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Table of Contents

International Entrepreneurship Review

2022, Vol. 8, No. 1

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Elaborating on a new entrepreneur typology from the corporate governance perspective

Driss El Kadiri Boutchich

ABSTRACT

Objective: This work aims to build a new entrepreneur typology in line with corporate governance approaches adopted by the enterprises and therefore to adequately implement public policy and strategy about entrepreneurship, since governance is an important basis for decision-making.

Research Design & Methods: To achieve the above objective, associations are established between entrepreneur types and corporate governance approaches via multiple correspondence analysis with grouping method for discretization and variable principal for normalization.

Findings: Findings highlight a new entrepreneur typology, which comprises four types of entrepreneurs with regard to corporate governance approaches. The new typology is as follows: structure-oriented shareholder; behaviour-oriented stakeholder; legal control oriented and economic-managerial control oriented.

Implications & Recommendations: This work has theoretical implications which reside in the need to use corporate governance for strategic modelling. It also has practical implications in that it is easier and more appropriate to make decisions from corporate governance approaches than from types of enterprises. Thus, enterprises and the state must take advantage of these implications to improve the entrepreneurship productivity.

Contribution & Value Added: This work conceives a new entrepreneur typology in line with corporate governance. Thus, it allows promoting strategic modelling based on corporate governance in business and public areas.

Article type: research article

Keywords: new entrepreneur typology; corporate governance approaches; strategic implications; ex-post typologies; multiple correspondence analysis

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INTRODUCTION

Entrepreneurship is an important factor for the development of a region or a country, since it is the source of the creation of wealth, jobs and incomes. In addition, entrepreneurship is an essential contribution to innovation and technological growth, driving productivity and economic development (Aljazzazen, 2021). Also, entrepreneurship is closely linked to the type of entrepreneur who shapes it according to his habits (Bourdieu, 1972). In this way, several types of entrepreneurs have been highlighted to offer attractive conceptualizations of the personality of the entrepreneur and enlighten the plurality of its behaviours (Grandclaude & Nobre, 2018).

On the other hand, corporate governance is a key factor of the enterprise performance and decision making (Ndemezo & Kayitana, 2018). But, there are several approaches to corporate governance, each of which fits well with a given type of entrepreneur, according to a configurational-contingency approach (El Kadiri Boutchich, 2020).

But the link between entrepreneur types and corporate governance is not highlighted, in particular via empirical studies (Tribbitt, 2012). Indeed, while several entrepreneur typologies have been constructed according to factors like psychological needs, risk and innovation, there is an ab-

sence of work on the entrepreneur typologies building in relation to corporate governance (Salmony & Kanbach, 2021).

Thus, this work seeks to fill this gap by establishing the relationship between the types of entrepreneur and the corporate governance approaches in order to build a new entrepreneur typology in harmony with corporate governance approaches adopted by the enterprises. At this level, the building of the above typology is motivated by the importance of corporate governance for performance improvement and decision-making (Ndemezo & Kayitana, 2018). In fact, the association of types of entrepreneur with governance allows adopting corporate and public strategies that ameliorate the entrepreneurship productivity, since the corporate governance is considered as a particular form of strategy (Salepçioğlu & Sarı, 2021).

In addition to the gap filled, this work is interesting, since it uses correspondence multiple analysis, which is not widely employed in the field of social sciences. Equally, the method used in this work adopts a configurational approach taking into account intra and inter-variable interactions. This configurational approach has an analogy with discriminating alignment hypothesis of Williamson, which postulates that transactions differ in their attributes, in line with governance structures, which differ in their cost and competence (Williamson, 1999). Furthermore, this work highlights scientific methods to build ex-post typologies for entrepreneurs and updates the types of entrepreneurs list, which further legitimizes its interest.

Lastly, the presentation of this work in terms of types allows highlighting the complexity of the phenomena studied (Grandclaude & Nobre, 2018) and produces a mirror-effect for the enterprise to better recognize itself and make adequate decisions (Savall *et al.*, 2017). Thus, the presentation of this work with reference to entrepreneur types contributes managerially and pedagogically to improve the performance of the enterprise (Fayolle, 2012).

This work is divided into five parts, in addition to the introduction. The first is devoted to the literature review. The second deals with the methodology, while the third is dedicated to the results. As for the fourth part, it is related to the discussion and finally, a general conclusion is subsequently drawn in the fifth section, which includes the response to the problematic, the implications of this work and the limitations, their justifications as well as the perspectives of this research.

LITERATURE REVIEW

The literature review deals with types of entrepreneurs, corporate governance approaches and relationship between the both.

Types of Entrepreneurs

Several typologies have been established and recapitulated by Woo *et al.* (1991), Filion (2000) and especially by Daval, *et al.* (2002) who built 36 typologies and proposed a related reading grid. After, other typologies of entrepreneurs have been built, such as that of Vega and Kidwell (2007) distinguishing social entrepreneur and business one and that of Tang *et al.* (2008) identifying four types of entrepreneurs based on the degree of their ignorance and reluctance. It is equally a question of the typology of Veena and Nagaraja (2013), which differentiates male entrepreneur, and female entrepreneur as well as the typology of Tarillon (2014) highlighting four types of entrepreneur-managers according to their representations of growth and governance.

Later, Tessier-Dargent (2015) refines the Global Entrepreneurship Monitor typology, which distinguishes entrepreneur by necessity and entrepreneur by opportunity through a study of the effectual dimension of start-up processes. After, Alexandre (2016) quoted 16 entrepreneur typologies. Then, Grandclaude and Nobre (2018) elaborated three entrepreneur categories according to sociological attributes. In the same period, Chen and Chang (2018) identify four types of creative entrepreneurs, with regard to creativity and opportunity recognition. Lastly, Cannatelli *et al.* (2019) distinguished entrepreneur with a passion for products and entrepreneur passionate about growth.

The main entrepreneur typologies are presented in table 1, in line with the literature review above and the typologies cited by Daval *et al.* (2002) as well as Alexandre (2016).

Table 1. Entrepreneur Typology

Author	Date	Typology
Cantillon	1755	Fixed income wage earners / Non-fixed income wage earners
Schumpeter	1935	Revolutionary entrepreneur / Imitating entrepreneur
Cole	1942	Empirical / Rational / Cognitive
Smith	1967	Craftsman / Opportunist
Collins and Moore	1970	Administrative entrepreneur / Independent entrepreneur
Laufer	1975	Innovator entrepreneur / Growth-oriented entrepreneur / Efficiency-oriented entrepreneur / Craftsman entrepreneur
Standworth and Curran	1976	Artisan / Classic/ Manager
Miles et Snow	1978	Prospector / defender (follower) / analyzer (innovator) / reactor
Dunkelberg and Cooper	1982	Craftsman / Growth-oriented / Independent
Carland *et al.*	1988	Entrepreneur / SME owner
Lafuente et Salas	1989	Craftsman / Risk-oriented / Family oriented / Managerial
Marchesnay	1998	Isolated, Nomadic / Notable / Enterprising
Filion	2000	Operator / Visionary
Vega and Kidwell	2007	Business entrepreneur / Social entrepreneur
Tang *et al.*	2008	True-believer / Ignorant / Practical / Reluctant
Fourquet	2011	Visionary / Enthusiast
Veena and Nagaraja	2013	Male entrepreneur / Female entrepreneur
Tarillon	2014	Independent / Collective / Manager / Self-centred
Tessier-Dargent	2015	Entrepreneur by necessity / Entrepreneur by opportunity
Grandclaude and Nobre	2018	Growth-oriented / Non-growth oriented/ Moderate
Chen and Chang	2018	Constructionist / Opportunist / Designer / Producer
Cannatelli *et al.*	2019	Entrepreneur with passion for products / Entrepreneur with passion for growth

Source: own study.

Corporate Governance Approaches

A multitude of governance approaches can be utilized in enterprise, among which the following are retained: shareholder, partnership, cognitive, ethical, institutional, legal, economic and managerial. The shareholder approach gives priority to funders, considers them as the source of value creation and seeks to protect their interests by disciplining leaders or managers and to solve the agency problem. The partnership approach takes into account the contribution of all the actors of the organization, in the process of creation and distribution of the value. As for the cognitive approach, it considers that value derives from the ability of management to imagine, perceive and create new productive opportunities through innovation, coordination and learning (Nordberg, 2018). Concerning the ethical approach, it states that the organization must be governed according to moral principles and good conduct (Mason & Simmons, 2014).

With regard to the institutional approach, it stipulates that governance is impacted by external institutional environment (Ge *et al.*, 2017) and enterprise specific institutional attributes such as trust and relational norms (Bell *et al.*, 2014). Thus, the institutional approach differs from legal one, since the former relies on norms to protect shareholders and the parties in relation to them, while the second uses an obligatory model of company's law, setting rules in order to protect the interests of shareholders, the company and the society (OECD, 2015).

Also, there is an economic efficiency approach to corporate governance, which consists of establishing a good match between the resources used and the results obtained in terms of corporate governance (Goo, 2017). Finally, there is the managerial approach to corporate governance, which is based on responsible managerial practices and strategies for better corporate governance (Filatotchev & Nakajima, 2014).

Relationship between Entrepreneur Types and Corporate Governance

In this section entrepreneur is not dissociated from enterprise. In this way, several studies linked entrepreneur (or enterprise) types to corporate governance. For instance, Zahra (1996) highlighted the

association between corporate governance and owner systems with its types of enterprises in terms of their level of entrepreneurship and the technological opportunities they have. Then, Hagen and Alshare (2005) and Tribbitt (2012) examined the impact of enterprise governance mechanisms on entrepreneurs. Also, Hung and Mondejar (2005) found that corporate governance approach influences the behavior of the entrepreneur in the risk and innovation area. Later, Albu and Mateescu (2015) showed that the impact of board independence and institutional ownership on entrepreneurship varies according to differences between types of entrepreneurs.

Furthermore, Bartholomeusz and Tanewski (2006) demonstrated that the difference between the family entrepreneur and the non-family entrepreneur has a significant impact on the structure of corporate governance. On other hand, Khurshed *et al.* (2011) found that institutional block-holding is associated with directors' ownership and board composition at governance level. Also, Omri *et al.* (2014) argued that governance based on ownership structure is associated with the enterprise innovation level. In the same vein, Bertoni *et al.* (2014) show that enterprise age (young enterprises vs older ones) affects board independence for corporate governance. Equally, Calabrò and Mussolino (2013) find that the relational norms trusts, as well as the board independence impact the enterprise internationalization level. Finally, several other studies have examined the aforementioned relationships between entrepreneur types and corporate governance (Li *et al.*, 2020).

RESEARCH METHODOLOGY

It includes problematic-epistemological stance, typologies, variables and the data analysis method employed to carry out this study.

Problematic-Epistemological Stance

The problematic of this research is articulated around the association between entrepreneur types and corporate governance approaches for identifying a new ex-post entrepreneur typology associated with the corporate governance approaches.

The epistemological stance adopted is positivist using an exploratory analysis, which allows avoiding the formulation of hypotheses and the need for their confirmation or invalidation (El Kadiri Boutchich, 2020). It is characterised by objectivity and exogeneity reflected by the distanciation from the object of the study.

In this way, a questionnaire was administered to 70 enterprises, of which only 63 agreed to fill it in 2020. The sample of 63 is composed by enough structured enterprises that can adequately respond to the questionnaire. The latter comprises questions from the data in table 3 (variables), to which are added some definitions of each type of entrepreneur and each governance approach. The respondent who is the entrepreneur need only to check the box that corresponds to his situation.

Typologies and Variables

Two typologies are used in the field of entrepreneurship, ex-ante typology and ex-post typology. The first uses intuition, while the second is based on an empirical approach, which is articulated around three main methods: ideal type's procedure, attribute reduction and aggregation kernel (Grandclaude & Nobre, 2018). Other multidimensional methods can be used is this area like multiple correspondence analysis, which is employed in this work in order to identify the ex-post typology of entrepreneurs in relation with corporate governance.

Related to this study, three typologies are retained as ex-ante entrepreneur typologies. They are as below:

1. Entrepreneur of Entrepreneurial Firm/ Entrepreneur of non-Entrepreneurial Firm.
2. Social Entrepreneur / Business Entrepreneur.
3. Entrepreneur by Necessity/Entrepreneur by Opportunity.

The first typology is determined from lexical analysis dashboard in table 2.

Table 2. Lexical analysis dashboard

Keyword	Frequency	Percentage
Growth-oriented	7	9.46
Craftsman/Artisan	5	6.76
Independent	3	4.05
Manager	3	4.05
Opportunist	2	2.70
Efficiency-oriented	2	2.70
Risk-oriented	2	2.70
Family-oriented	2	2.70
Classic	1	1.35
Innovator	1	1.35
Moderate	1	1.35
Product-oriented	1	1.35

Source: Sphinx Software from Data of Table1.

The table 2 distinguishes clearly entrepreneur of entrepreneurial firm (growth-oriented, independent, manager, opportunist, efficiency-oriented, risk-oriented and innovator) from entrepreneur of non-entrepreneurial firm (craftsman/artisan, family-oriented, classic, moderate and product-oriented).

Dealing with the two last typologies, they are retained because they are not sufficiently studied in empirical way (Alexandre, 2016; Daval *et al.*, 2002). Concerning the second typology, difference between social entrepreneur and business one is made according to the vision of Prabhu (1999), by insinuating that the former create an economic surplus like the second, but through a social mission. In the same vein, Parkinson and Howorth (2008) argued that social entrepreneurs can be found in profit-seeking businesses that have some commitment to helping society and the environment. Lastly, about the third typology, entrepreneur by opportunity seeks good opportunities in the market to create or develop an enterprise, while entrepreneur by necessity starts or develops a business because there is no better or no other choice for him to avoid unemployment (Mota *et al.*, 2019).

As for the typologies of governance approaches, the following three typologies are selected:

1. Shareholder / Stakeholder.
2. Economic-Managerial / Legal.
3. Behavioral (cognitive) / Structural.

The first typology is established on the basis of the targeted performance (financial performance versus overall performance). The second typology is built on the basis of the corporate governance control tool adopted. With respect to the third typology, it is constructed on the basis of corporate governance implementation; in this case the behaviours or structures. The approach based on structures for corporate governance implementation mobilizes both the shareholder approach and the stakeholder approach (Dallago, 2002).

Related to the variables used in this work, they are synthesized in table 3 with their codes.

The Method Used: Multiple Correspondence Analysis

Multiple correspondence analysis establishes the correspondences between variables and modalities in a reduced representation space by extracting dimensions so that they have a maximum variance, which is achieved through the diagonalization of the product matrix of column profiles and row profiles. This diagonalization allows calculating the eigenvalues and therefore the eigenvectors (coordinates) as well as the explained inertia. It also highlights associations between modalities of variables to constitute homogeneous groups of variables or modalities, often via two dimensions that encompass the more relevant information. The multiple correspondence analysis in this work employs grouping method for *discretization* and variable principal for normalization.

Table 3. Entrepreneurial Typologies and Corporate Governance Approaches Typologies

Entrepreneur Typologies	Modalities	Corporate Governance Approaches Typologies	Modalites
Typology 1	Entrepreneur of Entrepreneurial Firm (coded 1)	Typology 1	Shareholder (coded 1)
	Entrepreneur of non-Entrepreneurial Firm (coded 2)		Stakeholder (coded 2)
Typology 2	Social Entrepreneur (coded 1)	Typology 2	Economic-Managerial (coded 1)
	Business Entrepreneur (coded 2)		Legal (coded 2)
Typology 3	Entrepreneur by Necessity (coded 1)	Typology 3	Behavioral (coded 1)
	Entrepreneur by Opportunity (coded 2)		Structural (coded 2)

Source: own study.

RESULTS AND DISCUSSION

Results include quality of the multiple correspondence models, discrimination measures and associations between entrepreneur types and corporate governance approaches. After, a discussion of results is made.

Quality of the Multiple Correspondence Model

The quality of this model is evaluated via the rate of the variance explained and the Cronbach's Alpha, which reflects the homogeneity of the modalities used in multiple correspondence analysis. The Cronbach's Alpha is acceptable if it ranges from 0.6 to 0.8 for an exploratory study and 0.8 to 1 for a confirmatory one (Ghewy, 2010). This quality is shown through the model summary, which reveals that the two dimensions retained restitute 81.1% of the information. This rate is very good, given that it is often underestimated in the multiple correspondence analysis (on the contrary of principal components analysis), because of the repetition of the data contained in the disjunctive table used by the multiple correspondence analysis. Also, the consistency between the modalities is quite good as long as Cronbach's Alpha exceeds 0.6, with mean value of 0.707.

Discrimination Measures

Discrimination measures are presented in table 4.

Table 4. Discrimination Measures

TYpologies	Dimension	
	1	2
Entrepreneur Typology 1	0.**727**	0.012
Entrepreneur Typology 2	0.007	**0.889**
Entrepreneur Typology 3	**0.729**	0.019
Corporate Governance Approach Typology 1	**0.741**	0.006
Corporate Governance Approach Typology 2	0,027	**0.869**
Corporate Governance Approach Typology 3	**0,841**	0.000
Active Total	3.071	1.796
Per cent of Variance	51.184	29.937

Source: SPSS.

Discrimination measures indicate that Entrepreneur Typology 1, Entrepreneur Typology 3, Corporate Governance Approach Typology 1 as well as Corporate Governance Approach Typology 3 belong to the dimension 1, while Entrepreneur Typology 2 and Corporate Governance Approach Typology 2

belong to the dimension 2. These results associated with the variable coordinates provided in table 5 allow establishing associations between entrepreneur types and corporate governance approaches.

Associations between Entrepreneur Types and Corporate Governance Approaches

Discrimination measures with modality coordinates provided by SPSS allow establishing Table 5.

Table 5. Correspondences between Entrepreneurial Typologies and Corporate Governance

Dimensions	Modalities with Negative Coordinates	Modalities with Positive coordinates
D i m e n s i o n 1		
Entrepreneur Typology 1	Entrepreneur with entrepreneurial firm	Entrepreneur with non-entrepreneurial firm
Entrepreneur Typology 3	Entrepreneur by Opportunity	Entrepreneur by Necessity
Corporate Governance Approach Typology 1	Shareholder	Stakeholder
Corporate Governance Approach Typology 3	Structural Implementation Basis	Behavioural Implementation Basis
D i m e n s i o n 2		
Entrepreneur Typology 2	Social Entrepreneur	Business Entrepreneur
Corporate Governance Approach Typology 2	Legal control Tools	Economic-Managerial Control Tools

Source: own study.

With regard to the first dimension, entrepreneur of entrepreneurial firm is an opportunist entrepreneur, who favors the interests of shareholders (financial performance) and structural implementation basis at the corporate governance level. On the other hand, entrepreneur of non-entrepreneurial firm is an entrepreneur by necessity, who prioritizes the interests of stakeholders, (overall performance) and behavioral implementation basis for effective corporate governance.

About the second dimension, it opposes social entrepreneur who uses legal control tools to business entrepreneur who utilizes economic-managerial control tools in the field of corporate governance.

In definitive, the results allow highlighting a new entrepreneur typology, which comprises four entrepreneur types with regard to corporate governance approaches: structure-oriented shareholder; behaviour-oriented shareholder; legal control oriented and economic-managerial control oriented.

Related to the discussion, for associations between nature of the firm owned by the entrepreneur and others variables, it is argued that governance ownership structure is more developed in innovative enterprise and therefore in entrepreneurial firm (Omri *et al.*, 2014). In the same way, the structural implementation mechanisms to corporate governance are more advanced in entrepreneurial firm through innovation (Belenzon *et al.*, 2009) and growth orientation via R&D (Tribbitt, 2012). In the similar way, growth, financial performance and therefore the shareholder approach to corporate governance are crucial aspects in the entrepreneurial firm (Li *et al.*, 2020).

On the other hand, the entrepreneur of a non-entrepreneurial firm has great similarly with the entrepreneur by necessity insofar as both attach little importance to the growth of the firm (Fairlie & Fossen, 2018). In addition, the entrepreneur by necessity seems to be more social than the entrepreneur by opportunity according to this study. However, several studies refute this assertion, such as that of Larsson and Thulin (2018), which shows that the entrepreneur by necessity has a little interest in subjective well-being, that of Giacomin, Janssen, and Guyot (2016) who states the entrepreneur by necessity is locked into himself because of the weakness of his human and social capital and his professional network and the study of Tessier-Dargent (2014) that indicates the entrepreneur by necessity perceives the social, political and economic environment as negative, which has a negative impact on his behaviour.

But, Tessier-Dargent (2015), argued that the practice of entrepreneurship by necessity is differentiated according to individual and socio-economic contexts. In this way, the social character of entrepreneurs by necessity in this study can be explained by the fact that a great part of them is composed by people retiring through voluntary departure who continue to receive their full wages in addition to the voluntary departure grant, which has enabled them to create an enterprise under favourable conditions.

On another side, Young and Thyil (2014) demonstrated that corporate responsibility, which implies stakeholders and social aspects that entrepreneur by necessity prioritizes, is used by him as a strategy to counteract different contextual alias trough behavioural norms. In the same way, the entrepreneur by necessity favours governance based on behavioural control, since he does not have sufficient managerial potential to set up governance structures. In addition, the entrepreneur by necessity replaces the low importance given to its business activity by social aspects related to it (Tessier-Dargent, 2015; Williams, 2007;).

Concerning the two last associations between entrepreneurship and corporate governance, social entrepreneurship employs a legal approach to associate social responsibility with corporate governance in order to avoid unethical behaviour in socially vulnerable economies (Rahim, 2012). Conversely, business entrepreneurship favours managerial tools like performance reporting, financial controls and systems of risk management (Rigolini, 2013) and economic tools in terms of efficiency (Goo, 2017) at the corporate governance level.

CONCLUSIONS

The conclusion comprises the response to the problematic, theoretical implications, enterprise strategic implications, implications, public strategic implications as well as limitations, their justifications and perspectives of this work.

Response to the Problematic

As a response to the problematic of this research, this work highlighted four new entrepreneur types with regard to corporate governance: structure-oriented shareholder; behaviour-oriented shareholder; legal control oriented; economic-managerial control oriented. The first entrepreneur type favours the interests of shareholders and structures as basis of corporate governance implementation. The second entrepreneur type prioritizes the interests of stakeholders and behaviours for corporate governance implementation. The third entrepreneur type uses legal control tools to corporate governance, while the fourth entrepreneur type utilizes economic-managerial control tools at the corporate governance level.

These entrepreneur types are determined through appropriate multidimensional method, with is multiple correspondence analysis. This method allows building these types in configurational manner. This method was applied on three typologies of entrepreneurs and three typologies of corporate governance approaches that are selected from lexical analysis performed in this work and literature review. Finally, this method led to obtaining new types of entrepreneurs in relation to corporate governance from discrimination measures associated with the coordinates of the modalities of the six typologies integrated in the multiple correspondence analysis. In addition, since governance is an important factor of performance, the association of types of entrepreneurs with governance allows opting for adequate enterprise and public strategies.

Theoretical Implications

With regard to theoretical implications, this work encourages the elaboration on ex-post entrepreneurial typologies and based on empirical studies that highlight the complexity of entrepreneurial phenomena and improve the entrepreneur understanding (Grandclaude & Nobre, 2018). It equally leads to consider corporate governance as an inevitable intermediation between entrepreneurship and strategic decision-making on the one hand and between action and performance on the other hand (Ndemezo & Kayitana, 2018). Finally, this work is likely to promote the specific strategic modelling based on corporate governance like sustainable strategy and strategy within a crisis context (Salepçioğlu & Sarı, 2021).

Enterprise Strategic Implications

Enterprise strategic implications are studied, since strategy is the essential factor of enterprise performance (Islami *et al.*, 2020). In this way, the new entrepreneur types are useful for trainers to adopt the most appropriate training strategies with regard to the management and governance style the

entrepreneur wishes to adopt (Filion, 2000). At this level, according to Global Entrepreneurship Monitor (2017), it should be noted that insufficient or inadequate training is one of the important factors of entrepreneurial failure. However, training strategies must be defined via coordination with the university and enterprises to give convincing results (Galvão *et al.*, 2018).

Also, the entrepreneur typology produces a mirror-effect for entrepreneurs to better recognize themselves and make the right strategic decisions (Savall *et al.*, 2017). In this direction, enterprises can choose the strategic model taking into account the corporate governance approach they adopt. So, the first entrepreneur type identified by this study with important corporate governance structures must perform more strategic change than the second entrepreneur type with weak ownership structures (Brunninge *et al.*, 2007). In the same vein, the first entrepreneur type is able to adopt an intensive growth strategy, while the second entrepreneur type opts for a gradual growth strategy (Ramadani *et al.*, 2020).

In addition, it is plausible to take into account link between governance and strategy to identify some strategic types for enterprises. For instance, it is possible to use the McKinsey matrix, which crosses business strength (high, medium, low) and industry/market attractiveness (high, medium, low).

In this regard, the second entrepreneur type has business strength in terms of low governance implementation costs thanks to its modest governance structures, but has low market attractiveness (Giacomin *et al.*, 2016). On the other hand, the first entrepreneur type incurs high governance costs because of its sophisticated governance structures but has high market attractiveness by operating in profitable market segments to cover governance implementation costs and to achieve a satisfactory performance (Block & Wagner, 2010). Thus, it is possible to assert that the second entrepreneur type must adopt a selective strategy, while the first entrepreneur type has to opt for a leader strategy with intensive growth, according to the McKinsey matrix.

Also, the first entrepreneur type with an independent chairman of the board adopts a more diversified strategy for suppliers than the other entrepreneur types with a dependent chairman of the board (Da-Silva & Black, 2005). In the same vein, in the field of the internationalization strategy, the first entrepreneur type tends to apply unrelated diversification thanks to developed governance structures, while the second entrepreneur type tends to opt for other forms of diversification due to the insufficiency of its governance structures (Ritossal & Bulgacov, 2009).

Furthermore, the third entrepreneur type who is a social entrepreneur can take advantage of his respect for social rules related to governance to adopt a national or international citizen strategy that will be supported by governments and social associations (Forouharfar *et al.*, 2019), while the fourth entrepreneur type can borrow from the two first entrepreneur types in the field of strategy.

