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Volume 26 Number 2

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Agent-based modelling and economic complexity: a diversified perspective

Christophe Schinckus
School of Finance and Economics, Taylor’s University, Kuala Lumpur, Malaysia

Abstract

Purpose – The term “agent-based modelling” (ABM) is a buzzword which is widely used in the scientific literature even though it refers to a variety of methodologies implemented in different disciplinary contexts. The numerous works dealing with ABM require a clarification to better understand the lines of thinking paved by this approach in economics. All modelling tasks are a means and a source of knowledge, and this epistemic function can vary depending on the methodology. This paper is to present four major ways (deductive, abductive, metaphorical and phenomenological) of implementing an agent-based framework to describe economic systems. ABM generates numerous debates in economics and opens the room for epistemological questions about the micro-foundations of macroeconomics; before dealing with this issue, the purpose of this paper is to identify the kind of ABM the author can find in economics.

Design/methodology/approach – The profusion of works dealing with ABM requires a clarification to understand better the lines of thinking paved by this approach in economics. This paper offers a conceptual classification outlining the major trends of ABM in economics.

Findings – There are four categories of ABM in economics.

Originality/value – This paper suggests a methodological categorization of ABM works in economics.

Keywords Econophysics, Economic complexity, Agent-based modelling

Paper type General review

1. Introduction[1]

The last three decades have witnessed the emergence of a new scientific term called “complexity science”. Complexity is an unequivocal concept[2] whose definition differs from author to author[3]. Although complexity science seems to be an amalgam of methods, models and metaphors coming from several disciplines, there is a general agreement that a complex system refers to a “many-components system with specific interactions for which locally distinct patterns can be represented in at least one representation of its development” (Zuchowski, 2012, p. 179). However, the notion of complexity is used in so many disciplinary contexts that it favours the development of hybrid areas of knowledge between classical disciplines dealing with complexity. For example, one can mention the emergence of bio-informatics (see Pan et al., 2011) which combines computer sciences and biology for a better understanding of the brain or the development of sociophysics (Galam, 1982, 1986), a branch applying models coming from physics to political and social events. In the same vein, an area combining physics with economics (econophysics) emerged in the 1990s (Jovanovic and Schinckus, 2013a, 2017).

JEL Classifications — B41, C63, C89

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The author declares that there is no conflict of interest regarding the publication of this paper.
Although complexity is a slippery concept, there exists a specialized literature dedicated to “complexity science” in which a lot of different conceptualizations are proposed: hierarchical complexity (Simon, 1962), algorithmic complexity (Chaitin, 1987), stochastic complexity (Rissanen, 1989), compositional complexity (Wimsatt, 1972) dynamic complexity (Day, 1994), computational complexity (Albin and Foley, 1998; Velupillai, 2000), etc. However, whatever the complexity may be, a complex system might roughly be characterized as follows:

By complex system I mean one made up of a large number of parts that interact in a non-simple way. In such systems, the whole is more than the sum of its parts, not in an ultimate, metaphysical sense, but in the important pragmatic sense that, given the properties of the parts and the laws of their interaction, it is not a trivial matter to infer properties of the whole. (Simon, 1996, p. 4)

The era of complexity in economics generated a lot of studies modelling micro-interactions in which human behaviours are associated with abstract rules generating actions. These studies gave the rise to the emergence of agent-based modelling (ABM) which can be seen as a class of models simulating the actions and interactions of multiple autonomous agents in a complex situation (Bonabeau, 2001). ABM is become a fashionable methodology used in several disciplinary contexts (Epstein, 2006; Silverman, 2018). However, the profusion of works dealing with ABM requires a clarification in order to understand better the lines of thinking paved by this computational approach. ABM generated a lot of debates in economics and it opens the room for epistemological questions about the micro-foundations of macroeconomics (Gallegati and Richiardi, 2009). The scope of this paper only focusses on ABM applied to economic systems by proposing a new methodological categorization for the scattered literature dealing with this issue. This paper aims at clarifying the different uses of ABM to characterize the evolution of economic systems. This methodological categorization will highlight the major epistemological differences between these ways of modelling[4].

After having presented a quick history of the ABM, four ways (deductive, abductive, metaphorical and phenomenological) of implementing an agent-based technique in economics will be analysed. Modelling a complex phenomenon is a means of knowledge implying that the epistemic function of the modelling task can vary to some degree from disciplinary context to another. This paper shows that the different uses of agent-based technique for describing economic systems also refer to different ways of thinking the role of the modelling task.

2. From cellular automata to ABM

ABM is a technique based on a computerized simulation of interactions between a high number of agents whose behaviour has been translated into algorithms. This computational approach finds its origins in cellular automata initially developed by Von Neumann (1951), who worked on self-replication of systems by using a universal Turing machine[5]. Except few studies in the 1960s[6], cellular automata have not really been studied until the seventies when Conway (Gardner, 1970) introduced them in biology and Toffoli (1977) used them to model physical laws.

Cellular automata and related research really grew in the 1980s with the works of Wolfram who found in the Santa Fe Institute[7] a real catalyst for his computerized complexity (he already used this word in the early 1980s). The importance of cellular automata at the SFI has been institutionalized in 1994 when the physicist Jim Crutchfield created the Evolving Cellular Automata Project whose objective was to work on computerized interactions[8]. Because cellular automata can easily be developed through simple rules from which can emerge a very complicated behaviour, they were an ideal starting point to study complexity (Holland, 1986). Although cellular automata are
unquestionably the computational origins of ABM (Epstein, 2006), the methodological perspective of this technique rather dates back to the famous Schelling’s (1969) model of racial segregation combined with the adaptive methodology promoted by Brian Arthur and John Holland at the first meeting the Santa Fe Institute[9] dedicated to economic issues. While the first model is now renowned for explaining that segregationist residential structures can emerge from local behaviour of non-segregationist people[10], Holland (1986) and Arthur (1990a, b) introduced the notion of “complex adaptive system” implicitly based on adaptive individual components (i.e. agents). By component, Holland meant an epistemic entity whose initial configuration (which can be associated with beliefs, preferences or capabilities) allows it to change or adapt its behaviour in an evolving system.

The computational perspective associated with cellular automata promoted by physicists such as Wolfram (1984), Farmer et al. (1986) or Kaufmman (1984) combined with a methodological adaptive individualism enhanced by economists (Arthur (1990a, b), and the presence of Arrow at these meetings) and Holland (1986) progressively led to the emergence of what we call now ABM (Waldrop, 1992; Mitchell, 2011; Gallegati, 2018). The 1980s were an appropriate decade for the emergence of complexity studies because computers began to be everywhere (Johnson, 2007). Personal computers were booming and scientists learnt, at that time, how to integrate this new tool in their practices. Computers contributed to science in two ways: on the one hand, they were used as “bookkeeping machines” recording data related to phenomena and, on the other hand, they provided a higher power of computation paving the way to simulation. As Waldrop (1992, p. 63) explained it, “properly programmed, computers could become entire, self-contained worlds, which scientists could explore in ways that vastly enriched their understanding of the real world”. Computers can therefore be seen as technical tools enlarging our epistemic access to, on the one hand, the past phenomena (through recording historical data), and, on the other hand, the hypothetical future phenomena (through simulations)[11]. O’Sullivan and Haklay (2000, p. 4) explicitly associated the success of ABM with the increasing computerization of science combined with the academic success of the Santa Fe Institute[12]. The development of computer therefore created the favourable environment for the emergence of complexity paradigm as Waldrop (1992, p. 63) explained it properly, “scientists were beginning to think about more and more complex systems simply because they could think about them”.

In the 1990s, one can observe a popularization of computers research-based combined with a gradual computerization of society, offering therefore a large database to investigate. In this context, the ABM has been extended to other disciplinary contexts voting behaviors (Lindgren and Nordahl, 1994), military tactics (Ilachinski, 1997), organizational behaviors (Prietula and Gasser, 1998), epidemics (Epstein and Axtell, 1996), traffic congestion patterns (Nagel and Rasmussen, 1994), etc. ABM has been used in so many fields that it is not possible to number them in this section whose objective was to present a quick historical introduction on ABM. The following part of this paper will focus on the use of this computational method in economics.

3. ABM and economics
Initiated by the Santa Fe Institute in the 1980s, ABM has gradually been developed in the 1990s to become nowadays the most widely used tools to capture the economic complexity. Although that approach allows economists to define some behavioural features, this methodology explicitly associates human behaviours with a set of abstract algorithms supposing to describe the “fundamental behaviour” of agents[13]. In other words, models are formulated in terms of computer programs for which agents’ behavioural characteristics are inputs – the outputs are then associated with the macro-level resulting from agents’ micro-interactions (Delli Gatti et al., 2018).
Authors involved in modelling of economic micro-interactions try to calibrate the basic behaviour ruling agents’ interactions which lead the system to a complex situation (i.e. within macro-properties emerged), as Davis (2013, p. 234) explained it:

In the economy, agent-based modelling generally regards basic self-organizing agents as human individuals, explaining how they respond to changes in their environment in terms of how these individuals change their rules of behaviour in order to satisfy some fitness measure.

The way of defining these rules of behaviour determines the methodological perspective enhanced by modellers. Inspired by Moss (2009), I provide hereafter a methodological classification for works using ABM in economics:

1. a deductive approach: the perfectly rational ABM, An abductive approach: the adaptive ABM;
2. a metaphorical approach: the bottom-up agent-based econophysics; and
3. a phenomenological approach: the top-down agent-based econophysics.

The two first categories are already well documented (Arthur, 1995; Colander, 2000), whereas the two latter are more recent and therefore less investigated in the literature. This section aims at offering a methodological categorization to map the different use of ABM in modelling of economic systems. With this purpose, I will define in more details these four approaches by emphasising their common points but also their major differences; in this context, I will associate the last two approaches with works coming from econophysics that refers to a new area of knowledge and which emerged under the umbrella of complexity. Roughly speaking, econophysics can be seen as the importation of physical concepts/models into economics[14].

3.1 The deductive approach or the perfectly rational ABM
The perfectly rational ABM is the classical methodological individualism used in economics. Interaction rules are defined through a utility function associated with a rational optimization of theoretical constraints, and the system’s macroscopic behaviour is deduced from the addition of individuals characteristics. Assumptions are chosen through an intuitive/deductive framework in order to determine a mathematically defined set of interactions which is combined with an assumed perfect additivity of agents in order to estimate the aggregative rule at the macro-level of the system. This classical approach can roughly be summarized as follows.

Figure 1 indicates that a theoretical definition of individual behaviours is postulated without link to the empirical data. The perfect rationality is assumed as a universal principle and the aggregation is used to fit the modelling to concrete situations in which, “the empirical consequences of the theory are deduced from the axioms in the expectation that the deduced will be in agreement with the observed empirical findings” (Bailer-Jones, 2009, p. 84).

Although this way of modelling offers a reliable outcome based on a rational construction, the modelling process itself does not contribute to a potential discovery, it does not teach us...
more than what we can expect from the definition of the axioms. This deductive framework is
well known in economics[15] since it refers to the classical methodology of representative
agent according to which the economic macro-result can be described by studying the
aggregate economic variables as if differences between actors are negligible or cancel each
other on average. Although this way of modelling is still non-standard in economics (rather
based on an axiomatic approach), it is quite well used in the field. Economists might not like
this approach, but many of them are familiar with it. Although ABM challenged the
foundational idea that no interactive agents are described by a fixed utility function, there is
an important literature showing that this way of modelling is logically compatible with the
mainstream framework (Gallegati and Richiardi, 2009, 2018; Arthur, 2014). Several thematic
works can be mentioned here such as the opinion transmission mechanism (Deffuant, 2006;
Amblard and Deffuant, 2004), the development of industrial networks and the relationship
between suppliers and customers (Brenner, 2001; Gilbert et al., 2001; Epstein, 2006), the
addiction of consumer to a brand (Janssen and Jager, 1999), the description of second-hand
cars) markets (Izquierdo et al, 2006), the evolution of financial markets (LeBaron, 2006), etc.
[16]. Hamill and Gilbert (2016) and Arthur (2014) offered a very good review of this growing
literature. A quick look at the list of the recent winners of the Nobel Memorial Prize in
Economic Sciences also gives an indication about the acceptance of ABM in economics. Three
people have won this award for their contributions to the development of agent-based
economics: Thomas Schelling was the laureate of this prize in 2005 for his contributions to
game theory[17]; Elinor Ostrom won this prize in 2009 for her work on the agent-based
governance of complex economic systems; and Angus Deaton was awarded in 2015 for his
contributions to the micro-foundations (ABM) of consumption, welfare and poverty.
The growing importance of ABM can also be observed in finance, in which Meyers (2009)
showed how ABM also contributes to the financial mainstream.

3.2 The abductive approach: the adaptive ABM
In opposition with this perfectly rational ABM using a principle of additivity to deduce the
macro-level, the adaptive ABM rather required a large number of computerised iterations to
infer the macro-result[18]. This approach is actually the one associated with the ABM
developed at the SFI (Schinckus, 2018a, b). This methodology integrates the heterogeneity
and the autonomy of agents considering that “individuals may differ in myriad ways – genetically, culturally, by social networks, by preferences etc.” (Epstein, 2006, p. 6).
In other words, non-negligible differences between actors generate a complexity whose
analysis requires a computerized simulation. In contrast with the deductive approach, the
one based on an adaptive agent does not require the condition of perfect rationality and
assumptions are determined through an “intuitive plausibility” (Brock and Durlauf, 2001,
p. 35), meaning that micro-interactions are calibrated to meet observed heterogeneity of
agents. This ABM is definitely not standard in economics and it still somewhat in the
outside of the field (Gallegati, 2018; Delli Gatti et al., 2018).

Adaptive ABM limits the domain of abstract concepts by providing a computerized
framework, capturing the relationship between individuals within a specific environment.
Hence, this perspective allows to study how agents interact but also how they change their
own personal features. The evolving dimension of the process can also progressively
transform the agents’ goals. This approach enlarges the way of modelling economic
incentives since the algorithmically defined decision functions can integrate some concepts
coming from behavioural economics such as overestimation (Lux and Marchesi, 1999, 2000)
or conservatism (Chen and Yeh, 2001), etc. Regarding the agents’ autonomy, the adaptive
learning abilities defined for agents ensure them particular degree of freedom since they
can evolve depending on their plausible interaction rules inspired from economic world
(Gallegati and Richiardi, 2009). Once algorithmically defined, these interaction rules are
expected to generate an emergent order far beyond individual capacities or wishes. This kind of modelling could be described by the following schema.

