Relationship between slack resources and performance: temporal symmetry and duration of effects

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Abstract

Purpose – Although slack resources and their relationship to performance have been widely studied in the literature, the temporal symmetry of this relationship, and the duration of its effects, are still unknown aspects and are the objective of this paper.

Design/methodology/approach – To evaluate this effect, an exploratory study has been designed on a sample of 449 Spanish industrial companies over a period of 12 years, assessing the impact of idle resources on economic and financial profitability. By means of hierarchical regressions, the short- term, medium- term and long-term effects of slack resources have been evaluated.

Findings – The results show that the impact on performance depends on the type of resource considered. Available slack has a consistent and positive effect on economic profitability in the short term. Other types of slack show persistent effects on performance, but, in the case of the recoverable slack, with a negative sign that contradicts the benefits provided by these resources. Finally, potential slack only has a permanent effect on financial profitability, but the sign changes depending on the economic context under consideration. There are also differences in the duration of the effects according to the type of resources.

Originality/value – This paper advances the knowledge about the slack-performance relationship over time that has been scarcely studied.

Keywords Performance, Slack, Timing, Industrial companies, Temporal symmetry

Paper type Research paper

1. Introduction

Penrose (1959) established that those companies that had slack resources would obtain superior results to those competitors that did not have access to them. Specifically, it stated that "unused productive services, for the company, are both a challenge to innovate, an incentive to expand, and a source for competitive advantage" (Penrose, 1960 p. 2). However, the literature that has studied the link between these resources and performance has not been able to reach conclusive results (Daniel *et al.*, 2004), although the latest review studies generally confirm a positive relationship between these two variables (Carnes *et al.*, 2019; Wan and Yiu, 2009). In any case, practically all research analyses this relationship following a transversal approach or, in the best of cases, considering a reduced number of years (Gral, 2014).

Consequently, a relevant question that still needs to be clarified is to know the mechanisms through which companies systematically transform and use slack resources in

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pursuit of their objectives and goals (Kuusela *et al.*, 2017; Wan and Yiu, 2009). Among these mechanisms, time requirements for these resources to show measurable results for the organisation are particularly relevant (Argilés-Bosch *et al.*, 2018; Love and Nohria, 2005). This study of the temporal relationships between slack and performance is complicated by the multitude of partially contradictory or coincident classifications used, along with the absence of agreement on the appropriate way to measure slack (Carnes *et al.*, 2019).

The present work is an attempt to assess the impact that the slack resources have on performance over time. This research objective focuses on addressing the following research questions: (1) on the one hand, the duration of the effect of slack resources on performance, and (2) on the other, the existence of permanence of the relations between slack and performance over time. Regarding the duration, the paper aims to observe for how long the effect remains between a slack stock at any time and performance as different approaches have been used in the empirical literature (Argilés-Bosch *et al.*, 2018; Love and Nohria, 2005). With respect to the permanence of effects, it constitutes a subject of great relevance in any scientific discipline (Rosen, 2005), since it is a question of determining the temporal symmetry of the relations, that is to say if the link between slack and performance is contingent at the moment of time in which it is analysed.

In order to address these objectives, a longitudinal or temporal analysis is proposed, based on the information obtained from the annual accounts of 463 Spanish industrial companies over a period of 12 years (2006–2017). During this period of time, Spain suffered drastic changes in the munificence of the environment due to the financial crisis (Canto-Cuevas *et al.*, 2016), which has commonly been associated with the use or consumption of slack, what makes the single country sampling interesting. The balance sheet and profit and loss account allow estimating the most common indicators of slack resources that will be related to the economic and financial profitability of these companies.

The results obtained contribute to the existing knowledge both for the literature on slack resources and for business practice. From the theoretical point of view, the inclusion of time constitutes a relevant contribution insofar as most of the research on the subject is transversal or uses a relatively short period of time. From a practical perspective, the results show the disparate effect of the different types of slack, and, therefore, the conclusions establish recommendations for managers on the management of resource slack.

The article begins with a general review of the literature on slack resources, with special attention to the effect it has on business performance. After the presentation of the methodology used in the study, the results obtained are analysed. The work ends with conclusions and future lines of research.

2. Theoretical framework

Although the importance of slack resources and their definition goes back to the works of Cyert and March (1956), it was Bourgeois (1981) who established the guidelines for the current development of the concept and empirical analysis.

The literature on slack resources shows the opportunity they offer organisations to achieve their goals and objectives (Kuusela *et al.*, 2017; Sharfman *et al.*, 1988) or to face internal or external threatens (Bourgeois, 1981; Vanacker *et al.*, 2017; Wan and Yiu, 2009). From a general perspective, there are three theoretical approaches that dominate the works: the resource-based view, the theory of organisational behaviour and the agency theory. On this basis, Bourgeois (1981) identifies a diversity of possible applications of this type of resources.

One of the most studied aspects of the role of slack resources is their effect on performance. However, and despite the number of investigations carried out (see, Gral, 2014 for a broad review), there is still no precise knowledge of how companies make use of these resources in order to achieve these higher returns (Daniel *et al.*, 2004; Tsang, 2006). Some recent studies

(Carnes *et al.*, 2019; Guo *et al.*, 2018; Leyva-de la Hiz *et al.*, 2019) have attempted to complete the model by introducing mediating variables into that relationship. However, the results are not conclusive and leave an opportunity to deepen their analysis.

Three different theoretical perspectives have dominated the slack–performance relationship. First, following the initial approach of Cyert and March (1963), it is understood that the possession of resources beyond what is necessary presents a positive effect on business performance. Thus, these resources contribute to the growth of the company through their use in reaching more ambitious goals (Penrose, 1959), although they can also serve as a cushion against adverse situations (Lee, 2011). Second, slacks have been considered to negatively affect performance (Ju and Zhao, 2009; Tan and Peng, 2003), as they are resources that have not been used for value-generation process and therefore present an opportunity cost. In addition, companies with this excess of resources may face internal tensions associated with agency problems (Phan and Hill, 1995). Finally, some authors suggest that these resources present positive or negative effects depending on the quantity. Thus, Bourgeois (1981) identifies that it is preferable to have a certain "cushion" of resources to undertake strategic projects but that, past a limit, these resources reflect inefficiency in management, assuming a curvilinear relationship (Chiu and Liaw, 2009; Tan, 2003).

Empirical studies have indiscriminately adopted these three perspectives without being able to reach a conclusion (Daniel *et al.*, 2004). One of the reasons for this lack of convergence in results is that there are many ways of understanding slack resources (Lecuona and Reitzig, 2014; Tang *et al.*, 2015), although most researchers seem to continue to raise and find a positive meaning to this relationship (Carnes *et al.*, 2019).

The different works that have tried to unify the existing literature (Carnes *et al.*, 2019; Daniel *et al.*, 2004; Gral, 2014)) have shown that the effect on profitability varies according to the type of slack (Cheng and Kessner, 1997). The results seem to show recoverable resources as those with the least impact on performance (Daniel *et al.*, 2004). In the same way, the necessary capital intensity also features as a determining element at the time of understanding the effect (Sharfman *et al.*, 1988), making it necessary to control the industry. However, these results vary with the performance measure used (Gral, 2014).

The literature has also pointed to the need to apply controls when determining the impact of slack on performance, given the contingent nature of this relationship. In this way, uncertainty in the environment leads to a positive effect of the financial slack on performance. Faced with limited external resources, the positive impact becomes even stronger. In times or periods of crisis, the possession of slack initially results in a higher rate of decline in performance but allows for a faster speed of recovery in the post-recession period.

The consideration of the influence of the environment opens an interesting line of research, not yet explored. Studies on temporal symmetry (Rosen, 2005) try to determine whether a relationship between variables is maintained or changes at different times or periods of time, thus reflecting the effect that other variables or circumstances may have on that relationship. In short, the aim is to determine whether the relationship between slack and performance remains unchanged over time or whether the change in context, such as a crisis situation or a period of economic prosperity, influences that relationship.

Bearing in mind all these ideas, the paper, therefore, addresses the following research points. First, starting from a positive relationship between slack resources and performance, particularised according to the different types of slack that will be considered in this study. Second, this paper explores the possibility of a curvilinear relationship between these variables, following the ideas of Bourgeois (1981) and other authors (Love and Nohria, 2005; Wefald *et al.*, 2010). And third, the research tries to determine whether the relationships found, linear or curvilinear, are maintained in different periods of time, which are characterised by different economic contexts, either recession or expansion.

