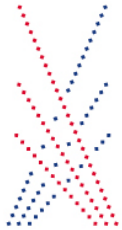

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Do resilient entrepreneurs plan better for adversity?

Maria Wishart
Warwick Business School (Maria.Wishart@wbs.ac.uk)

Halima Jibril
Warwick Business School (Halima.Jibril@wbs.ac.uk)

Summary

In uncertain times, the ability to anticipate and plan for adversity is vital for businesses in general, and small businesses in particular, which may have fewer resources to help them bounce back from an unanticipated crisis. This research sheds light on the relationship between an entrepreneur's individual resilience and the resilience planning practices of their firm. To interrogate this link, this study uses the Connor-Davidson risk scale and a data set of 9,755 micro businesses, with between 1 and 9 employees, in Great Britain, United States and Northern Ireland. We find a significant relationship between individual resilience and firm-level resilience planning strategies, suggesting that developing an individual leader's resilience may be a route to resilience in their firms. Micro business leaders in the service sector and in the United States appear less likely to translate their personal resilience into a business resilience strategy in their firms, a finding which merits further investigation.

Track

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1. Introduction

The objective of this paper is to shed light on the relationship between the individual resilience of a micro business leader and the resilience planning activities of their business. While business resilience research is a burgeoning field, relatively little resilience research has focused upon the specific context of small and medium sized enterprises (organisations with fewer than 250 employees as defined by the European Union) and none has been identified which has specifically considered micro businesses (firms with between 1 and 9 employees). This is perhaps surprising given the extent of the contribution made by micro business organisations. According to UK government statistics, in 2017 there were 1.11 million micro businesses in the UK, employing around 4.09 million people, and accounting for £552 billion in sales (Roper and Hart, 2018).

A highly resilient organisation is more adaptive, competitive, agile and robust than less resilient organisations, and is able to rebound from adversity strengthened and more resourceful (Wishart, 2018). Understanding what makes micro businesses better able to withstand and bounce back from adversity is clearly something which ought to be of interest to a wide range of stakeholders, including micro business owners and employees, their customers and suppliers, policy-makers and government and non-government agencies with an interest in the job and wealth creation that these organisations can deliver. A limited amount of research has considered the link between a business leader's resilience and that of their firm, but this has tended to focus on medium and large sized businesses. Small business leaders run their businesses differently from larger businesses, and so the findings of research with a larger organisation focus are not necessarily applicable to the small business context (Ates and Bitici, 2011). While there is precedent for using an individual manager resilience score to establish a connection to firm performance, the way that the relationship works has not been fully interrogated, and the link between individual resilience and the presence of firm resilience strategies has not, so far, been explored. By investigating whether there is a significant relationship between individual leader resilience and firm level resilience planning activities, this research aims to address this gap. With its focus on micro firms, the study addresses an under-researched business segment. Addressing the link between the individual resilience score of a micro business leader and the resilience strategies of their businesses, the research asks:

> What is the relationship between the individual resilience level of a micro business leader and the resilience planning approach of their firm? How, if at all, does this relationship vary with geographical location and business sector?

Understanding more about this relationship contributes to scholarship focused on business resilience and on entrepreneurship. It also has practical implications for the ways in which government and support agencies develop policy initiatives to support micro businesses, as well as for the ways in which micro business leaders themselves approach the day to day running of their firms.

This paper proceeds as follows. The theoretical background section which follows this introduction outlines the two broad areas of scholarship that underpin the study, and articulates our hypotheses. The data and methods are followed by a presentation of the empirical results in the findings section. The paper closes with discussion and conclusions, in which we also address the implications of the study.

2. Theoretical background

This study draws on theoretical insight from two areas of scholarship – business resilience research with an SME focus, which includes work on the link between the resilience of leaders and the resilience of their firms, and research which contemplates the relationship between individual characteristics of business leaders and the risk management practices of their organisations.

2.1 Resilience research in an SME context

Literature with a focus on resilience in organisations has delivered a range of insights which have relevance for this study. General resilience research has examined the attributes of employees, suggesting that in some instances individual behavioural capabilities and characteristics may be linked to the ability of an organisation to withstand shocks. These include the capacity to assimilate information quickly (Weick and Sutcliffe, 2006) and the ability to develop networks (Williams et al, 2017). Organisation-level enabling factors, including structural effects such as looser controls (Sutcliffe and Vogus, 2003) and broader empowerment (e.g., Alessi, 2008; Woodman et al, 2010), and stronger external associations (e.g., Van der Vegt et al, 2015; Gimenez et al, 2017; Seville et al, 2008) may encourage and amplify the effects of employee-level characteristics. The link between leader and organisational resilience has been considered in a few studies, and has been identified as a potential future focus for scholarship in this area (Linnenluecke, 2017; Annarelli and Nonino, 2016; Bhamra et al, 2015). Much of this work has focused upon larger organisations.

A limited body of resilience research addresses resilience in the specific context of SMEs. This stream of work includes some focus on the relationship between an SME's leader and the performance of the organisation, including studies that use the Connor Davidson individual resilience scale to explore the link. Ayala and Manzano's (2014) study tests the hypothesis that the resilience of an entrepreneur is correlated with the growth of their business, and finds a positive association. Fisher et al (2016) find that entrepreneurs exhibit high levels of resilience compared to the general population, and also find that resilience is a predictor for entrepreneurial success at the individual level. However they find no significant relationship between individual resilience and business success. Fatoki (2018) uses the CD-10 scale to measure individual resilience of SME owners in South Africa, comparing the scores to the respondents' judgements about the success of their organisations, and concludes that individual resilience in entrepreneurs is a predictor of organisational success. Hiramatsu and Marshall (2018) examine small firms' performance following a natural disaster (Hurricane Katrina). They find that high resilience scores were correlated with firms recovery, along with education level, gender, industry sector, and location of the business premises. These studies indicate a correlation between the individual resilience of the leader, as measured by the CD-RISC scale, and the performance of the business. Arguably, businesses that demonstrate success in terms performance may be better resourced to bounce back from adversity. However, these studies do not interrogate the link between specific behaviours and resilience planning.