Finally, the first type of entrepreneur, taking into account his expanded governance structures is able to adopt a causation strategy allowing a prediction and a control of the future, while the other entrepreneur types must go for an effectual strategy consisting of building the future according to the existing resources in the enterprise (Tessier-Dargent, 2015).

Public Strategic Implications

Currently, public strategy is primarily based on productivity in order to promote entrepreneurship, because entrepreneurial productivity leads to the country's economic growth (Bosma *et al.*, 2018). At this level, the State can orient its entrepreneurship strategy to increase the entrepreneurship productivity expressed is terms of entrepreneurial firm-to-non-entrepreneurial firm ratio. Thus, if this strategy tends to improve corporate governance quality and Per capita GDP, the State must encourage the first entrepreneur type aforementioned. However, if this strategy seeks to benefit from small economy size in order to reduce unemployment, the State has to encourage especially the second entrepreneur type (Fredström *et al.*, 2020).

Moreover, it is argued that flexible strategy by the State in the areas of finance, labour market, education and training, as well as inter-enterprise institutions, encourages the creation of the first entrepreneur type (entrepreneurial firms), which prioritize shareholder approach and are productive (Dilli *et al.*, 2018). Similarly, the State can adopt strategy of free entry into the market in order to promote entrepreneurial firms (Mazzarol & Reboud, 2020a). Furthermore, another strategy to increase the productivity of entrepreneurship is to provide continuous training to entrepreneurs by necessity

on managerial innovation (Sandström *et al.*, 2018), which leads to the development of their governance structures (Maizatul & Shahril, 2011) and then to growing their productivity (Ratten, 2021).

In the same vein, the State can opt for the partnership strategy to improve entrepreneurship productivity via bring together universities and companies so that the two participate in a concerted manner in promoting R&D and innovation (El Kadiri Boutchich, 2021a), which can transform the three last entrepreneur types into an entrepreneur of the entrepreneurial firm and thus increase the productivity of entrepreneurship.

For stimulating entrepreneurship productivity, besides the training, the government must ensure the financial support (Bowen & De Clercq, 2008) and financial stability (Bjørnskov & Foss, 2010) for the first and the fourth types. On the other side, the government must develop enterprise regulatory measures for the third type (De Clercq *et al.*, 2010) and socially supportive culture for the second type (Stephan & Uhlaner, 2010), since culture has a significant impact on entrepreneurship (Bätz, & Siegfried, 2021).

However, two oppositions emerge concerning the above assertions. First, the entrepreneurship productivity, expressed in terms of aforementioned ratio, is not always reliable, since a study showed that innovation in entrepreneurial firms is negatively correlated with total factor productivity growth. Thus, policy makers should put in place an alternative measure approach accordingly (El Ghak *et al.*, 2020).

Second, the encouragement of the first entrepreneur type (entrepreneurial firms), is not without problems because these can create economic and social risks in crisis period. In the same context, it is preferable to promote the second and the third entrepreneur types highlighted by this work, who are conservative entrepreneurs with social orientation and option for legal tools in support of their governance (Mazzarol & Reboud, 2020a).

Limitations, Justifications and Perspectives

First, several entrepreneur typologies may not be integrated in this work. However, most established entrepreneur typologies are based on an intuitive approach or a methodology that does not allow the comparability of the results of these typologies (Janssen, 2011). In this regard, this work uses an appropriate multidimensional empirical analysis, which enables to establish an entrepreneur typology in relation with governance approaches in order to improve enterprise performance.

It is also admitted that some governance approaches have not been processed in this work such as stewardship approach or resource-dependence approach. But, the objective of this work is to establish an association between entrepreneur types and governance approaches via an approach oriented towards the methodology more than the exhaustive citation of entrepreneur types and governance approaches.

Second, associations of entrepreneur types with corporate governance approaches do not take into account the influence of time and events, which reduces the observed reality (Messeghem & Sammut, 2011). To overcome this problem, it is possible to build a cartographic space to visualize the transition states of associations between entrepreneur types and corporate governance approaches (Grandclaude & Nobre, 2018). In this way, to assess the transition impact from one state to another, it is appropriate to use the econometric event study method or other dynamic econometric methods for considerations of time (Gilleskie, 2014).

Third, the problem of generalization of the results can be posed. In fact, the generalization of results depends on the sample size, its nature and the approach used to generate results. Related to the sample size, it has to be greater. With regard to the nature of sample, even if the study took place in a single country, the international character of this work is not affected, since the literature review, discussion, implications and limitations as well as future research are international in nature. In addition, according to generic constructivism, empirical analysis in an exploratory analysis like this one is only a complement to the literature review (Capelletti *et al.*, 2018). In relation with the approach used to generate results, generalizing of these is a very difficult task. Indeed, except for mathematical deduction and totalizing induction, the generalization requires the replication of the study in time and space and the absence of noise according to the mathematical theory of information (El Kadiri Boutchich, 2020).

As perspective, it is interesting to adopt hybrid forms of entrepreneurship and integrated approaches to corporate governance that serve the interests of shareholders and stakeholders simultaneously in the core strategy of the firm (World Economic Forum, 2020). It is equally interesting to associate to the four entrepreneur types, resulting from correspondences between entrepreneur types and corporate governance approaches, a dependent variable like entrepreneurship productivity to highlight the importance of each of the four entrepreneur types, from an appropriate multidimensional data analysis. In this way, it is commode to replace entrepreneurial firm-to-non-entrepreneurial firm ratio, which is very simplistic by a composite index of entrepreneurship productivity via a method that retains only entrepreneurial productive outputs such as adjusted data envelopment analysis (El Kadiri Boutchich, 2021b).

Moreover, there is a need for more empirical studies to verify the plausibility of associating the productivity of entrepreneurship with opportunism and innovation, and perhaps to replace these concepts with others such as achievement performance speed and responsiveness (Fu *et al.*, 2020). Thus, the productivity of entrepreneurship can be associated with particular types of companies such as gazelle companies (Mazzarol &Reboud, 2020b). It is also interesting to take into account behavioural addiction to entrepreneurship as important factor of the productivity and success of the entrepreneurship (Tshikovhi *et al.*, 2021).

Lastly, another perspective, which is developed thanks to economy digitalization, consists of replacing corporate governance by platform governance in terms of three strategies: community-based, cultural-based and content-based (Fenwick *et al.*, 2019). Thus, the link between entrepreneurship and strategy can be established directly without going through corporate governance. This promotes strategic entrepreneurship.

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Entrepreneurial ecosystem and start-ups in Sub-Saharan Africa: Empirical evidence based on Global Entrepreneurship Monitor database

Timinepere Ogele Court, Obaima Ateibueri Arikekpar

ABSTRACT

Objective: The aim of the study is to examine the nexus between entrepreneurial ecosystem and nascent entrepreneurship in sub-Saharan Africa.

Research Design & Methods: The study employed a quantitative methodology and consequently, the variables and data were drawn from the Global Entrepreneurship Monitor (GEM) survey ranging from 2004-2019. The sample observations of the study were eight countries across sub-Saharan Africa. The country-level data were analyzed through the application of least square regression to determine the nexus between the financing environment, government support policy, physical and service infrastructure and entrepreneurial start-ups.

Findings: The study findings demonstrate that entrepreneurial financing had positive effect on nascent entrepreneurship; government support policy had positive effect on entrepreneurial start-ups; infrastructure had positive effect on early entrepreneurial activity.

Implications & Recommendations: The paper recommends that there should be a renewed commitment on the part of governments to support and initiate intervention programmes to build entrepreneurial ecosystem and promote entrepreneurial activity but such programme design and implementation should look into contextual specifics and consider the COVID-19 related factors.

Contribution & Value Added: In this paper, we have offered significant contribution to the existing body of scholarship in small business management and entrepreneurship from the prisms of global health emergency and that building a friendly entrepreneurial ecosystem stimulates prevalence and sustainability of nascent entrepreneurship in countries.

Article type:	research article
Keywords:	entrepreneurial ecosystem; early entrepreneurial activity; start-ups; economic recession and Africa
JEL codes:	L26, R11, G38

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INTRODUCTION

There is overwhelming empirical evidence that entrepreneurship is the engine of economic growth and job creation across economies of the globe (Adusei, 2016; Gittell, *et al.*, 2014; Kumar & Raj, 2019; McMullen, 2011; Peprah& Adekoya, 2020). As such, governments all over the world focus on entrepreneurial policy, institutional frameworks and activities to grow developed and developing economies (Baumol & Strom, 2007; Holcombe, 1998; Valliere & Peterson, 2009).

However, the outbreak of Coronavirus (COVID-19) and the lockdown of social and economic life resulted in a recession of primary, secondary and tertiary sectors of the world economy (Nicola *et al.*, 2020). Fernandes (2020) asserted that full-scale lockdown of sectors of economies led to a decrease in

consumption and stoppage of production, stating that the global supply chain was truncated. From the statistics of IFM and OECD, the global economy plummeted by 2.4% and economic growth slowdown at 0.1 percentage point.

Furthermore, it is documented that due to the disruption of societies, businesses and economies, about 10,0000 participants in a survey of which 50 per cent of individuals experienced colossal losses of USD5,293 and USD33,482 of income and wealth respectively while aggregate consumption expenditure nosedived by 31 log percentage point in the U.S (Coibion *et al.*, 2020).

Although the immediate health impact of COVID-19 is evolving, the African continent is not the worst hit of the pandemic as most African countries recorded fewer than 50,000 cases (Worldometer, 2020). From the economic perspective, microeconomic units and macroeconomic aggregates have been affected in connection with income loss, productivity losses, GDP, unemployment and inflation rates. In specific terms, Africa incurred a loss of US$400m from African airlines only (Ataguba, 2020; Ozili, 2020). Considering unprecedented exogenous shocks of society, economies of Africa in particular and the world arising from the COVID-19 pandemic, governments across the world need to build friendly entrepreneurial ecosystems to stimulate entrepreneurial start-ups (Kuckertz *et al.*, 2020). From the Australian and global spectrum, Maritz *et al.* (2020) also underscored entrepreneurship as the means to salvage and rebound the economy from crisis due to the COVID-19 pandemic. They asserted that the health emergency has a devastating impact on the entrepreneurial ecosystem emanating from social distancing and lockdown of sectors of the economy and that the economy is currently under recession. In their view also, there is need to build friendly entrepreneurial ecosystems for opportunity-focused and necessity-based entrepreneurs to engage in start-ups and the creation of entrepreneurial ventures. In support of the aforementioned debate, Johnson *et al.* (2006), argue that nascent entrepreneurship is consequential for economic buoyancy.

Nascent entrepreneur "is somebody who is alone or with others currently trying to start a new business, expect to be an owner or a part-owner of a new firm and have been trying a new firm for 12 months" (Johnson *et al.*, 2006, p.1). Thus, nascent entrepreneurship refers to an early entrepreneurial activity or start-up and is the propensity to start a new business or early venture creation and existence of a new venture for one year. Further, start-ups are referred to as baby and infant firms that offer novel products and services with recent cutting edge technologies in the market space (Korpysa, 2019). As recorded in past crisis events like the September 11 attack and the present COVID-19 global health crisis with attendant sudden structural change in operational activities of businesses, Ketchen and Craighead (2020) assert that young entrepreneurial firms and entrepreneurs undergo turbulent times to acquire goods, distribute supplies, render services due to preventive protocols. Accordingly, we contend that this circumstance requires adequate funding, policy directions and entrepreneur-based infrastructural support to ease burdens associated with entrepreneurial start-ups immediately after the pandemic.

Early entrepreneurial activity differs across African countries, developed economies, individual entrepreneurs and the variation is accounted for by several factors (Alon *et al.*, 2016) and one of such factors that affect entrepreneurial start-up, new venture creation is the entrepreneurial ecosystem (EE). EE is conceptualized as the interplay of entrepreneurial mechanisms that influence early entrepreneurial activity and firm creation in regions and countries. The EE consists of institutional, economic, political and cultural factors that hamper or foster nascent entrepreneurship. EE focuses on generic system-based entrepreneurial support rather than a firm-specific approach and external business environment (Mack & Mayer, 2016; Nicotra *et al.*, 2018).

The objective of the study is to explore the relationship between entrepreneurial ecosystem and start-up in sub-Sharan Africa, applying data set from GEM. The examination of predictors to entrepreneurial start-ups has been a fundamental and recurring theme in extant literature. Empirical evidence of previous studies devoted scholarly attention to factors leading to venture creation (Davidsson & Honig, 2003; Stuetzer *et al.*, 2014). In addition, some scholars evaluated the unemployment of individuals (Nikiforou *et al.*, 2019) and availability of opportunities (Edelman & Yli-Renko, 2010) and psychological factors as determinants of entrepreneurial activity (Laguna, 2013).

A few studies investigate EE and early entrepreneurial activity (EEA). Sussan and Acs (2017) explored the digital ecosystem. In building a conceptual framework, attempts were made to distinguish the digital

economy from an entrepreneurial ecosystem and integrated the two constructs as a digital entrepreneurial ecosystem in their review. In applying a conceptual model, Acs *et al.* (2017) examine the actors and factors that make up the environment of entrepreneurs and entrepreneurship, which affect the performance of entrepreneurial firms and start-ups in a particular region. In concluding, the scholars proposed frameworks for measuring and testing causal links between eco-factors and eco-outputs.

In another related study, Hechavarria and Ingram (2019) assessed entrepreneurial ecosystem conditions and gendered-entrepreneurial activity from a country-level context. The findings of the study demonstrated that the predominance of women entrepreneurship arose from the entrepreneurial ecosystem with a low level of barriers, government support policy among several factors. The empirical evidence from prior studies in entrepreneurship scholarship germane to start-ups and the entrepreneurial ecosystem remain underexplored. The aforementioned studies reviewed only possible measures without empirical examination for EE except for the study of Hechavarria and others. Accordingly, we attempt to fill the knowledge vacuum.

The remainder of this paper is structured as follows. The first section focuses on conceptual clarification of entrepreneurial ecosystem and start-up. Secondly, we review literature for theory and hypothesis development. The third section is to explain the methodology employed. The fourth section centres on data analysis. The fifth part is to discuss the results and the final section presented limitations and directions for further studies.

LITERATURE REVIEW (AND HYPOTHESES DEVELOPMENT)

With the lockdown measures to contain the spread of COVID-19, business start-ups have been adversely affected by the stoppage of cash inflows (Kuckertz, *et al.*, 2020). Consequently, governments and nations need to ease the burden on entrepreneurial start-ups by building the ecosystem to alleviate the pressure and stimulate early entrepreneurial activity. The entrepreneurial ecosystem refers to communities of actors and factors that influence the friendly external environment of business for the survival and growth of entrepreneurial start-ups (Hechavarría & Ingram 2019; Kuckertz, *et al.*, 2020).

The concept of ecosystem originated from biology which means elements and their natural environment. An ecosystem consists of all living organisms and the physical environment which function interdependently. From the management and business dimension, Moore (1993), Iansiti and Levien (2004) state that business ecosystem refers to the role of actions and interactions of their collective properties. From this definition, OECD conceptualizes entrepreneurial ecosystem as consisting of regulatory frameworks, market condition, and access to finance among other factors. In the view of Hechavarría and Ingram (2019), an entrepreneurial ecosystem is made up of factors such as entrepreneurial finance, government support policies, legal and commercial infrastructure and others. Early entrepreneurial activity of countries is a function of an entrepreneurial ecosystem. As supported by World Bank (2017), ecosystem means environment and by extension, an entrepreneurial ecosystem consists of environmental factors of government policy, access to finance, culture, human capital and infrastructural support and these variables are presented in our framework for the review of the literature. In consideration of entrepreneurial ecosystem factors and the start-ups, relevant literature is reviewed for the development of hypotheses.

Access to finance and entrepreneurial start-ups

Access to entrepreneurial finance is a key to business startups (Brown *et al.*, 2020). A good number of entrepreneurs are encumbered with the challenge of accessibility to finance leading to the inability to succeed and survive (Block *et al.*, 2018). Following the COVID-19 pandemic, many start-ups are struggling due to the associated costs of the lockdown and preventive measures (Kuckertz *et al.*, 2020). In addition, Brown *et al.* (2020) from their research evidence asserted that the market for entrepreneurial finance, activity and nascent entrepreneurial start-ups have been disrupted following the lockdown as a consequence of the COVID-19 health crisis around the world. Therefore, governments in the different nations across Africa need to re-engineer their financial architecture

to promote accessibility to finance for a resurgence of entrepreneurial start-ups and activity to compensate for the short-run and long-run shocks of the pandemic.

Research has shown that:

> policymaker attention has inevitably, and quite understandably, centred on the immediate effects the COVID-19 crisis has for existing small and medium-sized enterprises (SMEs) in terms of their ability to maintain staffing levels, avoid cash-flow problems and prevent widespread bankruptcies in the wake of the lockdown (Organization for Economic Co-operation and Development (OECD), 2020). Empirical work from around the world shows that as many as half of all small firms have temporarily ceased trading since the lockdown and as many as 60% of SMEs are at risk of running out of their cash reserves. (Brown *et al.*, 2020, p.1)

Naude *et al.* (2008) explained regional determinants of entrepreneurial start-ups in developing countries. The report from their study indicates that access to formal bank finance among others as a key determinant of the rate of regional start-ups. In a related study, Paulson and Townsand (2004) investigated constraints associated with entrepreneurial activity in Thailand. Their investigation shows that financial constraints play an important role in shaping the pattern of nascent entrepreneurship and the likelihood of households to start business and become confronted with a few economic hardships. This accounts for creating an enabling financial environment to stimulate nascent entrepreneurial start-ups to face the challenges of the COVID-19 pandemic.

In assessing government policy towards entrepreneurial finance, cumming (2007) stated that the innovation investment fund programme of the Australian government facilitated investments in start-ups, early-stage air high tech firms. By extension, the research evidence underscores the need for governments in Africa to fashion out unique financial policy frameworks to stimulate entrepreneurial start-ups and promote economic growth. The issue of obstacles to accessing finance and start-up decision making among women was investigated by Roper and Scott (2009) and their findings indicated that a stronger perception of financial barriers affected the start-up decision of women in the UK to establish businesses. Given the argumentations arising from the literature review, we hypothesize that

H1: Financial environment positively affects early entrepreneurial activity.

Government policy support and entrepreneurial startups

Cumming (2007) explains that governments at all levels come up with entrepreneurial support programmes to promote entrepreneurial activity. The current COVID-19 crisis requires programmes in the Sub-Saharan region to resuscitate early-stage entrepreneurial firms and foster the formation of new ventures. Sternberg (2014) examined the ecosystem in a regional context and regional government support programmes. From the study, regional characteristics had more impact on start-ups than government support programmes for early entrepreneurial activity. This calls to question of providing government support programmes in line with unique regional characteristics and factors to influence start-ups. In assessing the effectiveness of government entrepreneurial support programmes towards start-ups, Yusuf (2010) in his study demonstrated that entrepreneurs' assistance programmes of governments were effective using data from the U.S. panel study of entrepreneurial dynamics. The study demonstrated the features of nascent entrepreneurs' support needs and the value attached to such programmes. Innovation is a key to entrepreneurial success, Buffart *et al.* (2020) wrote on how government entrepreneurial programmes support innovation ventures. The study evaluated the benefits of such government programmes to innovative entrepreneurial ventures. From the results, the scholars demonstrated that government-sponsored programmes in the US become beneficial depending on the challenge of participants to learn in collaboration and socialization of the entrepreneurs' growth objectives with business advisors. Following the literature development, we hypothesize that

H2: Government support programmes are positively associated with entrepreneurial start-ups.

Physical and service infrastructure and entrepreneurial start-ups

Early entrepreneurial activity and start-up formation to a large extent depend on the availability of infrastructural facilities of regions and countries. Most nascent entrepreneurs with new ventures face a huge challenge of utility cost due to a lack of adequate infrastructure to support their business (Tan *et al.*, 2000). Infrastructure refers to a set of facilities that are critical in helping individuals and organizations and such facilities are universities, research institutes, telecommunication technologies that stimulate entrepreneurial activity (Bliemel *et al.*, 2019). Bliemel *et al.* (2019) in their argument, stated that the start-ups' infrastructural development process is endogenous or a scenario consisting of several actors in entrepreneurial clusters.

In addition, Agboli and Ukaegbu (2006) in their study of the business environment and entrepreneurial activity, argue that physical infrastructure of roads, electricity supply, telecommunications, cost of security and transport services can inhibit or facilitate the entrepreneurial activity of a nation depending on the state of infrastructure at a given period. The research evidence from the Southeast of Nigeria by the report of the authors provided that small business owners and managers included inadequate infrastructural facilities as one major obstacle to successful entrepreneurial activity. In line with the literature review, we hypothesize that

H3: Physical and service infrastructure is positively associated with entrepreneurial start-ups.

RESEARCH METHODOLOGY

This research adopts a survey design in line with a sample and data of eight African countries drawn from the Global Entrepreneurship Monitor (GEM) survey of the National Expert Survey (NES) and Adult Population.

Based on earlier works done on the subject, a model was drawn up for this study. The model helps to verify the relationship between entrepreneurial ecosystem and entrepreneurial start-up in eight (8) Sub Sahara African countries. Limitations in data collection, as well as missing data, restricted our sample from all the sub-Sahara African countries to eight countries which include: Egypt, Morocco, Sudan, Senegal, Uganda, Ghana, Nigeria and Ethiopia. We compile these eight countries level data from the GEM database, which comprises 48 observations over the years 2004-2019 (see Table 1).

Table 1. Summarized Data Set for 2004-2019

s/n	Countries	Years	Entrepreneurial finance	Governmental support and policies	Physical and services infrastructure	Total early-stage Entrepreneurial Activity (TEA)	The Population of the Labour Force	GDP in US dollar
1	**Egypt**	**8**	2.43	2.43	3.77	13.79	30828413	3.03E+11
2	**Morocco**	**5**	2.26	2.3	3.93	14.18	12067484	1.19E+11
3	**Senegal**	**2**	2.1	2.65	4.2	14.18	4255475	23578084052
4	**Ghana**	**3**	2.34	2.55	3.01	35.39	12917053	66983634224
5	**Nigeria**	**3**	2.07	1.93	2.91	22.66	59873566	4.48E+11
6	**Sudan**	**1**	2.33	1.66	2.99	22.17	12410692	1.89E+10
7	**Ethiopia**	**1**	24	3.54	3.33	36.52	53195214	9.61E+10
8	**Uganda**	**6**	2.31	2.44	3.31	24.94	16658774	3.44E+10

Source: Global Entrepreneurship Monitor 2019 (Averaged Scores) and World Bank.

Dependent variable

Entrepreneurial start-up (Total early entrepreneurial activity). The measure is a percentage of the adult working-age of 18-64 and to identify individuals who were about to start a business. The respondents were asked whether they are alone or with others or currently trying to start a business or have started a business for the past 24 months. This includes self-employment.

Independent variables

We captured the entrepreneurial ecosystem using some variables: (1) financial environment (access to entrepreneurial finance); (2) government policy and support (government support and policies for entrepreneurship); (3) physical and services infrastructure.

Control Variables

(1) Population of the labour force and (2) Gross domestic product (GDP) are our control variables which we capture from World Bank. The percentage of the labour force is within the age bracket of 18-64 years while GDP is measured in current US dollar per capita. These variables are standardized scales based on responses to multiple items in the NES as listed in the Appendix.

Data Analysis

In the method of data analysis, descriptive and inferential test statistics were used for the analysis of the data gathered. For the descriptive analysis, we use mean and standard deviation while multiple linear regressions of ordinary least squares (OLS) were used for the inferential statistics. The hypotheses formulated were tested. The data analysis was aided with STATA software version 13.

Model Specification

The objective of this section is to formulate models that assist in achieving our stated hypotheses. The econometric technique is used to establish a model of the entrepreneurial ecosystem and entrepreneurial start-up in eight (8) Sub Sahara African countries.

The Gross Domestic Product (GDP) which captures the outputs level of these selected countries in the stated period and the variables which represents the entrepreneurial ecosystem could be represented as follows:

$$SU = f(ENF, GSP, PSI, PLF, GDP) \quad (1)$$

The OLS linear regression equation based on the above functional relation is:

$$SU = \beta_1 ENF_t + \beta_2 GSP_t + \beta_3 PSI_t + \beta_4 GDP_t + \beta_5 PLF_t + \mu_i \quad (2)$$

where:

Dependent Variable

SU - Entrepreneurial start-up (Total Early Entrepreneurial Activity);
ENF - financial environment (access to entrepreneurial finance);
GSP - government policy and support (government support and policies for entrepreneurship);
PSI - physical and services infrastructure;
GDP - Gross Domestic Product measured in terms of economic growth in USD;
PLF - Population of the labour force;
$\beta_1 - \beta_5$ - Parameters
μ - Error term.

RESULTS AND DISCUSSION

The data analysis begins with a preliminary presentation of descriptive statistics of means, standard deviations and intercorrelation of the variables of the study. The second part is regression analysis to determine the effect of explanatory variables on the dependent variable.

Table 2 presented the descriptive statistics of means, standard deviations and intercorrelations. The results show that business start-ups positively related to entrepreneurial finance, government support policy, infrastructure, labour force and gross domestic product with the corresponding mean and standard deviations.

Table 2. Means, Standard Deviations and intercorrelation Matrix of the variablesstudied

s/n	*Variables*	*1*	*2*	*3*	*4*	*5*	*6*
1	*Start-ups (SU)*	*1.00*					
2	*Finance(ENF)*	*0.61*	*1.00*				
3	*Policy(GSP)*	*0.46*	*0.80*	*1.00*			
4	*Infrastructure(PSI)*	*0.66*	*-0.09*	*0.29*	*1.00*		
5	*Labour (PLF)*	*0.35*	*0.53*	*0.24*	*0.43*	*1.00*	
6	*Gross Domestic Product(GDP)*	*0.20*	*0.12*	*0.24*	*0.19*	*0.23*	*1.00*
	Mean	***22.97***	***4.93***	***2.44***	***3.43***	***2.53***	***1.39***
	Standard deviations	***9.11***	***7.71***	***0.56***	***0.48***	***2.08***	***1.55***

Source: Stata computed output presented by the authors, 2020.