2.1 Time effect of slack resources

One of the least analysed issues, and with a great variety of results in the few analyses performed, is the temporal effect of the slack. It seems logical to propose the existence of an almost bidirectional relationship between resource slack and performance (Daniel *et al.*, 2004), given the dynamic and continuous nature of the company's operation. In this sense, both the accumulation of the slack and its use can present a delayed effect, since it is as much about the use of opportunities as the protection against threats, which do not have a temporal relation, *a priori*, between the resource, its accumulation and its use or orchestration.

Two different perspectives can be contemplated in the understanding of time. On the one hand, time can act as a contextualizing element. The reaction of companies in a period of economic crisis or in the evolution of a sector throughout its life cycle is an example of this perspective (Bradley *et al.*, 2011; Wan and Yiu, 2009; Zona, 2012). However, few studies have raised the possible symmetry of results over time (Dagostim Picolo *et al.*, 2018). On the other hand, time can be studied in relation to the durability of the effect of slack resources. In this case, the way in which companies use this "excess" of resources to reach their objectives is analysed (Guo *et al.*, 2018; Kuusela *et al.*, 2017), both in the speed of their consumption and in the prolongation of their effect in time (Love and Nohria, 2005).

When considering the relationship between slack resources and performance, it is necessary to bear in mind the dual role that performance plays. This accumulation will allow managers, according to the agency theory, to protect themselves against adverse situations that may occur in the future (Jensen, 1986). From a perspective centred on resources and capacities (Penrose, 1959), they are resources that can be orchestrated in order to make strategic decisions that favour obtaining a competitive advantage (Carnes *et al.*, 2019).

The few references to time in the literature (Argilés-Bosch *et al.*, 2018; Daniel *et al.*, 2004) have considered the possible delay in the effect of slack resources on performance, with effects lagged between 1 (Daniel *et al.*, 2004; Kuusela *et al.*, 2017) and 4 years (Love and Nohria, 2005), with the results not being significant in most cases.

3. Sample and methodology

This research uses the economic information contained in the financial statements to calculate the indicators. The data from the financial statements were collected by the SABI (Iberian Balance Sheet Analysis Systems) database covering the period from 2006 to 2017. This analysis period is justified as it covers the years prior to the economic crisis that began in 2008, and the subsequent years in which Spain was one of the most affected economies and their firms faced an environment with scarce resources and limited financial access (Canto-Cuevas *et al.*, 2016).

To guarantee, to a certain extent, the reliability of the information, those companies with a favourable audit report or a favourable audit report with qualifications in each and every one of the years of the period considered were selected, resulting in a total of 2,797 companies.

To reduce sectoral heterogeneity (Gral, 2014), the sample selected contains exclusively industrial companies (from NACE 20 to 38). Besides, companies that did not present complete information were discarded, reducing the sample to 449 companies.

The study has an exploratory character, because starting from a positive, linear or curvilinear (quadratic) relationship between slack and performance, it tries to determine the permanence in time (temporal symmetry) of this relationship, as well as the duration of the effect of the looseness of resources on the result of the company.

The Pearson correlation and the hierarchical linear regression were calculated using the SPSS software. These regressions were carried out, after checking the relevance of their estimation, in the successive years after the period considered and with delays, in order to determine the duration of the effects. A panel methodology was not used as it was a question

of determining the permanence of the relationship at different times, and not the consistency of that relationship throughout the whole period considered. Possible autocorrelation was evaluated by the Durbin–Watson test, with values around the adequate threshold for all regressions performed. Similarly, VIF values were below the value of 3 for all models tested in the paper.

3.1 Variables

With respect to dependent variables, the paper observes that the most common way of measuring profitability has been through economic profitability (ROA) (Carnes *et al.*, 2019). However, in order to obtain a more complete picture, following previous studies (see Daniel *et al.*, 2004), it was also decided to include financial profitability (ROE), as it reflects different objectives and management systems.

Consistent with previous studies, the paper uses financial ratios to calculate slack resources (e.g. George, 2005; Greenley *et al.*, 1998). Previous studies (Carnes *et al.*, 2019; Daniel *et al.*, 2004; Gral, 2014) indicate the need to consider the different types of slack (available, potential and recoverable), following the classification proposed by Bourgeois and Singh (1983), which continues to be the most used to date. Meta-analyses show how the current ratio (CR) (current assets/current liabilities) and the quick ratio (QR) (cash/current liabilities) are the most used ways to measure the available slack. Although the QR can be measured through other assets associated with liquidity, cash was considered for its immediacy (Deb *et al.*, 2017). For the other types of slack, the debt/equity (D/E) ratio was used to measure the potential, and the general sales and administrative expenses/sales ratio was used for recoverables. In this last category, the Spanish accounting system does not allow this type of expense to be identified by secondary data, so the analysis uses another of the most commonly used expenses, such as personnel expense/operating income (PE/I) (Lecuona and Reitzig, 2014; Paeleman; Vanacker, 2015).

After an initial evaluation, and observing the high values of collinearity between the CR and the QR, it was decided to use the first of them, which is the most used in the literature, thus facilitating greater comparability of results. All the variables were adjusted by subtracting the measure of each ratio from its industry, since it is common to compare the ratios in context in order to understand their effect (Paeleman *et al.*, 2017).

In order to control possible effects unrelated to the effect of slack resources, the following control variables were selected: the family nature of the company (George, 2005), international activity (exports, imports, both or none) (there is evidence of a relationship between slack resources and exports), whether or not the company is listed (George, 2005); the age of the company (logarithm of age) and, finally, the size of the company as measured by the logarithm of the number of employees (George, 2005).

4. Results

The interpretation of the results requires a differentiated analysis according to the dependent variable used (economic profitability and financial profitability), as well as the time horizon and the measurement of the slack. Regarding the period of time, the short term was considered as the immediate effect that the slack has on profitability; this is the approach followed by most of the literature, which has considered the effect of the slack on the profitability of the same year (Carnes *et al.*, 2019). For the medium term, an effect on the immediately subsequent year was considered, and for the long term, a period of 4 years was contemplated. These time horizons are arbitrary, but only respond to a manageable presentation of the results obtained; in the complete tables, the relations between slack resources and economic and financial profitability for the whole period considered are

included. Finally, three types of slack were considered: available, measured by the current ratio (CR); recoverable, measured through the personnel expenses / operating income (PE/I) relation; and potential, estimated by the quotient between debts and equity (D/E).

Table 1 presents the mean and standard deviation of the variables used in the analysis, as well as the correlation coefficients between them. It is observed that the economic and financial profitability of the different years selected is significantly related to some of the explanatory variables. The results of the regressions for those selected years are shown in Tables 2, 3 and 4.

4.1 Effect of different types of slack on economic profitability

In the short term, it can be observed that CR has a positive and significant effect for the years considered ($\beta = 2.947, p < 0.001$ for 2006; $\beta = 0.916, p < 0.01$ for 2010; and $\beta = 0.728, p < 0.01$ for 2013). When PE/I is analysed, a significant effect is also observed for the three years, but in this case, in a negative sense ($\beta = -0.19, p < 0.001$ for 2006; $\beta = -0.147, p < 0.001$ for 2010; and $\beta = -0.135, p < 0.001$ for 2013). On the other hand, the potential slack (D/E) presents a significant linear effect only for the year 2010 ($= -0.073, p < 0.001$). Following the proposal put forward by the literature and associated with the efficiency of these resources and the possible existence of a curvilinear relationship between slack resources and profitability (Daniel *et al.*, 2004), the quadratic effects were studied, finding that the relationship shows a U-inverted shape for the CR in the years 2010 and 2013, as well as for D/E in the 2010 and 2013 periods.

For the medium term, that is, the effect in the immediately subsequent year, a negative and significant effect of recoverable slack on economic profitability is observed for the years 2007, 2011 and 2014 (for PE/I; $\beta = -0.155, p < 0.001$; $\beta = -0.077, p < 0.05$; and $\beta = -0.117, p < 0.01$). In the case of the available slack, a significant effect was observed in 2007, and with less significance also in 2014 (for CR; $\beta = 2.436, p < 0.001$ and $\beta = -0.534, p < 0.1$). With respect to the potential slack, only a significant effect is observed in 2011 (For D/E; $\beta = -0.042, p < 0.05$). Quadratic analyses show significant inverted U-shaped effects for CR of each year and for D/E in 2010 and 2013.

