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Does Disclosure of Carbon Emission Able to Attract Investors?

Insyirah Putikadea [1*], Cantika Sari Siregar [2]
[1] Accounting Departement, Faculty of Economics and Business, Universitas Negeri Surabaya, Indonesia
[2] Discipline of Accounting, Yuan Ze University, Taoyuan City, Taiwan (R.O.C)

e-mail: [a] insyirahputikadea@unesa.ac.id*
* Corresponding Author

Abstract

Introduction/Main Objectives: *This study aims to examine the investor reaction to carbon emission disclosure as well as the impact of carbon emission disclosure on investor reaction through firm value.* ***Background Problems:*** *Carbon Emissions in Indonesia are one of the largest global carbon emitters, these issues encourage the firm to disclose their environmental concern which will affect the reputation and stakeholder's reaction.* ***Novelty:*** *Some studies state about the effect of carbon emission disclosure on firm value and lack of studies result investigate the relation with reaction of investor. This study concern on the reaction of investor as impact of carbon emission disclosure, either directly or indirectly through firm value.* ***Research Method:*** *This study uses path analysis by SPSS. A total of 144 samples were collected from the basic materials sector, which is listed on the Indonesian Stock Exchange (IDX) over two representative periods.* ***Finding/Results:*** *The basic material sector is the primary sector of the firm's value chain and is considered a stable sector that attracts the investor market. Nevertheless, this sector contributes to industrial emissions, such as carbon emission, which has become an essential issue in climate change that has become a stakeholder and customer concern.* ***Conclusion:*** *The study found that carbon emission disclosure impacts investor reaction directly; meanwhile, path analysis results showed that firm value could not mediate the effect of carbon emission disclosure towards investor reaction.*

Keywords: *carbon emission disclosure; climate change; firm value; investor reaction*
JEL Classification: M41; Q50

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INTRODUCTION

For the time being, climate change is the world's most serious issue caused by global warming. One of the leading causes of global warming is the release of carbon dioxide, known as carbon emissions. Carbon emissions are produced from energy incineration in basic materials, energy, transportation, industrial, commercial, and household sectors. Those carbon emissions will be released into the atmosphere, affecting global warming (IESR, 2012). In industrial activities, fossil incineration to produce cement, metal, and basic materials emits high carbon emissions; apart from the production process, carbon emissions are also the result of the greenhouse effect. The release of carbon emissions caused by fossil incineration and industrial processes has increased significantly over the past two decades, as shown in Figure 1. To reduce the impact of climate change, the Kyoto Protocol was issued in 1997, and the Paris Agreement in 2015. The Paris Agreement is an international agreement related to preventing climate change to avoid the

increase of global average temperature below two °C or 1.5°C, which is compared to global temperature levels during the pre-industrial period. This agreement was then bolstered by the United Nations Sustainable Development Goals (UN SDGs), which contained 17 goals as a blueprint for a global action plan that was agreed upon by world leaders. This action plan is expected to be achieved by 2030 (United Nations SDG, 2023).

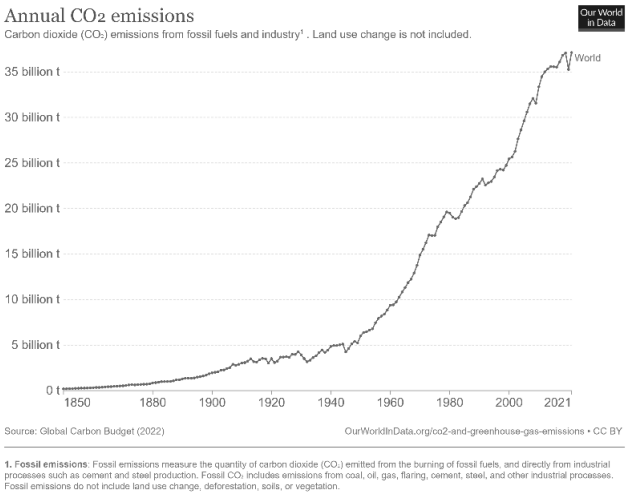

Figure 1. Release of the Global Carbon Emission
Source: Ourworldindata (2023)

According to the Global Carbon Project (2020), Indonesia contributes to the largest global carbon emitter, with 1.69% of total global emissions in 2020 (Figure 2). Indonesia's commitment to support carbon emission reduction is stated in Regulation No. 16/2016, which concerns ratifying the Paris Agreement to the United Nations Framework Convention on Climate Change in 2016. Indonesia has contributed to emission reduction as outlined in the NDC (Nationally Determined Contribution) in 2030 by decreasing emissions by 43.2% with international assistance and 31.89% with Indonesia's efforts (Enhanced NDC, 2022). It means the government agrees with the plan to prevent climate change by reducing emissions through mitigation.

