Business Strategy: Which Economic Drivers Influence Firms to Execute Circular Economy?

Md. Jahidur Rahman, PhD, CPA (corresponding author)
Department of Accounting, Wenzhou-Kean University
88 Daxue Road, Ouhai, Wenzhou, Zhejiang Province, China 325060
E-mail:mdjahidr@kean.edu

Liu Yuhan
Wenzhou-Kean University
E-mail: liuyuh@kean.edu

Rakiba Sultana
Wenzhou-Kean University
Email: sultanar@kean.edu

ABSTRACT
Circular economy (CE) is a method to make the best use of available resources. Some economic drivers that may influence firms to execute CE are utilization rate of fixed assets (URFA), average fixed assets (AFA), return on investment (ROI), and earnings before interest and taxes (EBIT). This study aims to investigate which economic drivers influence firms to execute CE. Using a sample of 100 Forbes firms from 2009 to 2018, we find that the lower the URFA, the more actively firms should execute CE. In addition, the higher the AFA, the more actively firms should execute CE because it can help them get rid of the inefficient situations. This study emphasizes the specific methods on how to "produce more with less." These specific methods are defined as "high efficiency" methods in this paper. They can be used to help firms execute CE.

Keywords: circular economy, economic drivers, produce more with less, inefficient situations, high efficiency methods.

1. Introduction
Circular economy (CE) is a method to make the best use of available resources or "produce more with less." CE is about profit maximization and cost minimization. It can help firms get more profit by saving cost and increasing revenue and become profitable in the long term. CE also enables firms to gain competitive advantages. Hence, execute CE is crucial for firms (Lieder and Rashid 2016; Muduli et al. 2013; Stahel 2013).

Gusmerotti (2019) identified some drivers that may influence firms to execute CE. These are economic drivers, environmental drivers, risk drivers, employee drivers, and regulatory drivers. Gusmerotti (2019) found that only economic drivers can significantly influence firms to execute CE but did not specify which economy drivers. Prior literature finds several specific economic drivers that may influence firms to execute CE. They are utilization rate of fixed assets (URFA), average fixed assets (AFA), return on investment (ROI), and earnings before interest and taxes (EBIT) (Bechtel 2013; Bürklin 2019; Gorman 2000; Romero and Molina 2012).

Basing on the above discussion, this study aims to investigate which economic drivers influence firms to execute CE. It then emphasizes how to “produce more with less.” Following, this study puts forward suggestions to help inefficient firms make the best use of available resources.

Identifying the economic drivers that influence firms to execute CE is important. Doing so can help firms make the best use of available resources. These firms know they should “produce more with less,” but they can only do so concretely when they determine the economic drivers. They can come up with targeted methods then. If firms ignore the importance of finding which economic drivers influence the execution of CE, then they cannot detect changes in these drivers. Some economic drivers are changing abnormally and badly, and firms cannot detect them in time. Consequently, they fail to make the best use of available resources or put themselves in an inefficient situation (George 2015; Stahel 2013; Xinan and Yanfu 2011).

This study uses multivariate regression analysis and correlation analysis as methodology to investigate which economic drivers influence firms to execute CE. This study finds that the lower the URFA, the more actively firms should execute CE.

This study makes three contributions. Most importantly, this study is the first to identify which economic drivers influence firms to execute CE. Second, it develops Linder and Williander’ (2017) idea to “produce more with less.” This innovative study emphasizes specific methods on how to “produce more with less.” Finally, this study defines these specific methods as “high efficiency” methods. They can be used to help firms get rid of the inefficient situations. As these firms cannot make the best use of resources. They are very eager to get out of these inefficient situations. Our “high efficiency” methods can give these firms suggestions that can help them overcome inefficiency and execute CE.

The remainder of this paper includes four sections. In the second section, we review relevant literature and propose four hypotheses. In the third section, we focus on the research methodology and empirical results to corroborate the hypotheses and present the findings. In the next section, we explain the main results and discuss the findings. We also make several suggestions to help the inefficient firms. In the last section, we conclude.