A possible long-term effect was also proposed, considering a delay period of 4 years. Although the literature has not considered such a long-term effect, the results show an effect between potential and recoverable slack through economic profitability, but only for 2013 (for D/E; $\beta = -0.642, p < 0.05$ and for PE/I; $\beta = -0.092, p < 0.01$).

4.2 Effect of different types of slack on financial performance

In the short term, there is a significant effect of the potential slack on financial profitability, although with a different sign depending on the year considered (for D/E; $\beta = 3.625, p < 0.001$ in 2006; $\beta = -7.152, p < 0.001$ in 2010; and $\beta = -5.569, p < 0.001$ in 2013). The effect is also significant in all years for the recoverable slack, but in this case, always with a negative sign (for PE/I; $\beta = -0.889, p < 0.001$ in 2006; $\beta = -0.833, p < 0.001$ in 2010; and $\beta = -0.347, p < 0.001$ in 2013). The effect of available resources (CR) is significant only in 2006 ($\beta = 5.265, p < 0.001$). No quadratic effects are observed for the available short-term slack in any of the years studied. The potential slack has a U-shaped relationship for 2006 and 2013, and inverted U for 2010 and 2014. On the other hand, the recoverable slack shows a U shape for 2006, without significant effect for the rest of the years.

In the medium term, it can be seen that potential slacks become relevant for 2006 and 2010 compared to the other two types of slack resources. Thus, the potential slack of 2006 has a significant and positive effect on the profitability of 2007 ($\beta = 15.987, p < 0.001$), and the 2010 slack on the financial profitability of 2011 ($\beta = 0.171, p < 0.01$). With regard to the PE/I ratio, there is a significant negative relationship between the 2010 slack and the 2011 financial

	Min	Max	Avg	SD	Family	Public	E/I	Age 06	Age 10	Age 13	Emp.06	Emp.10	Emp.13	CR06	CR10	CR13	D/E 06	D/E 10	D/E 13	PE/I 06	PE/I 10	PE/I 13	ROA 06	ROA 10	ROA 13	ROE 06	ROE 10
Family	0	1	0.43	0.50																							
Public	0	1	1.99	0.11	−0.122**																						
E/I	0	3	2.33	1.09	0.190**	−0.03																					
Age 06	8	97	25.78	16.15	0.06	−0.161**	0.08																				
Age 10	4	93	29.78	16.15	0.06	−0.161**	0.08	1.000**																			
Age 13	0	89	32.78	16.15	0.06	−0.161**	0.08	1.000**	1.000**																		
Emp.06	2.07	9.08	4.68	1.07	−0.269**	−0.08	−0.04	0.217**	0.217**	0.217**																	
Emp.10	1.60	9.31	4.64	1.02	−0.275**	−0.097*	−0.04	0.168**	0.168**	0.168**	0.926**																
Emp.13	0	9.49	4.64	1.01	−0.311**	−0.02	−0.02	0.179**	0.179**	0.179**	0.910**	0.948**															
CR06	0.17	17.98	0.00	0.90	0.04	0.093*	0.02	0.05	0.05	0.05	−0.100*	−0.098*	−0.111*														
CR10	0.13	14.96	0.00	1.23	0.094*	0.109*	0.01	0.09	0.09	0.09	−0.125**	−0.143**	−0.160**	0.635**													
CR13	0.14	12.76	0.00	1.51	0.07	0.08	−0.02	0.09	0.09	0.09	−0.135**	−0.135**	−0.154**	0.549**	0.815**												
D/E 06	−6.03	31.24	0.00	3.44	−0.02	0.01	0.01	−0.093*	−0.093*	−0.093*	0.04	0.05	0.08	−0.161**	−0.143**	−0.130**											
D/E 10	−4.49	369.58	0.00	17.30	−0.03	0.01	0.02	0.02	0.02	0.02	0.05	0.03	0.09	−0.03	−0.03	−0.02	0.428**										
D/E 13	−29.50	44.33	0.00	2.32	−0.08	0.01	0.06	−0.02	−0.02	−0.02	0.04	0.04	0.05	−0.180**	−0.203**	−0.211**	0.165**	0.232**									
PE/I 06	0.28	79.967	0.00	9.66	0.09	0.04	−0.07	0.093*	0.093*	0.093*	0.205**	0.178**	0.168**	0.09	0.05	0.03	−0.01	−0.02	−0.03								
PE/I 10	0.19	121.77	0.00	11.73	0.115*	−0.163**	−0.04	0.09	0.09	0.09	0.116*	0.109*	0.08	0.06	0.097*	0.129**	−0.04	−0.03	−0.07	0.782**							
PE/I 13	0.22	79.415	0.00	11.02	0.101*	0.01	−0.08	0.08	0.08	0.08	0.170**	0.165**	0.131**	0.135**	0.178**	0.209**	−0.06	−0.04	−.113*	0.810**	0.819**						
ROA 06	−46.11	53.131	7.29	8.38	−0.108*	0.04	−0.04	0.01	0.01	0.01	−0.02	0.01	0.00	0.296**	0.223**	0.187**	−0.08	−0.06	−.258**	−0.186**	−0.095*	−0.03					
ROA 10	−44.54	81.377	5.79	8.49	−0.07	0.06	−0.02	−0.05	−0.05	−0.05	−0.04	0.02	0.05	0.141**	0.101*	0.098*	−0.08	−0.145**	−0.108*	−0.06	−0.189**	−0.08	0.307**				
ROA 13	−58.65	47.244	4.63	8.42	−0.105*	−0.01	0.01	−0.07	−0.07	−0.07	−0.07	−0.03	0.01	0.09	0.01	0.09	−0.01	−0.03	−0.07	0.03	−0.05	−0.154**	0.167**	0.524**			
ROE 06	−258.15	514.02	19.33	33.45	−0.102*	0.03	−0.09	−0.116*	−0.116*	−0.116*	0.03	0.08	0.08	0.05	0.02	0.02	0.362**	0.00	−0.01	−0.231**	−0.166**	−0.137**	0.530**	0.267**	0.123**		
ROE 10	−2477.14	158.89	3.27	133.75	0.05	0.00	0.03	−0.01	−0.01	−0.01	−0.05	−0.03	−0.07	0.02	0.01	−0.01	−0.319**	−0.922**	−0.177**	−0.01	−0.05	−0.01	0.09	0.260**	0.09	0.05	
ROE 13	−100.08	519.21	9.94	31.15	−0.104*	0.00	−0.09	−0.06	−0.06	−0.06	0.03	0.04	0.09	0.04	−0.05	−0.03	0.196**	0.182**	−0.378**	0.03	−0.03	−0.08	0.151**	0.209**	0.440**	0.120*	−0.07

Note(s): *The correlation is significant at level 0.05 (bilateral). ** The correlation is significant at level 0.01 (bilateral)