In accordance with a neoclassical perspective, Li Calzi et al. (2010) explained that the simpler the algorithmic definition of the rules generating the micro-interactions is, the better the understanding of the macro-results will be. As suggested in Figure 2, modellers try to avoid complicated definitions of micro-interactions which could "obscure the significance of the model, especially if multiple complex rules are acting at once" (Li Calzi et al., 2010, p. 9). These authors justified this perspective as follows: "This appeal to simplicity is nothing more than a restatement of the Occam’s razor principle: why should I use an intricate model if (almost) the same results can be obtained in a cleaner way?" (Li Calzi et al., 2010, p. 2). In other words, the perfectly rational or the adaptive ABM usually describes economic situations in which a macro-behaviour emerged from agents’ behaviour by following simple (and plausible for the adaptive modelling) local rules. The conceptual foundations of these approaches refer to the idea that a decentralized economic system requires the description of agents’ incentives and their interactions structures. In accordance with this view, these agent-based approaches are an incentives-based modelling in which (economic or and behavioural) motivations must be initially pre-defined. In a sense, the only difference between the perfectly rational and the adaptive ABM refers to the way of inferring the macro-level of the system: while the first is explicitly based on deductive analysis, the latter rather required an algorithmic simulation.

According Gallegati and Rachiardi, (2009), adaptive ABM can be seen as an abductive method because the characterization of individual properties is not enough to deduce the macro-level: "something more is required". A large number of iterations are needed to infer the best plausible macro-regularity. These computerised iterations generate a specific dynamics in the model which "is designed to imitate the time evolution of a system" (Hartmann, 1996, p. 83). This dynamics has a very important epistemic function since it allows modellers to draw conclusions about the behaviour of the model and therefore about the behaviour of its components (Hughes, 1999). The modelling task has a real epistemic function since, through its evolving computerised iterations, adaptive agent-based models act as a “mediator” (Morgan and Morrison, 1999) between the theoretical understanding and the studied phenomenon. Indeed, the

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**Figure 2.** The adaptive ABM
modelling task can be looked on as an interpreted formalism supposing to inform us about a plausible story in our understanding of economic phenomena.

While the model is applied as a mathematical deduction in the perfect ABM, the adaptive perspective of ABM can rather be seen on as a way of exploring and/or extracting the dynamics generating what is studied. Adaptive ABM can be looked on as simulation allowing modellers “to map the model predictions onto empirical level facts in a direct way. Not only are the simulations a way to apply models but they function as a kind of bridge principle from an abstract model with stylised fact to a technological context with concrete facts” (Morgan and Morrison, 1999, p. 30).

Although the economic mainstream (based perfect rationality) is often said to be incompatible with economic complexity (LeBaron, 2006), the perfectly rational ABM can be presented as a complementary approach of the adaptive agent-based framework. Some works combine perfectly rational agents with irrational agents showing that the two frameworks can support and complement each other as Levy (2009, p. 20) explained it:

The Agent Based approach should not and cannot replace the standard analytical economic approach. Rather, these two methodologies support and complement each other: When an analytical model is developed, it should become standard practice to examine the robustness of the model’s results with agent based simulations. Similarly, when results emerge from agent based simulations, one should try to understand their origin and their generality, not only by running many simulations, but also by trying to capture the essence of the results in a simplified analytical setting.

The two methodologies presented in this section are the most widely used by economists when they model economic macro-systems based on interactions between micro-agents. Because the perfectly rational agent-based approach and the adaptive perspective are both founded on a micro incentives-based modelling, these two approaches can be looked on as a complementary framework, although the vast majority of works dealing with ABM in economics still refer to the perfectly rational assumption-based modelling.

During the 1990s, the ABM has been increasingly associated with complexity in different disciplinary contexts. In this perspective, scientists mainly coming from physics (econophysics) or biology (econobiology) began to apply their way of implementing agent-based method to economic systems. Econophysics refers to “the extension of physics to the study of problems generally considered as falling within the sphere of economics” [20] (Jovanovic and Schinckus, 2013a, p. 1) implying an importation of physical models into economics. In the same vein, “econobiology” (Rosser, 2010) describes the rise of a biological-based interpretation of economic systems.

The rest of this paper will focus on the two other ways of using ABM to describe economic systems: metaphorical and phenomenological. These two approaches have mainly been developed by scholars coming from other disciplines (biology or physics). The contribution of this methodological categorization is to extend the existing map of ABM methodologies by discussing in more details two very recent perspectives. The two following section will clarify these two physical ways of implementing the ABM in economics.

3.3 The metaphorical approach: the bottom-up agent-based econophysics
The majority of papers dealing with ABM in econophysics are related to situations for which micro-interactions are considered as an input and the emerging macro-result is looked on as an output of the process. More precisely, micro-defined agents form an artificial world in which “the ontological and theoretical commitments of agent-based models begin to emerge” (O’Sullivan and Haklay, 2000, p. 6) after a great number of iterations. This computational approach “consists in their displaying complex emergent behaviour, starting from simple atoms deterministically following simple local rule” (Berto and Jacopo, 2012, p. 6). Therefore, methodologically speaking, these studies are in line with ABM used in
economics since a calibration of micro-interactions is required to generate an (unexpected)
emerging macro-order. However, some differences exist between these works and
agent-based used by economists: in opposition to the latter, the first use non-economic
assumptions to calibrate the micro-interactions as explained hereafter.

Aggregate phenomena that exhibit unanticipated properties are not limited to social
systems. In physical systems, aggregate phenomena can also appear showing macro-properties
distinct from the properties associated with the micro-components. Agents are then considered
as interacting particles whose adaptive behaviours create different structures (such as
molecules, cells, crystals, etc). This methodological perspective generated a specific literature in
economics since some physicists decided to apply it in order to describe the evolution of
complex economic systems: Pickhardt and Seibold (2011), for example, explained that income
tax evasion dynamics can be modelled through an “agent-based econophysics model” based on
the Ising model of ferromagnetism, while Donangelo and Sneppen (2000) or Shinohara and
Gunji (2001) approached the emergence of money through studying the dynamics of exchange
in a system composed of many interacting and learning agents. In the same vein, some authors
used agent-based approach to characterize the emergence of a non-trivial behaviour such as
herding behaviour: Eguiluz and Zimmermann (2000), Stauffer and Sornette (1999) or Wang et al.
(2005), for example, associate the information dissemination process with a percolation model
among traders whose interactions randomly connected their demand through clusters. Some
econophysicists applied agent-based approach for studying the dynamics of order-driven
markets. Bak et al. (1997) used a reaction diffusion model in order to describe the orders
dynamics. In this model, orders were particles moving along a price line, and whose random
collisions were seen as transactions (see also Farmer et al. (2005), for the same kind of model).
Maslov (2000) tried to make the model developed by Bak et al. (1997) more realistic by adding
specific features related to the microstructure (organization) of the market. Challet and
Stinchcombe (2001) improved the Maslov (2000) model by considering two particles (ask and
bid) which can be characterized through three potential states: deposition (limit order),
annihilation (market order) and evaporation (cancellation). Slanina (2001) also proposed a new
version of the Maslov model in which individual position (order) is not taken into account but
rather substituted by a mean-field approximation.

These works can methodologically be characterized by a non-economic agent-based
approach since non-economic assumptions are initially made/used for the calibration of the
micro-interactions. In this non-economic based approach, a lot of econophysics papers are
founded on a what we call the “zero-intelligent agent” (ZI agent) very well summarized by
Gode and Sunder (1993, p. 121) when they explained that a ZI agent “it has no intelligence,
does not seek or maximize profits, and does not observe, remember, or learn. It seems
appropriate to label it as a zero-intelligence trader”.

Actually, ZI agents are conceptually close to atoms since they do not learn, observe or
maximize. They are modelled for their ability to interact and they can be considered as
physical objects rather than human actors. Another category of works dealing with
non-economic based approach use assumptions (and thus algorithmic rules determining
micro-interactions) that are defined in terms of “physically plausible events”. In this context,
agents and their interactions are defined in terms usually applied to physical systems such
as potential states (deposition, cancellation, annihilation, etc.), thermal features (heat release
rate, ignition point, etc.) or magnetic dimensions (magnetic permeability, excitation).
Whatever they use ZI agents or agents adopting a physically plausible behaviours,
econophysicists focus on the physical ability of agent to interact in order to study the kind of
order that will emerge from these interactions.

By transferring linguistic terms (concepts/meaning) from physics (source domain) to
economics (target domain), this approach refers to a metaphorical way of modelling economic
phenomena. In other words, the modelling task is used here as an interpreted (physical)
formalism whose economic meaning is not always easy to understand. That absence of “plausible meaning” in the assumptions is nothing new in philosophy of science since geometrical optics, for example, involve no assumptions about the physical nature of light (Morgan and Morrison, 1999). As Bailer-Jones (2009) explained it, the metaphorical way of modelling initiate transfers whose purpose is often to be a guide to further investigation. Indeed, although an inter-domain transfer is always a delicate issue, it can generate a specific innovation (Bailer-Jones, 2009). Concerning that point, it is worth mentioning that econophysicists obtained different results than those get by economists by applying their specific methodology[21].

From a methodological point of view, physicists involved in this kind of approach implicitly assume a kind of physicalism since they consider that a social reality can be explained in physical terms[22]. That physicalist perspective of economic systems appears to be what Cartwright (1983, p. 133) called an “unprepared description” containing no information that economists could think relevant in terms of existing economic theories. Consequently, there are few links with usual economic knowledge explaining why that kind of agent-based approach is largely ignored by economists. This way of implementing ABM can be described by the following schema.

In a sense, Figure 3 shows that these studies applied the same modelling processing than the ABM used by economists – the only difference refers to an implicit metaphorical equivalence between physical and economic systems. This perspective is often justified by an association of physical plausible understanding of the system under study. For example, some physicists describe the formation of coalitions or the fragmentation of opinions on the market by using the physical phenomenon of spins glasses[23] (Galam, 2008; Pickhardt and Seibold, 2011), while other rather associated herding behaviours with a slow-diffusing process (percolation phenomenon) likely to generate sudden “breakthrough” (Eguíluz and Zimmermann, 2000; Wang et al., 2005).

Despite this category of works widely used in econophysics, it is worth mentioning that this approach is also largely used in literature related to what some authors called “econobiology” (McCauley, 2004; Rosser, 2010; Schinckus, 2018a) that we quickly evoked in the previous section. Although several parts of economics such as evolutionary economics or ecological economics have long been rooted in biology, the emergence of a biological approach on economics rather dates back to Clark (1990), who promoted the development of a bio-economic perspective in order to model the complex economic dynamics.

Figure 3.
Bottom-up agent-based econophysics
Though bioeconomics sounds close to econobiology, it is worth mentioning that these two field are quite different[24]. In line with the approach presented in this section, the majority of authors involved in econobiology use a metaphorical bottom-up agent-based technique with the only exception that the assumption calibrating the micro-interactions are defined in terms of “biological plausibility”[25].

The last section of this paper will present a very different way of using ABM since it refers to a top-down methodology. I will present this specific approach through what I call “phenomenological ABM”.

3.4 The phenomenological approach: the top-down agent-based econophysics

This last category of works dealing with ABM of economic systems refers to research whose objective is to reproduce existing statistical data. In opposition to the previous categories of works, authors involved in this area of knowledge usually refer to existing empirical studies which have previously shown the persistence of a specific statistical pattern in economic data. This observation of a macro-statistical pattern is associated with the identification of a discernible and noteworthy phenomenon. Once this phenomenon is identified, the objective is to use its statistical macro-properties as an input for the calibration of micro-interactions which are then supposed to generate the macro-patterns initially observed. In other words, assumptions are empirically determined to fit the data. The real target is not the emergent macro-properties but rather the definition (calibration) of potential micro-interaction likely to generate the initial observed macro-pattern.

In opposition to agent-based economics, individual incentives are not defined as a constraint for the calibration of micro-interactions whose parameterization depends only on the statistical properties of the macro-laws that modellers would like to reproduce. The following diagram can roughly summarize the modelling process of this category of works.

Among works dealing with this technique illustrated in Figure 4, one can mention what econophysicists call the kinetic wealth exchange models whose objective is “to predict the time evolution of the distribution of some main quantity, such as wealth, by studying the corresponding flow process among individuals” (Chakraborti et al., 2011, p. 1026) by using the general theory of transport of energy and finite-time difference stochastic equations in order to generate a predictive power-law distribution related to the evolution of wealth in an economic system. Dragulescu and Yakovenko (2001), Ferrero (2004), Heinsalu et al. (2009) or Patriarca et al. (2010) provided models describing the transfer of wealth for homogeneous
agents (i.e. with the same statistical properties), while Chakraborti and Chakrabarti (2000), Angle (2002), Chatterjee et al. (2004), Chakraborti and Partriarca or Chakraborti et al. (2015) developed a more complex kinetic wealth exchange model in which agents are diversified (in terms of initial wealth and savings parameter for example). Whereas some studies (Richmond et al., 2013) used Lotka–Volterra equations to describe the wealth distribution, others expressed wealth exchange by using the matrix theory (Gupta, 2006), Markov chains (Scalas et al., 2006) or the Boltzmann equation approach (Slanina, 2004; During et al., 2008). In the same vein, one can also mention Levy et al. (1994, 2000), who developed a multi-agent model in which aggregative rule was derived from a particular statistical scheme.

It is worth emphasizing that the modelling task begins with the observation of a macro-pattern (identification of a phenomenon). When econophysicists combine agent-based approach with statistical physics, they target a particular economic system for which a specific macro-law is phenomenologically observed; afterwards, they propose a model based on an algorithmically generated micro behaviour of individual market participants that quantitatively reproduces the pre-identified macro power law. The statistical properties associated with the phenomenological pattern initially identified for an economic system will then be constraining for the calibration of the rules governing interactions between agents, as Feng et al. (2012, p. 8388) explained it, “the interaction strength between agents need to be adjusted with agent population size or interaction structure to sustain fat tails in return distributions [i.e. macro-law][26]. The objective of this approach is to generate plausible interactions which could reproduce the macro-law observed in real economic systems. According to this phenomenological way of implementing ABM, epistemic role of modelling refers to the identification of the class of events which can be associated with macro-laws (e.g. such power laws) well known by statistical physicists. By combining a micro perspective such as ABM with a strictly macro-description of financial/economic systems, authors involved in this kind of research tried to provide an algorithmic solution to the emergence of statistical invariance. This perspective also echoes to the debates in economics about the micro-foundations of macro-systems (Hayek, 1989; Colander, 2000, 2003).

