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ENTREPRENEURIAL DETERMINANTS OF MOROCCAN BUSINESS FAILURE: ENTREPRENEURIAL BEHAVIORS AND ATTITUDES

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Abstract. The main objective of this article is to determine the entrepreneurial determinants of Moroccan business failures. To address our research problem, we employ multiple regression models. Entrepreneurial behaviors and attitudes are sourced from the dataset provided by Global Entrepreneurship Monitor (GEM). Additionally, we enhance our dataset by incorporating entrepreneurial variables from the World Bank entrepreneurship database and OMPIC. Applying variable selection techniques and models selection criteria, such as AIC and BIC, the main results indicate that the model composed of variables related to entrepreneurial behavior and attitudes variables, specifically fear of failure rate, perceived capabilities rate, and perceived opportunities rate, better explains bankruptcy rate. This empirical study represents the inaugural examination in Morocco employing entrepreneurial behaviors and attitudes variables to assess their impact on business failure. The findings from this article could open up new perspectives for identifying entrepreneurial variables that explain business failure in Morocco. To the best of our knowledge, our research is the first to explore this topic in this country.

Keywords: entrepreneurial determinants, business failure, multiple regression, selection criteria.

JEL Classification: C3, C9, L2.

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1. Introduction

Throughout history and around the world, people have created businesses. Entrepreneurship is considered a transnational phenomenon. Understanding this phenomenon requires two elements. Firstly, there are universal factors that influence entrepreneurial behavior in all countries. Secondly, there are aspects of entrepreneurship that are specific to each culture (Minniti & Nardone, 2007).

The creation of new businesses is of great social and economic importance (Levesque & Minniti, 2006; Valliere & Peterson, 2009). Nevertheless, the outcomes of entrepreneurial performance are uncertain and failure represents a key feature of entrepreneurship (Aldrich & Martinez, 2001; Audretsch et al., 2006; Danarahmanto et al., 2020; Shepherd, 2003).

Business failure can have devastating effects on the entrepreneur. It can be a traumatic event that reduces confidence, risk-taking propensity, and motivation to try again (Cave et al., 2001; Shepherd, 2003). In some cultures, business failure can be stigmatized (Stokes & Blackburn, 2002). In addition, business failure can deplete the entrepreneur's capital and limit the acquisition of new loans (Lee et al., 2007).

In Morocco, the number of business failures is increasing at an alarming rate. According to Inforisk (2024), the country set a new record for business failures in 2023, with 14,245, an increase of 15% compared to 2022. In 2024, Inforisk (2024) forecasts 16,000 business failures, reflecting a 12.50% increase.

Several international studies have attempted to identify the determinants of business failure. However, the majority of these studies focus on the financial approach (Kherrazi & Ahsina, 2016; Zizi et al., 2020, 2021). The same holds true for Morocco, where the limited body of research on business failure also emphasizes financial determinants. Consequently, it is important to examine the determinants of business failure from an entrepreneurial perspective.

The objective of this article is to determine the entrepreneurial determinants of Moroccan business failures. In fact, the article aims to answer the following question: How do entrepreneurial behaviors and attitudes influence

Business failure in Morocco? It is worth clarifying what is meant by the term "business failure". In the definition used by Inforisk, the term is used to describe companies that have initiated a Sauvegarde procedure, receivership, or compulsory liquidation, via the commercial court.

To answer our research problem, we employ multiple regression models. Entrepreneurial behaviors and attitudes are collected from the Global Entrepreneurship Monitor (GEM) database. We supplement our data with entrepreneurial variables obtained from the World Bank entrepreneurship database and OMPIC.

According to variable selection techniques and models selection criteria, AIC and BIC, the main results indicate that the model composed of variables related to entrepreneurial behavior and attitudes variables, specifically fear of failure rate, perceived capabilities rate, and perceived opportunities rate, better explains bankruptcy rate.

This scientific paper contributes to the literature on business failure in two ways. Firstly, to the best of our knowledge, it is the first empirical study in Morocco to use entrepreneurial behaviors and attitudes variables to examine their influence on business failure. The limited research on business failure in Morocco has been based on studying financial and accounting ratios. These studies have obscured the potential relevance of entrepreneurial influences on business failure, such as entrepreneurial behaviors and attitudes. Secondly, we add to the literature the importance of fear of failure rate, perceived capabilities rate, and perceived opportunities rate in understanding Moroccan business failure.

The remainder of the article is structured as follows. Firstly, we review the existing literature. Secondly, we describe the methodology, namely data sources, variables definitions, and models presentation. Lastly, we present the results, their discussions, and their practical implications.

2. Literature review

According to Schumpeter (1949), entrepreneurship is associated with increased well-being and innovation. Nevertheless, Baumol (1996) has distinguished three types of entrepreneurship: productive, unproductive, and destructive. For the latter two, entrepreneurship has a negative effect on society. Business failure is a common occurrence in the world of entrepreneurship. Dyer (1995) describes the careers of entrepreneurs as "fraught with business failure". Altman (1983) asserted that bankruptcy rates increase with the number of entrepreneurial activities. Fu et al. (2020) concluded that insolvency is related to entrepreneurial activities in various ways.

Entrepreneurial behaviors and attitudes represent universal determinants that influence the decision to start a business, playing a pivotal role in the company's performance and sustainability. Numerous studies have demonstrated that the fear of failure, perceived opportunities, and capabilities are among the main drivers of entrepreneurial behaviors (Arenius & Minniti, 2005; Cacciotti et al., 2016; Duong & Vu, 2024; Koellinger et al., 2004; Kücher et al., 2020; Moghaddam et al., 2023; Morris et al., 2024).