Table 1.
Correlation, average y standard deviation

Table 2.
2006 Regressions for slack–performance relationship

Slack	ROA (2006)			ROA (2007)			ROA (2010)			ROE (2006)			ROE (2007)			ROE (2010)		
Models	M 1	M 2	M 2 (bis)	M 1	M 2	M2 (bis)	M 1	M 2	M 2 (bis)	M 1	M 2	M 2 (bis)	M 1	M 2	M 2 (bis)	M 1	M 2	M 2 (bis)
Cons	6.588	5.891	7.118	11.464	10.964	13.402	1.885	2.304	3.006	23.085	8.372	25.157	19.129	42.858	68.129	16.494	4.911	−25.457
	(8.211)	(7.752)	(7.847)	(7.957)	(7.69)	(7.737)	(8.336)	(8.348)	(8.431)	(32.567)	(29.525)	(26.064)	(121.632)	(110.954)	(98.408)	(131.81)	(126.625)	(126.331)
Family	−1.983*	−1.415+	−1.454+	−1.689	−1.224	−1.22	−1.394	−1.248	−1.215	−4.932	−1.942	−1.776	−10.612	−11.26	−9.681	9.043	9.033	8.887
	(0.854)	(0.81)	(0.809)	(0.828)	(0.803)	(0.798)	(0.867)	(0.872)	(0.869)	(3.389)	(3.083)	(2.687)	(12.656)	(11.587)	(10.144)	(13.715)	(13.223)	(13.022)
Public	1.842	0.758	0.25	−1.383	−2.279	−3.296	3.406	2.692	2.464	2.005	4.932	1.88	−6.907	−15.067	−17.272	0.901	4.02	9.037
	(3.848)	(3.621)	(3.64)	(3.729)	(3.591)	(3.589)	(3.907)	(3.899)	(3.911)	(15.262)	(13.789)	(12.09)	(57.002)	(51.819)	(45.648)	(61.772)	(59.138)	(58.601)
E/I	−0.198	−0.381	−0.483	0.199	0.042	0.031	−0.01	−0.055	0.022	−2.017	−3.113*	−2.471*	−1.976	−3.163	1.119	2.175	3.21	2.351
	(0.371)	(0.348)	(0.353)	(0.359)	(0.345)	(0.348)	(0.376)	(0.375)	(0.379)	(1.47)	(1.325)	(1.172)	(5.49)	(4.979)	(4.424)	(5.95)	(5.682)	(5.679)
Age	0.016	0.006	0.001	−0.013	−0.019	−0.019	−0.013	−0.021	−0.017	−0.236*	−0.149	−0.109	−0.82*	−0.502	−0.265	−0.03	−0.301	−0.357
	(0.026)	(0.024)	(0.024)	(0.025)	(0.024)	(0.024)	(0.026)	(0.026)	(0.026)	(0.101)	(0.092)	(0.08)	(0.378)	(0.344)	(0.303)	(0.41)	(0.393)	(0.389)
Tamaño	−0.44	0.264	0.368	−0.086	0.471	0.418	−0.409	−0.142**	−0.291	1.104	2.795+	−0.029	11.003+	8.3	−1.385	−4.962	−2.835	2.049
	(0.398)	(0.385)	(0.392)	(0.386)	(0.382)	(0.386)	(0.404)	(0.415)	(0.421)	(1.578)	(1.466)	(1.301)	(5.893)	(5.509)	(4.913)	(6.386)	(6.288)	(6.306)
CR06		2.947***	3.58		2.436***	3.572***		1.284	1.436*		5.265***	5.33*		10.792+	4.185		−5.83	−5.232
		(0.422)	(0.626)		(0.418)	(0.617)		(0.454)	(0.673)		(1.606)	(2.08)		(6.037)	(7.853)		(6.889)	(10.082)
D/E06		−0.084	0.011		0.029	−0.017		−0.154	−0.272*		3.625***	2.032***		15.987***	9.292***		−12.752***	−10.19***
		(0.109)	(0.12)		(0.108)	(0.118)		(0.118)	(0.129)		(0.416)	(0.397)		(1.564)	(1.501)		(1.785)	(1.927)
PE/I06		−0.19***	−0.191		−0.155***	−0.174		−0.054	−0.057		−0.889***	−0.524***		0.15	0.777		0.005	−0.75
		(0.04)	(0.048)		(0.04)	(0.047)		(0.043)	(0.051)		(0.152)	(0.158)		(0.573)	(0.598)		(0.654)	(0.768)
2CR06			−0.226			−0.475**			−0.105			−0.836			−0.118			1.156
			(0.185)			(0.182)			(0.199)			(0.615)			(2.32)			(2.979)
2D/E06			−0.008			0.006			0.012*			0.181***			0.699***			−0.299***
			(0.005)			(0.005)			(0.005)			(0.016)			(0.06)			(0.077)
2PE/I06			0			0.002			0.001			−0.017**			−0.006			0.039
			(0.002)			(0.002)			(0.002)			(0.006)			(0.024)			(0.031)
R^2 Adj	0.005	0.133	0.136	0	0.087	0.1	0.001	0.02	0.028	0.017	0.21	0.401	0.01	0.195	0.384	0	0.091	0.12

Note(s): Standard errors in parentheses; $+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$

Slack	ROA (2010)			ROA (2011)			ROA (2014)			ROE (2010)			ROE (2011)			ROE (2014)		
Modelos	M 1	M 2	M 2 (bis)	M 1	M 2	M2 (bis)	M 1	M 2	M 2 (bis)	M 1	M 2	M 2 (bis)	M 1	M 2	M 2 (bis)	M 1	M 2	M 2 (bis)
Cons	−1.516	3.408	−0.77	8.88	11.448	11.112	12.893	14.056	12.71	−3.604	−33.746	−41.33	25.436	31.804	37.32	19.109	24.275	−8.446
	(8.462)	(8.261)	(8.962)	(7.728)	(7.732)	(8.465)	(8.407)	(8.503)	(9.362)	(133.749)	(51.187)	(57.553)	(22.734)	(22.627)	(25.335)	(37.816)	(38.265)	(42.299)
Family	−1.049	−0.76	−0.559	−1.603*	−1.456+	−1.35+	−3.553***	−3.476***	−3.355***	11.227	8.339	8.363	−2.289	−1.229	−1.216	−8.072*	−7.739*	−6.766+
	(0.87)	(0.85)	(0.825)	(0.794)	(0.795)	(0.78)	(0.864)	(0.875)	(0.862)	(13.743)	(5.265)	(5.3)	(2.336)	(2.327)	(2.333)	(3.886)	(3.936)	(3.895)
Public	3.878	0.55	1.787	−0.673	−2.416	−2.762	−2.149	−2.936	−2.897	3.26	5.1	9.262	−3.668	−7.567	−10.638	−3.562	−6.692	4.796
	(3.922)	(3.86)	(4.099)	(3.581)	(3.613)	(3.872)	(3.896)	(3.972)	(4.282)	(61.984)	(23.915)	(26.322)	(10.536)	(10.571)	(11.587)	(17.525)	(17.878)	(19.346)
E/I	−0.01	−0.078	0.197	0.19	0.156	0.432	0.588	0.57	0.892*	2.188	4.154+	3.476	−0.037	−0.308	0.17	−1.402	−1.507	0.071
	(0.377)	(0.365)	(0.369)	(0.344)	(0.342)	(0.349)	(0.374)	(0.376)	(0.386)	(5.954)	(2.263)	(2.371)	(1.012)	(1)	(1.044)	(1.683)	(1.691)	(1.743)
Age	−0.02	−0.024	−0.021	−0.042+	−0.044+	−0.042+	−0.008	−0.008	−0.007	−0.087	0.081	0.083	−0.134+	−0.128+	−0.129+	−0.231*	−0.237*	−0.22+
	(0.026)	(0.025)	(0.024)	(0.023)	(0.023)	(0.023)	(0.025)	(0.026)	(0.025)	(0.405)	(0.155)	(0.156)	(0.069)	(0.069)	(0.069)	(0.115)	(0.116)	(0.114)
Tamaño	0.145	0.539	0.721+	−0.247	−0.039	0.028	−0.518	−0.425	−0.352	−1.499	2.412	2.596	−0.77	−0.474	−0.565	3.277+	3.566+	4.357*
	(0.42)	(0.413)	(0.41)	(0.384)	(0.387)	(0.387)	(0.417)	(0.425)	(0.428)	(6.638)	(2.561)	(2.631)	(1.128)	(1.132)	(1.158)	(1.877)	(1.915)	(1.934)
CR10		0.916**	1.765***		0.484	1.022*		0.202	0.561		−1.318	−0.943		−0.094	0.085		0.864	1.089
		(0.325)	(0.446)		(0.304)	(0.421)		(0.335)	(0.465)		(2.015)	(2.861)		(0.891)	(1.259)		(1.506)	(2.103)
D/E10		−0.073***	−0.367***		−0.042*	−0.31***		−0.017	−0.308***		−7.152***	−6.634***		0.171**	−0.23		0.073	−1.229***
		(0.022)	(0.079)		(0.021)	(0.074)		(0.023)	(0.082)		(0.139)	(0.506)		(0.062)	(0.223)		(0.104)	(0.372)
PE/I10		−0.147***	−0.17***		−0.077*	−0.072+		−0.036	−0.031		−0.833***	−0.924***		−0.262**	−0.205+		−0.122	−0.222
		(0.034)	(0.041)		(0.032)	(0.039)		(0.035)	(0.043)		(0.213)	(0.262)		(0.094)	(0.116)		(0.159)	(0.193)
2CR10			−0.244***			−0.175**			−0.136+			0.028			−0.13			−0.225
			(0.071)			(0.067)			(0.075)			(0.459)			(0.202)			(0.337)
2D/E10			0.001***			0.001***			0.001***			−0.002			0.001+			0.004***
			(0)			(0)			(0)			(0.002)			(0.001)			(0.001)
2PE/I10			0.001			0.000			0.000			0.003			−0.002			0.005
			(0.001)			(0.001)			(0.001)			(0.006)			(0.003)			(0.004)
R^2 Adj	0.000	0.064	0.126	0.007	0.025	0.073	0.028	0.025	0.062	0.000	0.855	0.855	0.002	0.03	0.035	0.024	0.02	0.05