Other scholars have adopted qualitative methods to examine the behaviours of SME leaders that may drive resilience in their firms. Powell and Baker (2011) argue that an SME's resilience is strongly correlated with its resourceful activities, which they define as actions that ensure the best use of limited resources, and which are shaped by the commitment of the leader to the business and its success. Whether a leader is driven by ideological

commitments, or by commitments based on their identity with their organisation, can impact on the business behaviours that they drive. Both ideological and identity-based drivers offer routes to resilience. The first tends to produce more rigid 'staying the course' behaviours while the second fosters more flexible approaches, but both can contribute directly to organisational resilience.

Strategic acumen, and in particular the ability of the firm's leader to choose appropriate strategies, is also advanced as a route to SME resilience. Conz et al (2015) find that SME resilience is linked to the ability of the leader to select and implement a range of strategies, depending upon the environment and circumstances they encounter. Strategic diversity driven by the leader is thus advanced as the key to SME resilience. This chimes with the findings of Bamiatzi and Kirchmaier (2014), who attribute resilience in small businesses to a tendency for their leaders to respond to challenging trading environments by embracing higher risk strategies like product innovation rather than the more prosaic retrenching approaches.

Baron and Markman (2000) point to the influence of the social capital and social skills of the leader in driving business success. Social capital is 'the actual and potential resources individuals obtain from knowing others, being part of a social network with them, or merely from being known to them and having a good reputation' (p107) and it is underpinned by social skills, including the ability to read others, and to impress and influence them. It is the combination of social capital and social skills in the leader that is crucial in influencing business success, because while social capital is likely to deliver contacts and opportunities, social skills shape ongoing relationships which are key to business success.

For Bernard and Barbosa (2016) resilience is a process that occurs in some individuals rather than a trait present in them. On their account, the resilience process unfolds over time, often provoked by a traumatic event early in life. Eventually, the resilience process itself can become a trigger for the individual's entrepreneurial ambitions. In this way, resilience is presented as a precursor of entrepreneurship. This notion offers a fresh perspective on the relationship between an organisation's resilience and that of its leader, with the contention that resilient individuals are naturally inclined towards entrepreneurial endeavour. This resonates with the work of De Vries and Shields (2006) who identify flexibility, motivation, perseverance and optimism not as traits, but rather as behavioural patterns which result from life experiences. They assert that these behaviours are present in entrepreneurs, underpinning their personal resilience but also 'the propensity for resilience in [their] business activity' (p42).

In an exploration of the impact of riots on small businesses in London, Doern et al (2016) contends that the mind-set of the owner is central to a resilient business. Distinguishing between *containment* and *anticipation* mind-sets, she notes that owner-managers tend towards the former, responding to crises rather than anticipating and planning for them, and argues that leaders who adopt an anticipation mind-set, thus increasing their response repertoires, and who undertake training to improving their adaptive thinking, will positively influence their firms' resilience. Doern et al (2016) also notes a tendency for prior experience of shocks in business owners to increase the likelihood of resilience SMEs. She also finds that previous experience of such events in local bodies who may provide assistance can mean quicker and better targeted assistance following shocks. This implies that the location of a business may contribute to its ability to bounce back in the event of a shock. It also resonates

with the assertion of others that previous experience of adversity may be key in making individuals and their businesses more able to withstand shocks.

Resilience researchers have also considered characteristics of SMEs which may influence the likelihood of their leaders to plan for adversity. Herbane (2015) provides empirical evidence to highlight the importance of firm age as a determinant of the propensity for SMEs to formalise resilience planning activities. Hammock, (2015) notes that smaller firms are less likely to have a resilience plan, which he attributes to a general assertion in their leaders that a business continuity plan is not necessary. Ownership of the business premises can also arguably affect resilience planning since ownership provides better access to financial resources than renting (Dahlhamer and Tierney, 1998) and firms which own rather than lease their premises have been found to be more likely to undertake resilience planning in previous studies (e.g., Dahlhamer and D'Souza, 1997). Jaaron and Backhouse (2014) advance the view that service organisations may demonstrate enhanced resilience because of a different culture or mind-set. They argue that this may, in part at least, be down to the vanguard method of systems thinking often adopted by service firms, which can have the effect of reducing hierarchical control and imbuing team members with increased feeling of ownership of problems.