4. Conclusion
The term “agent-based modelling” is become a buzzword widely used in the scientific literature though it refers to a variety of methodologies that are implemented in different disciplinary contexts. This profusion of works dealing with ABM requires a clarification in order to understand better the epistemic lines of thinking paved by this approach in economics. After a quick historical introduction on the ABM, this paper presents four ways of implementing an agent-based framework to describe economic systems. Modelling task is a source to and a means of knowledge and its epistemic function can vary depending on the methodology used. By presenting the four major agent-based techniques used in economics, this paper clarifies the epistemic role for each of these approaches. Four categories of works have been mentioned in this paper:

(1) a deductive approach: the perfectly rational ABM;
(2) an abductive approach: the adaptive ABM;
(3) a metaphorical approach: the bottom-up agent-based econophysics; and
(4) a phenomenological approach: the top-down agent-based econophysics.

Although the first two categories are already well documented (Arthur, 1995; Colander, 2000), the two latter are more recent and therefore less investigated in the literature. The objective of this paper is to clarify the situation and offer a methodological map for the different use of ABM in modelling of economic systems. The classical economic approach based on a perfect
rationality has been associated with a deductive way of implementing an agent-based approach in which the modelling task has no real epistemic function since the empirical consequences of the model are rationally deduced by aggregating axioms defining micro-interactions. Afterwards, the adaptive ABM and its abductive reasoning have been presented. The necessity to generate a large number of computerized simulations to infer macro-results gives to the modelling task a real epistemic role where it acts as a mediator between the theoretical formulation of the phenomenon and the reality. The third approach introduced in this paper is the metaphorical ABM in which authors (physicists or biologists) transferred linguistic terms from their discipline (source domain) into economics (target domain). Although this way of modelling often proposes an “unprepared description” in terms of economic meaning, it can also generate a specific innovation (when a theoretical bridge between the source and the target domain is possible). Finally, this paper also presents a more phenomenological way of implementing ABM whose epistemic role seems to focus on the identification of the class of events which can be associated with macro-laws (e.g. such power laws) well known by statistical physicists.

Beyond this methodological categorization of works dealing with the modeling of economic systems, this paper shows the conceptual richness of agent-based based modelling that can be associated with different perspectives/reasoning in scientific research.

Notes

1. This paper discusses different uses of agent-based technique for describing economic systems.
2. As reported by Horgan (1997, p. 305), Lloyd identified more than 45 definitions of complexity.
3. From a Kuhnian perspective, this diversity of definition indicates a non-maturity of complexity science which would therefore be seen as a “complexity pre-science” (see Zuchowski, 2012).
5. See Chopard and Droz (2005) or Schiff (2011) for further details about the early history of cellular automata.
7. Let us remind that the Santa Fe Institute has been founded in 1984 by seven physicists, of which five were based at the Los Alamos National Laboratory (see Waldrop, 1992, Chap. 2). Wolfram attended the first meeting founding the Institute and he has always been an active member of this community.
8. For a good introduction to the themes studied by this research group, see Griffeth and Moore (2003), while Hordwijk (2013) provided a more historical perspective on this group.
9. This adaptive framework based on interacting agents has also been enhanced by Axelrod and Hamilton (1981) and Axelrod (1984), who have been invited to contribute to the Santa Fe Institute in the following year – the call for the use of an adaptive agent-based modelling has been formalized by Holland (1986) and Arthur (1990a, b).
10. Without a priori segregationist structure (e.g. such as ghettos), agents generate a global segregation by behaving in line with their local preferences relating their neighbourhood – see Schelling (1969, 1971, 1978).
11. For further details on the impact of computers in economics, see Mirowski (2007).
12. These two elements paved the way to new modelling of evolving complex systems. “The economy as an evolving complex system” was the title of all proceeding volumes related to workshops that Santa Fe Institute organized about economics. See Schinckus (2018a, b) for further information on the topic.
13. In this perspective, “the entire market system is then seen as a network of interrelated individual automata/Markov chains whose profusion of forms may nonetheless be seen relatively coherent if explained in terms of computational hierarchies” (Davis, 2013, p. 238).

14. See Rosser (2009), Jovanovic and Schinckus (2013a, 2017) or Schinckus (2018a, b) for further details about the emergence of this field.

15. This approach generated a large literature. For further details on the major debates related to this topic, see Dennis (1998).


17. The game theory is a mathematical framework that can be tested or implemented through the methodology of agent-based modelling (Bonabeau, 2002).


19. That idea seems to be widespread in the specialized literature; see Gilbert (2007), Chen (2012) or Cristelli (2014) for example.

20. See Jovanovic and Schinckus (2013a) for a detailed history of econophysics.

21. See Rosser (2009) or Jovanovic and Schinckus (2013b, 2015) for further details on the innovative potential of these results.

22. Indeed, by using physical concepts to deal with economic/social reality, econophysicists “[physicists] don’t deny the world might contain many items that, at first sight, don’t seem physical – items of a biological, psychological, moral or social nature. But they insist nevertheless that at the end of the day such items are either physical or supervene on the physical” (Stoljar, 2009, p. 1).

23. “A spin glass is a disordered magnet with frustrated interactions, augmented by stochastic positions of the spins, where conflicting interactions, namely both ferromagnetic and also antiferromagnetic bonds, are randomly distributed” (Zhang, 2012, p. 10). This magnetic phenomenon exhibiting both quenched disorder and frustration, and have often been cited as examples of complex systems (Stein, 2003).

24. Econobiology imports concepts and tools from biology to characterize evolutionary economic systems while bioeconomics refers to the opposite approach consisting of using economic concepts to describe biological systems. For further details, see Schinckus (2018a, b).


26. It is worth emphasizing that econophysicists keep a physical vocabulary in their definition of the interaction rules since they talked about “interaction strength” or “interaction structure”, while economists rather use words “interactions” and “network”.

References


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Further reading


Corresponding author
Christophe Schinckus can be contacted at: christophe.schinckus@taylors.edu.my

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Ecotourists’ satisfaction and dissatisfaction: asymmetric effects of service attributes

Vo Thi Ngoc Thuy and Hoang Doan Phuong Thao
Faculty of Business Administration, University of Economics and Law, Vietnam National University Ho Chi Minh City, Ho Chi Minh, Vietnam

Abstract
Purpose – The purpose of this paper is to identify and classify ecotourism service elements according to their instrumentality to customer satisfaction.
Design/methodology/approach – Drawing on the ECOSERV model, the authors conduct further qualitative and quantitative research to find additional dimensions of service quality. Kano’s model and Customer Satisfaction Index are then employed with a sample of 324 ecotourists to categorize these service quality elements.
Findings – A new scale of ecotourism service quality is proposed, with the addition of four dimensions: price-quality, interaction with locals, interaction with other customers and relaxation feelings. The paper also confirms the existence of four groups which are classified according to their level of impacts on satisfaction and dissatisfaction: attractive, one-dimensional, must-be and indifferent.
Originality/value – The paper improves the present ecotourism scale and develops an integrated approach to facilitate effective decision making by identifying areas that require greater attention, thus providing practical benefits for eco-site managers. It also hopes to contribute to better understanding about ecotourism services in the context of an Asia country like Vietnam and encourages further research in this area.

Keywords Satisfaction, Kano model, Categorization, Ecotourism, ECOSERV, Asymmetrical weights

1. Introduction
The international tourism industry in the last few decades has witnessed a noticeable shift from mass tourism to awareness tourism, of which ecotourism is one of the fastest growing subsectors. Providing considerable benefits in terms of local economic development and environmental conservation, ecotourism has received considerable attention in the literature as well as the international tourism marketplace (Wearing and Neil, 2009). Ecotourism often involves the tourists from developed countries, with a specific interest in more intrinsic qualities of life, traveling to the less developed territories of the world (Whelan, 1991). While this group makes up the largest proportion of ecotourists, there is now a growing trend for people in developing countries to undertake this new, eco-friendly form of tourism as a result of increased environmental awareness and income in these areas.

Understanding about service quality and customer satisfaction in this field remains academically underexplored, however. In marketing, ECOSERV is the most adopted measurement instrument for ecotourism attributes (Ladhari, 2008). However, in our opinion, the ECOSERV model has some limitations such as lack of consideration for emotional and social aspects or price-quality fit which have been found to have a significant impact on the
consumption experience of ecotourists (Camelis et al., 2014; Reichenberger, 2017). Therefore, this study proposes to add price-quality inference as well as experiential attributes, such as sensory, emotional and social experiences to a new model. It is also the aim of this paper to investigate the linear relationship between service quality attributes and satisfaction as implicitly assumed in many studies adopting SERVQUAL and ECOSERV. Indeed, some research suggested the presence of a zone of indifference where there is no satisfaction nor dissatisfaction irrespective of the perceived performance of service attributes (Cadotte and Turgeon, 1988) and argued that satisfaction and dissatisfaction are, therefore, considered independent of each other (Herzberg, 1959).

2. Literature review

2.1 Ecotourism

There has been a lack of a core definition of ecotourism because “it is a complex notion which ambitiously attempts to describe an activity, set forth a philosophy and espouse a model of development” (Ziffer, 1989, p. 5). A review of the extant literature reveals three main approaches to understanding ecotourism. First, from the conservation organizations’ point of view, ecotourism is defined as nature-based tourism activities which have strong links with sustainable development (Dolnicar and Leisch, 2008). Such activities provide the benefits to the conservation of nature and environment which go beyond their costs to the environment. Another approach, supported by community development organizations, views ecotourism as community-based tourism which plays an important role in creating positive influences on the local economy and the life quality of poor local people (Carter et al., 2004). According to these definitions, ecotourism can be called natural tourism or responsible tourism. However, many researchers in tourism service marketing accepted a definition by Khan (2003), considering ecotourism as “purposeful time spent in natural environment to interact, learn, and experience other cultures, and to economically help local communities that work toward preservation of the ecosystem” (p. 111). For instance, Ceballos-Lascuráin (1991) defined ecotourism as “tourism that involves travelling to relatively undisturbed or uncontaminated areas with the specific objective of studying, admiring and enjoying the scenery and its wild plants and animals, as well as any existing cultural manifestations (both past and present) found in these areas” (p. 25). Most of the recent studies also find that ecotourism provides opportunities for experiencing and appreciating the nature, local customs and culture (Wurzinger and Johansson, 2006), and it also allows tourist to learn about responsible traveling (Ban and Ramsaran, 2016). Our study also adopts this third approach which reflects the motivation of ecotourists. Therefore, ecotourism may involve natural tourism, cultural tourism, soft tourism, discoverable tourism, adventurous tourism and responsible tourism.

2.2 Ecotourism in Vietnam

Vietnam is a tropical country that has enormous potential for ecotourism, with its stunning natural and cultural resources. One of the most attractive features of Vietnam is its rich biodiversity thanks to its unique topography and climatic conditions. Despite its small size, Vietnam’s special geographical location allows an exclusive combination of native species and organisms from the biota of the north (Himalaya–south China), the south (Malaysia–Indonesia) and the west (India–Myanmar) (Khanh, 1999), resulting in noticeably diverse and appealing flora and fauna with a high degree of uniqueness. Around 10 percent of the 8,000 known plant taxa in Vietnam are endemic, and the corresponding figure for faunal species is 11 percent (Reed, 1997). The forests of Vietnam, including rainforests in the south and evergreen forests in the north, have the highest number of avian and primate species in mainland Southeast Asia; similarly, the mangrove forests and wetlands are also abundant, proving possibilities for flora and fauna discoveries. Vietnam also has a long coastline that hosts a wide range of coastal ecosystems, of which the coral reefs in particular are a huge
attraction for divers. Another attraction for tourists is the Limestone Mountains distributed mostly from northern to central provinces. The mountains, which consist of evergreen forests with diverse fauna and flora species, are also home to the distinctive cultures represented by some of Vietnam’s ethnic minorities. With 54 peoples and diverse traditional customs and festivals, local cuisine, farming methods, indigenous lifestyle and language, ecotourism opportunities in Vietnam are ample, including both natural and cultural tourism.

In spite of these favorable conditions, Vietnam has not been able to take advantage of the natural beauty and rich culture due to the lack of development strategy and confusion in defining ecotourism activities. Considering the pivotal role of ecotourism in economic development as well as the growth potential of this sector in Vietnam, it is of great benefit for travel agents, ecotourism sites and even the government to understand its contents and identify service features that offer the best experience to ecotourists.

2.3 Service quality attributes in the ecotourism industry

With regard to the ecotourism sector, based on SERVQUAL (Parasuraman et al., 1985), Khan (2003) developed a model measuring service quality expectation of ecotourists, named ECOSERV. Besides five dimensions inherited from SERVQUAL without any modification (including reliability, responsiveness, assurance, empathy and tangibles), a new dimension, eco-tangibles, is added. Thus, while SERVQUAL measures the tangibles by 4 items, ECOSERV uses 14 items which are divided into two categories: equipment and service facilities, and elements related to the environment. ECOSERV has become a basic measurement instrument of ecotourism attributes (Ladhari, 2008), and has been applied in many subsequent studies in the field (Khan and Su, 2003).

However, many scholars have debated the comprehensiveness of the ECOSERV dimensions (Ban and Ramsaran, 2016) and suggested a need to improve this scale for better and more reliable measuring capability. While ECOSERV places greater emphasis on physical facilities and equipment appropriate to the environment, local recreational activities and other factors with endemic characteristics, arguably a major motivation for many ecotourists, are largely ignored. In addition, except for the relationship with staff, other social interactions which can affect the ecotourism experience are not mentioned adequately in the model. Given that ecotourism is a form of community-based tourism, the interactions between tourists and local people or cultures at the destination is one of the driving forces behind the decision to choose ecotours (Devesa et al., 2010; Kastenholz et al., 2012). Similarly, ecotourists’ experiences can also be affected by the presence, behavior and the quality of their interactions with other travelers (Camelis et al., 2014). It has been shown that meeting and exchanging views with people having the same interest is important to many tourists (Reichenberger, 2017) as such interactions create social values related to personal orientation (Richins, 1994). As “ecotourists are likely to perceive ecotourism site visits in terms of their expressive experience rather than merely as an utilitarian transaction,” the feelings of tourists toward their visit will shape their experiences (Lian Chan and Baum, 2007a, b). As such, “relaxation” feelings play a vital role in the process of the ecotourists’ experience (Eagles, 1992). Finally, while price-quality inference attributes have proven good indicators of product/service quality in previous research, they are rarely applied in the tourism service domain, especially with ecotourism. In response to this gap in the literature, this study aims to explore additional eco-attributes that help to measure service quality in the context of ecotourism.