Note(s): Standard errors in parentheses; $+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$

Table 3.
2010 Regressions for slack–performance relationship

Table 4.
2013 Regressions for slack–performance relationship

Slack	ROA (2013)			ROA (2014)			ROA (2017)			ROE (2013)			ROE (2014)			ROE (2017)		
Models	M 1	M 2	M 2 (bis)	M 1	M 2	M2 (bis)	M 1	M 2	M 2 (bis)	M 1	M 2	M 2 (bis)	M 1	M 2	M 2 (bis)	M 1	M 2	M 2 (bis)
Cons	11.699	10.744	15.371	10.616	9.646	13.787	7.828	5.924	6.368	18.593	8.921	12.553	15.195	10.985	4.49	17.364	10.237	11.514
	(8.189)	(8.075)	(7.84)	(8.252)	(8.21)	(8.012)	(7.852)	(7.733)	(7.77)	(30.208)	(27.649)	(27.471)	(36.88)	(36.918)	(36.744)	(20.49)	(20.208)	(20.412)
Family	−1.974*	−1.596+	−1.628+	−3.386***	−2.984***	−3.017***	−3.397***	−3.261***	−3.178***	−4.074	−4.65	−5.137+	−6.566+	−5.343	−4.826	−6.297**	−4.924*	−4.902*
	(0.868)	(0.866)	(0.836)	(0.875)	(0.881)	(0.854)	(0.832)	(0.829)	(0.828)	(3.203)	(2.966)	(2.929)	(3.91)	(3.96)	(3.918)	(2.172)	(2.168)	(2.176)
Public	−2.478	−2.984	−4.417	−1.677	−1.962	−3.304	1.474	1.9	1.697	−4.665	−2.165	−3.157	−5.475	−5.784	−5.522	1.719	3.51	3.097
	(3.851)	(3.799)	(3.67)	(3.88)	(3.863)	(3.751)	(3.692)	(3.638)	(3.638)	(14.203)	(13.008)	(12.862)	(17.34)	(17.37)	(17.203)	(9.634)	(9.508)	(9.557)
E/I	0.244	0.169	−0.058	0.592	0.492	0.293	0.474	0.472	0.499	−1.945	−1.458	−1.871	−1.535	−1.825	−1.088	−0.299	−0.672	−0.718
	(0.372)	(0.369)	(0.36)	(0.375)	(0.375)	(0.368)	(0.357)	(0.353)	(0.357)	(1.373)	(1.262)	(1.261)	(1.676)	(1.685)	(1.686)	(0.931)	(0.922)	(0.937)
Age	−0.036	−0.041	−0.046+	−0.01	−0.013	−0.016	−0.006	−0.004	−0.001	−0.134	−0.129	−0.148+	−0.259*	−0.262*	−0.214*	−0.103	−0.088	−0.088
	(0.025)	(0.025)	(0.024)	(0.026)	(0.026)	(0.025)	(0.024)	(0.024)	(0.024)	(0.094)	(0.086)	(0.086)	(0.115)	(0.115)	(0.115)	(0.064)	(0.063)	(0.064)
Tamaño	−0.147	0.315	0.285	−0.222	0.139	0.121	−0.737+	−0.534	−0.547	2.431	3.222*	3.279*	5.208**	6.306***	6.479***	−0.188	0.533	0.52
	(0.422)	(0.429)	(0.414)	(0.426)	(0.436)	(0.423)	(0.405)	(0.411)	(0.41)	(1.558)	(1.469)	(1.451)	(1.902)	(1.961)	(1.941)	(1.057)	(1.074)	(1.078)
CR13		0.728**	2.296***		0.534+	2.025***		−0.104	0.243		−1.31	−0.8		1.268	2.271		−0.25	0.245
		(0.275)	(0.388)		(0.28)	(0.397)		(0.264)	(0.385)		(0.942)	(1.361)		(1.258)	(1.82)		(0.689)	(1.011)
D/E13		−0.253	0.51*		−0.042	0.673**		−0.642*	−0.848***		−5.569***	−3.41***		−0.522	−2.685*		−0.502	−0.395
		(0.173)	(0.24)		(0.176)	(0.245)		(0.165)	(0.238)		(0.592)	(0.841)		(0.79)	(1.125)		(0.432)	(0.625)
PE/I13		−0.135***	−0.148***		−0.117**	−0.139***		−0.092**	−0.085*		−0.347**	−0.438**		−0.385*	−0.54**		−0.388***	−0.388***
		(0.037)	(0.041)		(0.038)	(0.042)		(0.036)	(0.041)		(0.128)	(0.145)		(0.171)	(0.194)		(0.094)	(0.108)
2CR13			−0.333***			−0.316***			−0.099			0.024			−0.361			−0.114
			(0.066)			(0.067)			(0.065)			(0.23)			(0.307)			(0.171)
2D/E13			−0.049*			−0.046*			0.019			−0.167***			0.169**			−0.005
			(0.013)			(0.013)			(0.013)			(0.045)			(0.06)			(0.033)
2PE/I13			0.001			0.001			0			0.006			0.013+			−0.000
			(0.002)			(0.002)			(0.002)			(0.005)			(0.007)			(0.004)
R^2 Adj	0.006	0.042	0.11	0.025	0.043	0.102	0.03	0.067	0.071	0.024	0.171	0.027	0.034	0.04	0.062	0.02	0.054	0.049

Note(s): Standard errors in parentheses; $+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$

return ($\beta = -0.262$, $p < 0.01$), and also between the 2013 slack and the 2014 return ($\beta = -0.385$, $p < 0.01$). The quadratic analyses show a U shape for the potential in the 2006 D/E and a U-inverted shape in the 2013 D/E, as well as a U-inverted shape for the recoverable in the year 2013, although with low significance.

Finally, in the long term, significant relationships are scarce, but there is an effect of the potential slack of 2006 on the financial profitability of 2010 ($\beta = -12.752$, $p < 0.001$) and of the recoverable slack of 2013 ($\beta = -0.388$, $p < 0.001$) on the profitability of 2017. In the first case, there is also a U-shaped relationship between potential slack in 2006 and profitability in 2010; this relationship is also observed between 2010 and 2014.

4.3 Analysis of the robustness of the results and duration of the effects

In addition to the previous analyses, which have estimated the linear and quadratic effects of the control and explanatory variables for three discretionally chosen years (2006, 2010 and 2013), a robustness analysis has been carried out comparing the different types of slack and the performance for all the years of the period considered. This analysis makes it possible to determine the degree of permanence in time, or temporal symmetry, of the relationships found. The results can be seen in Tables 5 and 6, which show the coefficients, deviations and level of significance of these effects.

Observing the short-term effect (values of the main diagonal), it is possible to verify that the ratio of both the available slack (CR) and the recoverable slack (PE/I) to the economic profitability occurs in all the years of the period, one in the positive and the other in the negative. It can therefore be said that there is a certain temporal symmetry in these relationships. This feature is not observed in the short-term relationship between D/E and economic profitability, as it is only significant in 4 out of the 12 estimated regressions. This is an expected result, taking into account the longer-term nature or potential effect of these resources.

In the medium term, the relationship between the recoverable slack and economic profitability persists, since in all the years considered it is significant and negative. On the contrary, this relationship is less permanent in the cases of available and potential slacks, which is significant only in 5 and 4 cases, respectively, out of 11 estimated ratios.

Finally, in the long term (delayed effect of 4 years), the relations between the variables are less persistent. Thus, the effects of the three types of slack on the economic profitability are produced in scarce relations, since only in 2 cases out 8 possible ones the three types of slack have a significant effect. This result indicates that the impact of the slack on the performance is less visible and permanent when it is removed in time.

In order to statistically confirm these observations, a *lincom* estimation was carried out using Stata 12 software, as it offers a confidence interval as well as a null hypothesis test on whether the difference between the coefficients is zero, that is, whether the intensity and the sign remain over time. The results show that in the regression on economic profitability, the coefficients are significantly different from the CR in the first two years analysed, but show homogeneity in intensity and sign for the rest of the period. For the other two slack ratios analysed, the results show a predominance of equality (only 7 out of 66 comparisons were significant for the D/E and 10 out of 66 for the PE/I), without observing a pattern in the relations.