According to Kirzner (1979), entrepreneurs are individuals most likely to detect existing opportunities in their environment. Indeed, opportunity recognition is considered the most fundamental and distinctive expression of entrepreneurial behavior (Minniti & Nardone, 2007). Moreover, role models play a crucial role in reinforcing self-efficacy by providing the information needed to create enterprises and reduce the degree of ambiguity (Minniti, 2004, 2005).

As far as fear of failure is concerned, it is primarily studied as a psychological factor that hinders business creation (Bosma & Levie, 2010; Hatala, 2005). Indeed, several studies have demonstrated that fear of failure has a negative impact on entrepreneurial activity (Li, 2011; Minniti & Nardone, 2007; Langowitz & Minniti, 2007), while other research has proposed that fear of failure can elicit both motivational and inhibitory responses in entrepreneurial activity (Ray, 1994; Mitchell & Shepherd, 2011).

In entrepreneurship, fear of failure has been studied from both economics and psychology perspectives (Cacciotti et al., 2016). From an economic standpoint, perceptions of the fear of failure have a negative impact on entrepreneurship as a career choice (Arenius & Minniti, 2005). Numerous studies have proposed that the probability of starting a business increases with a reduction in these perceptions (Langowitz & Minniti, 2007; Morales-Gualdron & Roig, 2005; Wagner, 2007). It should be noted that studies on the perception of the fear of failure have generally been based on the GEM database, where the fear of failure is measured as follows "fear of failure would prevent me from starting a business" (Bosma & Levie, 2010).

From a psychological perspective, fear of failure is associated with behavioral and psychological outcomes, it is a negative feeling that results from anticipating the possibility of failure (Chua & Bedford, 2016; Welpe et al., 2012; Wood et al., 2013, 2014). By using a three-phase random sampling to collect data from 1,890 graduate students in Vietnam, Duong and Vu (2024) found that the mediating effect of fear of failure on the relation between Entrepreneurial education and entrepreneurial intention weakens as the level of fear of failure increases.

Despite previous research contributing to a better understanding of the role of fear of failure in entrepreneurial activity, important questions remain as to its relationship with business failure.

Hypothesis 1: Fear of failure is positively associated with the rate of business failure.

When considering capabilities, they emerge as crucial for a company's survival, directly influencing its operations (Analoui & Karami, 2003). Within a company, entrepreneurs serve as the main actors responsible for acquiring skills and qualifications relevant to the development and success of their organizations (Al-Hawary & Al-Syasneh, 2020; Bruderl & Schussler, 1990; Savitri, 2018). Conversely, insufficient human capital, especially a lack of skills, within a company can results in challenges in corporate policy

and strategy, leading to poor performance compared to competitors (Franco & Haase, 2010; Kotsios, 2023; Kücher et al., 2020; Ooghe & De Sofie, 2008).

Literature on this subject has demonstrated that among the discriminating determinants between normal and failing businesses are education, management, and industry experience (Alvarado Valenzuela et al., 2023; Gimeno et al., 1997; Lussier & Halabi, 2010; Lussier & Pfeifer, 2001; Rauch & Rijsdijk, 2013). These determinants increase a company's probability of survival (Lussier & Halabi, 2010). Consequently, higher levels of education and information processing reduce the risk of failure (Shane & Venkataraman, 2000).

Similarly, several studies have highlighted the importance of education in entrepreneurial survival models (Carter & Van Auken, 2006; Cooper et al., 1994; Lussier & Halabi, 2010; Okunevičiūtė-Neverauskienė & Pocius, 2010). Based on data collected from master's students registered in Pakistan's leading universities, Martins et al. (2023) found that entrepreneurial innovativeness, entrepreneurial skills, and the ability to take risks significantly impact entrepreneurial intention. Additionally, higher education can be seen as an indicator of awareness regarding various potential risks and the prevention of internal and external threats. Carter and Van Auken (2006) concluded that having a university degree helps in preparing for entrepreneurial activity and significantly reduces the probability of failure, as graduates possess the skills needed to manage and develop their businesses.

Hypothesis 2: Entrepreneurial capabilities, such as education, industry experience, and management skills, decrease the rate of business failure.

3. Methodology

3.1. Database source

To answer our research question, we use three different databases. We collected entrepreneurial behavior and attitudes variables from the Global Entrepreneurship Monitor (GEM) database. GEM conducts survey-based research on entrepreneurial ecosystems and entrepreneurship worldwide, serving as the sole international research source that collects data from individual entrepreneurs.

GEM's research involves 115 countries, with a standardized survey, the Adult Population Survey (APS), administrated to a sample of at least 2,000 individuals in each country. For this research, the data is specific to Morocco. Detailed information on GEM data and methodology can be found in Reynolds et al. (2005) and Bosma and Levie (2010).

In addition to the data on entrepreneurial behavior and attitudes obtained from the Global Entrepreneurship Monitor (GEM) database, we complement our dataset with other entrepreneurial variables sourced from the World Bank entrepreneurship database and Office Marocain de la Propriété Industrielle et Commerciale (OMPIC). Specifically, we include data on newly registered companies with limited liability, new business density rate, and new firm creation. The World Bank entrepreneurship database project collects data on registered firms between 2006 and 2020.

Due to the unavailability of data beyond the year 2020 in the World Bank's entrepreneurship database and the absence of data on entrepreneurial behavior and attitudes in Morocco before 2015, our research covers the period 2015–2020.

3.2. Variable definitions

Dependent variable

Our variable to be explained is the business failure rate over the period 2015–2020, representing the growth rate of business failure for all Moroccan companies. The number of business failures is provided by Inforisk, the official source of statistics on business failures in Morocco. Inforisk defines business failure as the opening of safeguard procedure, receivership, or compulsory liquidation by the commercial court.

