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The importance of foreign direct investment and energy consumption and their effects on economic growth in the case of MENA

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Abstract

The main purpose of this paper is to investigate relationship between foreign direct investment and economic growth for MENA countries from 1990 to 2014. We firstly tested heterogeneity and cross sectional dependence and found that all series have homogeneity and cross sectional dependence. For that reason, Hadri Kruzomi and Pesaran et al. Multifactor Error Structure panel unit root tests were used. For obtaining long-run relationship, we used Weterlund's panel and group cointegration tests. The results supported the long-run relationship, therefore, we used Common Correlated Effect Model, thanks to this method, and coefficients for each cross-section unit could be calculated individually.

1. Introduction

Since the early 1990s, the world has been experiencing globalization, liberalization, regulation and technological progress, major changes that affect various economic sectors in different countries of the world, including Most of them have chosen an economic policy issued by a pop-up in order to be able to improve its economic growth and development and meet the challenges associated with this opening up while providing an appropriate ground for global competition to attract more foreign investment. Therefore, attracting FDI is always a matter of continuing interest for home countries as host countries where there is an almost complete consensus on the benefits that can be made and be attracted by FDI, they will create jobs that will promote economic growth and development, as they allow the transfer of knowledge and technology and encourage reforms, especially for host countries.

In the context of development, we can also talk about the importance of energy, as this sector has seen growing interest in recent years. Realizing the need to develop this sector, in terms of its economic and environmental benefits, a number of researchers have in fact documented the benign effects of alternative energies (nuclear and renewable energy) in reducing carbon dioxide emissions and reducing the impacts of climate change (AlFarra and Abu-Hijleh, 2012; Apergis et al. 2010; Lee, 2014; Monia and Weld Raphael, 2010bAnother important characteristic of renewable energy resources is that they promote sustainable development. Glorioso et al (2007)

Research on the relationship between foreign direct investment, energy consumption and economic growth is seen as a hierarchy of objectives and constraints that involve global, regional or local considerations and has attracted the interest of academic researchers and policy makers in the economic literature (Root and Ahmed, 1979; Dunning, 1981; Schneider and Frey, 1985) Mina (2020).

FDI and energy consumption were seen as the driving force of modern economies and societies. Therefore, as they were a top priority for economic growth, United Nations members would need to improve FDI and access to energy in order to achieve many economic growth objectives, including poverty reduction, industrialization, health and education.

Indeed, the growing interest of academics and scholars in the relationship between foreign direct investment, energy consumption and economic growth has made it a platform from which we are trying to seek to clarify their impact on economic growth by asking the following question: What is the importance of foreign direct investment and energy consumption and what are their effects on economic growth in the case of the countries of the Middle East and North Africa?.

2. Literature review and hypothesis

FDI uses foreign technology and management techniques to exploit local resources at low cost. There is a clear distinction between FDI and portfolio investment: in the FDI situation, the home company has direct and ultimate control over the scope and nature of day-to-day operations, and transfers not only capital to host countries, but also technology and management skills. On the other hand, portfolio investment is simply the provision of capital from a lender to a borrower; it is motivated by the per capita rate of return and obliges borrowers to repay the loan plus interest. The investment portfolio may involve the purchase of shares, bonds or other foreign securities and has no controlling interest in the investment. The main components of FDI are: equity, reinvested earnings (the investor's share of income retained in the form of dividends by subsidiaries in proportion to its share of equity) and intra-company loans (where the investor borrows funds from the subsidiary, usually without the intention of seeking repayment).

Hypothesis 1: Foreign direct investment (FDI) has a direct positive effect on economic growth.

In contrast, the subject of FDI has been studied by several economic disciplines both theoretically and empirically. The various existing theories on FDI evolve over time to adapt to new data in the international economic environment. It is first and foremost since the turn of the 2000s that the literature on FDI has experienced a strong acceleration, in line with the development of the phenomenon.

Indeed, the authors who have dealt with FDI have attempted to formalize its causes by developing or applying different theoretical approaches. The arguments put forward are inspired by several theories relating to economics, trade, investment or marketing.

Following a chronological order, the analysis will focus on the theories that have focused in particular on the impact of FDI on development and economic growth.

Blomston et al (1992) Khemici & Abdelmadjid, K. (2013), in studying the impact of FDI on growth, have shown that the magnitude of this impact depends on the stock of human capital in the host country. The authors highlight the positive effect of FDI on income growth. Moreover, (Ait Ken and Hanison, 1993), Idrissa & Abdou (2019), (Saggi, 2000) Acquah & Ibrahim (2019), have shown that FDI can generate negative, even mixed effects on the development of host countries.

In the same framework, Darrat et al (2005) carried out a comparative study (1979-2002) covering countries in two regions, namely those of MENA and those of Central and Eastern Europe. This study showed that FDI flows stimulate economic growth only in EU member countries. Whereas, the effect of FDI remains negative or even non-existent in the MENA countries.

Development economics argues that capital accumulation is a factor in long-term growth. However, this thesis has recently been challenged: the joint movement of investment (its GDP ratio) and the growth rate is largely driven by a third factor, technological innovation (Ben Habib and Jovanovic, 1991; King and Levine, 1994) Mtiraoui, A. (2020).

At this level, the OECD emphasizes the links between investment and growth, while conditioning them on the policy reforms that need to be put in place and on the need for co-operation between all countries, whether members or non-members of the organization.

Hypothesis 2: Foreign direct investment has a negative effect on economic growth.

In the energy literature, few studies have addressed the problem of intersectoral dependence and the degree of heterogeneity. Therefore, to address this problem, our study applied a heterogeneous panel technique with cross-sectional dependence. Moreover, energy policies developed at the global level can also affect individual nations. Moreover, it also manages exogenous shocks. This is one of the studies dealing with the problems mentioned by applying heterogeneous panel techniques for some countries.

Hypothesis 1: An increase in renewable energy consumption improves positive production, and if there is a decrease in renewable energy consumption, energy conservation policies will have a significant negative impact on economic growth. This means that renewable energy consumption leads to economic growth, which is called the growth hypothesis.

Hypothesis 2: The preservation hypothesis assumes a one-way causal relationship that links economic growth to renewable energy point-of-sale consumption; thus, a decrease or increase in energy consumption will not affect economic growth.

Hypothesis 3: The feedback hypothesis indicates a two-way causal relationship between renewable energy consumption and economic growth. Any increase in the use of renewable energy will play an important role in stimulating economic growth with the opposite effect.

Hypothesis 4: The neutrality hypothesis shows that these two variables are independent. Most of the existing energy literature has studied the links between renewable energy use and economic growth, but has given mixed empirical results from countries.

3. Methodology

All time series data below were collected from the database published by the World Bank. Our data include the following variables:
- **Economic growth**: measured by GDP per capita, an economic indicator of the wealth produced per year in a given country, in constant US dollars.
- **Foreign direct investment**: These investments play a major role in the internationalization of a firm. Highly appreciated by academics, they also help measure a country's economic attractiveness.
- **Energy consumption**: Energy consumption is variable according to various parameters. Among others, for a boiler it will depend on its efficiency, for an air conditioner on its COP and for a housing on its insulation.
- **Renewable energy**: Renewable energy is energy generated by natural processes that are continually replenished. It is measured by Renewable Energy Consumption (% of total final energy consumption).
- **Population**: In statistics, a population is a finite set of objects, units or individuals that are the subject of a study or observation and which is subject to statistical processing.

Details on the description of the variables used and their sources are presented in Table 1.

Table 1. Description of variables and data source

Variables	Description	Source
Growth economic	GDP growth (annual %)	World Bank
Foreign Direct Investment	Net foreign direct investment as % of GDP	World Bank

European Journal of Social
Impact and Circular Economy

Energy consumption	Total energy consumption	World Bank
Renewable Energy	Renewable energy consumption (% of total final energy consumption).	World Bank
Population	Total population	World Bank

Source: World Bank

3.1 Data source

The data used come from the World Bank database. These data will be annual and relate to Gross Domestic Product growth (annual GDP growth in %), Net Foreign Direct Investment as % of GDP, Renewable Energy Consumption (% of total final energy consumption), Total Population, Total Energy Consumption. There are 275 observations (1990-2015).

3.2 Empirical methodology

The paper uses a four-step empirical methodology. The first step is to examine the stationary properties of individual series in panel data. The second step is to test for the presence of cointegration. In the third step, we estimate our models using the estimator. The third step is to examine the short- and long-term causality between variables using the vector error correction model (VECM). In the third step, we estimate using individual effects models. In the last step one can be drawn from the ARDL which integrates the CT dynamics with the LT equilibrium without losing the LT information.

3.3 Unit root tests in panel data

The unit root test on time series data has become one of the most important tests for economists, particularly econometricians, although the unit root test on panel data is more recent. Unit root tests in panel data have become popular among economic researchers working on panel data structures because they are much more powerful than normal unit root tests for individual time series. Among the various unit root tests developed in the literature, Levin, Lin and Chu (LLC) (2002) and Im, Pesaran and Shin (IPS) (2003) are the most popular. Both tests are based on the ADF principle. However, LLC assumes homogeneity in the dynamics of the autoregressive coefficients for all panel members. In contrast, the SPI is more general in that it allows for heterogeneity in these dynamics. Therefore, it is described as a "heterogeneous panel unit root test". It is particularly reasonable to allow such heterogeneity in the choice of shift length in ADF tests, when the imposition of a uniform shift length is not appropriate. Furthermore, slope heterogeneity is more reasonable where cross-national data are used. In this case, heterogeneity is due to differences in the economic conditions and degree of development of each country.

Levin et al (2002) consider the following basic ADF specification:

$$\Delta X_{it} = \alpha_i + \beta_i X_{i,t-1} + \delta_i t + \sum_{j=1}^{k} \gamma_{ij} \Delta X_{i,t-1} + \upsilon_{it} \quad (1)$$

Where Δ is the first difference operator, X_{it} s the dependent variable i over the period t, is a white noise disturbance with a variance of σ^2. Both β_i and the order of shift

$$\begin{cases} H_0 : \beta_i = 0 \\ H_1 : \beta_i \prec 0 \end{cases};$$

Where the alternative hypothesis corresponds to Xit being stationary. The test is based on the $t_{\beta_i} = \dfrac{\hat{\beta}i}{\sigma(\hat{\beta}_i)}$, or is the OLS

estimate of β_i in equation (4) and $\sigma(\hat{\beta}_i)$ is his standard mistake.

According to the LLC test, the panel procedure significantly increases the efficiency of the finished samples. The proposed model is as follows:

$$\Delta X_{it} = \alpha_i + \beta X_{i,t-1} + \delta_i t + \sum_{j=1}^{k} \gamma_{ij} \Delta X_{i,t-1} + \upsilon_{it} \qquad (2)$$

At this level, Levin et al. (2002; LLC) also assumed:

$$\begin{cases} H_0 : \beta_1 = \beta_2 = ... = \beta = 0 \\ H_1 : \beta 1 = \beta_2 = ... = \beta \prec 0 \end{cases};$$

Where the test statistic is:

$$t_{\beta_i} = \dfrac{\hat{\beta}_i}{\sigma(\hat{\beta}_i)},$$ $\hat{\beta}_i$ is the OLS estimate of β_i in the equation (4) and $\sigma(\hat{\beta}_i)$ is his standard error.

Im et al (2003) proposed a test procedure based on the middle group approach. The starting point for the IPS test is also the ADF regressions given in equation (1). But the null and alternative hypotheses are different from the LLC test, where rejection of the null hypothesis implies that all series are stationary. We now have :

H0: β1 = β 2 = … = β N = 0 vs H1: Some but not necessarily all β i 0

IPS developed two test statistics and called them LM-bar and t-bar tests. The alternative t-bar statistics to test the null hypothesis of the unit root for all people (βi = 0) is as follows:

$$\bar{t} = \dfrac{\displaystyle\sum_{i=1}^{N} t\beta_i}{N} \qquad (3)$$

Where t is the calculated ADF statistics of the individual panel members. Using Monte Carlo simulations, IPS shows that t-bar convertiris normally distributed under the null hypothesis and outperforms M-bar in small samples. They then use estimates

of the mean and variance to convert ($\bar{t}$) in a standard z-bar ($\bar{z}$)statistics so that conventional critical values can be used to assess its significance. The test statistic ($\bar{z}$) is defined as follows:

$$\bar{z} = \frac{\sqrt{N}\ (\bar{t} - E[\bar{t}\,|\beta_i = 0])}{\sqrt{\text{var}[\bar{t}\,|\beta_i = 0]}} \rightarrow N(0,1) \qquad (4)$$

Where $\bar{t}$ is as previously defined , $E[\bar{t}\,|\,\beta_i = 0]$ and $\text{var}[\bar{t}\,|\beta_i = 0]$ are the mean and variance of obtained from Monte Carlo simulations with i = 1,2,…, N.