2. Literature review and hypothesis development

CE is distinguished from other types of economy. CE is making the best use of available resources. Only a few drivers may influence firms to execute CE because most drivers are unrelated to making the best use of resources (Moraga 2019). On another CE-related research, Gusmerotti (2019) identified a few drivers that may influence firms to execute CE. These are economic drivers, environmental drivers, and regulatory drivers. Gusmerotti (2019) found that only economic drivers can influence firms to execute CE.

To further study which specific economic drivers may influence firms to execute CE, they must be identified. To identify these drivers, Bonviu (2014) suggested to examine

whether they are involved in CE activities. If they are involved in CE activities, then they are the specific economic drivers may influence firms to execute CE. CE activities are the several activities involved in business operations (EMF 2015). For example, they can be cost-saving, fixed assets disposal, and investment activities.

Four specific economic drivers meet the conditions and can be the specific economic drivers that influence firms to execute CE. These are URFA, AFA, ROI, and EBIT (Bechtel 2013; Bürklin 2019; Gorman 2000; Romero and Molina 2012).

URFA is also known as fixed assets turnover. Sunjoko and Arilyn (2016) and Filbeck and Gorman (2000) mentioned it is commonly used in resource intensive industries. These industries require firms to make the best use of available resources. URFA can show whether firms make the best use of their fixed assets or not. It measures how much benefits that every dollar of fixed assets can create. Low URFA indicates firms only make little use of fixed assets (Filbeck and Gorman 2000). Hence, we posit that when URFA decreases, firms should more actively execute CE.

H1: *URFA negatively influences firms to execute CE: when URFA decreases, firms should more actively execute CE.*

AFA is a kind of fixed assets (Constand 1991). Romero and Molina (2012) mentioned fixed assets should be primarily considered when firms attempt to adopt CE because fixed assets are also available resources for firms. Increase of AFA urges managers to find ways to manage and make full use of them. We thus posit that when their AFA increases, firms should more actively execute CE. We empirically predict a positive relationship between them.

H2: *AFA positively influences firms to execute CE: when their AFA increases, firms should more actively execute CE.*

The next economic driver is ROI. Bechtel (2013) established a link between CE and sustainable development by executing effective management of investments. Bechtel (2013) found that when firms receive sufficient ROI, their motivation to execute CE increases. We empirically predicted the following:

H3: *ROI positively influences firms to execute CE: when their ROI increases, firms should more actively execute CE.*

EBIT is the last economic driver. Bürklin (2019) mentioned that as their EBIT decreases, firms should more actively execute CE to make progress or recover from damage in the future. We therefore empirically predicted that

H4: *EBIT negatively influences firms to execute CE: when their EBIT decreases, firms should more actively execute CE.*

3. Research methodology

Data and sample collection

This research uses a sample of 100 Forbes firms from 2009 to 2018. It includes financial data of ROI, EBIT, AFA, and URFA and firms' accumulative time length for executing CE. This sample is drawn from NASDAQ, Bloomberg database, Yahoo Finance, Market screener, and some firms' corporate social responsibility reports.

Data collection involves searching and selecting the firms that are eligible as the Forbes Top 100 firms (Forbes 2019). As targeted firms, most of them have experience in executing CE. This process yields a final sample of 940 firm-year observations.

Measurement of CE

Moraga (2019) found that measuring CE differs from measuring other types of economy. CE cannot be directly measured by firm profitability. CE includes short-term, long-term, and other non-monetary benefits like social and environmental benefits. Only considering one of them can lead to inaccurate results.

Seeing that CE is not an unchanging process, firms constantly adjust their CE based on operating conditions instead of executing it all the time. Most firms may only use CE to help them get rid of bad operating conditions. Franklin, Figge, and Canning (2016) put forward a solution. That is measuring CE by accumulative time length that firms execute CE. Doing so is a flexible way to measure CE.

The range of CE is from 0 to 10 because it is in line with this 10-year research scope. When firms get "0" for their accumulative time length of executing CE, they have not started to execute CE yet. If the accumulative time length increases, they should actively execute CE. If the accumulative time length is unchanged, then stopping executing CE is better for firms.