2.4 Customer satisfaction and dissatisfaction

Customer satisfaction is a central concept in marketing because of its role in creating the company’s competitive advantages (Mittal et al., 2005). There has been a growing tendency to consider customer satisfaction as a function of satisfaction and dissatisfaction at an attribute level (i.e. satisfaction and dissatisfaction toward different components of a product
or service) (Slevitch and Oh, 2010). Gardial et al. (1994) demonstrate that customers are more likely to evaluate their post-purchase experiences and describe their consumption outcomes based on attribute-level quality than on the overall offering, acknowledging the multi-faceted nature of service consumption. The recent popularity of this approach is due to the fact that it provides better diagnostic benefits for business managers by identifying areas (attributes) for improvement (Verhoef et al., 2004).

Many scholars in their models, however, implicitly assume a linear relationship between each constituent attribute and overall customer satisfaction. That is, adequate quality at an attribute level leads to a certain level of satisfaction while the same level of dissatisfaction is engendered by equally inadequate quality. Satisfaction, in this case, is considered a bipolar concept, implying that the opposite of satisfaction is dissatisfaction (Oliver, 1980; Westbrook, 1987). This view has been questioned by many subsequent studies suggesting service attributes which might generate satisfaction but their absence might not lead to dissatisfaction and vice versa (Cadotte and Turgeon, 1988; Johnston, 1995; Kano et al., 1984; Llosa, 1996). Interestingly, this approach, which has been widely adopted in marketing, was first introduced by Herzberg (1959) in the area of human resources. He argued that two groups of factors, namely, motivation factors and hygiene factors, have distinct impacts on employee satisfaction. Therefore, satisfaction and dissatisfaction are not two extremes on one continuum. Instead, the opposite of satisfaction is no satisfaction, and the opposite of dissatisfaction is no dissatisfaction (Figure 1).

2.5 Kano’s classification of service attributes
Supporting the two-factor approach, Kano et al. (1984) pointed out the non-linear nature of customer satisfaction function. Kano’s original contribution is that his model reconciled the traditional customer satisfaction and two-factor views by making a distinction between attributes that have one-dimensional effects and those that have asymmetrical effects. Kano’s model was later adopted and refined by other studies (Anderson and Mittal, 2000; Matzler and Sauerwein, 2002). By pointing out that product/service attributes do not contribute equally to customer satisfaction, these proposals challenge the traditional customer satisfaction models that suggest higher satisfaction on all attributes is more desirable.

In his model, Kano and colleagues (1984) distinguished five types of quality attributes whose performances impact differently on customer satisfaction. They are called attractive, one-dimensional, must-be, indifferent and reverse quality. The presence of attractive attributes tends to generate satisfaction, but their absence does not cause any feeling of dissatisfaction. Conversely, must-be attributes do not have a positive impact on satisfaction, at best only leads to a state of “not dissatisfied” if customers’ expectations are exceeded, but dissatisfaction is

![Figure 1. Two approaches of the asymmetry of (dis)satisfaction](source: Llosa (1996))
triggered by their absence. One-dimensional attributes have a symmetric impact on both satisfaction and dissatisfaction in proportion to their level of fulfillment. Indifferent quality includes attributes that have no impact on customer satisfaction or dissatisfaction whether they are present or absent, fulfilled or not. In contrast to one-dimensionals, reverse quality causes dissatisfaction when present and satisfaction when absent.

The relationships between these quality attributes and customer satisfaction are visually illustrated in Figure 2.

The classification of attributes according to Kano’s criteria has been conducted in various contexts, which further confirms the model’s usefulness in establishing positioning and pricing strategies and directing product development efforts (Gregory and Parsa, 2013). The Kano’s model has also been widely utilized in tourism and hospitality setting (Högström et al., 2010; Pawitra and Tan, 2003), but to the authors’ knowledge, there has been no attempt to use the model to categorize eco-service attributes according to tourist preference. Such categorization will help to reveal the origins of tourist satisfaction and the features that should be focused on in order for a tour provider to be competitive and differentiate itself in the marketplace.

3. Methodology
3.1 Qualitative research
3.1.1 Qualitative study design. While ECOSERV is used in this study as a basic framework for assessing ecotourism service quality, further dimensions to cover the experiential aspects of tourists have also been explored from the literature. In the next step, an in-depth interview approach was implemented in order to determine ecotourism service experience.

Source: Kano et al. (1984)
and identify the underlying dimensions and sub-dimensions (attributes) for Vietnamese tourists. The rationale for using a qualitative approach in this case is that it provides an insight into the complex behavior of ecotourists (Richardson et al., 1999). In total, 22 ecotourists who had traveled to a national forest or park area in the last two years participated in the interview as 20–40 in-depth interviews are recommended as the sample size for qualitative research (Travers, 2009).

An interview guide with a combination of open-ended and semi-structured questions was used, which ensures consistent conduct of the interview and systematic collection of data. The main interview questions were divided into three parts. First, the informants were asked about their recent trip at one ecotourism place regarding what they saw, did and explored about the tangibles, environment, culture of the place, what they perceived and felt about the staff, local people, the social interaction in their trip, and what they perceived about the overall service quality. Next, the participants were asked about critical service quality attributes during their experience. This second step included open-ended sub-questions based on service expectation attributes on ECOSERV. Finally, the informants were asked about the most positive and negative experiences in order to explore more aspects of experience and service quality attributes that they have not mentioned before.

3.1.2 Content analysis. All responses were recorded, transcribed and analyzed using inductive reasoning (Lincoln and Guba, 1985). With the objective of the study to test theoretical issues to enhance understanding of the concepts, the content analysis recommended by Lauri and Kyngas (2005) was then conducted, by manual procedures. Basically, it works by dividing the many contents of the text into much smaller content units, then classifying the units that share similar meaning into the same category (Bardin et al., 2005). The relevant units contribute to the explanation of the category. After the different categories had been established, we counted the frequencies of the units (attributes of ecotourism) to identify the presence of dominant and at times not so dominant units. The units whose frequencies were less than half of the total number of interviewees will be removed. We noted that convergence in the responses or repetition and saturation started to occur at the 15 interviews mark. Seven more interviews were conducted to ensure no new information was being provided.

Table I shows the service attributes that have been cited and have emerged from the qualitative research.

3.2 Quantitative research
3.2.1 Empirical study design. A questionnaire was constructed on the items that have been drawn from the literature review, confirmed or added by the subsequent qualitative research. In total, 367 tourists who had visited ecotourism destinations in Vietnam participated in the questionnaire by giving their answers to 48 sets of questions related to 48 service experience attributes. Of these, 324 valid answers were used. The questionnaire was conducted with the help of some tour operators in Ho Chi Minh City during six months.

The classification of service attributes was made using the method proposed by Kano et al. (1984), called the functional-dysfunctional questionnaire. In this structured questionnaire, each service attribute was represented by a pair of questions, one (functional) to capture the consumer’s feelings when the attribute is provided in the offering while the other (dysfunctional) examines the consumer’s feelings in the case of an absence of such attribute. For example:

**Functional item:** If the staff at the ecotourist destination provide you with necessary information, how do you feel?

**Dysfunctional item:** If the staff at the ecotourist destination do not provide you with necessary information, how do you feel?
<table>
<thead>
<tr>
<th>Service and experience attributes</th>
<th>Examples of existing literature in ecotourism</th>
<th>Emerging from qualitative study (Ratio equivalent n/22 × 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assurance1 Feeling safe during my visit</td>
<td>Parasuraman et al. (1988), Khan (2003), Kim Lian and Baum (2007) and Yusof et al.</td>
<td>22</td>
</tr>
<tr>
<td>Assurance2 Staff providing necessary information</td>
<td>Parasuraman et al. (1988) and Khan (2003)</td>
<td>18</td>
</tr>
<tr>
<td>Assurance3 Staff having knowledge to answer my questions</td>
<td>Parasuraman et al. (1988), Khan (2003) and Yusof et al.</td>
<td>11</td>
</tr>
<tr>
<td>Assurance4 Staff instilling confidence in customers</td>
<td>Parasuraman et al. (1988) and Khan (2003)</td>
<td>20</td>
</tr>
<tr>
<td>Assurance5 Staff consistently courteous</td>
<td>Parasuraman et al. (1988), Khan (2003) and Yusof et al.</td>
<td>17</td>
</tr>
<tr>
<td>Reliability1 Staff providing services at promised time</td>
<td>Parasuraman et al. (1988) and Khan (2003)</td>
<td>13</td>
</tr>
<tr>
<td>Reliability2 Staff insisting error-free service</td>
<td>Parasuraman et al. (1988) and Khan (2003)</td>
<td>12</td>
</tr>
<tr>
<td>Reliability3 Staff performing the service right the first time</td>
<td>Parasuraman et al. (1988) and Khan (2003)</td>
<td>11</td>
</tr>
<tr>
<td>Reliability4 Staff showing sincere interest in solving problem</td>
<td>Parasuraman et al. (1988) and Khan (2003)</td>
<td>13</td>
</tr>
<tr>
<td>Reliability5 Staff providing reliable information</td>
<td>Yusof et al.</td>
<td>14</td>
</tr>
<tr>
<td>Responsiveness1 Staff always willing to help</td>
<td>Parasuraman et al. (1988), Khan (2003) and Yusof et al.</td>
<td>20</td>
</tr>
<tr>
<td>Responsiveness2 Staff giving prompt service to customers</td>
<td>Parasuraman et al. (1988), Khan (2003) and Yusof et al.</td>
<td>11</td>
</tr>
<tr>
<td>Responsiveness3 Staff never busy to help</td>
<td>Parasuraman et al. (1988) and Khan (2003)</td>
<td>14</td>
</tr>
<tr>
<td>Responsiveness4 Staff providing details regarding the service/product offered</td>
<td>Qualitative result</td>
<td>22</td>
</tr>
<tr>
<td>Empathy1 Staff providing tourists with personal attention</td>
<td>Parasuraman et al. (1988), Khan (2003) and Yusof et al.</td>
<td>14</td>
</tr>
<tr>
<td>Empathy2 Staff understanding the specific needs of tourists</td>
<td>Khan (2003)</td>
<td>11</td>
</tr>
<tr>
<td>Empathy3 Operating hours of services being convenient</td>
<td>Parasuraman et al. (1988), Khan (2003) and Yusof et al.</td>
<td>15</td>
</tr>
<tr>
<td>Tangible1 Facilities reflecting local influence</td>
<td>Parasuraman et al. (1988) and Khan (2003)</td>
<td>21</td>
</tr>
<tr>
<td>Tangible2 Materials and facilities visually appealing</td>
<td>Parasuraman et al. (1988)</td>
<td>22</td>
</tr>
<tr>
<td>Tangible3 Facilities being clean</td>
<td>Qualitative result</td>
<td>20</td>
</tr>
<tr>
<td>Tangible4 Facilities being comfortable</td>
<td>Qualitative result</td>
<td>13</td>
</tr>
<tr>
<td>Tangible5 Natural resources easy to access (i.e. adequate transport, materials used to interact with nature […]</td>
<td>Yusof et al.</td>
<td>19</td>
</tr>
<tr>
<td>Eco-tangible1 Facilities appropriate to the environment</td>
<td>Khan (2003) and Yusof et al.</td>
<td>15</td>
</tr>
<tr>
<td>Eco-tangible2 Equipment minimizing degradation</td>
<td>Khan (2003)</td>
<td>14</td>
</tr>
<tr>
<td>Eco-tangible4 The transport minimizing the pollution</td>
<td>Qualitative result</td>
<td>12</td>
</tr>
<tr>
<td>Eco-tangible5 The environment being unpolluted</td>
<td>Qualitative result</td>
<td>20</td>
</tr>
</tbody>
</table>

Table 1. Service quality and experience attributes at ecotourism locations
The respondents have five options to register their responses: (1) I like it that way; (2) I expect it to be that way; (3) I’m neutral; (4) I can accept it that way; (5) I dislike it that way.

### 3.2.2 Quantitative data analysis

The data are then analyzed by means of an evaluation table, resulting in a categorization of the ecotourism service attributes for each respondent into five Kano categories (as illustrated in Figure 4). For instance, if the tourist answers

<table>
<thead>
<tr>
<th>Service and experience attributes</th>
<th>Examples of existing literature in ecotourism</th>
<th>Emerging from qualitative study (Ratio equivalent n/22 × 100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eco-tangible6</td>
<td>The nature being wild and undisturbed</td>
<td>Eagles (1992)</td>
</tr>
<tr>
<td>Eco-tangible7</td>
<td>The scenery and nature being attractive</td>
<td>Lu and Stepchenkova (2012)</td>
</tr>
<tr>
<td>Price-quality1</td>
<td>Price filling service quality</td>
<td>Qualitative result</td>
</tr>
<tr>
<td>Price-quality2</td>
<td>Staff respecting the listed prices</td>
<td>Qualitative result</td>
</tr>
<tr>
<td>Price-quality3</td>
<td>Staff ensuring the quality of services fits the listed prices</td>
<td>Qualitative result</td>
</tr>
<tr>
<td>Interaction with local1</td>
<td>Local people showing hospitality toward tourists</td>
<td>Qualitative result</td>
</tr>
<tr>
<td>Interaction with local2</td>
<td>Local people not having discrimination against different tourists</td>
<td>Qualitative result</td>
</tr>
<tr>
<td>Interaction with local3</td>
<td>Simple and authentic meetings with local people</td>
<td>Qualitative result</td>
</tr>
<tr>
<td>Interaction with local4</td>
<td>Experience of new lifestyles (local culture)</td>
<td>Eagles (1992)</td>
</tr>
<tr>
<td>Interaction with nature1</td>
<td>Authentic interaction with nature</td>
<td>Qualitative result</td>
</tr>
<tr>
<td>Interaction with nature2</td>
<td>Different nature-based local activities (jungle tracking, kayaking, live animals […])</td>
<td>Holden and Sparrowhawk (2002), Lu and Stepchenkova (2012) and Yusof et al.</td>
</tr>
<tr>
<td>Interaction with nature3</td>
<td>Delicious local foods made with natural ingredients</td>
<td>Qualitative result</td>
</tr>
<tr>
<td>Interaction with nature4</td>
<td>Beautiful and original local products made by using natural resources</td>
<td>Qualitative result</td>
</tr>
<tr>
<td>Interaction with other customers1</td>
<td>Not disturbed by the presence of other tourists in my visit (number, density)</td>
<td>Qualitative result</td>
</tr>
<tr>
<td>Interaction with other customers2</td>
<td>Nice exchange with other tourists in my visit</td>
<td>Eagles (1992), Kim Lian and Baum (2007) and Lu and Stepchenkova (2012)</td>
</tr>
<tr>
<td>Interaction with other customers3</td>
<td>Proper behavior of other tourists in my visit</td>
<td>Qualitative result</td>
</tr>
<tr>
<td>Relaxation1</td>
<td>Feeling like home</td>
<td>Eagles (1992) and Kim Lian and Baum (2007)</td>
</tr>
<tr>
<td>Relaxation2</td>
<td>Feeling a change from my busy job</td>
<td>Eagles (1992)</td>
</tr>
<tr>
<td>Relaxation3</td>
<td>Feeling an escape from the demands of life</td>
<td>Eagles (1992)</td>
</tr>
<tr>
<td>Relaxation4</td>
<td>Feeling I could act the way I like</td>
<td>Eagles (1992)</td>
</tr>
<tr>
<td>Relaxation5</td>
<td>Feeling a peaceful atmosphere</td>
<td>Kim Lian and Baum (2007) and Lu and Stepchenkova (2012)</td>
</tr>
</tbody>
</table>

**Notes:** A statement with negative meaning is regarded the same as one with positive meaning (of the same item) for the purpose of counting the frequencies of the items in 22 interviews. Items in italic indicate new service attributes found from studies other than those suggested in Khan’s model (2003)

Table I.
“I like it that way” to the functional form of the question, and answers “I am neutral” or “I can accept it that way” to the dysfunctional form of the question, the combination in the evaluation table reveals A (attractive quality). If the combination results in I, the customer is indifferent to the attribute whether it is provided or not. Category O indicates a one-dimensional attribute. A combination resulting in category R means the service attribute is not wanted; the customer prefers its absence. Category Q, where most answers do not fall into, represents questionable results. This may be caused by incorrect phrasing or misunderstanding (Matzler and Hinterhuber, 1998).

