Accounting and Market Value Implications of Business Environmental Initiative: The Case of JSE's SRI Firms

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Abstract: The paper examines environmental friendliness, measured by emissions intensity and energy usage intensity on accounting and market value, measured by return on asset, return on sale, equity returns and market value of equity deflated by sale of JSE's SRI firms for the period 2008-2014. Applying differenced Arellano-Bond DPD estimations, we cited shortcomings of some previously applied methods used to examine environmental performance effect on corporate financial performance. Our pooled data result showed a negative effect of energy usage intensity on return on asset and return on sale, but a positive effect on market value of equity deflated by sale. Contrary, emissions intensity showed positive effect on return on asset and return on sale, but a negative effect on market value of equity deflated by sale. When the paper accounts for omitted variable bias, environmental friendliness exhibited insignificant effect on all financial measures. After we control for omitted variable bias and possible orthogonality conditions we found negative effect of energy usage intensity on equity returns and a positive effect of emissions intensity on market value of equity deflated by sale.

Keywords: Financial performance; emissions intensity; energy intensity; South Africa

JEL Classification: Q5; Q56

1. Introduction

Studies in the past few decades are battling with question of if there exist a link between firms' green performance and financial performance. This is because there are researchers who subscribe to the view that "green behaviour" does not necessarily enhance corporate financial value. Hence to appease interest parties firms' only need to pretend to be "green" to legitimise their existence, (Wagner et al., 2002; Friedman, 1970) For example, "cost-concerned school of thought" is of

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the view that 'increase environmental investment and expenditures' adds up to firms' cost, decrease earnings and lower firms' financial value. Alternatively, "value creation school of thought" regards environmental efforts as a way to increase firms' competitiveness to improve financial gains to the investor. (Assabet Group, 2000)

Thus, we argue that using estimated effects resulting from some previously applied methods to conclude that it pays to be green (e.g. Carbon Disclosure Project, 2014; Barley, 2009; Goldman Sachs, 2009; Telle, 2006; Russo & Fouts, 1997) seem to be debateable. This is because should empirical findings on firms' environmental friendliness on financial performance has been consistent, one might have concluded that there is common underlining factor(s) influencing the relationship, and this might have tilted the direction of environmental performance and financial performance debate.

To contribute to the decades old problem of "accounting and market value implications of environmentally friendliness", we resorted to "differenced Arellano-Bond DPD estimations" to simultaneously cater for heterogeneity and possible orthogonality conditions to effectively cater for problem associated with short panels. To the best of our knowledge, this is the first study in quantitative accounting research to employ this tool to examine accounting and market value implications of environmentally friendliness on financial performance of socially responsible investing firms in an emerging market. Our Arellano-Bond DPD showed negative effect of "energy usage intensity" on equity returns, and positive effect of "carbon output" on "equity price deflated by sale".

The rest of the study is structured as follows: Section 2 is on related literature; section 3 focuses on the methods and materials. Section 4 is on empirical results while section 5 focuses on discussions and conclusion.

2. Related Literature

Studies in recent times have examined accounting and market value implications of environmentally friendliness, but thus far provided controversial and inconclusive theoretical and empirical findings. For example, on how carbon pollution affect financial performance of Chinese firms, Zeng et al., (2011) found positive association of all pollution classes irrespective of the pollution level, but a moderate correlation with financial indices. Marti-Ballester, (2014) cited that financial gains of firms involved in responsible business strategy is not different from firms engaging in conventional business approach using random effect estimation. With Lee and Park, (2009) showed that investment and improvement in social responsibility and pro-activeness enhances firm value and operating earnings.

Examining how social friendliness impact corporate financials, Surroca et al., (2010) demonstrated that there seemed to be no relationship between the factors under-study. But demonstrated an indirect link arising from "mediating effect" of intangible resources. On Greenhouse gas implications on return on asset and return on sale, Rokhmawati et al., (2015) showed positive association of "carbon emissions" on return on asset. Harjoto, (2017) examined corporate social responsibility link with operating and financial leverage, showed that "social responsibility strengths" may be positively (negatively) linked to "operating and financial leverage". Another research by Patari et al., (2014) found that corporate social initiatives Granger-cause the market value of firms. Waworuntu et al., (2014) applied correlation analysis and examined how meeting interest parties needs affect financial performance, found negative association between environmental pro-activeness and return on asset in the energy sector. Santis et al., (2016) compared financial performance of firms on "sustainability index" to those on the SPSE index, found no evidence of financial performance differences between firms on the indices.