Measurement of economic drivers

The four economic drivers that may influence firms to execute CE are URFA, AFA, ROI, and EBIT. Among them, URFA and AFA are involved in firms' fixed assets. URFA and AFA can be measured by usage efficiency of fixed assets and amount of fixed assets, respectively. ROI can be measured by the amount of return on a particular investment. EBIT can be measured by firms' net income excluding income tax and interest expenses.

Research model

We estimate the following multivariate regression model to test which economic drivers can influence firms to execute CE. It is also used to verify the four hypotheses.

$$Y\ (CE) = \beta_0 + \beta_1\ URFA + \beta_2\ AFA + \beta_3\ ROI + \beta_4\ EBIT + \varepsilon \qquad (1)$$

Where CE is measured by the accumulated time length that firms execute CE. It is the dependent variable. URFA is the utilization rate of fixed assets, AFA is average fixed assets, ROI is return on investment, and EBIT is earnings before interest and taxes.

They are independent variables. To test H1, we expect that URFA and CE can be negatively correlated. To test H2, we expect AFA and CE to positively correlated. For H3, the relationship between ROI and CE is expected to be positive. For H4, the relationship between EBIT and CE is expected to be negative. Table 1 shows the definitions of the variables and the sign of the hypothesis tested.

Table 1: Variable Definitions

Variables	Definition	Data Source	Observation	H(sign)
CE	It is a method to make the best use of the available resources (Moraga 2019). It is measured by accumulative years that firms execute CE (Franklin Figge and Canning 2016).	Bloomberg, Market screener, Yahoo Finance	940	
URFA	It is the ratio of sales to the value of fixed assets, which indicates how efficiently firms use fixed assets to generate sales (Warrad Omari 2015).	Bloomberg, NASDAQ Market screener, Yahoo Finance	649	H1: (-)
AFA	It refers to the average of the sum of current year's and previous year's fixed assets (Constand 1991).	NASDAQ Market screener, Yahoo Finance	649	H2: (+)
ROI	It is a performance measure used to evaluate the efficiency of an investment (Bechtel 2013).	Bloomberg, NASDAQ, Market screener	940	H3: (+)
EBIT	It is a measure of firms' profit that includes all incomes and expenses except interest and income tax expenses (Bürklin 2019).	Bloomberg, NASDAQ, Market screener, Yahoo Finance	606	H4: (-)

4. Results

Descriptive analysis

We conduct the summary and descriptive analysis to show the frequency of CE. Given that CE can be measured by the accumulated time length that firms execute CE, we can directly summarize the accumulated time length that firms execute CE to obtain the frequency of CE. Table 2 reports the results of summary and descriptive analysis. The range of CE is from 0 to 10, corresponding to the 10-year research scope. It shows 13.62% of the firms get "0" year. According to the measurement of CE, it means they have not begun to execute CE. In comparison, 86.38% of the firms have begun to

execute CE. A downward trend can be observed from accumulated 1 year that firms execute CE to accumulated 10 years that firms execute CE. As the accumulated time length that firms execute CE increases, the less firms actively keep executing it.

Table 2: Summary and Descriptive Statistics of CE

CE	Frequency	Percent	Cumulative Frequency
0	90	13.62%	13.62%
1	70	10.59%	24.21%
2	70	10.59%	34.80%
3	68	10.29%	45.08%
4	66	9.98%	55.07%
5	59	8.93%	63.99%
6	57	8.62%	72.62%
7	53	8.02%	80.64%
8	50	7.56%	88.20%
9	43	6.51%	94.70%
10	35	5.30%	100.00%

Correlation analysis

Table 3 presents the results of correlation analysis. It reports the correlations among CE and the economic drivers. The magnitude of these coefficients shows that multicollinearity is not a serious concern in the estimation of the multivariate regression model. For the correlations between URFA and CE, the Pearson's correlation coefficient is -0.208 and significant. URFA is negatively correlated with CE, following the expected direction of H1. The lower the URFA, the more actively firms should execute CE. The correlation between AFA and CE is significant and in the expected positive direction of H2. The higher the AFA, the more actively firms should execute CE. For the correlations between ROI and CE, the Pearson's correlation coefficient is -0.037, and their relation is not significant. For the correlations between EBIT and CE, the Pearson's correlation coefficient is 0.035, and it is not significant as well.