The frequencies of single-respondent categorizations provide the basis for the final classification of attributes (Figure 3).

The variations in market segments as well as differences in customer demands and expectations may result in some ambiguity in classification; for example, some attributes can be assigned to more than one category. Hence, understanding the impact of each service attribute on the satisfaction of all the customers provides a useful tool to compare and categorize the attributes. Berger et al. (1993) therefore suggest the customer satisfaction coefficient which is indicative of the extent of influence a specific product/service attribute has on satisfaction (in case of fulfillment) and on dissatisfaction (in case of non-fulfillment).

<table>
<thead>
<tr>
<th>Answer to functional question</th>
<th>Like</th>
<th>Expect</th>
<th>Neutral</th>
<th>Accept</th>
<th>Dislike</th>
</tr>
</thead>
<tbody>
<tr>
<td>Like</td>
<td>Q</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>O</td>
</tr>
<tr>
<td>Expect</td>
<td>R</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>M</td>
</tr>
<tr>
<td>Neutral</td>
<td>R</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>M</td>
</tr>
<tr>
<td>Accept</td>
<td>R</td>
<td>I</td>
<td>I</td>
<td>I</td>
<td>M</td>
</tr>
<tr>
<td>Dislike</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>Q</td>
</tr>
</tbody>
</table>

Figure 3. Kano’s method
The coefficient includes two indices, satisfaction increment index (SII) and dissatisfaction decrement index (DDI) which are calculated as follows:

\[
SII = \frac{(A + O)}{(A + O + M + I)};
\]

\[
DDI = \frac{(O + M)}{(A + O + M + I)(-1)},
\]

where A is attractive quality, O is one-dimensional quality, M is must-be quality and I is indifferent quality.

SII scores range from 0 to 1: a value of 0 means that the effect of the service attribute on consumer satisfaction is negligible, whereas a value of 1 represents a positive effect on customer satisfaction. Meanwhile, DDI ranges from $-1$ to 0. If it is close to $-1$ the influence of a non-fulfilled service attribute on dissatisfaction is strong while a value of 0 indicates no dissatisfaction caused when the attribute is not or under-fulfilled.

These indices will be calculated in this study to illustrate the level of impact of each service attribute on satisfaction and dissatisfaction.

4. Results

4.1 Defining service attributes in ecotourism

First, the study used principle component analysis with a varimax rotation (Kinnear and Taylor, 1996). The number of factors was not restricted. For the sake of convergent validity, 0.5 was used as a factor loading cut-off point. Items had to display a 0.3 loading difference with any other factors to ensure distinctive validity. After the first exploratory factor analysis (EFA), one item had been eliminated because factor loading was less than 0.5 “Operating hours of services at this place are convenient.” After this, EFA was run again. The results showed 11 factors with the factor structure fully matched: Bartlett’s test of sphericity is statistically significant ($p(Bartlett) = 0.000$), which verified that the correlation matrix was not an identity matrix, thereby validating the suitability of the factor analysis. The Kaiser–Meyer–Olkin (KMO) was performed, which showed KMO = 0.953, higher than the suggested 0.60. Total variance explained was 67.86 percent. The factor loadings of the remaining items ranged from 0.50 to 0.750. The results of the reliability test also met requirements (all Cronbach’s $\alpha \geq 0.706$), which showed the internal cohesiveness among items within each factor (Hair et al., 2010).

Following the procedure, similar units were clustered together to produce 11 categories or dimensions (together consist of 48 units or attributes) including: assurance, reliability, responsiveness, empathy, tangibles support, eco-tangibles, price-quality, interaction with nature, interaction with other customers, interaction with the locals and relaxation feelings. The first five categories were consistent with five service quality dimensions on SERVQUAL or ECOSERV. Also, most of the attributes of the eco-tangibles dimension were compatible with the same dimension in ECOSERV. However, there were additional service experience attributes found under each of these six dimensions. The finding is not totally novel, as some items can be found in a few studies that focus on ecotourists’ experience or motivation in the literature. The corroboration of these findings with the existing service quality or service quality expectation in the literature supports the rigor and trustworthiness of the study. Five emerging dimensions are labeled price-quality, interaction with nature, interaction with local people, interaction with other customers and relaxation feelings.

4.2 Classification of service attributes

The ecotourism service attributes classified by Kano’s method in this study fall into only four categories (rather than all six listed in Section 3.2.2): one-dimensional, must-be, attractive and indifferent. The degree of impact of these attributes on satisfaction and
dissatisfaction (SII and DDI indices) is also calculated. Details of classification results are shown in Figures 4–7. Of the total 48, the findings reveal 13 attractive attributes, 11 must-be attributes, 12 one-dimensional attributes and 12 indifferent attributes. However, the classification is not unambiguous. While most of the attributes can be classified into certain quality groups by 50 percent or more of individual responses, there are some attributes that combine the characteristics of different categories (i.e. proportion of the strongest category below 50 percent). For instance, in the one-dimensional group, one attribute also belongs to indifferent, one to must-be and one to attractive. Similarly, as observed in the must-be category, there is one attribute that can also be assigned to “attractive,” one to “one-dimensional.” With regard to attractive attributes, the combinations include three attractive that can also be “indifferent” and one which is also “one-dimensional.” Most noticeably, the indifferent group has the highest number of “hybrid attributes,” with only one attribute being totally indifferent. Meanwhile, eight attributes have potential to become “attractive,” two attributes have potential to become “one-dimensional” and two attributes have potential to become “must-be.”

![Figure 4. CS Coefficients of attractive attributes](image)

**Notes:** *(A–I); **(A–O)*

![Figure 5. CS Coefficients of must-be attributes](image)

**Notes:** *(M–I); **(M–O)*

Ecotourists’ satisfaction and dissatisfaction
This combination phenomenon is not uncommon. Several papers that adopt Kano’s techniques also come up with attributes that cannot be clearly classified (e.g., Högström et al., 2010; Löfgren and Witell, 2005). According to the authors, the dynamics of service attributes may be one possible explanation for this trend. For example, Kano (2001) suggested alternative life cycles of quality attributes. A successful service attribute, for example, starts from being indifferent to attractive when customers discover its usefulness and feel satisfied when using it. Then over time, customers who experience the attractive attribute with satisfaction will become dissatisfied if it disappears, making it one-dimensional quality, which eventually matures into a must-be attribute. A successful service attribute, therefore, has the typical pattern: indifferent – attractive – one-dimensional – must-be. Alternatively, “flavor of the month” attributes follow a life cycle from being indifferent to one-dimensional then back to indifferent. This explanation also seems consistent with Maslow’s hierarchy of needs that suggests customers having their needs substantially met will move to seek satisfaction of higher-level needs. As the lower-level needs now become basic and expected, lacking them will cause dissatisfaction. Nilsson-Witell and Fundin (2005) provided further support for the existence of the life cycles of service attributes. However, according to
Högström et al. (2010), regarding attributes classified as combinations, more research should be conducted to determine whether it is caused by changes in their life cycles or by differences between studied segments (e.g. gender, skill and age).

The following figures provide visual illustrations regarding the degree of impact each category of attributes has on customer satisfaction and dissatisfaction, with detailed analyses.

As can be seen, of the 13 attributes categorized as attractive, those that have the greatest potential to delight customers include the wilderness of nature, the attractiveness of scenery, local foods and the hospitality of local people. It can be noted from the results that a large share of ecotourists’ satisfaction comes from nature-related and site-specific elements. Support for this view is given in other studies in ecotourism. For example, Sim and Lee (2013), when examining visitors’ satisfaction and their intention to revisit and recommend national natural forests in Korea, found that visitors were most satisfied with forest scenery, cleanness of stream and kindness of personnel. Nepal (2007) surveyed trekkers in a mountain area in Nepal and reported higher importance ratings for natural attributes than for comfort and hygiene-related attributes. These findings seem consistent with how the extant literature has characterized ecotourists as those who seek “uncrowded, remote, wilderness, learning about wildlife, nature and local cultures, community benefits and having physical challenge” (Wight, 1997, p. 218). Attractive attributes act to increase importantly customer satisfaction, without triggering dissatisfaction in the case of under-fulfillment. As a consequence, significant investment in these attractive attributes is likely to generate exceptional and memorable experiences exceeding visitors’ expectations.

On the other hand, the must-be category presented in Figure 5 includes 11 attributes. Those with the strongest level of impact in this group are the courtesy of staff, respect of listed prices, the reliability of information and the cleanliness of facilities. Interestingly, most of these involve human factors. Also, people who decide to embark on an ecotour seem to have high expectations of the relaxative values it offers, a trend reflected through some attributes in this group such as a change from work or an escape from life. Must-be attributes require adequate attention because they are the main source of dissatisfaction.

The findings also show some attributes that have linear influences on customer satisfaction: customers will be happy if the quality of these attributes is assured and displeased otherwise. The 12 one-dimensional attributes are mainly associated with the interaction with nature, the range of nature-based activities, unpolluted environment, the attitude and competence of staff at ecotourism sites. They have similar levels of influence on tourist satisfaction and dissatisfaction (Figure 6). This classification of staff service is in agreement with Lu and Stepchenkova (2011) who suggest many service attributes (e.g. customer service or tour guide service) be categorized in this group.

Finally, there are 12 attributes that are placed in the indifferent category. It is of note that only one attribute has practically no impact on satisfaction and dissatisfaction irrespective of their performance (equipment minimizing degradation). Apart from this, some indifferent attributes, when performing well, have potential to become a source of customer delight, some others are more likely to become one-dimensional, and one has potential to be considered as must-be. It is also worth noticing that most of these “hybrid” attributes seem to be associated with service quality requirements that are deemed difficult to fulfill (such as service performed right the first time) or unnecessary in the context of ecotourism (such as feeling like home and comfortable facilities) or those that tourists may implicitly assume that the eco-site management has little control over such as behavior of other tourists during their visit or their exchange with other tourists.

5. Conclusion
The study enriches and contributes to the available literature on ecotourism service quality by proposing a modified model of ECOSERV which incorporates the social and experiential
aspects of the ecotourism service experience. Five further dimensions of the scale, including price-quality, relaxation feelings, interaction with nature, interaction with other customers and interaction with the locals, have been proposed.

The results confirm the multifactor structure of customer satisfaction. Attributes whose high quality has strong influences on customer satisfaction do not necessarily cause dissatisfaction when failing to meet customers’ expectations. For instance, it is found that if employees at an ecotourism site have sufficient knowledge to answer tourists’ questions with regard to the site and ecotourism activities, the tourists will be very pleased. However, limited knowledge of employees does not cause dissatisfaction, meaning it is not expected of the employees to be able to answer all questions. On the other hand, there are certain service attributes that are taken for granted; for example, the accuracy of information provided. The provision of correct information does not make tourists more satisfied, but they will become extremely displeased if information is later found inaccurate. Similarly, attributes whose performances are proportionate to customers’ satisfaction (one-dimensional) or unremarkable to them (indifferent) are also revealed in the study.

Our findings can provide practitioners with insights regarding how to better manage the customers’ service experience at ecotourism destinations so as to maximize satisfaction. Although a service-oriented company might wish to offer a continuously positive experience to its clients, maintaining such a performance is likely to be unrealistic. Rather, service experiences tend to consist of both positive and negative events. Understanding potential impacts of discrete events in a service experience on satisfaction and dissatisfaction provides managers with a basis for performing. Moreover, the classification of different elements of the ecotourism service is helpful to decide how much money and effort should be placed on each quality attribute. Consequently, optimal investment can be made in order to produce highest level of satisfaction within a predefined budget. This is especially important in trade-off situations when multiple service requirements cannot be met due to resource constraints. Travel agencies and tour operators will also find the classification useful to help them design effective and attractive ecotourism experiences that will deliver greater customer’s pleasure and satisfaction.

This study still has a number of issues hindering the generalizability of its findings, which suggest areas for further research. The sample size is adequate, but it should extend the sample to be generalizable to the whole population. This research focuses on ecotourists’ experience at national forests or parks. Also it has been conducted only with Vietnamese tourists. As culture gap may create significant differences in terms of tourists’ behavior and perception, it is recommended that the study is replicated for international ecotourism contexts in order to identify sources of satisfaction for tourists of different countries and cultures, draw a distinction between the different types of tourists and provide consequent managerial implications. Future research may also focus on the classification of service attributes according to other criteria such as gender, age, purpose of the trip.

References


Further reading


Corresponding author

Vo Thi Ngoc Thuy can be contacted at: thuyvtn@uel.edu.vn

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Analysis of cryptocurrency’s characteristics in four perspectives

Mirza Hedismarlina Yuneline
Management Study Program, School of Business Ekuitas, Bandung, Indonesia

Abstract

Purpose – The innovation of cryptography technique and blockchain has made cryptocurrency an alternative medium of exchange due to its safety, transparency and cost effectiveness. But its main feature cannot be separated from the users who use cryptocurrency for their illegal transactions. There are several arguments related to the legality of cryptocurrency. The purpose of this paper is to analyze the nature of cryptocurrency based on characteristics of money, legal perspective, economic perspective and Sharia perspective.