To support this action, the government issued several policies and regulations regarding carbon emissions consisting of Regulation of the Minister of Environment and Forestry of the Republic of Indonesia No P.19/Menlhk/Setjen/Kum.1/2/2017 about Emission Quality Standards for Business and Industrial Activities Cement then Regulation of the Minister of Energy and Mineral Resources of the Republic of Indonesia No 22 of 2019 about Guidelines for Implementing Inventory and Mitigation of Greenhouse Gases, this policy is related to the basic materials sector industry which is vulnerable to create carbon emissions then the emissions mitigation are needed. Basic materials or raw goods industries are the businesses that provide essential products used by other industries to produce finished goods, such as mining metals and non-energy materials, chemicals, construction, cement, plastic, wood, and paper.

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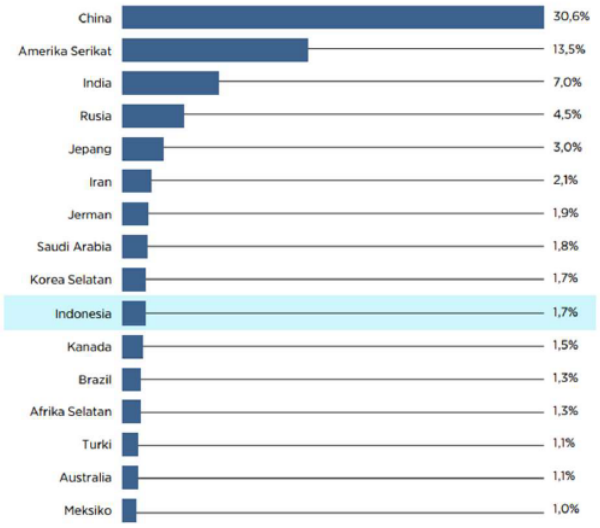

Figure 2. Global Carbon Emitter Countries
Source: Global Carbon Project (2020)

The global action plan is designed to mitigate global warming, which makes climate change and environmental issues a business consideration (Mardani et al., 2019) to encourage the firm to participate in environmental preservation from climate change. One of the firm's efforts to deal with the environmental issue is disclosing the carbon emissions in the firm's sustainability report or annual report. Nevertheless, companies listed on IDX voluntarily disclose environmental issues. On the other hand, firms must also understand the calculation of emissions and their impacts as regulated in OJK No. 51/POJK.03/2017 about the Implementation of Sustainable Finance for Financial Services Institutions, Issuers, and Public Companies, which is strengthened by SEOJK No. 16/2021 about Sustainability Reports as part of the Annual Report by adopting international standards such as GRI and TCFD on disclosure of sustainability reports. In line with that, in June 2023, the International Sustainability Standard Board (ISSB) published the IFRS Sustainability Disclosures Standards, which consist of IFRS-S1 and IFRS-S2. The existence of the IFRS Sustainability Disclosure Standards, even voluntary, encourages firms to provide specific information to stakeholders, such as carbon emission disclosure that might affect climate change. The disclosure of carbon emissions can be measured by the Carbon Disclosure Project (CDP) checklist, which contains information related to mitigating risks and opportunities for climate change, emission of greenhouse gas, energy consumption, calculating the cost of carbon emissions and carbon mitigations, and then accountability for carbon emissions.

