source: MPF, NBR calculations

industry, facing for years difficulties associated with the erosion of the competitive position, or manufacture of furniture, with market signals pointing to higher input costs in the recent period as a possible explanation. In the food industry, the successive increases of 2014-2016 no longer continued either; however, no pull-back was reported, so margins in 2017 were similar to those in the previous period.

Interpreting the results in terms of inflationary pressures should take into consideration the fact that the analysis focused on the firms' entire activity, on both the domestic (relevant for CPI dynamics) and foreign market, firms likely having different margins externally, compared with those applied to local customers.

Another reason that calls for a somewhat cautious interpretation of the results is that the data also include firms whose activity appears to be disconnected from economic fundamentals, and therefore their behaviour does not hold useful information for the issue tackled. Specifically, some firms have a very poor economic performance, yet continue to be present on the market, even if, normally, they should have disappeared. For example, 3.6 percent of the observations included in the sample refer to firms that recorded average margins lower than -20 percent, over a period of at least six years. Referring to an extreme threshold, 4.1 percent of observations correspond to margins below -100 percent, which is difficult to justify for an economic agent under usual circumstances. However, this generally concerns small firms, so that the values and, more importantly, the trends of the aggregate indicators taking into account the size of the firms are not very sensitive to the presence of such observations in the sample[4]. Rather, including or excluding them affects the measures of central tendency of margin distribution, as each firm is given the same importance.

Over the past years, the upward trend of margins coincided with the uptrend of the output gap. In fact, the two indicators had similar trajectories over the entire period under review, which suggests that, in Romania, margins have a pro-cyclical nature, comparable with the one observed in other economies (among the studies documenting such margin behaviour are Deutsche Bundesbank, 2017, which uses data related to seven European countries, or Macallan and Parker, 2008, analysing the UK economy). Thus, the pressures on consumer prices exerted amid excess demand are associated not only with higher costs (material and/or wage costs), but also with similar developments in margins. In the Romanian economy, such inflationary pressures have become more visible only recently, with a certain lag compared to the output gap re-entering positive territory (towards the end

4 For instance, by completely excluding the observations where the margin is lower than -100 percent, the indicator calculated for the whole economy increases by around 1 percentage point every year, thus maintaining its trend.

of 2016), which, nevertheless, can be explained by the influence of the external environment, namely the offsetting effect of the low prices of commodities at international level[5].

The direct relationship between demand conditions and margin developments is also substantiated by the results of econometric estimations based on panel data (Table A).

Table A. Results of estimations

Explanatory variables / specifications	Dependent variable: margin					
	sectoral			at firm level		
	whole economy	industry		consumer goods industry[1]		trade
	(1)	(2)	(3)	(4)	(5)	(6)
Sector HHI • Exposure to the domestic market	0.000018	0.000034	0.000022**	0.000022***	0.000020***	
HHI						0.0003***
Sector turnover differential	0.0272***	0.0211***		0.0415**		
Sector turnover differential • GDP gap	0.0049*	0.0066**		0.0135***		
GDP gap						0.0089***
Production gap			0.2182***		0.1628***	
Production gap • GDP gap			0.0473***		0.0183***	
Size				0.0800***	0.0769***	0.0593***
Importer (Yes/No)				0.0391***	0.0360***	0.0574***
Constant	0.0254**	-0.3077***	-0.2370***	-0.2338***	-0.2202***	-0.1485***
Sectoral effects	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	No
No. of observations	**800**	**300**	**319**	**188,436**	**210,354**	**1,505,535**
R-squared	**0.6452**	**0.6219**	**0.7841**	**0.0539**	**0.0537**	**0.0205**

Note: The calculations used the least squares method, taking into account the heteroskedasticity of the error term.

*, **, *** are statistically significant at the 90%, 95% and 99% levels, respectively

1) excluding the tobacco industry and the production of electronics for final consumption

Source: MPF, NIS, NBR, NBR estimations

The first three specifications connect the sector's margin to a measure of competition in that area of activity and to a measure of demand conditions, respectively. The intensity of market competition was estimated based on the Herfindahl-Hirschman Index (HHI), considering that higher concentration (higher HHI) leads to lower competition, facilitating higher margins (a mechanism documented in certain recent economic studies referring to the US economy[6]). However, the limitations of this proxy should not be ignored: (i) some sectors will be inherently characterised by a lower number of firms and, thus, by higher

5 The Box entitled "Wage-productivity Relationship and Implications for Inflation" of the NBR's November 2017 *Inflation Report* illustrates the intermediate consumption distribution (as a share of total collections) becoming skewed to the left between 2013 and 2016.

