

DEBT AND EXTINCTION OF FIRMS*

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But learn that to die is a debt we must all pay.

Eurípides

SUMMARY

The fact that a firm comes to the end of its activity through bankruptcy may be traumatic for its creditors. A firm which stops trading and voluntarily pays off its debts will rarely represent a significant economic problem. In this article we shall endeavour to validate the theoretical results which, in general, show that the higher the debt the greater the probability of exit through bankruptcy and lower the probability of voluntary liquidation. Using data from the Central Credit Register and staff payrolls, we show that all things being equal, a firm with double the amount of debt in comparison to another will have a 25 per cent higher annual probability of exit through bankruptcy, whereas the probability, in the case of exit through voluntary liquidation, will fall to 5 per cent. These results have evident implications for the pricing of loans to non-financial corporations in debt, owing to the fact that the higher the probabilities of exit, the higher the credit spreads.

1. INTRODUCTION

A firm can cease to trade in many different ways. One possibility is for its exit to be planned in advance; *i.e.* the firm is closed in an orderly manner. In this case, debts to credit institutions and suppliers will be settled, employees will be notified of the closure prospects and, after the necessary procedures, its representatives will formally close the firm down. At the other end of the spectrum we have classic bankruptcy in which a firm simply ceases to trade without paying its debts either in full or in part. In many cases, the owners and workers will be penalised. Although there may be a mixture of elements pertaining to both situations, our aim is to reduce this variety of situations to these two extreme cases.

This essay aims to use empirical data to study the factors which lead a firm to stop trading either in the form of an orderly liquidation or through bankruptcy. More specifically, we are interested in the relationship which may exist between the amount of a firm's debt and the way in which its exit is programmed. The reply to this question is also a test of theories on corporate debt which have been dealt with in the economic literature over the last thirty years.

* The opinions expressed are those of the authors and not necessarily those of Banco de Portugal or the Eurosystem. Any errors and omissions are the sole responsibility of the authors.

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Different theories suggest different predictions regarding the probability of an exit and its respective form. Economists believe that, in efficient markets with low monitoring and financing costs, it is the less efficient firms that cease to trade, as opposed to firms with the best projects which remain in the market. This conclusion, however, may not be applicable in cases of information asymmetries between firms and banks or different incentives between managers and investors.

As regards our particular interest, *i.e.* the issue of whether an eventual exit is voluntary or through bankruptcy,¹ the first argument is expounded by Ross (1977) and is based on the asymmetry of the existing information between a firm's managers and external agents, particularly credit institutions.² In simple terms, managers of good firms have an incentive to increase the amount of a firm's debt to indicate a low probability of ceasing to trade. Over indebtedness works because, in the case of its occurrence, it increases the probability of an exit being through bankruptcy, which would force them to incur major losses in the form of reputational losses, a reduction of income or even legal costs. External agents understand that, in the event of liquidation, managers incur major losses and accordingly deduce that if a firm were a bad firm, they would not wish to incur large debts and the firm must, therefore, be a good firm. In empirical terms this argument implies, *ceteris paribus*, that, in the case of an exit, debt should increase the probability of an exit through bankruptcy.

The second argument is based on the differences between the incentives existing between the owners of firms and the parties holding their debt and has, for example, been developed by Myers (2001). Owners of firms with large debts have an incentive to pursue riskier business strategies. Let us consider a project with a low possibility of success, but which, in the event of success, will make a large profit; in the event of failure, the losses are also high. In this situation, the benefits of success will essentially go to the firms' owners, who will only repay debts as per the agreed terms and keep the rest; in the event of the project's failure, the losses will essentially go to the parties holding the debt, as there will not be any resources to repay them. For managers, the gains are truncated at a lower but not a higher level; for the parties holding the debt, the gains are truncated at a higher level but could result in losses as high as the global amount of the debt. This asymmetry between gains induces a rational choice of this strategy as opposed to a strategy with a high possibility of repaying the debt but which would limit managers' potential gains.

There is also an argument (see Jensen, 1986) which defends that the simple existence of debt is associated with a higher probability of exit. The argument goes as follows: if an investment opportunity needs internal funding because it involves a high amount of debt, the owner will have to inject the required capital; however, he may not benefit in full from the investment gains as the firm could, in the meantime, cease to trade. This implies that several profitable investments are not made, which increases the probability of exit. In principle, the argument is valid both for exit through bankruptcy and voluntary liquidation. We do not, however, expect to see a significant impact of debt in the case of voluntary exit because the problem arises when debt levels are high and when only internal financing can be used, which means that, in the case of exit, a firm will find it difficult to avoid bankruptcy.

