The Non-Linear Relationship between Financial Distress and Trade Credit: Empirical Evidence from Pakistan

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#### Abstract

We propose a solution to the financial-distress-trade-credit puzzle that exists in the literature. On one hand we have studies that report a positive association between the two while on the other hand, there are others suggesting a negative relationship. Using Quadratic Regression technique to allow for testing the relationship at two different levels of financial distress, we show that this disagreement is largely because of the failure to account for the degree of financial distress. In our sample of non-financial firms from the Pakistan Stock Exchange over a seven years period i.e. from 2010 to 2017, we found that at lower-tomoderate degree of financial distress firms experience an increase in trade credit while at high levels of financial distress their use of trade credit falls. To the best of our knowledge, the relationship of trade credit and financial distress at different levels of distress probability has never been tested before. Our study therefore, not only reconciles the mixed findings in existing literature on this topic but also opens new doors for further research and practice.

**Keywords:** Financial Distress; Trade Credit; Short Term Financing; Z-Score

## Introduction

The existing literature on trade credit practices of financially distressed firms seems to be largely mixed and inconclusive. The literature on one hand suggests a negative relationship for example, studies like that of (Nilsen, 1999), (Baxter, 1967), (Altman, 1984) and (Andrade & Kaplan, 1998) empirically find that firms that are in a state of financial problems would not only find it difficult but also costlier to use suppliers' credit. These studies base their explanations on the "cost of financial distress" argument because during financial distress information asymmetry makes it harder for firms to obtain or even renegotiate with their suppliers for a trade credit (Hoshi, Kashyap, & Scharfstein, 1990). On the other hand, there are others who report a positive association between the two, for example, (Guariglia & Mateut, 2006), (Molina & Preve, 2012) and (Petersen & Rajan, 1997b) find a rise in the firm's reliance on trade credit during times of financial troubles. These studies view trade credit as the only option of financing left for financially distressed firms; we call it the "limited access to capital" argument. This is because firms in financial distress may lose repute and creditworthiness with the bankers and bond markets.

Suppliers therefore, rescue these firms as they are usually at an advantage in disciplining the firm thereby having a control over the supply of raw materials. (Cuñat & Garcia-Appendini, 2012)

We propose that while the "cost of financial distress" and "limited access to capital" arguments may seem apparently both valid; the puzzle is largely attributable to the fact that these studies are based on a simplifying assumption that a monotonic and linear (positive or negative) relationship exists between the use of trade credit and financial distress. Our major contribution is to reconcile this conflict in the existing literature by relying on the "limited liability" argument instead. Under this argument we propose that firms might have different incentives towards caring for problems linked with financial distress at lower levels of probability of distress while they may lose any such incentives at higher levels of distress probability, for example see, ((Purnanandam, 2008). We therefore, revisit this relationship taking into account the intensity or degree of financial distress. Using econometric treatments, we test the firm's extent of use of trade credit at low-&- moderate level as well as at high level of distress.

Our study is based on a panel of non-financial Pakistani firms over a 7-years period i.e 2010-2017. The Pakistani market being an emerging market is a natural laboratory for testing our specific analysis. Emerging markets are characterized by limited access to external capital markets and less developed financial markets (Claessens & Yurtoglu, 2013). Firms in such markets are restricted to rely only on trade credit and bank loans. Pakistan also does not have a developed bond market, making external finance through long term debt even more difficult. The major sources of financing of these firms are bank loans, venture capital and/or supplier credit (trade credit). This particular nature of Pakistani firms allows us to focus on the relationship between financial distress and trade credit in a controlled way in the absence of any noise from other sources of financing. We therefore, believe our study would also contribute to the understanding of the dynamics of corporate financing policies in emerging markets.

Our results suggest that there is a negative relationship between trade payables and financial distress at low to moderate level of financial distress and a positive relationship at higher levels of financial distress.

The rest of the paper is divided into 4 sections. Where, the next section, section 2, presents a review of the relevant literature highlighting the need for a reconciliation of the previous findings. Section 3 describes the sample, data and methodology followed in the study. Univariate and multivariate panel analysis is the subject of section 4 and

finally, section 5 concludes the paper along with policy recommendations and future directions.