Independent variables

We have grouped the independent variables into two categories. The first category relates to indicators of entrepreneurial behavior and attitudes (Table 1) and the second to indicators of business creation (Table 2).

a – Entrepreneurial Behavior and Attitudes;

Indicators of entrepreneurial behavior and attitudes are measured by the Adult Population Survey (APS). Adult Population Survey (APS) examine social attitudes towards entrepreneurship and explore the characteristics, motivations, and ambitions of individuals who set up a business.

b – Business creation;

The World Bank's Entrepreneurship Database project collects data on registered firms over the period 2006–2020. This database enables the analysis of the formal private sector's evolution and the identification of the factors encouraging businesses to initiate or transition into the formal sector.

3.3. Model selection in linear regression

The Gaussian linear model or multiple regression is considered with the objective of predicting a quantitative variable by a set of quantitative variables or a combination of quantitative and qualitative ones (covariance analysis). The objective is to search for a parsimonious model ensuring a good balance between the quality of the adjustment and the variance of the parameters in order to minimize the empirical risk. This involves using algorithms such as backward, forward, stepwise, etc., for model selection by minimizing penalized criteria (AIC, BIC) and selecting variables.

Classical regression models exhibit robust stability in the face of sample fluctuations, and possess the ability to scale up to massive data. This reliability explains why they still remain widely used, particularly when the function to be modeled is linear.

Table 1. Details of entrepreneurial behaviors and attitudes variables

Variable	Definition	Source
Entrepreneurial Intentions Rate	Percentage of the population aged between 18 and 64 who are latent entrepreneurs and intend to start a business within the next three years.	Global Entrepreneurship Monitor (GEM)
Fear of Failure Rate	Percentage of the population aged between 18 and 64 who indicate that fear of failure would prevent them from starting a business.	Global Entrepreneurship Monitor (GEM)
Perceived Capabilities Rate	Percentage of the population aged between 18 and 64 who believe they have the required knowledge and skills to set up a business.	Global Entrepreneurship Monitor (GEM)
Perceived Opportunities Rate	Percentage of the population aged between 18 and 64 who see good opportunities to set up a business in the area where they live.	Global Entrepreneurship Monitor (GEM)

Table 2. Details of business creation variables

Variable	Definition	Source
Newly registered companies with limited liability	The number of newly registered companies with limited liability (or their equivalent) per calendar year.	World Bank
New business density rate	The number of newly registered companies with limited liability per 1,000 people of working-age (ages 15–64), per calendar year.	World Bank
New Firm creation	The number of companies created per year in the 12 regions of Morocco, regardless of their legal form.	OMPIC

Model

A quantitative variable Y said to be explained is related to p quantitative variables $X^1,\ X^2,\ldots,X^p$ called explanatory.

Writing the linear model in this situation leads to assuming that the expectation of Y belongs to the subspace of $\mathbb{R}^n$ generated by $\left\{1,\ X^1,\ X^2,\ldots,X^p\right\}$ the $(p+1)$ random variables verify:

$$Y_i=\beta_0+\beta_1X_i^1+\beta_2X_i^2+\ldots+\beta_pX_i^p+\varepsilon_i,\quad i=1,2,\ldots,n. \quad (1)$$

With the following hypotheses:

1. The ε_i are independent and identically distributed error terms; $E(\varepsilon_i)=0,\ Var(\varepsilon)=\sigma^2I$.

2. The terms X^j are assumed to be deterministic (controlled factors) or else the error ε independent of the joint distribution of $X^1,\ X^2,\ldots,X^p$. In the latter case we write that:

$$E(Y\left|X^1,\ X^2,\ldots,X^p\right.)=\beta_0+\beta_1X_i^1+\beta_2X_i^2+\ldots+\beta_pX_i^p$$
$$\text{and } Var(Y\left|X^1,\ X^2,\ldots,X^p\right.)=\sigma^2. \quad (2)$$

3. Unknown parameters $\beta_0,\ \beta_1,\ldots,\beta_p$ are assumed to be constant.

4. As an option, for the specific study of the laws of estimators, a fourth hypothesis considers the normality of the error variable $\varepsilon\left(N\left(0,\sigma^2I\right)\right)$. The ε_i are then i.i.d. of law $N\left(0,\sigma^2\right)$.

The data are stored in a matrix $X\left(n\times(p+1)\right)$ with general term X_i^j. That the first column contains the vectors 1 $(X_0^i=1)$ and in a vector Y with general term Y_i. Noting the vectors $\varepsilon=\left[\varepsilon_1\ldots\ \varepsilon_p\right]'$ and $\beta=\left[\beta_0\ \beta_1\ldots\ \beta_p\right]'$, the model is written matrixly:

$$Y=X\beta+\varepsilon. \quad (3)$$

A regression without a constant implies that the regression line should run through the origin, i.e., the point where both the response variable and predictor variable equal zero.

The constant term in regression analysis is the value at which the regression line crosses the y-axis. The constant is also known as the y-intercept.

Coefficient of determination

We call the coefficient of determination the ratio:

$$R^2=\frac{SSR}{SST}. \quad (4)$$

With SST is the total sum of squares, and SSR is the regression sum of squares.

Which is therefore the part of variation in Y explained by the regression model. Geometrically, it is a ratio of squares of length of two vectors. It is therefore the square cosine of the angle between these vectors: Y and its projection $\hat{Y}$ on $Vect(X)$.

The quantity R is called the multiple correlation coefficient between Y and the explanatory variables, it is the usual correlation coefficient between Y and its prediction $\hat{Y}$.

3.4. Variable selection algorithms

Step by step

Selection (forward): At each step, a variable is added to the model. This is the one that allows us to best reduce the AIC criterion of the model obtained. The procedure stops when all the variables are introduced or when AIC no longer decreases.