There are many other arguments linking debt with bankruptcy. In general, almost all of them forecast a positive relationship between the level of debt and the probability of bankruptcy. In addition and as we have noted, in the argument set out in the preceding paragraph, the level of debt is also likely to be associated with a lower probability of voluntary exit. Cases in which a firm promptly settles its debts suggest that the problems of agency and asymmetry of information associated with debt are not

¹ The concept of bankruptcy that we use is not a legal one, but the notion of exit of activity without full repayment of the debt, as we shall see. The reader interested in a more detailed treatment of these arguments should see Mata, Antunes and Portugal (2010).

² We admit that the company managers have their interests aligned with those of its owners. This is certainly a natural assumption in many companies, but for some, especially large companies, managers and business owners may have different incentives.

relevant; and explains why, in the above case, we also expect a negative impact of debt in the probability of voluntary exit.³

The empirical results confirm these theoretical forecasts. Using the base statistical specification, we estimate that, in the case of a standard firm, the doubling of the level of debt corresponds to an increase of around 25% in the probability of exit through bankruptcy (from 1.9 per cent to 2.3 per cent per annum), and a reduction of around 5 per cent in the probability of voluntary exit (from 4.1 per cent to 4 per cent per annum). Given the probabilities of exit through bankruptcy and voluntary liquidation for a standard firm, this implies a total increase in the probability of exit from 6 to 6.3 per cent per annum, *i.e.* the debt level has a major impact on the occurrence of bankruptcies and a lesser impact in terms of voluntary liquidations, in the opposite direction; as the probability of exit of a standard firm is greater through voluntary liquidation than through bankruptcy, the global probability of exit is relatively unaffected by the level of debt.

2. EMPIRICAL DATA AND MODELLING STRATEGY

The type of question to which we aim to reply is suitable for a modelling exercise in which there are three mutually exclusive options available, at the end of each period: continuation of activity, voluntary liquidation and bankruptcy. This data structure suggests the use of multinomial discrete choice statistical models which is the strategy we shall adopt. But before delving into the issue of modelling, let us take a look at the available data and the way in which we shall characterise each of the above referred to options. This deviation will be useful to improve our understanding of the modelling options taken and our interpretation of the results. For debt information we shall be using Banco de Portugal's Central Credit Register (CRC), a database housing information on all credit relationships between non-financial corporations and credit institutions operating in Portugal. Although the debt measurements registered in the CRC may seem limitative, as they do not include debt issued by the firms, it is a well known fact that in Portugal, as in the case of other countries on mainland Europe, most credit relationships are processed between banks and firms and the issue of debt finance or capital offerings in organised markets are relatively restricted. In addition to the credit component, we also require several measures to characterise firms, known to be relevant to their level of debt, such as dimension, sector of activity, age, etc. Such data are obtained from staff payrolls. These data are published annually and cover establishments with employees and include variables such as the number of employees, volume of sales in the preceding year, date of the firm's foundation and sector of activity. In this article we shall be using data for the period 1995-2000.

2.1. Firm exits and their classification

To identify firm exits we use the following methodology. As the staff payroll survey is mandatory in Portugal, we consider that an exit always occurs when a given firm is absent from the database for two consecutive years. Therefore, if a firm reports its staff payrolls for a year t and continues to be absent in the years $t + 1$ and $t + 2$ we consider that there must have been an exit during the year t . Several other adjustments were made to the data, namely when there is only one year in which the report is missing; in these cases we fill in the data for the missing year with the average of the preceding years and following year.⁴ After the two databases have been linked we obtain each firm's credit history. The next step consists of classifying exits as bankruptcies or voluntary liquidations. We define bankruptcy as an exit in which a firm had a register of significant credit in default, in accordance with the CRC's credit

³ For a more detailed description of these arguments, as well as a more exhaustive treatment of the issues raised in this article, see Mata *et al.* (2010).

