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Full Length Research Paper

Rigidity and performance threshold: How routinization process affects dynamic capabilities

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Dynamic capabilities view has been considered vital to the long-term survival and adaptation of organizations in dynamic environments. Although, rich literature has probed into how dynamic capabilities are able to address organizational inertia issues and facilitate change, there are still heated debates on questions on dynamic capabilities' heterogeneity and performance. Current thinking was integrated in major researches of routines and dynamic capabilities and a rigorous modelling method was adopted to investigate how routinization process affects reconfiguration of ordinary capabilities. An interesting finding of this research is that there is a threshold effect both on routinization process and dynamic capabilities performance as a result of rigidity and knowledge accumulation. Firms in their effort of reconfiguration of ordinary capabilities should pay special attention on where they position the capabilities around such threshold. To achieve better effect and superior performance, different kinds of dynamic capabilities may be required. The implication of this study may help bridge the diverged views in the field of dynamic capabilities research, and open new avenues for future empirical research.

Key words: Dynamic capabilities, routinization, rigidity, threshold effect.

INTRODUCTION

How organizations tackle routine rigidity has been one of the primary topics in the discussion and advancement of organizational adaption theory. The concept of routines has been considered one of the most decisive features in adaption related selection and retention processes (Hannan and Freeman, 1984; Nelson and Winter, 1982). Traditionally, literature has extensively studied organizational inertia and revealed that the dual characters of organizational routine have the tendency of enabling consistent performance and disabling organization from adaptation in a volatile environment

(Amburgey et al., 1990; Hannan and Freeman, 1984). Routine rigidity as part of organizational inertia has attracted attentions from various research steams, among which, dynamic capabilities view has been tackled as one of its foremost goals (Eisenhardt and Martin, 2000; Winter 2003; Zollo and Winter, 2002).

Dynamic capacities theory was proposed by several major researches in the last two decades to tackle organizational inertia and sustain competitive advantages (Døving and Gooderham, 2008; Eisenhardt and Martin, 2000; Helfat et al., 2009; Teece et al., 1997; Teece, 2007;

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Winter, 2003; Zahra et al., 2006; Zollo and Winter, 2002). Dynamic capability is generally defined as the higher-order capabilities that changes operational-level capabilities and learning in new domains. As Wiggins and Ruefli (2005) reveals, the dynamism of environment has subject firms' competitive edge to a much shorter time span. In hypercompetitive or high-velocity environments, firms are facing major difficulty to achieve competitive advantage in the long-term. Circumstances require firms to strive for a solution to find successive temporary advantages by effectively responding to successive environmental shocks (D'Aveni, 1994). Dynamic capabilities theory asserts that firms need to develop such capabilities so as to purposefully create, extend or modify its resource base (Helfat et al., 2009) or sense and then seize opportunities quickly and proficiently (Teece, 2000).

A major obstacle that hinders further development of dynamic capabilities theory is the diverged views between two seminal papers by Teece et al. (1997) and Eisenhardt and Martin (2000) (Di Stefano et al., 2014; Peteraf et al., 2013). One of the diverged views in these two papers is concern with how routinization of organizational processes influences dynamic capabilities heterogeneity. Routinization is the extent to which organizational process become routine and organizations achieve stability and accountability (Hannan and Freeman, 1984; Nelson and Winter, 1982). The concept of routine is also considered an important micro-foundation and building blocks for organizational (dynamic) capabilities that sustain organizations' competitive advantage. However, to what extant organizations should routinize their process and capabilities has been a source of major debate between the two seminal papers. Research that follows Teece et al. (1997) has emphasized that both dynamic capabilities and operational capabilities should rely on large and complex routinized process, whereas research that follows, Eisenhardt and Martin (2000) argued that flexible and reduced routinization on organizational process should be the answer to build both operational and dynamic capabilities. Peteraf et al. (2013) suggest reconciling in such diverged theoretical views could help the future development for dynamic capabilities theory. Another major stream of debate is the link between dynamic capability and its performances. Teece et al. (1997) and some later researchers assume direct link of dynamic capabilities-performance link that asserts dynamic capability rent generation and superior performance. In contrast, Eisenhardt and Martin (2000) and Zott (2003) for example, showed dynamic capabilities as indirectly linking to performance and may only create superior performance under certain condition. Such debate has also hampered further development of theory and empirical researches.

In light of these debates, a fundamental question is asked: how does organizational process routinization affect reconfiguration of operational capabilities? Further, how does such relation affect dynamic capabilities-performance link? The authors wish to provide a nuanced view to explain such gap in major theoretical development as well as empirical results from a perspective of routinization and reconfiguration of operational capabilities (processes). A method of rigorous modeling method for our research was adopted. Parting from previous research that focus on managerial action or resource configuration, the current research finds out that timing of capability reconfiguration along the routinization process of organizational capabilities may be an important factor.

THEORETICAL BACKGROUND

Dynamic capabilities and debates on heterogeneity and performance links

Teece et al. (1997) defined dynamic capabilities as "the firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments." First, they categorized the nature of the concept as being an "ability" (or "capacity"), stressing the essential role of strategic management. Such a definition has be an extended resource based view by categorizing it as a special kind of capability. Dynamic capabilities are to integrate (or coordinate), build and reconfigure internal and external resource and operational capabilities. Makadok (2001) further reported such synthesis view of RBV and proposed dynamic capabilities as resource picking and capability building mechanisms. As special resources and capabilities considered within RBV, Teece et al. (1997) considers dynamic capabilities as heterogeneous across firms because they rest on firm specific paths, unique asset positions, and distinctive processes. In contrast, Eisenhardt and Martin (2000) asserted dynamic capabilities as best practices with only indirect link to competitive advantages that exhibit commonalities across firms. Later research tends to see two seminal papers by taking diverged views on many aspects of dynamic capabilities (Di Stefano et al., 2014; Peteraf et al., 2013).

The first divergence reside in the nature of dynamic capabilities, although major researches generally agree that dynamic capability follows evolutionary economics perspective (Nelson and Winter 1982) emphasizing the fundamental elements such as routine, path dependency and organizational learning, and that the creation and evolution of dynamic capabilities are embedded in organizational processes (Barreto, 2010). The differentiated views question a unified understanding of its heterogeneity. One question in particular of such debate is the relation between dynamic capabilities and routinization of organizational process. Sub-stream research around Teece et al. (1997) contended that dynamic capabilities rely on large complex routinization,

whereas others following Eisenhardt and Martin (2000) insisted on reduced routinization (Peteraf et al., 2013; Schreyögg and Kliesch-Eberl, 2007; Wohlgemuth and Wenzel, 2016). Another major debate is dynamic capabilities' outcomes, of which the dynamic capabilities performance is in the center of such heated discussion. Teece et al. (1997) contend that dynamic capabilities directly generate competitive advantage and sustain firm performances. Makadok (2001) used resource based perspective to explain that dynamic capabilities have two rent generating mechanisms. However, Eisenhardt and Martin (2000) argued that dynamic capabilities in reaching superior performance are only necessary but not sufficient. Zott (2003) also sees dynamic capabilities as indirectly linked to performances through modification of resource base, and such links are moderated by timing, cost and learning effect.

Although, such two streams have generated much discussion, a center element seems to be oversight by major researchers, which is routinization of organizational processes and capabilities. Dynamic capabilities literature has generally reached consensus on the role that routine played in the creation and development of dynamic capabilities. However, the process of creation of routines did not receive enough attention. Especially, the development of routine major properties seems to be missed in the conversation of dynamic capabilities and routinization and performance implications. As the concept of routine has been considered to have great importance, it is believed that there may be a hidden research avenue for bridging the theoretical divergence in developing dynamic capabilities theory.

Organizational routine and implication on dynamic capability

Routines are described by prior literature as "repetitive pattern of activity" (Nelson and Winter, 1982) or "the building blocks of capabilities, with a repetitive and context-dependent nature" (Becker, 2008b). Routines are also operationalized as organizational processes, together with organizational resources, to achieve certain goals (Grant, 1991). Process routinization is replication of known processes, which establishes and maintains organizational routines. It is also defined as a process in which knowledge from previous experiences accumulates in tacit forms (that is, in the minds of human actors) and results in quasi-automatic, uniform, response behavior to varied stimuli. As capabilities consist of routine or routine bundles, it can be easily seen that routinization process holds a center role in the creation and evolution of organizational capabilities. Thus, to understand how routinization process influence capability configuration, several important routine characteristics and the development of these characteristics should be highlighted.

Together with this dual nature of routine stability and change, several other characteristics are also incorporated in this research. These characteristics are reoccurrence (or repetition) (Winter, 1990; Pentland and Rueter, 1994), storage of knowledge (especially tacit knowledge) (Cohen and Bacdayan, 1994; Gilbert, 2005), stability (Nelson and Winter, 1982) and generative system that allows routine to variate (Feldman and Pentland, 2003; Pentland and Rueter, 1994; Pentland et al., 2012). Traditional literature primarily sees organizational routines as stable, exhibiting low variance in actions and in performance along its reoccurrence and development path (Nelson and Winter, 1982; Cohen and Bacdayan, 1994; Feldman and Pentland, 2003; Gersick and Hackman, 1990; Hannan and Freeman, 1984). Routines are considered to be able to maintain repeatable and reliable performance of organizational activities (Nelson and Winter, 1982). As it ensures stability, it is also considered to be primary source of organizational inertia or capability rigidity (Amburgey et al., 1990; Hannan and Freeman, 1984). Recent researches on routines, however, believe that routines are generative systems rather than source of singular stability or rigidity and may be a source of change and flexibility that also have endogenous variance within the routine. Such variation in routines may also enable organization change and flexibility (Adler et al., 1999; Amburgey et al., 1990; Feldman and Pentland, 2003; Feldman, 2000; Levitt and March, 1988; Nelson and Winter, 1982). Thus, it is believed that these distinct and comprehensive characteristics of routine can exert great influence on the dynamic capabilities, especially its reconfiguration of operational capabilities. In the following part of the paper, the authors built such a model that captures the current thinking in the field of routine research but also simple enough to capture its effect on the process.

MODEL

The current study model is designed to examine how the nature of routininzation process influences dynamic capabilities reconfiguring ordinary capabilities while controlling for other mechanisms covered in previous research such as variation and rigidification of routines. The authors wish to build such a model that reflect the current thinking in the routine (Feldman and Pentland, 2003; Feldman, 2000; Pentland et al., 2012) and dynamic capabilities research (Eisenhardt and Martin, 2000; Teece et al., 1997; Zollo and Winter, 2002). The model focuses on capabilities reconfiguration process rather than resource reconfiguration process (Zott, 2003). Capabilities were treated as routines and its reconfiguration as a variation-selection-retention process with emphasis on organizational learning mechanism (Zollo and Winter, 2002).

Preliminaries assumptions on routine's characteristics

Repetition

An obvious feature of organizational routines is recurrence (Egidi and Narduzzo, 1997; Winter, 1990; Cohen and Bacdayan, 1994; Cohen et al., 1996; Pentland and Rueter, 1994; Pentland, 1992). An activity that occurs only once cannot be a routine. Routines are "recurrent interaction patterns" (Feldman and Pentland, 2003; Becker, 2008a). In practice, they are repeated executions of similar tasks. Therefore, routines are units of organized activities that are repeated over time. The recurrence feature leads to an executable capability for repeated performance (Cohen et al., 1996).

Storage of knowledge

Routines are restored in organizational procedural memory (Cohen and Bacdayan, 1994). An activity is repeated because it previously provided a desirable result. In other words, routines are created and reinforced by past successes (Levitt and March, 1988). Thus, routines are remembered by doing (Nelson and Winter, 1982). Routines offer a way of capturing, codifying and sharing knowledge on procedures and best practices. Organizational routines are stored as procedural memory (Cohen and Bacdayan, 1994).

Stability

Repeated activities lead to repeated performance. Therefore, behaviors and their results are predictable (Nelson and Winter, 1982). Increasing repetition can enhance the predictability of a process (Nelson and Winter, 1982) due to reinforcement by past successes (Leavitt and March, 1988).

Generative

According to Pentland et al. (2012), routines are seen as generative system that could generate endogenous variation. a Denotes a variation ratio.

Baseline routinization model

A set of activities must be performed to accomplish any task. If the task is accomplished repeatedly, the activities in the set will naturally be automatically repeated. In this repetition process, it is assumed that the number of activities in the set remains constant; however, in a generative routine system, any activity may be replaced with a new activity. It is assumed that if an activity is variates, the original activity will never be performed again. In other words, when an activity is repeated i times, this implies that the activity has not changed from the first time to the $i+1$st time. The probability that an activity in a routine may be variate when it is repeated i times is a_i, where $i \in (0,1,2,L,n)$.

The experience accumulation mechanism relies on memory and suggests that the more frequent an event is, the greater the likelihood that previous experiences will be repeated (Zollo and Winter, 2002). This situation may hinder changes to the previous experience. Therefore, the probability of change to the previous experiences will decrease with their repetition. In this respect, the following assumption is presented. The probability a_i is assumed to decrease with the repetitions i.

According to this assumption, if the changing force of the activity remains constant, then $a_i \geq a_j$, where $i < j$ and $i,j \in (0,1,2,L,n)$. R_n^i denotes the number of activities that are repeated i times in the set when the task is accomplished n times continuously. C_n denotes the number of new activities in the set when a task is accomplished n times.

$$C_n = C_{n-1}a_0 + R_{n-1}^1 a_1 + L + R_{n-1}^j a_j + L + R_{n-1}^{n-2}a_{n-2} + R_{n-1}^{n-1}a_{n-1}$$
(1)

$$C_{n-1} = C_{n-2}a_0 + R_{n-2}^1 a_1 + L + R_{n-2}^j a_j + L + R_{n-2}^{n-2}a_{n-2}$$
(2)

The number of activities in the set is constant.

$$C_{n-1} + \sum_{j=1}^{n-1} R_{n-1}^j = C_{n-2} + \sum_{j=1}^{n-2} R_{n-2}^j .$$
(3)

From (3),

$$R_{n-1}^{n-1} = C_{n-2} - C_{n-1} + \sum_{j=1}^{n-2}\left(R_{n-2}^j - R_{n-1}^j\right)$$
(4)

(2) − (1), we have (5).

$$C_{n-1} - C_n = \left(C_{n-2} - C_{n-1}\right)a_0 + \sum_{j=1}^{n-2}\left(R_{n-2}^j - R_{n-1}^j\right)a_j - R_{n-1}^{n-1}a_{n-1}$$
(5)

Substituting (4) into (5) yields

$$C_{n-1} - C_n = (C_{n-2} - C_{n-1})(a_0 - a_{n-1}) + \sum_{j=1}^{n-2}(R_{n-2}^j - R_{n-1}^j)(a_j - a_{n-1}) \qquad (6)$$

When $n = 0,1$, then

$$C_0 = C_1 + R_1^1 = C_1 + C_0(1 - a_0), \qquad (7)$$

and

$$C_0 \geq C_1 \qquad (8)$$

It is assumed that

$$C_j \geq C_{j+1}, \text{ where } j \in (1,2,\text{L},n-2). \qquad (9)$$

According to the definition,

$$R_{n-2}^j = C_{n-2-j} \prod_{i=0}^{j-1}(1 - a_{j-i}) \qquad (10)$$

and

$$R_{n-1}^j = C_{n-1-j} \prod_{i=0}^{j-1}(1 - a_{j-i}) \qquad (11)$$

According to Equation 9 and comparing Equation 10 with 11 yields

$$R_{n-2}^j \geq R_{n-1}^j. \qquad (12)$$

Substituting Equations 8, 9 and 12 into 6 yields

$$C_n \leq C_{n-1}. \qquad (13)$$

Based on inductive reasoning, Equation 13 is satisfied for all n.

If the number of activities in the set remains constant, then the number of activities repeated i times when the task is accomplished m times exceeds the number of activities repeated i times when the task is accomplished n times by one, if $n > m$ and the changing force on the activities is invariant for every task. Therefore, $R_m^i \geq R_n^i$, where $i = 0,1,\text{L},m$. The number of new activities decreases with increase in the number of tasks accomplished if the variation level on the activities in the set is constant for every task (that is, $C_n \leq C_{n-1}$).

The above result is used to analyze the routinization process. An activity will become a routine after a sufficiently large number of repetitions. Let i_n^k be the number of activities repeated more than k times when the task is accomplished n times ($n \geq k$). Therefore,

$$i_n^k = \sum_{j=k}^{n} R_n^j$$

and

$$i_{n-1}^k = \sum_{j=k}^{n-1} R_n^j$$

Previous result yields $R_{n-1}^j \geq R_n^j$

Therefore,

$$\sum_{j=1}^{k-1} R_{n-1}^j \geq \sum_{j=1}^{k-1} R_n^j$$

and

$$\sum_{j=1}^{n-1} R_{n-1}^j - \sum_{j=1}^{k-1} R_{n-1}^j \leq \sum_{j=1}^{n} R_n^j - \sum_{j=1}^{k-1} R_n^j$$

Moreover,

$$i_n^k \geq i_{n-1}^k \qquad (12)$$

Thus, no matter how many repetitions are needed for an activity to become a routine, the activity set will ultimately become a routine set. A routine embraces the properties of recurrence, memory, predictability, and eventually, automation. That is, a number of repetitions is needed for an activity to become a routine, N, and if n is large enough, $R_i \in i_n^N$, then $p_{(O_i|R_i)}(M_{R_i}(k > N)) \to 1$.

If the number of activities in the set remains constant as assumed, the number of activities is repeated more than i times when the task is accomplished m times and is less than the number of activities repeated more than i times when the task is accomplished n times by one, if $n > m$ and the variation possibility on the activities in the set is invariant for every task. Therefore, $i_n^i \geq i_m^i$, where $i = 0,1,\text{L},m$.

Thus, the number of routines in the activity set will increase as the number of task repetitions increases under the condition that the variation possibility on the activities in the set is invariant for every task. Therefore, the recurrence process is a routinization process. The activities become stable, predictable and automatic

routines.

The above analysis gives us a clear view of the routinization process baseline scenario. Organizations generally tend to prefer stable and repeated performance, routinization process without exogenous interference such as dynamic capability, although endogenously variate on a certain level still tends to reach rigid state after certain time of repetition. Further, ordinary capability underpinned by routines and processes will also rigidify without dynamic capability, although to certain extent, it can be variate. Thus, the first proposition is reached:

Proposition 1: Organizational capabilities, although able to change, ultimately will reach a state of stability.

Rigidity model

The authors modeled rigidities associated with capability,

they built rigidity model based on Gilbert (2005)'s thinking that rigidity needs to consider factors from resources and tacit knowledge, and that rigidification is a self-reinforcing process. Let $R_i = \lambda e^{ir}$ denote the rigidity of an activity that is repeated i times, λ is a parameter that represents the associated resource and explicit knowledge, and r is the parameter that represent tacit knowledge accumulation mechanism. Thus, the e^{ir} will indicate the volume of accumulated tacit knowledge.

The rigidity of the activities in the set is defined in the following manner:

$$\mathfrak{R}_n = C_n \times \lambda e^r + R_n^1 \times \lambda e^{2r} + \mathrm{L} + R_n^j \times \lambda e^{(j+1)r} + \mathrm{L} + R_n^n \times \lambda e^{(n+1)r},$$

$$\mathfrak{R}_{n-1} = C_{n-1} \times \lambda e^r + R_{n-1}^1 \times \lambda e^{2r} + \mathrm{L} + R_{n-1}^j \times \lambda e^{(j+1)r} + \mathrm{L} + R_{n-1}^{n-1} \times \lambda e^{nr},$$

$$R_n^n = \left(C_{n-1} - C_n\right) + \sum_{j=1}^{n-1}\left(R_{n-1}^j - R_n^j\right),$$

$$\mathfrak{R}_n = C_n \times \lambda e^r + \sum_{j=1}^{n-1}\left(R_n^j \times \lambda e^{(j+1)r}\right) + \left[\left(C_{n-1} - C_n\right) + \sum_{j=1}^{n-1}\left(R_{n-1}^j - R_n^j\right)\right] \times \lambda e^{(n+1)r}$$

and

$$\mathfrak{R}_n - \mathfrak{R}_{n-1} = \left[\left(C_{n-1} - C_n\right)\lambda\left(e^{(n+1)r} - e^r\right) + \sum_{j=1}^{n-1}\left(R_{n-1}^j - R_n^j\right)\lambda\left(e^{(n+1)r} - e^{(j+1)r}\right)\right]$$

Thus,

$$\mathfrak{R}_n - \mathfrak{R}_{n-1} \geq 0$$

If the number of activities in the set remains invariant as assumed, then the rigidity of the activities in the set increases as the number of times the task has been accomplished increases, if the variation possibility on the activities in the set is invariant for every task.

From the above model, the authors took a closer look at how rigidity reinforce itself in a routine repetition process. Rigidity without the interference of dynamic capabilities, will accumulate with repetition through a non-linear course. Thus, we have our second proposition:

Proposition 2: Organizational rigidities without variation in routines, will self-reinforce and accumulate in a non-linear fashion.

Rigidity with consideration of variation in routines

In the rigidity model, the parameter r implies the different learning mechanisms associated with different

routines. We study the evolutionary character of rigidity in the routinization process. If a routine is repeated n times with no variations, its rigidity is expressed as $R_n = \alpha e^{nr}$. If the routine variate after it is repeated i number of times, where $i < n$, then the new routine is repeated $n-i$ times. According to Teece et al. (1997) and Sydow et al. (2009), endogenous variations in routines are influenced by past knowledge and path dependence. In considering such effect, the new routine's rigidity is denoted as $R_{i,n-i} = \alpha e^{ir} + \alpha e^{(n-i)r}$.

Let

$$y = R_n - R_{i,n-i} = \alpha e^{nr} - \alpha e^{ir} - \alpha e^{(n-i)r}$$

$$\frac{\partial y}{\partial n} = \alpha r e^{nr} - \alpha r e^{(n-i)r} = \alpha r e^{(n-i)r}\left(e^{ir} - 1\right) \geq 0 \tag{14}$$

From Equation 14, the difference increases with increase in the number of times a task is accomplished. In other words, there exists a certain n^*, where if $n > n^*$, then

$$R_n > R_{i,n-i}.$$

$$\frac{\partial y}{\partial i} = -\alpha r e^{ir} + \alpha r e^{(n-i)r} = \alpha r \left(e^{(n-i)r} - e^{ir} \right)$$

$$i = \frac{n}{2}, \frac{\partial y}{\partial i} = 0 \text{ and } \frac{\partial^2 y}{\partial i^2} = -\alpha r^2 e^{ir} - \alpha r^2 e^{(n-i)r} < 0$$

Therefore, the maximum y is expressed in the following manner:

$$y_{\max} = \alpha e^{nr} - 2\alpha e^{\frac{n}{2}r} = \alpha e^{\frac{n}{2}r} \left(e^{\frac{n}{2}r} - 2 \right) \qquad (15)$$

Where,

$$e^{\frac{n}{2}r} - 2 = 0$$

$$n^* = \frac{\ln 4}{r} \qquad (16)$$

Thus, if $n < \ln 4 / r$, then $R_n < R_{i,n-i}$ for any $1 \le i \le n-1$, or, if $n > \ln 4/r$, then $R_n < R_{i,n-i}$

From the above result, if $n < \ln 4/r$, then $y_{\max} < 0$, $R_n < R_{i,n-i}$ for any $1 \le i \le n-1$, which implies that rigidity is overcome more effectively when the activity is repeated frequently. However, $n > 1$ only occurs under the condition that the tacit knowledge learning mechanism parameter is less than $\ln 2$. A sufficiently small tacit knowledge learning mechanism parameter is more effective in overcoming rigidity when the routine is repeated many times. For example, if $r = 0.01$, then $n^* = 138$; rigidity is surmounted more effectively when the activity is repeated up to 138 times than any number less than 138. Otherwise, even though the tacit knowledge learning mechanism parameter is small enough, in the end, there exists a certain n^*; if $n > n^*$, then $R_n > R_{i,n-i}$.