The empirical link demonstrated in prior research between individual SME leader resilience and performance of their firm, gives rise to our first hypothesis:

> *H1: The individual resilience level of a micro business leader will predict the likelihood of their firm to plan for adversity.*

The connection asserted in the SME resilience literature between firm attributes, including sector and location, and the likelihood of resilience planning leads us to our second and third hypotheses:

> *H2: The effect of individual resilience on planning for adversity is higher for service sector micro businesses.*

> *H3: The effect of individual resilience on planning for adversity is higher for micro businesses which are located away from home.*

2.2 Manager characteristics and the link with firm risk management practices

A body of work examining broader links between the characteristics of a business leader and the characteristics and outcomes of their businesses with respect to risk management has identified some significant relationships. Although this body of work focuses upon financial risk taking, it has resonance for this study insofar as it considers ways in which leader characteristics can shape the strategies of their firms. For example, in a US based study focused on medium to large sized companies, CEOs who score highly on optimism scales were found to make different financial decision than others (Graham et al, 2013). Overconfidence has been empirically demonstrated to impact negatively on general investment decisions (Barber and Odean, 2001) and this effect is amplified in men and in particular in single men. Married managers have been demonstrated to be more risk averse than single ones (Roussanov and Savor, 2013). Religion has also been shown to influence the risk appetite of individuals (Noussair et al, 2013). Age of a business leader and their education level, notably having attained an MBA, are found to be correlated with firm policies and outcomes (Bertrand and Schoar, 2003). Cronqvist et al (2012) draw on

behavioural consistency theory, which posits that individuals will exhibit similar behaviour in different contexts, to show that managers' personal debt preferences are correlated with the debt behaviours they exhibit in their corporate lives. A small number of empirical studies find cross-country differences in risk attitudes. A small number of empirical studies find cross-country differences in risk attitudes. For example in a cross-country study Ferreira (2018) finds variation in individuals' risk acceptance depending on their location, and Rieger et al (2014) find differences between individuals in rich versus poor countries as measured by GDP per capita.

The asserted association between individual manager attributes, including gender, marital status, level of education and geographic location, and the risk management practices of their firms lead us to our next hypotheses.

H4: The effect of individual resilience on planning for adversity is higher for females.

H5: The effect of individual resilience on planning for adversity is higher for married individuals.

H6: The effect of individual resilience on planning for adversity is higher for individuals with a degree-level education.

H7: The effect of individual resilience on planning for adversity varies with geographical location i.e. country.

3. Data and Methods

3.1 Data set

The data set covers 9,755 micro businesses with between 1 and 9 employees in Great Britain, United States and Northern Ireland. It was generated during early 2018, in a computer assisted telephone interview survey of senior managers from the micro businesses. A filter question used in the telephone survey script ensured that the respondent was the most senior person in the organisation. If this was not the case, arrangements to call back to speak with the most senior person were made, or the interview was terminated. This means that all respondents were MD, CEO or owner of the firm in question. The firms surveyed came from nine sectors - three production sectors and six service sectors. The data excludes public sector organisations, charities and subsidiaries of larger firms. In addition to general information about business performance, this survey is unique in that it contains detailed information on the personal characteristics of business leaders, the characteristics of their households, their growth ambition and their plans for adversity. It therefore, provides a suitable basis for analysing the relationship between business leaders' perception of their own resilience and the degree to which they prepare their businesses for adversity.

3.2. Dependent variable

We are interested in the effect of business leader resilience on the resilience planning of their business. As our dependent variable, therefore, we use an indicator variable equal to one if the business has a formal strategy for dealing with adversity. We derive this variable from a survey question that asks business leaders the following: 'Thinking about the future of your |company and the business risks you might face, such as such as employees leaving, losing major clients, theft or fraud. Which one of the following best describes how you feel about business risks? i)

We don't think about risks at all until they arise, and then we deal with them ii) We sometimes think about risks but do not make formal plans to deal with them iii) We regularly think about business risks and formulate plans iv) We have a formal risk register with response strategies, which is kept under review'. Based on the responses, we categorise firms as having a formal resilience strategy if the business leaders answered 'yes' to (iii) or (iv); conversely, we categorise firms as having no resilience strategy if business leaders answered 'yes' to (i) or (ii). This variable thus indicates whether the business has any formal plans in place for dealing with potential adverse events. The interpretation of business risks and what constitutes a 'regular' pattern of thinking about those risks, formulating plans and reviewing risk registers are left to the respondents, so that this measure captures business leaders' own perspectives of resilience strategy. A caveat to using this measure is that subjective interpretations may influence the results. However, the large number of businesses in our sample should mitigate the effects of upward or downward biases in business leaders' perceptions of risks.

3.3. Main independent variable

Our main independent variable of interest is the Connor-Davidson Resilience Scale, a measure of individual resilience. This is the most widely used instrument for individual resilience measurement. Originally developed as an instrument with 25 data items, known as CD25, the scale has been used in different populations, cultural and linguistic contexts and has proved statistically valid. In a methodological review of nineteen resilience scales, the Connor-Davidson scale received the highest psychometric ratings, was the only one to have been used to assess change following an intervention, and was the one which scored highest on total quality assessment (Windle et al, 2011). The more recently developed and shorter version of the Connor-Davidson Resilience Scale with 10 data items instead of 25, known as CD10, was used in the present study as it was judged to be more straightforward to use for survey research (Campbell-Sills and Stein, 2007). This version of the scale has also been tested in different contexts and its validity confirmed (e.g., Lauridsen et al, 2017). The Micro-business survey applies the scale by asking respondents 10 questions aimed at measuring their resilience. Based on a Likert scale, they are asked to rank their feelings about each question from 0 (not true at all) to 4 (true nearly all the time). Thus, based on these 10 questions, the maximum level of resilience would be a score of forty, and the minimum level would be a score of zero. The full CD10 scale is attached in Appendix 1.

3.4 Control Variables

In addition to CD10, we control for other factors that might influence the probability that a business has formal plans for dealing with adversity, so that the impact of these variables does not bias the effect of CD10 on resilience planning. In particular, as noted in the literature review above, some individual traits can make business leaders more risk averse, affecting their probability of planning for adversity, and some firm level characteristics can influence the probability of resilience planning. We thus include variables that capture both firm level characteristics as well as the individual characteristics of business leaders.