The information related to carbon emissions is vital because the disclosure shows that the firm is concerned about environmental issues which affect the firm's reputation and sustainability (Asyari & Dianwicaksih Arieftiara, 2022; Kim et al., 2021; Wang, 2023). Further, the carbon emission disclosure will impact market reactions due to new information investors obtain. Investors consider the carbon emission disclosures as a signal from the firm (Hapsoro & Husain, 2019; Ilhan et al., 2021; Ramadhana, 2023). Thus, the firms are encouraged to disclose carbon emissions to attract and retain investors. Disclosure of carbon emissions is also expected to increase the firm's value added (Han et al., 2023; J. H. Lee & Cho, 2021; Rodgers et al., 2013; Saka & Oshika, 2014). Carbon emission disclosure is an achievement of the firm's performance due to environmental concerns, so the firm's reputation will escalate and add firm value

(Schiemann & Tietmeyer, 2022; Wardhani & Kawedar, 2019). Muhammad & Aryani (2021) states that the increase in the firm's value will also impact investor prosperity, so it is expected to attract investors to invest in the firm (Clarkson et al., 2013). This study examines the direct effect of carbon emissions disclosure on investor reactions and its impact indirectly through firm value.

RESEARCH METHOD

This study implements quantitative methods. The population used in this study only focuses on basic materials sector companies that are listed on the Indonesia Stock Exchange (IDX) during 2020 and 2021. Basic materials sector companies are chosen because those are the sectors that investors attract in which those businesses run in basic commodities that are needed in other companies as raw materials. This sector is sensitive to economics in Indonesia (MarketXLS, 2021). Moreover, the basic materials sector also contributes to carbon emissions and environmental waste. The criteria determined in this study consist of 1) The company should have an Annual Report (AR) and Sustainability Report (SR) or Integrating Report (IR); 2) The company should report the report for two consecutive years. According to that, there are 144 samples used in this study. Data were processed by path analysis in SPSS 25 as the analysis tool.

Table 1. Population and sample

No	Criteria	Companies
1	Basic Materials Company in 2020	86
2	Basic Materials Company in 2021	97
3	Do not publish AR/SR/IR	(21)
4	Do not publish the report in two consecutive years	(18)
	Total sample	144

Source: IDX (2023)

Following stakeholder theory (Freeman, 1984), stakeholders are individuals or groups who impact an organisation's goal-achievement process. The relationship between stakeholders and the firm should be well-maintained because stakeholders impact the resources needed for operational activities, in terms that investors are the parties who provide business capital. Stakeholders are the main consideration in whether to disclose information in financial reports. In signalling theory, executives as internal stakeholders who have more information about the firm will be encouraged to convey this information in order to increase share prices so that firms can attract investors as external stakeholders. This theory explains the reasons why companies provide good information to the capital market through financial reports because financial information is a signal from the company for investors to consider investment decisions and to differentiate firms from others that have bad news that is not disclosed (Alsultan, 2023; Morris, 1987). If the information provided contains a positive value, it is expected that investors will give a positive reaction at the time when the market receives the information. Investor reactions can be measured by abnormal returns (Alsaifi et al., 2020).

$$AR_{it} = R_{it} - E[R_{it}] \quad (1)$$

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Description:
AR = Abnormal Return i on t period
R_{it} = Actual Return i on t period
$E[R_{it}]$ = Expected Return i on t period

Climate change is a crucial environmental issue that is happening in the world. These changes will affect the ecosystem and life. The firm's operational activities indirectly produce carbon, which causes carbon emissions. Firms are expected to disclose information related to carbon emissions as an environmental concern (Eng et al., 2022; Hapsoro & Falih, 2020). Firms might disclose information regarding the proactive strategy in environmental activities to provide signals to investors. Investors rely on firms' voluntary disclosures to assess the environmental impact (Kumar & Firoz, 2018). Carbon emission disclosure is expected to reduce information asymmetry between companies and investors (Karim et al., 2021; Liesen et al., 2016). The Carbon Disclosure Project (CDP) checklist is used to measure carbon emission disclosure. CPD is considered a tool to reveal carbon emissions through greenhouse gases and energy released by firms (Bae Choi et al., 2013; Doda et al., 2016). Measurement is performed by giving a score to each disclosure item with a minimum score of 0 and a maximum of 18 (Downar et al., 2021; Schiemann & Sakhel, 2019). The following are the carbon emission disclosure measurement indicators and their items:

Carbon Emission Disclosure = Total score for each item : 18 (2)