The LLC and IPS unit root tests are used in this study to test the stationarity of the data used for the 30 African countries.

3.4 Cointegration tests in panel data

After checking that the series are integrated in the same order, we move on to the next step by testing the possibility of long-term convergence between our data series. Engle and Granger (1987) indicated that variable series can be stationary and are therefore interpreted as Co-integrated (having a long-run relationship) if there is a linear combination of two or more non-stationary variable series. The unique order of integration of the variables allows us to use the panel cointegration technique to test the long-run relationships between the variables in each model. The existing literature suggests several panel cointegration tests, such as Pedroni (1999, 2004), Kao (1999) and Westerlund (2007). For this study, we used the cointegration technique of Pedroni (1999). This test is based on a method similar to that of Engle and Granger (1987) on time series with the following data generation process:

$$Y_{it} = \alpha_i + X'_{it}\beta_i + \varepsilon_{it}; \quad N=1\dots 14; \quad T= 1 \dots 25 \qquad (5)$$

Where Y_{it} is the dependent variable; α_i is a fixed effect taking into account the unobserved heterogeneity between the dependent variables; and X'_{it} is a vector of explanatory variables. To test the cointegrating relations, Pedroni constructed seven different statistics based on the cointegrating residual of ε_{it} , which are divided into two categories. The first includes statistics called "intra-dimensional" or "within".

3.5 Model with individual effects

We will now focus on heterogeneous panel models, where the only source of heterogeneity comes from individual constants. It is thus assumed that the coefficients of the different stochastic explanatory variables are identical for all individuals in the panel ($\beta_1 = \beta$). It is further assumed that these coefficients are deterministic constants. The individual constants α_1 ; The latter differ from one individual to another.

$$Y_{it} = \alpha_i + \sum_k \beta_k\ x_{kit} + \varepsilon_{it}$$

Innovations ε_{it} are supposed to be i: i: d: of zero mean, variance equal to σ_ε^2 ; $\forall i \in [1; N]$ and are assumed to be uncorrelated either in the individual dimension or in the time dimension.

Therefore, in this context, two cases must be distinguished: the case in which the parameters α_i are deterministic constants (fixed-effects model) and the case where the parameters α_i are realizations of a random variable of expectation and finite variance (random effects model). We will thus successively consider these two types of model.

3.5.1 Fixed-effect model

It is now hypothesized that the individual effects αi are represented by constants (hence the name fixed-effect model). We will determine the general shape of the estimators of the parameters αi et β in this fixed-effect model.

Assumptions:

- The individual fixed effects model has a residue structure that tests standard OLS assumptions. It is in fact a classical model with individual indicator variables.
- We're going to make an additional assumption about the nature of the residue process. This hypothesis is simply the generalization in the panel dimension of the definition of a white noise $\forall i \in 1; N$ et $t \in 1; T$:

- $E\ \varepsilon it = 0$
- $E\ (\varepsilon it\ \varepsilon is) = \sigma_\varepsilon^2 t = s\ 0\ \forall t \neq s$
- $E\ (\varepsilon it\ \varepsilon js) = 0\ \forall j \neq i, \forall\ (t, s)$

<u>Estimateur Within ou LSDV (Least Square Dummy Variables)</u> : The Ordinary Least Squares (OLS) estimator of the parameters αi et β in the fixed-effects model is called the Within estimator; or the fixed-effects estimator or the Least Square Dummy Variable (LSDV) estimator. As we have seen, the term Within is explained by the fact that this estimator takes into account the within-group variance of the endogenous variable.

The third name LSDV is only because this estimator leads to the introduction of dummy variables.

The OLS estimators of this model are the best linear, unbiased and convergent (BLUE) estimators. In practice, the OLS or LSDV estimator is obtained from a transformed model where the different model variables are centred with respect to their respective individual means. The following specification is then retained :

$$\tilde{y}\,it = \sum_k \beta k\ \tilde{x}\,kit + \tilde{\varepsilon}\,it \quad \text{With} \quad \tilde{y}\,it = yit - \bar{Y}it$$

$$\tilde{x}\,it = xit - \overline{X}\,it \quad \text{and}\ \bar{Y}it = \frac{1}{T} \sum_{t=1}^{Ti} yit$$

$$\tilde{\varepsilon}\,it = \varepsilon it - \varepsilon\,it$$

The realizations of the estimators of the constants αi are deduced at the mean point, after estimation of the parameters βk by MCO on the previous transformed model.

$$\hat{\alpha}\,i = \bar{Y}i - \sum_{k=1}^{p} \hat{\beta}\,k\ \overline{X}\,ki$$

3.5.2 Random effects model

In the standard practice of econometric analysis, it is assumed that there are a large number of factors that can affect the value of the variable being explained and yet are not explicitly introduced as explanatory variables. These factors are then approximated by the structure of the residuals. The problem arises in a similar way in panel econometrics. The only difference is that three types of omitted factors can be considered. First, there are factors that affect the endogenous variable differently depending on the period and the individual under consideration. In addition, there may be factors that affect all individuals identically, but whose influence depends on the period under consideration (temporal effects). Finally, other factors may, on the contrary, reflect differences between individuals of a structural type, i.e. independent of time (individual effects). Therefore the residual, noted εit ; of a panel model can be decomposed into three main components as follows (Hsiao 1986):

$$\forall i \in 1; N \ et \ t \in 1; T \ ; \ \varepsilon it = \alpha i + \lambda t + \vartheta i$$

The variables αi s here refer to the individual effects that represent the set of structural or a-temporal specificities of the endogenous variable, which differ from one individual to another. It is assumed here that these effects are random. Random variables λt represent strictly identical temporal effects for all individuals. Finally, the stochastic process ϑit designates the component of the total residue εit orthogonal to individual and temporal effects. In general, a number of technical assumptions are made about this tailings structure.

Assumptions:

It's assumed that the residue $\varepsilon it = \alpha i + \lambda t + \vartheta it$ are i.i.d. and satisfy the following conditions, $\forall i \in [1; N] \ et \ t \in [1; T]$:

$$E \ (\alpha i) = E \ (\lambda t) = E \ (\vartheta it) = 0$$
$$E \ (\alpha i \lambda t) = E \ (\lambda t \vartheta it) = E \ (\vartheta it \alpha i) = 0$$
$$E \ (\alpha i \alpha j) = \{\sigma_\alpha{}^2 \ i = j$$
$$\{0 \ \forall i \neq j$$
$$E \ (\lambda t \lambda s) = \{\sigma \lambda \ 2 \ s = t$$
$$\{0 \ \forall s \neq t$$
$$E \ (\vartheta it \vartheta js) = \{\sigma \vartheta \ 2 \ s = t \ ; \ i = j$$
$$\{0 \ \forall s \neq t \ ; \ \forall i \neq j$$
$$E \ (\alpha ixit) = E \ (\lambda txit) = E \ (\vartheta itxit) = 0$$

Under these assumptions, the variance of the endogenous variable yit conditional on the explanatory variables xit is then equal to $\sigma_y{}^2 = \sigma_\alpha{}^2 + \sigma_\lambda{}^2 + \sigma_\vartheta{}^2$. The variances $\sigma_\alpha{}^2$, $\sigma_\lambda{}^2$ and σ_ϑ correspond to the different components of the total variance. For this reason, the random effects model is also called the Error Component Model.

In this course, due to simplification, the time effect is neglected. We will assume that it does not exist (static panel).

3.6 The ARDL models "Autoregressive Model with Scaled Distributed Delays"

The "AutoRegressive Distributed Lag/ARDL" or "Autoregressive Distributed Lag/ARRE" models are dynamic models. The latter have the particularity of taking into account time dynamics (adjustment lag, expectations, etc.) in the explanation of a variable (time series), thus improving forecasts and the effectiveness of policies (decisions, actions, etc.), unlike the simple (non-dynamic) model whose instantaneous explanation (immediate effect or not spread over time) only restores part of the variation of the variable to be explained. Within the family of dynamic models, there are three types of models. If we consider the dependent variable « Yt » and the independent variable « Xt », noteworthy:

Autoregressive (AR) models: these are dynamic models in which the explanatory variables include (Xt), the lagged dependent variable (its past values). In general, they are as follows (implicit form)

$$Yt = f(Xt, Yt\text{-}p) \dots (1a)$$

The term "autoregressive" reflects the regression of a variable on itself, i.e. on its own lagged values.

- Staggered lag or distributed lag (DL) models: these are dynamic models that have as explanatory variables: and its past or lagged values. In general, their form is:

$$Yt = f(Xt, Yt\text{-}q) \dots (1b)$$

The term "staggered delays" shows that the short-term effects of Xt on Yt are different from the long-term ones. From one point in time to another, the response scales of Yt at the change of Xt differ.

Autoregressive staggered-delay (ARDL) models: these models combine the features of the two previous ones; among the explanatory variables are the following (Xt), the shifted dependent variable (Yt-p) and the past values of the independent variable (Xt-q). They have the following general form:

$$Yt = f(Xt, Yt\text{-}p, Xt\text{-}q) \dots (1c)$$

Or

$$Yt = \varphi + \sum_{i=1}^{p} \alpha\, Yt\text{-}i + \sum_{i=1}^{p} bj\, Xt\text{-}j + e_t \dots (1d)$$

With $e_t \sim$ iid $(0, \sigma)$: error term; « b0» reflects the short-term effect of Xt on Yt Considering the following long-term or equilibrium relationship «Yt $= k + \varphi Xt + \mu$ », it is possible to calculate the long-term effect of X_t on Y_t (or « ») as follows:

$$\emptyset = \sum bj \,/\, \left(1 - \sum \alpha i\right)$$

As with any dynamic model, the following information criteria will be used (AIC, SIC and HQ) to determine the optimal offset (p* or q*) ; An optimal shift is one where the estimated model offers the minimum value of one of the stated criteria. These criteria are: Akaike's (AIC), Schwarz's (SIC) and Hannan and Quinn's (HQ). Their values are calculated as follows:

$$\text{AIC (p)} = \log \|\textstyle\sum\| + \frac{2}{T} n2p$$

$$\text{SIC (p)} = \log \|\textstyle\sum\| + \frac{\log T}{T} n2p$$

$$\text{HQ (p)} = \log \|\textstyle\sum\| + \frac{2\log T}{T} n2p$$

With : $\sum$ = variance-covariance matrix of estimated residuals; T = number of observations ; p = lag of the estimated model; and n = number of regressors. All of these dynamic models can help capture the short-term dynamics and long-term effects of one or more explanatory variables on a variable to be explained. This will only be possible if the time series under study are cointegrated, thus allowing the estimation of an error-correction/ERM model. In fact, two series are said to be "cointegrated" if they are integrated of the same order; and, a series will be said to be "d-integrated" if it has to be differentiated "d" times to make it stationary. A stationary series is stationary in terms of mean and variance, if its mean ($E(Y_t) = c$) remains invariant or constant over time and that its variance does not increase with time (Var (Y_t) = σ), as well as its covariances (E (Yt_{-c})(Y_{t-p} -c) = y_p).

To test the stationarity of a time series (absence of unit root), several tests are available in most software: Augmented Dickey-Fuller/ADF test, Phillippe-Perron/PP test, Andrews and Zivot/AZ test, Ng-Perron, Kwiatkowski, Phillips, Schmidt and Shin/KPSS test, Ouliaris-Park-Perron, Eliott-Rothenberg-Stock, etc. The first three tests are easy to apply and are commonly used. It should be noted that the ADF test is effective in the presence of error autocorrelation, the PP test is recommended in the presence of heteroskedastic errors, the AZ test is suitable for series that are victims of endogenously identified regime change (trend break), and the KPSS test decomposes a series into three components (deterministic part, random part, white noise) with the null hypothesis of stationarity. It should be noted that, as part of the family of dynamic models, an ARDL model makes it possible to estimate short-term dynamics and long-term effects for series that are co-integrated or even integrated at different orders, as will be seen with the boundary test approach of Pesaran et al. (1996), Pesaran and Shin (1995), and Pesaran et al. (2001). However, an ARDL model cannot be applied to integrated series at orders greater than 1.

4. Results and discussion

4.1 Results and discussion

To study the stationarity of the series used, we used unit root tests on panel data (Levin Lin and Chu, IM Persaran and Shin, Hadri, ...). The next table 2 summarizes the results of the (Summary) tests, applied to the different variables of the model. The unit root tests show that all the statistical series at the level are assigned a unit root. Moving on to first differences, we can see that all the series are stationary. We conclude that they are integrated of order I (1) and I(0).