For individual characteristics, we control for the level of education of the business leader, since prior research indicates that highly educated leaders may be more likely to plan for adversity (e.g., Bertrand and Schoar, 2003); we measure this using an indicator variable equal to one if the business leader has at least a bachelor's degree or equivalent, and zero otherwise. Given prior research that indicates differences related to gender (e.g., Barber and Odean, 2001) we include an indicator variable equal to 1 if the business leader is male, and zero if she is female.

Similarly, we control for the age group of the business leader, since older people are likely to be more risk averse (e.g., Morin and Suarez, 1983). We also consider whether the business leader lives with a spouse, lives alone, or has other living arrangements, since marital status has been found to be correlated with risk appetite (Roussanov and Savor, 2013). We include an indicator variable equal to one if the business leader has had prior experience in managing a business, or if they are currently managing another business, since we know that previous experience may have exposed them to experiences of adversity or may have influenced their attitudes towards resilience planning (Williams et al, 2017; Doern et al, 2016). We include a count variable that measures the personal ambition of the business leader. This variable reflects the number and type of ambitions, such as accumulating future wealth, achieving a greater level of work flexibility or freedom, being able to retire, being able to pass on the business to their family, or being successful business leaders in their community. Any of these personal ambitions could arguably affect the decision to adopt resilience planning. Additionally, we include three indicator variables that capture whether business leaders live with school age or younger children, whether they have children that have left home, and whether they have no children at all. This is because having small children, like being married, may be associated with higher risk aversion (e.g., Görlitz and Tamm, 2015) and a higher probability of resilience planning.

For firm level characteristics, we include a measure of the age of the business. As noted above, Herbane (2015) provides empirical evidence to highlight the importance of firm age as determinant of the propensity to formalise activities to deal with acute interruptions; a longer timeframe of ownership and operation confers the owner manager with multiple opportunities to learn, monitor, and anticipate threats. We also control for the size of the firm by including their number employees, since research indicates that smaller firms may be less likely to have a resilience plan (Hammock, 2015). Given the finding that firms which own rather than lease their premises have been found to be more likely to undertake resilience planning (Dahlhammer and D'Souza, 1997), as a partial proxy for ownership of premises, we include an indicator variable equal to one if the business is home based and zero otherwise. Although this variable does not explicitly capture ownership, as long as business leaders own the homes from which they run the business, it provides a partial indication of the relative stability of premises for homebased businesses. We also include an indicator variable that captures whether the business is family-owned.

The literature has also found that empowering a wider group of managers by extending involvement in, and responsibility for, business continuity planning beyond a central core group is a route to resilience (Alesi, 2008; Woodman et al, 2010). To capture this, we include an indicator variable that captures whether the business is run by its founder, as well as a count variable that captures the number of people managing the business. Liaising with external organisations can also improve resilience planning. Developing virtual communities of practice (Gimenez et al, 2017) and communicating with other organisations within networks can help a firm develop contingency plans for anticipated challenges (Seville, 2008). To capture the effect of external support, therefore, we include a count variable for the number of sources of advice the firm has consulted over the past year, as well as the number of networks in which the firm is member. We include an indicator variable equal to one if the firm invests in formal employee training, as this can equip firms to better anticipate and plan for adversity. Finally, to account

for differences between sectors and across countries, we include country and sector indicator variables.

Appendix 2 presents descriptive statistics of the variables used in our analysis and some further details on variable measurements. About 49% of the businesses in our sample adopt some form of formal resilience planning. The average score for individual resilience, i.e. CD10, is around 32. This indicates that most business leaders are very confident of their personal resilience; the median CD10 score is 33, the 75th percentile is 37 and the maximum is 40[1]. Around 35% of business leaders live with school age children, 44% have children who have left home and 23% have no children at all. About 38% of business leaders have experience of managing another business. Most business leaders are between 45 and 54 years old; 80% live with a spouse or partner, 15% live alone and 5% have other living arrangements. The business leaders are fairly ambitious, having around three out of six types of personal ambitions. About 49% of business leaders have at least a university degree or equivalent qualification, and 61% are male. Almost half of the businesses, 45%, are home based; 69% of businesses are family owned and 84% of businesses are managed by their founders. The average number of managers is two, and only about 39% of businesses access external finance. The businesses are fairly small, as the average number of employees is four. The vast majority of businesses have no external sources of advice or any memberships to external networks. Only about 31% of businesses have a formal business plan, 63% invest in formal training for their employees, and 36% export their products or services. Most business, 64% are in the UK; 20% are in the US and 15% are in Ireland.

3.5. The empirical model

We estimate the following Probit model for business resilience planning:

$$Y_i = \beta_0 + \beta_1 CD10_i + \beta_2 Controls_i + \varepsilon_i \dots\dots (1)$$

Where Y_i is a binary variable equal to 1 if a business has formal procedures for planning for adversity, and zero otherwise. $CD10$ is the Connor-Davidson 10-point scale that captures the resilience of individual business leaders, and $Controls$ is a vector of leader-specific and business-specific control variables outlined in Section 3.4. Marginal effects of β_1 would identify the effect of a unit change in CD10 on the probability that a firm has formal plans for adversity. We use heteroscedasticity robust standard errors, and sampling weights are used to obtain representative results. The Probit model employed here allows us to infer association, rather than causality, between CD10 and the probability of business resilience planning.