Table 2. Carbon Emission Disclosure Checklist

Category	Item	Description
Climate Change: Risk and Opportunity	CC1	Risk assessment or description of climate change and action to risk mitigation
	CC2	Assessment or description at present (and future) of the implementation of financial, business, and opportunity from climate change
Greenhouse Gas Emission	GHG1	Methodology to count Greenhouse gas emissions (GHG or ISO protocol)
	GHG2	External verification's presence in the computation of GHG emission
	GHG3	Total GHG emission (carbon ton metrics)
	GHG4	Disclosure of GHG emission scopes 1, 2, and 3
	GHG5	Disclosure of GHG emission referring to source
	GHG6	Disclosure of GHG emissions referring to facilities/segments.
	GHG7	GHG emission comparison with the previous period
Energy Consumption	EC1	Total energy consumed
	EC2	Calculation of energy used from renewable resources
	EC3	Disclosure of energy consumed based on type, facilities, or segment
Reduction of Cost and Emission	RC1	Action plan or strategy's breakdown to decrease GHG emissions
	RC2	Details of current reduction GHG emission target levels and emission quantity reduction targets
	RC3	Emission reductions of costs or savings are executed because of emissions reduction plans.

Category	Item	Description
	RC4	Future emission costs are withdrawn from capital expenditure planning.
Accounting Emission Carbon	ACC1	Proof that the board committee (or other executives) responsible for action concerning climate change
	ACC2	An explanation of the system by the board committee (or other executives) reviews the developments of the firm's climate change-related

Source: Carbon Emission Disclosure Checklist (2013)

Firm value reflects a firm's performance and impacts investors' perceptions of the company. Firm value describes the credibility of the firm's performance and future (Brigham & Houston, 2019; Setiadharma & Machali, 2017). If the firm value is high, it will increase shareholder welfare (Iswajuni et al., 2018; Wahyudi & Sholahuddin, 2022). The value of a firm is measured by Tobin's Q because it can measure the relationship between the market value of a firm's shares by estimating future investment returns seen by investors. Share prices reflect public information, including accounting data and financial information, following the market (Chancharat & Kumpamool, 2022; O'Sullivan & McCallig, 2012).

$$\text{Tobin's Q} = \frac{MVE + Debt}{TA} \quad (3)$$

Description:
MVE = Market Value of Equity
Debt = Total Liability
TA = Total Aset

Firm size refers to the magnitude of the small, medium, or large firms. The size of a firm is determined by its assets, with larger firms will have more tremendous assets. The measurement is assessed by the amount of assets a firm possesses. The total assets are transformed into a natural logarithm to standardise the value in correlation with other variables (Wardhana et al., 2022).

$$\text{Size} = \text{Ln (Total Assets)} \quad (4)$$

This study uses a path analysis model to examine the direct effect of carbon emission disclosure on investor reaction and the indirect effect through firm value. Meanwhile, firm size is a control variable.

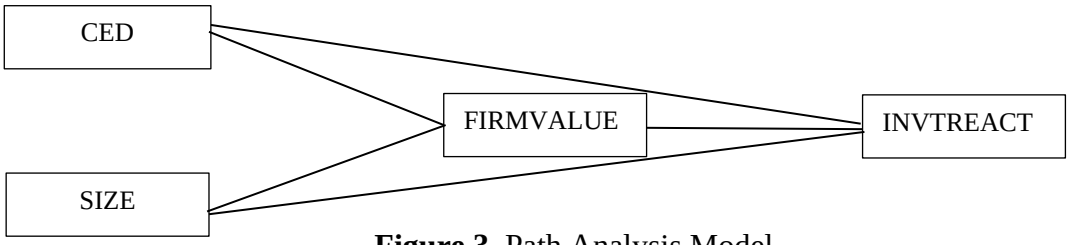

Figure 3. Path Analysis Model

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RESULTS AND DISCUSSION

The results of descriptive statistics for each variable are shown in table 3 below:

Table 3. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
CED	144	.00	1.00	.6026	.41243
SIZE	144	22.26	35.73	28.9475	2.29923
FIRMVALUE	144	.01	10.88	1.3512	1.34862
INVTREACT	144	-1.16	3.04	.0847	.74478
Valid N (listwise)	144				

Source: processed by researcher (2023)

Table 3 shows from the CED variable that the average value of a firm's revealing carbon emissions is 60.26% of 18 items. The SIZE variable describes that the average company size is 28.95, with a minimum value of 22.26 and a maximum of 35.73. The FIRMVALUE variable shows the average firm value is only 1.35 with a maximum range of 10.88, while the average value of the INVTREACT variable is 0.085.