Table 3: Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)
(1) ROI	1.000				
(2) AFA	0.068**	1.000			
(3) EBIT	0.049	0.072**	1.000		
(4) URFA	-0.018	-0.083**	-0.049	1.000	
(5) CE	-0.037	0.077**	0.035	-0.208***	1.000
Variable definitions are in Table 1. ** shows significance at the .05 level. *** shows significance at the .01 level.					

Multivariate regression analysis

Table 4 presents the results of multivariate regression analysis for Equation (1). The model aims to predict which economic drivers influence firms to execute CE. URFA has a negative coefficient, thus confirming the negative correlation between URFA and CE. The expected direction is consistent with the direction of H1. To test the H1, the coefficient on URFA is significantly negative ($p<0.001$), so H1 is corroborated and accepted. The lower the URFA, the more actively firms should execute CE.

As expected, the coefficient on AFA is significantly positive ($p=0.001$, two tailed). This result indicates a positive correlation between AFA and CE, thus corroborating and accepting H2. AFA positively influences firms to execute CE. When their AFA increases, firms should more actively execute CE.

With regard to ROI, the coefficient is negative but not significant ($p=0.275$), indicating no significant relationship between ROI and CE. Thus, H3 is not corroborated and accepted. Similarly, the results confirm that EBIT is not significantly associated with CE ($p=0.365$). Therefore, H4 is rejected.

The significant coefficient represents a mean change response of a unit change in the predictor while keeping other predictors in the model constant. It still can draw significant conclusions about how changes in the economic drivers are associated with changes in CE.

Table 4: Result of Multivariate Regression Analysis

Variables	Hypothesis and Expected Sign	Coefficient.	t-value	p-value	Significance
URFA	H1 (-)	-0.046***	-5.25	0.000	***
AFA	H2 (+)	0.000*	1.74	0.083	*
ROI	H3	-0.011	-1.09	0.275	
EBIT	H4	0.000	-0.91	0.365	
Constant		4.766	26.75	0.000	

Mean dependent variable	4.265	SD dependent variable	3.077
R-squared	0.050	Number of observation	649.000
F-test	8.441	Prob > F	0.000
Akaike criterion (AIC)	3272.426	Bayesian Criterion (BIC)	3285.852
*** shows significance at the .01 level (two tailed). ** shows significance at the .05 level (two tailed). * shows significance at the .1 level (two tailed).			

5. Discussion

Explanation of main results

This study has two main results. First, the lower the URFA, the more actively firms should execute CE. We have two explanations for this finding. First, when URFA decreases, firms can only use one dollar of fixed assets to create lesser benefits. Under such circumstances, they cannot make the best use of available resources. They only "produce less with more." If they want to change this situation, they should more actively execute CE to "produce more with less." To help firms make the best use of available resources, we suggest they use "high efficiency" method that is previously defined. They can use low-cost, higher-utilization materials to save costs and increase sales revenue. They also can obsolete the inefficient equipment to decrease useless fixed assets. After doing these, they can make the best use of fixed assets and "produce more with less."

Second, when firms were under the pressure of environmental regulations, they are required to invest money to update equipment or facilities. Although these new equipment and facilities can make full use of resources, a time delay occurs before the new fixed assets start generating benefits. The situation causes firms' URFA to decrease. If they want to get rid of this situation, they should more actively execute CE, that is, to make the best use of resources to earn more benefits and cover the cost. We suggest firms to make the best use of their existing fixed assets to generate more benefits based on the "high efficiency" method. We also suggest them to follow the win–win strategy (Miroshnychenko 2017). It can help them realize considerable economic benefits while undertaking environmental responsibilities.