4. Results

4.1. Main effects

The first column of Table 1 shows the marginal effects from the model in equation 1, where we estimate the main effect of CD10 on resilience planning. For an average business leader with all other variables held at their mean values, a unit increases in CD10 increases the probability of resilience planning by 0.5%. Although this effect is small, it is highly statistically significant and can be substantial given the scale of CD10; a one-unit increase in the CD10 score across five categories would increase the likelihood of resilience planning by 2.5%. In other words, with all variables held constant, a business leader at the 75th percentile of CD10 (with a score of 37) is 2.5% more likely to have a formal resilience plan than a business leader with an average CD10 score (a score of 32). We therefore find support for *H1*, in that business

[1] Percentiles are not reported for other variables to save space.

leaders who perceive themselves as intrinsically resilient are more likely to adopt resilience planning for their businesses.

The marginal effects of the control variables also show some interesting significant impacts. We first examine the effects of individual specific characteristics of the business leaders. For businesses where the leader has experience of managing another business, the probability of adopting resilience planning is 4.4% higher than for businesses where leaders have no such experience. This finding indicates that experienced managers are more likely to plan for adversity. Relative to business leaders with other living arrangements, business leaders that live with a spouse or partner are 7.9% more likely to adopt resilience strategies. In addition, a unit increase in our scale of personal ambition of the business leader increases the probability of resilience planning by 1%. Business leaders with at least a degree or equivalent qualification are 5.6% more likely to adopt resilience strategies that those with a lower education level. Notably, the business leader's age, parental status and gender have no significant impact on the probability of adopting a business resilience plan.

Turning to the business characteristics, an increase in the age of the business by one year increases the probability of resilience planning by 0.1%, in line with the expectation that older firms are slightly more likely to plan for adversity. Family owned business are 2.8% more likely to plan for adversity than non-family owned businesses. A unit increase in the size of the firm, captured as an additional employee, increases the probability of resilience planning by 1.3%, supporting the view that resilience planning increases with firm size. A unit increase in breadth of external advisors increases the probability of resilience planning by 2.7%, indicating the value of external sources of information in encouraging resilience planning. Businesses that have a formal business plan are 18.9% more likely to have a resilience plan, suggesting that resilience planning is highly correlated with general business planning. Businesses that invest in formal employee training are 8% more likely to adopt a resilience plan, showing the importance of continued employee development in anticipating and planning for adversity. However, being a home-based business, being a founder-managed business, having many business managers, accessing external finance, being an exporter, or having memberships to external networks have no significant impacts on the probability of resilience planning. Relative to businesses in the UK, businesses in the US are 6.9% *less* likely to have a resilience plan.

Table 1: Probit estimations of the effects of business leaders' C10 on business resilience planning.

	Main Model	Sectors	Home based	Gender	Living arrangements	Education	Country
CD10	0.005***						
	[0.001]						
CD10_production		0.008***					
		[0.003]					
CD10_services		0.003**					
		[0.001]					
CD10-female				0.005**			
				[0.002]			
CD10-male				0.004***			
				[0.002]			
CD10-home based			0.003*				
			[0.002]				
CD10-not home based			0.006***				
			[0.002]				
CD10_spouse					0.005***		
					[0.001]		
CD10_alone					0.001		
					[0.003]		
CD10_liveother					0.010**		
					[0.005]		
CD10_degree						0.006***	
						[0.002]	
CD10_nodegree						0.004**	
						[0.002]	
CD10_US							0.011***
							[0.003]
CD10_IR							0.003
							[0.003]
CD10_UK							0.003**
							[0.001]
Experience	0.044***	0.044***	0.044***	0.044***	0.044***	0.044***	0.044***
	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]
Leader age	-0.007	-0.008	-0.008	-0.007	-0.007	-0.008	-0.009
	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]

Lives with a spouse	0.079**	0.080**	0.080**	0.079**	0.243	0.080**	0.084**
	[0.036]	[0.036]	[0.036]	[0.036]	[0.151]	[0.036]	[0.035]
Lives alone	0.059	0.059	0.058	0.058	0.342**	0.059	0.063
	[0.040]	[0.040]	[0.040]	[0.040]	[0.156]	[0.040]	[0.040]
Personal ambition	0.010**	0.011**	0.010**	0.010**	0.011**	0.010**	0.010**
	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]
Degree qualification	0.056***	0.055***	0.056***	0.056***	0.056***	-0.018	0.055***
	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]	[0.081]	[0.016]
Gender	0.013	0.013	0.013	0.046	0.012	0.013	0.014
	[0.016]	[0.016]	[0.016]	[0.083]	[0.016]	[0.016]	[0.016]
School age children	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.011
	[0.019]	[0.019]	[0.019]	[0.019]	[0.019]	[0.019]	[0.019]
No children	0.003	0.002	0.002	0.003	0.002	0.003	0.002
	[0.022]	[0.022]	[0.022]	[0.022]	[0.022]	[0.022]	[0.022]
Age of business	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Home Based	-0.019	-0.018	0.062	-0.019	-0.019	-0.019	-0.018
	[0.015]	[0.015]	[0.079]	[0.015]	[0.015]	[0.015]	[0.015]
Family owned	-0.028*	-0.028*	-0.027*	-0.028*	-0.027*	-0.028*	-0.027*
	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]
Founder managed	-0.012	-0.013	-0.012	-0.012	-0.013	-0.012	-0.012
	[0.022]	[0.022]	[0.022]	[0.022]	[0.022]	[0.022]	[0.022]
Number of managers	0.007	0.007	0.007	0.007	0.007	0.007	0.007
	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]
External finance	0.015	0.016	0.015	0.015	0.015	0.015	0.016
	[0.015]	[0.015]	[0.015]	[0.015]	[0.015]	[0.015]	[0.015]
Number of employees	0.013***	0.013***	0.013***	0.013***	0.013***	0.013***	0.013***
	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Number of advisers	0.027***	0.027***	0.027***	0.027***	0.027***	0.027***	0.026***
	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]
Number of network membership	0.008	0.008	0.008	0.008	0.008	0.008	0.008
	[0.011]	[0.011]	[0.011]	[0.011]	[0.011]	[0.011]	[0.011]
Business plan	0.189***	0.190***	0.188***	0.189***	0.188***	0.188***	0.189***
	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]
Training practice	0.080***	0.080***	0.080***	0.080***	0.080***	0.080***	0.078***
	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]
Exporting	0.021	0.020	0.021	0.021	0.021	0.021	0.020
	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]	[0.016]