Table 4. Results of Path Analysis

No	Path	Coef.	t	Sig
	Direct			
1	Carbon Emission Disclosure → Firm Value	0.122	1.250	0.214
2	Firm Size → Firm Value	-0.039	-0.405	0.687
3	Carbon Emission Disclosure → Investor Reaction	0.284	2.981	0.004
4	Firm Size → Investor Reaction	0.119	1.252	0.213
5	Firm Value → Investor Reaction	-0.017	-0.189	0.850
	Indirect			
6	Carbon Emission Disclosure → Firm Value → Investor Reaction	0.002		No mediating
7	Firm Size → Firm Value → Investor Reaction	0.001		No mediating

Source: processed by researcher (2023)

The results of the direct effect between carbon emission disclosure and firm value show a significance value of 0.214, which is greater than 0.05 (sig>0.05), and t (1.250) is smaller than the t table as 1.980, so the hypothesis is rejected. The results of this study assume that carbon emission disclosure does not directly have a significant impact on firm value. For the time being, firms have voluntarily disclosed their environmental responsibility in sustainability reports or annual reports. According to descriptive statistics, the average value of carbon emission disclosure is 0.60, which means the firms barely disclosed 10 of 18 items, so the level of carbon emission disclosure is mediocre.

Some essential information firms have not disclosed regarding carbon emissions include environmental costs incurred in the greenhouse effect, carbon dioxide emission, renewable energy, and others. Firms are reluctant to disclose that information, worrying about the operational funds and profitability decreasing firm value. Otherwise, stakeholders and customers are not aware yet of the firm's environmental concerns due to a lack of socialisation on environmental issues, so the information on carbon emissions is unable to meet investor expectations and does not affect firm value directly (Muhammad & Aryani, 2021; Noor & Ginting, 2022; Rachmawati, 2021).

The direct effect of firm size on firm value results in a significance value of 0.687, which is more significant than 0.05 with t (-0.405), which is smaller than the t table, so the hypothesis

is unacceptable. The study shows that firm size cannot impact firm value directly. The larger firms are not guaranteed to manage the firm efficiently and effectively. Ineffective management will affect the decline in share prices, causing a decrease in firm value in the investor's view. This is in line with Narsa (2014), which stated that the bigger the firm, the greater the risks will be taken; those risks might provide information asymmetry among investors.

Furthermore, firm size does not affect firm value because the largeness of a firm, which is assessed by the amount of its assets, can be obtained through loans so that it might enlarge the firm's leverage. Firms with loans usually do not share the profits to investors through dividends. Firms tend to retain profits might affect share prices and firm value because most of Indonesia's investors merely consider fundamental aspects of making investment decisions (Diantimala et al., 2021; Nwamaka & Ezeabasili, 2017; Setiadharma & Machali, 2017). The large firm assets will impact operational activities, leading to higher costs and lower profitability, affecting the firm value (Hashmi et al., 2020).

As shown in Table 4, the results of a direct effect of carbon emission disclosure on investor reaction show a significance value of 0.004 (sig. < 0.05) with t (2.981), which is greater than the t table. It means that the hypothesis is accepted, so carbon emission disclosure directly affects investor reaction. Firm use sustainability reports to reduce stakeholder worry about environmental and social issues (Asyifa & Burhany, 2022); firm voluntary disclosure in sustainability reports also help to reduce the firm's negative externalities, especially when the firm has a bad environmental reputation (Clarkson et al., 2008; Fairbrother, 2016).