Table 2. Unit root test results

Variables / methods	Integration Order	Levin et al.	Im et al.	ADF-Fisher chi-square	PP-fisher chi-square
GDP	I(1)	*-8.13344 (0.0000)*	*-8.91040 (0.0000)*	*125.563 (0.0000)*	*130.484 (0.0000)*
stationarty		**Hadri Z-stat**		**Heteroscedastic Consistent Z-stat**	
		5.47912 (0.0000)		*3.10673 (0.0000)*	
FDI	I(1)	*-2.94203 (0.0016)*	*-4.46400 (0.0000)*	*59.9463 (0.0000)*	*54.5151 (0.0001)*
stationarty		**Hadri Z-stat**		**Heteroscedastic Consistent Z-stat**	
		3.58597 (0.0000)		*3.35800 (0.0000)*	
		Levin et al.	**Im et al.**	**ADF-Fisher chi-square**	**PP-fisher chi-square**

European Journal of Social Impact and Circular Economy

		En niveau	Différence première	En niveau	Différence première	En niveau	Différence première	En niveau	Différence première
Log CE	I(0)	-0.9882	-16.9238	1.18831	-16.4708	20.3619	202.044	20.5153	220.380
		(0.1615)	(0.0000)	(0.8826)	(0.0000)	(0.5604)	(0.0000)	(0.5508)	(0.0000)
stationarty		Hadri Z-stat				Heteroscedastic Consistent Z-stat			
		10.8187	(0.0000)			9.10802	(0.0000)		
CER	I(0)	1.06230	-11.4987	0.70665	-12.9988	21.2863	181.082	26.5511	175.253
		(0.8560)	(0.0000)	(0.7601)	(0.0000)	(0.5031)	(0.0000)	(0.2288)	(0.0000)
stationarty		5.99423	(0.0000)			5.99423	(0.0000)		
Log Pop	I(0)	1.64641	-3.12926	3.92872	-7.65503	15.4128	101.834	46.2751	82.1472
		(0.9502)	(0.0009)	(1.0000)	(0.0000)	(0.8439)	(0.0000)	(0.0018)	(0.0000)
stationarty		12.8872	(0.0000)			13.1507	(0.0000)		

Notes: Probability values are given in brackets. Significance thresholds * (1%), ** (5%), and *** (10%)

Source: Author elaboration on Eviews9

4.2 Co-integration

After checking the non-stationarity properties for all the variables in the panel, we study the existence of a short- and long-term relationship between these variables. That is to say, the study of the existence of a Co-integration relationship, by applying the Co-integration tests of Pedroni, Kao and Johansen which are based on unit root tests on estimated residuals. Table 3 summarizes the results of the seven (7) Pedroni Co-integration statistics.

They were established by Eviews 9.0 which has an appropriate program to handle Co-integration on heterogeneous panel data. The Co-integration of the variables depends on the probability value associated with each statistic. From the results of Pedroni's Co-integration tests we can see that out of the seven statistics, four have probability values less than 5%. These are mainly (Panel pp- statistic) and (Panel ADF-Statistic) for the intra-individual tests "Pedroni (1999), (Weighted statistic)", and (Group PP-Statistic) and (Group ADF-Statistic) for the inter-individual tests "Pedroni (1999)". Therefore, all of these tests show the existence of a Co-integration relationship. In what follows, we will estimate the long-term relationship of Co-integration using the most adequate methods for this type of approach.

Table 3. Co-integration model results

No deterministic trend	Intra dimensions (four statistics)				Inter dimension (3 statistics)		
Pedroni	Panel v-statistic	Panel rho-statistic	Panel PP-statistic	Panel ADF-statistic	Group rho-statistic	Group PP-statistic	Group ADF-statistic
Staistic	-0.772857	-3.372856	-10.82630	-8.643915	-1.912110	-17.11109	-8.810620
prob	(0.7802)	(0.0004)	(0.0000)	(0.0000)	(0.0279)**	(0.0000)	(0.0000)
kao	**ADF**				**RESID(-1)**		
stastic	-5.269950				-11.68755		
Prob	(0.0000)				(0.0000)		
Johansen	**Fisher (from trace test)**				**Fisher (from max-eigen test)**		
	Statistic		**Prob**		**Statistic**		**Prob**
None	470.5		(0.0000)		344.0		(0.0000)
At most 1	413.9		(0.0000)		272.4		(0.0000)
At most 2	233.4		(0.0000)		155.1		(0.0000)

At most 3	*115.8*	*(0.0000)*	*93.08*	*(0.0000)*
At most 4	*64.62*	*(0.0000)*	*64.62*	*(0.0000)*

Notes: Probability values are given in brackets. Significance thresholds * (1%), ** (5%), and *** (10%)

Source: Author elaboration on Eviews9

4.3 Casuality of Granger Panel

The existence of Co-integration implies the existence of causality in at least one direction. Having found that there is a long-term relationship between GDP, FDI, RCE, CET and Pop.the next step is to test the causal links between these variables using the Granger panel test Causality. A Granger causality analysis is performed to determine whether there is potential predictive power across indicators. The results of the Granger Panel Causality test for all individuals are summarized in the following table 4.

Table 4. The Panel VECM Granger Casuality Results

Dependent variables	Source of short-term causality (independent variables)					Long term
	ΔGDP	ΔFDI	ΔCER	ΔCE	ΔPop	ECT
ΔGDP	-	*0.051942* *(0.051942)***	*0.001617* *(0.00371)*	*-0.005544* *(0.00110)*	*5.06* *(6.1)*	*0.051942* *(0.04927)*
ΔFDI	*0.045439* *(0.08979)****	-	*0.004624* *(0.00480)*	*0.001820* *(0.00142)*	*6.47* *(7.8)*	*-0.005544* *-0.005544*
ΔCER	*-0.212568* *(1.30807)*	*-0.683442* *-0.683442*	-	*0.003703* *(0.02068)**	*0.000922* *(0.00114)*	*0.001617* *(0.00371)*
ΔCE	*4.649756* *(4.17685)*	*1.783248* *(2.96392)*	*-0.024501* *-0.024501*	-	*0.002028* *(0.00364)*	*-0.276848* *(0.12601)****
ΔPop	*-7.83706* *(37.0688)*	*-27.43068* *(26.3043)*	*2.058512* *(1.98284)*	*-2.163168* *(0.58612)*	-	*0.042438* *(0.23936)*

Notes: Probability values are given in brackets. Significance thresholds * (1%), ** (5%), and *** (10%)

Source: Author elaboration on Eviews9

The aim of our study is to demonstrate the interactive relationships between the set of variables GDP, FDI, CER, CET and Pop, but this does not preclude the study of all possible relationships. From the results of the Granger Panel Causality tests presented in the table above, we can deduce the meanings of the causal relations that can be found between the variables at the critical threshold (probability of error) of 1%, 5% and 10%.

The results indicate the existence of two unidirectional causalities: FDI to GDP and CER to GDP.

4.4 Models with individual effects

If the main objective is the estimation of the coefficients of the variables other than the constant and if they differ little.

Table 5. Results of individual effect models

Variables	Effet fixe	Effet aléatoire	Test Hausman
FDI	0.865040	0.352954	0.002507
	(0.865040)***	(0.7244)***	(0.00250)
CER	-1.884330	-0.016893	3.740207
	(0.0606)***	(0.9865)***	(0.0548)**
LCE	-0.304002	0.852544	1.035037
	(0.7614)***	(0.3946)***	(0.6463)***
LPop	-3.716112	-3.214474	1.650091
	(0.0002)	(0.0015)	(0.0024)

Notes: Probability values are given in brackets. Significance thresholds * (1%), ** (5%), and *** (10%)

Source: Author elaboration on Eviews9

4.5 Models ARDL

This approach was introduced by Pesaran and Shin (1999) and further developed by Pesaran et al (2001). This approach has many advantages over Johansen's cointegration technique. The variables are integrated of different orders. Another advantage is that the error correction model (ECM) can be derived from the ARDL which integrates the CT dynamics with the LT equilibrium without losing the LT information.

Table 6. Results from Models ARDL

Dependent variable(GDP)	Coefficient	Z-statistics	Probability
Log run results			
FDI	0.154327 (0.076262) ***	2.023651	(0.0454)*
LCE	6.62561 (1.431944)	4.627010	(0.0000)
LCER	0.357443 (0.638771) ***	0.559580	(0.5769)**
LPop	-3.728982 (0.771053) ***	-4.836217	(0.0000)*
Short run results			
ECT	0.288799 (0.288799) ***	2.241166	(0.0270)*
ΔIDE_{t-1}	0.152298 (0.272353)***	0.559194	(0.5771)***

ΔIDE_{t-2}	0.365498 (0.340335) ***	1.073937	(0.2851) ***
ΔCE_{t-1}	0.024823 (9.603603)	0.002585	(0.9979) ***
ΔCE_{t-2}	11.35308 (7.457255)	1.522420	(0.1307) ***
ΔCER_{t-1}	3.321993 (2.702170)	1.229380	(0.2215) ***
ΔCER_{t-2}	3.555253 (2.299951)	1.545795	(0.1250)
ΔPop_{t-1}	-3002.347 (3211.346)	-0.934919	(0.3518)
ΔPop_{t-2}	2711.985 (2711.985)	1.763306	(0.0806) ***

*Notes: Probability values are given in brackets. Significance thresholds * (1%), ** (5%), and *** (10%)*

Source: Author elaboration on Eviews9

The long and short terms of the ARDL methodology are presented in Table 6. The ARDL results for the relationship between economic growth and foreign direct investment are positive and important in both the long and short term given the same importance of the relationship between energy consumption and economic growth, which indicates foreign direct investment and energy consumption as in MENA countries Increases economic growth in the long and short term.

6. Conclusion

Bridging the gap between foreign direct investment and energy consumption is one solution to achieving development goals. The role of foreign direct investment and energy consumption in achieving these goals is becoming an important topic in some of the discussions in the current literature. International organizations, economists and policy makers have considered them as a means to achieve the future development of society as a whole.

Despite this growing interest and importance, the relationship between foreign direct investment, energy consumption and economic growth is not yet clear. Therefore, the main objective of this study is to clarify this relationship by showing the ability of foreign direct investment and energy consumption to achieve economic growth at a given point in time, reduce environmental degradation and improve social conditions in 11 transition countries over the period 1990 to 2015.

The Granger results revealed that FDI and energy consumption are closely linked to the pillars of economic growth. The result can be summarized as follows. First, the adoption of FDI has positive effects on economic growth, as well as on the use of renewable energy. In addition, the study indicates that foreign direct investment and energy use cannot stimulate growth simultaneously in economic terms and advance the environmental and social dimension without certainty of requirements, especially in countries in transition.

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The Nexus between Demographic Dividend and COVID-19 in Bangladesh: A Disappearing Opportunity

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Abstract

In common parlance demographic dividend means the economic growth caused by changes in the age structure of population of a country. Bangladesh entered the phase of demographic dividend in early 2007, considering the average timeline of this important phase which is 20-30 years; Bangladesh is currently passing the midway point of it. Amid this situation, sudden initiatives such as lockdown, closure of educational institutions, changes in the recruitment process, delayed employee selection process and declining trend of job posting caused by COVID-19 has created serious tension among the potential employee sector. The objective of this study is to find out the adverse impact of COVID-19 on demographic dividend, especially on the potential employee sector consists of tertiary level final year students, fresh graduates and job seekers. In doing so primary source of data is used; the data was collected using qualitative method followed by a semi-structured questionnaire. This is a cross-sectional study, for the data collection, non-probability convenience along with self-selection sampling technique is used due limited mobility induced by COVID-19 lockdown. After collecting, the data are analyzed using IBM SPSS software. The findings of this study revealed the adverse impact of COVID-19 on demographic dividend is taking place through potential employee sector.

Keywords: Demographic dividend; COVID-19; Employment; Job market; Potential employee sector.

1. Introduction

Since the COVID-19 induced closure of educational institutions, the tendency of suicide have multifolded in Bangladesh, a study identified lockdown, shutting down economic activities and social distancing as reason behind prevalent mental problem (Islam et al., 2020). A renowned daily news paper reported that "Covid triggered a rise in suicide ideation, with 10 students allegedly ending their own lives" ("Depression, Anxiety behind Rise in Suicide of DU Students," 2021), these students are from the Dhaka University which is the most reputed university of the country and the news is from just one daily, let alone student from countryside normal educational institutions and numerous local news paper. The authors argue that this is not just an isolated incident of mental case, rather a serious loss of potential human capital which threatens the demographic dividend. This is a serious problem due to the large number of student enrolled in tertiary level education as estimated by University Grant commission (Mannan, 2017) and since Bangladesh's unemployment rate climbed to 5.30 percent in 2020, up from 4.20 percent in 2019 (*Unemployment, Total (% of Total Labor Force) (Modeled ILO Estimate) - Bangladesh | Data*, 2019), pertaining to their age group, which falls under the demographic dividend age division, this issue

European Journal of Social Impact and Circular Economy

posses a formidable threat for the nations entire demographic dividend. The objective of this study is to find out the adverse impact of COVID-19 on demographic dividend, by classifying the entire potential employee sector into three sections; tertiary level final year students, fresh graduates and job seekers. The study initially introduces the importance of the issue by stating the problem followed by the research objective, and then it moved to literature review section, thirdly the methodology section is described to ensure validity and reliability of the study. After that in the analysis section graphical illustrations is used for reader's convenience, finally the findings are revealed prior to move to discussion part followed by the conclusions.