Regarding financial profitability, in the short term, the effect of the recoverable slack (11 significant and negative relationships out of 12 possible) and the potential slack (9 significant and mostly negative relationships) is permanent, but not so in the available slack, where only two significant relationships are identified. In the medium term, the permanence of the effects decreases, although it remains high in the case of the potential slack (8 significant relationships and mostly positive out of 11 possible) and less in the recoverable slack (6 significant and negative relationships). As in the short term, the available slack does not show

Table 5.
Analysis of temporal symmetry (ROA)

		ROA06	ROA07	ROA08	ROA09	ROA10	ROA11	ROA12	ROA13	ROA14	ROA15	ROA16	ROA17
Slack2006	CR	2.947***	2.436***	1.618***	1.091	1.284**	0.253	0.176	0.766+	0.625	−0.155	0.665	−0.066
		(0.421)	(0.418)	(0.465)	(0.675)	(0.454)	(0.415)	(0.507)	(0.450)	(0.455)	(0.579)	(0.650)	(0.429)
	D/E	−0.084	0.029	−0.191	0.035	−0.154	−0.296**	−0.234+	−0.012	0.132	−0.109	0.177	−0.300**
		(0.109)	(0.108)	(0.120)	(0.174)	(0.117)	(0.107)	(0.131)	(0.116)	(0.117)	(0.150)	(0.168)	(0.111)
	PE/I	−0.190***	−0.155***	−0.158***	−0.116+	−0.054	0.012	−0.015	0.061	0.022	−0.018	−0.033	−0.050
		(0.040)	(0.039)	(0.044)	(0.064)	(0.043)	(0.039)	(0.048)	(0.042)	(0.043)	(0.054)	(0.061)	(0.040)
Slack2007	CR		2.415***	1.517***	0.987	1.182**	0.722+	0.466	0.736+	0.405	0.453	0.638	−0.187
			(0.381)	(0.433)	(0.624)	(0.420)	(0.386)	(0.470)	(0.415)	(0.421)	(0.535)	(0.601)	(0.399)
	D/E		0.130*	0.054	0.087	0.091	−0.020	0.044	0.133+	0.086	0.017	0.118	−0.095
			(0.063)	(0.072)	(0.104)	(0.070)	(0.064)	(0.078)	(0.069)	(0.070)	(0.089)	(0.100)	(0.066)
	PE/I		−0.149***	−0.146***	−0.104	−0.050	−0.014	−0.013	0.059	0.025	−0.011	−0.016	−0.050
			(0.039)	(0.045)	(0.065)	(0.043)	(0.040)	(0.049)	(0.043)	(0.043)	(0.055)	(0.062)	(0.041)
Slack2008	CR			0.710***	0.255	0.255	0.132	0.085	0.055	−0.089	0.013	0.215	−0.146
				(0.212)	(0.311)	(0.210)	(0.193)	(0.234)	(0.208)	(0.210)	(0.266)	(0.300)	(0.198)
	D/E			−0.149**	0.013*	−0.091	−0.044	−0.054	0.097*	0.009	0.090	0.079	−0.097*
				(0.049)	(0.072)	(0.049)	(0.045)	(0.054)	(0.048)	(0.049)	(0.062)	(0.070)	(0.046)
	PE/I			−0.205***	−0.138*	−0.076+	−0.042	−0.055	0.027	0.002	−0.034	−0.032	−0.060
				(0.041)	(0.061)	(0.041)	(0.037)	(0.046)	(0.040)	(0.041)	(0.052)	(0.058)	(0.038)
Slack2009	CR				0.568+	0.361	0.258	0.156	0.037	−0.046	0.028	0.184	−0.218
					(0.325)	(0.222)	(0.203)	(0.249)	(0.222)	(0.224)	(0.284)	(0.319)	(0.211)
	D/E				0.061	0.059+	0.052	0.013	0.027	−0.008	0.034	0.070	0.001
					(0.051)	(0.035)	(0.032)	(0.039)	(0.035)	(0.035)	(0.045)	(0.050)	(0.033)
	PE/I				−0.225***	−0.123***	−0.083*	−0.077+	−0.024	−0.027	−0.058	−0.068	−0.061+
					(0.053)	(0.036)	(0.033)	(0.040)	(0.036)	(0.036)	(0.046)	(0.052)	(0.034)
Slack2010	CR					0.916**	0.484	0.381	0.178	0.202	0.335	0.439	−0.139
						(0.325)	(0.304)	(0.372)	(0.332)	(0.334)	(0.424)	(0.477)	(0.316)
	D/E					−0.073***	−0.042*	−0.028	−0.013	−0.017	−0.019	0.001	−0.025
						(0.022)	(0.021)	(0.025)	(0.022)	(0.023)	(0.029)	(0.032)	(0.021)
	PE/I					−0.147***	−0.077**	−0.076+	−0.028	−0.036	−0.073	−0.062	−0.078*
						(0.034)	(0.032)	(0.039)	(0.035)	(0.035)	(0.044)	(0.050)	(0.033)
Slack2011	CR						0.635**	0.221	0.295	0.263	0.219	0.331	0.004
							(0.232)	(0.287)	(0.255)	(0.257)	(0.328)	(0.368)	(0.243)
	D/E						−0.117*	−0.050	0.011	0.006	0.010	0.038	−0.091
							(0.045)	(0.056)	(0.050)	(0.050)	(0.064)	(0.072)	(0.048)
	PE/I						−0.104**	−0.089*	−0.035	−0.057	−0.085+	−0.072	−0.08*1
							(0.033)	(0.041)	(0.037)	(0.037)	(0.047)	(0.053)	(0.035)

(*continued*)

Table 5.

		ROA06	ROA07	ROA08	ROA09	ROA10	ROA11	ROA12	ROA13	ROA14	ROA15	ROA16	ROA17
Slack2012	CR							0.575*	0.400	0.295	0.306	0.453	−0.141
								(0.282)	(0.254)	(0.255)	(0.325)	(0.366)	(0.241)
	D/E							0.038	0.195	0.319*	0.375+	0.109	−0.486***
								(0.172)	(0.154)	(0.155)	(0.198)	(0.223)	(0.146)
	PE/I							−0.166***	−0.067+	−0.068+	−0.093*	−0.107*	−0.079*
								(0.041)	(0.037)	(0.037)	(0.047)	(0.053)	(0.035)
Slack2013	CR								0,728**	0,534+	0,401+	0,725+	-0,104***
									(0,275)	(0,279)	(0,355)	(0,400)	(0,263)
	D/E								−0.253	−0.042	−0.405	−0.042	−0.642
									(0.172)	(0.175)	(0.223)	(0.251)	(0.165)
	PE/I								−0,135***	−0,117**	−0,151**	−0,143**	−0,092**
									(0,037)	(0,037)	(0,048)	(0,054)	(0,035)
Slack2014	CR									0.470+	0.221	0.506	−0.141
										(0.251)	(0.319)	(0.360)	(0.235)
	D/E									−0.158	−0.406*	−0.038	−0.607***
										(0.150)	(0.191)	(0.215)	(0.141)
	PE/I									−0.119**	−0.153**	−0.146**	−0.104**
										(0.039)	(0.050)	(0.056)	(0.037)
Slack2015	CR										0.873**	0.642+	−0.137
											(0.286)	(0.334)	(0.219)
	D/E										0.027	0.099	−0.551***
											(0.152)	(0.178)	(0.116)
	PE/I										−0.321***	−0.165**	−0.116***
											(0.045)	(0.052)	(0.034)
Slack2016	CR											1.124**	0.156**
												(0.354)	(0.236)
	D/E											0.084	−0.446
												(0.242)	(0.162)
	PE/I											−0.203***	−0.149***
												(0.054)	(0.036)
Slack2017	CR												(0.455)*
													(0.212)
	D/E												(−0.19)
													(0.152)
	PE/I												(−0.16)***

Note(s): Standard errors in parentheses; $+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$

Table 6.
Analysis of time symmetry (ROE)