Table 3 above presents the results of the regression analysis. Results indicated that the R square of 0.94 suggests that 94% variation in entrepreneurial activity is accounted for by a friendly entrepreneurial ecosystem and the model is a good predictor (F 25.89, $p < 0.03$). Further, the predictors indicated that (1) access to entrepreneurial finance had positive but no significant relationship with entrepreneurial start-up ($\beta = 0.10$, $p > 0.819$) (2) government support policy had significant positive relationship with early-stage entrepreneurial activity ($\beta = 0.83$, $p < 0.047$) (3) physical and service infrastructure had significant positive relationship with entrepreneurial start-up ($\beta = 1.07$, $p < 0.021$).

Table 3. Regression output for an entrepreneurial start-up with other predictor variables

Model 1: Dependent Variable is Entrepreneurial Start-up(SU) R2 = 0.98, Ra2 = 0.94, F = 25.89, P>F 0.037					
Variables	**Coefficients**				
	Unstandardized (B)	**Standardized (β)**	**S. E**	**T**	**P>/t/**
Constant	62.48	–	10.91	5.72	0.029
Finance(ENF)	0.12	0.10	0.46	0.26	0.819
Policy(GSP)	13.63	0.83	3.06	4.45	0.047
Infrastructure(PSI)	20.20	1.07	2.97	6.80	0.021
Labour force(PLF)	-0.00	-0.45	0.00	-0.83	0.494
Gross Domestic Product(GDP)	0.00	0.12	0.00	0.29	0.799

Source: Stata computed Output presented by authors, 2020; Reject H0: if p value < 0.05, Accept H0: if p value ≥ 0.05.

The main aim of the study was to examine the nexus between an entrepreneurial ecosystem and start-ups in Sub-Saharan Africa with particular emphasis from the lens of the COVID-19 health emergency. We have offered important contributions to small business and entrepreneurship literature from our study. We asserted that several factors account for entrepreneurial start-ups and new venture creation such as psychological factors, human capital and availability of opportunities (Davidsson & Honig, 2003; Edelman & Yli-Renko, 2010, Lagunna, 2013) but in the light of our findings, building friendly entrepreneurial ecosystem stimulates prevalence and sustainability of nascent entrepreneurship in countries. Given the economic conditions across African countries due to the COVID-19 pandemic, many Africans are thrown out of jobs and will become necessity-based nascent entrepreneurs and engage in new entrepreneurial activity for survival. This is why building friendly entrepreneurial ecosystem factors of government support policies, access to finance and infrastructure is crucial for promoting early-stage entrepreneurial activity and new venture creation for self-employment and employment generation for others in Africa.

The result from hypothesis one (H1) indicated that financial environment had positive but no significant effect on entrepreneurial start-up. Thus, hypothesis was rejected. Financial inaccessibility has been the bane of entrepreneurial start-ups and new venture creation. The finding was not in agreement with the prior study of Hechavarría & Ingram (2019) who demonstrated that financial environment had negative effect on total early entrepreneurial activity. The reason for the variance of the findings could be accounted for the passage of time, coverage and gendered focus as against start-up activities of both male and female entrepreneurs. Our finding suggests that the financial environment needs to be overhauled as finance was not a significant predictor of new venture creation and this has the implication that most start-ups in Sub Saharan Africa still struggle with the challenge of inaccessibility to sufficient funds (Denis, 2004). In view of losses suffered by microeconomic units and start-ups from the pandemic, there is an absolute need for a policy framework to retooling the financial environment and come up with programmes at country and regional levels by financial stakeholders, intermediaries and institutions to cushion the effects of loss and promote new venture creation to boost the economy.

The result from hypothesis two (H2) demonstrated that government support programmes were positively associated with entrepreneurial start-up. Accordingly, the hypothesis was supported. In other words, our empirical evidence supported the postulation that government support policy programmes impacted positively on new venture creation. The finding is consistent with the work of Hechavarría & Ingram (2019) which indicated that government policy and programmes had positive effect on total early entrepreneurial activity. This means that there should be a renewed commitment on the part of governments. More of such support and intervention programmes should be initiated and executed to promote entrepreneurial activity and economic development but such programme design and implementation should look into contextual specifics and consider the COVID-19 related factors (Hechavarria & Ingram, 2019).

The result from hypothesis three (H3) was supported that physical and service infrastructure was positively associated with entrepreneurial start-ups. From the empirical evidence, physical and service infrastructural facilities had a significant effect on early-stage entrepreneurial activity in Africa. On account of the findings of the study, we thus recommend that various stakeholders in the public and the business policy sectors should provide entrepreneurial service infrastructure to promote entrepreneurial activities among nascent entrepreneurs in the African economy.

CONCLUSIONS

From the findings of the study, we conclude that building a friendly ecosystem is consequential to stimulating nascent entrepreneurship in the economies of sub-Saharan Africa. In specific terms, financial access, government support policy and physical and the provision of entrepreneurship-centric infrastructure serve as a catalyst to early entrepreneurial activity in emerging economies. We recommend that there should be policy and institutional frameworks for the financial environment, government support programmes and physical facilities at country and regional levels to foster and promote new venture creation to boost the economy. Although the study made significant contributions to the entrepreneurship literature and ecosystem studies, there are shortcomings. The entrepreneurial ecosystem is made up of a large number of actors and factors which could not be captured in a single study. Furthermore, the study was confined to Africa as an emerging economy. Accordingly, caution is required in making generalisations to advanced economies in the world. In line with the limitations of the study, future studies should focus on other variables left out in this paper.

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Agricutural entrepreneurship among the youth: The case of youth involvement in rabbit production in Nigeria

Ridwan Mukaila

ABSTRACT

Objective: The objective of this study is to examine agripreneurship among youths. Specifically, the study investigates the motivating factors for agripreneurship development among youths, examine the profitability of rabbit production among youth agripreneurs and identified the constraints faced in rabbit production.

Research Design & Methods: One hundred and twenty youth agripreneurs involved in rabbit production were selected using the snowball sampling technique and data were collected using a questionnaire. Descriptive statistics, cost and return analysis (gross margin analysis, net profit, operating ratio and return to capital invested) and Likert rating scale were means of analysing the data.

Findings: The study revealed that the majority of the youth agripreneurs were males (76.7%), single (85.8%) and obtained their capital from personal savings (87.5%). The important factors motivating agripreneurship development among youth were a quest to acquire personal wealth, to boost income, to achieve what one wants to have in life, to be financially independent, to be self-employed, for personal satisfaction and growth, for high self-esteem, desire to do a new thing and to contribute to their household income and needs. Furthermore, rabbit production among the youth agripreneur was profitable with a net profit of 339,193.56 NGN (826.21 USD), an operating ratio of 23% and a return on capital invested of 3.41. The major constraints faced by the youth agripreneur in rabbit production were lack of government support, poor extension contacts, inadequate credit facilities and diseases outbreak.

Implications & Recommendations: This study calls for governments and Non-Governmental Organizations to support and encourage youths to participate more in agripreneurship through the provision of credits and production inputs for profit maximization and cheap protein availability.

Contribution & Value Added: This study contributes to entrepreneurship literature by focusing on agripreneurship by youth in a view to enhance more participation in agripreneurship.

Article type: research article

Keywords: agripreneurship; agricultural entrepreneurship; entrepreneurship in agriculture; motivating factors; profitability; rabbit farming; youth agripreneurs

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INTRODUCTION

Overcoming the high malnutrition level in the world, especially in sub-Saharan Africa where the majority suffer from protein deficiency leading to kwashiorkor among the children, is a global concern. In Nigeria, a major nutritional problem has been the low rate of animal-based protein especially for the low-income farmers (Akinola, 2009). Today, the human population is increasing and as such, protein demand to feed the growing population is on the high side and would not rely on poultry or piggery as a source of white meat. Rather, other white meat animals should be exploited such as rabbit meat which is low in cholesterol and safe for both children and old people.

Youth participation in agripreneurship (agricultural entrepreneurship), especially small livestock rearing, such as rabbit, with little start-up capital, can play a significant role in increasing protein availability at a cheaper rate. In developing countries, there has been an increase in the acknowledgement of rabbit production in recent years as a means to help reduce poverty (Baruwa, 2014). Thus, youth involvement in rabbit production will not only enhance protein availability and solve the malnutrition problem, but also serve as a tool to lower the poverty rate and enhance the employment rate. This is to a large extent attributed to the high prolificacy, early maturity, rapid growth rate, gene selection ability, feed efficiency, ample use of land space, minimal competition for foods with humans and high-quality nutritious meat from the rabbit.

Rabbit production seems to be the most viable means of producing excellent quality animal protein for the ever-growing population of Nigeria (Onifade *et al.,* 2010). The major advantages of raising rabbits include short gestation length, low cost of production, small-bodied size, high prolificacy, rapid growth rate, high adaptability over an extensive range of eco-friendly environments and capability to utilise by-products from agriculture and forages (Abu *et al*., 2008). Their management requires less land space and can be kept in the backyard of a farmer's house. Rabbits reach maturity at five months and body mass of slaughter at three months with their ability to survive in both temperate and tropical environments (Iheukwumere, *et al.,* 2018). A well-fed doe can breed four times a year with an average of seven kits per kindling (Onifade, *et al.,* 2010). By feeding on greens alone, rabbits can get their entire feed requirement. Their feed conversion ratio of 4:1 is one of the highest feed conversion ratios among animals (Aduku & Olukosi, 1990). The meat of the rabbit is lustrously white, fine-grained, appetizing and nutritious and is a convenient source of excellent quality animal protein (Hernández & Dalle Zotte, 2010). Rabbit meat is high in protein and low in sodium, cholesterol and fat unlike some other animal protein such as pork, lamb and beef. Rabbits appear to be a low-cost solution to the problems of undernutrition and hunger of the poor rural dwellers in developing countries (FAO, 2000). It is one of the principal ways of alleviating animal-based protein deficiency in Nigeria via its advantageous qualities when compared to other animals (Marcus & Onyeonoro, 2018). They are known as animals of great economic significance (Ogbonna, 2015).

Rabbit production is a beneficial business with quick returns and also a high probability of recouping original investment (Oseni &Lukefahr, 2014). Thus, rabbit occupies economic niches not readily available to larger species and particularly useful on the margin of cash economy because it cost less to buy, represents a less financial risk, produces a faster return on investment, allows flexibility of operation, is easily transportable, provides a steady source of income or food and is often a very efficient feed converter (Wilson, 2011). Rabbits are primarily and above all regarded for poverty alleviation programs because of their little financing and early advantages, inherency on housing, general management and renewable resources for feeding. Thus, small-scale rabbit farming could be used as a great medium for the sustenance of livelihood and good nutrition among the youths. Taking into account the number of characteristics that are of great advantage to smallholder rabbit farmers, especially the youths, as well as a greater acknowledgement that rabbit production has a high level of indispensable potential to improve food security, lower the malnutrition problems and reduce unemployment, a concise study of the economic system is required to ascertain the maximum production and profitability of rabbit production.

Previous studies on entrepreneurship among youth focused on university students and were not on agripreneurship (e.g., Ben Moussa & Kerkeni, 2021; Fauzi *et al*., 2021; Gubik & Bartha, 2018; Hassan *et al*., 2021; Karyaningsih *et al*., 2020; Wardana *et al*., 2021; Zamrudi & Yulianti, 2020). There is thus a need to concentrate on youth involvement in agripreneurship. The aim of this study is, therefore, to explore youth involvement in agripreneurship. Specifically, the study described the socio-cultural and economic characteristics of youth rabbit producers; examined the motivating factors for agripreneurship development among youths; evaluated the profitability of rabbit production and identified the constraints faced in rabbit production among youth agripreneurs. These would enable the understanding of the profitability level of rabbit production to encourage and motivate more participation of youth, who always seek a white-collar job, in agripreneurship activities. This would, in turn, lower the high level of malnutrition through the availability of protein and consequently lower food insecurity, unemployment and poverty

rate. Good knowledge of factors responsible for the profitability of rabbit production would enable the youths to know where to channel their resources towards profit maximisation.

LITERATURE REVIEW

Entrepreneurship has received researchers' extensive attention due to its significant contribution to national prosperity, economics and social development (Khan, 2013; Reissova *et al*., 2020). It is recognised globally as an important economic development strategy for creating jobs and wealth (Sołek-Borowska & Numprasertchai, 2018). Entrepreneurship is defined as the identification of new business opportunities, mobilization of economic resources to start a new business or funding the existing ones under risk and uncertain conditions to make profits (Adenutsi, 2009). The creation of business opportunities can take place in any field such as agriculture, industry, social work and education. The creation of business in agricultural-related activities is agripreneurship.

Agripreneurship simply means entrepreneurship in agriculture. Agricultural entrepreneurship is defined as a value creation process composed of a unique set of resources to exploit and take advantage of opportunities in rural areas (Estahbanaty, 2013). It is the process of adopting new methods, processes, techniques in agriculture or the allied sectors of agriculture for better output and economic earnings. Agripreneurship converts agricultural activity into an entrepreneurial activity and take the risk to develop agricultural ventures to make a profit from the agricultural investment. It is also defined as the profitable marriage of entrepreneurship and agriculture (Bairwa *et al*., 2014). Rao and Kumar (2016) define agripreneurship as the entrepreneurial process taken up in agriculture or allied sectors. Kaur *et al*. (2018) defined agripreneurship as directly marketed agriculture that is community-oriented and generally sustainable. Agriculture is an important sector and has many areas with many available commodities in each area which requires improvement in their production through value addition (Kaur *et al*., 2018; Mukaila, 2021). Thus, the need to train the unemployed youths in agricultural entrepreneurship management and enlighten them on its importance. Agripreneurship training will support youth, especially rural youths, to create employment to be agripreneurs and consequently enhance their economic status in society. An agripreneur is described as a person who invests in and manages an agricultural enterprise for profit-making. An agripreneur managed and use all factors of agricultural production for economic and social benefits. They are independent, risk-takers, daring, rational and have the quality of leadership, competitiveness and achievementorientation.

Researchers have investigated entrepreneurship generally. Previous studies on entrepreneurship among youth focused on university students and the entrepreneurial investigated was not on agripreneurship. Gubik and Bartha (2018) identified the entrepreneurship motivating factors of students and checked the nexus between the factors and entrepreneurship education. The authors defined five factors of entrepreneurial motivation (market focus/Competition, Individual goals, community/collective goals, social mission and customer focus). Their findings revealed a weak correlation between the motivating factors and entrepreneurship education characteristics. Zamrudi and Yulianti (2020) investigate the driving factors of students' intention to do business in Indonesia using partial least square structural equation modelling (PLS-SEM). The study revealed that the supporting condition factors were structural support, university support and relational support. Meanwhile, entrepreneurial self-efficacy has no significant effect on students' entrepreneurial intention. Karyaningsih *et al*. (2020) investigated entrepreneurship education and students' intention to be entrepreneurs using structural equation modelling (SEM), factor analysis (CFA) and exploratory factor analysis (EFA). The results revealed that entrepreneurship education had an impact on entrepreneurial intention, knowledge and mindset. Students' entrepreneurial knowledge influenced their intention to be entrepreneurs but has no significant effect on the entrepreneurial mindset.

Hassan *et al*. (2021) investigate driving factors of entrepreneurship cultivation among higher institutions in Malaysia using structural equation modelling. The study revealed that the only significant factor that influenced entrepreneurial culture in the higher institution was empowerment. Wardana *et al*. (2021) examined the impact of entrepreneurship education, attitude and cultural influence on

economic students' entrepreneurship intension in Indonesia. The study revealed that entrepreneurship attitudes and culture influenced entrepreneurship intention among the students. Fauzi *et al*. (2021) examined students' entrepreneurial abilities in Malaysian using PLS-SEM. The study revealed that inspirational motivation was the strongest predictor of both entrepreneurial behaviour and knowledge sharing. An individualised consideration, knowledge sharing and psychological empowerment had a significant impact on entrepreneurial behaviour while intellectual stimulation and idealised influence show no effect. Ben Moussa and Kerkeni (2021) examined the importance and role of the family environment (family support for entrepreneurship, entrepreneurial role model and parental support for autonomy) in determining the entrepreneurial intention of young Tunisian students. Their result revealed that exposure to an entrepreneurial role model and parental support for autonomy were the most important factors that stimulate students' entrepreneurial intention. Meanwhile, family support for entrepreneurship (social and financial capital) does not affect the entrepreneurial intention of young students. Baharuddin and Ab Rahman (2021) investigate the dominant characteristic (antecedent) for becoming entrepreneurs among Muslim youths in Indonesia using the theory of planned behaviour model and PLS-SEM. The study shows that personal attitude (0.011), perceived behavioural control (0.040) and subjective norms (0.152) were the three exogenous driver constructs that have an effect on entrepreneurship intention among the students.

The current study defers from the previous studies by focusing on youth involvement in agripreneurship. The profitability of rabbit production among youths was also investigated which little information on it existed. The methodology employed in this study also defers from other studies. Therefore, there is the need to carry out an empirical study on youths' involvement in agripreneurship and profitability of rabbit production among the youth agripreneurs to promote youth involvement in agricultural entrepreneurship.

RESEARCH METHODOLOGY

Study Area

This study was conducted in Enugu state Nigeria which is one of the 36 states in the country. Enugu state was created in the year 1991 from the eastern two-thirds of Anambra state and is regarded as the coal city state but has a lot of agricultural practices ongoing. The inhabitants of the state are majorly farmers and traders, especially the rural dwellers. They rear animals like rabbits, goats, sheep, and poultry. They also grow food crops like yams, maize, beans, cassava, cocoyam and some cash crops like kola nuts, palm trees, oil bean trees, breadfruit, coconut and cashews.

Sampling Procedure

A multistage sampling technique was used in this study. In the first stage, four local government areas were randomly selected in the state. Three autonomous communities were randomly selected from each of the four local government areas making a total of twelve communities. At the last stage, the Snowball sampling technique was used to select ten youth agripreneurs who were involved in rabbit farming. Thus, a total of 120 youth agripreneurs served as respondents for this study.

Data Collection

Data were obtained from a primary source. It was collected via a structured questionnaire that contained a set of open and close-ended questions for the youths involved in rabbit production agribusiness as respondents. Federal Ministry of Youth and Sports Development (2019) defined youths in Nigeria as people within the age group of 15 to 29 years. Thus, the targeted population of this study were people between the age group of 15 to 29 years involved in rabbit production. The questionnaire gathered important data on the socio-economic and cultural characteristics of rabbit farmers, the costs and returns from the rabbit production system, the constraints associated with rabbit production, and the management process employed.

Data Analysis

Descriptive statistics such as means, frequency distribution and percentages were used to describe the socio-cultural and socio-economic characteristics of the youth agripreneurs. Costs and returns analysis (such as gross margin analysis, net profit, operating ratio and return to capital invested) and Likert rating scale were also used to analyse the data obtained from the respondents.

Costs and Returns Analysis

The profitability and returns were determined using gross margin analysis and net profit. The gross margin is a profitability analysis that shows the gross profit of an enterprise after deducting the variable costs. The difference between the total revenue (TR) accrued from rabbit production and the total variable cost (TVC) incurred in rabbit production is the gross margin (GM).

$$Gross\ margin = total\ revenue - total\ variable\ cost$$

Net profit takes care of the limitation of gross margin analysis since gross margin did not account for the fixed cost incurred in an enterprise. This study, therefore, further calculated the net profit of the enterprise. Net profit is the difference between the gross margin and the total fixed cost in rabbit production.

$$Net\ profit = gross\ margin - total\ fixed\ cost$$

The operating ratio is directly related to the farm variable input usage and measures the portion of total revenue used as a variable cost. The lower the ratio, the higher the profitability of the farm business.

$$\text{Operating ratio } = \frac{Total\ varibale\ cost}{total\ revenue}$$

Return on capital invested is defined as gross margin divided by total variable cost. It measures the return from a unit of currency invested in an enterprise.

$$\text{Return on capital invested} = \frac{gross\ margin}{total\ varibale\ cost}$$

Likert Scale

Likert scale is a scaling method used in research to measure individual's attitude, perception and opinions including the degree of agreement and disagreement to a statement. It is commonly used in research that requires questionnaires. A four-point Likert rating scale was used in this study to identify the constraints associated with rabbit production. The cut-point used was a mean score of 2.50. Any constraint with a mean score of 2.50 and above was considered severe while those with a mean score lower than 2.50 were considered not severe. A four-point Likert rating scale was also employed to identify the motivating factors promoting agripreneurship development among the youths.

RESULTS AND DISCUSSION

Socio-economic characteristics of youth entrepreneur involved in rabbit production

The socio-economic characteristics of the youth involved in rabbit farming were presented in Table 1. As shown in Table 1, youth rabbit farmers were predominantly male (76.7%) while a few proportions were females. Thus, the enterprise was male-dominated. Women involvement in activities such as caring for the home and other household chores which consumed most of their time may have been the reason for low female participation in rabbit farming (Baruwa, 2014). Regarding the age of the respondents, the majority (57.5%) were within 21 and 25 years, 21.7 per cent were within 26 and 29 years and 20.8 per cent were between 15 and 20 years of age. The average age of the rabbit farmers was 23 years. This implies that the study targeted the appropriate population who were in their economic active age to practised rabbit production (engage in agripreneurship). Most of the youth rabbit farmers were single (85.8%) while 14.2% of the respondents were married. The higher level of single-person involvement in rabbit farming was due to their youthful age. Results of educational level show that most youth agripreneurs had completed secondary education (68.3%), 26.7% had completed tertiary education, 3.3% had completed primary education, while 1.7% had no formal educational back-

ground. Education is important in livestock production because it helps to increase the farmer's knowledge on better management practices. Akanbi *et al*. (2020), and Mukaila *et al*. (2021) opined that education has an important influence on decision making and managerial ability. This will therefore enhance the producer's ability to embrace new technologies.

Regarding youth agripreneurs experience in rabbit rearing, 65 per cent of the youths had between one and five years of rabbit rearing experience, while 35 per cent had between six and ten years. They had an average of five years of experience in rabbit rearing. This shows that rabbit farming was not new to the youth and they can be said to be experienced in rabbit farming. Seventy per cent of the youth did not belong to any association while only 30 per cent of them were members of an association. This implies the low participation of youth rabbit farmers in social organization activities. The majority (80.0%) of the youths can easily access the market for their products while only 20 per cent find it difficult to access the market due to distance cover. These results imply that there is an availability of market for rabbit products. The result of access to extension services shows that 82.5% of the youthshad no meeting with an extension agent while only 17.5% of them had meetings with extension agents. Access to extension services translates to access to information that will, in turn, improve the productivity of rabbit production.

The majority of the youth (87.5%) had their main source of capital from the personal funds or own pockets, while 7.5% and 5% of youths sourced their main capital from friends or relatives and associations, respectively. Personal fund is not always enough in agriculture and limits farmers production level to a small scale. Thus, the majority of youths finance their businesses from personal funds which limit their activities to a small-scale level. The majority (76.7%) of youths had no access to credit or loans while only 23.3% had access to credit or loans. This implies that they did not have access to credit facilities from commercial and microfinance banks. This could also limit their production to a small scale. Regarding their annual income, 32.5 per cent of the youths had 400,001 NGN (974.33 USD) to 500,000 NGN (1,217.91 USD), 9.2% had 300,001NGN (730.75 USD) to 400,000NGN (974.33 USD), 21.6 per cent had 200,000 NGN (487.16 USD) to 300,000 NGN (730.75 USD), 26.7 per cents had less than 200,000NGN (487.16 USD) and 10 per cent had more than 500,001 NGN (1,217.91 USD) per annum. The youth rabbit farmers had an average annual income of 341,312.6NGN (831.37 USD). This suggests that rabbit production contributed to the youths' economic status.

Factors motivating youths agripreneurial development

The factors motivating agripreneurship development among youths were presented in Table 2. The results show that the most important motivational factor for youth involvement in agripreneurship was to acquire personal wealth. This was closely followed by the quest to boost income. Engaging in agripreneurship such as rabbit production serves as means of generating income and improving youths' economic status in society. The third-ranked motivating factor was to achieve what one wants to have in life. The youths were able to achieve some of their wants and needs from the income generated from the agricultural enterprise. The quest of youths to be financially independent was also a motivational factor for their agripreneurship development. Youth agripreneurs were able to get things done independently without depending on their families. Youths were also motivated to involve in agripreneurship to be a boss and to be self-employed. Youths engaged in agripreneurship to meet responsibility through being self-employed. For personal satisfaction and growth was also an important motivating factor for youths agripreneurship development. Youths were motivated to engage in agripreneurship for high self-esteemin society. Youth agripreneurs were respected in society for being independent and self-employed. Youths were also motivated to be agripreneur due to the quest desire to do new things such as rabbit production. For reputation and recognition as an agricultural entrepreneur was also a motivational factor for youths agripreneurship development. To achieve the needs of life such as foods and clothes was also motivating factor for youths agripreneurship development. The youths also engaged in agripreneurship to contribute to their household income and needs. They engaged in income-generating activities to contribute to their household's welfare. This suggests that rabbit production among the youths plays a vital role in their households' welfare and livelihoods. The least ranked motivating factor to engage in agripreneurship among youthswas for a bright future. Due to low education levels among some of the youths which may deprive them of getting white-collar jobs, they engaged in agripreneurship.