Utilising non-linear and linear estimators Nollet et al., (2016) examined social performance effect return on asset, return on capital and excess stock returns, and showed negative effect of social performance on return on capital with linear estimation and "u-shaped" relationship of the social measure and return on asset and return on capital employing non-linear tools. Ye et al., (2013) on how "energy reduction efforts" affect firm value, found that emission rights trading enhances market value of energy intensive firms. Probing and categorising conditions under which "greening may pay", Marilyn and Noordewier, (2016) found that environmentally unfriendly firms seem to exhibit positive but marginal financial performance. Oikonomou et al., 2012 observed that as social friendliness "weakly and negatively' affect systematic firms" risks, environmental measures tend to show a rather strong and positive effect on financial risk.

It's against this background of conflicting empirical findings that we thus hypotheses as: *H0: Environmentally friendliness does not impact accounting and market value of JSE's socially responsible investing firms.*

3. Research Method and Analysis

Examining how environmentally friendliness impacts accounting and market value of firms, we applied OLS on pooled data and specified our model as:

$$FP_{it} = \alpha + bSUS_{it} + d\,X_{it} + \varepsilon_{it,} \qquad (1)$$

Since equation (1) may be characterised by joint endogeneity, presence of "unobserved firm specific effects" is evident. Baum, (2013) cited that ignoring such "effects" may lead to "inconsistent estimates" as firm specific effects are likely to

correlate with explanatory variables. We accounted for firms' specific unobserved omitted variable bias and specified our model as:

$FP_{it} = \alpha_i + \beta CI_{it} + dW_{it} + u_i$ (2)

Addressing Omitted Variable Bias and Orthogonality Conditions

Nickell, (1981) cited the possibility of correlation between the error term and regressors in equations (1) and (2). Baum, (2013) argued this problem is overcome using dynamic panel estimator such as Arellano-Bond DPD estimations (1991). He we re-specified our model as:

$Y_{it} = X_{it}\beta_1 + W_{it}\beta_2 + V_{it}$ (3)

$V_{it} = u_i + e_i$

We represent firms' environmentally friendliness by "carbon intensity" measured by emissions intensity and energy usage intensity (independent variables). We measure annual energy usage intensity as a ratio between energy usage (in megawatt-hours) and sales revenue. Thus, energy usage intensity is written as:

$$CIIn_{i,t} = \sum_{k=1}^{kI} CIk,t \quad / \text{Sales} \qquad (4)$$

Annual emissions intensity is measured as the ratio between greenhouse gas emissions (in Tonnes) and sales revenue. We analogously derived emissions intensity (equation 5) from equation 4 as:

$$CoIn_{i,t} = \sum_{k=1}^{kI} Cok,t \quad / \text{Sales} \qquad (5)$$

We utilise firm size, financial risk, operating income and sales growth as control variables. (Hoffmann & Busch, 2011; Matsumura et al., 2011; Dragmoir, 2010; Waddock & Graves, 1997) We measured financial risk (leverage) as "long-term debt to total assets" (Dragmoir, 2010), and operating income as profit before extra-ordinary items and finance cost. We also measured sale growth as change in sales over eight fiscal years (Johnston et al., 2008), and used natural log of total asset to represent firm size. We further employed "dummy" to proxy for differences in firms' inherent business risk. Dummy vector indicate firm industry membership (Bachoo et al., 2013; Busch & Hoffmann, 2011) with 1 representing a mining company, otherwise 0.

We sampled fourteen out of thirty-one SRI firms on the JSE for the period 2008-2014, as these are the only firms we are able to access needed data for a period not less than seven (7) years.