#### Literature Review

In the typical (Modigliani & Miller, 1958) world i.e ideal capital markets (no taxes, no transaction costs, and symmetric information, etc.) any blend of debt and equity investment is as effective as adopted. However, real world aspects generate frictions with the ideal M&M assumptions, making the capital structure choice valuerelevant. For example, (Kraus & Litzenberger, 1973) suggest a trade-off between the tax benefits of debt and the expected costs of bankruptcy to be responsible in shaping a firm's capital structure. Further, support to this is found in the survey evidence of (Graham & Harvey, 2001). Similarly, (Myers & Majluf, 1984), (Shyam-Sunder & Myers, 1999), (Lemmon, Roberts, & Zender, 2008) and (Frank & Goyal, 2003) suggest a particular order of preference for financing, depending on the relative costs of financing of internal vs external and then debt vs equity financing.

During financial distress firms find it harder to avail further long term debt because investors are unwilling to invest in such firms for longer periods, short term debt is therefore often the only option left to finance a firm's operations during distress. Research studies in this area seem to support this idea by showing that trade credit is an alternative when other sources of financing are not available or harder & costly to acquire. For example, (Guariglia & Mateut, 2006) state that the use of trade credit by firms increases under tight monetary conditions. Similarly, (Fisman & Love, 2007), (Molina & Preve, 2009) and (Ferrando & Mulier, 2013) empirically support this idea by showing that more trade credit is used by firms in financial distress as compared to healthy firms. If the bank credit in unavailable for the firm then trade credit is the only option for that firm (Giannetti, Burkart, & Ellingsen, 2011). Another reason why some firms may be limited to the use of trade credit is their limited access to the external debt market. (Petersen & Rajan, 1997b) found that smaller firms use more trade credit during financial distress. Further, in line with this, previous studies and pecking order theory also agree with this arguments that, when banks reject to provide loan to the firms or there are more restrictions in the use of loan then firms use expensive source of financing e.g. trade credit and credit cards. (Danielson & Scott, 2004).

However, there are yet studies that suggest that the use of supplier trade credit indirectly define a high interest rate (hence high default risk) that is used as an efficient selection device when the information about the buyers' default risk is irregular and unclear. More to that, (Nilsen, 1999) argues that larger firms that are financially sound, have a bond rating and have access to alternate sources of financing do not utilize trade credit. Similarly, (Baxter, 1967) found that suppliers are unwilling to provide goods and services to the financially distressed firms so they have the only option to buy goods and services on cash leading to lower trade credit on their balance sheets. Similarly, suppliers might also be unwilling to sell their products and services to the financially distressed firms except under some restricted conditions e.g. charging them a higher cost or cash on delivery etc. These ideas reflect a negative association between the use of trade credit and financial distress. Further support to this can be found in (Altman, 1984) and (Andrade & Kaplan, 1998).

The discussion above clearly suggests that studies suggesting a positive relation between the state of financial distress and the use of trade credit seem frequently to use the "limited access to external capital" argument. They suggest that during financial distress firms may face higher information asymmetry, limited access to bond and capital markets and deteriorating relationships with the banks therefore they rely mostly on trade credit. On the other hand, studies that suggest a negative relation seem to rely on the "cost of financial distress" argument. They argue that firms shape their capital structure in ways that reduce the probability and costs of financial distress. Also since trade credit is often a costly option therefore firms in financial distress would reduce their use of trade credit in order to reduce the costs of financial distress.

It is however worth noting that none of these studies have taken into account the level of financial distress while testing these relationships. We suggest the "limited liability" argument of (Purnanandam, 2008) to resolve this issue. Firms, according to (Purnanandam, 2008), may try to spend organizational resources on risk management and avoiding financial distress as long as they are only moderately distressed, however, they stop doing so when distress risk is higher.

In this study our main hypothesis is that we suggest that a positive relation between the state of distress and trade credit may exist at one level and a negative one at another level. Moreover, as suggested by (Ge & Qiu, 2007) and (Claessens & Yurtoglu, 2013), in emerging market countries the financial institutions are less developed, firms finance their operations through informal financing sources that depend more on customer and suppliers relations. We therefore believe that our analysis on the Pakistani firms will prove as a natural experiment to produce unbiased and controlled results on the relationship of financial distress and the use of trade credit.