This result means that rigidity accumulation has a threshold in the repetition of routines. The threshold was defined as a number of routines repetition times, before which, the endogenous variation in routines may be selected and retained and after which, the endogenous variation in routines may not be selected and retained. When repetition times is less than this threshold, the endogenous variation can usually survive selection and retention process, which means that desirable change to capability is possible. However, when the repetition times are large than this threshold, which means that the accumulated rigidity is very large, any change to routines and capabilities will be eliminated if there is no exogenous forces such as dynamic capability to retain it. There is thus a third proposition:

Proposition 3a: Without exogenous intervention, endogenous variation to routines and change to capabilities can only be selected and retained before the rigidity threshold.

Proposition 3b: Without exogenous intervention, endogenous variation to routines and change to capabilities will not be selected and retained after the rigidity threshold, and capabilities become rigid.

This model result also has a more interesting implication for dynamic capabilities to exert influences. Consider the case that variation before the threshold number of repetition. A variation in routine before reaching the threshold cannot only survive, but also it can push the threshold forward, which means, for the next variation, the new n^* will be larger, because it is a repeated process. Thus, firms may be able to develop certain type of dynamic capability that creates conditions to continuously engender timely variation and proper process to select and retain such variation. This implication echoes with thinking in continuous improvement literature such as Adler et al. (1999, 2009), which emphasize routinization of process innovation.

The second case is what firms can do when the repetition times already surpass the threshold. When rigidity is already accumulated too large to let any endogenous variation survive, the model indicate two things for firms to do to make $R_n < R_{i,n-i}$. The first is to adjust λ, the resource and explicit knowledge base. The second is to adjust $e^{(n-i)r}$, that is, the tacit knowledge base and its learning mechanism. These two directions are all within the scope of dynamic capabilities (Eisenhardt and Martin, 2000; Teece et al., 1997; Zollo and Winter, 2002). However, these two directions have different level of influence over rigidity as our model indicates. Adjusting the tacit knowledge learning mechanism has much greater effect than that of resource and explicit knowledge base.

Firms that are more tempted to routinize its operational capabilities in pursuit of efficiency and stabilities, are more likely to find themselves in a situation that is already behind the threshold. For such firms, fostering endogenous variation-selection-retention process will be ineffective because no variation can survive selection and retention as our model shows; it will only become a cost

burden as Winter (2003) contended. However, firms in this case can pursue a second direction that is more effective, which is altering their organizational learning mechanism such as Zollo and Winter (2002) asserts.

There is also a very interesting theoretical implication for the question whether dynamic capabilities are heterogeneous. The model and analysis in this part indicate that for firms in reconfiguring their operational capabilities, there may be two directions for them to choose based on their operational emphasis. Thus, we have our fourth and fifth proposition:

Proposition 4: Dynamic capabilities are heterogeneous before and after the rigidity threshold, but share commonalities before or after the rigidity threshold.

Proposition 5a: Dynamic capabilities that foster endogenous variation in routines and change in capabilities are effective when rigidity has not accumulated enough to surpass the rigidity threshold.

Proposition 5b: Dynamic capabilities that alter resource base and change organizational learning mechanism are effective when rigidity has accumulated enough to surpass the rigidity threshold.

Modelling rent for capability reconfiguration

Routinization can lead to efficiency. Although, rigidity accumulates in the routinization process, it can also lead to efficiency. According to the above results on rigidity accumulation, rigidity increases with the repetition of routines. Therefore, efficiency increases with the repetition of routines. Let a be the revenue parameter to determine the value from efficiency. We assume that the cost parameter of this effort is b.

Let z be capability building rent. That is to say, for example, if the new market or technological opportunity indicates broad benefit to change into, the numerical value of z will be large. We also set organizations achieving the full potential of new market or technological opportunities in the process of capability change will be constrained by learning effect. Such effect is denoted by e^{-r}, which is also influenced by repetitions. π is the potential value of achieved change. We have the following model:

$$\pi = a\left(\sum_{j=1}^{i}\left(z-e^{-jr}\right) + \sum_{j=i+1}^{n}\left(z-e^{-(j-i)r}\right) \right) - b\left(e^{ir}+e^{(n-i)r}\right)$$

$$\pi = anz - \frac{2ae^{-r}}{1-e^{-r}} + a\frac{e^{-(i+1)r}+e^{-(n-i+1)r}}{1-e^{-r}} - b\left(e^{ir}+e^{(n-i)r}\right) \quad (18)$$

$$\frac{\partial \pi}{\partial i} = a\frac{-re^{-(i+1)r}+re^{-(n-i+1)r}}{1-e^{-r}} - b\left(re^{ir}-re^{(n-i)r}\right) = 0$$

$$i^{*} = \frac{n}{2} \quad (19)$$

Using (19),

$$\pi = anz - \frac{2a}{e^{r}-1} + 2a\frac{1}{e^{r}-1}e^{-\frac{n}{2}r} - 2be^{\frac{n}{2}r}, \quad (20)$$

$$\frac{\partial \pi}{\partial n} = az - ar\frac{1}{e^{r}-1}e^{-\frac{n}{2}r} - bre^{\frac{n}{2}r} = 0$$

$$e^{\frac{n}{2}r} = \frac{a\frac{1}{e^{r}-1} + \sqrt{\left(a\frac{1}{e^{r}-1}\right)^{2}+\frac{4abz}{r}}}{2b} \quad (21)$$

$$n^{*} = \frac{2\ln\left(\frac{a}{b}\frac{1}{e^{r}-1} + \sqrt{\left(\frac{a}{b}\frac{1}{e^{r}-1}\right)^{2}+\frac{4az}{br}} \right) - 2\ln 2}{r} \quad (22)$$

From Equation 22, result of this model shows that there is an optimal n^{*} for capability building to bring the highest rent and performance of dynamic capability. Thus, the performance of dynamic capabilities reconfiguring ordinary capabilities is also influenced by the rigidity threshold effect. That is to say, for every capability, there should be an optimal timing to select and retain a positive variation in its associated routines. This result indicates that high level of routinization or reduced level of routinization may not the best choice for firms. However, in reality, firms may find it very hard to always catch the best timing for every capability reconfiguring opportunities due to effect such as bounded rationality (Simon, 1991). It should be practical for firms to consider how to position their capabilities emphasis in light of such threshold.

First, if a capability such as an operational process (e.g. production) has a traditional emphasis on efficiency and reliable performances and has a high task frequency, managers that are associated with such operational process will probably find themselves in a situation already behind the optimal timing for reconfiguration. In such situation, managers should resist the temptation of fostering too much variation in routines but rather, they should reduce the level of routinization by focusing on reduction of reconfiguration cost such as enhancement on translating tacit knowledge to explicit knowledge (Nonaka, 2008).

Second, if a capability such as a strategic process (e.g.

restructuring, merger and acquisition, building alliances), has an emphasis on successful rate and low task frequency, managers of such capabilities probably find themselves in a situation that is before the threshold. Such capabilities in order to gain better performances, should focus on more routinization of processes such as emphasizing experiential learning and accumulation, knowledge articulation and codification (Zollo and Winter, 2002). Thus, the sixth and seventh proposition:

Proposition 6: Dynamic capabilities that reconfigure ordinary capabilities have an optimal performance along the repetition trajectory of associated routines.

Proposition 7a: Dynamic capabilities that reconfigure high task frequency capabilities should emphasize reduced level of routinization.

Proposition 7b: Dynamic capabilities that reconfigure low task frequency capabilities should emphasize high level of routinization.

DISCUSSION

Dynamic capabilities are embedded in routine organizational processes to implement effective change (Eisenhardt and Martin, 2000; Teece et al., 1997). The differentiated views in dynamic capability theoretical development still fail to reach a unified understanding of its heterogeneity and performance links. One question in particular in heterogeneity debate is the relation between dynamic capabilities and routinization of organizational process. Sub-stream research around Teece et al. (1997) contended that dynamic capabilities rely on large complex routinization, whereas others following Eisenhardt and Martin (2000) insisted on reduced routinization (Peteraf et al., 2013; Schreyögg and Kliesch-Eberl, 2007; Wohlgemuth and Wenzel, 2016). Another major debate is dynamic capabilities' outcomes, of which the dynamic capabilities performance is in the center of such heated discussion. Teece et al. (1997) contend that dynamic capabilities directly generate competitive advantage and sustain firm performances. Makadok (2001) uses resource based perspective to explain that dynamic capabilities have two rent generating mechanisms. However, Eisenhardt and Martin (2000) argued that dynamic capabilities in reaching superior performance are only necessary but not sufficient. In addressing relevant questions concerning dynamic capabilities, Zott (2003) offers a perspective to investigate dynamic capabilities with the consideration of timing, which reveals that the heterogeneity of firm performances links to dynamic capabilities may have their roots in the time that firms choose to reconfigure resources. However, Arend and Bromiley (2009) indicated that such conclusion is clouded by established economic theories and thus render such perspective specious. The organizational population school holds the view that organizational

environment favors firms with the most inert structure and routines, which makes successful firms almost impossible to change strategic directions (Hannan and Freeman, 1984). Such paradoxical views on dynamic capabilities left many questions unanswered, such as underdeveloped prescriptions (for example, how and when to reconfigure resources and capabilities) (Williamson, 1999) or unclear cost-benefit parameters concerning dynamic capabilities (Lavie, 2006).

In light of these debates, a rigorous modeling method was adopted to investigate the relationship between routinization and dynamic capabilities. The authors wish to provide a nuanced view to explain such gap in major theoretical development as well as empirical results from the perspective of routinization and reconfiguration of operational capabilities (processes). From previous research that focuses on managerial action or resource configuration, a very interesting finding of the current research is that along the trajectory of routine repetition and rigidity accumulation, there is threshold effect that may provide some new answers to why dynamic capabilities may be heterogeneous and with unclear performance links. It was found that in the process of routinization or routine repetition, there is a threshold both in rigidity accumulation, which is a result of development in multiple routine characteristics.

The implication of this threshold for dynamic capabilities heterogeneity debate is that in consideration of existence of such threshold, reconfiguring ordinary capabilities may need to take different approach considering before and after the threshold. Before routinization reach such threshold, a kind of dynamic capabilities that foster timely and rhythmic variation in routine activities and proper selection and retention of desirable variation may be more effective. Whereas, for capabilities and its routinization process that have already passed such threshold, fostering variation mechanism may not be very effective, because the threshold indicates that when the extent of routinization passes such threshold, new variation will not survive selection because previous routine patterns have too much associated rigidity. In such situation, managers of such capability or associated organizational process need to adopt dynamic capabilities that not only adjust resource base, but also need to alter mechanism of tacit knowledge learning to increase their understanding of new routines, such as enhancing experiential accumulation, knowledge articulation and codification.

The implication of this threshold for dynamic capabilities-performance link debate is that in considering the existence of such threshold, capabilities need to be routinized to certain extent for firms to gain both enough efficiency and capability building rent. However, the exact extent of routinization or the perfect timing within the trajectory of routine repetition is usually very hard to catch for every capability. A practical view should be differentiating separate positions a capabilities routinization emphasis along the routine repetition trajectory. In this

view, dynamic capabilities that reconfigure high task frequency and efficiency orientated capabilities should emphasize more on reduced routinization, whereas dynamic capabilities that reconfigure low task frequency capabilities with emphasis on successful ratio should highlight reduced routinization.

Thus, firms that implement dynamic capabilities may be particularly different in their approaches considering such threshold. One example of such contrast is how Toyota and IBM adopt dynamic capabilities to implement change. Toyota has been a universally reorganized firm as the advocator of continuous improvement. Adler et al., (1999) research illustrates in detail how a venture by Toyota implements changes and learnings in a form of continuous improvement and innovation. The manu-facturer adopts multiple measures to create environments and systems that encourage its employees to make improvement in the interim of their daily operation. Such dynamic capabilities emphasize and facilitate continuous change in the forms of Kaizen program (referring to continuous improvements in the daily operations) and major changeovers (referring to major innovations and integration of new production directions). Such settings for continuous change are a good illustration of how firms position themselves before the threshold to implement dynamic capabilities. Whereas in Harreld et al.'s (2007) research on IBM restructuring approach, a total shift of direction in certain time point was considered and labeled as a form of dynamic capability. In mid-1980s, IBM enjoyed a dominant place in the computer industry; however, in the early 1990s, the company suffered slow growth and lost its advantages in the industry, and had to make major job cuts after 70 years of avoiding layoffs to ensure its survival. In facing such disastrous situation, the company adopted a series of transformations in its strategy and business operation from production to solution services. These efforts placed heavy emphasis on changing organizational learning mechanisms and strategic execution. The company was later successfully restructured as a leading information technology service firm. Such route taken by IBM is a very good example of how firms behind the threshold should act to implement dynamic capabilities.

The main contribution of this research is that routinization was linked with dynamic capabilities' heterogeneity and performances. The findings on the threshold effect of routinization could open new avenues for explaining and integrating the divergence in dynamic capability theoretical development. Is there a threshold effect from routinization process that may require different types of dynamic capabilities? This question is also a new research avenue for future empirical testing and theoretical extension.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

Adler PS, Benner M, Brunner DJ, MacDuffie JP, Osono E, Staats BR, Winter SG (2009). Perspectives on the productivity dilemma. J. Operations Manage. 27(2):99-113.

Adler PS, Goldoftas B, Levine DI (1999). Flexibility versus efficiency? A case study of model changeovers in the Toyota production system. Organ. Sci. 10(1):43-68.

Amburgey TL, Kelly D, Barnett WP (1990). Resetting the clock: The dynamics of organizational change and failure. In Academy of Management Proceedings. Acad. Manage. 1:160-164.

Arend RJ, Bromiley P (2009). Assessing the dynamic capabilities view: spare change, everyone? Strateg. Organ. 7:75-90.

Barreto I (2010). Dynamic capabilities: A review of past research and an agenda for the future. J. Manage. 36(1):256-280.

Becker MC (2008a). Handbook of organizational routines. Edward Elgar Publishing.

Becker MC (2008b). Handbook of Organizational Routines. In: Dosi G, Faillo M, Marengo L (ed) Problem solving and governance in the capability-based view of the firm: the roles and theoretical representations of organizational routines. Cheltenham UK and Northampton MA, Edward Elgar, pp. 107-121.

Cohen MD, Bacdayan P (1994). Organizational routines are stored as procedural memory: Evidence from a laboratory study. Organ. Sci. 5(4):554-568.

Cohen MD, Burkhart R, Dosi G, Egidi M, Marengo L, Warglien M, Winter S (1996). Routines and other recurring action patterns of organizations: Contemporary research issues. Ind. Corp. Change, 5(3):653-698.

D'Aveni RA (1994). Hyper Competition. Managing the dynamics of strategic maneuvering, The Free Press, New York.

Di Stefano G, Peteraf M, Verona G (2014). The organizational drivetrain: A road to integration of dynamic capabilities research. Acad. Manage. Perspect. 28(4):307-327.

Døving E, Gooderham PN (2008). Dynamic capabilities as antecedents of the scope of related diversification: the case of small firm accountancy practices. Strateg. Manage. J. 29(8):841-857.

Egidi M, Narduzzo A (1997). The emergence of path-dependent behaviors in cooperative contexts. Int. J. Ind. Organ. 15(6):677-709.

Eisenhardt KM, Martin JA (2000). Dynamic capabilities: what are they?. Strateg. Manage. J. 21(10-11):1105-1121.

Feldman MS (2000). Organizational routines as a source of continuous change. Organ. Sci. 11(6):611-629.

Feldman MS, Pentland BT (2003). Reconceptualizing organizational routines as a source of flexibility and change. Admin. Sci. Quart. 48(1):94-118..

Gersick CJ, Hackman JR (1990). Habitual routines in task-performing groups. Organizational behavior and human decision processes, 47(1):65-97.

Gilbert CG (2005). Unbundling the structure of inertia: Resource versus routine rigidity. Acad. Manage. J. 48(5):741-763.

Grant RM (1991). The resource-based theory of competitive advantage: implications for strategy formulation. California management review, 33(3):114-135.

Hannan MT, Freeman J (1984). Structural inertia and organizational change. Am. Sociol. Rev. 49:149-164.

Harreld JB, O'Reilly CA, Tushman ML (2007). Dynamic capabilities at IBM: Driving strategy into action. California Management Review, 49(4):21-43.

Helfat CE, Finkelstein S, Mitchell W, Peteraf M, Singh H, Teece D, Winter SG (2009). Dynamic capabilities: Understanding strategic change in organizations. Wile-Blackwell. ISBN: 978-1-405-13575-7. 160p.

Lavie D (2006). Capability reconfiguration: An analysis of incumbent responses to technological change. Acad. Manage. Rev. 31(1):153-174.

Levitt B, March JG (1988). Organizational learning. Ann. Rev. Sociol. 14(1):319-338.

Makadok R (2001). Toward a synthesis of the resource-based and dynamic-capability views of rent creation. Strateg. Manage. J. 22(5):387-401.

Nelson RR, Winter SG (1982). An evolutionary theory of economic

change. Harvard Business School Press, Cambridge.pp.xi,437.

Nonaka I (2008). The knowledge-creating company. Harvard Business Review Press. 72p.

Pentland BT (1992) Organizing moves in software support hot lines. Admin. Sci. Quart. 37:527-548.

Pentland BT, Rueter HH (1994) Organizational routines as grammars of action. Admin. Sci. Quart. 39:484-510.

Pentland BT, Feldman MS, Becker MC, Liu P (2012). Dynamics of organizational routines: A generative model. J. Manage. Stud. 49(8):1484-1508.

Peteraf M, Di Stefano G, Verona G (2013). The elephant in the room of dynamic capabilities: Bringing two diverging conversations together. Strateg. Manage. J. 34(12):1389-1410.

Schreyögg G, Kliesch-Eberl M (2007). How dynamic can organizational capabilities be? Towards a dual-process model of capability dynamization. Strateg. Manage. J. 28:913-933.

Simon HA (1991). Bounded rationality and organizational learning. Organ. Sci. 2(1):125-134.

Sydow J, Schreyögg G, Koch J (2009). Organizational path dependence: Opening the black box. Acad. Manage. Rev. 34(4):689-709.

Teece DJ (2000). Strategies for managing knowledge assets: the role of firm structure and industrial context. Long Range Plann. 33(1):35-54.

Teece DJ (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. Strateg. Manage. J. 28(13):1319-1350.

Teece DJ, Pisano G, Shuen A (1997). Dynamic capabilities and strategic management. Strateg. Manage. J. 18(7):509-533.

Wiggins RR, Ruefli TW (2005). Schumpeter's ghost: Is hypercompetition making the best of times shorter? Strateg. Manage. J. 26(10):887-911.

Williamson OE (1999). Strategy research: Governance and competence perspectives. Strateg. Manage. J. 20(12):1087-1108.

Winter SG (1990) Survival, selection, and inheritance in evolutionary theories of organization. In: Singh JV (ed) Organisational Evolution-New Directions, Sage, Newbury Park, CA, pp. 269-297.

Winter SG (2003). Understanding dynamic capabilities. Strateg. Manage. J. 24(10):991-995.

Wohlgemuth V, Wenzel M (2016). Dynamic capabilities and routinization. J. Bus. Res. 69(5):1944-1948.

Zahra SA, Sapienza HJ, Davidsson P (2006). Entrepreneurship and dynamic capabilities: A review, model and research agenda. J. Manage. Stud. 43(4):917-955.

Zollo M, Winter SG (2002). Deliberate learning and the evolution of dynamic capabilities. Organ. Sci. 13(3):339-351.

Zott C (2003). Dynamic capabilities and the emergence of intraindustry differential firm performance: insights from a simulation study. Strateg. Manage. J. 24(2):97-125.

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Full Length Research Paper

Is integrated reporting a new challenge for public sector entities?

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Integrated reporting (IR) is a new communication tool that is gaining increasing attention among scholars, practitioners, and standard setters in both the private and public sectors. Therefore, it is important to discuss the suitability of the framework proposed by the International Integrated Reporting Council (IIRC). This paper offers some reflections based on case studies of public entities that differ in terms of legal structures, locations, and business models to demonstrate—despite legal and cultural requirements—that some common features exist. The primary aim is to discuss whether IR represents a new challenge for public sector organisations, specifically regarding their stakeholder engagement and their pursuit of greater accountability. In doing so, the selected case studies are examined through a theoretical framework based on the growing IR literature and specific objectives recognised by the <IR> Framework. The results that emerge from this study can be beneficial for both scholars and practitioners, enabling the identification of new paths towards improving reporting in public entities to achieve high stakeholder engagement and overcome the possible limitations of the IR model that has been proposed thus far.

Key words: Integrated reporting, integrated reporting framework, stakeholder engagement, public sector entities, accountability, state-owned enterprises.

INTRODUCTION

New trends in non-financial disclosure: An introduction

The present research aims to discuss whether and how public sector entities can employ integrated reporting (IR) as a suitable tool to provide information related to financial, environmental, and social performance, as well

as governance issues, in one document. The research is motivated by the profound changes that corporate reporting has undergone in both the private and public sectors in response to several types of pressure. Stakeholders require more information-not only related to financial performance but extended to environmental, governance, and sustainability issues as well (Gray,

2006; Dumay et al., 2010; Milne and Gray 2013). Policymakers, standard setters, legislators, and scholars have been paying increasing attention to different information needs with a view to overcoming the limitations that are commonly raised regarding annual reports.

In the public sector, the traditional financial report has been blamed for the limited attention paid to the future of public sector entities; this is because it focuses primarily on the financial aspect (Guthrie et al., 1999). The ability of financial reporting to meet citizens' information needs has been questioned because accounting information is technical in nature and difficult to understand (Brusca and Montesinos, 2006). In addition, the information overload that may occur under the growing pressure for transparency may lead to reduced attention from and lower engagement by stakeholders (Curtin and Meijer, 2006).

Undoubtedly, governments have an increasing tendency to enhance transparency and emphasise financial reporting to engage with their stakeholders (Mack and Ryan, 2007), in line with a New Public Governance (NPG) approach to managing public entities (Osborne, 2010). Based on this perspective, information and communication technologies (ICT) have facilitated communication with citizens, and governments have put forth considerable efforts to enhance online disclosure and democratic participation by citizens as a way to gain legitimacy (Brusca et al., 2016). For these reasons, researchers are proposing the use of tools to increase the production of information that is accessible, as well as easy to obtain and understand, as the so-called 'popular report' (Cohen and Karatzimas, 2015; Cohen et al., 2017).

With the development of a different strand of research touching upon the theoretical and practical consequences of adopting IR, the need has been identified for empirical research investigating case studies (De Villiers et al., 2014, 2017; Dumay et al., 2017). The present research adopts a case study method to assess whether IR may be a suitable tool for public sector entities. Public sector entities have been selected among those publishing reports that include environmental, governance, sustainability, and financial information. The aim is to determine whether the changes occurring in reporting tools are consistent with the information needs of stakeholders in the public domain, beyond specific cultural and legal requirements that characterise different context. The selected case studies are examined through a theoretical lens that is based on the <IR> Framework issued in 2013 and the recent and relevant literature on the matter.

The results of this study may provide a stimulus for practitioners and standard setters to develop detailed and specific guidelines for public sector entities that encompass these organisations' distinct features. Moreover, this study may contribute to the growing strand of research on IR in the public sector (Guthrie et al.,

2017; Katsikas et al., 2017).

LITERATURE REVIEW

The development of integrated reporting

The common call for a report that concisely and effectively provides information on an organisation's social, economic, and financial impacts is all but new. Since 1953, when Howard Rothmann Bowen published his article 'Social Responsibilities of the Businessman', attention towards a more sustainable method of creating value has increased substantially. The concept of a different, holistic form of disclosure that is suitable for comprehending financial and non-financial information in a forward-looking perspective animated the theoretical debate for many years, and scholars have promoted the preparation of reports suitable to demonstrate corporate sustainability (Ball and Grubnic, 2007; Elkington, 1999; Gray, 2006; Guthrie et al., 1999 and Milne and Gray 2013).

The increasing possibility of including all financial and non-financial information in one report led to the creation of the International Integrated Reporting Council (IIRC) in 2009. The council was formed by actors with strong regulatory powers related to accounting—the Association of Chartered Certified Accountants, the Chartered Institute of Management Accountants, and the International Federation of Accountants—with the support of the Big Four companies and organisations focused on sustainability reporting, such as the Global Reporting Initiative, the Climate Disclosure Standards Board, and the Sustainability Accounting Standards Board (Dumay et al., 2017).