Design/methodology/approach – In this study, the methodology used is descriptive with a qualitative approach. The object of this research is cryptocurrency. The data are secondary data obtained from peer-reviewed journal articles, conference papers review, working paper and Sharia consultant reports addressing the legality of cryptocurrency. The literature review analysis includes the following steps: material collection, descriptive analysis, discussion with people in Sharia competency and intuitive-subjective material evaluation.

Findings – Regarding the characteristic of money, cryptocurrency is acceptable. But in terms of the legal perspectives, cryptocurrency does not meet the criteria as currency. From the economic perspective, cryptocurrency does not fully meet the characteristic currency due to high price volatility, and from the Sharia perspective, cryptocurrency can be considered property (mal) but not as a monetary value (thamanniyah).

Research limitations/implications – The research findings are based on the journal articles, working paper and Sharia consultant report, and it may lack Sharia’s opinion. Any further discussion related to Sharia perspectives will be a great input to enrich the study.

Practical implications – This study also includes the implications related to the opportunities and the risks of cryptocurrency that can be discussed for the development of the cryptocurrency in the future.

Social implications – This study includes the implication cryptocurrency is using as nature of money and not as speculative instrument.

Originality/value – This study argued the legality of cryptocurrency in four perspectives such as the nature of money, legal, economy and Sharia perspective.

Keywords Cryptocurrency, Money, Currency, Legal perspective, Economic perspective, Sharia perspective

Paper type Conceptual paper

Introduction

Since its launch in 2009, the existence of cryptocurrency is becoming increasingly popular throughout the world. It has attracted so much attention, due to its unique characteristics. It is a digital currency that is not issued by any central authorities. It is also highly secured because it uses cryptography technique by using encryption protocol to identify and verify transactions. It is also transparent, storing publicly every transaction details in distributed ledger, but the identity of the users involved remains anonymous. The price of cryptocurrencies is based on the supply and demand law. Due to high interest, the price of cryptocurrencies, namely Bitcoin, rose highly. As recorded in July 2010, the price of Bitcoin
was USD 0.04951, and it reached highest in December 2017, which was USD 19,870, or increased by 40,133,206 percent from the first price recorded.

The high interest in cryptocurrencies creates threats to the banking and finance industries. As a digital currency that is not issued by any central authorities, its values are not influenced by monetary policy. Without any intermediaries, it can decrease the cost of a transaction. Furthermore, the cost that related to remittance also can be decreased, so the financial transaction across the border can be more efficient.

Despite cryptocurrency’s advantage, many countries reject cryptocurrency as a legal currency due to its negative publicity, namely Silk Road Case in July 2013. Silk Road is a hidden internet marketplace for drugs and illegal services that has been closed by the FBI. Buyers used Bitcoin for transaction and its main feature is that it makes the buyers anonymous (www.bbc.com/indonesia/bahasa_inggris/2013/10/131007_witin_silk_road_website.shtml).

In December 2013, China Central Bank officially said that virtual currency has no value and the use of virtual currency has minimum legal protection. The warning is followed by banning all the transactions that used virtual currency. Malaysia Central Bank adds a long list of institutions that prohibit the use of virtual currency as a digital currency. In January 2014, Malaysia Central Bank released a statement that Bitcoin is not a legitimate payment instrument in Malaysia and the central bank does not admit the use of Bitcoin. They also issued the warning of the Bitcoin’s risks (www.bbc.com/indonesia/majalah/2014/01/140106_bisnis_Bitcoin_malaysia).

In November 2016, Bank Indonesia or Indonesia Central Bank officially issued a regulation to ban the virtual currency in PBI 18/40/PBI/2016 regarding Implementation of Payment Transaction Process. The negative publicity such as illegal drugs transaction, blackmail and terrorist financing, become one of the consideration. Another risk that may happen is the price volatility that may lead to the bubble and may impact the stabilization of the financial system.

All of the negative publicity, the speculative issue, and other risks that may be facedenable cryptocurrency, in this case Bitcoin, to be considered as an investment than a currency. As a result, there are discussions surrounding the nature of Bitcoin and whether it can qualify as money in Sharia economy. In Sharia perspective, there are some debates regarding the existence of the virtual currency. Turkish Government’s religious authority and the Grand Mufti of Egypt have declared that virtual currency is *haram* or forbidden. But fatwa center of South African Islamic Seminary has taken the position that virtual currency is permissible for trading.

Thus, this study aims is to analyze the nature of cryptocurrency based on characteristics of money, legal perspective, economic perspective and Sharia perspectives. Furthermore, this study also considers the opportunities and risks of cryptocurrency that may happen.

**Literature review**

*The nature of money*

Money is invented to solve mankind problem of barter system to exchange goods and services among them. Referring to Lietaer (2001), money is agreement, within a community or society, to use something as a medium of exchange. Historically, mankind has used money in the different forms, from commodities such as salt, cattle, wheat; metallic material such as gold and silver; then mankind use fiat currency such as national currency and electronic money. Currently, by the rapid development of technology, virtual currencies are invented. The most popular virtual currency that used cryptography technique in a decentralized network was found by an entity named Satoshi Nakamoto in 2009.

Referring to Meera (2018), over the time, societies discovered that money can play an efficient and effective role if it meets the requirements, such as accepted, divisible,
homogenous, durable, mobile, rare and stable value. Accepted means that the money must have an intrinsic value, so it must be desired by its own sake. The requirement of accepted is complicated since current fiat money is not having an intrinsic value. It is forced by the government to be accepted through the legal tender law.

The second requirement is divisible means that money must be easily divided into small parts that people can purchase goods and services at any price. In order to be easily divided, the money must be uniform or homogenous. The next requirement is durable means that money has to be long lasting and not easily destroyed. It also must be easy to carry around. It must be rare means that the money must be relatively hard or scarce to obtain and its value must remain relatively constant over the time.

Historical development of money and fiat currency

Referring to Abu-Bakar (2018), the historical development of money has taken place through many stages over time. The first stage is barter system, when people exchanged and traded goods and services for other goods and services. The second stage is commodity money system, when people used commodities such as wheat, seeds, or cattle as a medium of exchange. The third stage is a metallic money system, when people used gold and silver as a medium of exchange. The metallic money system evolved over time, from weight-based, coins-based until paper-based, which was 100 percent backed by gold.

The next stage is fiat money, which then evolved into fiat currency. Fiat money has been used during the wars, when the governments needed money to pay for wars or the shortage of money. But the using of fiat money created another problem, which was hyperinflation and devaluation. Referring to Davies and Connors (2016), in 1971 when President Nixon canceled the direct convertibility of US dollars to gold, it was the end of fiat money that was backed by gold. The Central bank began issuing non-convertible fiat money and by legal tender law, people obliged to accept it as payment for goods or services and settlement of debts.

The Bank of England (2014) described legal tender as following:

Legal tender has a very narrow and technical meaning, which relates to settling debts. It means that if you are in debt to someone then you can’t be sued for non-payment if you offer full payment of your debts in legal tender. Throughout the UK, there are some restrictions when using the lower value coins as legal tender. For example, 1p and 2p coins only count as legal tender for any amount up to 20p.

There are many acceptable payment methods which aren’t technically legal tender. This is why the term “legal tender” has little use in ordinary everyday transactions. Most shops accept payment by debit or credit card, and some accept cheques and contactless payments. These are safe and convenient ways to pay, despite not being classed as legal tender.

Whether you pay with banknotes, coins, debit cards or anything else as payment is a decision between you and the other person involved in the transaction.

In addition, shops are not obliged to accept legal tender. If you hand over a £50 note to pay for a banana in your local grocery store, the staff are within their rights to choose not to accept it. Likewise for all other banknotes – it’s a matter of discretion.

Thus, we can distinguish between money and currency. Money is a medium of exchange and a store of value. Gold and silver are the optimum forms of money, because they maintain purchasing power over a long time period with limited quantity. Gold and silver also have an intrinsic value. Currency normally is the notes (or paper) and coins that are issued by government or central bank as a medium of exchange. Since fiat currency is not backed by gold, it has no intrinsic value. The value is determined by supply and demand. More currency in circulation will make it less valuable.
History and development of virtual currency

The rapid deployment of internet-based commerce and mobile technology are driving changes in the global economy. Many companies such as retail industry are falling down because they cannot compete with e-commerce companies such as Alibaba. The online payments systems are changing the way goods and services are paid. One of important development of economic changes is digital currencies.

Referring to He et al. (2016), digital currencies are digital representation of value that can be redeemed for goods and services. He et al. (2016) categorized that digital currencies based on the value can be denominated in legal tender. For example, PayPal and e-money are digital currencies that can be denominated based on fiat currency and can be exchanged in the real economy, and digital currencies that cannot be denominated in the legal tender are called virtual currencies.

Furthermore, He et al. (2016) explained that virtual currencies, on the contrary, primarily are used in the virtual world. They have their own unit of account and cannot be denominated in fiat currency. Virtual currencies have different levels of convertibility. Game coins, for example, is only used in their virtual domain. The exchange to fiat currency outside their virtual domain is restricted. On the contrary, the convertible virtual currency allows the exchange into fiat currency and also can be used for good and services payment in the real economy.

When the convertible virtual currencies use decentralized systems, they need cryptography technique to identify and verify transactions. It is called cryptocurrencies. By using decentralized systems, they allow the peer-to-peer transaction, so they do not need the central authority for administering the systems, and the clearing process can be eliminated. The innovation of cryptocurrencies created a challenge for the concept of fiat currency.

Money in Sharia perspective

Referring to Lietaer (2001) regarding the definition of money, most Islamic and Sharia scholars (Meera, 2018) agree that whatever a society takes a money based on the concept of maslahah (general welfare that can be interpreted all things that give benefit to the community for the common good and), it is allowed (halal). Hence, the rules of purchase agreement of a currency with another currency or foreign exchange (as-sarf) and the determination of interest of the loan upon repayment based on a certain percentage of the principal amount borrowed to the borrower (riba) are applied upon it.

Referring to Uthamni, money in Sharia law is a medium for exchange. It is forbidden to make a profit by dealing with money and make interest from the papers that represent the money. The only profit that is allowed is generated from the exchange of intrinsic utility that is sold for money or when different currencies are exchanged.

Imam Ibn Taymiyah stated:

When currencies and money are inter-traded with the intention of investment and profit, it opposes the very purposes of money and Thamaniyyah.

Referring to Sharia law, someone who has money must spend it or put effort and put labor to derive benefit from the money. Money is only a medium of exchange or a unit of measurement. It does not have an intrinsic value. It depends on the production activity that generates surplus value.

The Quran (4:5) interprets the role of money as following:

Do not entrust your properties – which Allah has made a means of support for you – to the weak of understanding, but maintain and clothe them out of it, and say to them a kind word of admonition. (www.islamicstudies.info/tafheem.php?sura=4)

This verse has a broad meaning. The word properties refers to wealth as one of the main supports of human life. Furthermore, the verse refers to the fact that Allah has created a
medium to upkeep the entire worldly system. The Quran has not defined the form of money but in (3:75) and (12:20), the Quran shows that the previous society used gold (dinar) and silver (dirham). Thus, referring to Abdullah, some classical Islamic scholars like Al-Mawardi, Abu Ubayd, Al-Ghazali, Ibn Khaldun, and Al-Maqrizi noted that the medium of exchange (wasilat at-tabadul) refers to the definition of dinar and dirham as Islamic money (an-Nuqud al-Islamiyyah). Furthermore, Meera (2018) argued that Islamic money is something that contributes to the attainment of meaning and purpose desired in presenting a law for the benefit of mankind (maqasid al-shariah).

In order to examine the characteristics of cryptocurrency, whether it is suitable for Islamic law, first of all, we need to take a look at the components of currency based on Islamic law. There are three components such as property (mal), lawful due to its value (taqawwum) and monetary value (thamaniyyah).

The Quran and the Sunnah of the Prophet Muhammad do not make a clear statement regarding property (mal). Referring to Islam (1999), since there are many definition interpretations of mal among Sharia scholars, the definition due to the different ways of expression is closely examined. The following are some definitions:

1. Mal is a human tendency that is able to be stored over time.
2. Mal is something that has been created for the goodness of human being.
3. Mal is usually desirable and can be stored over time.

From the definition above, there are two keywords that describe mal, which is something that is desirable and something that can be stored over time. Furthermore, Islam (1999) argued that mal is something for which there is a lawful benefit. Hence, something that does not give benefit, for example, insects, and is unlawful in Islam, for example, alcohol drink, is not considered as mal.

The requirement for the mal to be exchanged is mutaqawim. Mutaqawim refers to lawful item or subject for use in Sharia. There two criteria for any item that can be traded and exchanged, which is tamawwel and taqawwum. Referring Hayder (2003), tamawwel refers to anything used as mal. Taqawwum refers to anything that is lawful according to Islamic Law, as a result of being considered valuable.

Thamaniyyah is a monetary value or the key element in an asset that is eligible to serve as currency and money. Thamaniyyah has two functions, which are as an independent standard of value and as a unit of account. Referring to Adam (2017), thamaniyyah’s first function enables money to independently evaluate prices and rate goods. Since it is an independent standard value, it must have stability and should be worldwide acceptable. Thamaniyyah’s second function is as account unit. This refers to being the main reference point and it is a benchmark for people to send prices and record debt.

Methodology
In this study, the methodology used is descriptive with a qualitative approach. The object of this research is cryptocurrency. The data are secondary data obtained from peer-reviewed journal articles, conference papers review, working paper, and Sharia consultant report addressing the legality of cryptocurrency. The literature review analysis includes the following steps: material collection, descriptive analysis, discussion with people in Sharia competency, and intuitive-subjective material evaluation.

Results
Cryptocurrency as the nature of money
As mentioned above, referring to Meera (2018), money can play an efficient and effective role if it meets the seven requirements. First of all, this paper will examine whether
cryptocurrency represented by Bitcoin has fulfilled the seven requirements compared with other currencies (Table I).

From Table I, it can be observed that Bitcoin has the same characteristics with fiat currency that fulfills six of the seven requirements. Both of them do not have intrinsic value. The stable value requirements refer to the store of value function. All of the currency can be used as a store of value, but the value may decrease due to risk that may happen. For the durable requirements, in commodity currency is stated mixed depends on the commodity type. For example, commodities like wheat or salt are perishable through fungal, pest, water, fire, bacterial activity and are also destroyed by the process of consumption.