		ROE06	ROE07	ROE08	ROE09	ROE10	ROE11	ROE12	ROE13	ROE14	ROE15	ROE16	ROE17
Slack2006	CR	5.265***	10.792+	14.151*	−2.509	−5.830	−1.098	2.970	2.736+	6.237***	3.692	7.681**	0.181
		(1.606)	(6.036)	(5.766)	(6.959)	(6.889)	(1.230)	(1.904)	(1.644)	(1.865)	(2.518)	(2.452)	(1.076)
	D/	3.625***	15.987***	8.126***	3.024+	−12.752***	−0.167	0.803	1.855***	4.676***	3.154***	7.777***	1.764***
	E	(0.416)	(1.563)	(1.494)	(1.802)	(1.784)	(0.318)	(0.493)	(0.426)	(0.483)	(0.652)	(0.635)	(0.278)
	PE/	−0.889***	0.150	−1.290*	−0.393	0.005	−0.199+	−0.383*	0.091	0.041	−0.680**	−0.338	−0.315**
	I	(0.152)	(0.573)	(0.547)	(0.660)	(0.653)	(0.116)	(0.180)	(0.156)	(0.177)	(0.239)	(0.232)	(0.102)
Slack2007	CR		−3.901	−1.774	−4.109	2.872	−0.236	2.215	1.776	3.158+	1.193	2.308	−1.126
			(6.026)	(5.466)	(6.444)	(6.683)	(1.136)	(1.715)	(1.530)	(1.836)	(2.369)	(2.465)	(1.018)
	D/		−5.193***	2.571**	0.932	−2.545*	0.190	1.485***	0.949***	1.736***	1.181**	3.186***	0.753***
	E		(1.009)	(0.915)	(1.079)	(1.119)	(0.190)	(0.287)	(0.256)	(0.307)	(0.396)	(0.412)	(0.170)
	PE/		−0.378	−0.881	−0.508	−0.837	−0.196+	−0.245	0.132	0.179	−0.507*	−0.056	−0.225*
	I		(0.627)	(0.569)	(0.671)	(0.696)	(0.118)	(0.178)	(0.159)	(0.191)	(0.246)	(0.256)	(0.106)
Slack2008	CR			0.603	−1.641	0.185	0.048	0.837	0.333	0.744	0.874	0.951	−0.279
				(2.683)	(3.198)	(2.568)	(0.547)	(0.868)	(0.751)	(0.928)	(1.151)	(1.252)	(0.503)
	D/			−2.792***	1.544*	−10.521***	0.684***	0.731***	0.946***	0.996***	1.503***	1.864***	0.590***
	E			(0.626)	(0.747)	(0.599)	(0.127)	(0.202)	(0.175)	(0.216)	(0.268)	(0.292)	(0.117)
	PE/			−1.444**	−0.640	−1.305**	−0.240*	−0.351*	0.059	0.046	−0.517*	−0.233	−0.269**
	I			(0.526)	(0.627)	(0.504)	(0.107)	(0.170)	(0.147)	(0.182)	(0.226)	(0.245)	(0.098)
Slack2009	CR				−2.218	1.407	0.020	0.305	−0.117	0.536	−0.171	0.708	−0.682
					(2.765)	(3.572)	(0.600)	(0.929)	(0.820)	(1.007)	(1.268)	(1.385)	(0.550)
	D/				−6.667***	0.012	0.154	0.374*	0.294*	0.248	0.314	0.344	0.046(0.087)
	E				(0.438)	(0.566)	(0.095)	(0.147)	(0.130)	(0.159)	(0.201)	(0.219)	
	PE/				−1.055*	−0.327	−0.264**	−0.402**	−0.098	−0.116	−0.473*	−0.414+	−0.273**
	I				(0.452)	(0.584)	(0.098)	(0.151)	(0.134)	(0.164)	(0.207)	(0.226)	(0.090)
Slack2010	CR					−1.318	−0.094	0.193	−0.493	0.864	−0.970	1.613	−0.758
						(2.014)	(0.890)	(1.386)	(1.210)	(1.505)	(1.891)	(2.073)	(0.820)
	D/					−7.152***	0.171**	0.253**	0.325***	0.073	0.151	0.075	0.002
	E					(0.139)	(0.061)	(0.095)	(0.083)	(0.104)	(0.130)	(0.143)	(0.056)
	PE/					−0.833***	−0.262**	−0.369*	−0.055	−0.122	−0.494*	−0.355	−0.307***
	I					(0.212)	(0.094)	(0.146)	(0.127)	(0.159)	(0.199)	(0.219)	(0.086)
Slack2011	CR						0.241	0.192	−0.346	0.544	−0.292	1.044	−0.233
							(0.690)	(1.028)	(0.933)	(1.151)	(1.455)	(1.594)	(0.630)
	D/						0.032	1.292***	0.698***	0.576*	0.265	0.339	−0.125
	E						(0.136)	(0.202)	(0.184)	(0.226)	(0.286)	(0.314)	(0.124)
	PE/						−0.328***	−0.335*	−0.015	−0.121	−0.576**	−0.403+	−0.369***
	I						(0.100)	(0.149)	(0.135)	(0.167)	(0.211)	(0.231)	(0.091)

(*continued*)

Table 6.

		ROE06	ROE07	ROE08	ROE09	ROE10	ROE11	ROE12	ROE13	ROE14	ROE15	ROE16	ROE17
Slack2012	CR							0.730	−0.493	1.117	−1.517	1.821	−0.407
								(1.062)	(0.942)	(1.147)	(1.403)	(1.579)	(0.628)
	D/E							−0.471	−0.923	1.496*	−4.784***	2.304*	−0.592
								(0.647)	(0.573)	(0.698)	(0.854)	(0.961)	(0.382)
	PE/I							−0.587***	−0.153	−0.250	−0.652**	−0.479*	−0.353***
								(0.154)	(0.137)	(0.167)	(0.204)	(0.230)	(0.091)
Slack2013	CR								−1.310	1.268	−1.678	2.833	−0.250
									(0.942)	(1.258)	(1.540)	(1.722)	(0.688)
	D/E								−5.569***	−0.522	−5.210***	2.795**	−0.502
									(0.591)	(0.789)	(0.966)	(1.081)	(0.432)
	PE/I								−0.347**	−0.385*	−0.743***	−0.598*	−0.388***
									(0.127)	(0.170)	(0.209)	(0.233)	(0.093)
Slack2014	CR									1.489	−0.934	3.014*	−0.119
										(1.128)	(1.419)	(1.468)	(0.616)
	D/E									0.622	−2.148*	6.557***	0.558
										(0.676)	(0.849)	(0.879)	(0.369)
	PE/I									−0.405*	−0.730***	−0.528*	−0.400***
										(0.177)	(0.223)	(0.230)	(0.096)
Slack2015	CR										−1.444	2.507+	−0.228
											(1.265)	(1.334)	(0.567)
	D/E										−4.909***	6.477***	1.070***
											(0.672)	(0.709)	(0.301)
	PE/I										−0.691***	−0.497*	−0.401***
											(0.199)	(0.210)	(0.089)
Slack2016	CR											3.600*	0.253
												(1.464)	(0.602)
	D/E											7.221***	1.384***
												(1.005)	(0.413)
	PE/I											−0.641**	−0.484***
												(0.225)	(0.092)
Slack2017	CR												−0.226
													(0.486)
	D/E												−3.839***
													(0.349)
	PE/I												−0.550***
													(0.083)

Note(s): Standard errors in parentheses; $+p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$

a permanent effect on financial profitability. Finally, in the long term (4 years of delay in the effects), the relations are less permanent, although, in the case of both the potential and recoverable slack, 4 significant relations are observed out of 8 possible results. The lincom post-estimation test indicates a relative symmetry in the estimated relations.

The results also allow exploring the duration of the effect of slack resources on performance. Despite not showing a clearly identifiable general pattern, they show certain trends that need to be highlighted. Thus, the recoverable slack (PE/I) has the longest impact, particularly on economic profitability, since in all the years considered, this type of slack has (negative) effects on profitability. The duration of the effect is reduced in the central years of the period, but increases again in the final years. Effects are not so lasting for the other two types of slack. For financial profitability, both potential and recoverable slacks have a certain duration of effects, but only in certain years. In all cases, the ratios of the coefficients decrease as they move away in time.

In summary, the multiple results obtained allow us to identify patterns regarding the effects of the slack on performance, taking into account the persistence of the relationships and the duration of the impacts. Thus, the available slack (CR) has a positive short-term effect on the economic profitability that remains in time. The potential slack (D/E) has a persistent short-term impact on financial profitability, although, in this case, the sign of the relationship changes according to the year in question. Finally, the recoverable slack (PE/I) has a permanent and negative short-term effect on both economic and financial profitability. There is also a permanent and negative medium-term effect between recoverable slack and economic profitability. There is no significant pattern in the long term. With regard to the duration of the effects, a lasting effect is only observed in the case of recoverable slacks, especially in the case of economic profitability, although the prolongation in time of the impact changes according to the years.