Table 1. Socio-cultural and economic characteristics of rabbit producers

Variables	Categories	Frequency	Percentage	Mean
Sex	Male	92	76.7	
	Female	28	23.3.	
Age	15-20	25	20.8	22.8
	21-25	69	57.5	
	26-29	26	21.7	
Marital Status	Married	17	14.2	
	Single	103	85.8	
Educational Qualification	Primary	4	3.3	
	Secondary	82	68.3	
	Tertiary	32	26.7	
	No formal education	2	1.7	
Farm Experience (years)	1-5	78	90.0	4.75
	6-10	42	10.0	
Member of Association	No	84	70.0	
	Yes	36	30.0	
Access to Market	No	24	20.0	
	Yes	96	80.0	
Access to Extension Services	No	99	82.5	
	Yes	21	17.5	
Main Source of Capital for Rabbit	Owned funds	105	87.5	
	Friends/relatives	9	7.5	
	Association	6	5.0	
Access to credit	No	92	76.7	
	Yes	28	23.3	
Annual Income (NGN)	≤200,000	32	26.7	341,312.6
	200,001-300,000	26	21.6	
	300,001-400,000	11	9.2	
	400,001-500,000	39	32.5	
	>500,001	12	10.0	

Source: own study.

Table 2. Motivating factors that promote agripreneurship among youths

Motivational Factors	Very important	Important	Less important	Not important	Weighted score	Mean score
To acquire personal wealth	90(75)	20(16.7)	10(8.3)	0(0)	440	3.67
To boost income	63(52.5)	38(31.7)	19(15.8)	0(0)	404	3.37
Achieve what one wants to have in life	79(65.8)	20(16.7)	7(5.8)	14(11.7)	404	3.37
To be financially independent	75(62.5)	13(10.8)	32(26.7)	0(0)	403	3.36
To be my own boss	53(44.4)	36(30)	31(25.8)	0(0)	382	3.18
To be self employed	41(34.2)	50(41.7)	29(24.2)	0(0)	372	3.10
For personal satisfaction and growth	47(39.2)	31(25.8)	42(35)	0(0)	365	3.04
For high self esteem	42(35)	44(3.67)	29(24.2)	5(4.2)	363	3.03
Desire to do new thing	42(35)	34(28.3)	35(36.7)	9(7.5)	349	2.91
Reputation and recognition	36(30)	39(32.5)	29(24.2)	16(13.3)	335	2.79
To achieve the needs of life	34(28.3)	35(29.2)	37(30.8)	14(11.7)	329	2.74
To contribute to the household	27(22.5)	41(34.2)	41(34.2)	11(9.2)	324	2.70
For a bright future	21(17.5)	56(46.7)	27(22.5)	16(13.3)	322	2.68

Note: Figures in parenthesis are in percentage (%).
Source: own study.

Profitability of rabbit production among the youth agripreneurs

Table 3 presents the results of the cost and return analysis (profitability) of rabbit production among youth agripreneurs. To understand the rabbit production profitability among the youth agripreneurs, there is the need to find out the cost and returns of the investments in the production. The total variable cost of input was 100,542.88 NGN (244.90 USD) while that of the total fixed cost was 4060.44 NGN (9.89 USD). The cost of getting the parent stocks had the highest share of total variable cost followed by the cost of feeding. Cost of housing had the highest share of total fixed cost. The revenue from the sales of rabbits produced in a year (average of 68 rabbits) was 443,796.87 NGN (1,081.01 USD). Rabbit production had a gross margin of 343,254 NGN (836.10 USD) and a net profit of 339,193.56 NGN (826.21 USD). The return on capital invested was 3.41. This implies that for every one unit of a currency (1 NGNor 1 USD) spent or invested on rabbit farming, there is a return of 3.41 NGN or 3.41 USD to the farm enterprise (depending on the currency). The operating ratio was 0.23, which implies that rabbit production uses a lower portion (23%) of the gross revenue as a variable cost. These results imply that rabbit production among the youth agripreneur was a profitable agribusiness enterprise. These findings were in line with Akanni and Odubena (2003) who found out that the rearing of rabbits was profitable with an operating ratio of 43%. Adanguidi (2020) and Baruwa (2014) also reported that rabbit production was a profitable venture.

Table 3. Profitability of rabbit production among youth agripreneurs

Variables	Values (NGN)	Values (USD)
Total revenue (A)	443,796.87	1,081.01
Variable cost		
Cost of stocks	69,525.62	169.35
Cost of labour	8,278.13	20.16
Cost of feeding	13,436.25	32.73
Cost of water	2,056	5.01
Cost of drugs	2,772.5	6.75
Cost of transportation	4,474.38	10.90
Total variable cost (B)	100,542.88	244.90
Fixed cost		
Cost of housing/cage	3,477.68	8.47
Cost of feeders	288.76	0.70
Cost of drinkers	294	0.72
Total fixed cost (C)	4060.44	9.89
Gross margin (D) = A-B	343,254	836.10
Net profit = D-C	339,193.56	826.21
Operating ratio (B/A)	0.23	0.23
Return on capital invested (D/B)	3.41	3.41

Source: own study.

Constraints faced in rabbit production among youth agripreneurs

The constraints faced in rabbit production among the youth agripreneurs were presented in Table 4. The major constraints faced were lack of support or interest by government and research institutes (3.65), inadequate extension programs or contacts (3.36), poor access to credit (3.16), pest and diseases infestation (2.90), high cost of housing (2.71), termite attack (2.65) and high cost of feeds (2.5). Lack of support or interest by government and research institutes was a very severe constraint and ranked first among the constraints. The youth involved in rabbit production did not receive government support to enhance their production activities, especially during the recent covid-19 pandemic. Inadequate extension programs or contacts in rabbit production was also a very severe constraint and ranked second among the constraints. Most rabbit farmers did not get access to extension programmes where they can get relevant information on modern rabbit farming.

Poor access to credit was also a very severe constraint in rabbit production among the youth agripreneurs and ranked third among the youth agripreneurs. The majority of the youths could not access credit, the few that could access credit got it from family and friends where they got little financial assistance. This could limit their production to a micro-scale level. The poor access to credit could be linked to a lack of collateral and the high rate of interest that is attached to the said amount of loan from commercial banks. The severity of pest and diseases infestation in rabbit production was perceived as a severe constraint to rabbit production and ranked fourth among the youths. Disease outbreaks inhibit the productivity and profitability of rabbit production among the youth. Taiwo *et al*. (1999) reported that one of the major causes of poor rabbit production in sub-Saharan Africa is pests and diseases such as Mange. It is quite a limiting factor to rabbit profitability.

The high cost of housing was perceived as a severe constraint in rabbit production and ranked fifth among the youth agripreneurs. Because most of the youth involved in rabbit production used personal funds to start the business, some perceived construction of cages and hutches as a challenge to engage in rabbit farming. Termite attack at the rabbit house was also perceived as a severe constraint and ranked sixth among the youth agripreneur. The rabbit houses (cages and hutches) were constructed with wood which is easily affected by termites. This led to spending money to control termites and/or constructing a new cage. This result is in line with Baruwa (2014) who reported that soldier ants was a challenge to rabbit production. The high cost of concentrated feeds was perceived as a severe constraint and ranked last among the severe constraints in rabbit production. Due to the inflation in the country coupled with low agricultural productivity as a result of the pandemic that affected the 2020 planting season. This increased the price of concentrated feed given to the rabbit to enhance their growth. Cherwon *et al*. (2020) reported a similar finding that the high cost of feeds is a major challenge in rabbit production in Kenya.

High risk of theft (2.13), marketing problems (2.06) and high cost of labour were not severe problems to rabbit production among the youth agripreneur. This could be because the youth had their rabbits' cages and hutches at the backyard of their compound which preserve their rabbits from theft and enabled the household members to assist the youths in rabbit production.

Table 4. Constraints faced in rabbit production among youths agripreneur

Constraints	ES Freq (%)	VS Freq (%)	MS Freq (%)	NS Freq (%)	M	D	Rank
Lack of support by government and research institutions	93(77.5)	18(15.0)	3(2.5)	6(5.0)	3.65	VS	1st
Inadequate extension program or contacts	66(55.0)	36(30.0)	14(11.6)	4(3.3)	3.36	VS	2nd
Poor access to credit	71(59.2)	19(15.8)	6(7.5)	14(17.5)	3.16	VS	3rd
Pest and diseases infestation	42(35.0)	38(31.6)	27(22.5)	13(10.8)	2.90	S	4th
High cost of housing	24(20.0)	54(45.0)	26(21.6)	16(13.3)	2.71	S	5th
Termite attack	26(21.6)	40(33.3)	40(33.3)	14(11.6)	2.65	S	6th
High cost of feeds	16(13.3)	56(46.7)	28(23.3)	20(16.7)	2.57	S	7th
High risk of theft	13(10.8)	33(27.5)	29(24.2)	30(37.5)	2.13	NS	8th
Marketing problem	15(12.5)	24(20.0)	34(28.3)	47(39.2)	2.06	NS	9th
High cost of labour	1(0.8)	12(10.0)	38(31.7)	69(57.5)	1.55	NS	10th

Note: freq. = Frequency, VS = Very severe, S = severe, MS = moderately severe, NS = not severe, M = Likert mean, D = decision.
Source: own study.

CONCLUSIONS

This study investigated agripreneurship among youths viz-a-viz the profitability of rabbit production among youth agripreneurs to increase youths' participation in agripreneurship. The study revealed that the majority of the youth engaged in rabbit production were males, single, had access to the market, and sourced their capital through personal savings. The important factors motivating agripreneurship development among youths were to acquire personal wealth, to boost income, to achieve what one wants to have in life, to be financially independent, to be self-employed, for personal satisfaction

and growth, for high self-esteem, desire to do a new thing, reputation and recognition, and to contribute to their household income and needs. The study has shown that rabbit production among the youth agripreneurs was profitable. Rabbit production had a net profit of 339,193.56 NGN (826.21 USD), an operating ratio of 23%, and a return on capital invested of 3.41. Numerous constraints were limiting the effectiveness of rabbit production among the youth agripreneurs. These constraints were pest and diseases infestation, poor access to credit, inadequate extension programs or contacts, high cost of housing, high cost of feeds, termite attack and lack of support or interest by government and research institutes. Despite the numerous challenges faced by the youths, the rabbit production industry will do well when these constraints are reduced drastically.

Based on the findings of this study, with a view to promoting rabbit production among the youth as a profitable venture, the study recommends that there should be an awareness creation among the youth about the importance of rabbit production to encourage more participation and improved standard of living. There should also be an information program to the public on the nutritive benefits of rabbit meat to enhance its consumption to solve the malnutrition problem. This would also enhance the marketability of rabbit meats. There is also a need for the government's active support in disease control through vaccination and training for rabbit farmers to enhance adequate technical know-how. Government can also support the youth agripreneurs through the provision of rabbit farm clusters where there will be stronger and safer housing, biosecurity, security, availability of veterinary centres and adequate provision of drugs. There is a need for adequate visits and contacts from extension agents to the youth rabbit farmers. These change agents should be well equipped with knowledge, techniques and skills in rabbit rearing to be diffused to the youth agripreneurs. This could bring about an increase in animal production and a higher protein intake. Government should support and encourage youth rabbit farmers through the provision of farm inputs (such as subsidized quality feeds and high-quality breeds of rabbits) for maximum productivity and profitability. Provision of adequate funding inform of loans and grants by the government to the youth will also encourage more participation in agripreneurship among the youths and increase the profitability of rabbit production. Microfinance banks, commercial banks and other lending agencies should increase youths' access to credit. This would go a long way to provide business opportunities to the unemployed youths and reduce the financial constraints faced by rabbit producers. Youth agripreneurs on their part should form cooperative societies to help them in the acquisition of loans at very low-interest rates to finance their businesses, training and a subsidized cost of production inputs to the members. Such groups can also help to reduce losses by procuring facilities for its members' usage and enjoyment of economies of scale.

The study is limited to youth involvement in rabbit production agripreneurship. Future studies should focus on youth engagement in crop production. Future research can also examine the drivers of agripreneurship intension among youths.

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On the trail of the intangible: a theoretical and empirical investigation of innovations and patents in Germany in the years 2006-2019

Friedrich L. Sell

ABSTRACT

Objective: We want to better understand what incentives firms to pursue innovations. For this purpose, we set up a new intertemporal principal-agent model. We then proceed to empirically assess the determinants of innovation activities unfolded by German firms between 2006 and 2019 and to also look at the causal factors – related to innovation activities – for the occurrence of patent registration in Germany.

Research Design & Methods: In the theoretical part, we make use of intertemporal optimization tools based on the principal-agent model (PAM). In the empirical part, we apply the so-called DuPont decomposition and non-linear regression techniques.

Findings: It seems that investment activities in conjunction with product innovations are the major determinants of innovation intensity. The latter (and other innovation related variables) in turn, is (are) responsible for the dynamics of patent registration in Germany.

Implications & Recommendations: Our results highlight the importance of smart reward systems in R&D departments in order to incentivize innovative activities. Our findings also point at the significance of a patent regulation friendly to the innovator.

Contribution & Value Added: Our findings deliver a new foundation of innovation activities based on an intertemporal principal agent approach which is confirmed by the empirical facts in the case of Germany.

Article type:	research article
Keywords:	innovation economics; principal-agent model; DuPont decomposition; non-linear regression
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INTRODUCTION

Germany is estimated to spend 176, 1 billions of EUR for innovations in 2022 (Handelsblatt February 1, 2022). Although it spends only about 3.2% of its GDP to R&D, it is listed fourth in the worldwide ranking of innovations (Handelsblatt January 20, 2022). Germany also stands out with regard to the number of yearly patent registrations, presently being the world's number two (ibid). Good reasons to investigate the German innovation story more in depth.

The ambition/objective of this contribution is twofold: (i) in the theoretical part of the paper, it is our purpose to understand better the economic logic of innovations on the firm level. To that end, we go back to the principal agent model (Burr 2017; Richter & Furubotn, 1999) which has proven to be so successful in economics/entrepreneurial science. Management and owners of the firm have different interests: while the first aims at a high compensation for its effort, the latter is primarily concerned, for example, with the growth of the firm. Owners cannot directly observe the level of effort of the

management (asymmetric information), but they do can evaluate the result of the managements effort. Raising productivity, it seems, can serve both interests best: it is conducive to the growth of the firm, but it also enhances the possible compensation of management and employees.

We have extended the original (see, for example, Richter & Furubotn, 1999) most simple (no uncertainty, no adverse selection, no moral hazard) one-period principal-agent-model (PAM) to a two-periods or likewise intertemporal optimization approach – in the tradition of Frankel and Razin (1984) – which enables us to demonstrate the productivity raising effect of innovations. What matters here is not the absolute size of innovations, but their relative magnitude, i. e., the intensity of innovations: this ratio is often proxied by expenditures on innovations per unit of total firm's revenue. We will show that the productivity raising effect tends to be the larger, the higher the chosen innovation intensity is, c. p. The approach has to be intertemporal because the "decision to innovate" taken in the present involves a reallocation of resources whose benefits can hardly be reaped before the future arises.

In the empirical section (ii), we want to inquire empirically significant determinants of the innovation intensity in Germany. The data stem from the "ZEW Innovationserhebung 2021" following the method of the "Mannheimer Innovationspanel – MIP" and they cover the years 2006-2019. At the very start, we make use of the so-called DuPont decomposition technique. This method is "borrowed" from finance (Baumann, 2014; Kasik & Snapka, 2020), where "DuPont decomposition (is well known and, the author) is typically used … to further break down net operating surplus into its underlying components: returns on invested capital – or net operating surplus over net capital stock, which can be broken down further into profit margins on sales and capital turnover – and capital-to-output ratios" (McKinsey, 2019, p. 14). In our application, we will further break down "innovation intensity" into its underlying components. Thereafter, we test the impact of a high innovation intensity on the evolution of new knowledge, as it becomes evident through the registration (or likewise "production") of patents, as the most visible signal for new knowledge created by means of several non-linear regressions.

The rest of the paper is organized as follows: after this introduction, we give a brief review on related literature in section 2. In section 3, we first present our theoretical research methodology. Thereafter, we suggest a two-step empirical approach: DuPont decompositions of various stages and a number of non-linear regression analyses building on the former. Section 4 presents the results of our empirical investigations and discusses their relevance. Section 5 concludes and offers some scope for a future research on our topic. A flow-of-funds exercise for the transactions involved in the intertemporal PAM is located in the annex.

LITERATURE REVIEW

There is a great abundance of literature on the subject of innovations/patents. Broadly speaking, this literature can be categorized by the criteria of exogeneity vs. endogeneity: When we think of Schumpeter's pioneering entrepreneur or of economic policies labelled "innovation initiatives" to boost innovative investment, innovations are seen as a more or less exogenous variable. This strand of literature is not relevant for our subject. If taken instead as endogenous, innovations/patents may be regarded as a "natural" outcome of competition between firms (or even countries on the international level). But already on the firm level, innovations and the "production" of patents should result from implicit or explicit contracts between involved interest groups/stakeholders and are hence accessible to the use of PAM. Among the many relevant PAM applications in the area of innovations, Gang (2021), Taniguchi & Thompson (2018) and Chen *et al.* (2021) figure prominently.

As we suggest the key role of "innovation intensity" in both our own theoretical and empirical research, we came across the papers of Benazzouz (2019), Urbaniec (2019), Bigos and Michalik (2020) and of Kaszowska-Mojsa (2020). Complementary to Bigos and Michalik (2020), we go beyond the simple absolute record in the implementation of marketing (organizational, product, etc.) innovations, relying the analysis strictly on relative figures, such as "innovation intensity". Kaszowska-Mojsa (2020) deserves recognition for differentiating between persistent innovators, occasional innovators, and challengers. She has studied empirically the probability of implementing innovations which are affected by both supply side and demand side factors. Benazzouz (2019) puts some emphasis in making clearer the meaning,

the content and the dimensions of "innovation intensity" (such as frequency, degree and internationalisation of innovations). Urbaniec (2019) finds that innovation activities and competitiveness are necessarily interrelated: competitiveness spurs innovation intensity, but innovation intensity also enhances competitiveness. Many recent publications can be found which investigate the determinants of innovation intensity in cross-section or country studies (Falk & Hagsten, 2021; Thang *et al.*, 2021).

Goel and Zhang (2019) discover the possibility to hedge against political and economic uncertainties by innovating and, later on, patenting (Goel & Nelson, 2021). The traditional view, according to which, in the short-run, innovations in production processes bring in uncertainty for large parts of the employees is here contrasted with the observation that the long-run likelihood of firms' survival crucially hinges upon its capability to raise innovations and thereby to foster growth of the firm. Only surviving firms, in turn, can guarantee employment. As a result, the short-run trade-off between employment and innovations is softened. These positive implications of innovations for the employees of the firm are a key aspect of our model, too.

The usage of the Du Pont decomposition technique outside finance is rare, but fruitful: a recent study (McKinsey, 2019) has yielded far-reaching insights into the fall of the US labour share by means of this tool. There is a long-lasting tradition of investigating the "production" of patents, for example with regard to economic growth (Pena-Sanchez, 2013), the role of academic institutions (Coronado Guerrero, 2017) or international cooperation (Klauß, 2019).

Empirical investigations on innovations and patents in Germany are not often to find and mostly dedicated to specific industries (pharmaceuticals, automobile industry, ICT etc., see Behrens and Viete, 2020). Koppel *et al.* (2017) investigate the existence of a sort of "patent production function", comparable to our own approach. The authors report that R & D expenditures and employment of STEM (Smart energy storage and energy management service) graduates to successful patent applications.

In light of the cited literature, our own contribution is novel in as far as it combines a presumably new theoretical foundation for innovations with a two-step empirical validation.

RESEARCH METHODOLOGY

The research methodology chosen consists of two parts: in the first one, we develop a theoretical explanation for innovations in a two-periods-optimization horizon, extending the traditional principal agent model (PAM). In the second part, we test empirically the forces which tend to raise innovation intensity in German firms (2006-2019). We then investigate those variables related to innovation which presumably incentivize patent registrations in Germany. More information on the methodological steps made (optimization tool, variables used, data description, quantitative/econometric design, etc.) in detail will be provided in the following sub-sections.

An intertemporal principal-agent model of innovation

PAM already fits quite well when it comes to explain the conflicting incentives[1] within a R&D department or likewise between the R&D section and the management of the company (Burr, 2017). But it also helps to understand the overall motivation for innovation activities on the firm level. The intertemporal theory of the balance of payments (Frenkel & Razin, 1984) is a vehicle to introduce the two-period optimization perspective into the principal-agent model.

We have two periods of observation. Assume an agent (management of the firm) who is provided with a fixed budget given to him by the principal (owner of the firm) before production starts. The principal expects the agent to return the corresponding budget at the end of the production and sales period. Capital costs (return on capital), costs for imported inputs, etc. are neglected here in order to keep things simple. The agent will spend the budget in period 1 totally for wages and organize the production and the sales of a single good. The revenues generated by sales of the good are in equilibrium as large as the wage bill and so high enough to return the budget to the principal

[1] The principal seeks to maximize profits, but he can only do so by respecting both the incentive compatibility and the participation conditions of the agent.

at the end of period 1. In period 2, this process is replicated. So far, the base scenario. There is neither any productivity gain nor growth of the firm.

As an alternative, the agent may now save in period 1 part of the budget which in principle is designated to wages and then invest this amount of money, preferably into an innovation. One may think of the innovation in two ways: either the good is now produced with a higher quality at a given size of production (this would equal a product innovation) or the good is produced now, albeit with an unchanged quality, with a larger size of production (this would equal a technological innovation). The lower sales of the good in period 1, however, are now not high enough to cover the budget extended by the principal to the agent at the beginning of period 1. So the principal becomes now – whether he likes it or not – a lender vis-à-vis to the agent. Employees accept the lower wages or likewise forced savings in period 1 only because the agent promises to compensate them with a significantly higher level of consumption in period 2 than the one experienced in period 1. At the beginning of period 2, the principal now extends a larger budget to the agent as in period 1. The additional budget components are due to the forced savings plus the corresponding interest rate income the agent has to pass on to the employees. The principal expects to receive this extended budget back at the end of period 2, plus the implicit credit he extended in period 1 to the agent, including interest payments which now accrue to him. These interest payments can be regarded as a return on the credit (capital) extended by the principal to the agent.

The key control variable for the agent is the amount of innovative investment: he must generate a surplus in period 2 in order to fully compensate both his employees and the principal for the wage losses/credit payments they had to afford/extend in period 1, taking into account the respective time preference rate of workers and of the principal. To achieve this goal, obviously a critical marginal return on the innovative investment must be realized. The key control variable for the principal is the interest rate, which can be interpreted as a minimum fixed return on capital, which was purposely neglected in the base scenario: if it is "too low", the agent and the employees profit "too much" from the innovative investment activities and being a principal is sub-optimal. If the interest rate is "too high", the principal risks the default on the credit he has extended in period 1 to the agent and the innovation, and hence the firm's growth, cannot prevail.

The formal rationale for innovative investment

The budget delivered by the principal to the agent before productions starts in period 1 is a fixed lump sum which the agent distributes among the employees for their consumption only. Hence, there is no wilful saving on the part of the employees:

$$\overline{Y}_1 = C_1 \tag{1}$$

After production period 1 is completed, the agent returns the fixed sum to the principal. The principal's savings ratio is one in each period. So far, the base line scenario. This situation changes, once the agent diverts in period 1 some money from the principal's budget which he invests into an innovation:

$$\overline{Y}_1 = C_1 + I^n \tag{2}$$

$$C_1 = \overline{Y}_1 - I^n \tag{3}$$

$$S_1 = I^n \tag{4}$$

Employees hence have now to renounce on part of their consumption in period 1 according to (3) so that the agent can pursue an innovative investment strategy. Forced savings are, by definition, equal to investment expenditures (4). The principal becomes a lender to the agent at the end of period 1. Notice that actual production and income generated by the employees declines proportionally to their reduced consumption possibilities. In Figure 1, we identify the fixed incomes on the vertical (period 2) as well as on the horizontal (period 1) axis: $\overline{Y}_1 = \overline{Y}_2$. These two fixed incomes are given when there is no investment and hence no investment return is to be expected. They define the "Resource-Endowment Point" (REP). The "investment yield curve" is concave and it has its origin in the REP. It rises and turns counterclockwise and up towards the vertical axis. Its slope is meant to be the marginal gross return on investment (see below).

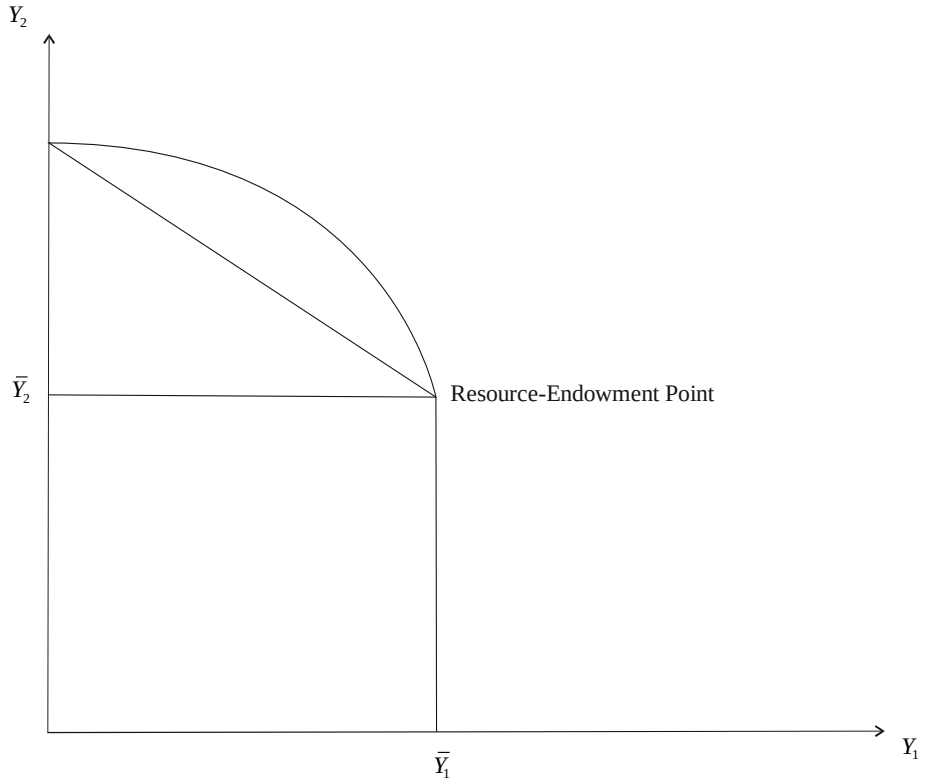

Figure 1. The investment yield curve
Source: own elaboration.