## Data and Methodology

#### Data and Sample

Our sample is based on a 7-year panel from 2010-2017. We initially started with all the firms listed at Pakistan's KSE-100 index. Further we refined the sample using the following criteria:

We excluded financial firms due to their distinct nature and different risk profile

We retained those firms for which consecutively annual reports are available from 2010 to 2017. This was necessary because we were constrained by the unavailability of databases for the Pakistani firms limiting us to collect accounting data from the annual reports.

We further excluded firms that did not report trade payables in their financial reports.

After applying the above criteria we ended up with a final sample of 54 nonfinancial firms over our seven years sample period resulting in 385 firm-year observations.

A summary of the sample is presented in table 1 and figure 1 below. Table 1 and figure 1 below both show that 18.51% of the sample consisted of textile sector firms, some 42% firms were from food producers sector, 11.11% from construction and materials (cement) sector and a 5.55% from oil and gas sector. The remaining of 22.21% of the sample was represented by automobile and parts and some others sectors. This shows that the sample of our study was a well diverse and unbiased one representing different sectors of non-financial firms.

# Table 1

INDUSTRY TYPE	FREQUENCY	PERCENTAGE OF THE	
		SAMPLE	
Textile	10	18%	
Food producers	23	43%	
Construction and Materials (cement)	6	11%	
Oil and Gas	3	6%	
Automobile and Parts	4	7%	
Others	8	15%	
Total	54	100	

## **Industry-wise Percentage of Sample**

Figure 1



# SECTOR WISE BREAKUP OF THE SAMPLE

#### **Model & Variables**

Our main variables of interest are trade payables-to-sales ratio and Altman's modified Z-score (Altman, 2000). We use trade payables-to-sales in line with previous studies e.g (Nilsen, 1999) to proxy for the extent of a firm's use of trade credit. This ratio has an advantage that it is not affected by transaction cost. Secondly, we use Altman's modified Z- Score (Altman, 2000) to measure the firm's likelihood of financial distress. Further, in order to take into account the different (moderate vs high) levels of likelihood of financial distress we include the square term of the Z-score variable.

Our main estimation model is given below:

$$\left(\frac{\text{Trade payables}}{\text{Sales}}\right)_{i,t} = \alpha_{i,t} + \beta_1 Z \cdot \text{Score}_{i,t} + \beta_2 (Z \cdot \text{Score})^2_{i,t} + \beta_3 \text{Profitability}_{i,t} + \beta_4 \text{Firm Size}_{i,t} + \beta_5 \text{Firm Credibility}_{i,t} + \varepsilon_{i,t} + \varepsilon$$

The subscripts "i" & "t" represent the measurement of each variable for each firm "i" at each time/year "t" of the sample period.

We include the square of the Z-score variable, in line with <u>Purnanandam</u> (2008), in anticipation of a nonlinear relationship between trade credit and financial distress. Thus, accordingly if our main hypothesis holds true, we expect to get opposite signs on the coefficients of the Z-score and its squared term (i.e  $\beta_1 \& \beta_2$  respectively). We closely follow (Altman, 2000) for calculating the modified Z-Score value for each firm using the following formula:

$$z - score = 1.2 X_1 + 1.4 X_2 + 3.3 X_3 + 0.6 X_4 + 1.0 X_5$$
(2)

Where,

 $X_1$  = Working capital/Total Asset

 $X_2$  = Retained Earning/Total Asset

 $X_3$  = Earning before Tax & Interest/Total Asset

 $X_4 = \text{Equity/Total Liabilities}$ 

 $X_5 = \text{Sales} / \text{Total asset}$ 

Altman Z-Score is used as a measure of financial strength of the firm (Alkhatib & Al Bzour, 2011). If the Z- score is bellow1.8 it means firm is in financial distress and if the Z-Score is 3 or above it means the financial position of the firm is strong.

In addition to this we include profitability, firm size and firm credibility/creditworthiness as control variables commonly suggested by previous literature on this subject. Below we briefly discuss the motivations and measures/proxies used for these controls.

#### **Profitability**

We proxy profitability by the net profit margin measured as the ratio of net profit to net sales. We used this ratio in our model because it is a determinant of trade credit (Niskanen & Niskanen, 2006) and (Petersen & Rajan, 1997a) stated that if the profit margin of the firm is high they rely more on trade credit and vice versa.