Following a consultation process and a pilot programme that was started in 2011, the IIRC released the Integrated Reporting Framework (<IR> framework) in 2013. This framework provides guiding principles and content elements to be disclosed in the report that illustrate the thoroughness of the various operations established in accordance with the business model. In addition, and in keeping with a defined vision and mission, the report shows how the inputs (related to the six capitals: financial, manufactured, intellectual, human, social and relationship, and natural) have been transformed into outputs and have produced certain outcomes, thereby creating new value.

The aim and scope of this new reporting tool are clearly stated in the <IR> Framework: 'The primary purpose of an integrated report is to explain to providers of financial capital how an organisation creates value over time. An integrated report benefits all stakeholders interested in an organisation's ability to create value over time, including employees, customers, suppliers, business partners, local communities, legislators, regulators and policy-makers' (IIRC, 2013).

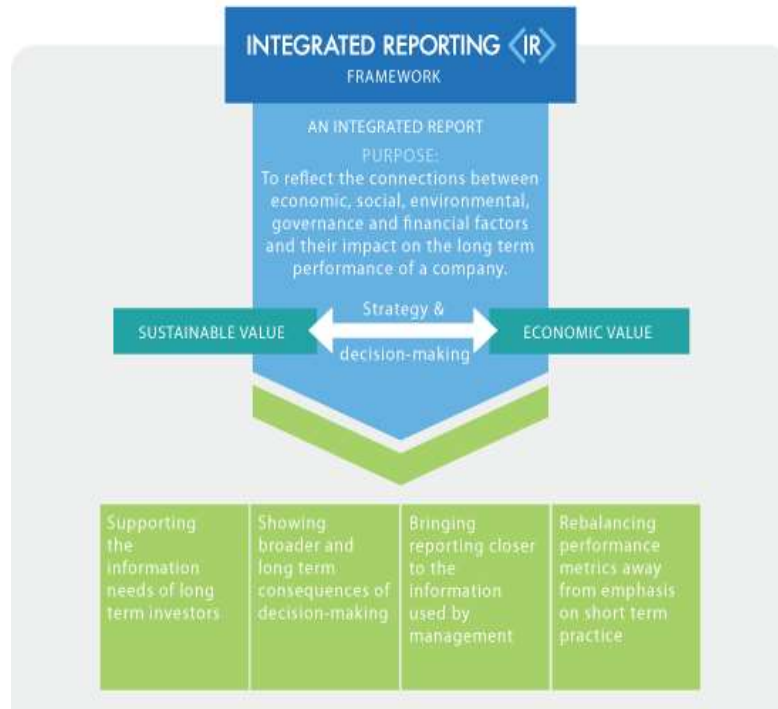Figure 1 summarises the purpose of the document and

Figure 1. Purposes of IR.
Source: AICPA Blog 2011.

highlights how sustainable and economic values should coexist to ensure value creation in the long term. A critical point is the focus on capital providers, rather than on all stakeholders. However, the framework states that all stakeholders may derive advantages from knowing the value created, making clear that <IR> may be undertaken by all kinds of entities: 'The Framework […] is written primarily in the context of private sector, for-profit companies of any size but it can also be applied, adapted as necessary, by public sector and not-for-profit organizations' (<IR> Framework).

Standard setters and consulting companies have devoted growing attention to IR and have investigated possible challenges and opportunities (IRC of SA, 2011; ACCA, 2013; EU, 2014; CGMA, 2014; Deloitte, 2015; JSE, 2015; PwC, 2015; GRI, 2015; IIRC, CIPFA, 2016 and Ernest and Young, 2016). Following an initial period wherein scholars were dedicated to exploring IR (Eccles and Krzus, 2010; Eccles and Saltzman, 2011; Jensen and Berg, 2012), some critiques emerged. Some authors discussed whether IR merely represents a new trend in particular areas, such as South Africa (Atkins and Maroun, 2015; Ahmed Haji and Anifowose, 2017; Doni et al., 2016), or if this tool has more to offer (Dragu and Tudor, 2013; Frías-Aceituno et al., 2013), or if the market rewards integrated reporting quality (Cosma et al., 2018).

Above all, an intense dialogue involves quite a broad group of scholars discussing how IR can be implemented in organisations and which kinds of changes are necessary so that it does not result in a 'patchwork' of different reports. Thus, several researchers have investigated the need for greater effort regarding *integrated thinking*, which is a prerequisite to enabling IR to paint a holistic picture of the value created by the entity and the contribution of the so-called six capitals, and to analyse stakeholders' engagement in defining strategies and objectives (de Villiers et al., 2014; Higgins et al., 2014; Guthrie et al., 2017; Katsikas et al., 2017).

Integrated reporting in the public sector: Hurdles, opportunities, and risks

A question that may arise in discussing IR is whether this tool could prove suitable for public sector entities. Scholars have already noted that the use of specific standards or guidelines may represent a way to restore an organisation's legitimacy (Beck et al., 2017).

In looking at the definition offered by the IIRC, IR primarily seems to attract the interest of investors. This may be the case solely for State-Owned Enterprises (SOEs), in which private shareholders may hold a certain number of shares. Moreover, public sector entities are often highly resistant to change, while the fruitful adoption of IR requires managers and politicians to share a common view of strategies and values (Guthrie, 2017). An additional obstacle to implementing IR in public sector entities may relate to their inadequate information

technology systems. The preparation of reports requires the collection of accurate data on how entire operations are managed, including results related to the management accounting systems that are in place.

As noted by Broadbent and Guthrie (1992), the great diversity of public sector entities means that there are different mechanisms of ownership and control: Some organisations are closer to the market than others, while the role played by elected politicians prevails in other organisations. Thus, accounting tools can play a key role in decision-making, control, and accountability. A holistic document, which incorporates all the different information related to the entity, may increase accountability and transparency. The central focus of IR is the creation of value. In a public entity, this should be interpreted as the creation of 'public value', which is inherent in the mission of any public organisation.

An additional perspective to consider is the importance of sustainability in the public sector. According to Birney et al. (2010), 'public sector organisations are central to the delivery of sustainable development. Every aspect of their role—from education to environmental services, and from planning to social care—shapes how people live their lives'. In the public sector in recent decades, there has been a common tendency to prepare several types of reports (sustainability report, governance report, human rights report, etc.) to meet different information needs. IR may represent an excellent opportunity for public entities that often have a significant impact on the community and environment, as it can provide a holistic view of these different issues and thereby highlight the connectivity that characterises them (Guthrie et al., 2017).

However, considering that the <IR> framework was not developed with specific reference to the public sector, the Global Reporting Initiative (GRI) guidelines may also represent a point of reference for preparing a report that accurately paints a holistic picture of how public entities create value by involving their stakeholders in the decision-making process (Dumay et al., 2017). An additional stimulus, at least in the European context, comes from the European directive on non-financial information. The adoption of IR would undoubtedly facilitate the involved public entities' compliance with the European directive and the related guidelines (EU, 2014; 2017). It is worth noting that the IIRC has established a Public Sector Pioneer Network to collect experiences and learn by doing (IIRC, 2016). However, this network has not yet proposed specific guidelines or documents to support public entities in their IR preparations.

Benefits related to the adoption of IR by public sector entities have already been posited by scholars and standard setters (IIRC and CIPFA, 2016; Katsikas et al., 2017). First, stronger *stakeholder engagement*, a pillar of IR that plays a fundamental role in public entities, may enhance democratic participation and increase citizens' trust. As highlighted by the KPMG report (2012) prepared for the public sector, stakeholder engagement can help an organisation to show how it balances the often-conflicting needs of different stakeholder groups.

Second, as noted by Eccles and Krzus (2010), IR ensures greater clarity regarding relationships and commitment, thereby supporting the disclosure of 'public value creation' through clear objectives and related metrics and identifying the relationship between these key financial and non-financial metrics. An additional advantage should be an improved decision-making process: Developing a set of metrics to ensure that the strategies, objectives, and activities coincide with the mission and vision of the organisation should improve its ability to approach decision-making holistically. Third, better disclosure improves trust within the entity, and integrated thinking reduces the risk of weak coordination, thus enhancing synergy and favouring the identification of key drivers of public value creation. In this respect, one of the key aims of integrated thinking is to break down silos and spot targets and objectives for the public entity as a whole, as this is meaningful for individuals, divisions, and departments.

Nonetheless, the possible limitations and risks related to the adoption of IR should be considered. One main risk, which is common to the introduction of any new accounting tool (Liguori and Steccolini, 2014), is that the adoption of IR may result in a cosmetic change that has no impact on management routines and actions. Furthermore, to be successful, IR requires managers and politicians to achieve a shared view of its strategies and values, which is anything but easy (Katsikas et al., 2017).

Additional limitations and barriers may be detected regarding the application of the <IR> framework to public sector entities: It has not been conceived explicitly for this kind of entity; thus, it does not consider the specific information needed. The lack of indicators is another limitation that is explicitly connected to the <IR> framework, as it creates room for each entity to choose a different standard as a reference to set key performance indicators or to formulate their own indicators. While this choice means there is the possibility to adopt any kind of measures that are more suitable to the specific realm of any single entity, it also reduces comparability between different entities.

Bearing this complex scenario in mind, some experiences in different types of public sector entities are analysed in the following sections to identify the extent to which the reports produced by pioneers are consistent with the <IR> Framework or whether a different approach has been undertaken and how this would improve stakeholder engagement.

METHODOLOGY

This study discusses whether IR may represent an appropriate tool to improve stakeholders' engagement in public sector entities. In doing so, a case study approach has been adopted. Case studies are an appropriate research method to employ when 'a "how" or "why" question is being asked about a contemporary set of events over which the investigator has little or no control' (Yin, 2014).

Table 1. Overview of selected case studies.

Variable	ENI	Munich airport	ROSATOM	Melbourne	Johannesburg	Warsaw
Type of PSE	SOE	SOE	SOE	City	City	City
Sector	Gas and Oil	Transport	Energy	City	City	City
Name of report	Integrated report	Integrated report	Public annual report	Annual report	Integrated annual report	Integrated report
N. pages	95	183	395	218	333	68
Period	2016	2016	2016	2016-17	2015-2016	2014-2015
Framework of reference	<IR>	<IR> + IFRS+GAS20+ GRI	<IR> + IFRS+ GRI4+ AA1000+ RSPP	GRI4	MFMAt + GRI4 + <IR>+ King III	GRI4 + ISO37120
Assurance	No	Yes	Yes	Yes but limited to financial data	Yes	No

Case studies have been selected in keeping with the aim of identifying different types of entities in different contexts. Although contextual factors in each continent (for example, different citizens' awareness of public sector accountability, different cultural approach to dialogue, technological maturity, law requirements) may create incentives for—or, rather, obstacles to—the development of this accountability tool, we believe that comparing experiences done in different contexts may allow for the detection of common features of these new accountability tools (Monfardini, 2010).

First, the <IR> database was examined, with 'public sector' selected as the type of entity. Based on this criterion, only one report published in 2013 was found (HM Revenue and Customs Annual Report, 2013). However, due to the year of reference and the fact that the report pertained to one year only, it was not considered. Further research was conducted with the aim of examining specific sectors in which SOEs are usually involved. The case of ENI (an Italian listed SOE) was selected on the basis that the report has been prepared annually since 2013. Based on the same criterion, the research was repeated for the 'utilities' and 'consumer services' sectors, and the case of Munich Airport and ROSATOM were identified. In keeping with the aim of analysing new reports provided by cities, and considering that none of them was included in the <IR> database, a similar search was run using the GRI database. The cases of the cities of Melbourne and Warsaw were selected to include different regions in the research. Finally, the case of the city of Johannesburg was added to include an example from a country that indubitably represents a benchmark in the field of IR.

Using a deductive approach, a theoretical framework was developed and then tested using the appropriate data (Saunders et al., 2009). Following Eccles et al. (2015) and the <IR> framework, four aspects were analysed in the reports: *focus* of business model, including how many and which capitals have been considered for the value creation process; *materiality*, to detect what has been considered significant for stakeholders; *conciseness*, because effective communication requires the satisfaction of information needs in a direct way, and because this requisite is especially important in public sector entities, where the needs to acquire legitimacy and demonstrate value for money imply the ability to provide accessible and clear information (Curtin and Meijer, 2006); and *stakeholder engagement*, strictly related to the core value of public entities, for which democratic participation and transparency are pillars. The adopted definition is the one provided by Thomson and Bebbington (2005):

Stakeholder engagement describes a range of practices where organisations take a structured approach to consulting with POTENTIAL stakeholders. There are a number of possible practices which achieve this aim, including: Internet bulletin boards, questionnaire surveys mailed to stakeholders, phone surveys, and community-based and/or open meetings designed to bring stakeholders and organisational representatives together.

Finally, secondary qualitative data from the annual reports, sustainability reports, and official websites of the entities were used to enrich the presentation of the six case studies. Table 1 provides a synthesis of the selected cases.

RESULTS

This section adopts a common approach to analyse the selected cases. Following a short synopsis of each entity, the *focus*, *materiality*, and *conciseness* of the document and the *stakeholder engagement* as disclosed in the documents are discussed. To enable a certain degree of comparison despite the different locations and types of activity, the three cases related to SOEs and three municipalities are discussed.

ENI

ENI is an Italian SOE that, based on its market value, is the sixth largest integrated energy company in the world. Its primary business is oil and gas, from hydrocarbon exploration to the downstream phase of product marketing. As stated in the section devoted to disclosing its activities, ENI is engaged in increasing the renewable energy sources segment to sustain the path of the business model towards a low-carbon scenario. As an SOE, ENI should disclose its non-commercial objectives, related-party transactions, policy commitments, ownership and governance structures, risk exposure, and risk management. Sustainability is not new to ENI, and it is deeply rooted in its strategies: The first chairman, Enrico Mattei, has managed the company since the 1950s and has built the business on long-term cooperation with producing countries, the transfer of

STRATEGIC PILLARS

- Transformation
- Restructuring
- Efficient and valuable growth
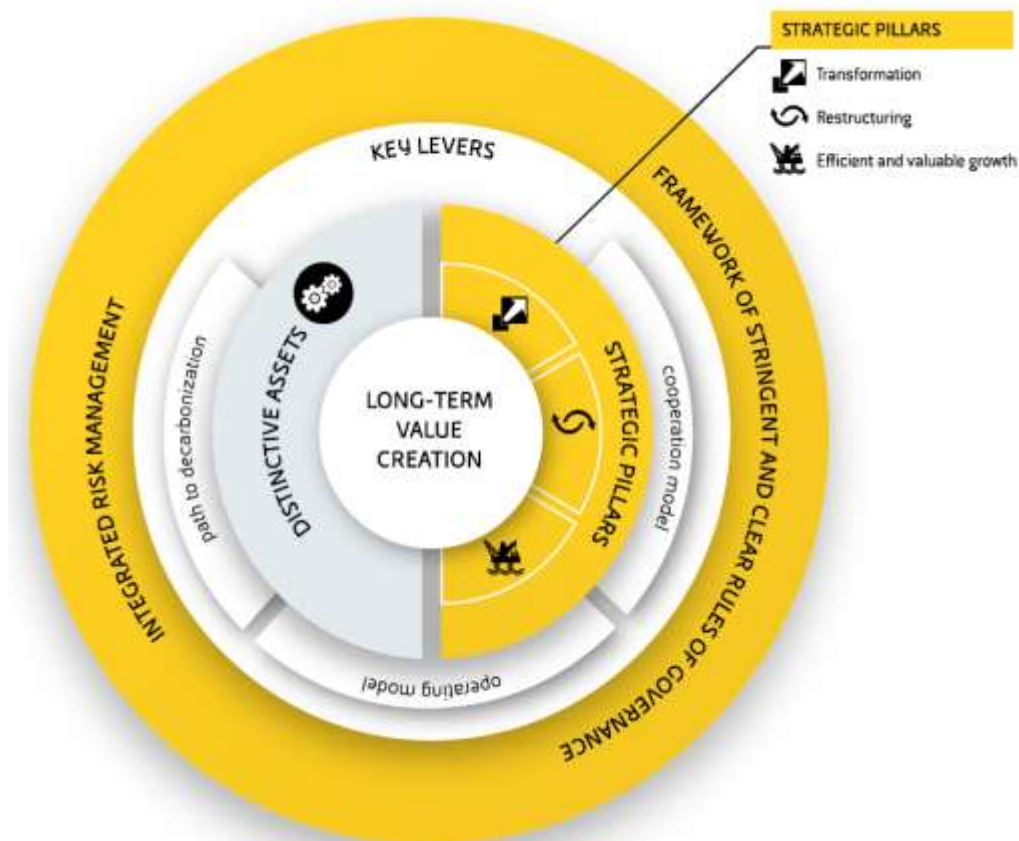
Figure 2. ENI: The business model.
Source: ENI Integrated Report, 2016, P 20.

knowledge, and mutual development. ENI prepared its first IR in 2010, abandoning the stand-alone sustainability report and joining the 2011 pilot programme launched by the IIRC.

IR 2016 is accessible in both PDF and interactive modality on the web. No assurance is provided on the content or on the process that was followed to prepare the report.

ENI focus

The IR for 2016 provides an in-depth review of the company's operations and performance, illustrating the business model and the challenges faced during the reporting period. It is worth noting that in defining its strategies, ENI has adopted an integrated thinking approach that reflects its business model. In fact, as declared by the chairman and chief executive officer, 'The transformation of our model from a divisional organisation to a fully-integrated company, resulted in more streamlined decision making processes and cost savings of €770 million on an annual basis compared to the 2014 budgeted level' (ENI, 2016). The IR presents

the financial results together with information on governance, sustainability, and other material factors identified in accordance with internal and external stakeholders' needs. The entity's business model (Figure 2) emphasises the long-term value creation approach, although no reference is made to the six capitals identified by the <IR> Framework rather, it illustrates distinctive assets in relation to the six dimensions of the value creation process. Information on risks is presented in connection with the company's targets, and forward-looking information is provided in relation to both the short and long terms.

ENI materiality

ENI held an extensive discussion with its stakeholders to determine material issues. The process of identifying, evaluating, and prioritising sustainability issues is based on the strategic plan for the next three years; the risk assessment provided by the internal risk control systems on environmental, sustainability, and governance issues; and the evaluation of the main requests presented by stakeholders, thus integrating internal and external

perspectives of what is 'material' for the company.

ENI conciseness

The IR prepared by ENI is a good example of conciseness, as all the information is provided in 95 pages. This is the consequence of disclosing essential financial figures: detailed data provided via consolidated reporting. It is worth noting that ENI continues to prepare a sustainability report and a strategic plan, both of which complement the information included in the IR. However, the IR makes limited use of graphs and figures, providing information and presenting strategies in a narrative manner.

ENI stakeholder engagement

In defining its strategies, ENI involves the company's shareholders, its employees, and the communities in which it operates. It explicitly mentions suppliers, universities and research centres, the financial community, local communities, domestic institutions, European and international institutions, international organisations, national and international NGOs, the United Nations system, customers and consumers, and other sustainability organisations. The activities that involve stakeholders are variegated, ranging from agreements, meetings, conference calls, and workshops to dialogues and discussions with different stakeholders. The focus on stakeholders also emerges in the business model, in which ENI specifies the value created for stakeholders.

Munich airport

Flughafen München GmbH, Munich (FMG), is an SOE. FMG shares are held by the state of Bavaria, the Federal Republic of Germany, and the city of Munich. It started the journey towards IR in 2010, adopting a forward-looking report and becoming a member of the <IR> Business Network. The integrated report is available on the company's website in the section devoted to 'responsibility' and can be consulted online using an interactive approach or downloaded as a PDF. The document includes the audit report related to the consolidated financial statement. The company's independent assurance report is also available on its website.

Munich airport focus

The report is prepared in accordance with IIRC recommendations but also adheres to German

accounting standards and IFRS in relation to financial data. Sustainability targets take into account the GRI comprehensive option. The report describes the business model that has been adopted in relation to long-term strategies, illustrating the main business units through which the value creation process occurs. This involves six capitals (financial, infrastructure, expertise, employees, environment, and society). Considerable attention is paid to future risks and opportunities, and the risk management system is clearly explained. A matrix provides an overview of the risks, illustrating the time frame and the expected financial impact. Similarly, a matrix provides an overview of the opportunities.

Munich airport materiality

Sustainability management, the responsibility of the Corporate Development division, identifies what is considered material for both internal and external stakeholders. The materiality matrix provides readers with a clear map of material issues that are identified by looking at the information needs of internal and external stakeholders in relation to the six capitals. Selected sustainable development goals from the United Nations are also identified in the materiality process (Figure 3).

Munich airport conciseness

The Munich Airport Integrated Report spans 183 pages, of which a high number are dedicated to financial data (82 pages) and sustainability indicators prepared in accordance with the GRI (12 pages). It must be noted that the company also provides an annual report, a consolidated report, and a sustainability programme. However, in the integrated report, the reader can find all the useful information for building a clear vision of the company's business model and value creation process. Moreover, numerous figures and graphics facilitate the reader's understanding of the content.

Munich airport stakeholder engagement

Based on the report, the relationship with stakeholders is considered pivotal. Thus, a wide range of communication channels has been activated, including the company's website and social networking, surveys, meetings, and working groups. The collected opinions are considered while defining business activities.

ROSATOM

ROSATOM is a State Atomic Energy corporation based in Russia. Founded in 2007, it is one of the largest power

The Sustainable Development Goals relevant for Munich Airport

Goal 3
Good health and well-being

Goal 4
Quality education

Goal 5
Gender equality

Goal 6
Clean water and sanitation

Goal 7
Affordable and clean energy

Goal 8
Decent work and economic growth

Goal 9
Industry, innovation and infrastructure

Goal 12
Responsible consumption and production

Goal 13
Climate action

Goal 15
Life on land

Goal 17
Partnerships for the goals

Figure 3. The sustainable development goals relevant to Munich Airport.
Source: Munich Airport Integrated Report, 2016, P 27.

generation companies in Russia and one of the leading players in the use of nuclear energy. It has also developed new businesses that 'include projects in the sphere of nuclear medicine, wind power, composite materials, additive manufacturing, lasers, robotics, supercomputers, etc'. *Performance of State Atomic Energy Corporation ROSATOM in 2016*, the public report presented by ROSATOM, is a unique case of a 'one report' among the presented cases prepared in accordance with the IIRC Framework, GRI G4, AA1000, IFRS, the Public Reporting Policy of ROSATOM, the Public Reporting Standard of ROSATOM, and RSPP Recommendations for Use in the Governance Practice and Corporate Non-Financial Reporting. ROSATOM's strategic plan is based on the goal defined by the state and approved by the supervisory board. For this reason, and despite ROSATOM's strong effort to be transparent and accountable, the limited involvement of stakeholders in the definition of strategies and activities emerges clearly. This effort also results in the public assurance process that is followed. The document is complemented by an independent assurance. In keeping with its holistic nature, the report includes the opinion of the Internal

Control and Audit Department in addition to the auditing commission's report on financial and business operations.

ROSATOM focus

The report presents the business model in a somewhat complex manner that represents the primary business areas and the connection with capitals. Value creation activities are also identified and connected to governing bodies. The six capitals employed in the value creation process are clearly stated and echo those proposed by the IIRC. The risks are identified and connected to strategic goals, thus describing the management approach. The risk management system adopted by ROSATOM is discussed in detail and illustrated in Figure 4. The actions taken to face the perceived risks are also discussed at length in the report, demonstrating the fundamental role of the risk management system. Future plans are examined in relation to the main strategic goals, and details about each strategic unit are provided for the following year.

ROSATOM materiality

The material aspects to be disclosed in the report have been defined in accordance with both GRI G4 and the <IR> framework, thanks to the joint efforts of a working group and top management. Four distinct levels of materiality have been identified, and a stakeholders' map is provided.

ROSATOM conciseness

The report comprises 395 pages. However, the length is justified by the need to provide detailed accounting information, as it is the only report published by the company. The narrative is complemented by numerous figures, pictures, and graphs to facilitate the reader's interpretation of the company's performance.