Elimination (backward): The algorithm starts with the complete model. In each step, the variable whose elimination results in the lowest AIC is removed. The procedure stops when AIC ceases to decrease.

Mixed (both) This algorithm introduces a variable elimination step after each selection step in order to remove

from the model possible variables which would have become less essential due to the presence of those newly introduced.

Selection criteria: AIC, BIC

The Akaïke's information criterion (1974) (AIC) is derived from an expression of the model's quality based on Kullback dissimilarity. It shares a similar but more general form than the Mallows (1995). AIC is applicable to any model estimated by maximizing a log-likelihood L and assumes that the family of densities considered to model the law of Y contains the "true" density of Y.

After some developments including numerous approximations (estimation of parameters by maximum likelihood, asymptotic properties, Taylor formula), the Akaïke criterion takes the form Akaïke (1974):

$$AIC = -2L + 2\frac{d}{n}, \tag{5}$$

where d is the number of model parameters (number of variables plus one), n the number of observations.

A Bayesian type argument leads to another criterion, Bayesian Information Criterion (Schwarz, 1978). BIC aims, approximately (asymptotically), to identify the model associated with the greatest posterior probability. In the case of a model resulting from the maximization of a log-likelihood, it takes the form:

$$BIC = -2L + \log(n)\frac{d}{n}. \tag{6}$$

Table 3. List of variables

Variable	Abbreviation
Entrepreneurial Intentions Rate	EIR
Fear of Failure Rate	FFR
Perceived Capabilities Rate	PCR
Perceived Opportunities Rate	POR
Entrepreneurship as a Good Career Choice Rate	EGCCR
Number of New Limited Liability Companies	NNLLC
New Firm Creation	NFC
New business density rate	NBDR
Bankruptcy_rate	BR

4. Results

Table 3 summarizes all the list of variables.

4.1. Descriptive statistics

We start with a descriptive study of the data during the years 2015–2020. The results are summarized in the Table 4. We note that the dependent variable BR varies between –0.21 and 0.24. the median of this variable (0.10) is far from its mean (0.06), and its standard deviation (0.16) is higher than its mean. Consequently, we conclude that the progression of the dependent variable (BR) is dispersed.

For all independent variables, we note that they have progressed homogeneously. In fact, for each independent variable, the median is near the mean and the standard deviation is very small compared with the mean.

We can see that for the survey population; 37% on average are latent entrepreneurs and intend to start a business within three years. Additionally, 45% on average indicate that fear of failure would prevent them from setting up a business. Furthermore, 51% on average believe they have the required skills and knowledge to start a business. While 44% on average see good opportunities to start a firm in the area where they live. 75% on average agree with the statement that in their country, most people consider starting a business as a desirable career choice.

Following this descriptive data summary, we proceed to examine the correlations between the independent variables as well as between them and the dependent variable. the study of correlations between variables requires the use of a statistical test to verify the significance of correlations. These tests include Pearson's parametric test (for variables following the normal distribution) and Spearman's non-parametric test (for variables not following the normal distribution). Therefore, we need to test the normality of the variables before determining which test to use to test the significance of the correlations between the variables.

To test the normality of the variables we choose two tests. The first is the parametric Shapiro-Wilk test and the second is the non-parametric Kolmogorov-Smirnov test.

Table 4. Descriptive statistics of variables

Indicators	Independent variables								Dependent variable
	EIR	FFR	PCR	POR	EGCCR	NNLLC	NFC	NBDR	BR
Min	26.64	32.85	29.54	33.58	61.11	35840	69555	1.57	–0.21
1st Qu	31.69	39.30	48.08	35.11	71.92	39295	76199	1.70	0.00
Median	38.01	41.80	52.85	41.34	77.56	42744	81957	1.81	0.10
Mean	37.24	45.37	51.43	44.24	75.21	44086	82766	1.87	0.06
Std	8.04	11.29	12.50	11.02	8.19	$7.05 * 10^3$	$1.00 * 10^4$	0.26	0.16
3rd Qu	41.40	50.30	60.79	54.22	80.97	48782	90899	2.04	0.15
Max	48.70	64.15	63.40	57.66	82.90	54250	94964	2.24	0.24

Note: Std: Standard deviation, 1st Qu: First quartile, 3st Qu: third quartile.

The results of the two tests are shown in the following Table 5. We can see from the results above that the null hypothesis is accepted in both tests and for all variables (p-value > 0.05). Consequently, we opt for the Pearson test to study the significance of correlations between variables.

The correlations are summarized in the following Table 6. We can note that the EIR variable is strongly correlated with NNLLC (0.89*) and NBDR 0.90*, PCR variable is highly correlated with FFR (−0.82*), EGCCR (0.99***) and POR (0.86*), POR and EGCCR are also strongly correlated (0.84*). NNLLC and NBDR variables are perfectly linearly dependent (correlation = 1.00***). On the other hand, we note that the dependent variable BR is strongly correlated only with the variables EIR, NNLLC and NBDR.

The independent variables FFR, PCR, POR, EGCCR and NFC were not significantly correlated with BR. For this reason, we are seeking appropriate transformations to correlate these variables significantly with the dependent variable BR. This is the object of the following section.

4.2. Variable transformations

In this section, we propose to look for appropriate transformations of independent variables that are not significantly correlated with the BR dependent variable.

According to the correlation table, the variables not significantly correlated with the BR variable are: FFR, PCR, independent variable not significantly correlated with BR. The graphical visualizations of the BR variables as a POR, EGCCR and NFC. For this reason, we visualize the BR variable graphically as a function of each function of these variables are given in the Appendix a.