⁴ See Mata *et al.* (2010) for more details on this procedure.

classification, in the two years following the exit. Both the total amount of credit and the part in default (if any) were calculated by aggregating the respective amounts for all of the credit institutions with which the firm in question had a relationship. All other cases were considered to be voluntary liquidations in which a firm succeeds in meeting its credit liabilities (if any), in full, in the two years following its exit.

To centre our analysis on firms with banking relationships, we only consider observations in which a firm had a positive amount of debt in the present or the preceding year or both. Out of a total number of 229,630 observations for the years 1995 to 1998, the propensity to exit is relatively low, with a total annual average of exits of 6 per cent of firms. Moreover, a 69 to 31 per cent split was observed between exits through voluntary liquidation and exits through bankruptcy (Table 1).

Table 1

SUMMARY STATISTICS OF SAMPLE					
		Permanence	Exit		Total
			Voluntary liquidation	Bankruptcy	
No. of observations		215,783	9,569	4,278	229,630
Variable					
Log (1 + debt)	average	9.7	8.1	11.1	9.6
	standard deviation	3.4	3.7	2.1	3.5
Log (no. of employees)	average	2.1	1.3	1.7	2.1
	standard deviation	1.2	1.1	1.1	1.2
Age	average	14.8	11.8	12.0	14.6
	standard deviation	12.5	11.4	11.3	12.4

Sources: *Quadros de Pessoal*, Banco de Portugal (Central Credit Register) and authors' calculations.

2.2. Debt and control variables

The most important of the explanatory variables, *i.e.* variables which help us rationalise firms' different exit or continuation modes, is the level of debt. As is usually the case in the literature, we shall be using the amount of debt logarithm in euros plus 1 euro, owing to the fact that there are observations with nil debt. In the case of exits through bankruptcy, firms are, on average, more in debt (around EUR 69 thousand) than the average for firms which continue to operate (around EUR 16 thousand), and those which exit through voluntary liquidation (around EUR 3 thousand). These observations firstly suggest that the technical arguments expounded above may be sustained empirically. However, as we are aware of numerous examples in the economic literature, which do not take into consideration other important dimensions relating to firms' exit processes, we may be led into drawing the wrong conclusions from our results (Table 1).

What other aspects – in addition to debt levels – may also be important to explain the phenomenon of firms' exits? One of them will be a firm's dimension. In this case, we use the logarithm of the number of employees. In general terms, surviving firms tend to be the larger firms, if we gauge their size by the number of employees. Converting the logarithmic units into natural units, the corporate survivors have an average of around 8.1 workers, in comparison to 5.4 and 3.6 workers for firms which exit through bankruptcy or voluntary liquidation. As regards the duration of activity of firms, no major differences have been observed between firms which exit through liquidation or through bankruptcy. In both cases their average age on exit is around 12 years, in comparison to 14.6 years for the firms total (Table 1).

These observations forthwith appear to indicate that more debt, fewer employees and shorter duration of activity favour exits through bankruptcy, as opposed to remaining in operation. By contrast, less debt

favours exit through voluntary liquidation as opposed to continuing to operate; in the case of the other two variables the effect is the same as the case of exit through bankruptcy. These observations, however, are only suggestive of the final effects and must be validated by a regression analysis.

To eliminate the specificity of the sector of activity and systematic impact of macroeconomic fluctuations we also add categorical variables by sector of activity (with a specific granularity) and for the year to which the observation refers.

One objection that can be raised to this choice of regressors is that all of these variables are measuring the same thing: the older a firm the bigger it will be and the greater its capacity to apply for bank loans. The estimation method we use will take this into account. Even if this association exists, the estimation method of the parameters of the chosen model (described later) is based on the comparison of changes of the exit modes of firms attributable to changes in the variable under study, taking all of the other variables as constants. A more profound objection is as follows. Suppose that there is an unknown variable and that this determines, to a large extent, a firm's exit mode. One example is the capacity of the businessman in question. Therefore when we estimate our models, and do not include that variable among the regressors, we are attributing all of the changes in the exit mode to changes in debt, when a part should have been attributed to the variable we have omitted.⁵ For readers who are more familiar with econometric terminology, the variable we are studying is correlated with the statistical model term error, *i.e.* with the part of the statistical model which captures everything of which we are unaware and which also influences the exit. To resolve this problem, economists use instrumental variables or instruments. In this case we should like to access a variable which, not having been included in the list of variables having a systemic effect on the exits, is, nevertheless associated with our variable of interest (in our case the level of debt), conditional upon the remaining regressors. The instrument should not suffer from the same problem as the variable of interest, *i.e.* it should not be correlated with the error term. A suggestion could be the change of one (or more) of the variables we have quoted, including the actual debt. This procedure places more emphasis on a firm's temporal evolution and if, in the case of a businessman's capacity, it remains constant over time, we have a possible instrument. A more detailed treatment of this topic is outside the scope of this work (see *e.g.* Train, 2009); and we shall content ourselves with estimating an instrumental variations regression.