2. Literature Review

2.1 Demographic dividend and COVID-19 in Bangladesh

Demographic dividend is a life time window of opportunity for any country, especially for country like Bangladesh which is graduating from the category of Least Developed Country (LDC), while coronavirus disease-19 or more popularly known as COVID-19 is a severe acute respiratory syndrome which succeeded at stopping the whole world from every dimensions range from social, economic to cultural and even political, and Bangladesh is not exception to that.

The siginfiaicne of demograpic dividend is unprecednted, as suggested by Urmanavicius, the demogrpahic dividend can even cause changes in the structure of the society as the demographic factors are associated with skill composition (2021) Bangladeshis is currently going through both demographic dividend and COVID-19. The demographic dividend is the difference between the number of working-age people between the ages of 15 and 64 and the number of non-working-age people between the ages of 14 and 65. It is a demographic dividend if the number of working individuals is larger than the number of non-working individuals. A country's demographic dividend era lasts no more than 20-30 years, in other words, by 2040, Bangladesh's ability to generate rapid economic development by using the demographic dividend would begin to diminish (Chowdhury, 2020). Demographic dividend comes with many advantages, but the proper utilization is only possible when the active functional youth engagement is ensured. Coronavirus disease 2019 (COVID-19) is a contagious illness caused by the coronavirus 2 that causes severe acute respiratory illness. In December of this year, the first known case was discovered in Wuhan, China (Page et al., 2021). Since then, the disease has spread worldwide, resulting in a pandemic. through spillover infection, the virus is considered to be natural and of animal origin. There are numerous ideas as to where the initial case (also known as patient zero) came from. The impact of COVID-19 caused serious distress around the world, and Bangladesh is no exception, on the contrary comparing other countries Bangladesh is facing greater risk because of COVID-91 as Bangladesh is yet to be a developing country and currently passing through the period of demographic dividend

2.2 COVID-19 and Student

The impact of COVID-19 has serious ramification all over the country, especially for student. Students as are passing through their tenure of learning, amid this situation their overall curriculum system turned upside down overnight, which subsequently affected their pathway for graduation. A study by Rahman et al (2021) on COVID-19 responses among university students of Bangladesh shows that the majority of the students that took part in the study had a significant impact (61.48 percent). Due to the epidemic, they were also extremely concerned about their mental health (47.84 percent). Online classes have become the only alternative option. Students in Dhaka, the capital city, reported more dangerous present locations than students outside of Dhaka. While online class has been a viable option for only private university, public university and the students of public university is suffering from long term discontinuity from their academic study, Begum et al (2020) in their study by covering a massive sample around eleven hundreds student find out some major barriers to students, which ranged from self bearing online learning cost to part time job through nearby COVID-19 patient, income reduction, financial problem associated with lost job, overpriced internet access etcetera, these problems manifested into physiological challenges and threatens the continuity of the study of students, the article concludes by recommending to provide financial subsidy to disadvantages students, another study supports the previous claim by focusing on socio-psychological impact of COVID-19 on student, the study identified numerous psychological concerns among university students and suggested to build awareness for the mental health of students (Far Abid Hossain

et al., 2021). A prominent study by (Faisal et al., 2021) reveled that Anxiety, depressive symptoms, and mental health status are common sympton among university students in Bangladesh during t his lockdown period. In total, 40% of the subjects experienced moderate to severe anxiety, 72% experienced depressive symptoms, and 53% had a moderate to poor mental health condition. There is no denying that such harsh condition can be overburden for any students to complete their academic journey and be prepared to enter the job market, many student have faced delayed graduation due to COVID-19 ((Maimuna, 2020)) and facing an uncertain future.

2.3 COVID-19 and Fresh Graduate

Besides running students, who are yet to complete their education, fresh graduate also suffers from COVID-19 induced challenges. These fresh graduates were about to enter the job market and start their cornerstone for their career, unfortunately as lockdown and associated closing initiatives were introduced by respective authority they couldn't enter the desired job market. Earlier studies from Khan (2020) shows that many organizations delimit their working personnel restrict their operations, shut down their projects to survive in the market, resulting less opening for fresh graduate to enter the job market thus proving the adverse impact of COVID-19 on fresh graduate. Another study by Shahriar et al (2021, p 1) supports the previous argument by stating that "the rate of graduate unemployment increased from 47% to 58% in 2020 with an expected annual loss estimated at $53 million".   The opening entrance in job market is hampered by COVID-19 induced challenges does not remains in the boundary of private sector, even oublic secotr is greatly under influence, for example the 43rd Bangladesh Civil Service Examination's Viva has been postponed for indefinite period ("42nd BCS Viva Postponed Indefinitely," 2021) . The actual scenario remains as volatile and fragile as ever in Bangladesh, while more students are entering job market without any experience even without the experience of an internship, as reported in news paper column , "With the Covid-19 pandemic and predicted economic recession, youths are warned that their career path and work-life settlement will not come easy" (Maimuna, 2021).

2.4 COVID-19 and Job Seekers

In addition to the tertiary level student and fresh graduate, an third group emerged as job seekers with the advent of COVID-19 period, who once was employed. It all began when to tackle to infection government of Bangladesh took preventive measures including lockdown, as a result most of the business and organization were shut down, and the employed person used their savings to live in one of the most expensive city of the world ("Dhaka One of the Most Expensive Cities in the World," 2020). As the situation remained unchanged for longer period of time, eventually many employed person went unemployed and lost their job, according to a World Bank report, around 68 percent of those who were forced to cease working due to the epidemic in Dhaka and Chattogram have lost their jobs (Byron, 2020). Another study by world bank portrayed "provides early insights into the labor market impacts of the ongoing Coronavirus 2019 crisis in Bangladesh. The findings point to substantial uncertainty about job prospects for many people" (Genoni, et al, 2020). Besides these one of the most revenue earning sector of Bangladesh which is Ready-made garments sector (RMG) also suffered from COVID-19 challenges, resulting less productivity, emotional health, fewer job posting and even loss of employment (Kabir et al., 2020). Another study by Hossain (2021) initially revealed that many people have experienced declining income and lost job due to COVID-19, followed by the limitation of unfavorable economic policy, and finally suggested to adopt employment-oriented economic policies. Besides individual research, institutional study from organizations likes Asian Development Bank by Hayashi & Matsuda (2020) provided key insight of COVID-19 impact on Job portal, stating that Since the COVID-19 outbreak, job listings on the main online job matching sites in Bangladesh and Sri Lanka have decreased significantly. All industries saw a large drop in new job ads including Bangladesh's textile sector, portrayed by another study, the link between employment and demogrphaic factors is high (Urmanaviciene & Arachchi, 2020)

The above discussion shows that both COVID-19 and government response to tackle the infection rate created an unfavorable situation for potential employee sector which comprised of tertiary level students, fresh graduate and job seeker; which in ultimately threatens the demographic dividend of Bangladesh, despite of the significance of the issue no study has been done to explore the adverse impact of COVID-19 on demographic dividend.

European Journal of Social Impact and Circular Economy

3.0 Methodology

The study is about the demographic dividend of Bangladesh which is experiencing adverse impact by COVID-19. As the study deals with sensitive issue the methodology of this study is carefully formatted. The objective of this study is to find out the adverse impact of COVID-19 on demographic dividend, especially on the potential employee sector consists of three groups namely; tertiary level final year students, fresh graduates and job seekers. In doing so primary sources of data is used; the data will be collected using qualitative method followed by a semi-structured questionnaire, the questionnaire is delivered by mail-survey questionnaire and Google form. This will be a cross-sectional study, so for the data collection, non-probability convenience along with self-selection sampling technique will be used due limited mobility induced by COVID-19 lockdown. The population of potential employees sector is huge as the population of entire city is around 18.2 million (Swapan et al., 2017), among them 4.81 percent people are unemployed (DataLEADS, 2017), which makes around 0.9 million people jobless, among them majority are students, fresh graduate and job seekers, and to maintain the consistency respondents from only social science background were suggested to participate, as subjects like Pharmacy and C.S.E have different modalities for academic activates like Lab class, field study etcetera. A total of 150 respondents have be taken as sample, where each groups will have 50 respondents. After collecting, the data is analyzed using IBM SPSS software and the results will be demonstrated using graphical illustration like figure, chart, bar etcetera.

Data type	Data collection method	Sampling style	Data source
Primary	Qualitative	Convenience & self-selection	Final year student (50), Fresh Graduate (50), Job seeker (50)

4.0 Analysis

The analysis part can be organized under three broader categories, analysis of student, and analysis of fresh graduate and analysis of Job seekers

4.1 Analysis of data from final year university students

The collected data from final year university students were analyzed using IBM SPSS software, and then illustrated in figures, bar, pie chart etc. the analysis is given below following.

First the degree of depression of the respondent (final year students) is measured using Zung Depression scale, which is a popular public domain scale and free to use as self rating depression scale. n=50.
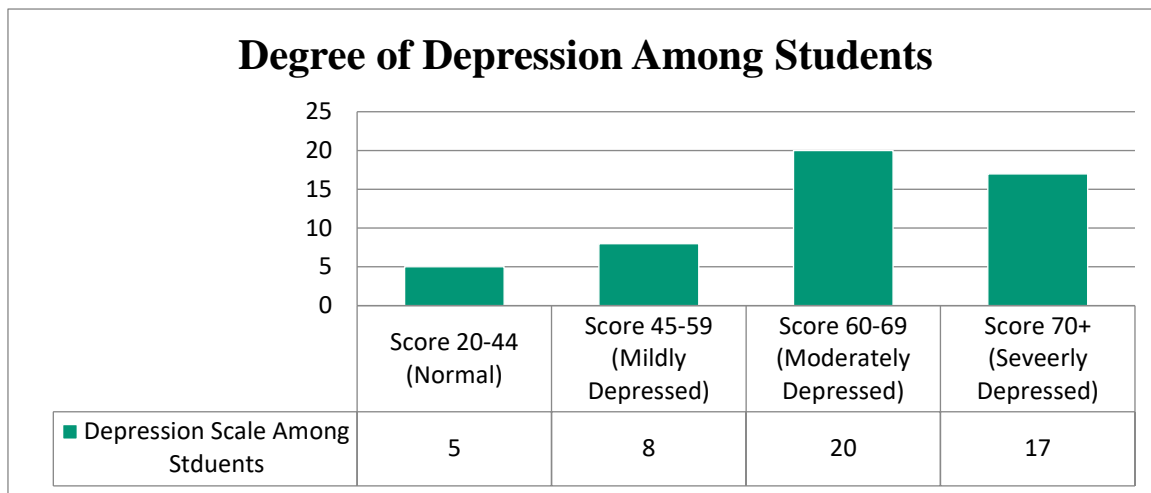
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Degree of Depression Among Students

■ Depression Scale Among Stduents	Score 20-44 (Normal)	Score 45-59 (Mildly Depressed)	Score 60-69 (Moderately Depressed)	Score 70+ (Seveerly Depressed)
	5	8	20	17

Figure 1: Figure 1 shows that among the 50 respondents, 5 respondents shows normal symptoms hence scoring below 44 in Zung Depression scale, while 8 students shows symptoms of mild depression, the degree of depression reach on the highest scale by 20 students who experience moderate depressions, and 17 students scored 70+ thus being severely depressed. 38 among 50 students who are suffering types of depressions, says they are losing interest to study.

