AGRICULTURE FIRMS UNDER UNCERTAINITY - FINANCING AND ATTITUDE TO RISK

Laura GIURCA VASILESCU[1]

[1]Faculty of Economy and Business Administration, Craiova
e-mail: laurra2004@yahoo.com

The paper examines the risk behavior of a competitive agriculture firm under price uncertainty. The aim was to find the answer for the question: what are the major determinants of the agriculture firm's attitude to risk and therefore of the firm's willingness to produce under uncertainty?

This study started from the approach of Greenwald and Stiglitz, which implies solely risk averse behavior of firms due to its restrictive assumptions about firm's financing. Based on other theoretical concepts mostly from agency theory and soft budget constraint literature we have incorporated other plausible assumptions about firm's financing: partial access to the equity market and possible existence of the soft budget constraint related to debt financing and there were formulated the conditions, under which the firm is induced to behave in more risky conditions. While the agriculture firm's attitude to risk directly influences its willingness to produce, our results indicate that in the environment of uncertainty the price and technology are not the only important determinants of the agriculture firm's optimal output level as is the case for the neoclassical theory of firm.

The results of our study have shown that additional factors like firm's net worth position, sensitivity of managers to bankruptcy, firm's ability to raise new equity, softness of the budget constraint and degree of uncertainty about the future prices may play an important role for agriculture firm's optimal output considerations.

On the other side, the perception of risk faced by firm can explain all types of attitude to risk (risk averse, risk neutral and risk-seeking behavior) and can potentially have large effects on the optimal output level.

***Key words**: agriculture firm, financing, risk, prices, equity*

In the previous decades there is clear tendency in the economic literature to remove the traditional assumption in the theory of firm, which says, that the demand for the products is known with certainty at the time when the output decision is made. The uncertain character of environment in which the firm has to operate has become a critical component in the theories of firm. It was shown on number of studies [7] that firm's attitude to bear the inherent risk of production has important effects on the firm's willingness to produce, i.e. on its choice of optimal level of production [6]. However, these older papers and also the contemporary microeconomic textbooks [2], take the attitude to risk as an exogenous characteristic associated with production "black box" called firm. In compliance

with the recent development of new institutional understanding of firm it is hardly acceptable to consider the firm as an individual with simple utility function. There are number of more recent papers [1], which relate the firm's attitude to risk with the financing considerations. In fact, they use the following logical framework for explaining the firm's risk behavior: financing → attitude to risk → optimal level of output. The New Keynesians [4] based their theory of risk-averse firm on asymmetric information between managers and capital providers, which in their models of firm leads to the firm's reliance on the usage of debt related with bankruptcy risk.

Although they capture important patterns of firm's risk behavior, they focus rather on the specific types of constraints or conditions of firm's financing. As a result they do not provide a complete picture of the determinants of the firm's attitude to risk and thus optimal output level under uncertainty.

MATHERIAL AND METHOD

The aim of paper is to develop a comprehensive model of firm, which would include all the important parameters, in the cases the firm behaves in risk averse, risk neutral or risk-seeking manner. The traditional neoclassical theory base the behavior of firm solely on the simple valuation maximization principle. Firms are assumed to either operate in uncertainty-free environment, because there is not aspect of time, or the firm behavior is not affected by uncertainty, because firms are assumed to be risk-neutral. The optimal output level is chosen so as to satisfy the equality of marginal costs of production and price of output [5].

Therefore it should be incorporated additional determinants for the firm's decision-making about optimal output, which is based on the uncertain character of the agriculture environment.

The firm's attitude towards risk can be summarized by an utility function, which, beside other properties, is increasing in profit $v'(\eta^i) > 0$.

If the firm is assumed to be risk averse and it chooses output to maximize:

Max $Ev(\eta^i) = p^i - (1+r)c(q^i)$, where:

- η' is uncertain profit of the firm,
- $c(q^i)$ is the firm's cost of production,
- q^i is an output level,
- p^i is the expected price,
- r is the interest rate representing the opportunity cost of production.

The results after the optimality exercise are the following:

$Ev'(\eta^i) [p^i - (1+r)c(q^i)] + cov [v'(\eta^i), p^i] = 0$

For a risk neutral firm the covariance item will be equal to zero, because marginal utility would remain constant independently on the development of uncertain price (and thus profit). Therefore, the risk-neutral firm chooses the optimal output at the level, which equalizes the expected price and present value of marginal costs. If the expected price is taken as equal to the mean price, the level of output that would be produced by the risk neutral producer facing price uncertainty is the same as the level of output under price certainty.