Based on this graphical visualization and after testing a set of transformations for each variable, we suggest the following transformations:

$$\begin{aligned} FFR_t^* &= \cos\left(\frac{FFR_t}{2}\right) + \cos\left(FFR_t\right); \\ PCR_t^* &= \sin\left(3PCR_t\right); \\ POR_t^* &= POR_t + 25 * \left(t - 2015\right); \\ EGCCR_t^* &= \sin\left(3EGCCR_t\right); \\ NFC_t^* &= \ln\left(NFC_t\right) + t. \end{aligned} \tag{7}$$

Note that (variable*) signifies the transformation of (variable). The graphs of the BR variable as a function of the new transformations over the period $t \in [2015, 2020]$ are presented in the Appendix b.

The correlations between the BR variables and the new transformations are summarized in the following Table 7.

Table 7. Correlation matrix

Dependent variable	New transformations				
	FFR*	PCR*	POR*	EGCCR*	NFC*
BR	−0.87*	−0.89*	−0.82*	0.71	−0.84*

Note: Signif. codes (*p*-value): '***' ≤ 0.001 < '**' ≤ 0.01 < '*' ≤ 0.05 < '.' ≤ 0.1 ' ' > 0.1.

It is observed that all the new transformations are significantly correlated with the BR variable except the EGCCR* variable.

Table 5. Normality test

List of variables	Independent variables p-value								Dependent variable p-value
	EIR	FFR	PCR	POR	EGCCR	NNLLC	NFC	NBDR	BR
Shapiro-Wilk	0.95	0.52	0.36	0.13	0.37	0.73	0.73	0.68	0.64
Kolmogorov-Smirnov	0.96	0.20	0.54	0.45	0.67	0.52	0.80	0.43	0.62
Accepted hypothesis	H0 in both tests and for all variables								

Table 6. Correlation matrix

List of variables	Independent variables								Dependent variable
	EIR	FFR	PCR	POR	EGCCR	NNLLC	NFC	NBDR	BR
EIR	1.00	–0.17	0.35	0.73.	0.31	0.89*	0.62	0.90*	–0.79.
FFR		1.00	−0.82*	–0.55	−0.78.	0.02	0.46	0.01	–0.19
PCR			1.00	0.86*	0.99***	0.39	–0.06	0.39	–0.13
POR				1.00	0.84*	0.78.	0.43	0.78.	–0.47
EGCCR					1.00	0.38	–0.05	0.39	–0.10
NNLLC						1.00	0.76.	1.00***	–0.87*
NFC							1.00	0.76.	–0.55
NBDR								1.00	–0.87*
BR									1.00

Note: Signif. codes (*p*-value): '***' ≤ 0.001 < '**' ≤ 0.01 < '*' ≤ 0.05 < '.' ≤ 0.1 ' ' > 0.1.

4.3. Models

In this sub-section, we present our proposed models explaining the dependent variable BR through the aforementioned independent variables.

We divide the independent variables into two groups: Group 1: consisting of the independent variables EIR, FFR*, PCR* and POR*. Group 2: consisting of the independent variables NNLLC, NFC* and NBDR. We exclude the EGCCR variable because it is similar to the POR variable.

For each group of independent variables, we propose the six types of model mentioned in the methodology section: Full model, Constant model, Without constant model, Forward model, Backward model and the Both model.

BR explanations through of Group 1 variables

We propose the following models:

For group 1, we note: Full model = FM1, Constant model = CM1, Without constant model = WCM1, Forward model = FoM1, Backward model = BaM1, Both model = BM1.

The results of these six models for this group are summarized in the following Table 8.

From the Table 8, the models with the lowest AIC and BIC criteria are: FM1, FoM1, BoM1 & BM1 (AIC = –46.03 & BIC = –47.28). Furthermore, all models converge and exhibit excellent data fit (Adjusted R2 = 0.999). Consequently, the optimal model explaining the dependent variable BR through the independent variables of group 1 is as follows:

Therefore, the prediction of the BR variable by the first group variables at a future year T is as follows:

$$\begin{aligned}&(M1): BR_t^* = 0.033 + 0.004EIR_t + 0.282FFR_t^* - \\ &0.409PCR_t^* - 0.002POR_t^* + \varepsilon_{t1}; \\ &\varepsilon_{t1} \sim \mathcal{N}\left(0, \sigma_1^2\right).\end{aligned} \tag{8}$$

The standard deviation of the theoretical error of this model is estimated by the residual standard deviation: Residual Std. Error $\hat{\sigma}1 = 0.005$.

Therefore, the prediction of the BR variable by the first group variables at a future year T is as follows:

$$\begin{aligned}&(\bar{M}1): \overline{BR}_T^* = 0.033 + 0.004\overline{EIR}_T + 0.282\overline{FFR}_T^* - \\ &0.409\overline{PCR}_T^* - 0.002\overline{POR}_T^*.\end{aligned} \tag{9}$$

From this model we can deduce that:

- BR exhibits growth in tandem with EIR and FFR^*, where a 100% increase in EIR corresponds to an 88% increase in BR, and a similar increase in FFR^* results in a growth of BR by 0.282.
- BR evolves in the opposite direction of PCR^* and POR^*, where a 100% increase in PCR^* leads to a decrease in BR by 0.409, and a similar increase in POR^* results in a decrease in BR by 0.002.

Total average factor productivity is estimated at 0.033.

Note that the variables FFR^*, PCR^* and POR^* are respectively transformations of the original variables FFR, PCR and POR. Consequently, it is necessary to return to these original variables to explain BR by these variables.