#### **Firm Size**

A firm's level of trade credit may be affected by its size. Large firms, as compared to small firms, have batter management and corporate governance to explore batter ways of financing therefore these firms may rely less on trade credit at the time of financial distress (Molina & Preve, 2012). We therefore include size as a control variable and proxy it by the natural logarithm of sales.

#### **Firm Credibility**

Larger and more creditworthy buyers may have higher levels of trade credit use as they may receive trade credit contracts with extended maturities. (en, Demirguc-Kunt, Klapper, & Peria, 2012), (Ng, Smith, & Smith, 1999) and (Petersen & Rajan, 1997b) support this idea. We include sales growth (measured as the percentage change in sales as compared to previous year) to account for this.

#### **Capital Structure**

Since short term financing levels are also decided by firms in harmony with its overall capital structure. We therefore include the debt-to-equity ratio to account for this fact.

Our model after including these variables (proxies) thus takes the following final form;



#### **Analysis and Results**

#### **Descriptive Statistics**

Table 2 below summarizes the descriptive statistics of sample. According to results the minimum value of trade payables/sales is 0.010 while the maximum value is 17.460 in the sample while mean value is 0.311 which shows that the average firms use 31% of their sales to pay their trade payables. The sample Z-scores range from as low as -1.148 (representing very high level of distress and probability of bankruptcy) to as high as 20.662 (representing a safe a very low level of distress and probability of bankruptcy). This shows that the sample is not only a well diverse one but is also just in line with our requirements for the analysis purposes (to have firms from both the extremes i.e. the ones with a high level of distress and those with a lower one too). The minimum and maximum value of sales growth also show the diverse rand unbiased nature of our sample. We also filtered and cleaned our data for the presence of any outlier observation. To this end we used methods like simple observation of bar chart plots, inter quartile ranges and Scatter plots.

#### Table 2

#### **Descriptive statistics**

The following table show the summery statistics. Trade payables/sales is the ratio of trade payables/sales. Z-Sore is a measure of financial distress and Z-Score2 is its square. Profit/sales is a ratio used to measure profit margin. Insale is a log of sales used as a proxy of size of firm and sales growth is used to measure annual increase in sales., Debt/equity ratio is used to measure financial leverage of firm.

(3)

Variable	Minimum	Maximum	Mean	Std. deviation
Trade payable/sales	0.010	17.460	0.311	1.338
Z Score	-1.148	20.622	2.944	2.558
Z Score2	0.00003	425.280	15.189	37.822
profit/sale	-1.116	2.108	0.053	0.223
Lnsale	11.390	20.750	15.480	1.470
sales growth	-1.000	69.271	0.412	3.888
Debt/equity	-14.717	795.697	4.307	40.875

Moreover, in order to be consistent with the assumption of non-multi co-linearity, data was also checked for multi colinearity. Table 3 below shows the results of Pearson correlation. The results show that there no serious issue of co- linearity among any pair of the independent variables. correlation. Trade payables/sales, is the ratio of trade payables to sales. While we include independent variables in our model are, Z-Sore is calculated with the help of five type of financial ratios (Working capital/Total Asset, Retained Earning/Total Asset, Earning before Tax & Interest/Total Asset, Equity/Total Liabilities and Sales / Total asset). Z-Score2 is the square of Z-Score, Insale is the log of sales used as a proxy of size of firm, sales growth is used to measure annual increase in sales.

#### Table 3

#### **Correlation Analysis**

The following table shows the results of Pearson

	Trade payables/sales	Z-Score	Z-Score2	Lnsale	Sales growth	Profit/sale	Debt/equity
Trade payables/sales	1						
Z-Score	129*	1					
Z-Score2	035	.841	1				
Lnsale	240***	.225***	030	1			
Sales growth	.714***	103*	025	258***	1		
Profit/sale	203***	.415***	.258***	.184***	139	1	
Debt/equity	.024	076	031	.069	015	012	1

\* and \*\*. show significance at the 5% and 1% level (2-tailed) respectively.

#### **Panel Regression Analysis**

We propose that the mixed findings in the previous literature regarding the relationship between financial distress and trade credit is largely because of the failure of those studies to take into account the different levels of financial distress probability. This is because the different motives suggested in the previous literature in favor and against the use of trade credit in reality change in relation to the level of the expectation of financial distress.