4. Results & Discussion

The paper employs OLS, fixed effect and differenced Arellano-Bond DPD estimations to examine the link between environmentally friendliness and accounting and market value of JSE's SRI companies**.** The pooled data results in appendix 1 showed a significant effect of pollution reduction, measured by energy usage intensity on return on assets and return on sale at p> 0.000 and p> 0.008. Emissions intensity similarly showed significant effect on return on assets and return on sale at p> 0.000 and p> 0.006. Nonetheless, as energy usage intensity showed negative relationships with return on assets and return on sale, emissions intensity demonstrated a positive relationship with the financial measures. Energy usage intensity although showed significant effect on "market value of equity deflated by sales" at p> 0.027, demonstrated negative relationship. Emissions intensity also showed a significant effect on "market value of equity deflated by sales" at level p>0.041, and demonstrated a negative relationship between the factors.

When the paper controls for omitted variable bias (see Appendix II), the empirical results showed insignificant effect of "carbon intensity" on the financial performance of the JSE SRI companies. The results however showed changes in direction of association between carbon intensity measures and financial performance indicators, except the relationship between energy usage intensity and equity returns. Furthermore, appendix 11 indicates an improvement in coefficient of determination (R^2) in model 2, 3 and 4, when "firms" unobserved omitted variable bias' is accounted for.

Our empirical results as reported in Tables I showed that when the study had simultaneously controlled for omitted variable bias and possible orthogonality condition, energy usage intensity demonstrated a significant effect on equity returns at p> 0.002. The study also found a significant effect of $EQRTNS_{t-1}$ on equity returns and that of MVE/S_{t-1} on "market value of equity deflated by sale".

Table III: Arellano-Bond results with ROA_{it}, ROS_{it}, $EQRTNS_{it}$ and MVE/S_{it} as dependent variables

Model 1				
Delta Method				
Variable	**ey/ex**	**Std-Err**	**z**	**P>|z|**
L1. Roa	.1051162	.1258711	0.84	0.404
Engint	-.54406	.5606529	-0.97	0.332
Emsint	.5427359	.5492298	0.99	0.323
Optinc	.4385364	.1547653	2.83	0.005
Lev	-.7623853	.3855701	-1.98	0.048
Lnasset	-37.15372	14.75418	-2.52	0.012
Growth	.0996031	.0295366	3.37	0.001

Obs=70, Wald chi2 =31.69, Prob>chi2 =0.0000, Sargan = prob >chi2 = 0.0075				
Model 2				
Delta Method				
Variable	**ey/ex**	**Std-Err**	**z**	**P>|z|**
L1. Ros	-.1658709	.1769095	-0.94	0.340
Engint	-.4271475	.9099432	-0.47	0.639
Emsint	.6046664	.8815802	0.69	0.493
Optinc	.6851699	.2557497	2.68	0.007
Lev	-1.293472	.621583	-2.08	0.037
Assets/s	-1.953175	.2851353	-6.85	0.000
Growth	.0685088	.0550959	1.24	0.214
Obs=70, Wald chi2 =313.47, Prob>chi2 =0.0000, Sargan = prob >chi2 = 0.0067				
Model 3				
Variable	**Coef.**	**Std-Err**	**t**	**P>|t|**
L1. Eqrtns	-.2307569	.0929779	-2.48	0.013
Lnengint	-.2570587	.0826096	-3.11	0.002
Lnemsint	-.0174331	.1109119	-0.16	0.875
Optinc	3.6100	1.7900	2.02	0.044
Lev	.0569395	.6702148	0.08	0.932
Lnmve	.4844929	.0835467	5.80	0.000
Growth	-.1836034	.1686687	-1.09	0.276
_cons	-15.39804	2.475597	-6.22	0.000
Obs=70, Wald chi2=61.14, Prob>chi2 =0.0000, Sargan = prob >chi2= 0.0735				
Model 4				
Delta Method				
Variable	**ey/ex**	**Std. Err**	**z**	**P>|z|**
L1.Mve/s	.1846434	.1075111	1.72	0.086
Engint	-.0876682	.2273712	-0.39	0.700
Emsint	.4045871	.2338853	1.73	0.084
Optinc	.0926753	.0601782	1.54	0.124
Lev	.3502018	.1710599	2.05	0.041
Assets/s	1.355761	.0519263	26.11	0.000
Growth	-.0082349	.0133326	-0.62	0.537
Obs=70, Wald chi2 =3050.33, Prob>chi2 =0.0000,Sargan = prob >chi2 = 0.0002				