Despite its highly volatile price, the value of Bitcoin exists when its users have trust to use it and accept it as payment. Furthermore, DeVries (2016) stated that the Bitcoin can be adopted widely because of what DeVries described as “fire triangle”. It needs vendor acceptance, user acceptance and innovation. Hence, in terms of the nature of money, Bitcoin is accepted as money, with notes: it is trusted, accepted as payment and becomes an alternative in this current internet-fueled global market.

Cryptocurrency in legal perspectives
Referring to He et al. (2016), in the law perspective, currency is referred to a unit of account and medium of exchange that is issued and denominated exclusively by monetary authorities (or central bank). It is associated with the power of sovereignty wherein the value and the credibility of a country’s currency are linked with the country’s ability to support the currency. Referring to Proctor (2012), the legal concept of money is broader than the concept of currency. Money can be created by a private party (not only paper and coin money but also demand deposit), but it should be denominated in currencies that are issued by the central bank and should be accepted as a medium of exchange within the country. Hence, referring to the legal concept, Bitcoin is not acceptable as money.

Although Bitcoin is accepted as a medium of exchange by thousands of merchants throughout the world, some countries have issued the regulation to ban Bitcoin and other cryptocurrencies due to bypassing of the central bank authorities. Bangladesh, Bolivia, Ecuador and Kyrgyzstan have made a clear decision that Bitcoin is illegal. In the meanwhile, other countries that do no state that Bitcoin is illegal still review regulatory implications. Table II shows the regulation implication of Bitcoin acceptance.

The UK has commissioned the Treasury to conduct studies on cryptocurrencies regarding their role in the UK economy. Palestinians and Russians have also started to develop their own cryptocurrencies. In the case of Palestine, cryptocurrency will be the answer for the scarce of money printing. The cryptocurrency will decrease their dependence on Israel’s government.

<table>
<thead>
<tr>
<th>Seven requirements</th>
<th>Fiat currency</th>
<th>Gold (commodity)</th>
<th>Commodity currency</th>
<th>Bitcoin (cryptocurrency)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrinsic value</td>
<td>None</td>
<td>Yes</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td>Divisible</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Homogenous</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Durable</td>
<td>Yes</td>
<td>Yes</td>
<td>Mixed</td>
<td>Yes</td>
</tr>
<tr>
<td>Mobile</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Rare</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Stable value*</td>
<td>Yes*</td>
<td>Yes*</td>
<td>Yes*</td>
<td>Yes*</td>
</tr>
</tbody>
</table>

Table I. The seven requirements of money: a comparison

Analysis of cryptocurrency’s characteristics
In Indonesia, the legality of cryptocurrencies as a currency will be defined on the basis of the President of the Republic of Indonesia (2011). In Article Number 1 and 2, the following is stated:

(1) The currency shall be the money of which issued by the Unitary State Republic of Indonesia of which hereinafter referred to as Rupiah.

(2) Money shall be the legal payment instrument.

Furthermore, under Article 21 on the Use of Rupiah Paragraph 1, it is stated that Rupiah shall be used in the following cases:

(1) each transaction whose objective is for the payment purpose;

(2) settlement of the other obligation that has to be settled using money; and

(3) other transactions that are performed in the territory of the unitary state of the Republic of Indonesia.

Related to Article 21 paragraph (1) above, Article 33 paragraph (1) on Criminal Provision stated that anyone who does not use the Rupiah:

(1) each transaction whose objective is for the payment purpose;

(2) settlement of the other obligation that should be fulfilled using the money; and

(3) other financial transaction as set forth in Article 21 section (1) shall be subjected to sentence with imprisonment for not less than 1 (one) year and subjected to sentence with fine not less than Rp. 200,000,000.00 (200m rupiah).

Referring to the Law on Currency Act above, the Government of the Republic of Indonesia strictly stated that the only legal payment in the territory of the unitary state of the Republic of Indonesia is only Rupiah. Furthermore, related to Bitcoin, Bank Indonesia held the Press Release regarding Bitcoin and other virtual currencies, referring to Law Number 7 the Year 2011 on Currency Act, and stated that Bitcoin and other virtual currencies are not valid currencies or payment instruments in Indonesia. Bank Indonesia also released warning for the Bitcoin and other virtual currencies’ risk, since any risk of ownership and the use of

<table>
<thead>
<tr>
<th>Country</th>
<th>Legality</th>
<th>Regulations</th>
<th>Tax treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>Legal as</td>
<td>Controlled by government and KYC must be applied</td>
<td>Subject to self-employment tax</td>
</tr>
<tr>
<td></td>
<td>commodity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>Legal as private</td>
<td>Illegal for financial institutions and the Bitcoin exchange is shut, but China has developed its own cryptocurrency</td>
<td>Not mentioned</td>
</tr>
<tr>
<td></td>
<td>property</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>Legal as regular</td>
<td>Bitcoin business are obliged to submit detailed costumer reporting</td>
<td>Subject to GST (goods and services tax)</td>
</tr>
<tr>
<td></td>
<td>money</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>Legal as money</td>
<td>Bitcoin exchanges must register to FSA, have minimum requirement capital, submit annual report, and undergo auditing</td>
<td>Subject to consumption tax</td>
</tr>
<tr>
<td>Iceland</td>
<td>Illegal for bitcoin</td>
<td>The regulation has amended by the central bank due to the innovation of local cryptocurrency named aurocoin.</td>
<td>Not mentioned</td>
</tr>
<tr>
<td>Singapore</td>
<td>Not regulated</td>
<td>Not regulated but issued warning for Bitcoin risk</td>
<td>Bitcoin currency exchanged will be subject to taxes on the basis of Bitcoin sales</td>
</tr>
</tbody>
</table>

**Table II.**

**Regulation implication of bitcoin acceptance**

**Source:** https://news/reviews/6163-total-control-top-5-countries-withstrictest-bitcoin-regulation (accessed June 27, 2018)
Bitcoin and other virtual currencies would be borne solely by Bitcoin and other virtual currencies' owners/users.

Since the Currency Act did not strictly state the legality of Bitcoin, the popularity of Bitcoin was booming in Indonesia. The users of Bitcoin in Indonesia were around one million. Surprisingly, the number surpassed the investor numbers in the capital market, which was around 600,000 investors.

Hence, Bank Indonesia released BI Regulation Number 18/40/PBI/2016 on the Implementation of Payment Transaction Process and BI Regulation Number 19/12/PBI/2017 on the Implementation of Financial Technology. In BI Regulation Number 18/40/PBI/2016 Article 34, it is clearly stated that Bank Indonesia prohibits the Provider of Payment System Services to conduct payment transaction processing using virtual currencies. Virtual currencies mentioned in BI Regulation above are the digital currencies that are not issued by any monetary authority and are obtained by the way of mining. Among others are Bitcoin, BlackCoin, Dash, Degecoin, Litecoin, Namecoin, Nxt, Peercoin, Primecoin, Ripple and Ven.

The Governor of Bank Indonesia stated that the main reason for prohibiting the virtual currencies is to implement prudential principles, safeguard business competition, risk control, consumer protection, and also to prevent crime, such as money laundering, terrorism financing, and maintain the sovereignty of the rupiah as a means of legitimate payment in Indonesia. The result of the BI regulation enforcement is a decrease in Bitcoin users, which is around 300,000 users nowadays.

**Cryptocurrency in economic perspectives**

From an economic perspective, this paper analyzes whether cryptocurrency will fulfill the characteristic of a successful currency. It should have the functions as a medium of exchange, an account unit, and a store of value. Table III consists of the comparison among the currencies.

Currently, the cryptocurrency does not fully meet the three characteristics of a successful currency. A function as a store of value is limited by high price volatility. The cryptocurrency’s price, in this case Bitcoin’s price, is very unstable, which is much higher than the national currency. The picture below is the chart of Bitcoin’s price for 2 years. In July 2017, the Bitcoin’s price reached USD 1,975 per bitcoin. After five months, the price rocketed to USD 19,345 per Bitcoin. In five months, it reached 880 percent growth or 176 percent per month. After reaching the peak, the Bitcoin’s price continued to sour down. In six months, the price declined to USD 6,503 per bitcoin or dropped to 11 percent per month. In Figure 3, the high volatility of Bitcoin price compared to gold is shown. Therefore, it is clear that Bitcoin does not meet the store of the value function.

Phillip et al. examined the nature of cryptocurrency to evaluate the investability of the five largest cryptocurrencies based on the market capitalization such as Bitcoin, Ethereum, Ripples, NEM and Dash. Phillip et al. stated that all the cryptocurrency characteristics are negatively correlated between one-day ahead volatility and return (Figures 1 and 2).

The second characteristic is as unit of account functions. Referring to Yermack (2013), Bitcoin does not seem to establish itself as an account unit or a store of value.

<table>
<thead>
<tr>
<th>Currency characters</th>
<th>Fiat currency</th>
<th>Gold (commodity)</th>
<th>Commodity currency</th>
<th>Bitcoin (cryptocurrency)</th>
</tr>
</thead>
<tbody>
<tr>
<td>As medium of exchange</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes*</td>
</tr>
<tr>
<td>As unit of account</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes*</td>
</tr>
<tr>
<td>As store of value</td>
<td>Yes (subject to inflation risk)</td>
<td>Yes (subject to commodity price risk)</td>
<td>Yes (subject to dilution of quality)</td>
<td>No (subject to high exchange risk)</td>
</tr>
</tbody>
</table>

Table III. Currency character: a comparison
But currently, there is a piece of evidence that cryptocurrencies are used as a unit of account. The mechanism is by valuing the goods and services based on cryptocurrency exchange rate. For example, sellers who accept the cryptocurrency payment will quote a price in fiat currency, with prices in cryptocurrency based on exchange rates at a given point in time.

The third characteristic is as medium of exchange functions. Since cryptocurrency is not a legal tender, the transactions that accept cryptocurrency must involve two parties that have an agreement regarding the acceptance of cryptocurrency. Referring to He et al. (2016), although the growth of cryptocurrency-based payments is very fast, the number and volume of transactions in cryptocurrency remain small. Indeed, the current total market value of cryptocurrency is about USD 7bn, compared with the US currency in circulation, which is around USD 1.4 trillion.

**Cryptocurrency in Sharia perspectives**

In general, Sharia scholars have two different opinions. The first group argues that cryptocurrency is prohibited by Islamic Law (*haram*). Another group has opinion that it is permissible in Islamic Law (*halal*).
Referring to Abu-Bakar (2018), Sharia scholars, such as the Grand Mufti of Egypt, the Turkish Government, Palestinian Fatwa Center, and Seyyid Hattam for the UK, have stated that cryptocurrencies are forbidden. The main reason of their statements are as follows:

1. The negative publicity that cryptocurrency is easy to use for illegal activities; hence, they buy it in order to avoid and hide from government or authorities.
2. Cryptocurrency is intangible and only available on the internet.
3. Cryptocurrency has no central authority to monitor and audit its systems; hence, it is not a legal tender.
4. Cryptocurrency transaction is open to speculation (excessive gharar). The miners of cryptocurrency are based on zero sum game. If the miners succeed to solve mathematical puzzles, they gain cryptocurrency, otherwise they get nothing.
5. Cryptocurrency is not backed by anything. Even Bitcoin is invented by an entity or a real person.

The Fatwa Center of the South African Islamic seminary, Darul Uloom Zakariyya, has taken the position that Bitcoin is permissible in principle. The consideration is that cryptocurrency meets the criteria and definition of property (mal) and money because of the following reasons:

1. treated as valuable thing among people;
2. accepted as a medium of exchange by a group of people;
3. it measures a value; and
4. has a unit account functions.

Referring to the consideration of Sharia scholars, there are some subjects that can be analyzed in terms of Sharia Law. Basically, the Sharia scholars argued regarding cryptocurrency for following items:

1. Whether cryptocurrency is a property (mal)?
2. Whether cryptocurrency is a currency?
3. Whether the price instability has an impact on cryptocurrencies on Sharia’s complaint?
4. Whether illegal use has an impact on cryptocurrencies on Sharia’s complaint?

**Cryptocurrency as property**

Referring to Hanafi scholars, there are two attributes to consider something as *mal* or property:

1. It would be desirable for a human being.
2. It would be capable to be stored over time.

Based on the attributes above, this paper examines whether the cryptocurrency can meet those criterion based on Bitcoin’s case in economic demand (desirability). In Figure 3, it is shown that the Bitcoin’s price surpassed the price of a troy ounce of gold. The current market capitalization of Bitcoin is around USD16bn, with average volume transaction per day being 281,04m. The high demand of Bitcoin indicates that Bitcoin can meet the desirability criterion.

In terms of storability, Bitcoin is encoded within the blockchain and is entered on the distributed ledger system. For example, when Client A makes payment to Client B.
The transaction is settled by the miners who solve the cryptographic puzzle as a part of the validation process. The miners who find the solution faster will receive Bitcoin as a reward. The copies of transaction records will be kept in the distributed ledger that can be accessed in the network. Hence, Bitcoin can be considered as property (mal).

Cryptocurrency as currency
As a currency, we have to examine whether cryptocurrency has Thamaniyyah criterion, as previously mentioned above:

1. an independent standard of value; and
2. a unit of account.

Thamaniyyah demands that the currency should give a clear reference to its value. The cryptocurrency’s value is not an independent standard value. We need the value of fiat currency to determine the value of cryptocurrency. Even though the cryptocurrency does not meet the first criterion, since it is a digital currency, it can be used as a unit of account. As mentioned previously, the mechanism is by valuing the goods and services based on cryptocurrency exchange rate. Thus, the cryptocurrency still can be used as a medium of exchange. Referring to Adam (2017), something that does have thamaniyyah can still be traded as a medium of exchange in a transaction. In cryptocurrency’s case, it will be regarded as price (thaman) in a particular transaction.

But the use of cryptocurrency as a medium of exchange meets challenges regarding its status as a legal tender. Regarding the legal tender issue, the government makes something as a legitimate means of payment and it must be issued by the central authority. But in Islamic Law, the main criterion for a medium of exchange is its acceptance by people – whether it arises by imposing it on the people through law or through voluntary acceptance of the people.

The speculative issue
One of the considerations mentioned by Sharia scholar argued that cryptocurrency is forbidden (haram), as it has a high price volatility. It is referring to the terms of speculation. Speculation is an external factor that has no concern for determining something like money and a valid currency. Prices are always based on supply and demand rules, as in all other assets including, gold, silver and fiat currencies as well.