In order to test this, we particularly use quadratic regression model (see Equation 1) in which financial distress is treated as a main independent variable. The financial distress variable and a square term of its square is thus used to test the relationship at medium to low level and high level of financial distress probability. In our analysis, therefore, if the coefficients on the financial distress and its square term have opposite signs it will confirm that the relationship is in fact a non-monotonic (non-linear) one and is rather a quadratic one. We first run both the fixed effects and random effects models and then estimate the Hausman specification test based on the coefficients obtained in order to ascertain which of the two models is more consistent in our case. We report the results of the Hausman test in table 4 below.

#### Table 4

# Hausman Specification Test for Fixed vs. Random Effects

The following table shows the results of Hausman test. Where trade payables/sales is a ration of trade payables/sales this ratio is our measure of trade credit. Z-Sore is calculated using Altman (2000) and is a measure of financial distress while Z-Score2 is its square. Profit/sales is a ratio used to measure profit margin. Insale is a log of sales used as a proxy of size of firm and sales growth is used to measure annual increase in sales., Debt/equity ratio is used to measure financial leverage of firm.

	(b)	(B	(b-B)	<pre>sqrt(diag(V_b-V_B))</pre>
	Fixed	random	Difference	S.E.
ZScore	-0.0047841	-0.0689941	0.0643102	0.0661981
ZScore2	-0.0013913	0.0040319	-0.0054223	0.0033145
Lnsale	-0.6554608	-0.1535782	-0.5018825	0.1747923
Sales growth	0.20055611	0.2296641	-0.029114	0.010345
Profit/sale	-0.2120712	-0.3245902	0.1125192	0.0793808
Debt/equity	0.04991163	0.04993853	-0.000026	0.007788
	Ch	ii2(6) = (b-B)	)'[(V_b-V_B)^(-1]	)](b-B)
		= 8.	.830	
	Prob>chi2	= 0.	.1835	

Table 4 above shows that the probability of the chi squared is greater than any significance threshold. This therefore suggests that the random effects model is more appropriate in this case. We therefore retain and report the results of our random effects model below in table 5.

## Table 5

## Random effects Panel regressions of Trade Credit on Financial distress

The following table mentions the results of the following random effects panel regression model

$$(\frac{\text{Trade payables}}{\text{Sales}})_{i,t} = \alpha_{i,t} + \beta_1 Z - \text{Score}_{i,t} + \beta_2 (Z - \text{Score})_{i,t}^2 + \beta_3 (\frac{\text{Profit}}{\text{Sales}})_{i,t} + \beta_4 \text{LnSales}_{i,t} + \beta_5 \text{SalesGrowth}_{i,t} + \beta_6 (\frac{\text{Debt}}{\text{Equity}})_{i,t} + \varepsilon_{i,t} + \varepsilon_{i,t$$

Where trade payables/sales is a ration of trade payables/sales this ratio is our measure of trade credit. Z-Sore is calculated using Altman (2000) and is a measure of financial distress while Z-Score2 is its square. Profit/sales is a ratio used to measure profit margin. Insale is a log of sales used as a proxy of size of firm and sales growth is used to measure annual increase in sales., Debt/equity ratio is used to measure financial leverage of firm. Whereas \*, \*\* &\*\*\* show significance level at 10%, 5%, and 1% respectively.

Number of obs =	332	
Number of groups $=$	55	
R-sq: Within =	0.0646	
Between =	0.0944	
Overall =	0.0687	
Wald $chi2(5) =$	23.31	
Prob > chi2 =	0.0003	

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Results in table 5 above show that trade payables and Z-Score are negatively associated at a significance level of 5%. Z-score is a measure of financial strength of firm therefore the interpretation of this variable foe firm distress is the inverse i.e a greater value of ZScore means low chances of distress and vice versa. In other words, there is a positive association between the probability of distress and trade credit. Therefore the greater the chances of distress the more a firm relies on trade credit. This finding is thus in line with the "limited access to external capital" argument and thus supports the findings of previous studies for example (Guariglia & Mateut, 2006), (Fisman & Love, 2007), (Molina & Preve, 2012), (Ferrando & Mulier, 2013), (Giannetti et al., 2011) and (Petersen & Rajan, 1997a) empirically found that more trade credit is used by firms in financial distress.