ROSATOM stakeholder engagements

ROSATOM declares that it involves stakeholders in the decisions made in each area of its business and identifies its main stakeholders. However, upon analysing the information disclosed in the section dedicated to stakeholder engagement, it appears that a strong effort has been made to enhance communication and transparency in accordance with information needs. The stakeholders' involvement in the decision-making process does not seem clear, which may be due to the nature of the business. However, the report includes a table that

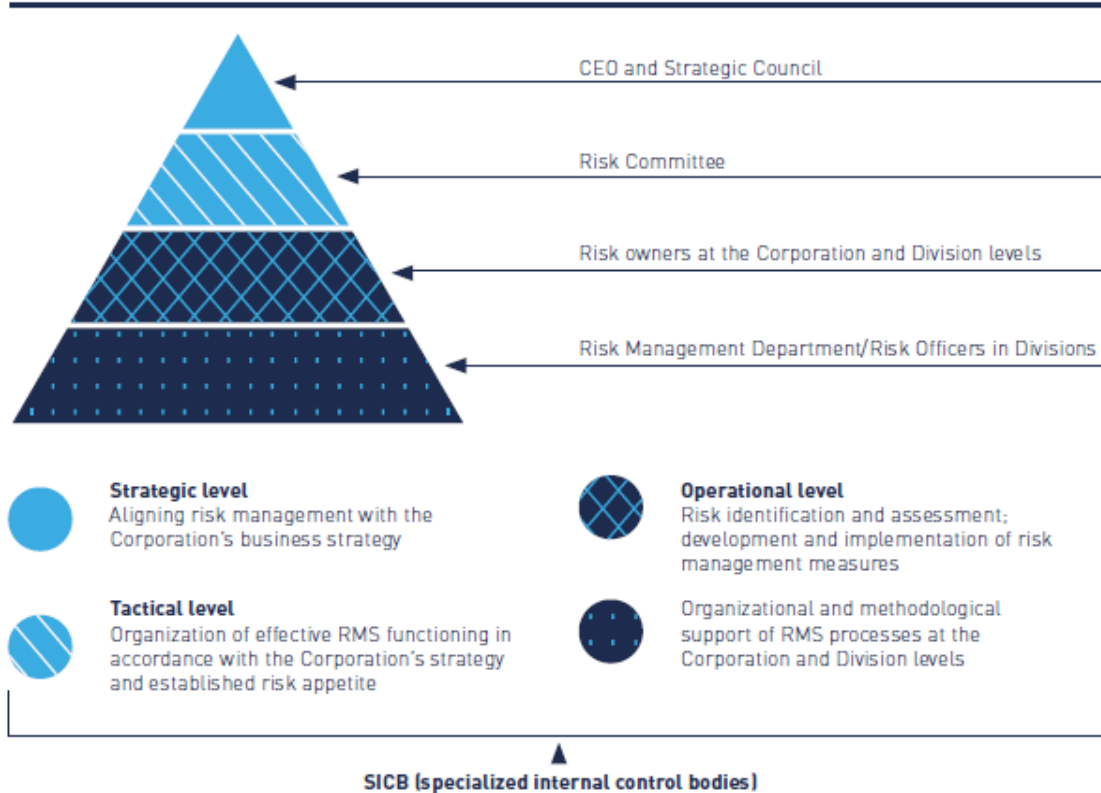ORGANIZATIONAL MODEL OF THE RISK MANAGEMENT SYSTEM AT ROSATOM

CEO and Strategic Council

Risk Committee

Risk owners at the Corporation and Division levels

Risk Management Department/Risk Officers in Divisions

Strategic level
Aligning risk management with the Corporation's business strategy

Operational level
Risk identification and assessment; development and implementation of risk management measures

Tactical level
Organization of effective RMS functioning in accordance with the Corporation's strategy and established risk appetite

Organizational and methodological support of RMS processes at the Corporation and Division levels

SICB (specialized internal control bodies)

Figure 4. Risk management system.
Source: ROSATOM Annual Public Report 2016, P 184.

discloses the fulfilment of the commitments assumed during its preparation. The individuals involved in the public assurance process related to the 2016 report have also signed the document. In addition, during the year, opinion polls, surveys, dialogues, and public assurance procedures have facilitated communication with stakeholders.

City of Melbourne

Melbourne is the capital of the state of Victoria, Australia, and its annual report for 2016 to 2017 was prepared in accordance with the Local Government Act 1989 and, for all matters related to sustainability, with the GRI4. The report provides information on performance achievement in light of the objectives of the annual plan and budget for the same period, as well as the four-year priorities of the Council Plan 2013 to 2017. The city is home to 148,000 citizens and hosts 743,000 people who visit daily for work and recreation. The report is available on the website in the section devoted to the city council; a feedback form to collect opinions from readers is located on the same page.

City of Melbourne focus

The report is strongly focused on performance achieved against the eight fundamental goals of the four-year plan and in keeping with the vision (provided at the beginning of the report), for which sustainability plays a fundamental role (Figure 5). Neither the business model nor the capitals involved in the value creation process are mentioned, but the planning framework is clearly described in addition to how priorities have been translated into actions. Detailed information about the organisation and its human resources is also provided. Below the index, a disclaimer clarifies that, even if it is accurate, it may not be wholly appropriate for specific purposes. A link is also included for individuals interested in actively participating in the decision-making process.

City of Melbourne materiality

The items included in the report are consistent with those identified in the Local Government Act, but there is no materiality matrix, nor is a clear identification of stakeholders provided. However, consistent with GRI4

Figure 5. Eight goals for Melbourne.
Source: City of Melbourne Annual Report 2016–17, P 29.

requirements, material issues are defined and are presented alongside their related boundaries.

City of Melbourne conciseness

The report is not based explicitly on the principle of conciseness, although it aims to provide a clear picture of the performance in an accessible manner. It consists of 220 pages, including a wide range of service and financial performance indicators and a financial report, which together account for more than a third of the entire report.

City of Melbourne stakeholder engagement

The city of Melbourne devotes considerable effort to involving stakeholders in its decision-making process. For this reason, a section on the website ('Participate Melbourne') includes all projects that are open for consultation. Questionnaires, documents, and focus groups are presented to allow for high engagement by all those who are interested in participating in the life of the community, and the report provides some metrics on these activities. In addition, a consultation process involving specific interest groups aims to give a voice to vulnerable stakeholders (Figure 5).

City of Johannesburg

Johannesburg is the biggest city by population size in South Africa, with an estimated population of approximately 4.9 million people. It faces poverty, unemployment, and inequality because many migrants move to the city in search of opportunities for economic prosperity. The report represents the final one related to the *Integrated Development Plan 2011/2016*, which is a part of *Growth and Development Strategy 2040*. The city aims to create liveable communities that are closer to basic services and jobs.

City of Johannesburg focus

Ten strategic priorities are defined and their related programmes disclosed in the report. These are in keeping with the growth and development strategy, and an integrated value creation model is provided to explain how the resources included in the six capitals can be combined in the programmes selected to produce certain outputs and outcomes (Figure 6). More specifically, the outputs are organised into four clusters (sustainable services, economic growth, human and social development, and good governance), while the outcomes are identified in relation to four broad areas: economic, administrative, social, and environmental sustainability.
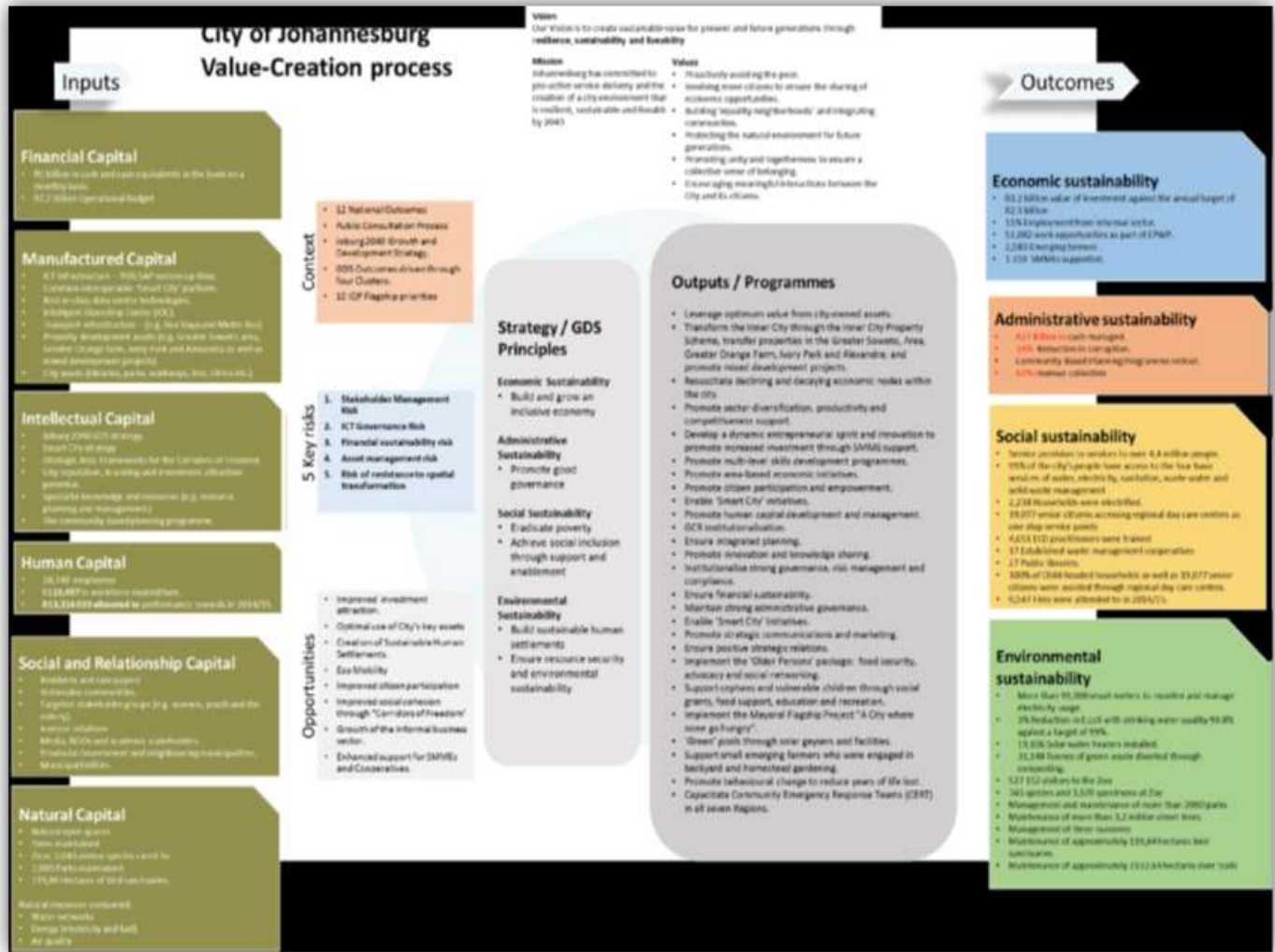
Figure 6. City of Johannesburg value creation process.
Source: Integrated Annual Report Johannesburg 2015/2016, P. 20.

City of Johannesburg materiality

Material issues are defined in accordance with the growth and development strategy and include key aspects in relation to the four clusters that have already been described. However, the need exists for a proper materiality matrix that can identify material issues in accordance with stakeholders' needs.

City of Johannesburg conciseness

The report is a consolidated integrated report. Thus, it contains information on SOEs that are under the city's control. For this reason, it is quite long, consisting of 333 pages. Most of the document (198 of the 333 pages) is dedicated to the disclosure of financial statements and indicators inspired by the GRI4. Because it is mainly

narrative in nature, with limited figures, graphs, and pictures, it is not easy to read.

City of Johannesburg stakeholder engagement

The city has embraced a path of engaging with the community, organising regional ward clusters (24 in the period 2015 to 2016) to enable community members, non-governmental organisations (NGOs), councillors, and committees to participate in the preparation of the city's plans.

City of Warsaw

Warsaw, the capital of Poland, is a city of more than 1.7 million residents. In 2013, it published the first *Integrated*

Warsaw's stakeholders

Local population	✓ including groups with special needs and profiles, such as people with disabilities, students, young parents, people aged 50 and more, job migrants, residents of the limited-use area, etc.
Social institutions	✓ cultural institutions, universities, etc.
Public services	✓ healthcare, security, etc.
Public administration	✓ regional (voivodeship) agencies, central government, ministries, EU authorities, etc.
NGOs	✓ global, local NGOs, etc.
Local government	✓ the Mazowieckie Voivodeship, other Polish cities, adjacent communes, etc.
Cities and countries	✓ neighbouring countries, partner cities, intercity organisations, etc.
Employees	✓ of City of Warsaw, District Offices, subsidiaries, trade unions, outsourced (security staff), etc.
Utilities	✓ electricity, heating, gas, water, etc.
Tourists	✓ from Poland, abroad.
Business	✓ international corporations, domestic businesses, investors, etc.
Media	✓ local, domestic, international, etc.
Environment	✓ soft landscaped areas, air, etc.

Figure 7. Warsaw's stakeholders.
Source: Warsaw's Third Integrated Report, P 20.

Sustainability Report. In July 2017, the mayor presented the third report for 2014 to 2015, which is available in English on the website (Warsaw, 2015). Considering that the first report was prepared while the <IR> Framework was still under consultation, it is not surprising that it was prepared in keeping with the GRI4 and indicators of ISO37120. In the subsequent editions, however, the mayor decided to continue with the same model, and introduction explicitly mentions the effort made to ensure comparability with previous reports. The report is available in PDF in both English and Polish. No assurance is provided regarding the content or the methodology followed in preparing the report.

City of Warsaw focus

In accordance with the title, the report discusses the three pillars of sustainability: economic, social, and environmental factors. It offers general information on the governance code and data about employees. It presents facts and data that are essentially framed in the past, with limited reference to future plans and related risks. Because the report was prepared in accordance with the GRI4, there is no specific identification of capital involved in the value creation process.

City of Warsaw materiality

The report provides the reader with a list of reporting aspects defined in accordance with stakeholders' requirements. Public consultations using the City of Warsaw's website and social networks allow for the identification of the reporting aspects included in the document; these are organised into three main areas (economic, social, environmental) and are further structured in specific activities.

City of Warsaw conciseness

The third report, which devotes considerable effort to conciseness, is 62 pages plus 6 pages of detailed indicators. The data are presented in an easy and understandable format, making extensive use of graphs and pictures that facilitate comprehension. The willingness to facilitate understanding for all stakeholders is evident based on the wide use of graphs, including those that provide a comparative representation of expenditures over the two years (Figure 7).

City of Warsaw stakeholder engagement

The city identifies its core stakeholders as seen in Figure 7. In addition to public consultations, the participatory budget has been adopted, and the plans chosen by citizens have been executed. The report identifies the main stakeholders (the local population, social institutions, public services, public administration, NGOs, local government, cities and counties, employees, utilities, tourists, business, media, and environment) and declares that five different channels have been used to communicate with them: phone, self-service website, mobile app, email, and chat (Figure 7).

DISCUSSION

New reporting trends in public sector entities

The analysis of these six selected cases deserves further discussion regarding the extent to which the <IR> framework provides a point of reference for preparing a holistic report that is suitable for presenting financial and non-financial information in a language that is accessible to all stakeholders. To this end, Table 2 offers a comparative overview of the cases analysed.

A key point to note is that not all entities discussed in the presented cases have decided to follow the <IR> Framework as a point of reference. Of those that have, early adopters (ENI and Munich Airport) have used additional guidelines such as the GRI, a benchmark for sustainability issues and for identifying suitable key performance indicators. The case of Johannesburg begs further deliberation. This report was prepared in accordance with the legal requirements for a municipality in South Africa but also takes into consideration the <IR> Framework and the King III. The level of stakeholder engagement is considerably low, and there is no place for a participatory budget or for defining specific priorities in a clear and transparent manner. Thus, the role played by the environment and by a certain degree of 'maturity' on the part of the community regarding its participation in a public entity's decision-making process may prevail.

In the case of Warsaw, even if the document is defined as 'integrated', its primary focus is sustainability. Although some key elements required by the <IR> Framework, including the 'capitals', are missing, the report seems suitable for satisfying information needs: The preference for conciseness may lead citizens and other stakeholders to search in other documents when more detailed information is needed. Nonetheless, the report allows stakeholders with no accounting background, such as citizens and taxpayers, to easily understand how resources are used, which resources are prioritised, and the resulting impacts.

Undeniably, several differences exist between the cases analysed. However, the comparison is not intended to highlight the differences but to discuss the extent to which the requirements of the <IR> Framework may be well suited to public sector entities and to discern the main common characteristics of the different reports analysed. It is also important to consider whether the reports analysed may represent a tool to enhance stakeholder engagement. Possibly due to their experience as early adopters, ENI and Munich Airport seem to have assumed an integrated thinking approach in defining strategies and facing risks and opportunities, and they have achieved a high level of stakeholder engagement, as shown in their reports (ENI report, pp. 14–15; Munich Airport Report, 2016.p. 26).

ROSATOM presents other characteristics that deserve attention. First, due to the type of activities undertaken, strict control is exercised by the central government in defining strategic objectives. Thus, stakeholder engagement can be used only in relation to accountability issues. This is a clear example of how the public sector's compelling needs and priorities as defined at the national level may prevail, creating hurdles and barriers to deeper stakeholder engagement in the decision-making process. Again, the business model affects the focus on risks, which is particularly robust and pervades all activities. Nonetheless, the willingness to be accountable has led ROSATOM to provide an assurance process by stakeholders and by an independent auditor. It seems quite clear that IR has been used as a tool to achieve legitimacy in the delicate nuclear energy field, disclosing how much attention and care the company pays to safety and environmental issues.

In summary, the case studies presented show the different approaches used by various types of organisations, which is further evidence of IR as a tailor-made tool that must be shaped in accordance with the specific features of each entity and that can be prepared following different frameworks. In this regard, the analysed case studies demonstrate the contemporary use of different references in the preparation of annual reports. The business model can emerge clearly or partially, the risks to be faced can be clarified in connection with different strategies or generally in relation to the whole organisation, and what is material can be identified following an open and continued dialogue or some embryonic forms of consultation with stakeholders. However, at the core of these reports is the willingness to communicate values, strategies, and actions undertaken, together with output and outcome produced, and to progressively increase stakeholder engagement.

It is also clear that the need for accountability may be a major driver in defining material aspects to be disclosed in accordance with requests by different groups of stakeholders, thereby empirically demonstrating the fundamental role of stakeholder engagement in public sector organisations' sustainability issues (Rinaldi et al., 2014). From this point of view, the integrated report offers public sector entities an excellent opportunity to clarify

Table 2. Comparing IR in public sector entities.

Variable	Descriptions	ENI	Munich airport	ROSATOM	Melbourne	Johannesburg	Warsaw
Strategic focus and future orientation	Explain how the entities plan to use 'the capitals' and the impact of business activities on the capitals	√	√	√	-	√	-
	Explain the time frames (short-, medium-, and long-term) associated with strategic objectives	√	√	√	√	√	√
	Explain the strategic importance of material risks and opportunities in the discussion of business strategy	√	√	√	√	√	-
Stakeholder engagement	Have the stakeholders been involved in the definition of the material issues?	√	√	√	√	√	√
	Have the needs and expectations of the stakeholders been considered in the definition of the external environment?	√	√	√	√	√	√
	Have the stakeholders been identified in the definition of the business model?	-	√	-	-	-	√
	Does the organisation activate stakeholder engagement activities?	√	√	√	√	√	√
	If the answer to the previous question is yes, are the inputs used in the definition of the strategy?	√	√	-	√	√	√
Materiality	Explain material risks and opportunities in detail, especially regarding known or potential effects on financial, environmental, social, or governance performance	√	√	√	-	√	-
	Identify the time frames (short-, medium-, and long-term) associated with material risk and opportunities	√	√	√	-	-	-
	Prioritise material risks and opportunities based on their magnitude/importance		√	√	-	-	-
	Prioritise the perspectives of stakeholders consulted		√	√	-	-	√
Conciseness	Information includes sufficient context to understand the organisation's strategy, governance, performance, and prospects without being burdened with less relevant information	√	√	√	√	√	√
	There is a balance between conciseness and the other guiding principles, particularly completeness and comparability	√	-	√	√	-	√

how competing challenges have been balanced to achieve more sustainable growth while respecting intergenerational equity (Ball et al., 2014). It also considers the specific requests of stakeholders, even in those cases in which there is not yet a community that is able to engage in the decision-making process. Moreover, many public sector organisations often must disclose how they comply with national or local strategies defined at the political level, and IR may offer them opportunities to communicate how these overarching objectives have been harmonised with these entities' missions and values.

An additional area that is worth investigating is the integrated thinking approach to defining strategies and actions. One main advantage of an integrated approach is the possibility of breaking down traditional borders between departments or units to achieve a common view of future actions, thus increasing cooperation and coordination (Katsikas et al., 2017). This kind of approach may, in turn, lead to high efficiency in the use of resources, thereby avoiding overlapping and conflicts. However, as already noted by scholars (Higgins et al., 2014), this is possible only if radical changes occur in the entities. The effective

adoption of IR requires time and a shared view among managers and, in some public sector entities, politicians (Table 2).

Conclusion

IR is receiving increasing attention from professional organisations, standard setters, and scholars in both the private and public sectors. Early adopters are actively contributing to the improved definition of which content and approach should be followed to ensure the report reflects an

innovative way to manage an entity. By analysing six different case studies, this study makes it possible to consider how the approach to IR has been interpreted in different contexts and how stakeholders may be involved in defining material issues. However, it does not investigate internal processes and, consequently, does not allow for an assessment of whether integrated thinking permeates the various organisations.

A fundamental lesson emerging from the case studies is that, as it stands, the <IR> Framework does not provide sufficient support for public sector entities for it to be considered the primary reference for accountability purposes. Thus, further effort should be made to interpret the peculiarity of public sector organisations. All reports demonstrate-even if with different nuance—that stakeholder engagement is a key aspect of the accountability process and that in some cases (in particular in the cities) stakeholders have been involved in decision-making processes. IR, then, may be considered a tool to enhance stakeholder engagement, improve accountability, and, in turn, gain legitimacy (Beck et al., 2017; Guthrie et al., 2017).

An additional point that deserves attention is the different levels of 'maturity' regarding the approach to IR: In those countries in which NPG is well established and public sector entities are already accustomed to providing information on value for money, illustrating their activities in terms of inputs, outputs, and outcomes, the implementation of IR is a natural development of a disclosure process that is connected to strong stakeholder engagement.

Further research on public sector entities would be beneficial, as it would enable a better understanding of how they create public value for the benefit of the community. Standard setters are aware of the relevance of this new tool and are working to provide better support for IR preparation. Working collaboratively with these standard setters, scholars can contribute to discussions about IR content, principles, and practices. Efforts are necessary to avoid the rhetorical use of this tool and unveil all the management changes that are necessary for the implementation of reliable reports that address stakeholders' information needs.

Abbreviations

GRI, Global Reporting Initiative; **IIRC,** International Integrated Reporting Council; **IR,** Integrated Reporting; **ISO,** International Organization for Standardization **NPG,** New Public Governance; **SOEs,** State-Owned Enterprises.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

REFERENCES

Association of Chartered Certified Accountants (ACCA) (2013). Understanding investors: directions for corporate reporting, retrieved 11 December 2017 http://www.accaglobal.com/content/dam/acca/global/PDF-technical/financial-reporting/pol-afb-ui02.pdf

Ahmed Haji A, Anifowose M (2017). Initial trends in corporate disclosures following the introduction of integrated reporting practice in South Africa. J. Intellect. Cap. 18(2):373-399.

AICPA Blog (2011) Integrated Reporting Framework in the Profession's Future (posted by Carol Scott), retrieved 11 December 2017 from http://blog.aicpa.org/2011/07/integrated-framework-in-the-professions-future.html

Atkins J, Maroun W (2015). Integrated reporting in South Africa in 2012: Perspectives from South African institutional investors. Meditari Account. Res. 23(2):197-221.

Ball A, Grubnic S (2007). Sustainability accounting and accountability in the public sector in Unerman, J., Bebbington, J. and O'Dwyer, B. (Eds), Sustainability Accounting and Accountability (Routledge, London).

Ball A, Grubnic S, Birchall J (2014). Sustainability accounting and accountability in the public sector. in Bebbington. J. Unerman, J., and O'Dwyer, B. (Eds), Sustainability Accounting and Accountability (Routledge, London).