Table 8. Models explaining the BR variable via group 1 variables

Dependent variable: BR			
	CM1	BR FM1,FoM1 BoM1 & BM1	WCM1
EIR		0.004* (0.001)	0.005*** (0.0003)
FFR*		0.282** (0.014)	0.287*** (0.021)
PCR*		−0.409** (0.015)	−0.418*** (0.022)
POR*		−0.002** (0.0001)	−0.002*** (0.0001)
Constant	0.059 (0.065)	0.033 (0.017)	
Observations	6	6	6
R2	0.000	1.000	0.999
Adjusted R2	0.000	0.999	0.998
Residual Std. Error	0.160 (df = 5)	0.005 (df = 1)	0.007 (df = 2)
F Statistic		1,442.406** (df = 4; 1)	692.579*** (df = 4; 2)
AIC	–2.06	–46.03	–38.55
BIC	–2.48	–47.28	–39.59

Note: *p < 0.1; **p < 0.05; ***p < 0.01.

Thus:

The function $FFR^* = \cos\left(\frac{FFR}{2}\right) + \cos\left(FFR\right) = 2\left(\cos\left(\frac{FFR}{2}\right) - \frac{1}{2}\right)\left(\cos\left(\frac{FFR}{2}\right) + 1\right)$ is positive if and only if $FFR \in \left[4k\pi, \frac{2\pi}{3} + 4k\pi\right]$, $k = 0,1,2,\ldots$. Since BR grows in the same direction as FFR^*, then FFR has a positive impact on BR for FFR values such as $FFR \in \left[4k\pi, \frac{2\pi}{3} + 4k\pi\right]$, $k = 0,1,2,\ldots$. In the reverse case, FFR impacts negatively BR. We observe that the width of the interval is $\frac{2\pi}{3} \simeq 2{,}09$. The impact of FFR on BR varies for each interval of 2.09% length.

The function $PCR^* = \sin\left(3PCR\right)$ is positive if and only if $PCR \in \left[\frac{2k\pi}{3}, \frac{(2k+1)\pi}{3}\right]$, $k = 0,1,2,\ldots$. Since BR evolves in the opposite direction of PCR^*, then PCR has a negative impact on BR for PCR values such as $PCR \left[\frac{2k\pi}{3}, \frac{(2k+1)\pi}{3}\right]$, $k = 0,1,2,\ldots$. In the reverse case, PCR positively impacts BR. Or, the width of the interval is $\frac{\pi}{3} \simeq 1{,}04$, so the PCR impact on BR varies for each interval of 1.04% length.

According to *POR**'s formula, *POR** and *POR* grow in the same direction, so *POR* and *BR* grow in opposite directions.

BR explanations through of Group 2 variables

We propose the following models:

For group 2, we note: Full model = FM2, Constant model = CM2, Without constant model = WCM2, Forward model = FoM2, Backward model = BaM2, Both model = BM2.

The results of these models are summarized in the following Table 9.

Table 9. Models explaining the BR variable via group 2 variables

Dependent variable: BR				
	CM2	FM2 & BaM2	WCM2	FoM2 & BM2
NNLLC		−0.001 (0.001)	−0.0001 (0.0003)	−0.00002** (0.00001)
NFC*		0.207 (0.230)	0.0002 (0.001)	
NBDR		14.934 (16.732)	2.306 (8.871)	
Constant	0.059 (0.065)	−421.192 (467.012)		0.934** (0.245)
Observations	6	6	6	6
R2	0.000	0.837	0.803	0.765
Adjusted R^2	0.000	0.592	0.606	0.706
Residual Std. Error	0.160 (df = 5)	0.102 (df = 2)	0.099 (df = 3)	0.087 (df = 4)
F Statistic		3.414 (df = 3; 2)	4.072 (df = 3; 3)	13.011** (df = 1; 4)
AIC	–2.06	–6.94	–6.89	–8.75
BIC	–2.48	–7.98	–7.72	–9.38

Note: *p < 0.1; **p < 0.05; ***p < 0.01.

From the Table above, the models with the lowest AIC and BIC criteria are: FoM2 & BM2 (AIC= –8.75 & BIC = –9.38). Furthermore, all models converge and exhibit excellent data fit (Adjusted R^2 = 0.706). Consequently, the optimal model explaining the dependent variable BR through the indepdent variables of group 2 is as follows:

$$\left(M2\right): BR_t^* = 0.934 - 0.00002 NNLLC_t + \varepsilon_{t2}; \quad \varepsilon_{t2} \sim \mathcal{N}\left(0, \sigma_2^2\right). \tag{10}$$

The standard deviation of the theoretical error of this model is estimated by the residual standard deviation: Residual Std. Error $\sigma_2 = 0.087$.

Hence, the prediction of the BR variable by the second group variables at a future year T is as follows:

$$\left(\bar{M}2\right): \overline{BR_T}^* = 0.934 - 0.00002 \overline{NNLLC}_T. \tag{11}$$

From this model we can deduce that:

- BR grows in the opposite direction of NNLLC, where a 100% increase in NNLLC results in a decrease of BR by 0.00002.
- Total average factor productivity is estimated at 0.934.

4.4. Comparison between explaining BR via group 1 variables or via group 2 variables

According to the previous sub-section, the models retained in the first and second groups are $M1$ and $M2$, respectively. Or $AIC\left(M1\right) < AIC\left(M2\right)$ and $BIC\left(M1\right) < BIC\left(M2\right)$, also Adjusted $R^2\left(M1\right) >$ Adjusted $R^2\left(M2\right)$. Therefore, the best model between the two is the Group 1 model $\left(M1\right)$.

Consequently, we deduce that the variables in the first group better explain Bankruptcy rate (BR) than Group 2 variables.

5. Discussion

The results of the selected best model show that fear of failure rate, perceived capabilities rate, and perceived opportunities rate have a significant impact on the business failure rate in Morocco.