Moreover, table 5 suggests that the coefficient on the square term of distress variable has an opposite (positive) sign and is also significant at the 10% level. This shows that as ZScore increases (decreases) too much the use of trade credit is increased (reduced) by firms. In other words, at very high levels of distress probability firms use less trade credit and vice versa. This confirms thus our main hypothesis that firms may have different motivations for holding trade credit at different levels of its distress probability. This finding is in compliance with the other half of the literature that is based on the "cost of distress" argument and confirms studies that report an inverse relationship between the use of trade credit and financial distress. These studies include (Nilsen, 1999), (Baxter, 1967), (Altman, 1984) and (Andrade & Kaplan, 1998) and (Michaelas, Chittenden, & Poutziouris, 1999). These findings also verify the idea of healthier firms using more trade credit as reported in previous studies e.g. (Wilner, 2000) stated that creditors offer low rate (and hence more credit) to the firm whose financial position is strong.

The findings above confirm that the mix results in the previous literature on the relationship of trade credit and financial distress are due to not taking into account the fact that the motives of the firms for having trade credit in their financing mix changes with the changes in their probability of financial distress. Thus, our study empirically links and verifies the results of both the strands of this literature by showing that there is an inverse relation between trade credit and financial distress at lower to moderate levels of distress probability while a positive relationship between the two at very higher levels of distress. This further highlights that at lower levels of distress it is the "limited access to external capital" motive while at higher level of distress it is the "higher cost of distress" motive that prevails. As regards our control variables, Table 05 shows a negative relationship between trade payables and log of sales at 10% level of significance. Log of sales was our proxy of the size of the firm, these results indicate that larger firms could be expected to depend less on financing received from suppliers. This finding is also in line with the previous studies, for example, (Titman & Wessels, 1988) who found that small firms depend more on debt and bear more transaction cost. Similarly, we found a highly significant positive relationship between trade payables and sales growth. This shows that growing firms may rely more on supplier financing.

#### Conclusion

We analyzed the relationship between trade credit and financial distress, particularly attempting to resolve an important conflict in previous studies on this association. A critical review of the relevant studies on this subject suggests that, where some studies report and justify a positive association between financial distress and trade credit others report a negative one. Those that report and support a positive association between the two, present the "limited access to external capital" argument stating that firms in financial distress have more reliance on trade credit due to a limited (or sometimes a very costly) access to other sources of finance. On the other hand, studies that report a negative association rely on the "cost of financial distress" argument by arguing that since trade credit is usually a costly source of financing, firms may use less of it to avoid a more costly financial distress. We propose that the firms' financial policies, as suggested by previous literature and theories of capital structure, might change dramatically in response to different levels of financial distress probability.

We propose a solution to this conflict by testing the relationship at different degrees of financial distress probabilities. We use the quadratic regression model, where we use the financial distress variable and its square term in order to test the relationship at moderate and high levels of distress respectively. Panel data from non-financial Pakistani firms from the KSE-100 index over a period of 7-years from 2010 to 2017 was used. Our choice of the Pakistani market provides us with a natural laboratory and allows us to test the relationship between trade credit and different degrees of financial distress probabilities because firms in emerging markets are usually characterized by frequent distress situations, less developed credit markets, limited access to external capital and therefore an increased reliance on trade credit.

Our findings suggest that at moderate to low probabilities of distress there is a positive relationship between distress probability and level of trade credit. In other words, firms in distress rely more on trade credit. This suggests that at moderate level of distress probability the "limited access to extern al" capital argument holds. On the other hand, we also found that at very high levels of distress probability this relationship reverses and firms' reliance on trade credit decreases in an increasing distress probability. This finding therefore suggests a "high cost of financial distress" argument to be applicable.

#### **Future Directions**

The study opens doors for a number of future research directions. First, future studies might also test the relationship of net trade credit (i.e. the difference between trade payables and trade receivable) and financial distress. Second, some firms do not have access to capital markets so they are limited to only use trade credit because they do not have more option to finance firms operations, future research should considered this factor by devising a mechanism to identify such firms and then test the association. Third, firm life cycle should be taken into account in future research because firm financial policies vary at different stages of the firm's cycle of life. Finally, the effect of Corporate Governance factors must also be considered in future research.

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