Primary sector	0.070	-0.057	0.068	0.070	0.070	0.069	0.070
	[0.044]	[0.105]	[0.044]	[0.044]	[0.044]	[0.044]	[0.044]
Construction	-0.039	-0.127	-0.039	-0.039	-0.038	-0.039	-0.040
	[0.030]	[0.099]	[0.030]	[0.030]	[0.030]	[0.030]	[0.030]
Retail and wholesale	-0.027	-0.165*	-0.027	-0.027	-0.027	-0.027	-0.027
	[0.025]	[0.097]	[0.025]	[0.025]	[0.025]	[0.025]	[0.025]
Transport, accommodation and food	-0.034	-0.014	-0.034	-0.035	-0.034	-0.033	-0.035
	[0.029]	[0.027]	[0.029]	[0.029]	[0.029]	[0.029]	[0.029]
Information, Finance, real estate services	0.061**	-0.019	0.062**	0.061**	0.062**	0.062**	0.061**
	[0.027]	[0.031]	[0.027]	[0.027]	[0.027]	[0.027]	[0.027]
Professional and scientific services	0.001	0.075**	0.002	0.001	0.002	0.002	0.001
	[0.027]	[0.029]	[0.027]	[0.027]	[0.027]	[0.027]	[0.027]
Administrative services	-0.014	0.015	-0.014	-0.014	-0.013	-0.014	-0.014
	[0.031]	[0.029]	[0.031]	[0.031]	[0.031]	[0.031]	[0.031]
Other services	0.010	0.024	0.010	0.010	0.010	0.010	0.010
	[0.031]	[0.033]	[0.031]	[0.031]	[0.031]	[0.031]	[0.031]
USA	-0.069***	-0.069***	-0.069***	-0.069***	-0.070***	-0.069***	-0.296***
	[0.019]	[0.019]	[0.019]	[0.019]	[0.019]	[0.019]	[0.103]
Ireland	-0.021	-0.021	-0.022	-0.021	-0.021	-0.021	-0.019
	[0.022]	[0.022]	[0.022]	[0.022]	[0.022]	[0.022]	[0.118]
Pseudo R2	0.07	0.07	0.07	0.07	0.07	0.07	0.07
N	7,643	7,643	7,643	7,643	7,643	7,643	7,643

* $p<0.1$; ** $p<0.05$; *** $p<0.01$
Standard errors in parenthesis

4.2. Moderating effects

In line with *H2-H7*, we examine the moderating impacts of sectors, home-based businesses, gender, marital status, education level and geographic location. These results are presented in further columns of Table 1. In column 2, we classify sectors as either production or services sectors. Primary production, manufacturing and construction are the Production sectors; retail and wholesale, transport, accommodation and food, information, finance, and real estate services, administrative services and other services are classified as service sectors. We find that the impact of CD10 on resilience planning in the Production sectors is almost three times as large as its impact in the Service sectors, but this difference is not statistically significant, conferring no support for *H2*. Still, this result indicates that a five-point increase in CD10 of business leaders in Production sectors will increase the likelihood of resilience planning by 4%; this effect is only 1.5% in the Service sectors. Business leaders in Services appear less likely to translate their personal resilience into a business resilience strategy.

In column 3, we partition CD10 among home-based businesses and those that are not, and find that, although the effect of CD10 for non-home-based businesses is twice as large as that of home-based businesses, the difference is not statistically significant; we thus find no support for *H3*. In column 4, we find that CD10 has a slightly higher marginal effect for females, but the difference with the male sample is insignificant; we therefore find no support for *H4*. The next column of Table 1 shows the effects of CD10 based on the living arrangements of the business leaders. For business leaders that live with a spouse, the positive impact of a five-unit increase in CD10 is similar to that of the whole sample, 2.5%. For business leaders that live alone, CD10 has no statistically significant impact on resilience planning. Most striking is the effect of CD10 for business leaders that have other living arrangements: a five-point increase in CD10 increases the likelihood of resilience planning by 5%. This is especially interesting because the main effects of living arrangements indicate that business leaders that neither live with a spouse nor live alone are the *least* likely to adopt resilience strategies. The moderating effect, however, indicates that an increase in CD10 for these business leaders has a substantial impact on the likelihood of business resilience planning. This indicates that feeling intrinsically resilient is especially important if these business leaders are to adopt resilience planning for their businesses. Despite the variation in the magnitudes and significance of the moderating impacts of living arrangements, the difference in coefficients is again not statistically significant. We thus find no support for *H5*. The next column of Table 1 shows that there is no significant difference in the effect of CD10 between business leaders with a degree and those with a lower qualification; we thus find no support for *H6*.