6 For further details, see *Deutsche Bundesbank* (2017) and the works cited by this study.

concentration, possibly in the context of higher entry barriers (as is the case of some areas that entail higher capital intensity and considerable initial investment, such as crude oil processing); (ii) HHI is built on the assumption that the entire sector of activity corresponds to a single market, when, in fact, the latter can be more fragmented (e.g., at a geographical level); (iii) HHI does not capture the intensity of competition with foreign firms, being relevant only for the domestic market (which is why the estimations include an interaction with exposure to the domestic market, calculated by subtracting from 100 percent the share of sector exports in the total sector turnover).

Demand conditions at sector level were assessed based on the differential between the turnover dynamics of the said area of activity and those of the entire economy. For the industrial sector, another proxy for demand conditions was determined as the difference between actual and potential production, the latter being estimated with the help of the Hodrick-Prescott filter.

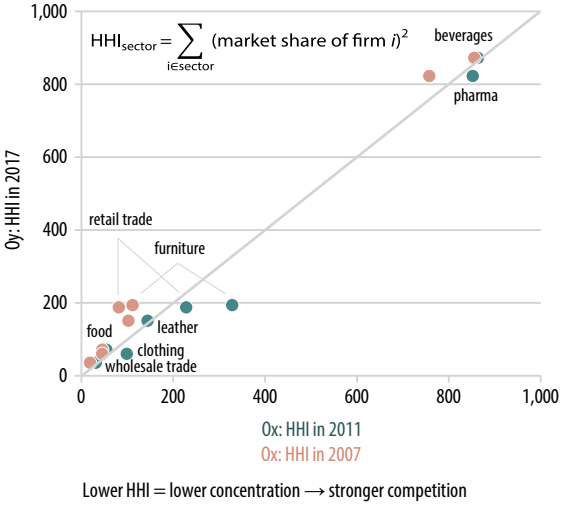
The results of the estimations show that an increase in sectoral demand will translate to a higher margin for the sector, this effect being amplified by the cyclical position assessed for the whole economy, as captured by the interaction term. Specifically, in the case of a neutral output gap, a 10 percentage point pick-up in annual turnover growth rate (above the aggregate one) will result in an increase in the sector's margin of about 0.3 percentage points; adding to this are 0.05 percentage points for each percentage point of excess demand.

With regard to the influence of the competitive environment, the coefficient related to the interaction between the HHI and the exposure to the domestic market is positive, yet statistically significant only for the last specification run with sector data. This suggests an inverse relationship between domestic competition and margins, which is yet somehow masked by the above-mentioned limitations of the HHI as a measure of competition.

For a clearer picture of the influence exerted by the competitive environment on the inflationary process, the empirical exercise also sought to investigate the link between margins and determining variables based on information at firm level (specifications (4)-(6) in Table A), focusing on the areas of activity highly relevant for inflation: the consumer goods industry and the trade sector.

Beyond the fact that these estimations confirm the direct link between demand conditions and margins, pointing at the same time to the fact that importers apply, on average, higher margins (most likely due to their access to goods or production inputs under more advantageous conditions, while another possibility is that they bring to the domestic market more exclusive final goods that are harder to replace), they also suggest that margins tend to be higher amid increased concentration. In this respect, both in the consumer goods industry and in the trade sector, the coefficient related to sectoral HHI is positive and statistically significant. Moreover, all the specifications estimated using microeconomic data

Chart C. Herfindahl-Hirschman Index in consumer goods industry and trade



Source: MPF, NBR calculations

include as determinants the size of the firm[7], which also has a positive and statistically significant link to the level of the margins. Specifically, as an economic agent increases in size (most likely witnessing a gain in market share as well), it will apply higher margins, and therefore lower margins are expected to prevail in a more fragmented sector.

Hence, it may be assumed that a step-up in competition (determined by a decrease in concentration, i.e. lower HHI) would reduce margins. Thus, in regard to trade developments, the expansion of modern chain stores contributed to the drop in margins in the sector, and, implicitly, to weaker inflation dynamics. Turning to consumer goods industries, they are characterised by an intense and/or intensifying competitive environment – a generally low HHI which was even lower in 2017 compared with 2011 (Chart C) –, which acted towards a slower growth of margins.

Conclusions

The demand conditions and the intensity of competition in the market reflect in the economic agents' margins, establishing the direction of these influences *a priori* being, however, hindered by the plethora of theoretical mechanisms that might govern the relationship between the variable of interest and its determinants. Empirical investigations revealed that in 2007-2017, the trajectory of margins in the domestic economy followed that of the output gap, suggesting they have a pro-cyclical behaviour. Specifically, inflationary pressures during boom periods are based not only on higher costs (material and/or wage costs), but also on similar developments in margins. At the same time, the results showed that the more intensely competitive environment observed in the areas of activity that hold a greater relevance for inflation – trade and consumer goods industries – had a dampening impact on margins.

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7 The variable was defined based on the number of employees, with a value of 1 (for firms with 9 employees at most), 2 (10-49 employees), 3 (50-199 employees) or 4 (over 200 employees).