Secondly, the degree of knowledge of the respondent (final year students) is measured using Staple scale, where n=50. The rationale of using staple scale is that as staple scale does not support neutral value it is appropriate to measure the degree of knowledge of the students because being a student there is no point of neutrality in terms of gaining knowledge.
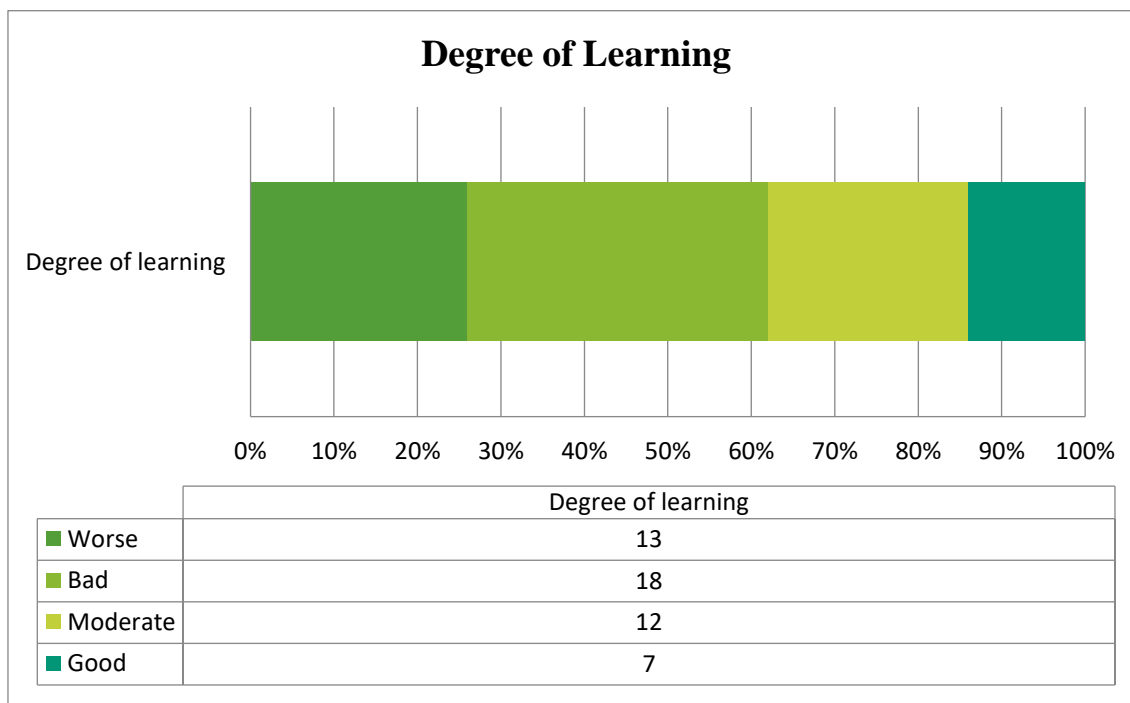

Degree of Learning

Degree of learning	
■ Worse	13
■ Bad	18
■ Moderate	12
■ Good	7

Figure 2: Figure 2 shows the degree of learning of the final year students using staple scale. the graph shows that among the respondents 13 students think that the degree of learning is worse, while 18 students think it is bad, on the contrary 12 students think that the degree of learning is moderate and 07 students thinks it is good. The total

number of students who think the degree of learning is on negative is 33. Among the 50 students, 38 students believe that the knowledge they are receiving through online classes is inadequate to enter the job market.

Finally for the issue of delayed graduation of students is addressed, the respondents (n=50) reflected their perception towards the reason for delayed graduation and associated impact of it.
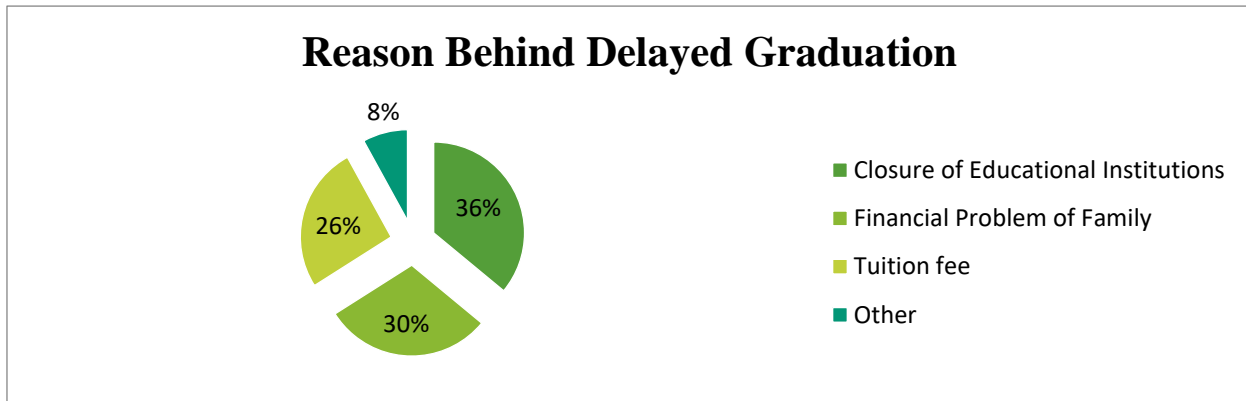

Reason Behind Delayed Graduation

- Closure of Educational Institutions
- Financial Problem of Family
- Tuition fee
- Other

Figure 3: Figure 3 shows the reason behind delayed graduation of students induced by COVID-19. The most prevalent reason identified by the majority of student (18) is the closure of educational institutions, followed by the second biggest reason financial problem of family induced by COVID-19 which is identified by 15 students. The third biggest reason behind delayed graduation is identified by 13 students as the tuition fee problem, and only 4 students identified several other reasons including lack of study environment, absence of teachers company etcetera.. 42 out of 50 students think that they will not be able to complete their study if the situation remains unchanged, thus they will be fall below the margin of human capital without education.

4.2 Analysis of data from Fresh Graduate

First the degree of depression of the respondent (fresh graduate) is measured using Zung Depression scale, which is a popular public domain scale and free to use as self rating depression scale, where the n=50.
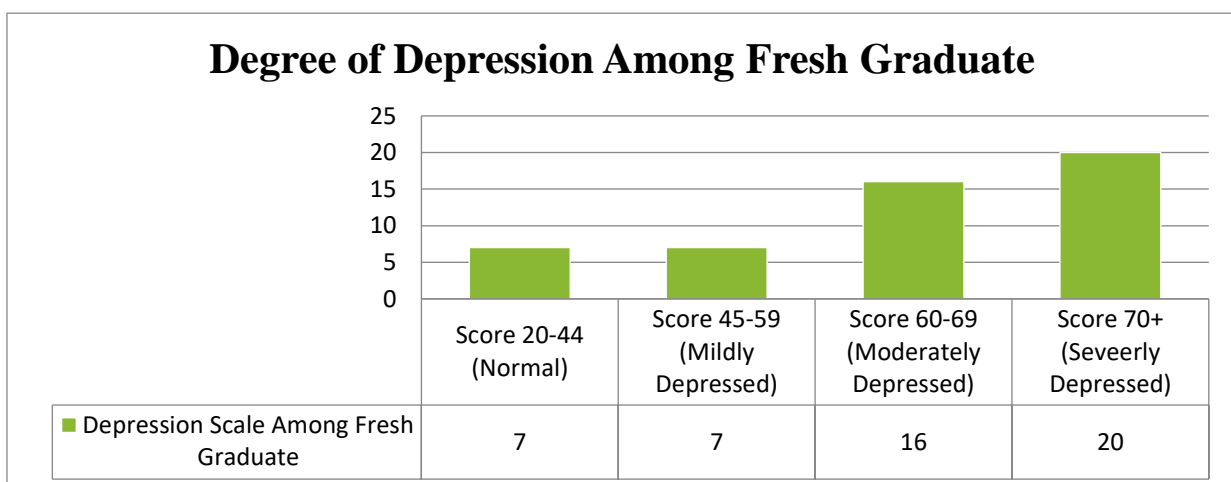

Degree of Depression Among Fresh Graduate

	Score 20-44 (Normal)	Score 45-59 (Mildly Depressed)	Score 60-69 (Moderately Depressed)	Score 70+ (Seveerly Depressed)
Depression Scale Among Fresh Graduate	7	7	16	20

Figure 4: Figure 4 shows that among the 50 respondents, 7 respondents shows normal symptoms hence scoring below 44 in Zung Depression scale, and 7 fresh graduate shows symptoms of mild depression, the degree of depression reach on the moderate scale by 16 students who experience moderate depressions, and 20 students

scored 70+ thus being severely depressed. 32 among 50 fresh graduates who are suffering types of depressions, says they are losing hope for bright career.

And for analysis of the major problems to enter the job market faced by fresh graduate which induced by COVID-19, is given below, where n=50
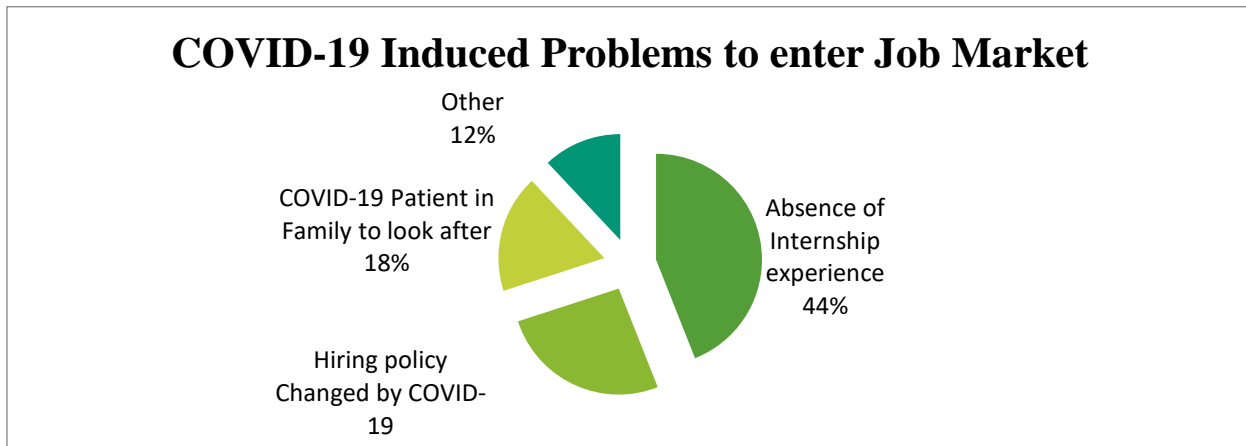

Figure 5: Figure 5 shows that, among the problems induced by COVD-19 to enter the job market three problems are most prevalent. Among the respondents, 22 fresh graduates hold the absence of internship experience as a major challenge to enter the job market, the second major problem identified by 13 fresh gradates is the changed hiring policy of organization induced by COVID-19 which discourage to recruit fresh graduate, finally 9 students experienced the responsibility to look after COVID-19 relative fallen onto their shoulder. While only 6 students mentioned about other problems like low job posting, delayed recruitment process etcetera.

4.3 Analysis of data from Job seekers

As mentioned earlier, Job seekers mean the individual respondents who have prior job experiences. .First the degree of depression of the respondent (Job seekers) is measured using Zung Depression scale, which is a popular public domain scale and free to use as self rating depression scale, where the n=50.
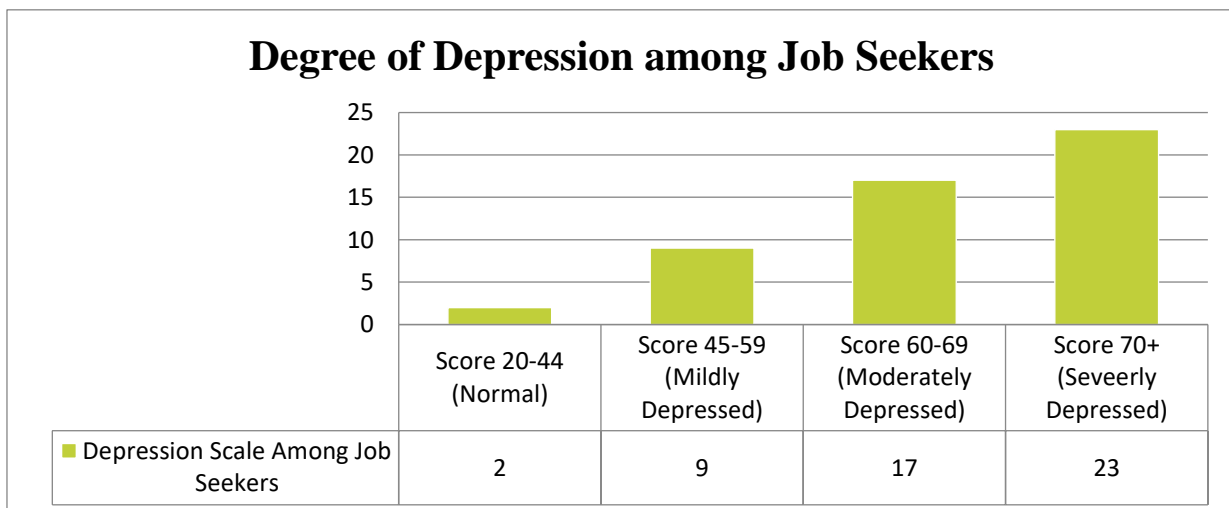
Figure 6: Figure 6 shows that among the 50 respondents, only 2 respondents shows normal symptoms by scoring below 44 in Zung Depression scale, and 9 job seekers shows symptoms of mild depression (scoring 45-59), the degree of depression reach on the moderate scale by 17 job seekers who experience moderate depressions, and 23 respondents shows symptom of severely depressed by scoring above 70+. Among the 50 respondents, 40 respondents who are suffering moderate and severe types of depressions, says they are being compelled to lose interest for job opportunity.