Following signalling theory, environmental issues might be a factor that impacts investment decisions. In line with stakeholder theory, firms that disclose environmental information might fulfil stakeholder's expectations so the firms will strengthen the relationships with stakeholders (Cotter & Najah, 2012; J. Lee et al., 2023; Maon et al., 2009) and gain stakeholder support (Marano et al., 2017). Bolton & Kacperczyk (2021), Zhang et al. (2018), and Guiral et al. (2020) also state that disclosure of carbon emissions and environmental issues has a significant effect on investor reactions and market returns. Qian et al.(2021) use a carbon emissions score to measure carbon disclosure, and a high score means the firm's level of carbon performance is high with low carbon risk and vice versa. This study found that the market reacts more to higher carbon performance.

The direct effect between company value and investor reaction results from a sig value of 0.850, greater than 0.05, with a t value (-0.189) smaller than the t table, which means the hypothesis is unacceptable. Firm values use Tobin's Q to measure managerial performance (Servaes, 1991), where managerial performance meets or fails to market expectations, which impacts investor reactions. Even if the firm's value increases, but managerial performance fails to meet market expectations, investors can react negatively. Changes in firm value sometimes might not affect long-term investors who focus on fundamental aspects compared to new investors who react sensitively to firm value (Cremers et al., 2016). This is similar to Liu et al. (2021), which states that investors might not immediately react to fundamental information such as future profitability, asset growth, and financial information directly affecting firm value.

This study hypothesises that firm value acts as a mediating role in the influence of carbon emission disclosure on investor reactions. To be a mediator, some conditions must be met: significant value and path direction. However, the results of the path analysis found that the

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effect of carbon emission disclosure on firm value results in a sig value of 0.214, and the effect of firm value on investor reaction shows a sig value of 0.850, where both values are more significant than 0.05, so the significance conditions are not met. Meanwhile, the path of the effect of carbon emission disclosure on firm value indicates a positive direction with a coefficient of 0.122. Otherwise, the direction of firm value on investor reaction indicates as -0.017, which means that both paths are opposite to each other's direction and do not match the requirements of path analysis. It concludes that firm value is not a mediating variable because it could not mediate the influence of carbon emission disclosure on investor reaction. It is proven by the coefficient value of the direct effect of carbon emission disclosure on investor reaction as 0.284, which is greater than the coefficient value of the indirect impact mediated by the firm value of 0.002.

Voluntary disclosure of carbon emissions reflects a firm's choice of what to report, thereby limiting investors' ability to assess a firm's performance in mitigating climate change and environmental issues. Environmental costs have an insignificant effect on firm value because investors rarely consider them in investment decision-making. A lot of industrial firms have not disclosed environmental costs in social responsibility reports, which makes investors often fail to notice the signals provided by the firm (Noor & Ginting, 2022). Firms that are concerned about the environment and disclose carbon emissions might be hesitant to create a competitive advantage to attract the attention of customers and investors. The impact of this phenomenon will decrease the profitability and firm value due to the firm reducing the dividend payments, which is caused by its high carbon emitter (Balachandran & Nguyen, 2018; Rachmawati, 2021). In addition, there is a possibility that carbon emission disclosure does not affect firm value due to a lack of stakeholder awareness of environmental concerns or a lack of socialisation of environmental issues. This means that carbon emissions disclosure is not considered a signal of firm value because firm value tends to be affected by fundamental aspects of a firm's financial performance (Wahyudi & Sholahuddin, 2022).

CONCLUSION

This study found that firm value is unable to mediate the effect of carbon emission disclosure on investor reaction. The result indicates that carbon emission disclosure does not affect firm value nor investor reaction. Conversely, carbon emission disclosure impacts investor reaction directly. It concluded that the disclosure of carbon emissions provides positive information for investors in investment decisions considering the firm's environmental concern. However, suppose the environmental issues are related to firm value. In that case, investors tend to react less because firm value has been more affected by fundamental aspects and firm performance since socialisation with investors regarding climate change is rare. In contrast, this announcement might determine firm performance and firm value. It is expected that future research might use sectors that have more effect on the issue of climate change and corporate sustainability due to this study's focus on one business sector, which is stable in the investor market, an essential sector in the industry, and the higher carbon emitter.

AUTHORSHIP CONTRIBUTION STATEMENT

Conceptualisation and Research Design, Data Collection, Methodology, Supervision, Writing Entire Paper, Conceptualisation, Data Collection and Analysis, Editing and Layouting. All Authors have read the final version of the paper.

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