With regard to the impact of fear of failure rate on the business failure rate, our results indicate that the influence of fear of failure rate on the business failure rate remains unclear. Unlike previous studies conducted in different contexts, which have emphasized that fear of failure plays a pervasive and central role in entrepreneurship, particularly in explaining entrepreneurial behavior and decision-making (Al Halbusi et al., 2024; Cacciotti & Hayton, 2015; Morgan & Sisak, 2016). Our findings do not provide conclusive evidence supporting this relationship. Therefore, we reject the first hypothesis that fear of failure is positively associated with the rate of business failure.

Fear of failure has received considerable attention in recent years (Mitchell & Shepherd, 2010; Wood et al., 2014; Cacciotti & Hayton, 2015; Cacciotti et al., 2016). According to Mitchell et al. (2014), fear of failure should be seen as potentially exerting a motivating effect on entrepreneurial behavior rather than solely an inhibiting one. Indeed, fear of failure may depend on the entrepreneur's position in the entrepreneurial process. Using a sample of 979 higher education students from four Latin American countries, Galindo-Martin et al. (2023) demonstrated that fear of failure negatively influences attitude and perceived behavioral control in the Brazilian and Mexican samples. Consequently, it is important to consider fear if failure as a key antecedent of perceived behavioral control and attitude to enhance the likelihood of higher entrepreneurial intention among students.

Cacciotti et al. (2016) employed a qualitative approach to explore the experience of fear of failure at different stages of the entrepreneurial process. The study, based on 65 interviews with entrepreneurs and potential entrepreneurs in Canada and the United Kingdom, highlighted

that fear of failure is a complex phenomenon, encompassing aspects of action, cognition, and affect.

According to Wyrwich et al. (2016), observing peers who can succeed in entrepreneurship should reduce the observer entrepreneur's fear of failure. This finding aligns with several previous studies demonstrating a positive relationship between the presence of entrepreneurial role models and engagement in entrepreneurship, as well as entrepreneurial intentions (Arenius & Minniti, 2005; Van Auken et al., 2006; Lafuente et al., 2007).

Our results indicate that the perceived capabilities rate has not a clear impact on the business failure rate. These results are inconsistent with previous finding (Headd, 2003; Santos et al., 2023). Headd (2003) found that individuals with a university degree over the age of 35 were less likely to close their businesses. Santos et al. (2023) have suggested how digitization influences entrepreneurial resilience. The authors analyzed 42 reflective interviews with entrepreneurs who had successfully coped with the COVID-19 pandemic. The emergence of new digital technologies enabled companies to avoid bankruptcy during the COVID-19 crisis. Digital technologies are key to assessing and exploiting opportunities, improving efficiency, and boosting a company's competitiveness, particularly in a world of uncertainty.

Kücher et al. (2020) examined the relationship between entrepreneurial characteristics such as education, experience, gender, and age, and the probability of internal causes of bankruptcy. The authors applied logistic regression analyses to a sample of 102 Austrian corporate bankruptcies in 2012. The results showed that management experience significantly reduces the risk of bankruptcy. However, the results of the same study showed that the entrepreneur's university degree has no significant impact on the studied causes of bankruptcy. **Therefore, we reject the second hypothesis.**

According to our results, the perceived opportunities rate has a negative impact on the business failure rate. Ben Jabeur et al. (2021) used partial least squares regression (PLS) and fuzzy-set qualitative comparative analysis (fsQCA) to investigate the relationship between the aggregate business bankruptcy and three macro-level factors, namely entrepreneurship activity, government effectiveness, and control of corruption for six European countries from 2004 to 2017. The finding found that countries with a high level of entrepreneurial activity and new firm creation may experience an increase in the number of company failures.

For Plehn-Dujowich (2010), an entrepreneur's career doesn't necessarily end in failure. Entrepreneurs who have experienced failure often embark on new projects. Failure is not a "one-way exit", but a "revolving door" (Stokes & Blackburn, 2002). The act of creating a new business, leaving it, and subsequently creating another has been described as "serial entrepreneurship" (Ucbasaran et al., 2006; Sarasvathy et al., 2013). Peng et al. (2023) highlighted that using past experiences and adjusting risk preferences helps serial entrepreneurial businesses perform better in China.

Entrepreneurs can learn more from failure than from success (McGrath, 1999). Indeed, lessons can be learned from failure (Alvarez & Parker, 2009). For instance, failure can enhance abilities to assess the value of entrepreneurial opportunities and judge the relevance of information (Cooper et al., 1995; Davidsson & Honig, 2003). Moreover, the ability to recover from failure is fundamental for fostering resilience (Shepherd, 2003; Shepherd et al., 2009). Entrepreneurs who have experienced failure, postfailure entrepreneurs, may find themselves in a unique position to successfully launch new businesses (Shepherd et al., 2009; Uriarte et al., 2023).

6. Conclusions

Cultural-specific aspects of entrepreneurship are unique to each country. Morocco as a North African country has its own entrepreneurial specificities. In this country, the business failure rate has reached a new record in 2023. According to Inforisk forecasts, this rate will continue to reach new records, with 16,000 business failures by the end of this year. Based of these two motivations, the aim of this article is to identify the entrepreneurial determinants of Moroccan business failure.

To address our research problem, we selected entrepreneurial variables from three different databases. Global Entrepreneurship Monitor to select entrepreneurial behavior and attitudes. World Bank entrepreneurship and OMPIC databases to obtain business creation variables. We proposed multiple regression models developed for two groups of variables. The first group consists of entrepreneurial behavior and attitudes and the second one includes business creation variables. In fact, for each group, we suggested six models, namely full model, constant model, without constant model, forward model, backward model and both model.

