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## ABSTRACT

Research has shown that a firm's performance has disregarded the existing resources and capabilities to apply environmental management leading practices. The leading practices concept refers to that of protecting the environment while minimizing costs. The aim of this paper is to analyze the importance of complementary assets and whether they are required to generate a cost advantage as a result of implementing leading practices. Results from 88 chemical companies have shown that creating a relationship between leading practices and cost advantage is achievable through the application of process innovation and implementation as complementary assets.

## RESEARCH PLAN

This research employs a resource-based view of the firm current complementary assets and how they can affect the relationship between leading practices of environmental management and competitive cost advantage of a firm. For this research, two set of hypotheses were generated based on data collected from the survey and literature information. The survey was designed to ask respondents to identify one environmental issue that greatly affected their business unit.



Before testing the hypotheses generated for this research, two quality checks were performed on the collected data. The first quality check evaluates the extent of multicollinearity among the independent variables [3]. The second quality check was used to test the common-method variance. Table 1 shows the correlations between independent variables reviewed for multicollinearity.

Table 1: Means, Standard Deviations, and Spearman Coefficient

	N	MEAN	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1 Cost Advantage	88	0.00	0.86	1.00															
2 Pollution Prevention	88	0.00	0.84	-0.01	1.00														
3 Innovation	88	0.00	0.88	0.21 <sup>†</sup>	0.01	1.00													
4 Early Timing	88	0.00	0.90	0.10	-0.01	0.02	1.00												
5 Complementary Assets	88	0.00	0.90	0.09	0.20 <sup>†</sup>	0.10	0.42 <sup>***</sup>	1.00											
6 Complementary Assets*Pollution Prevention	88	0.15	0.94	0.20 <sup>†</sup>	-0.19 <sup>†</sup>	0.17	-0.13	-0.18 <sup>†</sup>	1.00										
7 Complementary Assets*Innovation	88	0.08	0.78	0.12	0.22 <sup>*</sup>	-0.12	0.16	0.08	-0.29 <sup>**</sup>	1.00									
8 Complementary Assets*Early Timing	88	0.34	0.89	0.22 <sup>*</sup>	-0.16	0.13	0.16	0.03	0.34 <sup>**</sup>	-0.15	1.00								
9 Firm Size (log)	88	9.00	2.01	0.00	0.06	0.01	0.03	0.01	0.01	0.10	0.00	1.00							
10 Water	88	0.14	0.35	-0.01	-0.03	0.01	-0.06	-0.09	0.02	0.04	0.10	-0.13	1.00						
11 Waste	88	0.22	0.41	0.05	0.04	0.00	0.04	0.05	-0.16	0.05	-0.07	-0.06	-0.21 <sup>†</sup>	1.00					
12 Product	88	0.09	0.29	-0.10	-0.21 <sup>*</sup>	0.35 <sup>***</sup>	-0.17	-0.15	0.25 <sup>*</sup>	-0.23 <sup>†</sup>	0.25 <sup>*</sup>	0.06	-0.13	-0.17	1.00				
13 Superfund	88	0.05	0.21	-0.37 <sup>***</sup>	0.13	-0.22 <sup>*</sup>	-0.04	0.07	-0.01	-0.08	-0.14	0.08	-0.09	-0.11	-0.07	1.00			
14 Other	88	0.11	0.32	0.18 <sup>†</sup>	0.20 <sup>†</sup>	0.08	0.04	0.05	0.00	0.05	-0.05	0.06	-0.14	-0.19 <sup>†</sup>	-0.11	-0.08	1.00		
15 3-year stock returns (1192-1994)	49	0.22	0.42	0.28 <sup>†</sup>	-0.08	-0.06	0.11	0.08	0.08	-0.21	0.19	0.00	-0.34 <sup>*</sup>	0.08	-0.09	-0.05	0.26 <sup>†</sup>	1.00	

<sup>†</sup>p<.10 <sup>\*</sup>p<.05 <sup>\*\*</sup>p<.01 <sup>\*\*\*</sup>p<.001

## METHODOLOGY

To test the hypotheses for this research, the use of ordinary least square regression was employed [4]. Moderated regression analysis was tested on the possible relationship suggested on hypotheses 4 through hypotheses 6.

The three leading practices of environmental management measures and the complementary assets variable were multiplied to generate interaction terms. To minimize multicollinearity among the independent variables analyzed in this study, each interaction had their own separate regression equation. The hypotheses regarding the moderating effects support both interaction terms of significant regression coefficients and increases in the descriptive power of the model through inclusion.