5. Discussion, conclusion, implications and limitations

Meta-analyses have revealed a positive relationship between slack resources and performance (Daniel *et al.*, 2004; Carnes *et al.*, 2019). However, effects vary according to the type of slack, the measurement of performance and other contingent variables, such as the sector or the nature of the company. Differences between the studies, although significant, can be explained by the contexts used rather than by deep theoretical differences (Carnes *et al.*, 2019). Based on these ideas, the objective of this study has been to analyse the permanence of these relationships over time, as well as the duration of the effects, taking into account different types of slack and different measures of performance. The results obtained provide interesting conclusions that allow advancing the knowledge of the role of slack resources on performance.

The analysis covers 12 years (2006–2017) comprising periods of economic prosperity, recession and recovery. Results show numerous significant results, but many respond to short-term or contingent effects at a given time, to a type of slack or to a performance measure. In this discussion, we are only interested in those significant results that remain over time and give rise to clearly identifiable patterns.

The available slack, measured through the current ratio (CR), has a positive short-term effect on economic profitability in all the years analysed. This impact is significantly more intense in the first two years, showing that companies use these resources more aggressively and with greater complexity (Carnes *et al.*, 2019) in periods of economic prosperity. In other stages of the cycle, the available slack continues to have a significant and positive effect, although with lower coefficients. There are no significant relationships between this type of slack and profitability in the medium and long term, showing that companies use these resources immediately, something to be expected bearing in mind that their measurement is

made through magnitudes of current assets, and, therefore, linked to the short-term activity of the company.

The effect of the available slack is produced exclusively on the economic profitability and not on the financial one, indicating that this relation is contingent to the performance measure used. It is a resource of operational nature, related to the short-term operating or ordinary profit of the company. Consequently, this type of slack reflects the ease and flexibility of its operational use to face both internal and external fluctuations and thus ensure the companies' performance (Cyert and March, 1956; Sharfman *et al.*, 1988).

The recoverable slack shows a significant, negative and permanent effect, in the short and medium term, on both economic and financial profitability. This persistently negative effect is consistent with the one found by Carnes *et al.* (2019, p. 76). The negative relationship indicates that the inefficiency hypothesis (Ju and Zhao, 2009; Tan and Peng, 2003) takes precedence over the advantage of having slacks, that is, that the higher costs compensate for the benefits of recovering and deploying this type of slack (Carnes *et al.*, 2019). Certainly, retaining excess workers or paying higher wages may allow the company to have greater tacit knowledge and skills that can be used in times of need, but the results show that these slack resources really represent inefficiencies rather than knowledge retention and flexibility (Lecuona and Reitzig, 2014) and are often used in order to improve performance (Sánchez and Suárez, 2005).

It is surprising that this effect occurs throughout the period considered and both in the short and medium term, reflecting that in each year, the most inefficient companies in the use of their human resources obtain lower economic and financial returns than other companies. The analysis makes it possible to ensure that companies with recoverable human resource slack in a given year do not use this excess to obtain higher returns in subsequent years, as no long-term effects on performance are observed.

Finally, the potential slack has an effect mainly, or almost exclusively, on financial profitability. This result reflects that the relationship is due not only to the use of the slack but also to the financial strategy of the company, in this case, the use of financial leverage, in which the effects of the interest and tax rate have a special relevance. The direction of the relationship changes according to the period of time considered, a result similar to that obtained by Carnes *et al.* (2019, p. 76) in their meta-analysis: "the finding that potential slack negatively affects short-term performance but positively affects long-term performance reflects utilization differences".

The results, when considering a wide time horizon, show that the relationship between potential slack and performance is more complex than that obtained by other studies, since that negative relationship on short-term profitability and positive long-term performance changes according to the economic context considered. Thus, during economic growth, relationships similar to those indicated by Carnes *et al.* (2019) are obtained, but this relationship is inverted in periods of recession or crisis (positive in the short term, and sometimes negative in the medium and long term). These differences reflect the various possibilities that slacks offer companies, depending on their nature and the circumstances. In periods of crisis, companies must use their possible financial slacks to ensure their survival, facing the external fluctuations they must face (Cyert and March, 1956). Hence, there is positive relationship in the short and medium term between potential slack and performance, with no long-term relationship observed in those slacks. On the contrary, in periods of growth, the slack may have a more strategic character (Bourgeois, 1981), and, therefore, the relationship with performance will be in the longer term, while in the short term, an excess of potential slack indicates that the company is not sufficiently leveraging its financial structure (Carnes *et al.*, 2019).

The study also explored the possibility of a curvilinear relationship between slack and performance (Bourgeois, 1981; George, 2005) reflecting an inefficiency in management. The

results obtained confirm this curvilinear relationship (Chiu and Liaw, 2009; Tan, 2003), but with differences according to the types of slack and periods considered. The inverted U-shaped relationship is relatively consistent between available slack and economic profitability, especially in periods of crisis, reflecting the need to fine-tune the use of this type of resource. There is also a U-shaped relationship between potential slack and financial profitability, showing the need to use these resources in their appropriate proportion. Excessive leverage or scarce use of external financing reflects situations that harm profitability, especially in the short term.

Finally, the duration of the effects of the slack on performance is only seen consistently in the case of recoverable slack, showing that inefficiency in the use of human resources is difficult to eliminate over time, although the effect decreases over the years. Available slack only has an impact in the short term, except in periods of economic prosperity that can continue for several years. The duration of the effect of potential slack is contingent on the stage of the cycle under consideration, with a more prolonged impact on periods of growth than crisis.

In conclusion, when analysing and determining the slack resources–performance relationship, it is necessary to take into account the type of slack, the measurement of performance and other contingent variables, such as the period and context in which this relationship is studied. Although the concept of slack is widely accepted, characterised by those resources that can be deployed quickly to support a series of actions to achieve organisational objectives (Sharfman *et al.*, 1988), its nature is complex, and, therefore, its relationship with performance offers diverse results.

Slack resources respond to the advice of saving resources for scarcity times. However, this strategic recommendation does not seem to be adequate for all slack resources. Only the available slack, as its name reflects, has a consistent and positive effect on performance, but only in the short term. In addition, this relationship is curvilinear, highlighting the need for proper management of this type of resource. In the other types of slack, there are also persistent effects on performance, but, in the case of the recoverable slack, with a negative sign that contradicts the benefits provided by these resources, and in the case of the potential slack, the sign of the relationship changes, depending on the economic context considered.

Consequently, these results present important implications for academia and for practitioners. Thus, researchers must take into account this diversity of results according to the type of slack considered and adequately define the research issue and the context of the study. Thus, the literature that has paid attention to this issue must be cautious in order to control the economic situation as well as the firm-level variables as they seem to behave in a contingent way. From a practical point of view, managers must be cautious when accumulating resources that can be used in adverse or unexpected situations. Especially in the case of the recoverable slack, the results indicate that it is difficult to "recover" this type of resource in times of difficulty and that an excess of human resources leads to lower performance in any circumstance. The other types of slack require an intentional and adequate management because these resources positively affect the performance only in certain circumstances and quantities. As the effect of slack resources diminishes over time, it is necessary for the company to properly manage not only their use, but also the possible accumulation where feasible.

This study is not without its limitations. Thus, the sample selection concentrates on manufacturing industries, omitting extractive or service sectors (Marlin and Geiger, 2015). The incorporation of new sectors, or data from different countries, would make it possible to know the differentiated and comparative effect in order to arrive at more generalisable results, albeit the focus in the Spanish economy was justified by the overreaction showed during the crisis period studied. The possibility of carrying out a study of panel data may help to confirm the stability of the relations, although it is true that this methodological

approach will not allow us to contextualise the results and understand their symmetry. Another limitation is that the empirical model does not include potential moderators of the slack–profitability relationship (Carnes *et al.*, 2019). It is also necessary to acknowledge that the paper treats firms in a rather "systemic" manner, without paying attention to the critical role of agency (e.g. managers, executives). Finally, although the availability of data for a long period of time has allowed carrying out a longitudinal study of slacks, it has not been possible to determine how companies use these resources before internal or external fluctuations and for strategic purposes.

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