The new (gross) income generated in period 2 now amounts to:

$$Y_2 = \overline{Y}_2 + F(I^n) \tag{5}$$

With: $F(I^n)$ = gross return on investment and I^n = net expenditures on investment. Notice that the new income Y_2 is not what the agent owes to the principal at the end of period 2 (see below). By definition, the net return on investment, π, equals:

$$F(I^n) - I^n(1+r) = \pi = \text{net return on investment (capital value)} \tag{6}$$

The problem to be solved by the agent consists in maximising the net return on investment:

$$\text{Max!}\ \pi = F(I^n) - I^n(1+r) \tag{7}$$

Where π stands for the capital value of the investment. Derivating this equation with respect to net investment (I^n) yields:

$$\frac{\partial \pi}{\partial I^n} = F'(I^n) - (1+r) = 0;\ F'(I^n) = 1+r \tag{8}$$

Hence, the marginal gross return on investment must in the optimum equal the interest rate factor. Notice that the interest rate factor has to have a negative impact on π, ceteris paribus:

$$\frac{\partial \pi}{\delta(1+r)} = -I^n < 0 \tag{9}$$

Consumption (employees and agents) behaviour

Households face an intertemporal budget constraint which, in the case of the first, base line scenario (no investment), reads:

$$C_1 + \frac{C_2}{(1+r)} = \overline{Y}_1 + \frac{\overline{Y}_2}{(1+r)} = W \tag{10}$$

$$C_2 = (1+r)(\overline{Y}_1 - C_1) + \overline{Y}_2 = W \tag{11}$$

Actual consumption together with the present value of future consumption must not exceed the corresponding sum of income variables (which equals total wealth, W).

$$C_1 = 0\,;\; C_2 = (1+r)\overline{Y}_1 + \overline{Y}_2 \tag{12}$$

$$C_2 = 0;\; C_1 = \overline{Y}_1 + \frac{\overline{Y}_2}{(1+r)} \tag{13}$$

The position of the intertemporal budget constraint is determined by income, its increase by the interest rate factor: $[\tan(\alpha) = -(1+r)]$.

The utility function is standard and has the following form:

$$U = u(C_1) + \beta u(C_2); \beta = \text{discount factor and } 0 < \beta < 1 \tag{14}$$

A totals differential of this equation leads to:

$$dU = u'(C_1)dC_1 + \beta u'(C_2)dC_2 = 0 \tag{15}$$

$$\frac{dC_2}{dC_1} = -\frac{u'(C_1)}{\beta u'(C_2)} \tag{16}$$

The slope of the intertemporal indifference curve, must, hence, be in the optimum identical with the slope of the intertemporal budget constraint, – (1+r).

Looking now more closely at our constrained maximization problem, the maximum of utility in both periods reads:

$$\max L = u(C_1) + \beta u(C_2) + \lambda\left[W - C_1 - \frac{C_2}{(1+r)}\right] \tag{17}$$

$$\left.\begin{aligned} \frac{\partial L}{\partial C_1} &= u'(C_1) - \lambda = 0 \quad (18)\\ \frac{\partial L}{\partial C_2} &= \beta u'(C_2) - \frac{\lambda}{1+r} = 0 \quad (19)\\ \frac{\partial L}{\partial \lambda} &= W - C_1 - \frac{C_2}{(1+r)} = 0 \quad (20) \end{aligned}\right\} \frac{u'(C_1)}{\beta u'(C_2)} = 1 + r$$

As a rather standard result, we achieve the equality of the interest rate factor, (1 + r), on the one hand and the ratio between the marginal consumption utility in the present and the (discounted) marginal consumption utility in the future, on the other hand.

In the second, investment scenario, the following budgeting equations must be fulfilled:

$$\overline{Y}_1 = C_1 - I^n \tag{21}$$

$$C_1 = \overline{Y}_1 - I^n \tag{22}$$

In the first period, consumption possibilities for the employees and the agent are constrained by the net investment activity of the agent which equals forced savings from the viewpoint of employees.

$$\overline{Y}_2 = C_2 - \left(\overline{Y}_1 - C_1\right)(1+r) - \pi \tag{23}$$

$$C_2 = \overline{Y}_2 + \left(\overline{Y}_1 - C_1\right)(1+r) + \pi \tag{24}$$

In period 2, employee's and the agents consumption possibilities encompass three items: the budget extended by the principal at the beginning of period 2, the forced savings of period 1 times the interest rate factor, plus the net return on investment gained from innovative investment in period 1.

Solving the agents puzzle (investment plus consumption)

What a difference does it make when there happens to be not just an ordinary, but an innovative investment in period 1? In Figure 2, we have depicted a relatively steep investment yield curve. This can only occur in the case of an innovative investment. Otherwise, the investment yield curve must behave differently and run comparatively flat. The size of investment expenditures I^n is given by the distance, AB (or I = S). Given the negative sloped budget contraint line IH, a tangential point is reached in E, which determines equilibrium of income and production in period 2. Income has now the level Y_2. We observe a gross return on investment AE. Notice that the equilibrium for consumption is located in D (where the relevant budget constraint line denotes JK), because the distance ED is that part of production of period 2 which accrues to the principal. We realize that

the capital value π (BF) of the innovative investment enables all households (employees plus the agent) to reach a higher consumption level in D than it would have been possible without the innovative investment (as for example in L which lies on the original budget constraint line). Notice that the new income Y_2 is obviously higher than it was before ($\overline{Y}_1$), a result which – at a given and unchanged degree of employment – points at the increase in (labor) productivity. The latter is a prerequistite for the growth of the firm, just as much as it is on the national level of any economy. $(Y_2 - \overline{Y}_2)/\overline{Y}_2$ can serve as a proxy for such a growth rate.

What is the impact of alternative interest rates? With a high interest rate charged by the principal, two outcomes appear possible: on the one hand, the probability for a default of the agent rises, ceteris paribus. On the other hand, a high interest rate forces the agent to find particularly productive and hence innovative investment opportunities, both to satisfy the claims of the principal, but also to be able to compensate the employees for the loss of welfare in period 1.

Discussion

(i) both employees and the agent have a strong interest in achieving innovative investments which can boost income of period 2 to so far unprecedented levels. The agent and the employees profit in direct proportionality to the (high) net capital value which (only) an innovative investment is capable to raise. This finding adds to the positive implications of innovations for employees already stressed in literature (see above). (ii) It is obvious that this concern is served best when the agent is able to achieve a high innovation intensity. This quota can be proxied by the ratio between expenditures on innovation ($I^n = S$) and the (original) level of revenues, $\overline{Y}_1$. Notice that "innovation intensity" will be the key variable in our empirical section, too. (iii) The principal does not profit from innovative investment directly, his net gain is just a modest interest income. He could do better, if he would share a part of the net capital value raised by the agent.[2] For that he would have to switch to a flexible contract with the agent. In the annex, we simulate a numerical flow of funds analysis with all transactions between the three players considered in our theoretical model.

RESULTS AND DISCUSSION

The available sector-specific data from the ZEW will be used for empirically testing the relevance of variables which possibly are the most relevant influencial factors on innovation intensity. In doing so, we can refer ourselves and the reader to other contributions in literature which (see Benazzouz, 2019; Bigos & Michalik, 2020; Kaszowska-Mojsa 2020; Urbaniec, 2019; and further papers cited therein) highlight the significance of innovation intensity for entrepreneurial success.

Unfortunately, the available informations/data on German firms do not allow for an investigation of the impact of governments patent policy on innovation activities. However, it is possible to empirically assess the reverse question, that is, to what extent innovation activities "produce" the registration of patents. In all of the mentioned analyses, we limit our scope to Germany and to the recent time period from 2006 to 2019 (14 observations). While the latter time span is more or less dictated by data availability, Germany is chosen in particular because of its long-history with patents and its outstanding innovation record.

[2] Notice the similarity of our modeling to the "sharecropping vs. fixed rent contracts in agriculture" literature. See Narayan *et al.*, 2019.

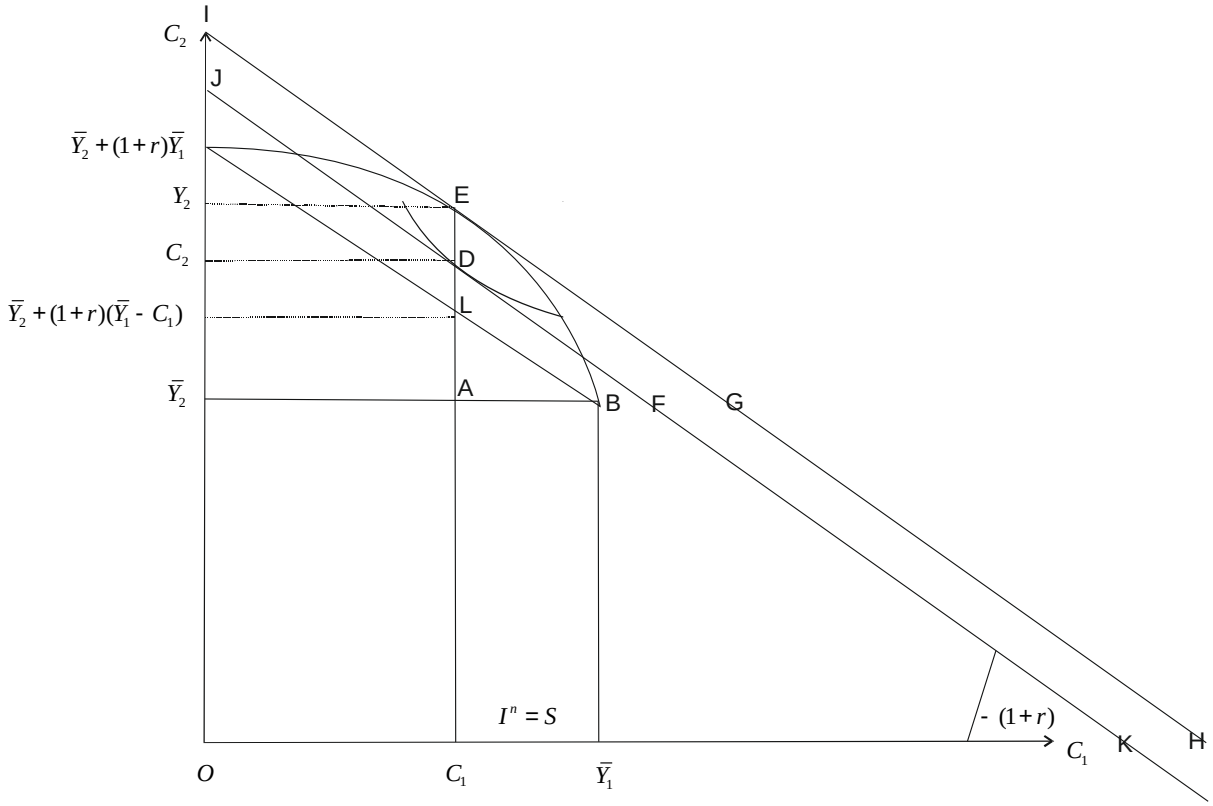

Figure 2. The optimal innovative investment
Source: own elaboration.

In this section, we intend to address the following two questions:

1. What does the empirical calibration of the DuPont decomposition yield with regard to the determinannts of innovation intensity (II)?
2. How is empirically the relationship between different proxies for innovation activities (such as expenditures on innovation, innovation intensity (II), innovative investment expenditures and/or R&D expenditures) on the one hand and patent registration (PR) on the other hand? This can be a sort of test for the existence of a "patent production function" by means of a non-linear regresion analysis.

DuPont decomposition

In the following, we conduct a two-step, a three-step and a four-step so-called „DuPont decompostion" (Borodin, 2021; Morris & Daley, 2017), a technique widespread in finance, to detect, in our case, the main determinants of innovation intensity (II).[3] The latter seems to be a key variable enabling firms to register patents, and, after that, to possibly reap the benefits of patents as (more or less) transitory monopolists in the sense of Schumpeter (1911).

Data Description

A huge data set is available thanks to the courtesy of the "Zentrum für Europäische Wirtschaftsforschung" (ZEW), Mannheim. Their research project, called "Kernindikatoren zum Inovationsverhalten von Unternehmen"[4] collects and systematically orders quantitative figures on the innovative behaviour of business firms in Germany (2006-2019). These firms belong to a sample

[3] This definition of *innovation intensity* follows ZEW (2021) and means expenditures on innovations per unit of total firm's revenue. How are "expenditures on innovations" related to "expenditures on R&D?" R&D implies the existence of a corresponding internal unit within the firm with permanent employees, a specific budget, etc. Expenditures for R&D are hence a part of the (aggregate) expenditures on innovations. The latter also include expenses for patents, licenses, external consulting, etc.
[4] Key indicators for innovative behaviour of firms.

encompassing both the production and the services sector. The project is sponsored by the "Bundesministerium für Bildung und Forschung"[5] (Berlin). The purpose of the project is to raise quantitative data on the innovative activities in the busines site. All absolute figures have the dimension Billions of Euro, all shares are meant to be percentage values.

Two-step DuPont decomposition

Under this approach, we break down innovation intensity (II) into two firm-specific ratios as follows:

II = EOIPUOIIE x IIEPUOTFR

Where all the following ratios have the dimension of percentage points:

EOI = Expenditures on innovations;
II = Innovation intensity = Expenditures on innovations per unit of total firms revenue[6]
EOIPUOIIE = Expenditures on innovations per unit of innovative investment expenditures
IIEPUOTFR = Innovative investment expenditures per unit of total firms revenue[7]

Example for 2019:	**Example for 2010:**	**Example for 2006**:
II = 3.3	II = 2.6	II = 2.8
EOIPUOIIE = 0.04	EOIPUOIIE = 0.031	EOIPUOIIE = 0.029
IEEPUOPIR = 82.508	IEEPUOPIR = 83.2	IEEPUOPIR = 98.0

Growth rates (G) of the two-step DuPont Decomposition:

GII = GEOIPUOIIE + GIEEPUOPIR

Growth rates (2019-2010)	**Growth rates (2010-2006)**
GII = -7.1	GII = 26.9
GEOIPUOIIE = 29	GEOIPUOIIE = 6.9
GIIEPUOTFR = - 2.1	GIIEPUOTFR = - 14

Four-step DuPont decomposition

Under this decomposition, II is now a function of the following three indicators:

II = EOIPUOIIE x IEEPUOPIR x PIRPUOTFR

where:

EOI = Expenditures on innovations;
II = Innovation intensity = Expenditures on innovations per unit of total firms revenue;
EOIPUOIIE = Expenditures on innovations per unit of innovative investment expenditures;
IIEPUOTFR = Innovative investment expenditures per unit of total firms revenue = Innovative investment expenditures per unit of product innovations revenue x product innovations revenue per unit of total firms revenue;
IEEPUOPIR = Innovative investment expenditures per unit of product innovations revenue;
PIRPUOTFR = Product innovations revenue per unit of total firms revenue.

[5] The Federal Ministry for Research and Education in Germany.

[6] Notice that this definition of innovation intensity is rather standard. It combines information from the input *and* from the output level of the firm. Therefore, it will follow this logic, when we make use of indicators which possess the same property in the above DuPont decomposition.

[7] While expenditures on innovations encompass all sort of spending related to innovations, innovative investment expenditures only (and strictly) apply to *investment* into innovations. Together with the information of footnote 1, we achieve: Expenditures on innovations = expenditures on R&D + specific budget of R&D department = innovative investment expenditures + other expenditures on innovation.

Example for 2019:	**Example for 2010:**	**Example for 2006**:
II = 3.3	II = 2.6	II = 2.8
EOIPUOIIE = 0.04	EOIPUOIIE = 0.031	EOIPUOIIE = 0.029
IEEPUOPIR = 5.946	IEEPUOPIR = 5.497	IEEPUOPIR = 5.435
PIRPUOTFR = 13.876	PIRPUOTFR = 15.136	PIRPUOTFR = 18.03

Growth rates (G) of the three-step DuPont Decomposition:

GII = GEOIPUOIIE + GIEEPUOPIR + GPIRPUOTFR

Growth rates (2019-2010)	**Growth rates (2010-2006)**
GII = 26.9	GII = -7.1
GEOIPUOIIE = 29	GEOIPUOIIE = 6.9
GIEEPUOPIR = 8.2	GIEEPUOPIR = 1.1
GIRPUOTFR = -10.3	GIRPUOTFR = -0.9

Four-step DuPont decomposition

Under this decomposition, II is a function of the following four indicators:

II = EOIPUOIIE x IEEPUOPIR x PIRPOUMI x MIPUOTFR

where:

EOI = Expenditures on innovations;
II = Innovation intensity = Expenditures on innovations per unit of total firms revenue;
EOIPUOIIE = Expenditures on innovations per unit of innovative investment expenditures;
IEEPUOPIR = Innovative investment expenditures per unit of product innovations revenue;
PIRPUOTFR = Product innovations revenue per unit of total firms revenue = Product innovations revenue per unit of market innovations revenue x market innovations revenue per unit of total firms revenue;
PIRPUOMI = Product innovations revenue per unit of market innovations revenue
MIPUOTFR = Market innovations revenue per unit of total firms revenue[8]

Example for 2019:	**Example for 2010:**	**Example for 2006**:
II = 3.3	II = 2.6	II = 2.8
EOIPUOIIE = 0.04	EOIPUOIIE = 0.031	EOIPUOIIE = 0.029
IEEPUOPIR = 5.946	IEEPUOPIR = 5.497	IEEPUOPIR = 5.435
PIRPUOMI = 4.724	PIRPUOMI = 4.139	PIRPUOMI = 5.143
MIPUOTFR = 2.9	MIPUOTFR = 3.6	MIPUOTFR = 3.5

Growth rates (G) of the four-step DuPont Decomposition:

GII = GEOIPUOIIE + GIEEPUOPIR + GPIRPOUMI + GMIPUOTFR

Growth rates (2019-2010)	**Growth rates (2010-2006)**
GII = 26.9	GII = -7.1
GEOIPUOIIE = 29	GEOIPUOIIE = 6.9
GIEEPUOPIR = 8.2	GIEEPUOPIR = 1.1
GPIRPUOMI = 14.1	GPIRPUOMI = -19.5

[8] What is the difference between „product innovations“ on the one hand and “market innovations” on the other hand? According to ZEW (2021), market innovations encompass only new and/or significantly improved products (including services), which were firstly introduced by firms on the market. As opposed to this, product innovations can be market innovations, but they may include also non-novelties, to say so, which are labelled “imitative innovations”. This implies also that there is no single category for “imitations” alone. Indirectly spoken, imitations’ weight or importance should be the higher, the higher the ratio between product innovations and market innovations is.

GMIPUOTFR = -24.4 GMIPUOTFR = 4.4

Results achieved from the DuPont decomposition technique and discussion:

- The two subperiods available (2006-2010; 2010-2019) are obviously completely different with regard to the dynamics of innovation intensity: while we observe a decline (negative growth rate) in the first, shorter period, there is a significant increase (positive growth rate) in the second, longer period.
- Looking at the main driving forces for the growth of innovation intensity, the growth rate of expenditures on innovations per unit of innovative investment expenditures figures prominently. Next come the growth rate of innovative investment expenditures per unit of product innovations revenue and the growth rate of product innovations revenue per unit of market innovations.
- So, in essence, innovative investment expenditures and product & market innovations seem to dominate the picture of influential factors for the achievement of a high innovation intensity. This comes very close to our theoretical explanation from above, where the decision of the agent to renounce on consumption/to invest "forced" savings in the present period in exchange for a higher income and welfare in the next, future period, highlights the relevance of innovations. Such an innovative firm also resembles to Joseph Schumpeter's view of competition, where the pioneering innovator and his imitators play the key roles (ibid, 1911).
- And yet, the data available to us are not quite capable to directly measure the relevance of imitations. Only a clear differentiation between innovations and imitations would in principle allow to empirically follow the footsteps of Schumpeter. For that, it would be indispensable to be able to distinguish conceptually between innovative investment expenditures and imitative investment expenditures.

Non-Linear Regression Analysis

The relationship between patents and innovations is diverse and far from being clear. Patents are sometimes seen as a proxy for measuring innovations (Burhan *et al.*, 2017), patents may protect inventions and innovations against mental theft (Belleflamme & Bloch, 2013), patents are also assessed as a key source of innovations (Behrmann, 2007), at the same time, it is said that inventions lead to innovations and both can lead, in the end, to patents (Burr, 2017).

When it comes to empirically investigate the relationship between innovations and patent registration, (at least) two different approaches are feasible: on the one hand, one may look after the effect of patent registration activity on innovations. This first question is somehow uneasy to answer because patent registration obviouosly triggers licenses and licenses, in turn, will have a strong impact on imitation activities. Hence, a typical "identification problem", well known since long in econometrics, arises. However, one may also, conversely, be interested in the effect of innovation activity on the dynamics of patent registration. Since we already have an idea, what empirically are – according to the above DuPont decomposition – the main determinants of innovation intensity on the firm level, we decided to investigate the latter puzzle, that is the impact of innovation intensity and of closely related varaibles on patent registration.

Data Description

The data for expenditures on innovation, innovative investment expenditures, for R&D expenditures and for innovation intensity (see above) stem from the "Kernindikatoren zum Inovationsverhalten von Unternehmen", a document edited by ZEW (2021). They cover the period from 2006 to 2019. The data on patent registration activities of private firms in Germany, also for the period 2006-2019 (n = 14 observations), come from the "Deutsches Patent- und Markenamt (2020): "The number of patent registrations in Germany between 2000 and 2019".

Based on the above described data set, we have regressed total patent registration (absolute numbers) of private firms from Germany (2006-2019) alternatively on (in that order): expenditures on innovation, innovation intensity, innovative investment expenditures, and relative R& D expenditures (see Figures 3 through 6). More precisely, we tested/estimated the equation:

$$X_t = a_i + b_i \ln Z_{it} \quad (25)$$

with

$$X_t = \text{Patent registration (Germany, } 2006 - 2019) \tag{26}$$

Z_{1t} = Expenditures on innovation; Z_{2t} = Innovation intensity; Z_{3t} = Innovative investment expenditures; Z_{4t} = R&D expenditures as a percentage of total investment expenditures.

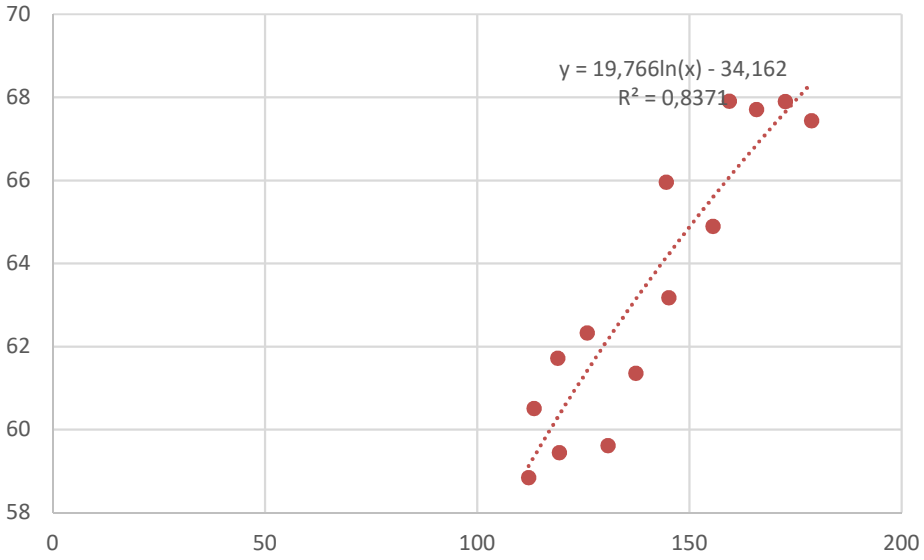

Figure 3. Patent registration as a function of expenditures on innovation (Germany, 2006-2019)
Source: own elaboration.

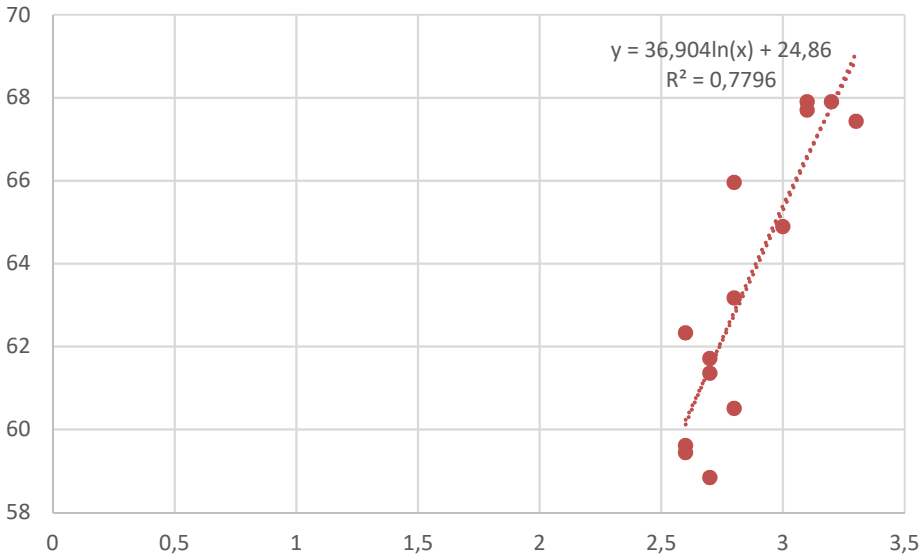

Figure 4. Patent registration as a function of innovation intensity (Germany, 2006-2019)
Source: own elaboration.