And finally for analysis of the major challenges induced by COVID-19 for Job seekers to enter the job market is given below, where n=50
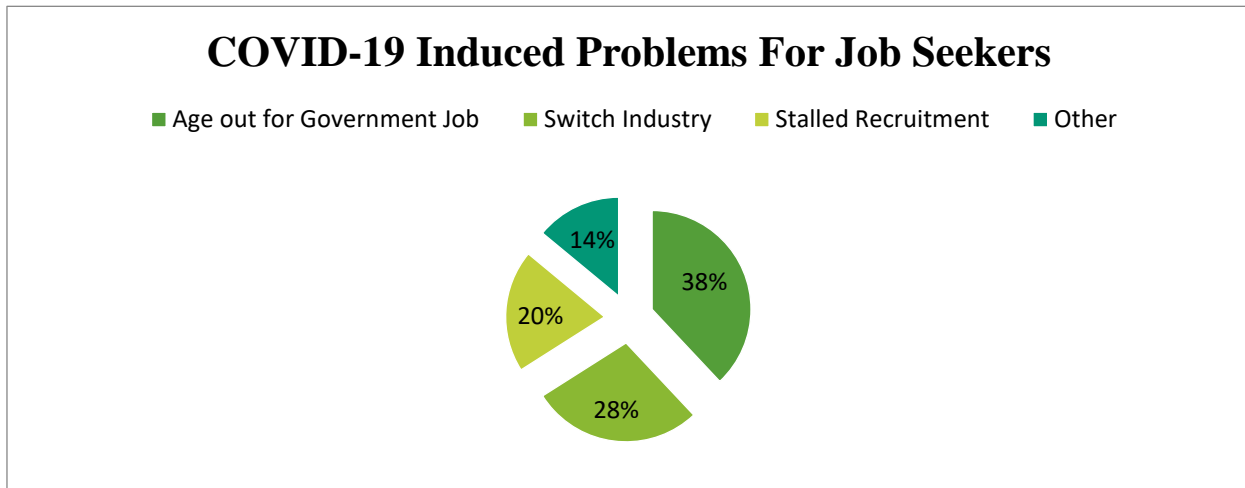

COVID-19 Induced Problems For Job Seekers

■ Age out for Government Job   ■ Switch Industry   ■ Stalled Recruitment   ■ Other

Figure 7: Figure 7 shows that, among the challenges induced by COVD-19 to enter the job market three problems are most prevalent. Among the respondents, 19 job seekers fears the age out for public job, 14 respondents finding it hard for them to switch job industry, and 10 respondents find the stalled recruitment as disruptive challenge for their career. Only 7 respondents identified challenges like maintain hygiene, long distance and family restrictions.

4.4 Analysis of data from student, fresh graduate and Job seekers

The reflection of students, fresh graduate and Job seekers on the adverse impact of COVID-19 on demographic divided is given below;
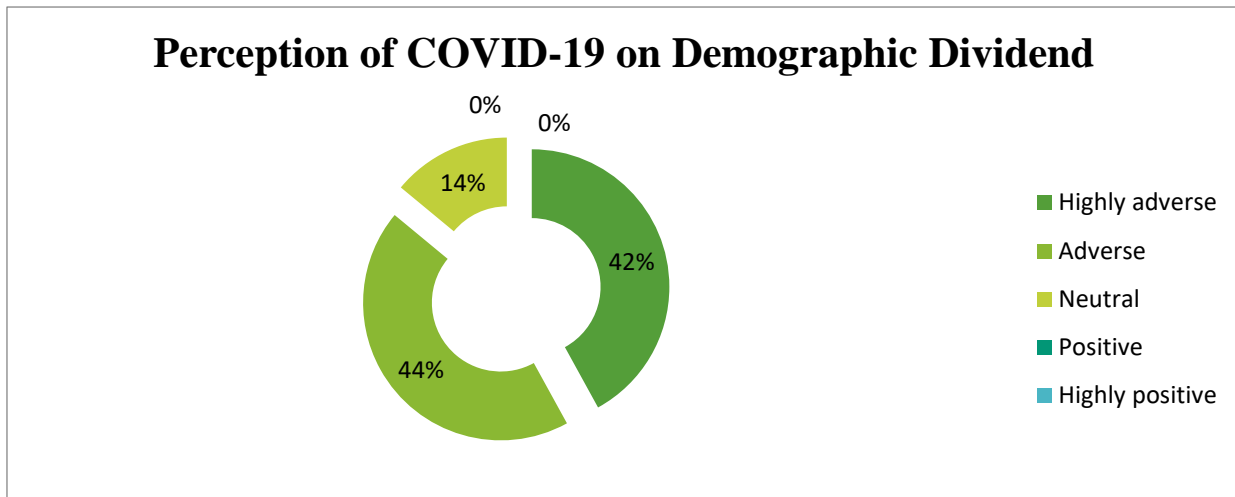
Perception of COVID-19 on Demographic Dividend

Figure 8: The figure 8 shows the perception of entire respondents towards the impact of COVID-19 on demographic dividend of Bangladesh. Among the 150 respondents none could identify any positive indication of COVID-19 on demographic dividend, where 21 respondents find it neutral by claiming that the higher degree usage of technological devices equalizes the negative impact, on the contrary 66 respondents find the impact of COVID-19 on demographic dividend has adverse impact and 63 respondents labeled the impact as highly adverse.

5.0 Summary of main results

Drawing the key insight from each analysis sagements, it can be said that the COVID-19 and associated initiatives are taking a toll on the potential employments sector of Bangladesh. The findings of the study are given below;

- Serious depression is prevlenant among students, fresh graduate and Job seekers , resulting them less active and emotionally unstable for active functionality. Among the three classes, The severe degree of depression is more prevalent among fresh graduate comparatevely than students, and subsequently more prevalent among job seekers than fresh graduate.

- Most of the student is affected by delayed graduation caused by COVID-19, and they are afraid that the learning modalities or quality during COVID-19 period will not help them to complete in the job market

- Fresh graduates are suffering from experience gap as well as changed hiring policy of market and responsibility for family member diagnosed with COVID-19; all problems are induced by COVID-19.

- Majority of job seeker are already lost their job due to first wave of COVID-19, and still struggling to get into the market before their age runs out, in addition to that switching job industry is pretty had during this time and stalled recruitment caused by COVID-19 added another layer of challenges for them.

6.0 Discussion

The above results indicate a serious situation forthcoming for Bangladesh. Both COVID-19 and unsophisticated absent mined government action is responsible for such situation. The results of this study imply the uncertain future for Bangladesh's potential employment sector due to COVID-19, which subsequently will threaten the demographic dividend of this country. As Bangladesh is on the midway of this life time opportunity named demographic dividend, and the Government of Bangladesh could not took appropriate measure to secure the

smooth work flow of working people, there is high possibly that this window of opportunity will disappear soon unless required initiatives are taken.

7.0 Conclusions

The study deals with a crucial subject which is responsible for Bangladesh's decade long success and achievement that is demographic dividend. The aim of this study was to reveal the adverse impact of COVID-19 on Bangladesh's demographic dividend by identifying the key affected area of potential employee sector, this study shows how the COVID-19 created waves of challenges for this sector thus threading the flow of demographic dividend. In spite of declaring stimulus packages to handle this issue and make a favorable environment for the potential employee sector, budget 2021-22 proposed 15% tax on private universities(Report, 2021) which has created concern among all stakeholders and made the situation volatile and fragile than ever.

7.1 Limitation of the study

The study was done during the peak devastating hour of employment sector caused by Covid-19, hence the sample may represent a protion of margin of error as the sample style was selfe selection, on top of that the study was conduced only on 150 samples, leaving the majority out of equation. Finally the qualitative dala collection method may not revel the actual scenario of the respondents.

Regardless of the limitations, considerig the toll taken by Covid-19, the study was successful and all set-out objectives achieved. Furthermore, the following areas needs further attention;
- dynamic between population management and demogrphic divided during Covid-19 time
- Use of ICT to mitigate the impact of Covid -19 and utiliize demogrphic divided
- Siginificance of stress or depression management into public health concern

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How to resolve audit matters in European Affairs? Introduction to a sustainable management accounting under IAS 37

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Abstract

Concerns regarding the development of environmental accounting have been around for decades. This work is an update to some of the previous questions around the development of ecological accounting to see how this has changed over the last two decades. Specific findings from the paper analysis include ecological management accounting, "cost of decommissioning" (IAS 37) requires a fundamental change to organization management, different values exploring relationships such as corporate governance, inclusive of the living and physical world, with a longer time horizon, and a centrality of external factors. Environmental accounting is a more commonly used synonym for ecological accounting, though this term is distinct and does not cover many of the ecological challenges. In terms of corporate governance, the board of directors (BoDs) is the main responsible structure in meeting and safeguarding both shareholders and stakeholders' interests. Integrated reporting's primary aim is to improve information quality provided to shareholders while responding to stakeholders' interests and needs. Using lenses of stakeholder theory, this study explores the relationship between board of directors' characteristics as size, gender diversity, Return on Decommissioning Asset, outside directors, number of executive committee and, using a self-constructed Performance Disclosure Index. Applying a content analysis method, data were collected from integrated reports to determine the self-constructed disclosure index. Through quantitative analysis, we analyzed which BoDs' characteristics are correlated to disclosure index. The analyzed sample was formed of 100 integrated reports produced by 27 European members states, published on the website for the period 2016–2020. The current study contributes to existing knowledge by exploring the voluntary adoption of integrated reporting using quantitative analysis and focusing on the European context. The obtained results highlight that integrated report alignment levels is directly correlated with the proportion of outside directors on the board and Return on Decommissioning Asset.

1. Introduction

This research sets out to explore how far ecological management accounting; the business community over the last two decades has developed an interest in external factors, broadly termed as social and environmental concerns (Van der Stede, 2012, 2015). The development of frameworks such as Integrated Reporting and narrative reporting guidelines have increased

the reporting on and accountability of organizations to these issues (Umar et al. 2020). This paper is exploring how far this move has developed in terms of ecological management accounting over the last two decades. This work starts with a challenge to the concept of environmentally concerned businesses, drawing a wider ecological view of the issues and business concerns (Corvo et al. 2021). In doing so, one central issue is whether the business community can carry on with small changes and become ecological enterprises, or whether this requires a significant and fundamental change in organizations to shift the focus to achieve a more ecological balance (Alexis 2017). This can be seen as a move towards relationships and away from the discrete object system that underpins much of accounting theory. More recently there have been additions to this discussion with a subsequent call as to the current state of affairs with sustainability, and the macro picture of ecological catastrophe that may be around the corner. The prevailing notion is that businesses have argued all is fine and, that under the term 'sustainable business', they are tackling environmental concerns (Biancone et al. 2020). This argument can be developed, and several models used to explore the permutations. There are some different ways that the environmental issues can be resolved.

So, an important sub-question is how these do (or do not) cross into the boundary of what can be defined as ecological accounting? In the end, is this a reflection on a business and whether becoming more environmental and sustainable is leading to an ecological business model and or is this something else? This paper is, in effect, updating this discussion to explore how far the notion of ecological management accounting has come over the last twenty years (Birnberg 2000). It is important to stress that terms such as environmental and sustainability have become commonly used and synonymous in the business community (Biancone et al. 2018). Previous discussions on ecological accounting have highlighted the care that must be taken to ensure these terms are not conflated in and with the ecological term and concepts and in exploring this to highlight where there are differences and how this is moving forward the discussion and debate on ecological business (Ashraf 2019). Both have covered social and environmental concerns in the accounting field over the 20 years but to what extent and specifically can this be connected back to the ecological debate? (Hopper & Bui 2016) The difference in this work is that it has a specific focus on one topic area, environmental accounting.

2. Literature Review

The activity of internal auditors, and the processes and control systems they deal with, are not predicable ex ante and are depicted contingently, they cannot rely on a "one-size-fits-all" procedure, but need to be adjusted to the specific context of a specific firm at a specific time. That said, management accounting as a discipline is able to identify specific procedures, which can better match specifically defined situations in which the organization may be involved (Bocken, Short, Rana & Evans 2014).

According to contingency theory, situational factors (or contingent or contextual factors) influence the design of the management accounting system, while organizational performance and effectiveness depend on the quality of fit of the management accounting system, when designed ad hoc, and the specific situational factors that activated it (Chapman 2006). These characteristics of the discipline make it difficult to undertake big numbers-based empirical studies, as each organization is unique and the potential situational factors are infinite and nested with each other, while the effectiveness of the fit between the management accounting system and the situational factors is often not easily measurable.