Beck C, Dumay J, Frost G (2017). In pursuit of a 'single source of truth': from threatened legitimacy to integrated reporting. J. Bus. Eth. 141(1):191-205.

Birney A, Clarkson H, Madden P, Porritt J, Tuxworth B (2010). Stepping Up: A Framework for Public Sector Leadership on Sustainability. Forum for the Future. London: UK.

Broadbent J, Guthrie J (1992). Changes in the public sector: A review of recent alternative accounting research Accounting, Audit. Account. J. 5(2):3-31.

Brusca I, Manes Rossi F, Aversano N (2016). Online sustainability information in local governments in an austerity context: An empirical analysis in Italy and Spain. Online Inform Rev. 40(4):497-514.

Brusca I, Montesinos V (2006). Are citizens significant users of government financial information?, Pub. Mon. Manag. 26(4):205-209.

Chartered Global Management Accountant (CGMA) (2014) Integrated Thinking. The next step in integrated reporting, retrieved 11 December 2017 http://www.cgma.org/resources/reports/downloadabledocuments/integrated-thinking-the-next-step-in-integrated-reporting.pdf

Cohen S, Karatzimas S (2015). Tracing the future of reporting in the public sector: introducing integrated popular reporting. Int. J. Public Sector Manag. 28(6):449-460.

Cohen S, Mamakou XJ, Karatzimas S (2017). IT-enhanced popular reports: Analyzing citizen preferences. Gov. Inf. Q. 34(2):283-295.

Cosma S, Soana M G, Venturelli A (2018). Does the market reward integrated report quality? in Afr. J. Bus. Manage. 12(4):78-91.

Curtin D, Meijer AJ (2006). Does transparency strengthen legitimacy? Inform. Polity, 11(2):109-122.

de Villiers C, Rinaldi L, Unerman J (2014). Integrated Reporting: Insights, gaps and an agenda for future research. Accounting, Audit. Account. J. 27(7):1042-1067.

de Villiers C, Hsiao PCK, Maroun W (2017). Developing a conceptual model of influences around integrated reporting, new insights and directions for future research in Meditari Account. Res. 25(4):450-460.

Deloitte (2015). Integrated Reporting as a driver for Integrated Thinking? retrieved 11 December 2017 https://www2.deloitte.com/content/dam/Deloitte/nl/Documents/risk/deloitte-nl-risk-integrated-reporting-a-driver-for-integrated-thinking.pdf.

Doni F, Gasperini A, Pavone P (2016). Early adopters of integrated reporting: The case of the mining industry in South Africa. Afr. J. Bus. Manage. 10(9):187-208.

Dragu IM, Tiron-Tudor A (2013). The integrated reporting initiative from an institutional perspective: Emergent factors in Procedia. Soc. Behav. Sci. 92:275-279.

Dumay J, Guthrie J, Farneti F, (2010). GRI sustainability reporting guidelines for public and third sector organizations: A critical review. Pub. Manag. Rev. 12(4):531-548.

Dumay J, Bernardi C, Guthrie J, La Torre M (2017). Barriers to implementing the International Integrated Reporting Framework: A contemporary academic perspective. Meditari Account. Res., 25(4):461-480.

Eccles RG, Krzus MP (2010). One Report. Integrated reporting for a sustainable society. John Wiley & Sons. USA.

Eccles RG, Krzus MP, Sidney R (2015). The integrated reporting movement: Meaning, momentum, motives, and materiality. John Wiley & Sons. New Jersey.

Eccles RG, Saltzman D (2011). Achieving sustainability through integrated reporting in Stanford Social Innovation Review, Summer, pp. 56-61.

Elkington J (1999). Triple bottom-line reporting: Looking for balance in Australian CPA, 69:18-21.

ENI (2016). Integrated Annual Report 2016. retrieved 11 December 2017 https://www.eni.com/docs/en_IT/enicom/publications-archive/publications/reports/reports-2016/Integrated-Annual-Report-2016.pdf

Ernest and Young (2016). EY's Excellence in Integrated Reporting Awards. A survey of the integrated reports of South Africa's top 10 state-owned entities, retrieved 11 December 2017 from http://www.ey.com/Publication/vwLUAssets/ey-excellence-integrated-reporting-awards-2016/$FILE/ey-excellence-integrated-reporting-awards-2016.pdf

EU (2014). Directive 2014/95/EU of the European Parliament and of the Council of 22 October 2014 amending Directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups, retrieved 11 December 2017 from http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32014L0095&qid=1430238231690

EU (2017). Guidelines on non-financial reporting (methodology for reporting non-financial information) (2017/C 215/01), retrieved 11 December 2017 from http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52017XC0705(01)&from=EN

Frías-Aceituno JV, Rodríguez-Ariza I, García-Sánchez IM (2013). Is integrated reporting determined by a country's legal system? An exploratory study. J Clean Prod. 44:45-55.

Gray R (2006). Social, environmental and sustainability reporting and organizational value creation? Whose value? Whose creation?. Accounting Audit. Account. J. 19(6):793-819.

Global Reporting Initiative (GRI) (2015). Sustainability and reporting Trends in 2025-Preparing the future. GRI's Reporting 2025 Project: First analysis paper, May 2015, retrieved 11 December 2017 from www.globalreporting.org/resourcelibrary/Sustainability-and-Reporting-Trends-in-2025-1.pdf.

Guthrie J, Olson O, Humphrey C (1999). Debating developments in new public financial management: the limits of global theorising and some new ways forward. Financ. Account. Manage. 15(3-4):209-228.

Guthrie J (2017). Preface. In Katsikas E., Manes-Rossi F. and Orelli R. Towards Integrated Reporting - Accounting Change in the Public Sector, Springer, Switzerland.

Guthrie J, Manes-Rossi F, Orelli R (2017). Integrated reporting and integrated thinking in Italian public organizations in Meditari Account. Res. 25(4):553-573.

Higgins C, Stubbs W, Love T (2014). Walking the talk(s): Organisational narratives of integrated reporting, Accounting, Audit. Account. J. 27(7):1090-1119.

International Integrated Reporting Council (IIRC) (2013). International <IR> Framework, retrieved 11 December 2017 from http://integratedreporting.org/resource/international-ir-framework/

International Integrated Reporting Council (IIRC) and CIPFA (2016). Focusing on value creation in the public sector, retrieved 11 December 2017 from http://integratedreporting.org/wp-content/uploads/2016/09/Focusing-on-value-creation-in-the-public-sector-_vFINAL.pdf

IRC of SA (2011). Discussion Paper of the Framework for Integrated Reporting and the Integrated Report Discussion Paper, retrieved 11 December 2017 from http://integratedreporting.org/wp-content/uploads/2012/02/Integrated-Reporting-Committee-of-South-Africa.pdf

Jensen JC, Berg N (2012). Determinants of traditional sustainability reporting versus integrated reporting. An institutionalist approach. Bus. Strat. Env. 21(5):299-316.

Johannesburg Stock Market (JSE) (2015) Limited Listings Requirements Issue 21, retrieved 11 December 2017 from https://www.jse.co.za/content/JSERulesPoliciesandRegulationItems/JSE%20Listings%20Requirements.pdf

Katsikas E, Manes-Rossi F, Orelli R (2017). Towards Integrated Reporting - Accounting Change in the Public Sector, Springer, Switzerland.

KPMG (2012). Applying Integrated Reporting principles in the public sector, retrieved 11 December 2017 from, https://home.kpmg.com/content/dam/kpmg/pdf/2013/04/applying-ir-principles.pdf).

Liguori M, Steccolini I (2014). *Accounting*, innovation and *public-sector change*. Translating reforms into *change*? Crit. Perspect. Account. 25(4-5):319-323.

Mack J, Ryan C (2007). Is there an audience for public sector annual reports: Australian evidence? Int. J. Pub. Sect. Manage, 20(2):134-146.

Milne MJ, Gray R (2013). Whither ecology? The triple bottom line, the global reporting initiative, and corporate sustainability reporting. J. Bus. Ethics 118(1):13-29.

Monfardini P (2010). Accountability in the new public sector: a comparative case study. Int. J. Pub. Sect. Manage. 23(7): 632-646.

Munich Airport (2016). Munich Airport Integrated Report 2016 https://report2016.munich-airport.com/fileadmin/16/PDF_EN/Integrated-Report-2016-EN.pdf (Access 11th December 2017)

Osborne SP (Ed.). (2010). The new public governance: Emerging perspectives on the theory and practice of public governance. Routledge.

PWC (2015). Implementing integrated reporting, retrieved 11 December 2017 from https://www.pwc.com/gx/en/auditservices/publications/assets/pwc-ir-practical-guide.pdf.

ROSATOM (2017). Public Annual Report, retrieved 11 December 2017 from http://www.rosatom.ru/upload/iblock/467/46723195e1f932824a69f8af914fec1b.pdf

Saunders M, Lewis P, Thornhill A (2009). Research methods for business students, 5/e. Pearson Education India.

Thomson I, Bebbington J (2005). Social and environmental reporting in the UK: a pedagogic evaluation. Crit. Perspect. Account. 16(5):507-533.

Warsaw (2015). Sustainable Development of Warsaw 2014-2015. Warsaw's Third Integrated Report., retrieved 11 December 2017 from https://infrastruktura.um.warszawa.pl/sites/infrastruktura.um.warszawa.pl/files/sustainable_development_of_warsaw.pdf

Yin RK (2014). Case Study Research: Design and Methods, 5th ed., Sage, Thousand Oaks, CA.

Full Length Research Paper

Effect of Chinese outward foreign direct investment on international trade of Africa

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This article aimed at analyzing the relationship between foreign direct investments from China and the international trade of African countries. International trade was found to be affected by the degree of openness of the economy, the level of exports and the level of imports. The findings were brought out by using a Vector Error Correction Model in a cylindrical panel of 52 African countries on a period going from 2000 to 2015. The three main findings were: There was a two-way relationship between foreign direct investment and international trade; foreign direct investment had a strong positive influence on international trade; trade exerted a weak and negative influence on foreign direct investment. Thanks to this study, it was indicated to recommend that alternation be sought by African heads of states through transparent elections to guarantee political stability necessary to attract foreign direct investment.

Key words: Foreign direct investment, outward Chinese foreign direct investments, international trade, exports, Imports, Africa.

INTRODUCTION

In 1955 at the Bandung conference in Indonesia, the first diplomatic contact between China and Africa was made. Relations have since become tighter and China has become the largest trading partner for Africa. At this time, Outward Foreign Direct Investment (OFDI) of China was supported by central governments (UNCTAD, 2007). China has continued since this period to support African countries. Chinese investment in Africa has increased dramatically in the last 15 years (MOFCOM, 2017). This increase of investment in Africa is part of a growing social, economic and political cooperation between China

and Africa; indeed, the relationship is embodied in the Forum on China-Africa Cooperation (FOCAC).

Since the year 2003, cooperation between China and Africa has been growing considerably. China's total OFDI to Africa stood at $4,875.41 million in 2015 (MOFCOM, UNCTAD and Author's imputation data, 2017). In 2008, the Statistical Bulletin of China's OFDI showed that China invested in 45 of 54 African countries during the period 2003 to 2008. Africa came third behind Latin America, accounting for 6.9 per cent of China's total OFDI.

In 2012, the Chinese department of trade published an

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agreement in which China was, under the direct investment, investing in different ways in Africa, allowing the African continent to take off in the fight against poverty and in the improvement of its economic growth; all benefits that aligned with the Millennium Development Goal set by the international community. Chinese direct investment is well oriented in various sectors such as the extractive industries, trade, construction of road infrastructure and railway. A large share of FDI inflows to Africa goes to the primary and tertiary sector.

In 2013 the share of world OFDI had overcharged three times more from 2.8% in 2008 to 3.2%. Africa had 2.7% (UNCTAD, 2014) of world OFDI and 23% of FDI coming from China ministry of commerce, which made china not only a donor, but also a backer, investor and contractor. In 2017, global foreign investment inflows increased by 38%in 2015 to $1,762 billion, up from $1,277 billion in 2014. The past decade witnessed a dramatic increase in FDI flows to developing countries except the year 2015. FDI flows to developing economies decreased to 9.5 percent in 2015 dipping to $765 billion; however, there is a high probability of growth over the next 10 years. This is welcome news, especially for some developing countries that do not have access to international capital markets. The African continent has received inflows of foreign investment for $ 54,079 million in 2015. The rapid growth of Chinese OFDI is likely to continue, particularly in services and in infrastructure industries.

Relationships between FDI and trade are studied by several researchers. Some of them have found that there is a substitution effect between FDI and trade. Others have concluded on complementarity between the two variables. Positive relationship between these variables has emerged in the literature in the recent years. Also we note that negative relationship has stand out. Certain authors have found that there is short run causality between FDI and trade and others have found a long run relationship between these variables.

In addition to financial support through its FDI in Africa, China has kept tight commercial relations with the African market. The share of African market considered as sizeable, although not representing a high level on the international market. The place of Africa in the global economy accurately reflects its economic weaknesses. The share of Africa in world trade and foreign investment has never exceeded 4% between 1990 and 2016.

The increase in the volume of trade is accompanied by rapid inflow of FDI in Africa. It is interesting to note that the main investors are also the major trading partners of Africa. The relationship between China and Africa has intensified since the beginning of the year 2001, with expansion of bilateral trade. We noted an increase of 16.5 percent in the Chinese exports in Africa from 2013-2015 and a decrease of 25.5 percent of African export to china from 2011 to 2015.

LITERATURE REVIEW

FDI and trade

The empirical literature that studies the impacts of FDI and trade is very large. The results of these studies vary considerably from country to country and from industry to industry. Mundell (2010) in his study on International Trade and International Capital Flows mentioned the substitutability of trade and capital flows in different ways: An increase in trade impediments stimulates factor movements, and an increase in impediments to factors stimulates trade. Mundell (2010) has taken an example to illustrate the assumption (Mundell, 2010). This example concludes that a change in the structure of trade, in this case led by an exogenous increase in tariffs, created incentives for capital to move across borders. In conclusion, FDI and international trade have substitution effect.

Bruce and Blonigen (1999) in the study in research of substitution between foreign production and exports, used dataset of product-level for the period 1972 to 1996 to find substantial evidence for both a substitution and a complementarity effect between affiliate production and exports with Japanese automobile parts for the US market. Authors have used methods such as Zellner's iterative SUR technique; regression analysis and AR1 correction to show that substitution of foreign production for exports are often large one-time shifts, not gradual changes over time. However, it is also apparent that there is no complete replacement of exports by local production. Thus, firms may often choose to have some combination of both to serve a market.

Simionescu (2014) studied the relationship between trade and FDI. The author used several methods such as Granger causality tests, unit root test and ADF test for panel data for the period 2002 to 2013 for G7 country. The result showed that there is only short run causality between FDI and exports and FDI and imports. There were unidirectional causal relationships on long run between FDI and trade. Moreover, short run causality in both senses was observed for FDI and trade in G7 countries on the considered horizon.

Liu et al. (2002) analyzed the causal relation between FDI and trade (exports and imports) in China. The authors used a panel of bilateral data for China and 19 regions on the horizon from 1984 to 1998. The panel data methods were used to test unit roots and causality. The results showed a potential development for China: the increase in imports determined the increase in FDI from regions to China and an increase in exports from China to regions or home country. An increase in exports determined the increase in imports.

Markusen and Maskus (2002) argued that vertical FDI where multinational enterprises geographically split

stages of production is likely to stimulate trade; On the other hand, horizontal FDI where multinational enterprises (MNCs) produce identical goods at multiple locations is likely to substitute for trade. Causal links between trade liberalization and FDI was highlighted by Iqbal et al. (2015). They carried out studies by taking evidence in Pakistan. For this purpose, they used secondary data from year 1990 to 2005. By applying in gretl test data and using dependent variable (FDI, Taxes, and Taxes on income) and independent variables (trade liberalization), the results were estimated through the economic tool known as Autoregressive model (AR1) and computes feasible Generalize Least Square (GLS) to estimate the model in which error term will assume to follow first-order autoregressive process. The model interpreted that there were positive relationship between dependent and independent variables which is shown by P value.

The value of P was also greater than 0.5 which indicated that this study results were significant. The null-hypothesis were rejected and accepted alternatives (H1,H2,H3 and H4) which means that reducing custom and other duties, taxes, taxes on income and capital gain and profit, and interest payment will cause FDI to increase. Relationship between FDI and export trade was also made by Wang and Qiang (2016) in Shaanxi province in China; they used co-integration analysis for the data from 1996 to 2015 to explore long-term equilibrium relationship between FDI and export trade. The research found that FDI and export trade were co-integrated. The coefficient estimation value of log (FDI) of 0.8979 indicated that there were promoting relationship between FDI and export. It is important for the policy formulation to give priority to large Multinational companies and make full use of the technology spillover effect to expand to Shaanxi the scale and improve the quality of actual use of foreign investment.

Popovici and Calin (2017) conducted an empirical analysis to evaluate whether FDI is involved in the promotion of Exports and Imports in eight of the newest European Union member states. Using a dynamic method for the panel data from 1999-2013, the result showed that there were a complementarity relation between FDI and both exports and imports. Mainly, the capacity to attract foreign investment would provide higher amounts of exports in the next year, indicating that foreign companies located in the host countries were developing export activities.

Tham et al. (2017) employed a more advanced dynamic panel econometric technique known as System Generalized Moments (System GMM) to sort up relationship between bilateral-export, OFDI and IFDI using sectorial data from Malaysia 2005 to 2013 to 78 countries. The findings revealed that both inwards and outwards FDI were complementary to bilateral export

trade in services, mining and manufacturing.

African's research perspective

Africa has seen a decrease of his exchange rate with the low international market, despite the relatively large number of countries within it. The contribution of foreign trade of African countries is relatively low (less than 5% of world trade, the World Trade Statistical Review, 2016). The bulk of African exports consist mainly of raw materials for factories in developed countries. Most African Imports are manufactured goods. The virtual absence and the lack of involvement of African countries in international trade is an obstacle to continuous development. Several studies have examined the relationship between FDI and trade in host countries. N'guessan and Yaoxing (2010) examined the long-run impact of FDI and trade openness on economic growth in Cote d'Ivoire.

The study used the more recent data analysis technique-the bounds testing cointegration approach and the VAR Granger causality/Block Exogeneity Wald tests. The data span for the study was from year 1980-2007. The Result showed that there were a long run relationship between the FDI, trade openness and output; and the VAR Granger causality/Block Exogeneity Wald tests revealed unidirectional causal relationship running from FDI, trade openness to output and from output, FDI to trade openness. Both FDI and trade openness are significant in explaining output growth in Cote d'Ivoire. This study concluded by recommending: Cote d'Ivoire by the opportunities offered by world markets has to manage a good combination with a domestic investment and institution-building strategy to attract more inflows of FDI for output growth dynamics.

Frimpong (2012) studied the relationship between trade and FDI between China and Ghana. Research results showed that FDI and Trade were an integral part of an open and effective international economic system and a major catalyst to development; National policies and the international investment architecture matter for attracting FDI to a larger number of developing countries and for reaping the full benefits of FDI for development; The challenges primarily address host countries, which need to establish a transparent, broad and effective enabling policy environment for investment and to build the human and institutional capacities to implement them. The result indicated that, China is the second highest country in terms of trade and FDI in Ghana.

Belloumi (2014) studied the dynamic causal relationships from the series of economic growth, FDI, and trade openness, labor and capital investment in Tunisia. This paper examined this issue for Tunisia by applying the bounds testing (ARDL) approach to co-

integration for the period from 1970 to 2008. The bounds tests suggested that the variables of interest were bound together in the long run when FDI is the dependent variable. The associated equilibrium correction was also significant, confirming the existence of a long-run relationship. The results shown that there was co-integration among the variables specified in the model when FDI is the dependent variable. Trade openness and economic growth promoted FDI in Tunisia in the long run. The results indicated that there was no significant Granger causality from FDI to economic growth or from economic growth to FDI in the short run. Turning to the Granger causality test results for economic growth and trade openness, there was also no significant Granger causality from trade to economic growth or from economic growth to trade in the short run.

Kipeja (2015) analyzed the various key determinants of China's outward FDI for a sample of selected African economies and a panel data analysis was used in the study. The time frame for analysis was a 7-year period, 2005 to 2011 and 43 African countries were involved in this study, based on data availability. The Hausman test specification, recommended the using of fixed effects model. An empirical analysis revealed that China's OFDI to Africa responded positively to openness, resource seeking and market opportunities ties.

Akame et al. (2016) examined the impact of the business climate on FDI in the Economic and Monetary Union of Central African States (CEMAC) region from 2007 to 2014 using panel data with the adoption of the Feasible Generalized Least Squares (FGLS) technique of estimation. The study found that the doing business index, the corruption perception index and the Ibrahim Index of African Governance positively and significantly affect FDI in the CEMAC region.

Thus, the study found that some components of the Doing Business Index positively and significantly affected FDI in the CEMAC region. However, economic freedom index and other components that constitute the Doing Business Index though with positive coefficients did not significantly affect FDI. The study recommended that policymakers of the CEMAC region put in place laws, measures and structures that improve the business climate of the region to attract more FDI. It is therefore imperative that the various economic agents of the CEMAC region ensure a favourable business environment or investment climate for this will go a long way in attracting FDI thereby leading to economic growth and development through the multiplier effect.

Dupasquier and Osakwe (2003) examined the performance, promotion, and prospects for FDI in Africa. Several factors such as weak infrastructure, political and macroeconomic instability were identified as being responsible for the poor FDI record of the region. The authors stressed the need for more trade and investment

relations between Africa and Asia. They also argued that countries in the region should pay more attention to the improvement of relations with existing investors and offer them incentives to assist in marketing domestic investment opportunities to potential foreign investors. The result also indicated that the current wave of globalization sweeping through the world has intensified the competition for FDI among developing countries.

Overview of Chinese OFDI to Africa and Africa trade

Many prior studies have examined the determinants of inward (FDI) with respect to China. Comparatively less, however, has been written in regard to the Chinese economy. In many ways, the trajectory of growth in terms of China's OFDI has appeared to be highly counter cyclical and opportunistic. In the period following the global economic crisis in 2008 and as recessionary conditions took hold and asset values decreased, Chinese firms seemed to be acquiring distressed firms at bargain prices on every continent, particularly in the technology and natural resource sectors.

Chinese OFDI to Africa

The growing interest of China in Africa has sparked intense debate. In recent years, China was the new partner for most of African countries. FDI in Africa grew on average by 46% per year during the last decade. In 2015, African countries received inward FDI flows for $ 54.079 million (UNCTAD, 2016) (UNCTAD Handbook of Statistics, Foreign Direct Investment Inflows, P 192), amounting for 3% of total world inwards FDI; Figure below (Appendix 1) shows the evolution of OFDI from China to Africa by region and country. The remarkable thing about Chinese OFDI stems not from its aggregate size but rather the trajectory of its recent growth, not to mention its staggering long-term potential (Belloumi, 2014).

In absolute terms, China is a minor player when it comes to OFDI. Total worldwide OFDI stocks only totaled around $1280974.6 million in 2016 (World Investment Report, 2017), far below its inward FDI stock of $1354404.0 million. In other words, while the inward-to-outward gap seems to be shrinking, China remains very much a net importer of FDI. Generally speaking, Chinese OFDI in Africa involves various business areas including trade, turnkey projects, resources exploration and extraction, processing, manufacturing, transport and communications, finance, etc. (Kipeja, 2015).

China's average annual OFDI grew from less than $50 billion in 2008 to upwards of $101 billion in 2016, which amounts to a compound annual growth rate of 102%.

Some studies estimate Chinese OFDI could increase to reach as high as $2 trillion by 2020 (Rosen and Thilo, 2011). Although Chinese OFDI to Africa is still low, the rate of growth over the last years has been impressive. Available data on approved investments per country of destination shows that the pattern of Chinese investment in Africa has been historically low. The top 5 African destination of Chinese FDI in 2014 were Algeria, Zambia, Kenya, Republic of Congo, and Nigeria. Algeria accounted for more than 20% of all Chinese OFDI to Africa in 2014.