2.3. Statistical modelling

The modelling strategy may be described as conventional. There are three mutually exclusive possibilities in each period: continuing to operate, exit through voluntary liquidation and exit through bankruptcy. This structure suggests a multinomial choice model, such as the logit or multinomial probit model.

The specific model we shall be using has a multinomial probit specification. It is a mutually exclusive multiple choice model, in which one of the possible choices is defined as the reference and the remaining options are compared with this reference. In formal terms, we shall assume that the relevant characteristics of the firm i in the year t are summarised by the vector x_{it} and that the benefit of the option $j = 0, 1, 2$ is

$$u_{it}^j = x_{it} \gamma_j + \varepsilon_{jit},$$

in which γ_j is a regression coefficients vector, ε_{jit} is a random error with normal distribution and the index j is 0 in the case of a firm which continues to operate, 1 in the case of voluntary exit and 2 in

⁵ Note also that the same problem will occur if the exit type has some influence on debt. For example, if the threat of bankruptcy exit entails a higher debt, then the result you want to study influences the level of debt itself. This is a situation of reverse causality.

the case of bankruptcy.⁶ The decision is made in accordance with the benefit in each option. The option m is chosen if and only if $u_{it}^m \geq u_{it}^j$ for all $j \neq m$. If y_{it} is a random variable which gives us the option chosen by the firm i in the year t what we have expounded above implies that the probability of choice being m is $\Pr(y_{it} = m) = \Pr(u_{it}^m \geq u_{it}^j \text{ for all } j \neq m)$.

If we pay careful attention, the model of the preceding equation is invariant if (i) we add the same constant to all of the equations (which does not change the order when we compare the different options) and (ii) we change the magnitude of the standard error deviations by the same factor (for a rather more obscure reason, and which will remain so if the reader does not, for example, consult, Long and Freese, 2006, page. 272). The fact (i) implies that the decisions are made on the basis of the difference between the benefit attached to the different alternatives, for which, choosing one alternative as a reference – e.g. $j = 0$ continuing to operate – we can express the model in terms of such differences. Defining $v_{it}^j = u_{it}^j - u_{it}^0$, $\varepsilon_{jit} = \varepsilon_{jit} - \varepsilon_{0it}$ for $j = 1, 2$, we end up with a slightly different model:

$$v_{it}^1 = x_{it}\beta_1 + \varepsilon_{1it} \quad (1a)$$

$$v_{it}^2 = x_{it}\beta_2 + \varepsilon_{2it} \quad (1b)$$

$$\Pr(y_{it} = 1) = \Pr(v_{it}^1 \geq v_{it}^2 \text{ and } v_{it}^1 \geq 0) \quad (1c)$$

$$\Pr(y_{it} = 2) = \Pr(v_{it}^2 \geq v_{it}^1 \text{ and } v_{it}^2 \geq 0) \quad (1d)$$

As we have the expressions for the v_{it}^j 's in terms of the ε_{jit} 's and accept that the errors have a normal distribution, we can use the bivariate normal distribution to calculate the above probabilities, conditional on β_1 and β_2 . We then maximise the likelihood of the sample (basically the product of all of the probabilities, one for each observation) in these two parameter vectors. We must also, maximise with respect to variance ε_{2it} ; the observation (ii) above implies that we can normalise the variance of ε_{1it} to 1.