In the standard theory of firm under uncertainty the firm is assumed to be risk averse. As a consequence the firm will have negative covariance between the marginal utility of owner's income, because increased price will decrease marginal utility of income. Hence the difference between expected price and present value of marginal

costs must be positive. Since it is assumed that marginal costs are increasing this implies that the optimal output is smaller than for risk neutral firm.

RESULTS AND DISCUSSIONS

The variable which should be taken into account in order to explain an agriculture firm's behavior under uncertainty could be grouped in two categories: exogenous and endogenous.

The exogenous parameters are the following:

- the net worth position;
- the risk-free interest rate;
- the capital structure;
- the softness of the budget constraint;
- the sensitivity of managers towards bankruptcy;
- the expected sector price;
- the weather influences.

The endogenous variables are the followings:

– the total amount of necessary financial resources;

– the contractual interest rate;

- the probability of bankruptcy;
- the optimal level of output.

With the help of agency theory argument towards capital structure (and references to other approaches) can be shown the rationale for the usage of equity-financing besides the loans. Therefore based on the agency theory concepts it is hardly possible to state any conditions under which the firm behave or not behave in the risk adverse manner with appropriate consequences on output decisions. The soft budget constraint literature [8] adds another piece to the picture, which has not been covered in any of the mentioned concepts. It demonstrates that if the firm faces soft budget constraint, it is induced to behave in the risk seeking manner with extensive production levels. But in the market economy this can last only in the short run time horizon.

Based on the previous researches [1] and the new factors identified, could be established the hypothesis of the firm's production behavior under uncertainty.

Firstly, agriculture firms with stronger net worth position and with easier access to the equity market will tend to produce more. The impact of these parameters is decreasing with their absolute value with maximum being at the level associated with the traditional neoclassical firm.

Secondly, the degree of price uncertainty has dual effect depending on financial shape of the given firm. Under normal circumstances, when the probability of bankruptcy is relatively low, the increase in the price uncertainty will lead to the output reduction. On the other hand, the firm balancing at the edge of bankruptcy will be tempted by the increased uncertainty towards higher levels of production.

Thirdly, the soft budget constraint leads to the output expansion. The optimal output level of our firm facing soft budget constraint may get even above the neoclassical optimal output level. As we assume that in the market economy the soft budget constraint is not sustainable in the long run horizon, this behavior only creates short run production up-and-downs.

CONCLUSIONS

Risk is present in all management decisions of agricultural systems, as a result of price, yield and resource uncertainty. If farmers were risk-neutral, it would be irrelevant to consider risk in their decision-making process, since their responses could be represented by the maximization of the expected profit. However, farmers' generalized risk aversion results in production decisions that conflict with those that would be regarded as optimal. This fact has brought agricultural economists to devote a great deal of attention to the stabilization features of agricultural policies aimed at reducing farming risk.

The attitude to risk directly influences the firm's willingness to produce in the environment of uncertainty. The presence of uncertainty thus changes many of the predictions of neoclassical theory of firm under certainty, where the only important determinants of firm's optimal output are technology and relative prices. Therefore, other assumptions about firm's financing should be added: firm's ability to raise new equity, firm's net worth position, possible existence of the soft budget constraint related to debt financing, managers sensitivity to bankruptcy.

BIBLIOGRAPHY

1. Bauer, M. 2005, – *The Theory of Firm under Uncertainty: Financing, Attitude to Risk and Output Behavior*. Working Paper, UK FSV-IES, nr. 71
2. Chambers, G. and Quiggin, J., 2000 – *Uncertainty, Production, Choice and Agency: The State- Contingent Approach*. New York, Cambridge University Press 2000.
3. Djankov, S. and Murrel, P., 2002 – *Enterprise Restructuring in Transition: A Quantitative Survey*. Journal of Economic Literature, 2002, vol. 40, n.3, p.739-792
4. Greenwald, B. C., Stiglitz, J.E., 1993 – Financial Market Imperfections and Business Cycles. The Quarterly Journal of Economics, vol. 108, n.1, p. 77-114.
5. Hau, A, 2004 – *Theory of the Firm Facing Uncertain Demand Revisited*. Economic Theory, vol. 24, p. 457-464.
6. Leland, H., 1972 – *Theory of the Firm Facing Uncertain Demand*. The American Economic Review, vol.62, p. 278-291.
7. Sandmo, A., 1971 – *On the Theory of the Competitive Firm Under Price Uncertainty*. American Economic Review, vol.61, p. 65-73.
8. Schaffer, M. E., 1998 – *Do firms in transition have soft budget constraint? A reconsideration of concepts and evidence*. CERT Discussion Paper nr. 97/20.