China-Africa bilateral trade

Currently, as international situation undergoes profound and intricate changes, newly emerging and developing economies have become the major force pushing forward the world's economic development. China has become Africa's largest trade partner, and Africa is now China's major import source, second largest overseas construction projects contract market and fourth largest investment destination. China-Africa bilateral trade has been steadily increasing for the past 15 year, punctuated by a slight slump and quick recovery from the 2009 financial crisis (Chinese worked in Africa, China Africa Research Initiative 2017; http://www.sais-cari.org/). In 2016, the largest exporter to China from Africa was South Africa, followed by Angola and Sudan. South Africa is the largest buyer of Chines goods, followed by Nigeria and Egypt. Trade volume between China and African countries surged 16.8% year on year in the first quarter of 2017 to $38.8 billion (Said by the commerce ministry, Mofcom, May 11 2017; http://english.gov.cn/). This was the first quarterly rebound in bilateral trade between China and Africa since 2015, with Chinese imports from Africa up 46% to $18.4 billion (Press Conference by Sun Jiwen, spokesperson for the Ministry of Commerce, 2017). Chinese exports to Africa declined 1% year on year to $20.5 billion in the first three months of 2017, compared with an 18 percent drop in the same period in 2016. In the first quarterly 2017, Chinese enterprises made more than $750 million of non-financial DFI to African countries, up 64% year on year. Bilateral trade between China and Africa stood at $149.1 billion in 2016. Total China-Africa trade volume, China's export volume to Africa and China's import volume from Africa all reached new highs.

FDI and trade nexus

With specific regards to the recent rise of multinational enterprises from emerging economies, it is believed that their investments are 'triggered by trade-related variables, which facilitate and necessitate OFDI (Banga,

2008). In China, Cheung and Qian (2008) add that the complementarity between FDI and exports has increased after the launch of the 'Going Out' strategy and that it is stronger for investments directed towards developing countries. Therefore, looking at the impact of trade on FDI, it is possible to assume that more exports on the one hand may require an improvement in trade supporting services and, on the other hand, providing knowledge on external markets may also reduce transaction costs of the investments and encouraging FDI. Imports, providing an indication of the importance of the products (mostly natural resources) transferred and may spur firms to internalize these strategic flows by means of OFDI.

METHODOLOGY

This article investigates whether Chinese OFDI and international trade of Africa have causal relationship. This research is quantitative based and data is quantified by using Vector Error Correction Model (VECM). A model is designed to access the variables like trade, exports, imports, institution, gross domestic product, human capital and labor force. Secondary data is used for this research with the econometric methodology of cross country studies such as Wang and Qiang (2016), Gul and Naseem (2015) and Iqbal et al. (2015) to bring out the causal relationship among variables.

Data and variables

We have time series data of 16 years ranging from 2000 to 2015 taken from secondary source. All the data were collected from the database of United Nations (UN), World Bank, international monetary fund (IMF), Comtrade and MOFCOM 2016 and 2017. The 52 samples (Table 1) used in this study consist of African countries across six different regions that have consistent and available data of the period of investigation.

Dependent variable

Trade (sum of export and import), export and import are the dependent variable.

Independent Variable

Independent variables for this research study are outwards Chinese foreign direct investment (OCFDIA), institution (INST-P.S), institution (INST-C.C), gross domestic product (GDP), human capital (H), labor force (L), SouAfr, CenAfr, NorAfr, WestAfr, Indianocean and EastAfr written on right side of equation.

Theoretical framework

This theoretical framework shows the relationship between dependent variables (TRADE: EXP+IMP/GDP, EXP, IMP) and independent variables (L, H, INST-P.S, INST-C.C, OCFDI, SOUAFR, NORAFR, CENAFR, WESTAFR, INDOCEAN and GDP).

Table 1. Countries list.

List of 52 countries in the study
Southern Africa: 10 countries
Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, South Africa, Swaziland, Zambia, Zimbabwe.
Central Africa: 10 countries
Burundi, Cameroon, Central African Republic, Chad, Congo. Dem. Rep. Congo, Equatorial Guinea, Gabon Rwanda, Sao Tome and Principe.
Eastern Africa: 7 countries
Djibouti, Eritrea, Ethiopia, Kenya, Sudan, Tanzania, Uganda.
Western Africa: 16 countries
Benin, Burkina Faso, Cabo Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra-Leone, Togo.
Northern Africa: 5 countries
Algeria, Egypt, Libya, Morocco, Tunisia.
Indian Ocean: 4 countries
Comoros, Madagascar, Mauritius, Seychelles

Trade (export-import)

Trade relates to the openness of the economy to the rest of world. Nonetheless, due to time shortage, series data for the measure of openness, the sum of import and export as a ratio of GDP is used as proxy trade. This is justified by arguing that the more a country is open to globalization, the more attractive it is to FDI. *A* priori, it's expected that trade will be positively related to FDI.

Gross domestic product (GDP)

GDP is actually the measure of overall economy's expenditures and output. GDP in real terms is a national income contributing towards economic growth by viewing the number of domestic products produces from domestic resources.

Institution (INST)

The institution variable is the political stability and absence of violence and control of corruption index from the World Institute Governance Indicators. It measures the extents which agents have confidence and abide by the rules of society, and in particular the quality of contract enforcement, property right, the police, and the courts, as well as the likelihood of crime and violence. The index runs from -2.5 to 2.5, with higher numbers signifying better institutions. This index broadly reflects the preceding theoretical arguments on the role of institutions in attracting Chinese OFDI which also regulate trade policy.

Labor force (L)

Labor force is the supply of labor services for the production of goods during a stipulated time period. It includes both employed and unemployed labor. When all labor force is fully employed the output ratio increase with appropriate allocation of resources. Labor force is the sum of two components, that is, population growth rate and employment opportunities.

Human capital (H)

Human capital is used as a proxy of level of education among different countries. Countries that have more educated people attract more FDI, and have more knowledge on doing business.

Outward Chinese foreign direct investment to Africa (OCFDI)

Foreign capital is the amount of Chinese OFDI to Africa. It represents market shares by foreign investors. Foreign investors buy local assets and domestic residents also. Foreign capital shows the balance of payment recording positive balance on capital account. Present study is intended to investigate the OCFDIA contribution on trade boosting from 2000 to onward.

Hypotheses development

H1: An increase of Chinese OFDI leads to an increase of the degree of economy's openness.
H2: An increase of Chinese OFDI leads to an increase of exports.
H3: An increase of Chinese OFDI leads to an increase of imports.

Data analysis (econometrics techniques)

The hypotheses are sought out after many review of literature that

are related to the topic, the model is specified and data is fitted into software known as Eview 9.0 for identifying whether OCFDI and Trade (Exports and Imports) are correlated positively. The model used is Vector Error Correction Model (VECM). The details of the model are outlined below:

Equation for model

The three main equations are :

Model 1

$$\Delta ltrade_{it} = \alpha_1 + \delta_{11}\Delta lgdp_{it} + \delta_{21}\Delta llabor_{it} + \delta_{31}\Delta lh_{it} + \delta_{41}\Delta linstps_{it} + \delta_{51}\Delta linstcc_{it}$$
$$+\tau_{11}SOUAFR_{it} + \tau_{21}CENAFR_{it} + \tau_{31}NORAFR_{it} + \tau_{41}WESTAFR_{it} + \tau_{51}INDOCEAN_{it} + \sum_{k=1}^{4}\theta_{1k}\Delta ltrade_{i,t-k} +$$
$$\sum_{k=1}^{4}\lambda_{1k}\Delta locfdi_{i,t-k} + \gamma_1\hat{\varepsilon}_{i,t-1} + v_{1,it} \quad (1)$$

$$\Delta locfdi_{it} = \alpha_2 + \delta_{12}\Delta lgdp_{it} + \delta_{22}\Delta llabor_{it} + \delta_{32}\Delta lh_{it} + \delta_{42}\Delta linstps_{it} + \delta_{52}\Delta linstcc_{it}$$
$$+\tau_{12}SOUAFR_{it} + \tau_{22}CENAFR_{it} + \tau_{32}NORAFR_{it} + \tau_{42}WESTAFR_{it} + \tau_{52}INDOCEAN_{it} + \sum_{k=1}^{4}\theta_{2k}\Delta ltrade_{i,t-k} +$$
$$\sum_{k=1}^{4}\lambda_{2k}\Delta locfdi_{it-k} + \gamma_2\hat{\varepsilon}_{i,t-1} + v_{2,it} \quad (2)$$

Model 2

$$\Delta lexp_{it} = \alpha_1 + \delta_{11}\Delta lgdp_{it} + \delta_{21}\Delta llabor_{it} + \delta_{31}\Delta lh_{it} + \delta_{41}\Delta linstps_{it} + \delta_{51}\Delta linstcc_{it}$$
$$+\tau_{11}SOUAFR_{it} + \tau_{21}CENAFR_{it} + \tau_{31}NORAFR_{it} + \tau_{41}WESTAFR_{it} + \tau_{51}INDOCEAN_{it} + \sum_{k=1}^{4}\theta_{1k}\Delta lexp_{i,t-k} +$$
$$\sum_{k=1}^{4}\lambda_{1k}\Delta locfdi_{i,t-k} + \gamma_1\hat{\varepsilon}_{i,t-1} + v_{1,it} \quad (1)$$

$$\Delta locfdi_{it} = \alpha_2 + \delta_{12}\Delta lgdp_{it} + \delta_{22}\Delta llabor_{it} + \delta_{32}\Delta lh_{it} + \delta_{42}\Delta linstps_{it} + \delta_{52}\Delta linstcc_{it}$$
$$+\tau_{12}SOUAFR_{it} + \tau_{22}CENAFR_{it} + \tau_{32}NORAFR_{it} + \tau_{42}WESTAFR_{it} + \tau_{52}INDOCEAN_{it} + \sum_{k=1}^{4}\theta_{2k}\Delta lexp_{i,t-k} +$$
$$\sum_{k=1}^{4}\lambda_{2k}\Delta locfdi_{i,t-k} + \gamma_2\hat{\varepsilon}_{i,t-1} + v_{2,it} \quad (2)$$

Model 3

$$\Delta limp_{it} = \alpha_1 + \delta_{11}\Delta lgdp_{it} + \delta_{21}\Delta llabor_{it} + \delta_{31}\Delta lh_{it} + \delta_{41}\Delta linstps_{it} + \delta_{51}\Delta linstcc_{it}$$
$$+\tau_{11}SOUAFR_{it} + \tau_{21}CENAFR_{it} + \tau_{31}NORAFR_{it} + \tau_{41}WESTAFR_{it} + \tau_{51}INDOCEAN_{it} + \sum_{k=1}^{5}\theta_{1k}\Delta limp_{i,t-k} +$$
$$\sum_{k=1}^{5}\lambda_{1k}\Delta locfdi_{i,t-k} + \gamma_1\hat{\varepsilon}_{i,t-1} + v_{1,it} \quad (1)$$

$$\Delta locfdi_{it} = \alpha_2 + \delta_{12}\Delta lgdp_{it} + \delta_{22}\Delta llabor_{it} + \delta_{32}\Delta lh_{it} + \delta_{42}\Delta linstps_{it} + \delta_{52}\Delta linstcc_{it}$$
$$+\tau_{12}SOUAFR_{it} + \tau_{22}CENAFR_{it} + \tau_{32}NORAFR_{it} + \tau_{42}WESTAFR_{it} + \tau_{52}INDOCEAN_{it} + \sum_{k=1}^{5}\theta_{2k}\Delta limp_{i,t-k} +$$
$$\sum_{k=1}^{5}\lambda_{2k}\Delta locfdi_{i,t-k} + \gamma_2\hat{\varepsilon}_{i,t-1} + v_{2,it} \quad (2) \quad avec\ \gamma_2 = 0$$

Where,

Trade = trade openness;
OCFDI = Outwards Chinese Foreign Direct Investment;
GDP = Gross Domestic Product;
H = Human Capital;
L = Labor force;
IMP = Imports goods and service (% of GDP);
EXP = Export goods and service (% of GDP);

INST-P.S = Political Stability and Absence of Violence;
INST-C.C = Control of Corruption;
SOUAFR = Southern Africa;
NORAFR = Northern Africa;
CENAFR = Central Africa;
WESTAFR = Western Africa;
INDOCEAN = Indian Ocean;
SOUAFR, NORAFR, CENAFR, WESTAFR, INDOCEAN are dummy variables that take the value 1 if a country belongs to the

Table 2. Variables of study by subregion.

Africa region	Southern Africa	Central Africa	Eastern Africa	Western Africa	Northern Africa	Indian Ocean	Africa
LTRADE	4.374	4.147	3.853	4.235	4.277	4.574	4.233
LEXP	3.548	3.231	2.762	3.294	3,597	3,669	3.331
LIMP	3.772	3.546	3.400	3.709	3,535	4,063	3.665
LOCFDI	6.720	6.731	6.741	6.727	6,743	6.742	6.731
LGDP	22.551	23.227	22.353	22.320	23.973	22.516	22.721
LLABOR	15.087	14.422	15.943	14.848	15.836	13.727	14.953
LH	4.624	6.827	5.102	6.219	6.123	5.310	5.791
LINSTPS	0.941	0.448	0.257	0.646	0.662	1.053	0.657
LINSTCC	0.328	-0,072	0.058	0,124	0.263	0.562	0.168

Source : Author's calculation.

Table 3. Descriptive statistics of study for whole Africa during the period 2000-2015.

Variable	Obs.	Mean	Std.Dev	Coeff. of variation	Min	Max
LTRADE	832	4.233	0.461	0.109	2.950	5.861
LEXP	832	3.331	0.622	0.187	1.488	5.200
LIMP	832	3.665	0.450	0.123	2.351	5.465
LOCFDI	832	6.731	0.334	0.050	-2.408	8.635
LGDP	832	22.721	1.732	0.076	17.183	26.864
LLABOR	832	14.953	1.615	0.108	10.689	23.915
LH	832	5.791	3.294	0.569	4.605	18.169
LINSTPS	832	0.657	0.598	0.910	-4.362	1.358
LINSTCC	832	0.168	0.493	2.927	-2.757	1.112

given sub-region and 0 otherwise.

RESULTS AND DISCUSSION

Descriptive analysis

For all 832 observations (52 countries x 16 years), the most dispersed distributions are those related to the governance variables, which have the highest coefficients of variation (CV), 2,927 for the control of corruption, and 0.910 for political stability (Table 3). The panel is therefore sufficiently heterogeneous with regard to governance. Regarding the control of corruption, the Indian Ocean is on average the least corrupt zone (0.562) and Central Africa is the most corrupt (-0.072). For political stability, the Indian Ocean remains better (1.053) and East Africa is the most unstable (0.257) (Table 2). For international trade, the most homogeneous indicator is LTRADE with a coefficient of variation of 0.109, followed by LIMP (0.123) and LEXP, the most heterogeneous (0.187). Import behavior would be more similar than exports. Regarding FDI inflows from China,

LOCFDI represents the most homogeneous distribution with a CV of 0.050. Its highest average sub-regional value is north Africa with 6,743 and the lowest is Southern Africa with 6,720 (Table 16 and Appendix 2). This shows a fairly low average gap (0.017) compared to the governance variables. The influx of FDI from China would therefore not be very different from one subregion to another.

Trends of international trade and FDI flows from China

Figure 1 highlights the change in the average values of the three variables informing international trade and FDI flows from China for the whole African continent. In terms of trend, we can say that LTRADE variable has globally evolved upwards, with a slight stagnation for the last three years. Thus, there is a significant shock in 2009 that materializes by a V-shaped trough. However, starting in 2012, there is a gradual decline. The level of LTRADE in 2015 is indeed similar to its 2005 value. The evolution of LEXP is similar to LTRADE. The LIMP trend is almost
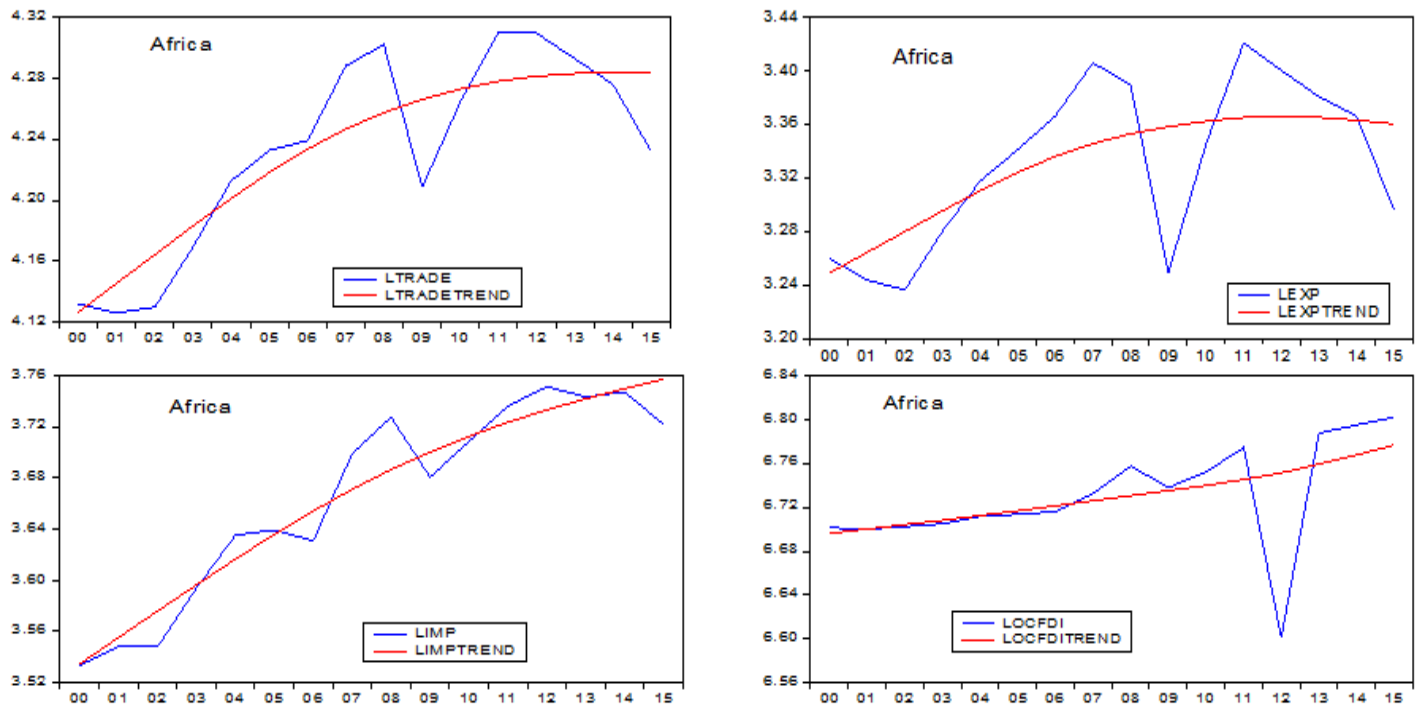
Figure 1. Evolution of International Trade and FDI Inflows from China.

Table 4. Growth rate (%) of international trade and FDI in Africa.

Period	LTRADE (%)	LEXP (%)	LIMP (%)	LOCFDI (%)
2000-2008	0.51	0.49	0.67	0.10
2009-2015	-0.23	-0.37	-0.02	0.10
2000-2015	0.16	0.09	0.35	0.10

linear and increasing with a slight length cyclicity of 3 years. With regard to LOCFDI, the evolution is slightly linear and stagnant, with a vertiginous fall in 2012. This accidental variation is also observed in South Africa during the same year (Appendix 1). The trends of the four variables that define their long-term movements are obtained by applying the Hodrick-Prescott filter. Table 4 summarizes the evolution of these four variables. It can be seen that LOCFDI has almost stable evolution. Its growth rate is 0.10% for the two sub-periods 2000-2008 and 2009-2015. The international trade through its three indicators increased range from 2000 to 2015, 0.16% for LTRADE, 0.09% for LEXP and 0.35% for LIMP. However, they are decreasing during the period 2009 to 2015, for respective values of -0.23%, -0.37% and -0.02%. This implies that the commercial performance of the African continent fell overall between 2009 and 2015. This result

is the most dependent on the fall in exports (-0.37% <- 0.02%).

Comparison of average levels of international trade and FDI indicators by sub-regions of the African continent

For the inter-regional comparison, looking at Figure 2, three sub-regions show practically better levels for LOCFDI. These include North Africa (6,743), the Indian Ocean (6,742) and East Africa (6,741). Southern African countries receive on average the least FDI, in this case (6,720), this is mainly attributable to South Africa, which has the lowest average (6,372) of the 52 countries in the study. For the three variables of international trade, the Indian Ocean has the highest values, 4,574 for LTRADE, 3,669 for LEXP and 4,063 for LIMP. East Africa has the

LEXP
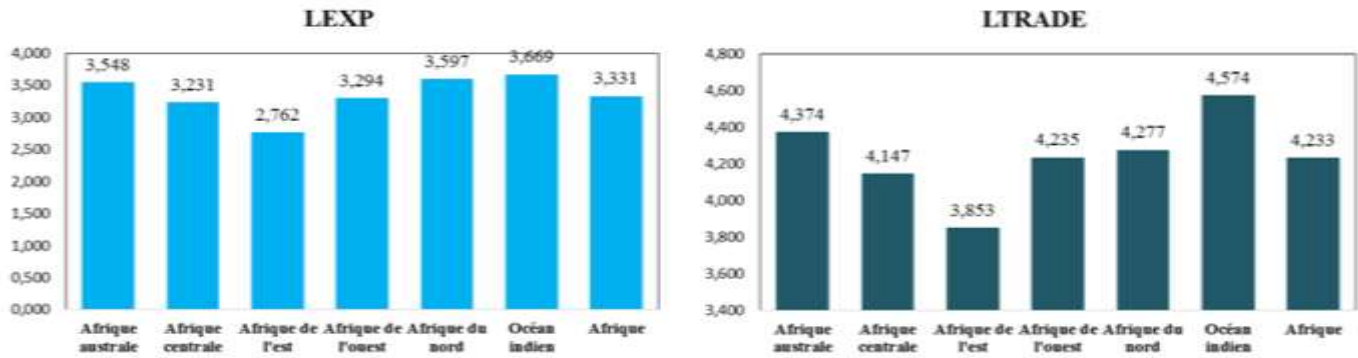
LTRADE

Figure 2. Average variables of international trade and FDI from China by sub-regions of the African continent.

LIMP

LOCFDI
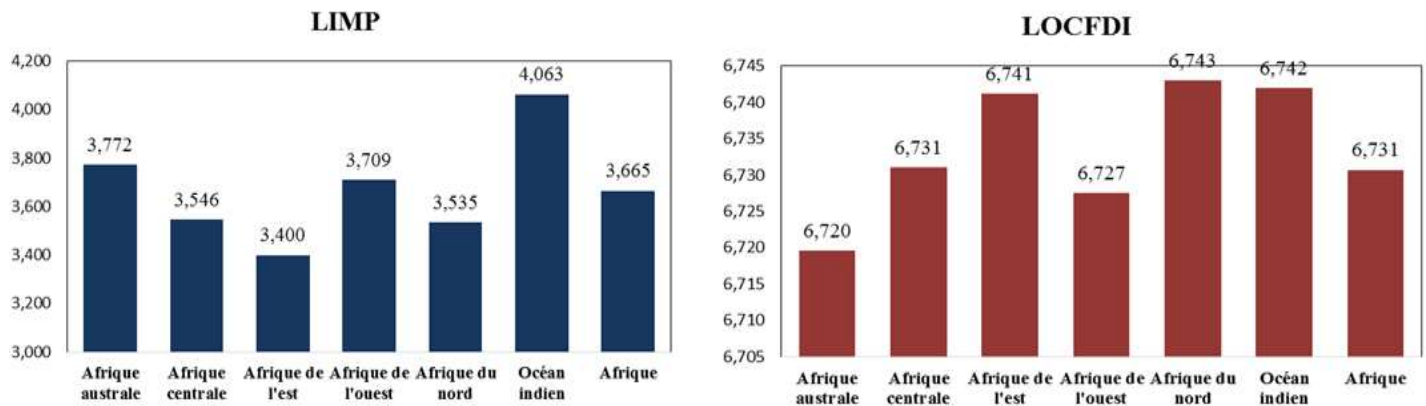
Figure 3. Average of variables of International Trade and FDI from China by African countries.

lowest values (3,853, 2,762 and 3,400 respectively). These results would push us to say that at the sub-regional level, international trade is moving in the same direction as FDI.