3. RESULTS

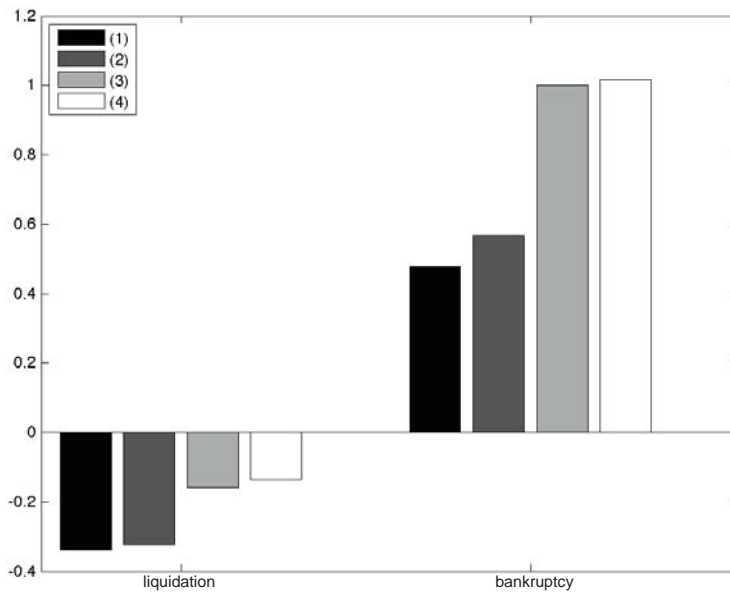
Chart 1 gives a graphical representation of the results of several multinomial regressions. For each type of exit (liquidation or bankruptcy) and for each of the four regressions, the bar is proportional to the value of the coefficient associated with the debt. We should remember that the economic literature forecasts that a higher level of debt will be corresponded to by a lower propensity to exit the activity through voluntary liquidation and a greater tendency to exit through bankruptcy. This conclusion is suggested by the regression (1), which uses only the level of debt as a regressor. We note that, in this case, the coefficient associated with exit through voluntary liquidation is negative and that it is positive in the case of exit through bankruptcy. In the context of a multinomial probit model, this corresponds to a reduction of the probability of exit through voluntary liquidation and an increase in the probability of exit through bankruptcy. This result is entirely consistent with the arguments presented in section 1.

It can now be argued as follows: the result is spurious because debt is only one measure of a firm's creditworthiness; explicit consideration should be given to variables related with the firm's track record and its macroeconomic or sectoral environment. To obviate such arguments, the regression (2) shows the result when we include, in addition to the debt, annual and sectoral dummies, the age of the firm and the square of the age of the firm. This latter variable aims to capture the non-linear effects of age in the decision to exit. The initial result remains: more debt implies greater propensity to exit through bankruptcy and lesser propensity to exit through voluntary liquidation.

⁶ The errors are considered independent across equations and observations. We also considered specifications that allow for correlation across equations but this modeling is much more complex and is therefore outside the scope of this article; however, it leads to results consistent with those presented here.

Chart 1

THE EFFECT OF DEBT



Multinomial probit regression model with the following specifications:

- (1) only debt as a regressor;
- (2) the previous plus annual and sectoral dummies, the firm age and firm age squared;
- (3) the previous plus the logarithm of the number of workers;
- (4) The previous using instrumental variables.

Sources: *Quadros de Pessoal*, Banco de Portugal (Central Credit Register) and authors' calculations.

Note: All values as a fraction of the coefficient for debt in exit by bankruptcy of regression (3). The omitted category is continuation of activity. All coefficients are significant at the 1% level.

Another argument goes like this: debt may be a measure of a firm's dimension and it is a well known fact that firms with better projects, *i.e.* with a lesser possibility of going bankrupt, will grow. In addition to the former controls, the regression (3) includes, a measure of the firm's dimension: the logarithm of the number of workers. In this case, we obtain a significant reinforcement of the debt's magnitude in exits through bankruptcy and an attenuation of the effect of the reduction of the probability of exit through voluntary liquidation. The use of the number of workers in a firm enables the dimension effect of the debt's effect to be isolated.⁷ The coefficient associated with the firm's dimension is similar for the two types of exit and is equivalent to around double the coefficient associated with the debt variable in exits through bankruptcy.

The regression (4) consisted of the use of instruments to eliminate the effects of distortion in our estimates per omitted variable or endogeneity of the regressors – see section 2.2. The instrumental variables used are annual variations of both debt and the number of employees' logarithms. The estimation technique used is referred to in Train (2009). In this case it is reassuring to note that the debt's effect remains practically unchanged.