The second main result shows that the higher the AFA, the more actively firms should execute CE. Constand (1991) mentioned that AFA refers to the average of the sum of current year's and previous year's fixed assets. When AFA increases year by year, the fixed assets also increase. Seeing that fixed assets are also available resources for firms, these increasing available resource should be well managed and used efficiently. Under such circumstances, if firms want to make the best use of these available resources, they should more actively execute CE. To help firms avoid an "inefficient situation," we suggest translating the increasing fixed assets into present fixed assets. Firms can then make the best use of more available resources and create more benefits.

Limitations

This research has three limitations. First, a part of the financial data is incomplete. Some firms' early financial data cannot be found, especially from 2009 to 2012. Next, when we measure the execution of CE, we use the "accumulated years that firms implement CE." We only consider it and treat other factors as constant, making the measurement under ideal conditions. Lastly, the sample is not large enough to make suggestions for the whole industry to "produce more with less." The suggestions lack wide applicability.

Reliability and validity

All the target firms of this research are listed firms. They have obligation to legally open

their financial conditions accurately, so the data sources are unbiased and traceable. Table 7 is the output of variance inflation factor (VIF) test. The VIF values of AFA and EBIT are 2.482 and 2.47, respectively. This finding indicates a little multicollinearity that can still be tolerated. For the VIF values of URFA and ROI, the issue of multicollinearity does not exist. With all the results, VIFs are satisfactory.

Table 7 Multicollinearity Test Result

	VIF	1/VIF
AFA	2.482	.403
EBIT	2.47	.405
URFA	1.008	.992
ROI	1.001	.999
Mean VIF	1.74	.

Theoretical Contribution

Most importantly, this study is the first to identify which economic drivers influence firms to execute CE. Second, it develops Linder and Williander's (2017) idea to "produce more with less." This innovative study emphasizes specific methods on how to "produce more with less." Finally, this study defines these specific methods as "high efficiency" methods. They can be used to help firms in inefficient situations. As these firms cannot make the best use of resources, they are very eager to get out of these inefficient situations. Our "high efficiency" methods can give these firms suggestions and help them overcome inefficiency and "produce more with less."

6. Conclusion

The research aims to investigate which economic drivers influence firms to execute CE and help firms "produce more with less." Existing research does not specify which economic drivers can influence firms to execute CE. Hence, this study helps to fill the knowledge gap. We find that the lower the URFA and the higher the AFA, the more actively firms should execute CE.

This study uses a sample of 100 Forbes firms from 2009 to 2018. We conduct descriptive analysis, correlation analysis, and multivariate regression analysis to find out the economic drivers that influence firms to execute CE. We then explain how and why these economic drivers can influence firms to execute CE.

Based on the analyses of findings, we make some suggestions for firms to make the best use of fixed assets and "produce more with less." For the firms with lower URFA, we suggest them to use "high efficiency" method. In particular, they should use low-cost, higher-utilization materials to save costs and increase sales revenue. They also can obsolete the inefficient equipment to decrease useless fixed assets. Then, they can get rid of "inefficient situation" and "produce more with less." For firms under the pressure of environmental regulations, we suggest them to make the best use of their existing fixed assets to generate more benefits based on the "high efficiency" method. We also suggest them to follow the win–win strategy (Miroshnychenko 2017), which enables

them to realize considerable economic benefits while undertaking environmental responsibilities. For firms with higher AFA, we suggest them to translate the increasing fixed assets into present fixed assets. Then, they can make the best use of more available resources and create more benefits.

This research has three limitations. A part of financial data is incomplete, the measurement of CE is under the ideal conditions, and the sample of this research is not large enough to make suggestions for the whole industry. Among CE studies, this work is unique because it provides a different view for firms to realize the goal of “produce more with less.” It translates the idea to “produce more with less” into specific methods. This study defines these specific methods as “high efficiency” methods. They can be used to help firms get rid of inefficient situations. This study only takes the first step for the related topic; it lays a foundation for further research. Future researchers can explore more views on this basis. They can use improved methods and more complete data to overcome the limitations and make suggestions with wide applicability for the whole industry.

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