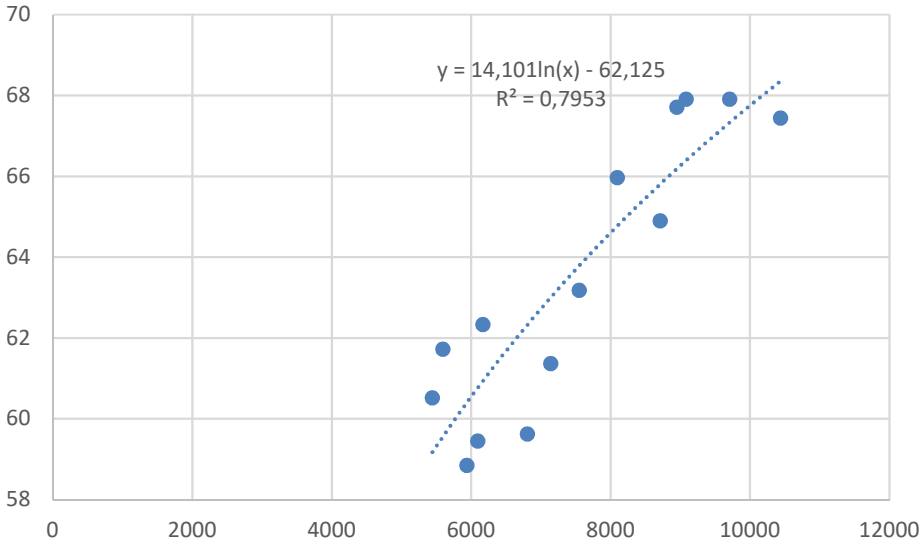

Figure 5. Patent registration as a function of innovation intensity (Germany, 2006-2019)
Source: own elaboration.

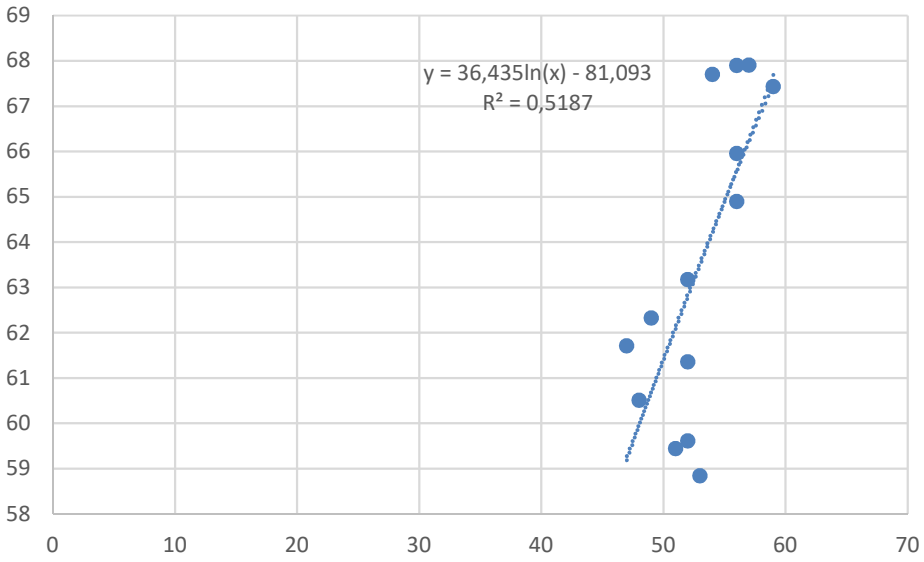

Figure 6. Patent registration as a function of R&D expenditures as a percentage of total investment expenditures (Germany, 2006-2019)
Source: own elaboration.

Results and discussion of the non-linear regression analysis

It turns out that all four alternative explanations for the behavior of patent registration – namely expenditures on innovation, innovation intensity, innovative investment expenditures and relative R&D expenditures – prove to be quite useful in our simple non-linear regression analysis as explanatory variables. The fact that a semi-logarithmic form of the estimation equation performs best points at the presumed declining marginal returns of innovative investment (see Burr 2017). The R^2 achieved is almost always in the neighborhood of 80 percent (see Figures 3 through 6). All parameter estimates, with the exception of $\hat{a}_4$ (10%) are significant at the 1 % probability of error level:

$$\hat{a}_1 = -34{,}162^{***};\ \hat{b}_1 = 19{,}766^{***}\quad \hat{a}_2 = -24{,}186^{***};\ \hat{b}_2 = 36{,}904^{***}\quad \hat{a}_3 = -62{,}125^{***};\ \hat{b}_3 = 14{,}101^{***}$$
$$(-2{,}746);\qquad (7{,}852)\qquad (-4{,}180);\qquad (6{,}515)\qquad (-3{,}376);\qquad (6{,}827)$$

$\hat{a}_4 = -81,093^{*}$; $\hat{b}_4 = 36,435^{***}$

$(-2,017)$; $(3,596)$

Looking at the size of the parameter estimates, we can see that innovation intensity ($\hat{b}_2 = 36,904^{***}$) seems to comparatively have the strongest impact on patent registration, ceteris paribus.

CONCLUSIONS

In this paper, we have analyzed both theoretically and empirically innovations, patents and how their reciprocal relationsship possibly functions. The principal agent model (PAM), once it is further developed to an intertemporal approach, serves good to better understand the motivation and the economic effects generated by innovation seeking and investing agents. It also helps to identify the key control variables of the principal, which is the interest rate, and of the agent, which is the chosen innovation intensity.

In our empirical section, we have in the first place made use of the DuPont decomposition in order to detect – for the time span of 2006-2019 – the determinants of innovation intensity among German firms of all kind of sectors. Notice that hereby we also contribute to a broader application of the DuPont decomposition technique. Looking at the derived main driving forces for the growth of innovation intensity, the growth rate of expenditures on innovations per unit of innovative investment expenditures figures prominently. Next come the growth rate of innovative investment expenditures per unit of product innovations revenue and the growth rate of product innovations revenue per unit of market innovations revenue. Investment and product innovations seem to dominate the picture. This comes very close to Joseph Schumpeter's view of competition, where the pioneering entrepreneur succeeds via innovative investment and product innovations.

In the subsequent regression analysis, we tested for alternative explanations of the behaviour of patent registration – namely expenditures on innovation, innovation intensity, innovative investment expenditures and relative R&D expenditures. The fact that a semi-logarithmic form of the estimation equation performs best points at the presumed declining marginal returns of innovations (Burr 2017). The R^2 achieved is always in the neighbourhood of 80 percent, all (but one) estimated coefficients are significant at the 1% percent level of error likelihood.

These findings confirm earlier studies on the outstanding role of innovation intensity for the production of patents, as mentioned before in our brief literature review, but contradicts recent findings of Hernandez and Rueda Galvis (2021): … "that overconfidence arises in relation to competition when registering patents and not developing continuous improvement or innovation processes" (p. 154). These results, however, apply to emerging economies such as Colombia only and not to advanced economies such as Germany.

The limitations of our investigation are obvious. Just to mention three of them: (i) patents are an uncomplete measure of innovation (not all innovations are patentable for legal reasons; not all patentable innovations are patented by firms for strategic reasons). (ii) The available data are not (yet) quite capable to directly measure the relevance of imitations. Only a clear differentiation between the categories of innovations and of imitations would in principle allow us to more or less perfectly follow empirically the footsteps of Schumpeter. (iii) This would help us further to verify whether the Schumpeterian momentum still applies in a world of digitalisation and globalisation.

Theoretical implications of our paper can be found in the potential to further develop the PAM along the lines of our approach (intertemporal optimization, inclusion of the employees' perspective etc.). As far as managerial implications of our findings are concerned, our results highlight the importance of smart reward systems in R&D departments in order to incentivize innovative activities. As far as economic policy is concerned, there is no substitute for keeping markets open and to secure property rights.

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Appendix: A flow of funds analysis of transactions between principal, agent and employees

Period	Principal	Agent	Employees
t10	-100	100	80
		-20	
		-80	
t11	80	80	
		-80	
t20	-122	122	122
		-122	
t21	144	150	
	122	-144	
	22		
Balance	2	6	
		-6	6

Explanation: At the beginning of period 1, the principal gives 100 units to the agent. The agent divides these 100 units into 80 units which he pays to the employees and 20 units which he invests in an innovation. These 20 units can be taken as forced savings of the employees which are accustomed to a wage sum of 100 units. At the end of period 1, the agent receives the revenue from the sales of the good, produced by the employees. These sales amount to 80 units because we disregard from capital costs, management compensation, etc. The agent passes on 80 units to the principal. The difference to the 100 units, the principal extended to the agent at the beginning of period 1, can be understood as an implicit credit. At the beginning of period 2, the principal gives to the agent 122 units: 100 units as an equivalent to regular wages of 100 units and say 22 units as the return of forced savings, including interest payments (10%), to the employees. The agent passes these 122 units on to the employees. At the end of period 2, income and production reach a new level of 150 units due to the innovative investment of the agent in period 1. The agent returns 144 units to the principal: 100 units as an equivalent to the regular wage sum of 100 and 22 units as the return of forced savings of the employees plus another 22 units. These latter 22 units are a payment to cover the credit costs and include interest payments (2) of the implicit credit given earlier by the principal to the agent. The total balance for the principal is positive, but only by the margin of 2 units. The total balance for the agent is “ex aequo”, if he transfers his positive balance of 6 units to the group of employees to which he belongs not only way of his role of consumer, but also according to labor market classification.

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Conflict of Interest

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Examining the determinants of import demand in Tanzania: An ARDL approach[1]

Nomfundo Portia Vacu, Nicholas Mbaya Odhiambo

ABSTRACT

Objective: This study estimates the determinants of import demand in Tanzania using time-series data for the period from 1985 to 2015.

Research Design & Methods: The study applied the ARDL approach on Tanzania's time-series data to examine the key drivers of import demand. The study used both aggregate import demand model (i.e., Model 1) and disaggregated import demand models, i.e., Model 2 (for consumer goods), Model 3 (for intermediate goods) and Model 4 (for capital goods) to examine this linkage.

Findings: The study found that in Model 1, aggregate imports in Tanzania are positively influenced by investment and exports, and negatively determined by trade policy. In Model 2, it was found that imports for consumer goods are positively influenced by consumer spending and foreign reserves, but negatively influenced by trade policy. In Model 3, imports for intermediate goods were found to be positively influenced by exports in the long run. Finally, in Model 4, the study found imports for capital goods to be positively influenced by exports (in the short- and long-run), but negatively influenced by investment (in the short-run).

Implications & Recommendations: The study recommends that policymakers in Tanzania should strengthen their macroeconomic policies to ensure that their imports are not consumption-based and have an enhancing effect on the country's economic activities.

Contribution & Value Added: The study contributes to the empirical body of knowledge by incorporating various components of disaggregated import demand. This is an aspect that is scant in the existing literature as most previous studies only focused on aggregate import demand.

Article type: research article

Keywords: aggregate Imports; disaggregated Imports, Tanzania, ARDL, error correction model

JEL codes: F14, C20

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INTRODUCTION

Both theoretical and empirical literature confirm a strong link between total trade and growth in developing and developed countries. The role of total trade in growth is stimulated by the increased interdependence between countries (Huang & Chang, 2014; Mishra, 2012). Trade openness enables economies to explore potential benefits of the increasing returns to scale through specialisation (Alesina & La Ferrara., 2000; Bond *et al.*, 2005 cited in Zahonogo, 2016).

Tanzania is one of the developing economies that benefit significantly from trade. Over the period 1985 to 2016, Tanzania's total trade as a share of economic growth has increased rapidly from 13% to 42%, respectively. This is driven by the participation in different trade agreements at country level, regional level and globally, and the gradual implementation of different reforms and trade liberalisation policies (Msaraka & Hongzhong, 2015). According to Busse and Koeniger (2012), trade policies

[1] The study is based on the PhD thesis written by Nomfundo Portia Vacu at the University of South Africa.

promote improved resource allocation, allow accomplishment of economies of scale and competition in international markets. Tanzania's participation in trade has been predominantly on the import side, resulting in a constant recording of trade deficits. Over the period from 1985 to 2016 the country experienced a general increase in imports as a share of economic growth from 9% to 23%, respectively (United Nations Conference on Trade and Development database , 2015).

Literature provides no consensus on the imports-growth nexus, as some argue that imports are detrimental to economic growth and the country's balance of payments (BOP), while others argue that, depending on the nature of the imported goods, imports may have positive effects on economic growth (Bakari & Mabrouki, 2017). According to Bakari and Mabrouki (2017), imports are considered to be a source of economic growth if they include hardware and electronic equipment to help and contribute to the increase and improvement of the investment. According to World Bank (2016) Tanzanian imports are dominated by manufactured good and fuels, accounting for an average of 68% and 15.3%, respectively. This raises questions on the key drivers of the country's import demand, as it is dominated by manufactured goods, which may have no influence on economic development. Although numerous studies have examined the determinants of import demand in various countries, most of those studies only examined the determinants of aggregate import demand. The current study, therefore, aims to analyse the main drivers of import demand in Tanzania and contributes to the body of knowledge by examining both aggregate and disaggregated import demand.

The remainder of the study is organised as follows: The Literature Review section provides an overview of previous studies that have been conducted on the key determinants of import demand in various countries. The Methodology section deals with model specification, estimation techniques and empirical analysis. The final section (Conclusion) concludes the study.

LITERATURE REVIEW

Numerous studies on the imports have been carried out for both developing and developed countries. These studies found different factors depending on the type of imports used as a dependent variable. This includes studies such as that by Narayan and Smyth (2005), who analysed the drivers of import demand in Brunei Darussalam during the 1964-1997 period. The explanatory variables used in the study includes GDP, exchange rate, petroleum price and population. The study confirmed that population and exchange rate are the main drivers of import demand, while GDP and petroleum price have no significant effect.

Adam *et al* (2011) emphasised the importance of inequality for import demand. To validate this, they assessed the effect of inequality on aggregate import demand for 59 selected developed and developing countries. For empirical analysis the authors used OLS on panel data during the period from 1970 to 1997. The results revealed a highly significant impact of inequality on import demand. Also, a negative impact in low-income countries and a positive link in high income countries were found. The study asserts that the nature of the impact of income inequality is also determined by a country's level of development.

Arize and Malindretos (2012) studied the link between foreign exchange reserve and import demand in five Asian countries. To estimate this, the study applied OLS on quarterly data during the period 1973-2005. The findings of the study shows that foreign exchange reserve, relative prices and income do matter for import demand.

In 2012, Hameed and Arshad employed the ARDL-bounds test to estimate the import function for palm oil in five leading countries, that is, India, China, Bangladesh, Pakistan and the USA. The study used data from the period from 1979 to 2010 for Bangladesh, 1978 to 2010 for Pakistan and 1977 to 2010 for the rest of the countries. The import demand for these countries was specified as a function of income, palm oil price, and the price of a substitute oil. The results from the study showed that the palm oil and its substitute prices are major determinants of palm oil demand in the studied countries, except for India. On the other hand, GDP was found to be an important determinant of palm oil demand in India. Trade liberalization policies, exchange rates and health concern-induced government rules were also found to be among the main drivers of import demand for palm oil in the studied countries.

Yahia (2015) evaluated Libya's import demand function using data from 1975 to 2008. The model expressed imports as a function of economic performance (GDP), relative import prices, investment spending, managerial spending, population size and fluctuations in oil prices. The findings showed that the main determinants of Libyan imports include the GDP, oil price fluctuations and partial adjustment of imports. Furthermore, the author emphasised the need to consider the structure break problems and long-term relationship in estimating the import function.

Mansi and Nteegah (2016) studied the main determinants of import demand in Nigeria using data for the period 1980-2014. The authors used the ordinary least squares and ECM to estimate the effects of income, exchange rate, external debt, investment spending, price level and trade openness. The results confirmed that income, price level, exchange rate, trade openness and external debt are the key determinants of import demand in Nigeria. Based on these findings, the study further recommended an increase in income and trade restriction, and a review of investment climate to stimulate growth in the Nigerian economy.

Hossain *et al*. (2019) examined the impact of gross domestic product, relative prices, and exchange rate on import demand using three panels of eight frontier countries, eight emerging countries, and ten developed countries from 1980 to 2016. The study employed panel cointegration tests and the results confirmed that import demand is determined by gross domestic product, relative prices, and exchange rate, both in the long run and the short run.

Other studies that have examined the key drivers of imports in African countries include studies such as Razafimahefa and Hamori (2005) for the case of Madagascar and Mauritius; Chimobi and Ogbonna (2008) for the case of Nigeria; Bathalomew (2012) for the case of Sierra Leone; Narayan and Narayan (2010) for South Africa and Mauritius; Fatukasi and Awomuse (2011) for the case of Nigeria; and Omoke (2012) for the case of Nigeria, among others.

RESEARCH METHODOLOGY

This study estimates the key determinants of aggregate and disaggregated import demand in Tanzania. The general import demand model as follows[2]:

$$IMD = f(FER\ INVS\ EXP\ RIP\ GS\ CS\ TP) \quad (1)$$

where:

IMD = aggregate imports (Model 1), imports of consumer goods (Model2), imports of intermediate goods (Model3) and imports of capital goods (Model4);
FER = foreign exchange reserves;
INVS = investment spending;
EXP = exports;
RIP = relative import price;
CS = consumer spending;
GS = government spending;
TP = dummy (for trade liberalisation policy).

Stationarity Test

Although the ARDL approach does not require all variables to be I(1), it is necessary to first perform the stationarity test to ascertain whether all variables are either I(0) or I(1). To test for stationarity, the study employs the DF-GLS, Phillips-Parron and KPSS tests.

[2] See also Yahia (2015), Dutt and Ahmend (2004), Anaman et al. (2001), among others

Table 1. Definition of Key Variables

Variable	Description
Foreign exchange reserves (FER)	FER refers to foreign currency deposits held by a country's central bank.
Consumer spending (CS)	CS is measured as total private spending.
government spending (GE)	GS is measured as total public spending.
Investment spending (INVS)	INVS is measured through gross domestic fixed capital formation.
Exports of goods and services (EXP)	EXP is measured through spending on exports.
Trade liberalisation (TP)	TP is measured through a dummy, where '1' represents a period where there was an import policy change, while '0' is used where there was no policy change.
Relative import price	RIP this variable is measured through import price as a share of domestic price
Imports of Capital goods (IMDCP)	IMDCP Includes imports of machinery and other capital equipment, and transport equipment, etc.
Consumption goods (IMDCON)	IMDCON Includes imports of consumer goods such as food and beverages for household consumption, non-industrial transport, and other consumer goods.
Intermediate goods	This includes goods such as food and beverages for industry, fuel and lubricants, parts and accessories for capital goods and other industrial supplies.

Source: own study.

The ARDL Bounds Test

The ARDL method is preferred in this study because, unlike the other normally used econometric co-integration methods, it does not require all the series be of the same order of integration. Based on the ARDL approach, the general model specified in equation 1 can be reparametrized as follows:

$$\begin{gathered}\Delta LIMD_t = \pi_0 + \sum_{i=1}^{n} \pi_{1i} \Delta LIMD_{t-i} + \sum_{i=0}^{n} \pi_{2i} \Delta LFER_{t-i} + \sum_{i=0}^{n} \pi_{3i} \Delta LINVS_{t-i} + \\ \sum_{i=0}^{n} \pi_{4i} \Delta LEXP_{t-i} + \sum_{i=0}^{n} \pi_{5i} \Delta LCS + \sum_{i=0}^{n} \pi_{6i} \Delta LGS_{t-i} + \sum_{i=0}^{n} \pi_{7i} \Delta LRIP_{t-i} + \\ \sum_{i=0}^{n} \pi_{8i} \Delta TP_{t-i} + \Omega_1 LIMD_{t-1} + \Omega_2 LFER_{t-1} + \Omega_3 LINVS_{t-1} + \Omega_4 LEXP_{t-1} + \Omega_5 LCS_{t-1} + \\ \Omega_6 LGS_{t-1} + \Omega_7 LRIP_{t-1} + \Omega_8 TP_{t-1} + u_t \ldots\end{gathered} \tag{2}$$

where:

Δ = 1st difference;
i = number of lags;
L = logarithm;
u_t = error term;
π_0 = constant;
$\pi_1 - \pi_8$ = long-run coefficients;
$\Omega_1 - \Omega_8$ = short-run coefficients.

The general Error Correction model (ECM) of the general model in equation 1 can be presented as:

$$\begin{gathered}\Delta LIMD_t = \pi_0 + \sum_{i=1}^{n} \pi_{1i} \Delta LIMD_{t-i} + \sum_{i=0}^{n} \pi_{2i} \Delta LFER_{t-i} + \sum_{i=0}^{n} \pi_{3i} \Delta LINVS_{t-i} + \\ \sum_{i=0}^{n} \pi_{4i} \Delta LEXP_{t-i} + \sum_{i=0}^{n} \pi_{5i} \Delta LCS + \sum_{i=0}^{n} \pi_{6i} \Delta LGS_{t-i} + \sum_{i=0}^{n} \pi_{7i} \Delta LRIP_{t-i} + \\ \sum_{i=0}^{n} \pi_{8i} \Delta TP_{t-i} + \delta_1 ECM_{t-1} + u_t \ldots\end{gathered} \tag{3}$$

Data Sources

The data on disaggregated import variables was obtained from the World Bank database and Quantec easy data, while the data on aggregate imports, consumer spending, foreign reserves, investment, government spending and exports were collected from the UNCTAD database.

RESULTS AND DISCUSSION

Table 2 gives a summary of the unit root test results. The results from the unit root tests confirm that the variables included in Models 1, 2, 3 and 4 are either I(0) or I(1), which permits the use of the ARDL approach to analyse the key drivers of imports in the studied countries.

Table 2. Stationarity Tests

Variable	DF-GLS				PP				KPSS			
	Level		Difference		Level		Difference		Level		Difference	
	No Trend	Trend	No Trend	Trend	No Trend	Trend	No Trend	Trend	No Trend	Trend	No Trend	Trend
LFER	-2.732**	-5.907**	–	–	-5.884	-11.089**	–	–	0.397	0.156**	–	–
LINVS	0.481	-1.698	-4.329**	-4.348**	-0.837	-1.797	-4.097**	-4.070**	0.403	0.146**	0.130**	–
LEXPP	0.026	-3.552	-6.572**	-6.949**	-2.610	-4.582**	-5.331**	_	0.409	0.169**	0.307	–
LCS	-0.704	-1.991	-3.293**	-3.337**	-1.332	-1.790	-2.923**	-2.977	0.408	0.173**	0.287**	–
LGS	1.818	-1.741	-2.365**	-2.776**	0.799	-1.147	-2.913**	-3.253	0.385	0.167**	0.161**	–
LRIP	-0.425	-1.055	-3.411**	-3.324**	-4.843**	-4.326**	–	–	0.413	0.250**	0.304	–
LAIMD	-0.068	-2.792	-4.830**	-5.247**	-1.527	-2.334	-4.666**	-4.934**	0.406	0.157**	0.214	–
LIMDINT	-1.899	-4.542**	-5.322**	–	-2.164	-4.135**	-8.653**	–	0.379	0.203**	0.385	–
LIMDCON	-0.209	-1.714	-3.109**	-3.256**	-0.251	-2.498	-3.320**	-3.321**	0.340**	0.150**	–	–
LIMDCP	-1.107	-3.016	-4.716**	-4.860**	-0.764	-2.909	-6.467**	-6.553**	0.385**	0.179**	–	–

Note: ** denoted statistical significance at the 5% level. PP – Phillips-Perron.
Source: own study.

COINTEGRATION TEST

The cointegration results for all the models are presented in Table 3.

Table 3. Co-integration results – ARDL Bound Test[3]

Model	Description	F-statistic	Conclusion
Model1	AIMD = f(AIMD|FER INVS EXP CS GS RIP TP)	6.658***	Co-integrated
Model2	IMDCON = f(IMDCON| FER INVS EXP CS GS RIP TP)	8.302***	Co-integrated
Model3	IMDINT = f(IMDINT| FER INVS EXP CS GS RIP TP)	3.832***	Co-integrated
Model4	IMDCP = f(IMDCP| FER INVS EXP CS GS RIP TP)	3.947***	Co-integrated

Note: ***indicates statistical significance at the 1% level.
Source: own study.

The cointegration results show that all the variables included in all the four models, i.e., Models 1,2,3 and 4 are cointegrated. The F-statistics for Model 1-4 are 6.658, 8.302, 3.832 and 6.658, respectively. These F-tests have been found to be greater than the upper bound critical values provided by Pesaran *et al.* (2001).

Short-Run and Long-Run Results

Table 4 presents the short-run and long-run results for Models 1-4.

The results for Model 1 (reported in Table 4) show that exports (LEXP) and investment (LINVS) have a positive impact on aggregate imports, while trade policy (TP) has a negative impact. It is found that a one percent increase in LEXP and LINVP results in a 0.54 percent and 1.16 percent long-run increase in aggregate imports, respectively, while a one percent increase in TP results in a 0.52 percent decrease. The results also show that, in the short run, a one percent increase in DLEXP and DLINVS results in a respective 0.35 percent and 0.78 percent increase in aggregate import demand, while a one percent increase DTP results in a 0.35 percent decrease.

In the case of Model 2, the results suggest that imports for consumer goods are positively influenced by consumer spending (LCS), foreign reserves (LFER) and lagged imports (LIMCON1) and negatively influenced by trade policy (TP). The results show that in the long run, a one percent increase in LCS and LFER results in a 1.71 percent and 0.64 percent increase in imports for consumer goods, respectively, while a one percent increase in TP results in a 1.31 percent decrease. In the short run, the results show that a one percent increase in DLCS, DLFER and DLIMCON1 results in a 1.24 percent, 0.44 percent and 0.63 percent increase in the demand for consumer goods, respectively, while a one percent increase in DTP results in a 0.97 percent decrease.

In the case of Model 3, the findings confirm that the demand for imported intermediate goods is positively related to exports (LEXP) and lagged imports for intermediate goods (DLIMDINT1), but negatively related to trade policy (TP). The findings show that a one percent increase in LEXP and TP result in a 0.91 percent increase and 0.32 percent decrease in imports, respectively. The short-run coefficients presented in Panel B confirm that a one percent increase in DLIMDINT1 and DTP respectively results in a 0.63 percent increase and 1.23 percent decrease in imports for intermediate goods.