5. Conclusion & Future Direction for Research and Policy

The pooled data results seem to indicate that improvement in "prevention activities" is value destroying with respect to return on asset and return on sale, and value drives market value of equity deflated by sales. Alternatively, the results seem to indicate that improvement in "end-of-pipe" does enhance return on asset and return on sale, while improvement in 'control activities' shows value destroying tendencies with respect to market value of equity deflated by sale. After accounting for omitted variable bias the direction of association of environmentally friendliness with financial performance seemed to dissolve in most of the estimations.

When we control for firm's omitted variable bias and possible orthogonality conditions, the results indicate that improvements in "prevention activities" value destroys equity returns, while improvement in "end-of-pipe" activities value drives market value of equity deflated by sale. This result also shows some consistencies with our OLS results with respect to the direction of association between energy intensity and return on asset, return on sale and equity returns, while emissions intensity exhibits some consistency with return on asset and return on sale. The Arellano-Bond DPD and OLS results also seemed to show that while improvement in "preventions activities" are value destroying, improvement in end-of-pipe actives are value driven.

For the purposes of improving corporate wealth we found that JSE's SRI companies should be more involved in "control activities" than "prevention oriented activities". We further observed that "environmentally friendliness" reflects market-base measures and not accounting-based performance measures. As to whether environmentally friendliness impact might have been same, if carbon tax and emissions trading scheme has been operational in the jurisdiction is recommended for research in the near future.

We further observed how low power associated with OLS and fixed effect tend to render effect estimated in most previous studies contestable. We belief much work remains to be done to help understand the dynamics and fundamentals of financial implications of environmental performance improvements. While our results on the financial implication of pollution reduction and causal relations between factors seem to confirm some previous empirical findings, we belief there are areas in environmental accounting research that needs to be explored further in the attempt to resolving environmental performance-financial performance conundrum. These include environmental performance threshold effects on corporate financial performance, impulse response analysis of financial performance response to environmental performance due to policy change, which we believe may provide insight as to when and if it does pay to be green. Our findings support stakeholder theory as the results indicate the extent to which companies manage fossil related resources to meet interested parties needs by instituting integrated programme of

activities to improve corporate impact on the environment. We therefore recommend further research into these areas to help resolve decades old problem.

6. References

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APPENDIX 1. Pooled Data results with ROA_{it}, ROS_{it}, $EQRTNS_{it}$ and MVE/S_{it} as dependent variables

Model 1				
Delta Method				
Variable	**ey/ex**	**Std-Err**	**z**	**P>|z|**
Emsint	1.181975	.3164713	3.73	0.000
Engint	-.8897372	.2435079	-3.65	0.000
Optinc	.3475794	.0690451	5.03	0.000
Lev	.1369644	.1360852	1.01	0.314
LnAsset	-6.682856	2.968473	-2.25	0.024
Growth	.0527726	.0304131	1.74	0.083