Following multiple regression analysis metrics and model selection criteria, we found that entrepreneurial behavior and attitudes, particularly fear of failure rate, perceived capabilities rate, and perceived opportunities rate better explain bankruptcy rate.

Overall, these findings are suggestive, and more work in this research area is required. The article has practical implications for company managers and financial institutions in Morocco. Regarding Moroccan managers, considering the variables proposed in this study will help them prevent the occurrence of business failure. For the financial institutions, the suggested results could assist in integrating these specific variables into their predictions models, thereby reducing costs associated with credit defaults.

However, this article has several limitations. Firstly, our data is confined to entrepreneurial variables. Secondly, the data is limited to one single country, Morocco.

Finally, this article could open up new perspectives for identifying entrepreneurial variables that explain business failure in Morocco. To the best of our knowledge, our research is the first to explore this topic. For future research

perspectives, it would be valuable to integrate additional variables related to macroeconomic and financial explanatory approaches to business failure, as well as to use cross-country datasets to enrich the empirical study.

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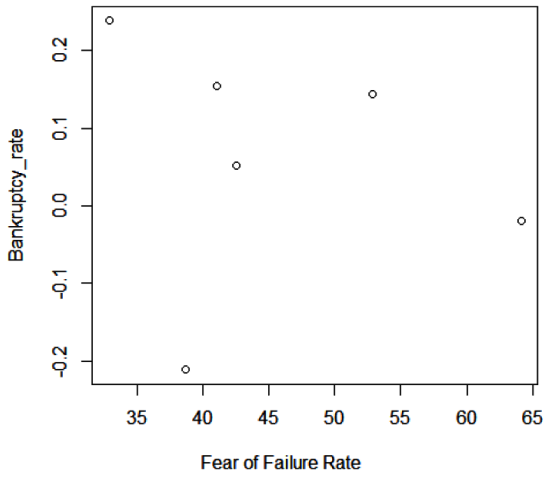
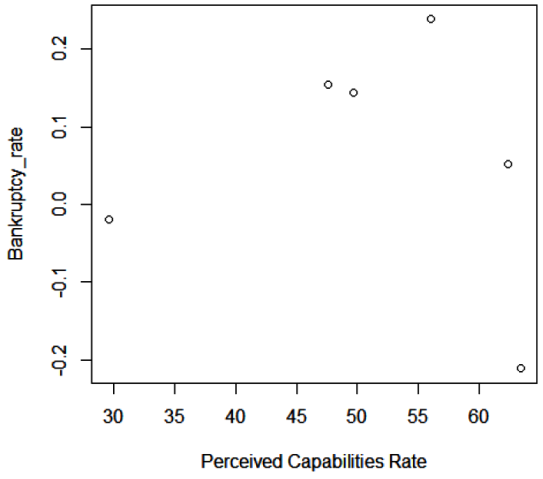
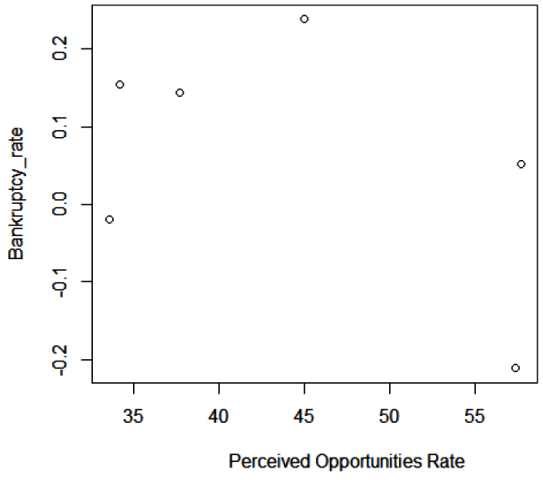
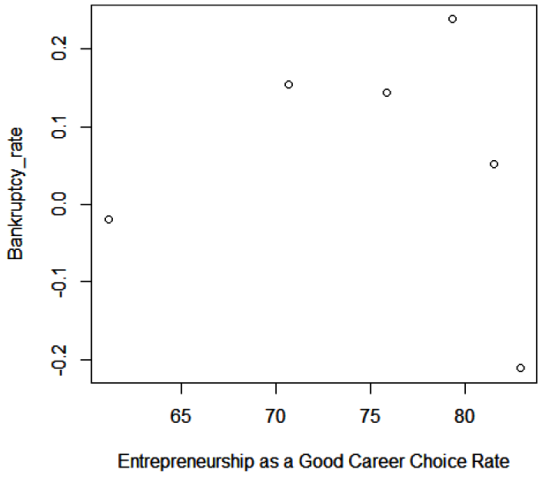
APPENDIX

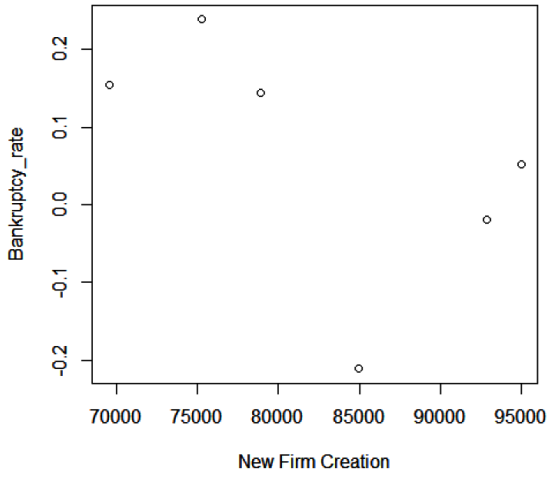
a) business failure as a function of independent variables before transformation











b) business failure as a function of independent variables after transformation