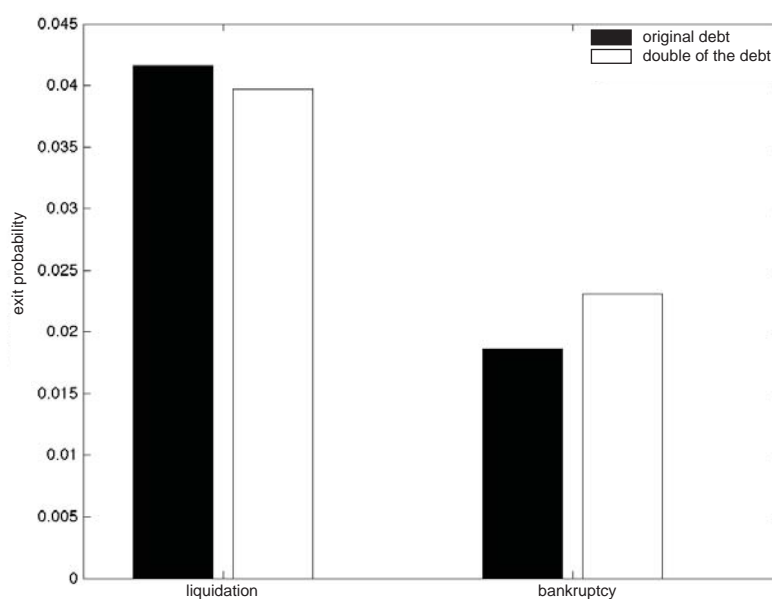
⁷ Including other variables for size, such as annual sales, does not entail significant differences relative to these results.

We have already referred to the fact that errors can be multiplied by a positive arbitrary factor without changing our results. The consequence of this is that the scale of the coefficients of chart 1 is, *per se*, arbitrary. Although a comparison of the magnitude of the coefficients for the different variables and for the two equations is a fully valid exercise, to verify whether or not the debt's effect is substantial, its marginal effects should be estimated. A possible measure is the average change in the probability of the exit in question, calculated for the sample, triggered by a change in the variable of interest, in this case debt. Let us consider the reference regression (3). Based on the estimated model we can calculate the average probability, for the sample, of an exit through liquidation or bankruptcy. The values we obtain are 4.1 per cent per annum for exit through voluntary liquidation and 1.9 per cent per annum for exit through bankruptcy. In addition, however, we can also obtain a reasonable estimate of the average probability of exit if, for example, each firm's debt were double its initial level. The result is represented in chart 2.

The conclusion reached from the chart is that the quantitative effect on the probability of exit through bankruptcy is high and is smaller in the probability of global exit (*i.e.* including both types of exit). We note that when the debt level is doubled, there is an increase of around 25 per cent in the probability of exit through bankruptcy; the reduction of the probability of voluntary exit is around 5 per cent of the original level. In global terms, these values imply an increase in the probability of exit from 6 to 6.2 per cent per annum. As a reference number we estimate that a 10 per cent reduction of a firm's debt implies, under certain simplifying hypotheses and through the reduction of the probability of bankruptcy, a maximum reduction of around 7 basis points in the interest rate charged.⁸

Chart 2

IMPACT OF LEVEL OF DEBT IN THE EXIT PROBABILITIES



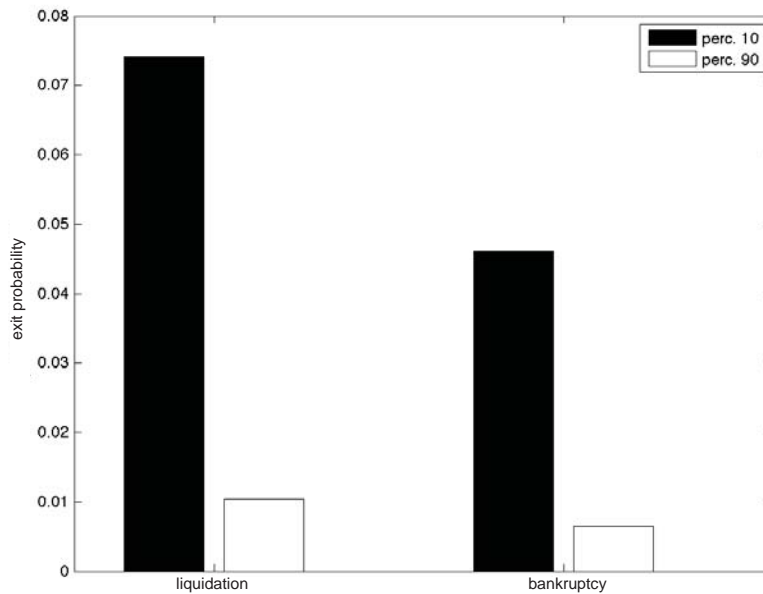
Sources: *Quadros de Pessoal*, Banco de Portugal (Central Credit Register) and authors' calculations.