indtype	-.5038317	.1557549	-3.23	0.001
Obs=98, F(7,90) =12.16, Prob>F =0.000, R-Squared=0.4861				
Model 2				
Delta Method				
Variable	**ey/ex**	**Std-Err**	**z**	**P>|z|**
Emsint	1.239902	.4477549	2.77	0.006
Engint	-.9503387	.3607048	-2.63	0.008
Optinc	.3310326	.0818202	4.05	0.000
Lev	.1858781	.2020815	0.92	0.358
Assets/s	-1.431419	-1.4314419	-.6.03	0.000
Growth	.0850021	.0508776	1.67	0.095
Indtype	.224118	.2234676	1.00	0.316
Obs=98, F(7,90)=40.70, Prob>F=0.000, R-Squared= 0.7599				
Model 3				
Variable	**Coef.**	**Std-Err**	**t**	**P>|t|**
Lnemsint	.0568116	.0612551	0.93	0.314
Lnengint	-.0290324	.0552625	-0.53	0.526
Optinc	1.6000	6.88000	2.33	0.024
Lev	-.0038448	.0364043	-0.11	0.551
Lnmve	.0251036	.0164095	1.53	0.124
Growth	.0228819	.1481452	1.50	0.143
indype	-.1537693	.0762562	-2.02	0.079
_cons	-.4058411	.3706471	-1.09	0.247
Obs=98, F(7,90)=2.26, Prob>F=0.0322, R-Squared= 0.1526				
Model 4				
Delta Method				
Variable	**ey/ex**	**Std. Err**	**z**	**P>|z|**
Emsint	-.5813349	.2847642	-2.04	0.041
Engint	.5134729	.2323989	2.21	0.027
Optinc	-.027996	.0449743	-0.62	0.534
Lev	-.0266335	.136436	-0.20	0.845
Assets/s	1.5936575	.1763086	9.04	0.000
Growth	-.010177	.0336206	-0.30	0.762
indtype	-.39433	.1556425	-2.53	0.011
Obs=98, F(7,90)=81.29, Prob>F=0.000, R-Squared= 0.8528				

Note: Model 1, Model 2, Model 3 and Model 4 have ROA, ROS, EQRTNS and MVE/S as dependent variables respectively

Appendix 1.1. Fixed Effects results with ROA_{it}, ROS_{it}, $EQRTNS_{it}$ and MVE/S_{it} as dependent variables

Model 1				
Delta Method				
Variable	**ey/ex**	**Std-Err**	**z**	**P>|z|**
Emsint	-.2887077	.4825336	-0.60	0.550
Engint	.1374969	.4783928	0.29	0.774
Optinc	.47054394	.1412988	3.33	0.001
Lev	-.3445976	.250607	-1.38	0.169
Lnasset	-33.791	12.48252	-2.71	0.007
Growth	.042844	.0297679	1.44	0.150
Obs=98, F (6, 78)= 4.75, Prob>F =0.0004, R-sq: within= 0.2675				
Model 2				
Delta Method				
Variable	**ey/ex**	**Std-Err**	**z**	**P>|z|**
Emsint	-.0270618	.6495017	-0.04	0.967
Engint	.1790759	.6599864	0.27	0.786
Optinc	.7435502	.2033618	3.66	0.000
Lev	-.268324	.3386351	-0.79	0.428
Assets/s	-1.557325	.2170734	-7.17	0.000
Growth	.0497849	.0451618	1.10	0.270
Obs=98, F (6, 78 =56.55, Prob>F=0.0000, R-sq: within = 0.8131				
Model 3				
Variable	**Coef.**	**Std-Err**	**t**	**P>|t|**
Lnemsint	-.0324097	.1052902	-0.31	0.758
Lnengint	-.13057	.0841415	-1.55	0.125
Optinc	1.46000	2.17000	0.67	0.502
Lev	.5308853	.5393001	0.98	0.328
Lnmve	.3402628	.0910796	3.74	0.000
Growth	.1146952	.1528924	0.75	0.455
_cons	-10.67433	2.770349	-3.85	0.000
Obs=98, F(6, 78) = 3.29, Prob>F=0.0062, R-sq: within= 0.2019				
Model 4				
Delta Method				
Variable	**ey/ex**	**Std. Err**	**z**	**P>|z|**
Emsint	.2965897	.2367357	1.25	0.210
Engint	-.0511902	.2400678	-0.21	0.831
Optinc	.0803762	.0663485	1.21	0.226
Lev	.0835742	.1227191	0.68	0.496
Assets/s	1.421648	.0737938	19.27	0.000
Growth	.003361	.0162873	0.21	0.837
Obs=98, F(6, 78)= 317.90, Prob>F= 0.0000, R-sq: within= 0.9607				

Note: Model 1, Model 2, Model 3 and Model 4 have ROA, ROS, EQRTNS and MVE/S as dependent variables respectively.