For Model 4, the findings show that capital goods are positively determined by exports (LEXP) in the short run and in the long run, but negatively influenced by investment (DLINVS) in the short run. In the long run, one percent increase in LEXP results in a 1.12 percent increase in imports for capital goods. The short-run results, however, reveal that a one percent increase in DLEXP leads to a 0.82 percent increase in capital goods imports, while a one per cent increase in DLINVS results in a 1.34 percent decrease.

[3] The critical values used in this analysis were obtained from Pesaran *et al.* (2001).

Table 4. Long-Run Results

Panel A: Long-Run Results				
Regressor	**Model 1**	**Model 2**	**Model 3**	**Model 4**
LCS	-0.435(-1.022)	1.795(1.824)*	-0.612(-0.676)	0.175(0.142)
LEXP	0.536(3.557)***	-0.080(-0.149)	0.999(1.934)*	1.119(2.277)*
LFER	0.198(0.871)	0.635(2.064)*	0.087(0.282)	-0.244(-0.296)
LGS	-0.318(-0.998)	-0.109(-0.231)	-0.410(-1.245)	-0.040(-0.034)
LINVS	1.157(3.165)***	0.717(1.049)	0.341(0.795)	0.569(1.175)
LRIP	-0.227(-0.571)	-0.897(-0.887)	0.342(0.604)	0.922(0.651)
TP	-0.520(-1.856)*	-1.397(-2.734)**	-1.320(-2.838)*	-1.189(-1.281)
INPT	-1.032(-0.292)	-14.781(-2.133)**	7.345(0.884)	-9.364(-1.246)
Panel B: Short-Run Results				
dLIMDCON1	–	0.627(4.537)***	–	–
dLIMDINT1	–	–	0.634(4.266)***	–
dLCS	-0.292(-1.135)	1.240(1.755)*	-0.583(-0.740)	0.127(0.140)
dLEXP	0.359(3.688)**	0.304(0.847)	-0.025(-0.085)	0.815(2.351)**
dLEXP1	–	–	-0.418(-1.423)	–
dLFER	-0.087(-0.928)	0.439(2.132)**	-0.114(-0.462)	0.414(1.273)
dLGS	0.273(1.442)	-0.075(-0.231)	-0.391(-1.151)	-0.177(-0.300)
dLINV	0.776(3.723)**	0.175(0.402)	0.324(0.750)	-1.342(-1.741)*
dLRIP	0.012(0.032)	-0.620(-0.951)	0.326(0.624)	0.671(0.620)
dTP	-0.349(-2.082)*	-0.965(-2.855)**	-1.257(-3.360)***	-0.866(-1.429)
ECM(-1)	-0.671(-5.333)***	-0.691(-5.441)***	-0.728(-4.409)***	-0.728(-4.409)**
R-Squared	0.901	0.850	0.896	0.705
DW-statistic	1.760	1.969	1.977	1.604
F-Statistics	20.5059 [0.000]	10.7362 [0.000]	13.7970 [0.000]	5.9651[0.000]
Serial Correlation	0.706[0.401]	0.458[0.499]	0.003[0.958]	1.813[0.178]
Functional Form	4.070[0.044]	8.271[0.004]	0.770[0.380]	11.459[0.001]
Normality	0.425[0.808]	0.007[0.996]	1.211[0.546]	1.317[0.518]
Heteroscedasticity	0.008[0.929]	0.172[0.990]	0.464[0.983]	1.168[0.280]

Source: own study.

Based on these results, it can be concluded that import demand in Tanzania is positively determined by exports of goods and services, foreign exchange reserves, investment spending and consumer spending, but negatively determined by trade policy. The positive impact of these variables on import demand is supported by theory and is in line with the results from previous studies, such as those by Fukumoto (2012), Agbola (2009), and Bartholomew (2010). Furthermore, the positive impact of these variables implies that economic policies regulating these variables in Tanzania encourage imports. However, it is recommended that, to address the negative impact of investment spending on capital good, the government should design fiscal policies in a manner that encourages import substitution, boosts domestic production capacity, and discourages consumption-oriented imports. The negative effect of trade policy is inconsistent with theory; however, it is supported by findings in previous studies, such as Narayan and Narayan (2005) and Samuel (2015).

Figure 1 shows the results of CUSUM and CUSUMSQ tests.

The results of CUSUM and CUSUMSQ confirm that the four import demands models estimated in this study are stable.

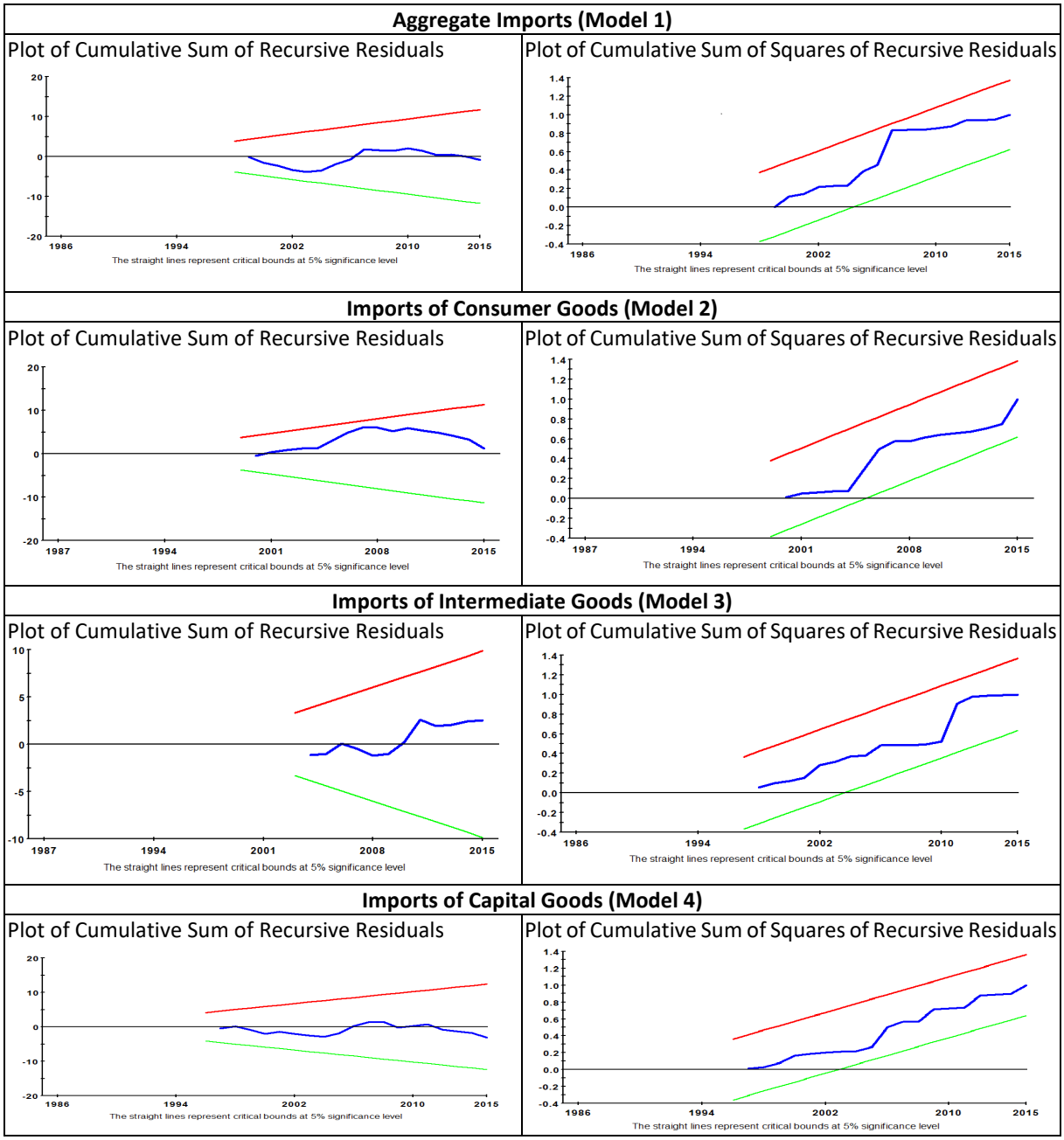

Figure 1. The CUSUM and CUSUMSQ tests
Source: own elaboration.

CONCLUSIONS

In this study, the key drivers of import demand in Tanzania are examined for the period 1985-2015 using the ARDL approach. The study used both aggregate (Model 1) and disaggregate imports (Models 2, 3 and 4) to examine this linkage. The disaggregated imports include import demand for consumer goods – Model 2, intermediate goods – Model 3 and capital goods – Model 4. The estimated determinants include foreign reserves (FER), investment (INVS), exports (EXP), government spending (GS), consumer spending (CS), import price (RIP), and trade policy (TP). The results for Model 1 confirmed that aggregate imports are positively influenced by exports and investment, but negatively influenced by trade policy. For Model 2, consumer spending and foreign reserves were found to have a positive impact on consumer goods imports, while trade policy was found to have a negative effect.

In the case of Model 3, the findings show that imports for intermediate goods are is positively influenced by exports in the long run, but negatively influenced by trade policy in the short run. In Model 4, the results suggested that imports for capital goods are positively influenced by exports both in the short- and long-run, but negatively influenced by investment in the short run. Overall, the results confirmed that exports and trade policy are the main drivers of import demand in Tanzania. The results further confirm that each of these variables significantly affect import demand in at least two models and exports appear to be more influential.

Although efforts have been made to ensure that the study is empirically defensible – our study like other previous studies – still suffers from some limitations. The main limitation of our study mainly relates to data unavailability. For example, annual time series data was used in the study, which has been found to have some weaknesses for some variables when compared to quarterly data. Also, the study covered the period from 1985 to 2015, which translates to only 30 observations. The use of annual data and the selection of this period was based on data unavailability. This has also affected the proxies used for each of the employed variables. Future studies on this subject can examine the determinants of import demand for Tanzania or other countries using data covering a longer period when data becomes available. It would also add value to compare the results from those studies with the findings in this study. Also, the study examined the key determinants of import demand, and did not examine the causality between import demand and its determinants, as that was beyond the scope of the current study. Future studies may explore this analysis further and may examine whether there is a feedback effect between import demand and its determinants.

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Conflict of Interest

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Virtual management during the Covid-19 era: Changes in leadership and management

Vincent Montenero, Cristina Cazorzi

ABSTRACT

Objective: The objective of the article is to understand the impact of the Covid-19 crisis on the management style and the relationship between managers and subordinates.

Research Design & Methods: We used a mixed-method combining a qualitative part based on 20 semi-structured interviews as well as a quantitative part based on a questionnaire intended to confirm the observed trends more precisely. All data were analyzed using the grounded theory method.

Findings: The analysis of the data shows an irreversible evolution towards a more frequent use of home-office. This situation, welcomed very positively by the leaders, requires however to review the way of operating of the managers as well as the interaction between managers and their subordinates.

Implications & Recommendations: We are entering a new phase of management, during which managers will have to create a closer relationship with subordinates, concretely entering the role of manager coach.

Contribution & Value Added: This research provides access to the vision that top managers have of the impact of the Covid-19 crisis. Despite many problems, they retain the interest of having accelerated the transition to home-office and remote management while beginning to question the concrete implications of this situation.

Article type: research article

Keywords: Management; Covid-19; leadership; virtual teams; change management; home-office; remote management

JEL codes: M10, O15, P19

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INTRODUCTION

The spread of the Covid-19 pandemic has forced all companies to ask more of their employees and managers. For many, the discovery of the fragility of our economy and of our well-being was an element of surprise. The lockdown period has or should have opened the way to create new opportunities to change approaches, to reflect on the consequences of a system based on constant growth, and to establish new values. Moreover, this crisis has affected the world differently and it has accentuated the differences between poor and rich countries, but also within rich countries: populations who can stay at home on the one hand and people dedicated to production—or worse, employees and temporary workers—on the other hand. Finally, the lockdown suspended many civil liberties such as the freedom to move within a country, bringing about unprecedented growth in remote working. Thus, managers had to manage and energize individuals and teams remotely. They had no choice and almost no specific training. Nevertheless, generalized virtual management allowed people to discover the true meaning of work. To work is not only to act or to produce, but it is also to occupy a position as an individual within a company, pointing out our social relations and the sense of the consideration of each individual.

This imposed development has had several consequences: i) The discovery that the remote way is really a different job; ii) The emergence of new challenges between time devoted to work and to per-

sonal lives; iii) The fact that smart work may be different from remote work; iv) The conviction that managers must adopt new styles of leadership. A fundamental difference is that managing at a distance requires managers to change their point of view to encourage the autonomy of their subordinates. They still need to monitor results, but they must agree not to investigate how those results were achieved. On this point, the values carried by the company can help managers by creating this very rare link which makes it possible to unify the what and the how.

This article focuses on the vision that leaders have of the pandemic period, its difficulties and its possible contributions. It adopts the perspective of the top management team to analyze in greater depth, the last point mentioned above: How can managers strengthen the team without being present in person? How can the figure of the manager face the pandemic phenomenon and people's fear? How can managers remain in the same position and also assume a new role in the current global crisis that entails changing management methods?

LITERATURE REVIEW

Our research is rooted in two main theoretical fields: the literacy of change management and leadership styles.

Change Management

According to the Cambridge Dictionary, change management is "the planning and introduction of new processes, methods of working, etc. in a company or organization." At all times, change, even when it was considered necessary, has been difficult. Many models have been developed to limit the effect of various resistances and help teams and organizations move to a new state (Galli, 2018). As early as 1951, Lewin (1951) imagined a model comprising three stages: unfreeze, change, and re-freeze. According to him, for a change to occur it was essential to have a change motivator.

Kotter *et al.* (2008) later expanded Lewin's original change strategy by moving to an eight-step approach and highlighting the role of managers: "Leadership must create and sustain the kind of changes needed for successful organizations to compete in the current competitive world." He also insisted on what he calls a "need for change," which is supposed to create "a sense of urgency" at the level of the teams concerned. To move forward successfully, it is necessary to have a vision of transformation capable of uniting the group around the change. The model starts with the team or organization realizing a need for change. In step 2, the team creates a coalition for change that will be able, in step 3, to develop a strategic vision and align objectives and progress as a group (Calegari *et al.*, 2015). After sharing the vision with all members of the group in step 4, employees are encouraged to then try new ideas and approaches in step 5. Step 6 is an essential moment of the model, as it brings short-term wins that help demonstrate that the change effort is constructive and helps the team to make necessary adjustments. In step 7, the organization should consolidate gains and produce more changes, before step 8, which was presented as the moment when the change is institutionalized and anchored in the organizational culture (Kanter, 2003). Failing to do this can pave the way for a return to previous habits and destroy the efforts made in the previous 7 steps. Coming later, ADKAR's model (Hiatt, 2006) focused much more on individuals and on how they adapt to the constraints of change. In this case, employees must have sufficient motivation to participate in the change as well as the ability to effect necessary changes. We find the importance given to the involvement of individuals in the names used to describe the stages: awareness, desire, knowledge, ability, and reinforcement. Employees need knowledge of what to change and what change entails. Ability refers to the skills required to implement change, whereas reinforcement is needed to maintain and sustain it.

The McKinsey 7-S Model was described by Peters (2019), who all worked at McKinsey at the time. Unlike previous models, it built on the different areas to work on to ensure change: strategy, structure, systems, skills, team, style, and shared goals. We find here, for the first time, a notion of structure that defines and confirms the roles and responsibilities of each member (Singh, 2013). Likewise, systems emerge to ensure the dissemination of information, the allocation of resources, as well as the measurement of performance in planning, budgeting, and reward. Additionally, Kübler-Ross (1969) tracked

the different stages of an individual's psychological journey through change, basing it on the observation of how people react emotionally to grief. Identifying what phases individuals undergoing a change are going through can help when deciding when to communicate information, what level of support is required, and when best to implement final changes.

All these models emphasize the iterative aspect of change (Rosenbaum *et al.*, 2018) and share a common awareness of the need for change, which brings motivation. The groups concerned feel, or are brought to feel, the necessity of transforming an unsatisfactory situation. Moreover, these developed models show the importance of evolving a new state considered preferable to the previous situation. Once achieved, if the process was successful, this desired state should remain for some time. Some models put more emphasis on the effort to be made in the final stages so that the change cannot be lost, and the team does not return to where it was at the very beginning.

The situation that we describe in this paper is different, mainly in that individuals are faced with an external intervention that asks them to change as quickly as possible, without going through the phases described in the models mentioned. It will be interesting to see if all people reacted the same way and to identify the factors that will undoubtedly determine the extent of the return to old habits after the crisis.

Virtual management and leadership

Leadership influences the group also in cases in which there are no hierarchical links (Burke *et al.*, 2006; Dirani *et al.*, 2020; Samimi *et al.*, 2020). In the modern concept of leadership, which belongs to the American tradition of the matrix company, creating a subordination link is not necessary (even if it may help), because the staff accept function links. To be influential, we need leadership at the team level and leadership values, a double binding that gives managers a double function: hierarchical and functional. In the literature, a large space is devoted to managing virtually, an approach mainly referring to those who have a team spread throughout the world and seldom referring to managers who stay close to their employees and make them use a virtual system due to the spread of Covid-19.

During the Covid-19 crisis and repeated lockdowns in various countries, the manager was obliged to avoid using a bureaucratic form of control and to instead use different approaches and practices to manage virtual teams.

New technologies are at the heart of the system. It would be impossible to manage efficiently without them (Karolak, 1999; Malhotra, 2000; Sotomayor *et al.*, 2009; Staples & Ratnasingham, 1998). Creating trust, the biggest item in a team, is very difficult to produce virtually (Bisbe & Sivabalan, 2017; Caulat & De Haan, 2006; Kanawattanachai & Yoo, 2002; Mumbi & McGill, 2008; Ridings *et al.*, 2002). Having a correct videoconference system and other technological tools can help the team to build trust but the virtual situation makes it difficult (Avolio *et al.*, 2010; Kahai *et al.*, 1997).

The flexible way of working is considered favorable (Liao, 2017; Sarros *et al.*, 2008), but effectiveness in leadership can be an issue. Only a change in management styles can favor the efficiency of management and give new roots for virtual management. Kurt Levin, also following the critics (Cherry, 2006; Hussain *et al.*, 2018), showed the difference between authoritative, autocratic, and democratic leadership modes. Schmidt (2014) and Caulat (2012) added that in this case, comparing to special context, leadership is strongly influenced by the medium and the frequency of the communication style.

Communication is important to see acting leadership and look at the managers' approach (Gibson & Cohen, 2003; Hambley *et al.*, 2007; O'Neill *et al.*, 2009). Communication style can be influenced by the difference between cross-cultural managers and the cultural frame (Arun & Kahraman-Gedik, 2020; Shah *et al.*, 2020). This is what allows us to understand the reason for laissez-faire in Afghanistan or authoritative methods in Turkey. Every country can influence the leadership style of the managers, but we should not forget that leadership styles have been created in the West.

Virtual management prefers transactional (Chaudhry & Javed, 2012) and transformational leadership modes (Bass & Avolio, 1993; Hwa, 2008; Sosik, *et al.*, 1997; Sosik *et al.*, 1998;). Transactional management is based on a complex system of rewards, whereas the transformational style is closer to the concept of the charismatic leader, as Weber considered (Masood *et al.*, 2006). The exemplarity of the leader's own action and the coherence of his or her beliefs (Yammarino & Dubinsky, 1994) are considered

essential. This kind of leadership is based on learning cognition (Harris, 1970; Merriam, 2004), open-mind mindset (Antonakis, & House, 2014), and one-to-one motivation. The effectiveness of the team (Chandani *et al.*, 2016; Paracha *et al.*, 2012) and innovation influence (Gumusluoglu & Ilsev, 2009) seem to directly be related.

RESEARCH METHODOLOGY

The Covid-19 crisis has pushed companies to innovate to continue their activities whenever possible. The question we are asking in the research is how this rapid evolution has affected methods of managing? More precisely, we wish to understand how this change happened, if it has brought with it a transformation of the relations between managers and their subordinates, and if this leads to modifications in the competencies that the managers should possess. We would also like to understand what is likely to happen once the pandemic is over.

To carry out this work, we favored a mixed research method. The quantitative part is intended to provide basic information on how managers operate during a pandemic, while the qualitative part should allow us to better understand the details of the functioning and daily experience of the managers concerned. The phrase "mixed method" has become an umbrella term used whenever more than one methodological approach is utilized (Bazeley, 2008). Using a combined design serves several different purposes (Adamson, 2003). First, there is a desire to verify, by using two different approaches, the credibility of the findings (triangulation). For this reason, a fundamental point, when one uses a mixed-method, is to check if the results of the two approaches are contradictory. The problem here is that in the event of contradictory information, one does not always know what conclusions to draw from it (Mason, 1998). Another reason for using a combined design is linked to the desire for complementarity. In this case, the strength of one method is used to increase the performance of the other (Morgan, 1998). Finally, one advantage of such research is that it makes it possible "to have two paradigms, or two worldviews, mixed throughout a single research project" (Tashakkori & Teddlie, 2003, p. 11).

Regarding the design of combined methods, Tashakkori & Teddlie identified 40 different types of uses. What seems most important, however, is knowing exactly which need each method responds to and avoiding transforming data acquired by a quantitative method into data acquired in another way or vice versa. In our case, we wanted to use a quantitative approach first to understand the extent of the change, for example, to measure the evolution of the use of remote management before and during the crisis. We also wanted to understand the feelings of managers forced to resort to this form of management. Consequently, we designed a questionnaire of 15 questions (see Table 1) to get a general overview of the situation. We knew, by carrying out this survey, that we would get very little information on the reasons and the conditions of the change, as well as on the evolution of the relations between managers and their subordinates.

While including closed questions, this questionnaire left the possibility for respondents to note individual remarks. It was sent to 200 people, managers, and employees alike, who worked in the French subsidiary of an American company. The responses, numbering 49 (representing 24.5% of requests), were free and anonymous. The questions were organized as follows: Firstly, we located the department where the respondents worked. Then we ascertained whether the IT platforms were well suited to managing remotely for the given function. The other three parties then asked questions about the Covid-19 crisis, in particular on virtual management as such, on the impact of the crisis on the method of managing, and finally, on the sustainability of the domination of remote management.

Our mixed-method also involved a qualitative approach, i.e., an ethnographic method based on a semi-structured questionnaire. The questionnaire was passed to 20 managers working in 12 different companies. Among these managers, only three belonged to the company where we carried out the quantitative study. The literature gives little information on the selection of the interviewed population, other than selecting the combination that best meets the reason why we chose a combination design (Tashakkori & Teddlie, 2003). We have deliberately decided to diversify the number of companies in order to enrich the information collected and to cover different situations. Table 2 describes the content of the interviews and Table 3 provides a short description of the interviewed population.

Table 1. Description of the survey sent to 200 managers in September 2020

First series of questions: locate the people who are answering	What is your function?
	How many people in your direct line?
Second series of questions: general questions	How do you consider the coronavirus situation?
	Why? How do you explain your answer?
	System and platform; How do you consider your situation compared to the system and internet network?
	System and platform: What kind of technical issues did you have?
Third series of questions: Experiencing virtual management	Before the crisis, what was your level of experience with virtual management?
	How do you feel towards virtual management?
	Changing patterns: Since you have been managing remotely, what has changed in your way of managing?
	Changing patterns: What are the main features that you changed?
	Changing patterns: What is the main challenge of virtual management?
	Changing patterns: What is the main difficulty of communication in remote management?
Fourth series of questions: How do you do with the team?	What do you do to bring the team to reach the objectives?
	What are your tips to motivate the Team?
Fifth series of questions: The future	Do you think that this crisis will have consequences on the way managers will work in the future?
	What are the two main features that you think will be changed?

Source: own study.

Table 2. Description of the semi-directive questionnaire used for interviews between April 2020 and February 2021

The pandemic as a crisis	- What makes it critical for management? - What could be the short term and long-term consequences? - What will happen after the pandemic will have been gone?
Changes in the way of managing	- Towards the team - Towards the direction / the headquarters - Towards customers
Managing uncertainty	- When, how and why?
Skills and / or competences	- New expectations for employees - New expectations for international managers

Source: own semi-directive questionnaire.

The managers' interviews were all done remotely and lasted between 20 and 40 minutes. They were often carried out as part of longer interviews on international management. The interviews were recorded and transcribed. They were subsequently analyzed using the Grounded Theory (Glaser, 1978; Glaser & Strauss Anselm, 1967; Strauss & Corbin, 1997). In a first phase, we questioned a certain number of top-managers on the consequences of the Covid-19 crisis. When we understood that the people interviewed considered that the increase in the use of the home office was a very positive consequence of the crisis, we wanted to better understand the extent of this increase and to know how this evolution was perceived by launching a survey (phase 2) while continuing interviews (phase 3). Throughout the process, we applied the Grounded Theory method to each piece of information collected, whether it was the results of the questionnaire or the interviews: while transcribing the information, we have each time extracted the key information that we have coded before returning to the field (phase 3 bis). In phase 4, we launched the final analysis during which we combined all repetitive elements. Our approach can be described as Grounded Theory applied to current flow. Finally, we did not want to look at linguistic issues and we contented ourselves with translating into English the quotes made in other languages while maintaining the original quotes.