## RESULTS

Table 2: Results of Regression Analysis

	Dependent Variable: Cost Advantage					
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Intercept</b>	-0.01	0.02	0.01	-0.03	0.18	-0.04
<b>"Leading Practices" of Environmental Management</b>	<b>0.42</b>	<b>0.42</b>	<b>0.42</b>	<b>0.41</b>	<b>0.41</b>	<b>0.42</b>
Pollution Prevention		-0.03	-0.04	-0.01	0.04	-0.02
Innovation		<b>0.11</b>	<b>0.11</b>	<b>0.11</b>	<b>0.12</b>	<b>0.11</b>
Early Timing		0.19 <sup>†</sup>	0.18	0.14	0.15	0.18 <sup>†</sup>
<b>Complementary Assets and Interactions</b>		<b>0.11</b>	<b>0.11</b>	<b>0.11</b>	<b>0.11</b>	<b>0.11</b>
Complementary Assets				0.06	0.09	0.11
Complementary Assets*Pollution Prevention				<b>0.11</b>	<b>0.11</b>	<b>0.11</b>
Complementary Assets*Innovation					0.23 <sup>*</sup>	
					<b>0.09</b>	
						0.24 <sup>†</sup>
						<b>0.13</b>
						0.22 <sup>*</sup>
						<b>0.10</b>
<b>Control Variables</b>						
Firm Size (log)	0.01	0.01	0.01	0.01	0.01	0.01
Water	<b>0.04</b>	<b>0.04</b>	<b>0.04</b>	<b>0.04</b>	<b>0.04</b>	<b>0.04</b>
Waste	-0.08	-0.11	-0.10	-0.09	-0.08	-0.18
Product	<b>0.27</b>	<b>0.27</b>	<b>0.28</b>	<b>0.27</b>	<b>0.26</b>	<b>0.27</b>
Superfund	0.01	-0.02	-0.02	0.04	-0.03	-0.01
Other Issue	<b>0.23</b>	<b>0.23</b>	<b>0.23</b>	<b>0.23</b>	<b>0.22</b>	<b>0.23</b>
R <sup>2</sup>	-0.35	-0.56	-0.54	0.63 <sup>†</sup>	0.65 <sup>†</sup>	0.73 <sup>*</sup>
Delta R <sup>2</sup>	<b>0.32</b>	<b>0.36</b>	<b>0.36</b>	<b>0.35</b>	<b>0.34</b>	<b>0.36</b>
F-Test for Delta R <sup>2</sup>	-1.51 <sup>***</sup>	-1.35 <sup>***</sup>	-1.37 <sup>***</sup>	-1.43 <sup>***</sup>	-1.37 <sup>***</sup>	-1.29 <sup>***</sup>
	<b>0.43</b>	<b>0.44</b>	<b>0.44</b>	<b>0.43</b>	<b>0.43</b>	<b>0.44</b>
	0.35	0.30	0.30	0.29	0.26	0.30
	<b>0.29</b>	<b>0.30</b>	<b>0.30</b>	<b>0.29</b>	<b>0.29</b>	<b>0.29</b>
	0.17	0.20	0.21	0.26	0.27	0.25
				0.05	0.06	0.04
				5.73 <sup>*</sup>	7.11 <sup>*</sup>	4.61 <sup>*</sup>

Standard errors are in bold  
<sup>†</sup>p<.10 <sup>\*</sup>p<.05 <sup>\*\*</sup>p<.01 <sup>\*\*\*</sup>p<.001

## CONCLUSION

On this research, the concept of the firm's complementary assets was applied to the analysis of the competitive effects of environmental practices. Results indicate that leading practices of environmental management did not positively affect firm's cost advantage. Nevertheless, in order to create cost advantage from the implementation of leading practices of environmental management, it is necessary that firms acquire complementary assets.

The outcomes on this research show a differentiation among firms that possess certain characteristics in their approach on environmental strategies. Such outcomes suggest that future research is necessary to understand the firm's existing resources and capabilities to effectively develop environmental strategies that would lead to firm's cost advantage. Additionally, future research would be needed in the detail identification of complementary assets and their specific role on the competitive advantage. The reasoning behind this approach is to have a better understanding of the several environmental practices and their significant importance and impact to the environment.

## REFERENCES

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