In the last column of Table1, we examine the effect of CD10 by country. For the US, CD10 has a substantially higher impact than the UK and Ireland. In particular, a five-point increase in CD10 for business leaders in the US increases the likelihood of resilience planning by 5.5%; in the UK, this effect is 1.5%. The effect for Ireland is insignificant, but is of similar magnitude to the UK. In terms of statistical significance, a Wald test of the equality of coefficients shows that the effect of CD10 in the US is significantly higher than that for the UK, but is not significantly different from that of Ireland. Overall, the results indicate that feeling intrinsically resilient is much more important for adopting resilience business planning if the business is located in the US. We thus find support for *H7*. Again, this is especially important since the main effects indicate that businesses in the US are significantly *less* likely to adopt resilience

planning; the moderating impact suggests that personal resilience turns the effect around, and enables US businesses to be substantially more likely to adopt resilience planning. Finally, in unreported regressions, we find that there is no statistically significant differences in the effects of CD10 for business leaders with different levels of personal ambition or previous experience, and for businesses with different forms of ownership i.e. family owned vs non-family owned businesses.

5. Discussion and conclusions

As expected, we confirm that the individual resilience of a micro business leader predicts the likelihood of the firm to plan for adversity with our finding that for every incremental point of our respondents CD10 score, the likelihood of resilience planning being performed in their businesses increases by 0.5%. This significant relationship between individual resilience and firm-level resilience planning strategies makes an empirical contribution to knowledge, shedding light on the connection between leader and firm, and implies that developing resilience in leaders may well be a route to developing more resilient practices in their companies. This finding contributes to understanding of the foundations of resilient practices in the under-researched segment of micro businesses. In connecting the CD10 individual measure of resilience with the presence of resilience planning practices in individuals' businesses, it contributes to understanding of the way in which the resilient characteristics of the leader work to influence the resilience of their business. As such, it offers a starting point for elucidating the link between leader resilience and firm resilience which has been often asserted but never really probed (Bhamra et al, 2015).

Perhaps unsurprisingly, we find that that experienced managers, and those with higher education levels are more likely to plan for adversity. It is possible that education and business experience offer the opportunity for individuals to develop and hone cognitive and behavioural capabilities such as the ability to detect and respond to issues and the ability to co-operate with others in the pursuit of shared goals (Williams et al, 2017) which may make them more likely to embrace resilience planning activities. Experiences of adversity in prior business experience may also shape attitudes towards resilience planning. Our finding that a higher level of personal ambition increases the probability of resilience planning suggests that ambitious micro business leaders spend more time reflecting on and planning for the future, which may explain why they are more likely to put in place strategies to address potential risks. It is also possible that ambition is linked to education and experience, through which individuals are exposed to aspirational businesses, business ideas and business leaders. Additionally, evidence suggests that the mind-sets of growth-oriented small business owners mean that they tend to view challenges as surmountable, and that they are therefore more likely to strategize for long-term success (Braidford et al, 2017). It seems likely that this strategizing includes putting in place crisis plans.

In line with prior research into individual risk practices which indicates, for example, that risk aversion increases with marriage (Wong, 2011) and that married CEOs are more risk averse than non-married ones (e.g., Roussanov and Savor, 2014) our study finds that micro business leaders that live with a spouse are more likely than those that live alone to lead firms that plan for adversity. This effect has been attributed to a variety of factors including the need to take account of dependents in married individuals, biological factors related to marital status and an increased tolerance for risk in single people provoked by a desire to achieve higher social status. Perhaps more intriguing than the underlying cause for this correlation is the effect that it may

predict in terms of resilience practice adoption across societies with differing levels of marriage (Roussanov and Savour, 2014) and in the future as marriage norms shift and evolve.

On the basis of prior research, we would have expected older leaders, females and those with children to adopt a more cautious attitude towards risk, and therefore to be more likely to put in place contingency plans. Unexpectedly, however, the business leader's age, parental status and gender appear to have no significant impact on the probability of adopting a business resilience plan. This may be related to the nature of their businesses, and particularly to the sectors that they operate within. Moderating effects of industry sector show that the impact of CD10 on resilience planning in the service sector is considerably smaller than in the production sector. Although females and parents may be more conservative in general terms, which would suggest that they would be more likely to plan for crises, it is also possible that their businesses are more likely to be service-based and that they are smaller in scale and ambition, perhaps driven by a need to fit in with their parental responsibilities, in which case they simply do not deem it necessary or appropriate to put in place formal risk management plans. More broadly, business leaders in the service sector appear less likely to translate their personal resilience into a business resilience strategy. This may be a function of the kinds of services in question. Those services with less tangible and less technologically intensive outputs perhaps require less capital investment, and leaders may feel they have less to lose if the business fails. It could also be that resilience planning is a more established practice in non-service sectors, which need to ensure continuity of raw materials and distribution networks. Service providers may believe that they can be more flexible and rapid in their responses to crises, for example by adjusting market or service focus, whereas those in the production sector may feel more physically rooted in their production plants, and heavily technologically invested.

As expected, age and size of business are correlated with resilience planning, as is the use of external sources of advice and employee training. Unsurprisingly, there is a strong correlation between businesses with a formal business plan and those with a resilience plan. However, being a home-based business, and being a founder-managed business, have no significant impact on the probability of resilience planning. This may also be a function of the type of business in question.