Comparison of average levels of international trade and FDI indicators at the level of the countries of the African continent

Looking at the average values over the entire period (2000 to 2015) country by country (Figure 3), the first five and the last five are as follows (Appendix 3). In terms of country analysis, the strong regional correlation between international trade and FDI from China is not fully confirmed. We are even faced with a contradiction, particularly the case of Sudan, which is among the first for FDI and last for LTRADE and LIMP. We would therefore be tempted to say that imports vary in the opposite direction to China's FDI. This implied that at the

country level, other factors than FDI would influence the level of international trade.

Linear correlations between variables of study

Considering all of the 832 observations, we notice a weakly linear relationship between China's FDI and African international trade. The Table 5 reveals a linear correlation coefficient of -0.004 between LTRADE and LOCFDI, 0.005 between LEXP and LOCFDI and -0.011 between LIMP and LOCFDI. These results, however, reflect a positive association between FDI and exports, and negative with imports. Correlations are also strong between the three indicators of international trade. However if we take this analysis back to the period, the sub-regional level or the country level, the results are undoubtedly different. For example, for Burkina-Faso, these three correlations are significant at the 5% threshold and are 0.974 between LTRADE and LOCFDI,

Table 5. Pearson linear correlations of variables of study in Africa (2000-2015).

Variable	LTRADE	LEXP	LIMP	LOCFDI	LGDP	LLABOR	LH	LINSTPS	LINSTCC
LTRADE	1.000	0.881	0.895	-0.004	-0.047	-0.402	0.039	0.334	0.027
LEXP	0.881	1.000	0.604	0.005	0.027	-0.272	0.100	0.273	-0.040
LIMP	0.895	0.604	1.000	-0.011	-0.120	-0.428	-0.044	0.338	0.120
LOCFDI	-0.004	0.005	-0.011	1.000	0.047	0.032	0.010	-0.057	-0.053
LGDP	-0.047	0.027	-0.120	0.047	1.000	0.306	0.016	-0.103	-0.067
LLABOR	-0.402	-0.272	-0.428	0.032	0.306	1.000	-0.128	-0.329	-0.095
LH	0.039	0.100	-0.044	0.010	0.016	-0.128	1.000	-0.148	-0.323
LINSTPS	0.334	0.273	0.338	-0.057	-0.103	-0.329	-0.148	1.000	0.517
LINSTCC	0.027	-0.040	0.120	-0.053	-0.067	-0.095	-0.323	0.517	1.000
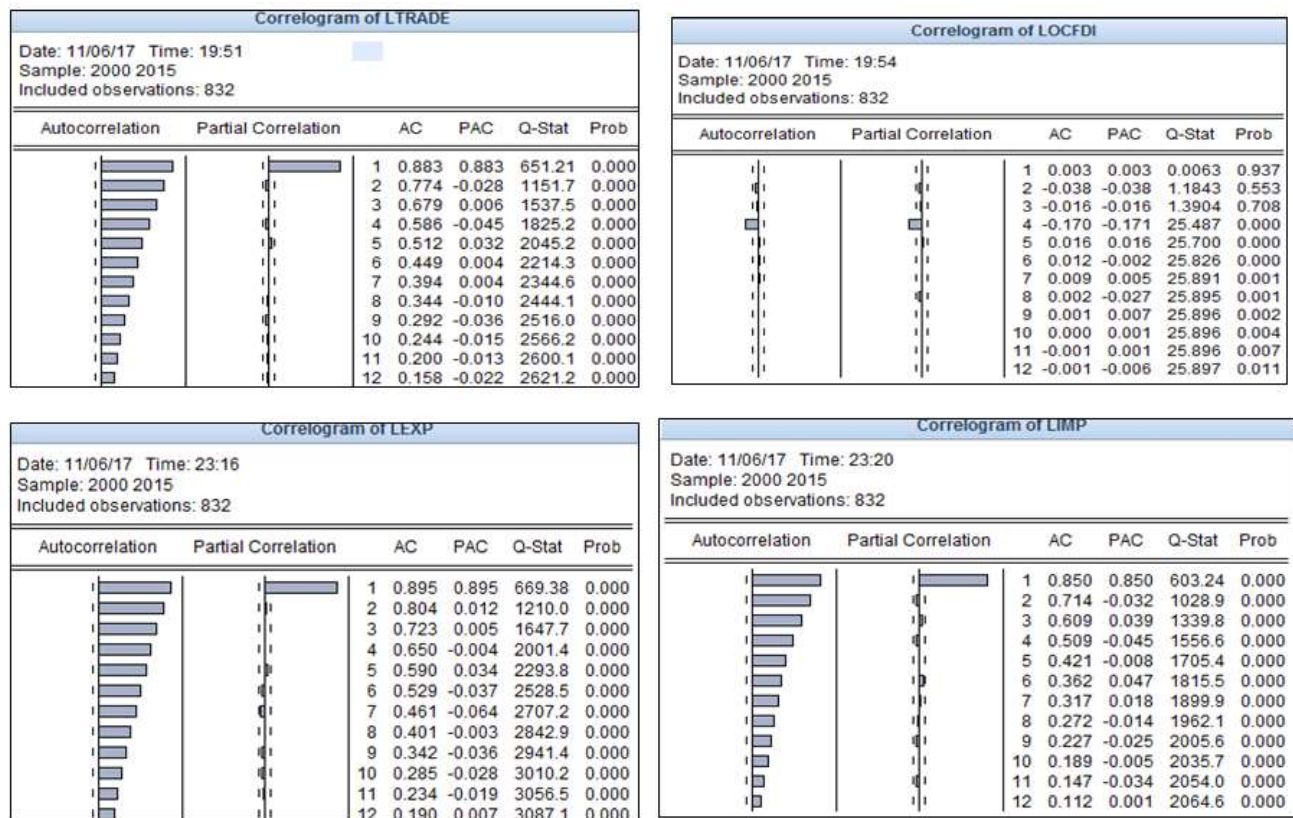
Figure 4. Simple and partial autocorrelations of variables LTRADE, LEXP, LIMP and LOCFDI.

0.983 between LEXP and LOCFDI, and 0.942 between LIMP and LOCFDI. By examining simple autocorrelations (Figure 4), we found that there is a significant correlation between current LTRADE and its lagged values. The decrease is always exponential, that means the influence of past values decreases as one moves away from the present, but remains positive. This is almost the same for LEXP and LIMP. On the other hand, for LOCFDI, the relation between the current value and the delayed values becomes significant only from the fourth shift. The simple autocorrelation coefficient of order 4 has a negative sign and the others are almost null, it is the same for the partial autocorrelation coefficients.

Unit root test

In the analysis of the common and individual unit root

Table 6. Panel unit root test.

Variable	Common unit root test			Individual Unit Root Test						Ccl.
	Levin. Lin et Chu * t-stat			Im. Peasaran et Shin *W-stat			ADF-Fisher *Chi2-stat			
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	
$ltrade$	0.5678	0.0000	0.0000	-	0.0000	0.0000	0.9999	0.0291	0.0234	I (1)
$\Delta ltrade$	0.0000	0.0000	0.0000	-	0.0000	0.0000	0.0000	0.0000	0.0000	
$lexp$	0.0745	1.0000	1.0000	-	0.0017	0.0625	0.9906	0.0017	0.0496	I (1)
$\Delta lexp$	0.0000	0.0000	0.0000	-	0.0000	0.0000	0.0000	0.0000	0.0000	
$limp$	0.4269	1.0000	1.0000	-	0.0094	0.0019	1.0000	0.0090	0.0017	I (1)
$\Delta limp$	0.0000	0.0000	0.0000	-	0.0000	0.0000	0.0000	0.0000	0.0000	
$locfdi$	1.0000	0.0041	0.0000	-	0.7693	0.0000	1.0000	0.1669	0.0000	I (1)
$\Delta locfdi$	0.0000	0.0000	0.0000	-	0.0000	0.0000	0.0000	0.0000	0.0000	
$lgdp$	1.0000	0.6365	0.0000	-	1.0000	0.1385	1.0000	0.9913	0.0042	I (1)
$\Delta lgdp$	0.0000	0.0000	0.0000	-	0.0000	0.0000	0.0000	0.0000	0.0000	
$llabor$	1.0000	0.2025	0.0000	-	1.0000	0.0000	1.0000	0.5422	0.1814	I (1)
$\Delta llabor$	0.0000	0.0000	0.0000	-	0.0000	0.0000	0.0000	0.0000	0.0000	
lh	1.0000	1.0000	1.0000	-	1.0000	1.0000	1.0000	0.2088	0.0000	I (1)
Δlh	0.0000	0.0000	0.0000	-	0.0000	0.0000	0.0000	0.0000	0.0000	
$linstps$	0.0007	0.0000	0.0000	-	0.0000	0.0000	0.0334	0.0000	0.0000	I (1)
$\Delta linstps$	0.0000	0.0000	0.0000	-	0.0000	0.0000	0.0000	0.0000	0.0000	
$linstcc$	0.0168	0.0002	0.0000	-	0.0250	0.0990	0.0214	0.0018	0.0060	I (1)
$\Delta linstcc$	0.0000	0.0000	0.0000	-	0.0000	0.0000	0.0000	0.0000	0.0000	

The hypothesis Ho for all these tests provide that there is a presence of unit root but alternative hypothesis are different. The first line represente the variable at level and the second ligne is the first difference. The v alues in the cell are the P-value. The intercept points up the individual effect and trend, individual trend. (1) : without intercept and trend   (2) : with intercept (3) : with intercept and trend.

Table 7. Kao cointegration test.

Model	Pool of variable	Elements of test
Model 1	LTRADE LOCFDI LGDP LLABOR LH LINSTPS LINSTCC	Pr (ADF) = 0.0012
Model 2	LEXP LOCFDI LGDP LLABOR LH LINSTPS LINSTCC	Pr (ADF) = 0.0003
Model 3	LIMP LOCFDI LGDP LLABOR LH LINSTPS LINSTCC	Pr(ADF) = 0.0000

The Kao test has four hypothesis Ho, no cointegration. ADF is the augmented Dickey-Fuller.

tests (Table 6), which have the same basic hypothesis H0, but different alternative hypotheses, it can be said without ambiguity that all series associated with the variables retained are integrated for order 1. We also note, a significant presence of individual effects and temporal effects, this is the case, for example, with LTRADE.

Tests de cointégration

This study has three variables for capturing international

trade, which leads to three models. The cointegration test of Kao denotes cointegrated variables in all three models (Table 7). This cointegration is precisely of rank 1.

Tests de causalité en panel

The examination of the linear correlation of coefficients gave us rather mixed results according to the level of analysis (Africa, subregion, period, country). From one period to another, the correlation between international trade and FDI is generally significant, but for the same

Table 8. Granger causality test between LTRADE –OCFDI.

Number of delays	Granger test (common coefficient)	Dumitrescu-Hurlin of test (individual coefficient)
K=1	0.1837 0.9962	0.8786 0.0000
K=2	0.3404 0.8127	0.7355 0.0000
K=3	0.4611 0.9194	0.7717 0.0008
K=4	0.4277 0.0310	NA
K=5	0.0011 0.2526	NA
K=6	0.0031 0.6222	NA

(1)*HO: No Granger Causality between LOCFDI and LTRADE (2)*HO : No Granger ; Causality between LTRADE and LOCFDI. The first line representes the associate P-value for the Case(1) and the second for the case (2).

period the heterogeneity between countries mitigates this association. Therefore, it is necessary to perform panel causality tests.

Model 1 : LTRADE and LOCFDI

Examination of Table 8 shows that for the first three offsets, the common test is not significant for both directions of causality. On the other hand, the non-admissible Dumitrescu-Hurlin coefficient test from the fourth shift reveals that LTRADE causes LOCFDI for the first three delays (p-value takes the values 0.0000, 0.0000 and 0.0008, respectively), but not the other way around (p-value = 0.8786, 0.7355, 0.7717 respectively). For the fourth delay, LOCFDI does not cause LTRADE (p-value = 0.4277> 0.05), but LTRADE causes LOCFDI (p-value = 0.0310 <0.05) according to the Granger test. From the fifth delay, LOCFDI causes LTRADE (p-value = 0.0010 for L = 5 and 0.0031 for L = 6). But LTRADE does not cause LOCFDI (p-value = 0.2526 and 0.6222 respectively). These results lead us to glimpse a double causality with staggered delays between LOCFDI and LTRADE.

Model2 LEXP and LOCFDI

Table 9 reveals similar conclusions to those found in

Table 8. However, the Dumitrescu test is only valid for the first two discrepancies. The results with LEXP go in the same direction as those of LTRADE.

Model3 LIMP and LOCFDI

For the Granger test (Table 10), the conclusions are the same as those obtained for model1 (Table 8). The Dumitrescu test has a special feature. In fact, for the second delay, there is double causality. For delays L = 1 and L = 3, the decisions are the same as in the case of LTRADE.

Estimation choice of methods for the three models

The results of the panel causality tests lead us to glimpse the use of a dual causality model. The VAR model appears to be indicated between international trade variables and China's FDI. However, to ensure the correct VAR or VECM (Vector Error Correction Model) specification, the econometric procedure is as follows:

Step 1: Determining the number of p delays of the model according to the AIC or SC criteria.
Step 2: Johansen test determines the number of cointegration relationships.
Step 3: Identification of cointegration relationships, that

Table 9. Granger causality test (LEXP and LOCFDI).

Number of delays	Granger test (common coefficient)	Dumitrescu-Hurlin of test (individual coefficient)
K=1	0.2272	0.8893
	0.8176	0.0000
K=2	0.3680	0.1103
	0.8319	0.0000
K=3	0.4973	NA
	0.8681	
K=4	0.4033	NA
	0.0638	
K=5	0.0013	NA
	0.2870	
K=6	0.0030	NA
	0.5467	

(1)*HO: No Granger Causality between LOCFDI and LEXP (2)*HO: No granger causality between LEXP and LOCFDI. The first line represents the associate P-value for the Case(1) and the second for the case (2).

Table 10. Granger causality test (LIMP and LOCFDI).

Number of delays	Test de Granger (coefficients communs)	Test de Dumitrescu-Hurlin (coefficients individuels)
K=1	0.3159	0.5126
	0.8069	0.0000
K=2	0.5771	0.0054
	0.8404	0.0016
K=3	0.7264	0.7086
	0.9424	0.0002
K=4	0.6708	NA
	0.0060	
K=5	0.0216	NA
	0.1505	
K=6	0.0322	NA
	0.4444	

(1)*HO : No Granger Causality between LOCFDI and LIMP (2)*HO : No granger causality between LIMP and LOCFDI. The first line represents the associate P-value for the Case(1) and the second for the case (2).

is, long-term relationships between variables.
Step 4: Estimation by the maximum likelihood method of the vector model with error correction and validation using the usual tests: coefficient significance and verification that the residues are white noises, low exogeneity tests.

Determination of the optimal number of delays

The number of delays (Table 11) to be retained in these models according to the panel causality tests (Tables 8 to 10) would be at least 5. Thus, we will retain the number of delays that minimize the Akaike information

Table 11. Determination of the optimal number of delays.

Number of delays	Model1	Model 2	Model 3
L=1	AIC=0.248 SIC=0.286	AIC=0.606 SIC=0.644	AIC=0.620 SIC=0.658
L=2	AIC=0.152 SIC=0.219	AIC=0.565 SIC=0.632	AIC=0.527 SIC=0.594
L=3	AIC=0.200 SIC=0.299	AIC=0.596 SIC=0.696	AIC=0.564 SIC=0.664
L=4	AIC= -1.087 SIC= -0.950	AIC= -0.564 SIC= -0.427	AIC= -0.762 SIC= -0.625
L=5	AIC= -1.050 SIC= -0.870	AIC= -0.467 SIC= -0.287	AIC= -0.808 SIC= -0.628
L=6	AIC= -0.915 SIC= -0.685	AIC= -0.326 SIC= -0.096	AIC= -0.706 SIC= -0.475
L=7	AIC= -1.001 SIC= -0.710	AIC= -0.240 SIC= 0.050	AIC= -0.763 SIC= -0.472
Decision	Hold h=4	Hold h=4	Hold h=5

Table 12. Determination of the number of cointegration relationships.

Hypothesized No. of CE(s)	Model1 LTRADE-LOCFDI		Model2 LEXP-LOCFDI		Model3 LIMP-LOCFDI	
	Trace test	Max Eigen-value test	Trace test	Max Eigen-value test	Trace test	Max Eigen-value test
None	576.4 (0.0000)	262.4 (0.0000)	472.7 (0.0000)	210.4 (0.0000)	588.5 (0.0000)	286.3 (0.0000)
At most 1	113.0 (0.2576)	113.0 (0.2576)	95.11 (0.7219)	95.11 (0.7219)	114.6 (0.2246)	114.6 (0.2246)

Decision For the 3 models, there is exactly one cointegration relation; Values in parentheses represent p-value.

criteria (AIC) and Schwarz (SIC), based on the gradual estimation (delays ranging from 1 to 6) of VAR models with international trade variables and FDI as first differences.

Test de Johansen-Fisher

The number of cointegration relationships (Table 12) is determined by the Johansen test. Indeed, it is based on the test of the trace and the test of the maximum eigenvalue of the variance-covariance matrix of the errors, starting from five specifications. As some unit root tests for the LOCFDI series reveal (see Table 7) the presence of a deterministic trend, we will retain the specification N ° 4 (Bourbonnais, 9th edition - 2015, pp 312-313) which is based on the presence of a linear trend.

Low exogeneity test

The weak exogeneity test (Table 13) consists in verifying if the variables are indeed endogenous. This test relates

Table 13. Low exogeneity test.

Variable	Model1		Model2		Model 3	
	Eq.LTRADE	Eq.LOCFDI	Eq.LEXP	Eq.LOCFDI	Eq.LIMP	Eq.LOCFDI
Terme correcteur d'erreur	-0.078*** (0.011)	-0.059*** (0.021)	-0.047*** (0.008)	-0.028** (0.011)	-0.086*** (0.018)	-0.053* (0.030)

Decision for the first 2 models, both variables is endogenous. However, in model 3, LOCFDI is weakly exogenous; Values in parentheses represent p-value.

to the coefficient γ of the restoring force towards equilibrium (as there is only one cointegration relation). Performing a test on γ amounts to checking if the cointegration relation is present in all equations of the model. In the end, model 3 will have to be estimated with a constraint stipulating a nullity of the correction term for the LOCFDI equation.

Estimations results and interpretation

Model 1 LTRADE

The estimation of model1 reveals mainly the following results (Table 14):

Validity of the model

Regarding the validity of the model, the two variables LTRADE and LOCFDI are endogenous variables, based on the low exogeneity test (Table 13). Indeed, the corrective term is significant at 1% in both equations and has the expected negative sign. There is a reminder to balance. The model has residuals that are uncorrelated according to the Ljung-Box test (p-value = 0.1758> 0.05), so they have the behavior of a white noise. These elements indicate that model 1 is indeed valid.

Coefficient of endogenous variables

On the other hand, all 4 variables delayed by LOCFDI are positively associated with LTRADE at the threshold of 1%. This means that when LOCFDI increases by 10% today, LTRADE increases 5.22% 4 years later, 5.21% 3 years later, 5.44% 2 years later and 5.48% the following year. These results show a positive and almost stable influence of FDI from China on the trade openness of African countries. With regard to the decomposition of the conjectured variance at the 10th delay, LOCFDI explains 55% of the variation of LTRADE. This result is confirmed by the p-value of the Wald statistic of the Granger test,

which has a value of 0.0000. It is thus concluded that LOCFDI actually causes LTRADE.

Coefficients of exogenous variables

Only sub-regional dummies in Africa are significant at 1, 2 and 3%. Souafr, Cenafr, Norafr, Westafr and Indocean are dummy variables indicating the country's membership in a given sub-region, with Eastafr being the reference variable omitted for reasons of multicollinearity. The coefficients of these variables measure the gap of the LTRADE mean for a given subregion with respect to East Africa. They are all positive, but their values do not reach 10%. In addition, the LLABOR variable with a negative sign is significant at 10%. This would mean that when the labor force increases by 10%, the trade opening decreases by 0.23%.

Equation 2

Coefficient of endogenous variables

With regard to LOCFDI, only LTRADE variables delayed by one period and LOCFDI lagged by 4 periods are significant at 5% and 1% respectively. Thus, 10% of increase of LTRADE value at time t results an decrease of 1.19% of LOCFDI in t + 1. An opening up of the economy in the present, would therefore reduce an influx of FDI in the near future. For an increase of 10% of LOCFDI in t, it is expected to observe a decline of LOCFDI 4 years later of the order of 32.16%. With regard to the decomposition of the conjectured variance at the 10th delay, LTRADE only explains 0.85% of the LOCFDI variation. The Granger test reveals that LTRADE does not cause LOCFDI (p-value = 0.5075). It is concluded that LTRADE does not formally cause LOCFDI.

Coefficients of exogenous variables

As for the LOCFDI equation, no exogenous variable is

Table 14. Estimations results for the 3 models by the VECM.

	Model 1: $ltrade$			Model 2: $lexp$			Model 3: $limp$	
Variable	$\Delta ltrade_t$	$\Delta locfdi_t$	Variable	$\Delta lexp_t$	$\Delta locfdi_t$	Variable	$\Delta limp_t$	$\Delta locfdi_t$
Delayed endogenous variables and error correction term								
Terme correcteur	-0.078*** (0.011)	-0.059*** (0.021)	Terme correcteur	-0.047*** (0.008)	-0.028** (0.011)	Terme correcteur	-0.032*** (0.006)	0.000^{NA} (0.000)
$\Delta ltrade_{t-1}$	-0.001 (0.037)	-0.119** (0.070)	$\Delta lexp_{t-1}$	-0.091** (0.041)	-0.059 (0.060)	$\Delta limp_{t-1}$	-0.052* (0.041)	-0.119** (0.069)
$\Delta ltrade_{t-2}$	-0.074** (0.036)	-0.037 (0.069)	$\Delta lexp_{t-2}$	-0.078** (0.040)	-0.083* (0.058)	$\Delta limp_{t-2}$	-0.063** (0.036)	0.019 (0.062)
$\Delta ltrade_{t-3}$	0.043 (0.034)	0.0004 (0.065)	$\Delta lexp_{t-3}$	-0.065* (0.039)	-0.033 (0.057)	$\Delta limp_{t-3}$	0.017 (0.035)	0.006 (0.059)
$\Delta ltrade_{t-4}$	-0.041(0.034)	-0.029 (0.066)	$\Delta lexp_{t-4}$	-0.067** (0.040)	-0.078* (0.058)	$\Delta limp_{t-4}$	0.003 (0.034)	0.016 (0.057)
-	-	-	-	-	-	$\Delta limp_{t-5}$	-0.100*** (0.033)	-0.019 (0.057)
$\Delta locfdi_{t-1}$	0.548*** (0.081)	0.142 (0.155)	$\Delta locfdi_{t-1}$	0.679*** (0.118)	0.125 (0.171)	$\Delta locfdi_{t-1}$	0.455*** (0.114)	-0.235 (0.195)
$\Delta locfdi_{t-2}$	0.544*** (0.081)	0.032 (0.155)	$\Delta locfdi_{t-2}$	0.670*** (0.117)	0.016 (0.170)	$\Delta locfdi_{t-2}$	0.467*** (0.100)	-0.099 (0.170)
$\Delta locfdi_{t-3}$	0.521*** (0.079)	0.180 (0.151)	$\Delta locfdi_{t-3}$	0.638*** (0.113)	0.163 (0.165)	$\Delta locfdi_{t-3}$	0.449*** (0.099)	0.011 (0.169)
$\Delta locfdi_{t-4}$	0.522*** (0.086)	-3.216*** (0.163)	$\Delta locfdi_{t-4}$	0.635** (0.121)	-3.225*** (0.177)	$\Delta locfdi_{t-4}$	0.446*** (0.111)	-3.521*** (0.188)
-	-	-	-	-	-	$\Delta locfdi_{t-5}$	-0.056 (0.171)	-1.335*** (0.291)
Endogenous variables								
C	-0.055*** (0.017)	0.040 (0.033)	C	-0.035* (0.023)	0.052* (0.033)	C	-0.059*** (0.021)	0.066** (0.036)
$\Delta lgdp_t$	0.058 (0.080)	-0.045 (0.153)	$\Delta lgdp_t$	0.138* (0.105)	-0.056 (0.153)	$\Delta lgdp_t$	0.016 (0.093)	-0.012 (0.160)
$\Delta llabor_t$	-0.023* (0.014)	-0.006 (0.027)	$\Delta llabor_t$	-0.059*** (0.019)	-0.003 (0.029)	$\Delta llabor_t$	-0.003 (0.016)	-0.011 (0.028)
Δlh_t	-0.0005 (0.003)	-0.002 (0.006)	Δlh_t	0.002 (0.004)	-0.002 (0.006)	Δlh_t	-0.002 (0.003)	-0.001 (0.006)
$\Delta linstps_t$	-0.021 (0.018)	0.045* (0.035)	$\Delta linstps_t$	-0.008 (0.024)	0.042 (0.034)	$\Delta linstps_t$	-0.037** (0.022)	0.048* (0.037)
$\Delta linstcc_t$	-0.001 (0.040)	0.053 (0.076)	$\Delta linstcc_t$	-0.0007 (0.052)	0.042 (0.076)	$\Delta linstcc_t$	0.011 (0.047)	0.062 (0.081)
Southern Afr.	0.072*** (0.021)	0.017 (0.040)	Southern Afr.	0.042* (0.027)	0.003 (0.040)	Southern Afr.	0.090*** (0.025)	0.005 (0.043)
Central Afr.	0.039* (0.021)	-0.032 (0.039)	Central Afr.	0.008 (0.027)	-0.03 (0.039)	Central Afr.	0.061*** (0.024)	-0.050 (0.042)
Northern Afr.	0.052** (0.024)	0.005 (0.047)	Northern Afr.	0.021 (0.032)	-0.003 (0.047)	Northern Afr.	0.069*** (0.029)	-0.017 (0.049)

Table 14. Contd.