The external environment and its level of uncertainty are relevant situational factors, related to change in the environment, which occur unexpectedly, such as the financial crisis of 2008 (Secinaro, Brescia, Calandra & Biancone 2020). When the conditions under which the firm operates are more stable, the external environment will be considered as more certain (Eckles, Hoyt & Miller 2014).

On the contrary, dynamic conditions are the premise for an uncertain external environment. It is documented that firms operating in a more stable and certain environment adopt a formula-based approach to the measurement of management accounting systems effectiveness, whereas firms operating in a dynamic and uncertain environment adopt a subjective approach to performance evaluation. In the current situation, a formula-based approach, which presupposes the meeting of targets, will easily fail if the uncertain dynamics of the environment make the targets inappropriate.

Uncertainty is also correlated with the level of sophistication of the management accounting system, given that a certain external environment needs only internal, financial and historical information, whereas an uncertain external environment will require a more sophisticated management accounting systems, which can also gather information that is external, less finical and future-oriented, as well as generally requiring decentralization in the organizational (and decisional) structure.

The competitive strategy adopted by the firm is also a situational factor, which is able to shape the management accounting systems. A low-cost competitive strategy will require a formula-based approach, requiring significant attention paid to cost

European Journal of Social
Impact and Circular Economy

control mechanisms and frequent and detailed quantitative reports on performance. On the other hand, a differentiation strategy will control costs less effectively and be mainly focused on non-financial measures of performance.

Sustainable destination can then appear in their holistic vision, as integrated, adaptive socio-ecological system (Clarke 1997). These are the elements that will be discussed:

a. destination as an integrated systems;

b. destination as a social system;

c. destination as a socio-ecological system;

d. destination as an adaptive system.

In this context, the stakeholder theory is also employed to explain stakeholder relationship in business belonging to different sectors, including the tourism sector. The theory can contribute to regulating relationship between tourism actors at the destination level. In particular, the principles of the theory are considered more significant in the case of destinations involved in sustainable tourism development, due to the role stakeholders should play. Indeed, as described in previous paragraphs, international and European sustainable tourism organizations consider the involvement and the commitment of all stakeholders in planning and in the decision-making process at the destination level as a fundamental step in sustainable tourism development (Fischer 1995).

Many studies aim to identify stakeholder of tourism. Sautter and Leisen (1999), refer to workers, local enterprise, residents, tourists, public administrators, competitors, activists and international chains as the stakeholders involved in tourism planning at a destination level. Ryan (2002), considering potential stakeholders of an hypothetical tour operator in an hypothetical destination, identifies government, travel agencies, local administrators, accommodation enterprises, natural and urban environment, workers, brokerage houses and other special interest groups. Currie (2009) considers the Mitchel (1997) categories and identifies local indigenous enterprises as dormant stakeholders, fishing and sailing enterprises as discretionary stakeholders, the water managing authority as demanding stakeholders, governmental authorities as dominant stakeholders, tourism and accommodation enterprises as dependent stakeholders, environmentalists as dangerous stakeholders, and natural resources managing enterprises as definitive stakeholders. Byrd (2007) selects the current and potential community and tourists as the stakeholders principally involved in sustainable tourism development at the destination level.

According to the traditional approach, the interests of the three stakeholder groups are incompatible. For example, actions aimed at the maximization of business profits could cause damage on the natural environment. Expectations of workers could be conflicting with business profit objectives. Environmental associations and local authorities could conflict in the management of natural resources.

However, according to a different perspective, stakeholders interests can be considered complementary. In destinations focused on tourism development, and especially sustainable tourism development, business cannot pursue economic goal that negate the efforts to safeguard the natural and cultural environment. This is because natural and cultural attractions represent the core of tourism products and the most interesting destination features for tourists

3. Methodology

Empirical research conducted in order to understand the characteristics of the financial statement disclosure concerning decommissioning funds in listed European non-financial companies (significant amounts exceeding 1 million euro of decommissioning funds) for the years 2016-2020 for the 27 member countries of the European Union (Stoval, Higham & Stephenson 2019). We voluntarily excluded banks, insurance companies and other financial companies from the analysis due to the wide existing regulatory differences and the peculiarities of the typical activities of these companies.

From the reading of the financial reports it emerges that in the section dedicated to the presentation of the accounting principles adopted, the non-financial companies report the letter or in any case the indications provided by the accounting standard IAS 37 although only some companies make explicit reference (Baxter & Jack 2008).

For these reasons, the purpose of the research is to verify how the information contained in the accounting documents is managed with the relative level of transparency provided about the characteristics that determine the values of the items in question (Currie, Seaton & Wesley 2009) (Table1).

Table 1. Data sampling of European business corporation with cost of decommissioning.
Materiality: substantial amounts exceeding 1 million euros.

European Members	2016	2017	2018	2019	2020
Austria	1	1	0	1	1
Belgium	3	4	2	2	2
Bulgaria	4	3	3	4	3
Croatia	4	5	4	3	4
Denmark	2	1	1	1	2
Estonia	1	1	0	0	1
Finland	1	1	0	0	1
France	13	14	17	15	16
Germany	15	17	23	19	20
Greece	2	0	0	0	1
Ireland	3	1	1	0	1
Italy	12	16	17	20	18
Netherlands	4	2	2	2	2
Poland	5	3	2	5	3
Portugal	6	8	7	6	7
Czech Republic	3	3	2	2	2
Romania	3	3	2	3	2
Slovakia	1	0	0	0	0
Slovenia	1	0	0	0	0
Spain	10	11	12	12	9
Sweden	3	3	3	2	3
Hungary	3	3	2	3	2
Other	0	0	0	0	0
Total Annuals Reports	**100**	**100**	**100**	**100**	**100**

Source: Author's elaboration on European Commission data set.

The quality of the external information regarding the provisions for risks and charges relating to the dismantling of plants, the repurposing of sites and reclamations in the financial statements of the 100 listed companies is rather heterogeneous (Battaglia 2011). It can certainly be said that if the disclosure required by the accounting principle were expected by the companies in a complex manner, there would certainly be an improvement in the level of transparency. Below is an example of a summary checklist for the Italian context which highlights the information required by the accounting standard with its presence in the financial statements being researched (Table 2).

Table 2. Summary of empirical evidence of disclosure for cost decommissioning: Italy checklist 2016

IAS 37 indications	Presence of information	
	Yes	No
84. For each class of provisions, the company must highlight: a) the book value at the beginning and end of the financial year;	29	0
b) the additional provisions made during the year, including increases to existing provisions;	23	6
c) the amounts used (ie costs incurred and charged to the provision) during the year;	22	7
d) amounts not used and reversed during the year;	11	18
e) the increases in the discounted amounts that occurred during the year, due to the passage of time, and the effect of any change in the discount rate.	11	18
85. The company must indicate for each class of provisions: a) a brief description of the nature of the obligation and the expected timing of the resulting outlay;	11	18
b) an indication of the uncertainties relating to the amount or timing of such disbursements. Where it is necessary to provide adequate information, the company must highlight the main assumptions made about future events.	6	23
c) the amount of any compensation provided, specifying the amount of each asset recognized for the expected compensation.	0	29
86. Unless the likelihood of engaging any resource to settle the obligation is remote, the company must disclose for each class of contingent liability at the reporting date a brief description of the nature of the contingent liability and, where feasible:		
a) an estimate of its financial effects,	0	29
b) an indication of the uncertainties relating to the amount or timing of each disbursement; is	0	29
c) the probability of each indemnity.	0	29

Source: Author's elaboration

The table highlights the lack of information required by paragraph 86 regarding contingent liabilities. The reader of the financial statements cannot be certain either that the company is not exposed to potential liabilities or that these, although they exist, are not indicated (Castellani & Sala 2010).

By categorizing the indications present in the accounting standard, it is possible to reach the following groupings:

a. indications of paragraph 84: quantitative information expressed with numerical values and through the use of tables.

b. indications of paragraph 85: information of a descriptive nature that can be expressed in discursive form.

c. indications in paragraph 86: information on elements that are not reflected in the numerical values of the financial statements.

This categorization allows us to identify, in summary, how the information reaches a good level of transparency regarding the formation and variations of the elements that are represented by numerical values. Lower levels of information concern the description of the phenomena that generated the values that feed the financial statements (Bryman & Bell 2007). Finally, an even lower level of disclosure can be found in all the elements that are not reflected in the book values.

Once the results of the empirical analysis have been summarized in an aggregate manner, the understanding of the level of transparency in the financial statement disclosure concerning the decommissioning funds can be carried out through the construction of a transparency index (Cook & Reichardt 1979). Although it is generally recognized that information transparency is an abstract concept, difficult to measure and undermined by the subjectivity of the researcher in the appreciation of phenomena, in the context of empirical research the use of these indices is widely used. This is due to the fact that the indicators are capable of giving a representation of the observed phenomenon which, although it does not exist in reality, can still be appreciated. In order to limit the subjectivity inherent in the choice of variables to be considered in defining the indicator, it is considered appropriate to include only the information required by IAS 37 and reported in the paragraphs indicated above (Acar & Ozkan 2017). For the study it is considered appropriate to construct two indicators. The first having as variables the information required by the accounting standard, each considered with the same importance as the others in defining the level of transparency (Corbetta 2003). This indicator allows to minimize the subjectivity of the researcher regardless of any consideration regarding the relevance of the researcher's subjectivity regardless of any consideration regarding the relevance of each single element. The second considers the same variables but attributes a different weight to each of them due to the subjectivity inherent in the sensitivity of the writer (Le, P. T. A. 2019).

Below is the first unweighted disclosure index used, which is based on the presence of the elements required by the accounting standard in paragraphs 84, 85 and 86.

Unweighted disclosure index

$= 1/11 \ 84a + 1/1184b + 1/1184c + 1/1184d + 1/1184e + 1/1185a + 1/1185b + 1/1185c + 1/1186a + 1/11 \ 86b + 1/11 \ 86c$

The attribution of an equal weight to all variables, although it reduces the subjectivity of the researcher in attributing different weights, implicitly assumes that each variable has the same relevance for the reader of the report. This assumption, although it may not be completely correct, at the same time it could be less incorrect than the attribution of a different weight to the individual variables due to the subjectivity of the evaluator.

In the doctrine, there are different possibilities for attributing weight to variables. In particular, the criterion of distinction is used in two main types:

a. specific variables of the issuing company, corporate variables, which depend on the choices made by the company and which an investor can only become aware of through the information provided by the company;

b. market variables, publicly available, from which the reader of the financial statements can learn through alternative instruments to the financial statements.

This distinction therefore makes it possible to attribute greater weight to company variables, information that is characterized by having the specific company as the only supplier of these elements (Brasini 2010). In the context of liabilities, the elements referred to by the accounting principle are characterized by exclusively relating to company-type variables and therefore the possibility of distinguishing the weights based on this classification is precluded. It is therefore necessary to identify possible solutions in order to distinguish the relevance of the multiple information requested.

For this purpose, it is possible to distinguish how the information required by paragraphs 84 and 85 represents charges whose probability of occurrence is judged by management as high unlike those required in paragraph 86 and relating to charges whose possibility of future manifestation is remote. From this point of view, at least double importance can be attributed to the elements referred to in paragraphs 84 or 85 with respect to those indicated in paragraph 86 (Creswell 2013). In consideration of the fact that the quantitative information required by paragraph 84 may allow the reader to be more aware of the numerical values only if supported by an adequate description, it is believed that the information required by the two paragraphs can be attributed the same importance. The reasoning illustrated leads to attribute a weight of 0.4 to the information required by paragraph 84, of 0.4 to that required by paragraph 85 and, finally, of 0.2 to that referred to in paragraph 86 (Cook & Reichardt 1979). At this point it is necessary to identify within each paragraph of the weights based on the most basic information required. Also in this circumstance it is important to consider the trade-off between desired objectivity and sensibility of the evaluator. Based on the assumption that the elementary variables mentioned contribute to the definition of the information transparency of the same aspect, it is particularly complex and risky to attribute different weights.

On the basis of the reasoning described, it is considered reasonable to attribute the same weight to each variable referred to in the same paragraph.

Weighted disclosure index
= 4/10 (1/5 84a + 1/584b + 1/584c + 1/584d + 1/584e) + 4/10 (1/385a + 1/385b + 1/385c) +2/10 (1/386a + 1/3 86b + 1/3 86c)

The index reported considers the information required by the accounting standard in paragraphs 84 and 85 as equally relevant in the definition of a transparency standard and overall suitable for the definition of 80% of the level of disclosure due to the presence of the individual elements mentioned.

The information required by paragraph 86, due to the remote probability of occurrence, is therefore suitable for defining 20% of the level of disclosure due to the presence of the individual elements referred to in the paragraph (Table 3).