We find that, relative to the UK, US businesses are much less likely have a resilience plan, but that the moderating impact of CD10 is higher here. Thus, individual resilience levels are more important in the US as a predictor of resilience strategies than in the UK or Ireland. The reason for this is unclear. Further investigation would allow this finding to be interrogated, to establish whether it is perhaps a result of differing cultural attitudes towards risk, or of different market or regulatory conditions.

The results of our study have several implications. First, our results show a clear link between resilience levels of micro business managers as measured by the CD10 scale and the likelihood of their businesses to have in place some kind of resilience planning. This sheds light on the way that the link previously asserted between leaders and their businesses works, and implies that initiatives focused on developing individual resilience in micro business leaders are likely to deliver greater resilience planning in their businesses. The finding that this effect is smaller in the service sector suggests that these leaders approach their businesses differently from other business sector leaders, and this difference merits further investigation. The difference observed between US and UK businesses suggests that individual resilience levels in these

leaders is even more important in driving resilience planning in their businesses. Overall, however, we find that the effects of CD10 does not significantly vary along business or leader characteristics.

The study also has limitations. Firstly, in the absence of any widely-accepted measure of business resilience, we have focused on the presence of resilience planning strategies. Although these may indicate engagement with crisis planning, they are an imperfect indicator of actual business resilience. Secondly, although our study indicates a relationship between personal resilience score and the presence of resilience planning activities, we cannot ascertain the direction of causality and say that resilient individuals provoke resilient practices in their firms; we can only infer association. Thirdly, the estimated impact of CD10 is quite small, especially in the UK and Ireland. Further investigations into the conditions under which CD10 would have larger effects is a potential avenue for future research. Finally, this data set focuses on micro businesses in the UK, USA and Northern Ireland, and additional work to replicate the study in different geographical locations would undoubtedly generate further culture and context-related insights.

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Appendix 1: Content of the Connor-Davidson resilience scale

	Not at all True	Mostly Untrue	Neither True nor Untrue	True some of the time	True nearly all the time
I am able to adapt when changes occur	0	1	2	3	4
I can deal with whatever comes my way	0	1	2	3	4
I try to see humorous side of things when I am faced with problems	0	1	2	3	4
Having to cope with stress can make me stronger	0	1	2	3	4
I tend to bounce back after illness, injury or other hardships	0	1	2	3	4
I believe I can achieve my goals even if there are obstacles	0	1	2	3	4
Under pressure, I can stay focused and think clearly	0	1	2	3	4
I am not easily discouraged by failure	0	1	2	3	4
I think of myself as a strong person when dealing with life's challenges and difficulties	0	1	2	3	4
I am able to handle unpleasant or painful feelings like sadness, fear and anger	0	1	2	3	4

Source: Connor and Davidson (2003)

Appendix 2: Descriptive statistics

Variable	Mean	Std. Dev.
Adopting resilience planning	0.487989	0.499882
CD10	32.26832	6.226024
Lives with school age children	0.352845	0.477879
Has children that have left home	0.444798	0.496969
Have no children at all	0.226346	0.418487
Has experience of managing another business	0.386145	0.48689
Age of business leader[2]	4.283972	1.261164
Lives with a spouse	0.796842	0.40237
Lives alone	0.150632	0.357708
Other living arrangements	0.052526	0.223097
Personal ambition[3]	3.690565	1.566703
Degree qualification	0.490739	0.499944
Gender	0.615179	0.486578
Business age	22.74609	17.76719
Home based business	0.456086	0.498093
Family owned business	0.691352	0.461959
Founder managed business	0.848078	0.358964
Number of managers	1.992394	1.22018
External finance	0.397745	0.489457
Number of employees	3.943926	2.360661
Number of advice sources[4]	0.575271	1.139414
Number of network memberships[5]	0.497924	0.687905
Having a business plan	0.314813	0.464465
Invests in formal employee training	0.631881	0.482319
Exporting	0.364019	0.481179
Primary production	0.055151	0.228287
Manufacturing	0.096156	0.29482
Construction	0.094413	0.292418
Retail and wholesale	0.180933	0.384982

[2] This is a group variable that represents the age band in which the respondent falls. The questionnaire asks business leaders to choose from one of seven age bands: Under 25, 25-54, 35-44, 45-54, 55-64, 65-74, 75 and above.

[3] The questionnaire asks respondents to indicate which of the following six personal objectives drive them: i) accumulating future wealth ii) achieving a greater level of work flexibility for personal and family life iv) Greater freedom to adopt their own approached iv) being able to retire v) being able to pass on the business to their family vi) being successful business leaders in their community. Our 'personal ambition' variable is a count variable that measure the number of ambitions indicated by the business leader.

[4] This is a count variable that captures the number of external sources of advice that the firm consulted over the previous 12 months. The questionnaire asks firms to indicate if they consulted any of the following 13 sources: accountant, bank, business adviser/consultant, business mentor, business network/trade association, chamber of commerce, friend or family member, government website, internet search, local authority, local enterprise partnership, non-executive director, or solicitor/lawyer.

[5] This is a count variable that captures the number of formal business organisations or networks of which the firm is a member. The questionnaire asks business leaders to indicate their membership in any of the following six organisations/networks: business referral networks, chamber of commerce, federation of small business, institute of directors, LinkedIn, and sector or trade association.

Transport, accommodation and food	0.107022	0.309157
Information, finance and real estate services	0.13142	0.337876
Professional and scientific services	0.163096	0.369472
Administrative services	0.082009	0.274393
Other services	0.0898	0.28591
UK	0.641107	0.4797
USA	0.205126	0.403814
Ireland	0.153767	0.360744