Western Afr.	0.048** (0.019)	-0.020 (0.037)	*Western Afr.*	0.022 (0.025)	-0.033 (0.037)	*Western Afr.*	0.056*** (0.023)	-0.036 (0.040)
Indian ocean	0.083*** (0.027)	0.040 (0.051)	*Indian ocean*	0.059** (0.034)	0.014 (0.049)	*Indian ocean*	0.111*** (0.033)	0.032 (0.059)
Eastern Afr.	Réf.	Réf.	*Eastern Afr.*	Réf.	Réf.	*Eastern Afr.*	Réf.	Réf.
Obs.	572	572	Obs.	572	572	Obs.	520	520
R^2	0.109	0.816	R^2	0.105	0.815	R^2	0.112	0.827
Ajusted R^2	0.079	0.810	Ajusted R^2	0.075	0.809	Ajusted R^2	0.075	0.820
F-statistic	3.553	129.18	F-statistic	3.422	128.67	F-statistic	2.993	113.26
-	-	-	-	-	-	LR test Res. (A(2,1)=0)	p-value=0.0761	
Pr Wald causality test	0.0000	0.5075	Pr Wald causality test	0.0000	0.3856	Pr Wald causality test	0.0000	0.6884
%variance LTRADE h=10 retards	45.00%	55.00%	%variance LEXP h=10 retards	49.48%	50.52%	%variance LIMP h=10 retards	51.23%	48.77%
%variance LOCFDI h=10 retards	0.85%	99.15%	%variance LOCFDI h=10 retards	0.46%	99.54%	%variance LOCFDI h=10 retards	0.24%	99.76%
Test Ljung-Box	P=0.1758	-	Test Ljung-Box	P=0.1240	-	Test Ljung-Box	P=0.0923	-

significant at 5%. Only linstps explains LOCFDI at 10%. One could say that when the stability score increases by 10%, the volume of FDI increases by 0.45%.

Model 2 LEXPORT

The estimation of model 2 reveals mainly the following results (Table 14).

Validity of the model

Regarding the validity of the model, the two variables LEXPORT and LOCFDI are endogenous variables, based on the weak exogeneity test (Table 14). Indeed, the corrective term is significant at 1 and 5% in both equations, and has the expected negative sign. There is a reminder to balance. The model has residuals that are uncorrelated according to the Ljung-Box test (p-value = 0.1240> 0.05), so they have the behavior of a white noise. These elements indicate that model 2 is indeed valid.

Equation 1

Coefficients of endogenous variables

For delayed endogenous exports, the coefficients from the first to the fourth offsets are significant at 5%. This means that when LTRADE increases by 10% during the year considered, it is expected that it decreases by 0.91% the following year, 0.78% two years later, 0.65% three years later, 0.67 four years later. On the other hand, all 4 delayed LOCFDI variables are positively associated with the 1% threshold export. This means that when LOCFDI increases by 10% today, the export increases 6.35% 4 years later, 6.38% 3 years later, 6.7% 2 years later and 6.79% the following year. These results show a positive and almost stable influence of foreign direct investment from China on the level of exports of African countries. With regard to the decomposition of the conjectured variance at the 10th delay, LOCFDI explains 50.52% of L EXPORT variation. This result is confirmed by the

p-value of the Wald statistic of Granger test, which has a value of 0.0000. It thus concludes that LOCFDI actually causes LEXPORT.

Coefficients of exogenous variables

Only the dummies of the Souther Afr, Indian Ocean sub-regions are significant at 10%and 5%. Souafr, Cenafr, Norafr, Westafr and Indocean are dummy variables indicating the country's membership in a given sub-region, with Eastafr being the reference variable omitted for reasons of multicollinearity. The coefficients of these variables measure the difference in the average of exports for a given sub-region with respect to East Africa. They are all positive, for the significances of 5% and 10% for only two sub-regions. In addition, the LLABOR variable with a negative sign is significant at 1%. This would mean that when the labor force increases by 10%, the trade opening decreases by 0.59%.

Equation 2

Coefficients of endogenous variables

With regard to LOCFDI, only the variables lexport delayed by two periods and four periods and LOCFDI offset by 4 periods are significant at 10%, 10% and 1% respectively. Thus, 10% of increase in the value of the export at time t results a decrease of LOCFDI of 0.83% in t + 2 and 0.78% in t + 4. Increasing exports in the present, would therefore reduce an influx of OCFDI in the near future. For an increase of 10% of LOCFDI in t, it is expected to observe a decline of LOCFDI 4 years later of the order of 32.25%. As for the decomposition of the conjectured variance at 10th delay, LEXPORT explains only 0.46% of the variation of LOCFDI. The Granger test reveals that the export does not cause LOCFDI (p-value = 0.3856). It is concluded that LEXPORT does not formally cause LOCFDI.

Coefficients of exogenous variables

Regarding the LOCFDI equation, no exogenous variables are significant.

Model 3 LIMPORT

The estimation of model 3 reveals mainly the following results (Table 14).

Validity of the model

Regarding the validity of the model, only IMPORT is an endogenous variables, based on the weak exogeneity test (Table 13). Indeed, the correction term is significant at 1% and 10% in both equations and has the expected negative sign. There is a reminder to balance. The model has residuals that are uncorrelated according to the Ljung-Box test (p-value = 0.0923> 0.05), so they have the behavior of a white noise. These elements indicate that model3 is indeed valid.

Equation 1

Coefficients of endogenous variables

For endogenous retarded of limport, only the coefficient of the first, second and third shifts are significant at 10, 5 and 1%, respectively. This means that when the import increases by 10% during the year, it is expected to decrease by 0.52% the following year and by 0.63% two years later. On the other hand, all 4 delayed LOCFDI variables are positively associated with the 1% threshold. This means that when LOCFDI increases by 10% today, limport increases by 4.46% 4 years later, by 4.49% after 3 years, by 54.67% 2 years later and by 4.55% the following year. These results show a positive and almost stable influence of foreign direct investment from China on the level of imports of African countries.

With regard to the decomposition of the conjectured variance at 10th delay, LOCFDI explains 48.77% of LIMPORT's variation. This result is confirmed by the p-value of the Wald statistic of the Granger test, which has a value of 0.0000. It thus concludes that LOCFDI actually causes LIMPORT.

Coefficients of exogenous variables

Only the dummies in the sub-regions of Africa are significant at 1%. Souafr, Cenafr, Norafr, Westafr and Indocean are dummy variables indicating the country's membership in given sub-region, with Eastafr being the reference variable omitted for reasons of multicollinearity. The coefficients of these variables measure the difference in the average of limport for a given subregion with respect to East Africa. They are all positive, but their values do not reach 10%. In addition, the linstps variable with a negative sign is significant at 5%. This would mean that when the level of political stablity increases by 10%, the level of imports decreases by 0.37%.

Equation2

Coefficients of endogenous variables

As far as LOCFDI is concerned, only the lagged variables

of a period, the fourth period and LOCFDI lagged by 5 periods are significant at 5, 1 and 1% respectively. Thus, an increase of 10% of limport at time t results a decrease of 1.19% of LOCFDI in t + 1, 35.21% in t + 4 and 13.35% in t + 5. An increase of imports in the present, would therefore reduce an influx of FDI in the near future. For a LOCFDI increase of 10% in t, it is expected to observe a decrease of LOCFDI 4 and 5 years later of the order of 35.21% and 13.35%. Regarding the decomposition of the conjectured variance at 10th delay, LIMPORT explains only 0.24% of the variation of LOCFDI. The Granger test reveals that limport does not cause LOCFDI (p-value = 0.6884). It is concluded that LIMPORT does not formally cause LOCFDI.

Coefficients of exogenous variables

As for LOCFDI equation, no exogenous variable is significant at 5%. Only linstps explains LOCFDI at 10%. One could say that when the stability score increases by 10%, the volume of FDI increases by 0.48%.

Conclusion

This study examines the effect or impact of Chinese OFDI on international trade in Africa during the period 2000 to 2015. To bring out this result, we have firstly posed three hypotheses that must be tested to confirm several literature review and assumption. Data was collected through several sources as World Bank Indicator, International Monetary Fund, MOFCOM, UNCTAD. The error corrector model has been chosen to show the long-run relationship between trade and OCFDI. Secondly we applied Levin, Lin and Chu; Im, Pesaran and Shin; ADF-Fisher to see if our variables have unit root or not. The results reveal that hypothesis H0 (has unit root) is rejected; the variables are integrated I (I), (Table 6).

After tested the stationary of the variables, the cointegration test needs to be done; results in Table 7 show that all the variables are cointegrated. Thus the ECM is applied to have the long run equilibrium relationship between Chinese OFDI and international trade. As we see, the trade has positive and significant long-run relationship with OCFDI (Table 14). In the short term, there are bidirectional causality between LTRADE, LEXP, LIMP and OCFDI (Tables 8 to 10). Export and import have a positive and significant relationship with OCFDI; OCFDI cause both Export and Import.

African government should create the mechanism to attract more world FDI and particularly Chinese OFDI. By example, the reduction of time of administrative procedures that are too long; the fight against corruption

must be put in the forefront by the African leaders, which should allow investors to invest in Africa and also allow international organizations to provide development assistance on the continent.

Furthermore, to increase also the share of African international market, African leaders must ensure political stability through alternation in power in real time and through transparent elections of the head of states; to give a better image of the continent to the global investors.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

ACKNOWLEDGEMENTS

REFERENCES

Akame AJ, Ekwelle ME, Njei GN (2016). The Impact of Business Climate on Foreign Direct Investment in the CEMAC Region. J. Econ. Sustainab. Develop. 7(22):66-74.
Banga, R (2008). Drivers of Outward Foreign Direct Investment from Asian Developing Economies. Asia-Pacific Trad. Investm. Rev. 4:195-215.
Belloumi M (2014). The relationship between trade, FDI and economic growth in Tunisia: An application of the autoregressive distributed lag model. J. Econ. System 38(2):269-287.
Bruce A, Blonigen (1999). In search of substitution between foreign production and exports. J. Int. Econ. 53(2001):81-104.
Cheung YW, Qian X (2009). The Empirics of China's Outward Direct Investment. CES Working Paper No 2621.
Dupasquier C, Osakwe PN (2003). Performance, Promotion, and Prospects for Foreign Investment in Africa: National, Regional, and International Responsibilities. Paper Prepared for the "Eminent Persons' Meeting on Promotion of Investment in Africa", Tokyo, February.
Frimpong SK (2012). Research on Relationship between China and Ghana: Trade and Foreign Direct Investment. J. Econom. Sustainab. Develop. 3(7):51-61.
Gul MK, Naseem I (2015). Impact of Foreign Direct Investment on Economic Growth of Pakistan. Am. J. Bus. Manage. 4(4):190-202.
Iqbal S, Shahid S, Bukhari A (2015). Trade Liberalization and FDI in Pakistan. J. Econ. Sustainab. Dev. 6(11):101-108.
Kipeja BSK (2015). Key Determinant of China's Outwards FDI to Africa. J. Econ. Sustainab. Dev. 6(6):216-234.
Liu X, Wang C, Wei Y (2001). (2002). Causal links between foreign direct investment and trade in China. China Econ. Rev. 12(2-3):190-202.
Markusen JR, Maskus KE (2002). "Discriminating among alternative theories of the multinational enterprise", Rev. Int. Econ.10(4):694-707.

Mundell R (2010). International Trade and International Capital Flows: A theoretical perspective. Available at https://personal.lse.ac.uk/jink/pdf/globalization_chapter.pdf

N'guessan BZSC, Yue Y (2010). The Relationship between Foreign Direct Investment, Trade Openness and Growth in Cote d'Ivoire. Int. J. Bus. Manage. 5(7):99-107.

Popovici OC, Calin AC (2017). The role of Foreign and Domestic Investment in Promoting Exports and Imports: A Dynamic Panel Approach. J. Econ. Lit. C36, F14, F21.

Rosen DH, Thilo H (2011). Maximizing the Benefits of Chinese Foreign Direct Investment. Center on US-China Relations, Asia Society Report, and Kissinger Institute on China and the United States, Woodrow Wilson International Center for Scholars. p16.

Simionescu M (2014). The Relationship between Trade and Foreign Direct Investment in G7 Countries: a Panel Data Approach. J. Econ. Dev. Stud. 2(2):447-454.

Tham SY, Goh SK, Wong KN, Ahmad F (2017). Bilateral Export Trade, Outwards and Inwards FDI: A dynamic Gravity Model Approach Using Sectorial Data from Malaysia. J. Econ. Lit. F21.

Wang T, Qiang L (2016). Relationship between FDI and Export Trade in Shaanxi Province in China: A Co-integration Analysis Based on Data from 1996 to 2015. J. Econ. Sustainab. Develop. 7(12):173-177.

World Trade Statistical Review (2016). https://www.wto.org/english/res_e/statis_e/wts2016_e/wts16_toc_e.htm

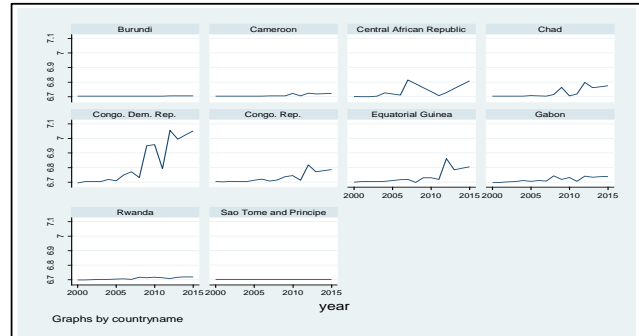World Investment Report. (2017). http://unctad.org/en/PublicationsLibrary/wir2017_en.pdf

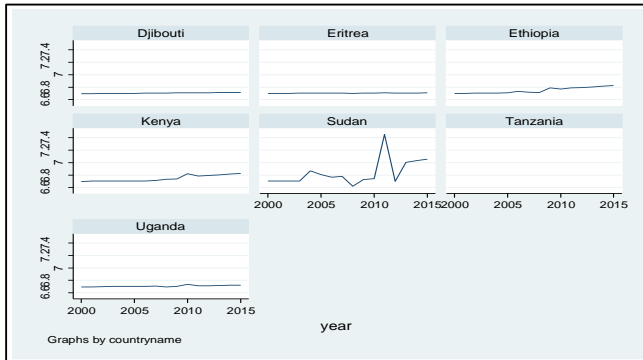## APPENDICES

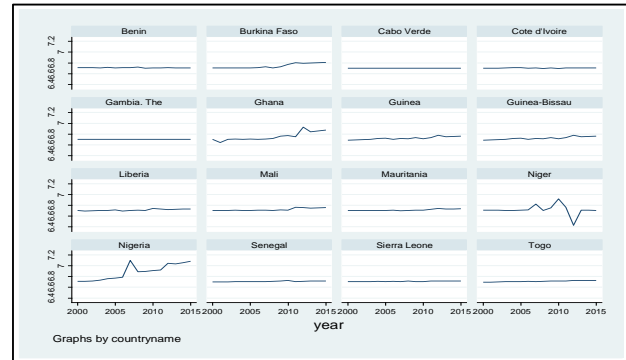**Appendix 1.** Evolution of LOCFDI by country.

Southern Africa
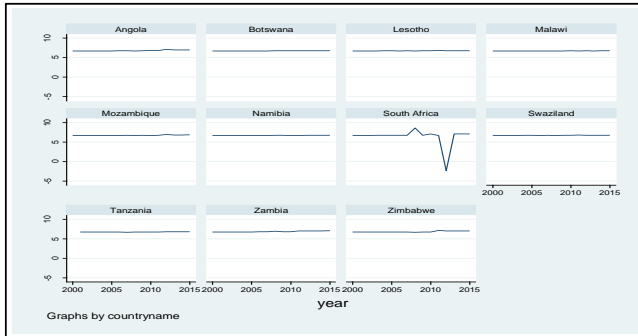
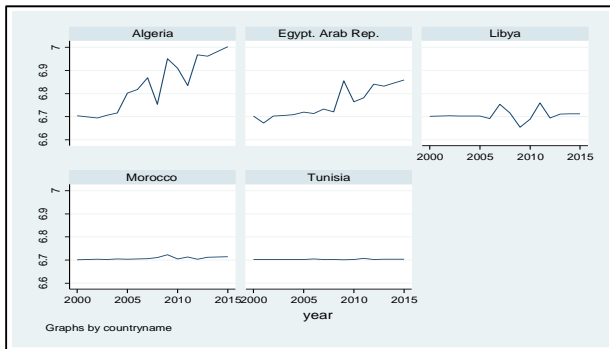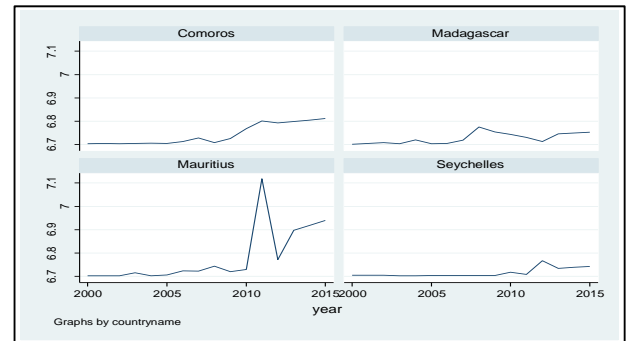### Central Africa

Eastern Africa

Western Africa

Northern Africa

Indian Ocean

Appendix 2. Average of OCFDI and international trade by country.

Country Name	LTRADE	LEXP	LIMP	LOCFDI
Africa	**4,233**	**3,331**	**3,665**	**6,731**
Southern Africa	**4,374**	**3,548**	**3,772**	**6,720**
Angola	4,741	**4,179**	3,886	6,792
Botswana	4,568	3,913	3,821	6,721
Lesotho	4,468	3,352	4,066	6,731
Malawi	4,067	3,138	3,558	6,706
Mozambique	4,381	3,329	3,938	6,748
Namibia	4,597	3,802	3,991	6,710
South Africa	4,070	3,382	3,370	6,372
Swaziland	**4,824**	4,051	**4,204**	6,731
Tanzania	3,825	2,928	3,297	6,743
Zambia	4,219	3,475	3,564	**6,848**
Zimbabwe	4,320	3,443	3,772	6,815

	LTRADE	LEXP	LIMP	LOCFDI
Central Africa	**4,147**	**3,231**	**3,546**	**6,731**
Burundi	3,613	1,971	3,392	6,703
Cameroon	3,794	3,017	3,171	6,709
Central African	3,633	2,622	3,165	6,740
Chad	4,386	3,462	3,815	6,727
Congo, Dem, Rep,	4,045	3,264	3,430	**6,832**
Congo, Rep,	4,930	4,370	4,069	6,732
Equatorial Guinea	**5,069**	**4,477**	**4,200**	6,736
Gabon	4,450	4,031	3,373	6,717
Rwanda	3,670	2,426	3,325	6,710
Sao Tome and Principe	3,875	2,667	3,520	6,703

	LTRADE	LEXP	LIMP	LOCFDI
Eastern Africa	**3,853**	**2,762**	**3,400**	**6,741**
Djibouti	**4,564**	**3,720**	**4,001**	6,705
Eritrea	3,776	2,018	3,561	6,704
Ethiopia	3,575	2,342	3,229	6,749
Kenya	4,006	3,093	3,489	6,747
Sudan	3,460	2,675	2,838	**6,835**
Tanzania	3,511	2,593	3,002	6,703
Uganda	3,757	2,736	3,307	6,709

	LTRADE	LEXP	LIMP	LOCFDI
Western Africa	**4,235**	**3,294**	**3,709**	**6,727**
Benin	4,030	3,103	3,525	6,710
Burkina Faso	3,760	2,646	3,352	6,743
Cabo Verde	**4,594**	3,563	4,148	6,703
Cote d'Ivoire	4,430	**3,824**	3,639	6,705
Gambia, The	4,136	3,124	3,665	6,703
Ghana	4,467	3,571	3,941	6,755
Guinea	4,210	3,365	3,634	6,725
Guinea-Bissau	3,906	2,985	3,394	6,725
Liberia	4,902	3,561	**4,540**	6,712

Appendix 2. Contd.

Mali	4,041	3,200	3,474	6,721
Mauritania	4,591	3,635	4,092	6,714
Niger	3,959	2,915	3,521	6,716
Nigeria	3,938	3,411	3,024	**6,880**
Senegal	4,254	3,296	3,768	6,708
Sierra Leone	3,973	2,816	3,583	6,709
Togo	4,569	3,683	4,037	6,711

	LTRADE	LEXP	LIMP	LOCFDI
Northern Africa	**4,277**	**3,597**	**3,535**	**6,743**
Algeria	4,192	3,642	3,303	**6,836**
Egypt	3,871	3,054	3,285	6,760
Libya	4,490	**4,023**	3,483	6,707
Morocco	4,267	3,447	3,685	6,708
Tunisia	**4,564**	3,818	**3,920**	6,704

	LTRADE	LEXP	LIMP	LOCFDI
Indian Ocean	**4,574**	**3,669**	**4,063**	**6,742**
Comoros	4,074	2,801	3,729	6,743
Madagascar	4,242	3,311	3,734	6,727
Mauritius	4,761	4,004	4,125	**6,783**
Seychelles	**5,220**	**4,561**	**4,662**	6,716

Appendix 3. Looking at the average values over the entire period (2000-2015) country by country (Figure 3), the first five and the last five are as follows:

Rank	LTRADE	LEXP	LIMP	LOCFDI
1[er]	Seychelles	Seychelles	Seychelles	Nigeria
2[e]	Equatorial Guinea	Equatorial Guinea	Swaziland	Zambia
3[e]	Congo	Congo	Liberia	Algeria
4[e]	Swaziland	Angola	Equatorial Guinea	Sudan
5[e]	Mauritius	Swaziland	Cabo verde	Congo democratic
48[e]	Rwanda	Burkina-Faso	Ethiopia	Burundi
49[e]	Central African Rep.	Central African Rep.	Cameroon	Cabo verde
50[e]	Burundi	Ethiopia	Central African Rep.	Gambia
51[e]	Ethiopia	Eritrea	Nigeria	Sao tome
52[e]	Sudan	Burundi	Sudan	South Africa

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