Table 3. "Unweighted" disclosure index by macro sector: year 2016

Sector	Average paragraph 84	Average paragraph 85	Average paragraph 86	Overall average
Consumer services	0.389	0.000	0.000	0.399
Industrials	0.323	0.043	0.000	0.363
Oil & Gas	0.233	0.019	0.000	0.309
Tecnology	0.183	0.000	0.000	0.189
Telecommunications	0.132	0.000	0.000	0.189
Utilities	0.289	0.043	0.000	0.333

Source: Author's elaboration

Once the disclosure indicators have been defined as illustrated above, it is possible to quantify the average value of the index for each macro-sector, divided between the paragraphs of the accounting standard where such information is referred to (Table 4).

Table 4. "Weighted" disclosure index by macro sector: year 2016

Sector	Average paragraph 84	Average paragraph 85	Average paragraph 86	Overall average
Consumer services	0.343	0.000	0.000	0.343
Industrials	0.283	0.059	0.000	0.443
Oil & Gas	0.256	0.027	0.000	0.283
Tecnology	0.161	0.000	0.000	0.163
Telecommunications	0.161	0.000	0.000	0.163
Utilities	0.253	0.067	0.000	0.319

Source: Author's elaboration

The differences in the statistical results obtained from the application of the two different indices are summarized below (Table 5).

European Journal of Social Impact and Circular Economy

Table 5. Results of financial statement disclosure performance index (ID (1;2): weighted and unweighted index: year 2016

Statistical Quantities	Weighted index 1	Unweighted index 2
Average	0.336	0.329
Std. Dev.	0.019	0.017
Median	0.343	0.273
Minimum	0.081	0.091
Maximum	0.533	0.545
Q_1	0.243	0.273
Q_2	0.443	0.455

Source: Author's elaboration

This study aims to outline a modeling system to measure sustainability and the aggressiveness of European corporate governance in non-financial companies, concerning activity and analysis of decommissioning asset with environmental issues. Hypothesis testing (Table 6) uses the following design sustainability research model:

$$ID(1;2) = \beta_0 + \beta_1 (Size) + \beta_2 (Gender\ Diversity) + \beta_3 (RODA) + \beta_4 (Out\text{-}side\ Director) + \beta_5 (Number\ of\ Executive\ Committee) + \xi$$

Table 6. Framework and hypotheses

Independent Variable	Previous Studies of Irrituals Rites	Expected Sign	Evidence
Size	(H$_1$). Companies having larger boards issue integrated reports that have a higher alignment level to disclosure index (ID). BoDs' monitoring capacity increases with the number of its constituting directors, a benefit that might be surpassed by the disadvantages related to inadequate communication and inefficient decision-making process, specific for large groups (Andriotis 2018). After reaching a specific size, the larger the board is, the	+	

	more ineffective it becomes. A board larger than 7–8 members is less likely to function effectively, diminishes its monitoring capabilities, and is much easier to be controlled by the CEO. Board size positively impacts the integration of various reports, whether mandatory or voluntary, influencing $ID_{(1;2)}$ voluntary adoption and dissemination of integrated CSR (Jones, Atkinson, Lorenz & Harris 2012). Larger boards, being formed of more experienced and knowledgeable directors, can deal with integrated report preparation, playing a central role in the integrated reporting process. Environmental performance and disclosure are higher for companies with larger boards, where a larger board increases the probability of having the required expertise and diversity to enhance environmental performance (DeNichilo 2020c).		Log(Asset)
Gender Diversity	(H_2). Companies with higher board gender diversity issue integrated reports that have a higher alignment level to disclosure index (ID). BoDs should be composed of an appropriate mix of independent directors having relevant knowledge, competence, and industry experience to bring a diverse perspective and take objective decisions, enabling their preferential access to outside and additional resources, broader social networks, and build new business relationships (Arena et al. 2010). Board diversity is closely related to board composition, as group diversity can improve the quality of the decisions in that group, and can be referred to gender, age, nationality, cultural background, and educational attainment. Environmental performance is higher for firms having a board composed of more legal experts and active CEOs. Moreover, companies that have a more significant proportion of Western European directors record higher Environmental Corporate Social Responsibility (ECSR) governance mechanisms, while those with a higher number of colored directors report a higher quality of the integrated report. Companies should disclose their diversity policy (including gender, ethnicity, cognitive, and social) regarding senior management and board, reporting on diversity with measurable	+	Dichotomous variable (0/1)

European Journal of Social
Impact and Circular Economy

http://www.ojs.unito.it/index.php/ejsice/index

	targets and the progress made (Baltaretu 2011). Regarding gender, it is considered that men and women have different moral reasoning, women using more care reasoning and protective attitudes. The presence of women directors on boards positively impacts the integration of various reports, whether mandatory or voluntary, while $ID_{(1;2)}$ quality is higher for companies that have more women directors.		
Return of Decommissioned Assets	(H_3). Companies that have a higher profitability of decommissioning asset have a lower alignment level to ID. The profitability is one of significant determinants of financial reporting disclosure of decommissioned assets (DeNichilo 2020 (a) and (b)). Companies with high levels of profitability of decommissioned assets improved influence in investor decision and have more interesting stakeholders, so there is a lower propensity of performance index ID.	-	Return on Decommissioning Asset (RoDA)
Out-side Director	(H_4). Companies that have a higher proportion of outside directors on the board issue integrated reports that have a higher alignment level to ID. Board composition and independence are closely related, the last one increasing with the proportion of independent outside directors (Chenhal & Morris 1985). The presentation of CSR information is impacted by outside directors, meaning that they have a role in ensuring that companies take into consideration the interest of their shareholders and stakeholders. Board independence is closely linked to independent non executive directors' presence, which should be in the majority. Companies having a board formed in majority by independent non executive directors record higher levels of voluntarily disclosed information and voluntarily disclose more strategic and forward-looking information. Moreover, boards formed in a higher proportion of outside directors have greater control over management's decisions and improved monitoring effectiveness (Modica 2012). Outside non executive directors are more objective and independent when managing and analyzing a company's actions than executive directors, offering additional assurance to market participants that their interests are safeguarded	+	Dichotomous variable (0/1)

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	and reducing the agency costs (Stoval, Higham & Stephenson 2019). The integrated report quality is higher for companies that have more nonexecutive directors.		
Number of Executive Committee	(H5). Companies that have a more active board issue integrated reports that have a higher alignment level to ID. Board activity has contrary views an active board with more meetings can be interpreted or viewed as inefficient, while others believe that more board meetings enable directors to supervise the company better (Buckley 2012). By having more meetings, the board can debate, analyze, and decide on a broader range of topics, including the information included in the integrated report.	+	Number

Source: Author's elaboration

4. Results

The study analyzes the characteristics and determinants of the sustainability index on investment projects with cost of decommissioning. First we see the results of the descriptive analysis of the sustainability model of the projects (Tables 7 and 8). Next we present the results of multivariate analysis (Tables 9, 10 and 11).

Table 7. Descriptive statistics of independent variables

Variable	Mean	Std. Dev	Min	Max
Size	25.95	4.25	10.75	44.88
Gender Diversity	0.44	5.33	0	1
Return of Decommissioned Assets	4.55%	0.99	-17.55%	10.33%
Out-side Director	0.55	6.55	0	1
Number of Executive Committee	7.88	1.25	3	12

Source: Author's elaboration

Table 8. Descriptive statistics ID $_{(1;2)}$ index from 2017 to 2020

Variable	Mean ID$_1$	Std. Dev ID$_1$	Min ID$_1$	Max ID$_1$
2017	0.339	0.021	0.081	0.553
2018	0.411	0.022	0.085	0.552
2019	0.421	0.024	0.089	0.554
2020	0.441	0.023	0.082	0.555

Source: Author's elaboration

Table 9. Descriptive statistics ID $_{(1;2)}$ index from 2017 to 2020

Variable	Mean ID$_2$	Std. Dev ID$_2$	Min ID$_2$	Man ID$_2$
2017	0.331	0.019	0.091	0.545
2018	0.333	0.021	0.092	0.549
2019	0.339	0.023	0.094	0.548
2020	0.411	0.022	0.092	0.549

Source: Author's elaboration

Table 10. Multivariate analysis of ID $_{(1)}$ model

Model	Coefficient ID$_{(1)}$	T and P Value
Intercepts	1.33	1.75***
Size	1.55	-1.09
Gender Diversity	0.25	1.11
Return of Decommissioned Assets	-1.07	2.22***
Out-side Director	2.22	2.19***
Number of Executive Committee	0.22	1.29
2017	0.01	Dichotomous variable (0/1)
2018	0.01	
2019	0.02	
2020	0.02	
R^2	0.38	F value 3.33

Source: Author's elaboration
*, **, *** p-value at 0.10, 0.05 and 0.01

Table 11. Multivariate analysis of ID $_{(2)}$ model

Model	Coefficient ID$_{(2)}$	T and P Value
Intercepts	1.22	2.75***
Size	1.45	-1.11
Gender Diversity	0.22	1.22
Return of Decommissioned Assets	-1.15	3.33***
Out-side Director	2.44	3.55***
Number of Executive Committee	0.44	1.22
2017	0.01	Dichotomous variable (0/1)
2018	0.01	
2019	0.02	
2020	0.02	
R^2	0.59	F value 2.85

Source: Author's elaboration
*, **, *** p-value at 0.10, 0.05 and 0.01

Model 1 is significant (p value 0.01 level) and R2 is 0.38.
Model 2 is significant (p value 0.01 level), and R2 is 0.59.
The independent variable that have a significant result (level 0.01) are: RoDA and Out-side Director.
An optimal solution for anticipating uncontrollable factors and mitigating their dangerous effect may be to rely on subjectivity (Power 2009).

Using objective performance measures can lead to the myopic decision to analyze only what is in the numbers and only what was predictable when those objective metrics for performance settled down, which implies the risk of overlooking the relevance of some factors that clearly impact on actual performance. Hence, subjectivity could should affect estimates, while forecasting and budgeting, at the time of control, may have consequential repercussions for the incentive system of the organization (Palermo & Van der Stede 2011).

Subjectivity in performance evaluations unfortunately impose various criticalities. First, subjectivity is expensive, in terms of the time and resources required to assess the evaluation and to investigate the causes of any inefficiency in performance

European Journal of Social Impact and Circular Economy

(DeNichilo 2021b). Moreover, subjectivity creates ambiguity regarding its causes and the fairness of the procedure adopted in the evaluation, as the evaluation itself may be characterized by a series of biases (Power 2007).

5. Discussion and conclusion

Several themes emerged throughout the analysis, the first is around terminology and its impreciseness and multiple usages of terms (Torkington Stanford & Guiver 2020). Of most concern is the concept of sustainability, which is seen as a connected, interchangeable, and over-arching concept and, in many ways, has hindered the development of environmental management accounting (Freeman 2001). The concept of ecological accounting has not been used to any note in the period since 2000. Environmental management accounting is more of a favored term and is positioned as separate from sustainability, this may be a clearer way forward (Adams 2020). The use of environmental and accounting can provide a clearer path along which environmental concerns and accounting can be developed. Alongside mainstream accounting research that has become more aware of stakeholders of the firm, more entities need including in the environmental accounting debates (Adelman 2017). The environment cannot speak for itself and operating in an anthropomorphic environment, the concerns and impacts on the voiceless entity will be marginalized (Berke & Conroy 2000). The environmental entity must be central to any debate on ecological development. This means starting with the impact on the environment and working backwards to the organization changing the emphasis allows a clearer ecological standard to be established and not seen as a nice add on (DeNichilo 2021a).

The traditional accounting discipline was settle with the aims of disclosing information on the organization, moving certainty and reliability about business contracts towards the business community. The postmodern view of management accounting discipline clarifies that the certainty of contracts in the business community is hardly believable. The best way to maintain environmental uncertainty is to smooth over the information and the requisites for the accounting of failure. Accordingly, discussions on the organizational performance should move from statements of what happened towards projections on what will happen, supporting the reliability of traditional management accounting systems with a forward-looking strategy of "as-if" planning, thus evolving risks into opportunities.

Finally organizational should equilibrate the instruments adopted to control uncontrollable situational factors and adequately combine objective and subjective instruments for management accounting. Excessive reliance on objective performance metrics leads to business as usual, while new opportunities are missed out on. While, in business life nowadays, there is no room for demonizing objective metrics and relying on a purely subjective approach to evaluations, which would likely be affected by hidden pitfalls and side effects, there is a general call to avoid myopic evaluations and look at performance dynamically, with a continuous approach to management accountants' role as risk mitigators, while considering risks and financial distress as facilitators for turnaround activity, which is positively centered on innovation.

Further development of these accounting approaches, with an awareness of the factors impacting on the development of ecological accounting, will help shape the development of ecological management accounting into the near future.

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