Table 3. Characteristics of the interviewed population: 20 interviewees, 12 companies, 6 different nationalities between April 2020 and February 2021

Activity of the company	Functions of the managers interviewed	Dates of the interviews	Nationality	Number of subordinates
Chemistry 1	Director Global Marketing	April 2020	French	40 people
	Head of Country Cluster North West Africa	April 2020	Tunisian	200 people
	Country Manager Italy	May 2020	German	200 people
Chemistry 2	Vice-president	May 2020	German	150 people
Chemistry 3	Senior Vice-president EMEA	May 2020	German	400 people
Production of house equipment	Head of controlling	January 2021	Brazilian	20 people
Production of house equipment	Head of controlling	January 2021	Brazilian	20 people
	Head of CRM Projects	February 2021	Italian	250 people
	Head of IT	February 2021	Argentinian	90 people
Food – production of raw material	Plant Director	May 2020	French	800 People
Production of hospital appliances	President of French subsidiary	June 2020	Czech	250 people
	Quality Director	June 2020	Czech	20 people
	Export Sales Director	June 2020	Czech	20 people
	Managing Director	June 2020	Czech	2000 people
	Export Manager	November 2020		–
Construction material	CEO Czech Subsidiary	November 2020	Czech and German	150 people
Energy supply and installation	CEO Czech Subsidiary	November 2020	French	300 people
Startup Investor Company	CEO	November 2020	French	–
Energy	CEO Central Europe	December 2020	Polish	550 people
Construction and engineering	Vice-President	December 2020	Czech	150 people
Automotive Industry	Head Business Development	January 2021	French	40 people

Source: data used for semi-directive questionnaire.

RESULTS AND DISCUSSION

The results of the two approaches used for our mix-method are consistent. As we had imagined, the responses to the semi-structured interviews provided interesting additional information. For this reason, in each paragraph, we will start with the findings from the quantitative approach, followed by the information from the qualitative approach. When the Covid-19 crisis appeared, the patterns were always the same: in the first month companies had to organize themselves in a different way to continue their activities and ensure a minimum of services to their customers, involving protective measures against the spread and a reorganization of teams as well as the use of the home office or video meetings. A selection of quotes from the interviews used for our analysis is shown in Table 4.

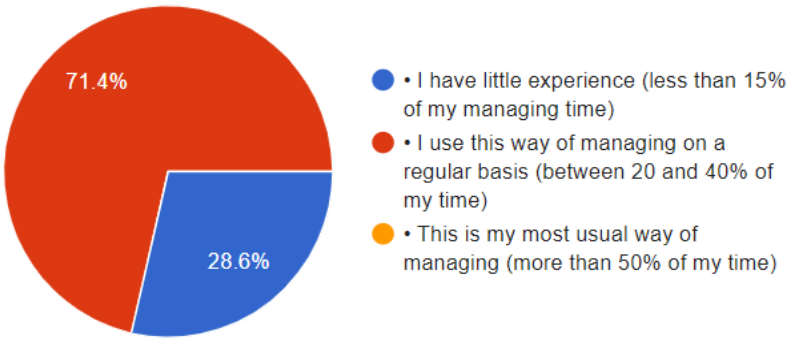

Figure 1. When virtual management becomes essential
Source: own elaboration.

The responses to the questionnaire (See Figure 1) showed at first that all managers had some experience with virtual management. There were no technical limitations: the web platform was available and sufficiently powerful. Yet, we can see that the use of virtual management was far from dominant before the pandemic (no more than 50% of the time and less than 15% for 25.8% of those questioned). The Covid-19 crisis had therefore accelerated the drift from a transient practice to an almost exclusive one. The change took place without setting up a specific projector going through a complex process to ensure that direction and employees agreed on the benefit of the change.

As in the case of the questionnaires, before the crisis, the companies concerned used the "home office" to a greater or lesser extent. In all cases, managers were wondering when and how to increase its use. Several noted that it was impossible to imagine that such a change could have been implemented in such a short time. During its first three or four months, the Covid-19 crisis created many organizational problems, many constraints that generated a high level of stress among managers and employees. But, it was a strong accelerator of the use of teleworking. Managers interviewed after September 2020 recognized the positive contribution of the crisis and saw it as an opportunity. While all managers agreed that the move to remote management was imposed from the outside and was not made by choice, they admitted that it would be impossible to return to the pre-crisis situation once Covid-19 is tamed.

A second critical point, present in the word "revealer" used by some interviewees, is the fact that what happened in the case of the Covid-19 crisis highlighted the necessity of companies to operate in an agile manner. Clearly, not everyone is fit for agile work and the pandemic increased economic divisions. While remote working seemed to be easy for white-collar workers, this may not have applied to all of them. But on top of that, not all people working in the factory could be exposed to the possibility of teleworking in the same way.

The new constraints of remote management

For the past twenty years, several researchers have sought to understand the possible consequences of the progression of teleworking, perceived as a "spatial and temporal dispersion" of work (Taskin, 2006), which makes it possible to accomplish certain tasks necessary for the functioning of companies at anytime, anywhere (Kurland & Bailey, 1999). This approach often fell within the framework of a "regulationist" approach aimed at finding how to reorganize work processes and managerial activities (Taskin, 2006; Geary, 2003; Sisson & Marginson, 2003). No doubt, in 2019, very few people suspected that we would have a transformation as rapid as what was caused by the Covid-19 crisis. The form of remote management required changing the way people operated. The interviewees recognized particularly that this led to more frequent and sometimes longer interventions. The extra time was intended both to take stock of the work in progress, but also to create moments of free discussion. Moreover, the interviews showed that if managers wanted their teams to be efficient, they needed be reachable as soon as one of the employees had a problem.

Interestingly, it was rare for employees to adopt the exact hours they had in the office. Some may have been working at other times by personal preference or more often, due to family constraints such as the presence of children, or because they had difficulty organizing themselves when they needed to work alone. Two managers mentioned a case in which some employees tended to finish the tasks of the week on Sunday evenings when their children were sleeping. All of this impacts the follow-up of tasks, which cannot be done like it was when it was a question of simply going to the next office. If, as we have seen, it is necessary to set aside time for follow-ups, it is often necessary to define the tasks in a different way to be able to follow the employees' progress in another context.

Today, managers must be able to know the environment in which their employees evolve. Do they have a practical place to work? Can they isolate themselves? And at what time of day can they work? Moreover, they must also be able to estimate the capacity of the various employees to work in isolation, away from the company, and identify any decline in motivation, or increase in stress. As was demonstrated in other contexts, communication is becoming a key-point of teams' efficiency (Polowczyk *et al.*, 2021).

Generally, we observe that the new management must play on two different levels: 1) at the individual level, managers must try to be as close as possible to their subordinates to avoid any dehumanization and to support them steadily to make sure that they do not feel alone, 2) at the team level, they must motivate people, achieve the objectives, and maintain the team members aligned with the enterprise.

Acting at the individual level

Figure 2 shows that if ⅔ of the respondents to the questionnaire considered that it was an opportunity to be able to change the management mode, ⅓ indicated that this could create new problems. Many feared that employees would not be able to follow the evolution towards more home office because they felt isolated, and they could have the impression of being abandoned by their own managers.

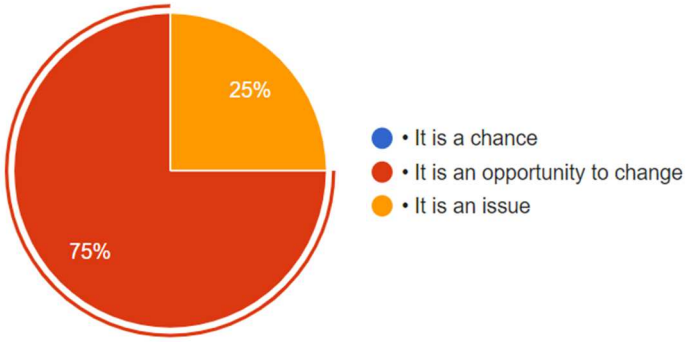

Figure 2. Perception of the consequences of the Covid-19 crisis for survey done in October 2020
Source: own elaboration.

Remote communication can be difficult. Indeed, how to virtually copy the tacit behavior or the silent communication of the body? Is it not just a problem of communication, of cultural hubbub, or of games of telephone, or is it rather linked to the need to see, to be looked at, to observe, and to be observed? (Howells, 1996; Nonaka *et al.*, 1996). In the SECI model, a large part of the onboarding of a new employee is carried out through tacit knowledge. Personal contact is also very important in selling and the relationship is a must, allowing people to be connected and to maintain that connection.

At the individual level, two aspects are important: the fact of giving a meaning to one's work and all anxiety-inducing aspects. For the anxiety-provoking aspects, managers must share with people who have difficulty in being agile, who are not used to it, or exchange on familiar reasons such as the pandemic phenomena. Large companies have normally provided practical training and psychological support for all teams. Other large companies have also provided small equipment such as printers, computer mice, or office chairs. At any rate, the role of the manager has always been important to cover and endorse every person in the team and to follow all of these issues and problems. Virtual calls are replacing normal knowledge: we know the people individually and for this kind of team we interact in a different way. To avoid it, several interviewees told us about the importance of increasing communication: to be open and to be available.

1. Increase communication

Communication can fill the gap between a physically distant management and the coffee system procedure: we must overcommunicate to be heard and we must listen to others' opinions. There is no system advised, but everything can be tested: phone calls, Visio, email, chat, and so on. It is just important that managers try using what they are comfortable with. At the individual level, the conversation should not limit itself to the job or the things to accomplish but also about life, the family, or regular fears. In this attempt to humanize virtual management, it is important to be open to the real fears of the people because it may be now the first time when nobody knows what the future will be like.

2. Be present and available

Virtual management first obliges managers to be nearer to the people, discovering themselves as human beings, showing interest to others, and discovering that the first characteristic of their tasks is to be a normal person. The second level is the continual availability of the manager: an interviewer told us that the most important thing is to always be "reachable and available." This can be very difficult to drive and can interfere with family life. This overcommunication can cause fatigue and exhaustion for the manager, creating new nearness with the employees also for the future.

Acting at the team level

It is useful to say that Covid-19 has for a long time determined our behavior and company acceptance. A manager must align and motivate the team to boost their effectiveness. This is why managers must reinvent themselves and try to reverse the trend. Figure 3 shows us the most important challenges in this way of management: 50% of respondents to the questionnaire believe that the way of communicating and motivating has changed. First, communication not only involves the ways in which people communicate, but there is also a necessity to overcommunicate to make everyone feels that they are part of the company and that their presence is useful. For the second aspect, we must create trust and a change of leadership.

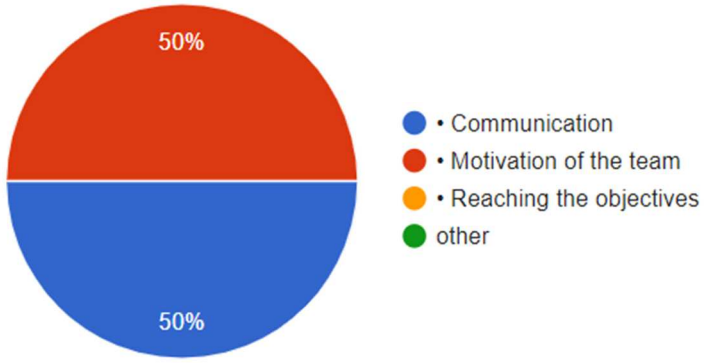

Figure 3. Results of survey done in October 2020: At the team level the key point is 'motivate the group'. This can be possible only with a good communication.
Source: own elaboration.

1. Communication

> A French manager told us that communicating to the team must be strengthened and done in a continuous way, that they would multiply the meetings and the calls. *"In one conversation I had with an employee on a stage in another company, discussing the normal daily routine, she explained to me that she had many difficulties in a daily meeting because it was not only a job meeting but also a meeting among friends with long-held knowledge of the company."*

The interviews showed a real distinction between communication in a single way and if managers had the whole team in face. The difficulty can be due to time and space ("availability of the people") but also due to the absence of feedback or the incapability of using virtual tools. The managers used all the items they could (Hangout, Visio chat, and so on) but it was always time dispensing. What we understand is not only a problem of communication but also an issue of reaching objectives and finding the way to do so.

2. Create trust

The need to function as a team will not change. The team is stable. It existed before and will carry on existing after the crisis. The literature has often considered virtual teams to be merely temporary, while the pandemic has shown us the ability of virtual teams to function as conventional teams, able to share initiatives, establish a high level of trust and to improve it. The literature often considered virtual team to be merely temporary, whereas the virtual teams that. Traditional teams will gradually

become virtual teams, able to maintain trust and motivation. The literacy of the trust explains that the construct is directly related to the knowledge of the objectives and the clear transparency of them. This point was highlighted by the managers interviewed when they described the changes in the organizations due to the Covid-19 crisis.

Changing Leadership

Leadership is the mantra of the new organization: the linear bureaucratic organizational system is yet throughout, and the new kind of chief is created. In Figure 4, 75% of interviewees answered that the actual crisis can also change the methods of managing teams in the future. The first is to trust in your team to do. The second is to create more flexibility and to "share experience and empathy."

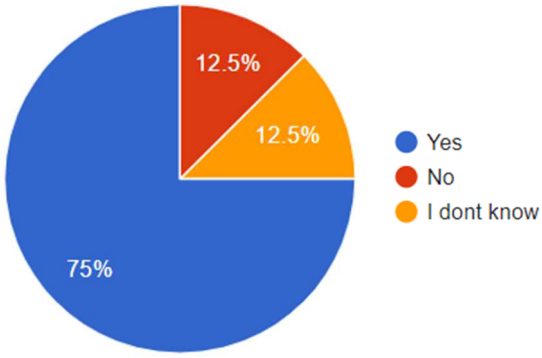

Figure 4. Survey done in October 2020: Answer to question on whether the crisis has changed the mode of management
Source: own elaboration.

More flexibility is something that we cannot control, and in this case, we must accept it. We cannot use bureaucratic ways to control (also it was very near in the French manner), but we can check if the objectives will be achieved. This means allowing a lot of autonomy and letting people be themselves and do what they want. It is clear that each company must have clear rules regarding what it wants to achieve and how to achieve it. Work not only helps people belong to a group but it also helps us do things that are useful for the entire community.

CONCLUSIONS

Our research answered several questions on the way the changes from in-person work to virtual work took place and the extent of the transformations of the workplace. Managers used teleworking, even when they had no prior experience. However, this use fluctuated according to government or company policies and it did not lead to a new structured system. Although few interviewees were able to imagine what would happen after the pandemic was over, they were convinced that the organization of work would never go back to what it was before. The models of change management insist on the importance of agreeing between managers and employees on the objective to be achieved and how to get there. The change in the workplace due to the pandemic happened fast because of necessity but not because there was a clear will to implement it. What is the sustainability of a change that took place without collective agreement? The question in the future will be not only about defining a new system, but also about creating cohesion around it. Interestingly, the pandemic made it possible to offer a concrete example of dominating remote management, whereas this was until now merely a textbook case. Many managers said the experience had been useful because it had shown that increasing teleworking and replacing many trips with videoconferencing was possible. This crisis had major consequences.

First, the pandemic obliged managers to become human beings again by ceasing to be supererogatory supporters of the direction of companies and it changed the idea that we have of leadership. It may thus have helped managers give another meaning to their function: 1. To be successful in the crisis required them to put their humanity more at the forefront than before; 2. It was not

sufficient for managers to give their employees objectives to achieve but they needed to explain them transparently; 3. They tried to replace the ability to give orders with that of being empathetic. This development may have led managers to rediscover themselves, to recognize their normality and admit that they do not always understand what is happening. It can be a very healthy discovery if it helps create a good work atmosphere and build stronger empathy among the team. The evolution of the workplace could consequently lead managers to understand that the best attitude is serving and listening the team rather than being served by them.

Secondly, we must understand the intentions behind the actions of managers, not only their way of acting but also what they have learned and what they want to put in place. This is the only way to guarantee sustainability. This will be an important part of a further investigation. Thirdly, the way of managing must change, particularly by avoiding bureaucratic control over the group. Control has less impact from a distance because it becomes difficult to identify the precise actions to criticize or blame without taking the risk of getting back to the starting point.

As the literature tells us, virtual management usually works best with transactional or transformational leadership models. The first model is useful because it helps the team become autonomous, but also leads managers to discover new ways to explain and share the objectives. It is a whole new approach of leadership: sharing goals, empathizing, and asking for help to reach the goal. The transformational path, typical of a charismatic leader, can be more difficult to set up with videoconferencing alone, without a face-to-face relationship. If the relationship is well established, a lengthy separation may cause the quality of the relationship to change if it is not nurtured by regular face-to-face contact.

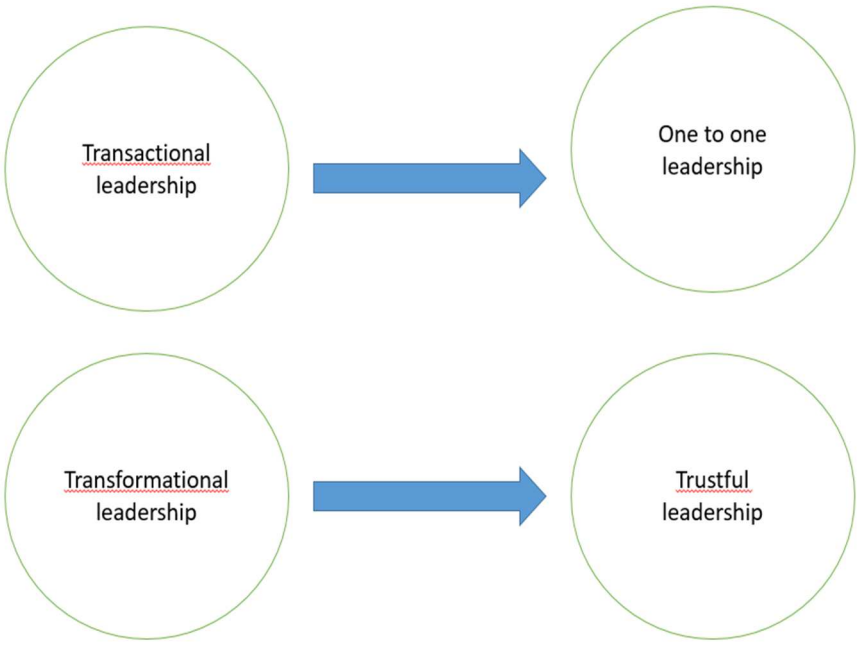

Figure 5. Potential developments of transactional and transformational leadership models after COVID-19 experience
Source: own elaboration.

Figure 5 explains the main differences existing between transformational and transactional leadership and the new approach that may be required tomorrow. In effect, transactional leadership based on rewards would not disappear, but it would be transformed into a one-to-one relationship. This type of leadership can accept, for example, the individual level and it better explains overcommunication, which is one of the most important characteristics that we show in the field results (cocooning management). Transformational leadership based on charismatic leaders would be changed into a trustful leadership: Each individual in a team is worthy of respect and trust, not only the leaders. Everyone can be a leader and others can become followers (autonomist management). More generally, for the manager, if the autonomy of the members of the team is crucial, it is difficult

to teach or achieve it. It is at the heart of subordination relations, which can sometimes block the employee's ability to act freely. This is the real problem today: Will people who previously worked on well-defined tasks be as efficient tomorrow? Will they be sufficiently autonomous? This question can be extended to managers accustomed to the old bureaucratic approach. Are they aware of the need to evolve and will they be able to question themselves?

One limitation of this paper is the fact that we only interviewed managers and not employees. We cannot predict the employees' response. They could have the same attitude as the managers, or they could present the new situation as hectic and confusing. Is the new system so positive and will the future be as rosy as what the managers said? This point must be addressed in a further paper in which we will discuss the employees' position. Another limitation of our research is that we transcribed the new needs, but we were unable to describe the traits of the manager of tomorrow, as proposed for example by Zbierowski & Gojny-Zbrowska (2022). This work would be interesting to organize in continuation of our research.

The Covid-19 crisis has shown certain trends that will impose choices on the businesses of tomorrow. Will we be able to function without changing the form of management? Will gender and age issues be experienced the same way in the future as they are today? Maybe it is too early to discuss, but we need to lay the groundwork for this discussion.

Finally, the interviews revealed some obvious economic implications. The development of the home-office will make it possible to save on office space. Indeed, three managers contacted at the end of 2020 and the beginning of 2021 declared that they had already reduced the size of their offices. At the corporate level, we note also substantial savings in business travel. Whenever this element of change was mentioned by the respondents, they declared that we would not return to the previous situation because the crisis had forced people to adapt and to understand the interest of certain meetings organized in using Zoom, Teams or Meet.

Conversely, companies now admit having to participate in equipping employees working in the home office. Currently, the aids are different from one company to another, but participation in the costs seems to be accepted. Surprisingly, only one person interviewed asked whether training should be organized to help managers change roles. But it was probably too early at the end of 2020 to ask these kinds of questions. However, we believe that such training is important, in the same way that it will be necessary to support employees to help them work independently, considering the separation between private life and professional life.

On the side of the employees themselves, the increase in the use of the home office leads to a reduction in the costs devoted to travel, but above all it makes it possible to reduce travel at a time when we are trying desperately to reduce CO2 emissions. Generally, even if it will be necessary to plan for several types of expenses when we approve the transition to hybrid operations, the complete changes will be positive for companies, employees and the planet.

Changing the form of management cannot be done so simply. It is linked to other developments. Several managers indicated that the success of this system depended on the managers' confidence in the employees who were teleworking, but it is also linked to the employees' trust in the manager, with whom they should be ready to share any difficulties. Trust is at the heart of this new system. We are convinced that it is not compatible with the preservation of a time-control system that is supposed to replace clocking. The question that arises here revolves around knowing how to train and support the manager evolving in a system where telework would represent a significant portion of office hours. On top of this, such a change is impossible if corporate culture does not change too. We can imagine a continuation of our research in the form of interviews with managers and HR managers to check whether they have identified the need for change and whether the HR department takes this into account in the process of selecting new training staff and support.

Table 4. A short selection of quotes from the semi-directive interviews (April 2020 and February 2021)

Paragraph	English version	Original version
The necessity of virtual management	"The word that I have in mind is "revelator". A revelator and the accelerator of two dimensions"	« Le mot qui me vient à la tête, c'est révélateur et un accélérateur. Il y a deux dimensions. »
	"Everything is done remotely. So, we [need] to organize ourselves…"	« Tout se fait à distance. Donc, on s'organise… »
	"And all this "happened very quietly, without having to tell people 'I will slap you on the fingers if you don't do it'!"	" Et tout s'est passé très, très calmement, sans qu'on ait besoin de dire aux gens, «je vais te taper sur les doigts si tu ne fais pas."
	"All companies understood that "agile working" doesn't mean less working…"	Toutes les entreprises ont compris que le télétravail, non, ne veut pas dire forcément pas de travail."
	"…and in the future, there will be a better balance between professional and private life"	« [il est certain] qu'on aura, dans le futur, un mix un plus sain, un plus équilibré entre [vie professionnelle et vie privée] »
	"…[easiness]…depend[ed] on the task"	« [Le degré de facilite], cela dépend de la tâche »
The new constraints of remote management	"In effect, how to copy virtually the tacit behavior of the silent communication of the body?"	
Individual level	"Eye contact is important. In this configuration communication is sometimes not easy."	
	" Sales is also a matter of human relationship"	
	"People are searching for social interaction. A little Team building is lacking"	« L'interaction sociale, les gens en demande. Un petit team building, il y a des choses comme ça [qui] manquent vraiment »
	"The exchanges with each other around the coffee machine, this is tremendous! You can create a virtual coffee, but it is not the same thing!"	« Les échanges, vous savez bien les échanges informels autour de la machine à café, c'est comme quelque chose de phénoménal. Même si on peut créer une machine à café virtuelle, mais c'est pas la même chose »
	[Newcomers] are not so efficient because they don't know the job and to whom they worked"	« [Les nouveaux] n'étaient pas aussi efficaces qu'ils pouvaient parce qu'ils (ne) connaissaient pas avec qui ils travaillent »
	"We have to organize daily crossing points"	
	"[It was necessary to add] additional hangout sessions to understand also how it was going from a personal perspective based on situation" or [we would have] more emails"	
	"We have identified with a manager, the most important point which always, always show employees that they belong to the company and that they are important for the company, that they belong to the company and that they are an important part of the company!"	« On a identifié avec un manager, un des points les plus importants, toujours, toujours, présenter aux gens qu'ils appartiennent à la société et qu'ils sont importants pour la société, qu'ils font partie de la société, et qu'ils sont une partie importante de la société ! »

Paragraph	English version	Original version
	"Yes it's multiplied, yes but also the network"	« Donc oui, ces actions ont multiplié. Je pourrais dire, cela a multiplié les réseaux. »
	"At least we can have a real discussion, to be in touch with our agents for example and share some training…."	
Team Level	"Communication one to one is quite easy. Communication as a team is more difficult".	
	« [It is essential] that people should be available each time it is necessary."	"Que les personnes soient disponibles le moment voulu"
	"Not all the employees are used to work in agility. The first days was not easy to achieve the same reaction as per face to face meetings or discussions."	
	The managers used all the items they could such as "giving the right message using hangout chats but "The calls have increased a lot and the working time has expanded and it is more difficult to share and motivate the team."	
	"To motivate the Team, we are keeping as Team, a routine, where at the end of business topic discussions, we are also exchanging tips on how to improve our life in lockdown mode sharing on line initiatives can support all we need."	
	"… try to spend more times with them to set priorities and keep a high morale"	
	"[Take more time] Making them aligned on objective and means to reach them"	
	"Eliminate stress and provide support for priority activities."	
	"It is important to have confidence in your team… If I trust [my employee] I understand that agile working or smart working is not 'No work', but 'work in a different way'.	
	"Working by priority and focusing on the goal give a lot of autonomy to the employee and they are only controlled by the facts, what they have done, and not by the balance of the time dedicated to work and to family and personal activities"	
	"[Managers] must use smart working, giving flexibility to employee to be able use more days in agile."	
	"Once back at office we will appreciate how is important be part of a community".	
	"To motivate the Team, we are keeping as Team, a routine, where at the end of business topic discussions, we are also exchanging tips on how to improve our life in lockdown mode sharing on-line initiatives can support all we need."	
	"We federate the teams…. For example, we are cooking together at Christmas time. This is important. But it is also important to communicate clearly on what we are doing, where we want to go and what the impact on the team will be." "	« On anime nos équipes. Par exemple, pour Noël, on va cuisiner ensemble on line. Ça passe par ça, mais ça passe aussi par une communication très claire de ce qu'on fait, où est ce qu'on va, quel est l'impact sur nous. »

Source: answers to semi-directive questionnaires (interviews).

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