Note: For each observation, the probability of exit by voluntary liquidation or bankruptcy is estimated both for the initial level of debt, and twice that level. The values in the chart are sample averages of those probabilities.

⁸ The hypotheses are: perfect competition in the credit market, total loss in case of bankruptcy, voluntary liquidation losses negligible. See Chatterjee, Corbae, Nakajima and Rios-Rull (2007) for a model in which the probability of default affects the interest rate charged by the credit institution, according to $\Delta_i = \Delta_p$, where Δ_i is the change in interest rate charged and Δ_p is the variation of the probability of bankruptcy.

Chart 3

EXIT PROBABILITY AND FIRM SIZE



Sources: *Quadros de Pessoal*, Banco de Portugal (Central Credit Register) and authors' calculations.

Note: For each observation, the probability of exit by voluntary liquidation or bankruptcy is estimated holding constant the dimension variable at the 10 and 90 percentile level. The values in the chart are sample averages of those probabilities.

A last issue is related with the influence of the firm's dimension, as measured by the logarithm of the number of employees in the probability of exit. Chart 3 shows that the dimension has an enormous influence on the probability of exit. For example, a relatively small firm *i.e.* a firm with a number of workers equal to the 10th percentile of this variable in the sample (2 employees), has estimated average probabilities of exit of 7.4 per cent through voluntary liquidation and 4.6 per cent through bankruptcy. By contrast, for a relatively large firm (in the 90th percentile of the dimension, 37 employees) the same probabilities are 1 and 0.65 per cent.

4. CONCLUSION

The results of this work suggest that a firm's debt is an essential determinant for the calculation of the probability of exit and the form in which it is processed. The above affirmation is consistent with the voluminous literature on debt and the exit of firms. As, in most of these works, there has been a tendency to identify any type of exit as a bankruptcy, we show that on most occasions exits are processed in a relatively orderly manner and without leaving too many unpaid debts. What is the difference between the two situations? The difference is debt, that helping hand as well as harbinger of failure. If, on the one hand debt makes it possible to improve efficiency in the allocation of resources and exploit a project's potential, on the other hand it generates powerful incentives to strategic moral hazard behaviour and translates into palpable effects in the probability of credit default.

The results of this work may lend support to the notion that, as opposed to what should be displayed by a frictionless economy, in an economy with agency and information asymmetry and other problems, the probability of a firm's extinction, and particularly extinction in the form of a traumatic bankruptcy process, is considerably dependent on debt levels. It goes without saying that this increased risk is reflected in the interest rate charged: firms with more debt, in the presence of financial frictions, face higher interest rates. This is a painful situation which economic agents or even countries in debt must face.

REFERENCES

- Chatterjee, S., Corbae, D., Nakajima, M. and Rios-Rull, J.-V. (2007), "A quantitative theory of unsecured consumer credit with risk of default", *Econometrica* 75(6), 1525–1589.
- Jensen, M. C. (1986), "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers", *American Economic Review* 76(2), 323–329.
- Jensen, M. C. and Meckling, W. H. (1976), "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure", *Journal of Financial Economics* 3(4), 305–360.
- Long, J. S. and Freese, J. (2006), *Regression Models for Categorical Dependent Variables Using Stata*, second edn, Stata Press.
- Mata, J., Antunes, A. and Portugal, P. (2010), "Borrowing Patterns, Bankruptcy and Voluntary Liquidation", *Working Paper 27*, Banco de Portugal.
- Myers, S. C. (1977), "Determinants of Corporate Borrowing", *Journal of Financial Economics* 5, 147–175.
- Myers, S. C. (2001), "Capital Structure", *Journal of Economic Perspectives* 15(2), 81–102.
- Ross, S. A. (1977), "The Determination of Financial Structure: The Incentive-Signalling Approach", *Bell Journal of Economics* 8(1), 23–40.
- Train, K. (2009), *Discrete Choice Models with Simulation*, second edn, Cambridge University Press.