The exchange rate of cryptocurrency as we know is more unstable than any fiat currency. Thus, it is not recommended to trade cryptocurrency. It is forbidden to make a
profit by dealing in the money of the same currency. However, cryptocurrency cannot be declared forbidden (haram) based on the fact of speculation experience. Even if this principle is valid and enforced, then trading of gold, silver, and foreign exchange will all be ruled as haram because they also experience the extreme levels of speculation.

The illegal use issue
As mentioned above, the cryptocurrency is usually identical with negative publicity. Many users of cryptocurrency exploit the feature for illegal purposes. Actually, the issue of illegal use is an external factor, and it does not directly affect the legal criterion in Islamic Law. Referring to Abu-Bakar (2018), the use of something lawful for unlawful purposes does not make it unlawful. For example, wine is prohibited (haram) in Islamic Law. But Islamic law does not prohibit people to eat grapes. Fiat currency, as well, can be used for illegal purposes but it does not make the fiat currency unlawful.

Risk and opportunities of cryptocurrency
From the explanation above, we can examine the risk and opportunities of cryptocurrency. As mentioned above, being invented by using cryptography technique and using distributed ledger has made cryptocurrency as a popular alternative as a medium of exchange due to its safety, transparency, and cost effectiveness. But its main feature cannot be separated from the activities of users who use cryptocurrency for their illegal transaction. Since the cryptocurrency is bypassing the central authority, it is not admitted as a legal tender. The following are some opportunities and risks of cryptocurrency:

(1) Opportunities:
• strengthening global financial efficiency, by reducing transaction and costs by facilitating peer-to-peer exchange;
• in the long term, the technologies have potential in deepening financial inclusion by offering secure and low-cost payment options; and
• the implications can affect financial market infrastructures for the secure, accurate and fast settlement transaction process.

(2) Risks:
• misused for illegal activities;
• risky for financial stability because it is not backed with any assets; and
• lack of consumer protection because there are no central authorities behind it.

Conclusions
From the foregoing discussion, the following are conclusions regarding the analysis of cryptocurrencies:

(1) There are seven requirements related to the nature of money, which are intrinsic value, divisible, homogeneus, durable, mobile, rare and stable value; cryptocurrency has the same characteristics as fiat currency that fulfills six of the seven requirements. Both of them do not have intrinsic value. Thus, in the terms nature of money, Bitcoin is acceptable as money.

(2) From a legal perspective, terms of currency are referred to unit of account and medium of exchange that are issued and dominated exclusively by monetary authorities (or central bank) and associated with the power of sovereignty wherein the value and the credibility of a country’s currency are linked with the country’s
ability to support the currency. In terms of the legal perspectives, cryptocurrency does not meet the criteria as currency.

(3) From an economic perspective, terms of currency should have the functions as a medium of exchange, an account unit, and a store of value. The cryptocurrency does not fully meet the three characteristic of successful currency due to high price volatility.

(4) From Sharia perspective, cryptocurrency can be considered as *mal* (property) due to desirability and storability, but it cannot be considered as *thamaniyyah* (monetary value), since it still needs the value of fiat currency to determine the value of cryptocurrency.

(5) The negative publicity, such as high price volatility and illegal use of cryptocurrency, is advisable to become an external factor that has no concern for determining whether it is prohibited or permissible by Islamic Law.

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Further reading
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Impacts of the monetary policy on the exchange rate: case study of Vietnam

Van Anh Pham
Department of Monetary Policy, State Bank of Vietnam, Hanoi, Vietnam and Crawford School of Public Policy, Australian National University, Canberra, Australia

Abstract

Purpose – The purpose of this paper is to evaluate and analyze impacts of the monetary policy (MP) – money aggregate and interest rate – on the exchange rate in Vietnam.
Design/methodology/approach – The study uses data over the period of 2008–2018 and applies the vector autoregression model, namely recursive restriction and sign restriction approaches.
Findings – The main empirical findings are as follows: a contraction of the money aggregate significantly leads to the real effective exchange rate (REER) depreciating and then appreciating; a tightening of the interest rate immediately causes the REER appreciating and then depreciating; and both the money aggregate and the interest rate strongly determine fluctuations of the REER.
Originality/value – The quantitative results imply that the MP affects the REER considerably.

Keywords Exchange rate, Vietnam, Monetary policy, VAR, Time series

Paper type Research paper

1. Introduction

It is likely that the exchange rate (RX) is a sensitive element, which significantly affects various social and economic aspects. Therefore, it plays an important role in the economies generally, and particularly for developing and integrating countries such as Vietnam. Integration stance bolsters the role of the RX as a “bridge” of internal and external economic activities. As the RX is a crucial factor, it is necessary to investigate shocks including monetary shocks on the RX. This could evaluate the fluctuation of the RX and then, predict its impact back to macroeconomics. Besides that, the State Bank of Vietnam (SBV) have changed the way to manage the RX since 2016. The RX mechanism now is more flexible, which goes up/down to reflect the market movement. Therefore, shocks including MP shocks could be more sensitive, evaluating impulse responses and variance decompositions of the RX to these shocks that is needed to stabilize the RX in particular and economy in general. The important role of the RX and the necessary evaluation of monetary shocks on the RX are the reasons why this research was carried out, in order to contribute to the existing literatures.

Besides that, the paper analyzes impacts of the MP on the RX in Vietnam based on two models and the data over the period of 2008–2018. It is far different from the existing studies in Vietnam. First, it focuses on impacts of the MP on the RX in which the RX is the sole

JEL Classification — C32, E52, F31

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The author is grateful to Professor Renee Fry-McKibbin, Professor Ippei Fujiwara, Associate Professor Tatsuyoshi Okimoto and Doctor Bao Nguyen for comments and suggestions that help significantly improve the paper.
objective of the analysis. Second, it uses both the monetary aggregate and the interest rate as proxy for the MP. The existing studies in Vietnam such as Le and Pfau (2009), Bui and Tran (2015), Le (2015) and Bach (2017) only provide research on the MP transmission regime through the RX channel. The main purpose of these studies is to analyze impacts of the MP on outputs of the economy such as the growth rate and the price level through the RX channel. This means that existing studies in Vietnam do not analyze the RX as the objective of research. Given this, the paper focuses on impacts of the MP on the RX in which the RX is the sole objective of analysis. In addition, since 1997 Vietnam has been operating the MP based on the broad money M2. However, the Law on the SBV in 2010 has caused a significant change in the MP, which requires the operation of the MP moving gradually from quantitative control (M2) to qualitative control (interest rate). It means that the interest rate plays an increasingly important role in addition to broad money M2. Therefore, the interest rate and the broad money M2 are both used as proxy for the MP in the paper.

The analysis of impacts of the MP on the RX in Vietnam is based on two models. The first model analyses impacts of money aggregate shocks on the RX, and the second model analyses impacts of interest rate shocks on the RX. The first model, which uses the recursive restriction method, shows that money aggregate shocks have a significant effect on the RX. This is consistent with Dornbusch's (1976) overshooting hypothesis. The other model analyses the reaction of the RX to interest rate shocks. RX puzzles appear when the recursive restriction method is applied. However, they disappear when the sign restriction method is used. This shows that interest rate shocks have a significant effect on the RX, and it is also consistent with Dornbusch's (1976) overshooting hypothesis. In short, results of both models reveal that the MP, including money aggregate and interest rate, affects the RX in Vietnam considerably.

The paper starts with the introduction, followed by Sections 2–7. Section 2 mentions the literature review. Section 3 presents the methodology and data in order to identify MP shocks. Section 4 explains the results of models; meanwhile, Section 5 checks robustness. Section 6 discusses policy implications, and Section 7 provides conclusion and future study.

2. Literature review
Dornbusch (1976) represents the RX overshooting hypothesis, which is well-known and is the central theory in existing international macroeconomics. According to it, the tightening MP causes the RX to decrease instantaneously (i.e. appreciation), followed by its gradual increase (i.e. depreciation). Empirical studies show controversial results, some support the overshooting hypothesis, whereas others do not. Studies by Sims (1992), Eichenbaum and Evans (1995), Peersman and Smets (2003), Favero and Marcellino (2004), Mojon and Peersman (2003) and Lindé (2003) are in favor of the overshooting hypothesis. However, other empirical studies reveal abnormal results such as the increase in the RX or the decrease in the RX in a prolonged period due to the tightening MP. Study by Grilli and Roubini (1995) showed the increase in the RX in case of the tightening MP. This phenomenon is known as “RX puzzles.” Additionally, the study by Cushman and Zha (1997) shows the decrease in the RX in a prolonged period in the case of the tightening MP. This phenomenon is known as “delayed overshooting or forward discount puzzle.”

The common approach used in the above-mentioned studies to estimate quantitatively impacts of the MP on the RX is vector autoregression model (VAR), which is initiated by Sims (1980). However, the VAR model also has a major weakness; it requires identifying simultaneous relationships among variables. Most of VAR studies use (zero) recursive contemporaneous restrictions on the relationship between the MP and the RX. This probably causes abnormal results regarding impulse responses of the RX to MP shocks (Bjornland, 2009). In studies which use (zero) recursive contemporaneous restrictions to evaluate macro-variable interactions, puzzles may appear (Roubini and Grilli, 1996; Cushman and Zha, 1997). They might be less apparent or disappear in the context of identifying structural VAR by (zero)
long-run restrictions or (zero) non-recursive contemporaneous restrictions as these methods allow contemporaneous relationships between the MP and the RX (Bjornland, 2009; Kim and Roubini, 2000). An alternative method to solve puzzles is sign restrictions, which is used by Faust (1998), Canova and De Nicolo (2002), Uhlig (2005) and Peersman (2005). Kim and Roubini (2000) argued that it is useful to apply (zero) non-recursive contemporaneous restrictions to identify MP shocks. According to (zero) recursive contemporaneous restrictions, in order to get impulse responses of the RX to MP shocks, the VAR ordering is required in which the RX is put after the MP. This means that the MP does not react contemporaneously to RX shocks. Kim and Roubini (2000) believed that it is not convincing for two reasons. First, in small open economies, the increase or decrease in the RX can have large influence on price levels. Therefore, it requires a quick adjustment in the MP to respond to RX shocks. Second, Roubini and Grilli (1996) and Sims (1992) suggested that the depreciation over the period when the tightening MP is applied could be explained as the Central Bank sets up the tightening MP when observing the depreciation.

Bjornland (2009) identified the VAR model by imposing (zero) long-run restrictions. She assumed that MP shocks do not influence the RX in the long run. However, they affect the RX in short run in a free manner. Therefore, impacts of the MP shocks on the RX in the short run would die out in the long run and the RX could return to the initial level. In the literature, this phenomenon is considered as a standard neutrality assumption that is used widely in MP studies (Obstfeld, 1985; Clarida and Galli, 1994).

Fisher and Huh (2016) stated that sign restrictions are preferred to recursive and non-recursive models as they could avoid the strong assumptions, which identify contemporaneous interactions among variables. Based on the sign restriction approach, Faust and Jogers (2003) did not find robust results for timing of RX peak under the tightening MP. Applying the sign restriction method, Scholl and Uhlig (2008) found robust evidence for RX delayed overshooting. Both studies identified only MP shocks in structural VAR and left other macro-variables’ shocks unidentified. This issue may occur in the context that some shocks are not identified in the system. Therefore, the sign assumption for MP shocks could be satisfied by other variables’ shocks. In other words, MP shocks in the system would not be uniquely identified. Fry and Pagan (2011) considered its problem as multiple shocks phenomenon. This raises a controversial discussion of whether or not the sign restriction model is efficient to identify “true” impulse responses of the RX to the MP shocks.

Fry and Pagan (2011) mentioned a method to generate “true” impulse responses in sign restrictions. To begin with, it is necessary to run a recursive model and standardize the estimated structural shocks. This gives an initial set of shocks characterized by uncorrelated property, zero mean and unit variance. After that, this first set of shocks would be re-combined to make another set of shocks. This second set of shocks is also characterized by uncorrelated property, zero mean and unit variance. There are two approaches used to re-combine shocks, namely Givens transformation and Householder transformation. Ouliaris and Pagan (2016) suggested another method to generate “true” impulse responses in sign restrictions. Following this approach, impulse response of macro-variables is judged against the sign assumptions. The method combines structural VAR with instrumental variables, thus for getting exact identification, the unidentified coefficients are assigned values. These values are generated randomly. Based on each set of these coefficient values, the structural VAR is investigated and the impulse response will be obtained.

3. Methodology and data

3.1 Methodology

Based on arguments of Eichenbaum and Evans (1995) as well as Christiano et al. (1999), the paper investigates impacts of the MP on the RX by two benchmark policy shocks, namely money aggregate and interest rate. A popular approach to estimate macro-economic interactions...
is the VAR (as in Sims 1980 among others). In VAR, Cholesky decomposition is used to orthogonalize independent shocks. It is understood that a variable reacts contemporaneously to shocks of variables that are placed ahead and does not respond contemporaneously to shocks of variables that are placed behind. Bernanke and Mihov (1998) stated that non-policy variables should be placed as the first place, followed by policy variables. Besides, Sims and Zha (1995) also argued that variable ordering depends on information delay assumption.

From above-mentioned arguments, two benchmark policy shocks that are evaluated in this paper are as follows.

3.1.1 Monetary policy shocks: money aggregate. Reduced form equation:

$$X_t = AX_{t-1} + e_t,$$

where $X_t$ is the real industrial production (IP), the price level (CPI), the money aggregate (M2), and the real effective exchange rate (REER) at time $t$, $A$ the coefficient matrices and $e_t$ the shock at time $t$.

Recursive restrictions (Model 1):

$$\begin{bmatrix}
e_{IP} 
e_{CPI} 
e_{M2} 
e_{REER}
\end{bmatrix} = \begin{bmatrix}
a_{11} & 0 & 0 & 0 
a_{21} & a_{22} & 0 & 0 
a_{31} & a_{32} & a_{33} & 0 
a_{41} & a_{42} & a_{43} & a_{44}
\end{bmatrix} \begin{bmatrix}
e_{IP} 
e_{CPI} 
e_{M2} 
e_{REER}
\end{bmatrix}.$$  \tag{1}

3.1.2 Monetary policy shocks: interest rate. Reduced form equation:

$$Y_t = BY_{t-1} + u_t,$$

where $Y_t$ is the real industrial production (IP), the price level (CPI), the OMO interest rate (IR), and the real effective exchange rate (REER) at time $t$, $B$ the coefficient matrices and $u_t$ the shocks at time $t$.

Recursive restrictions (Model 2):

$$\begin{bmatrix}
u_{IP} 
u_{CPI} 
u_{IR} 
u_{REER}
\end{bmatrix} = \begin{bmatrix}
b_{11} & 0 & 0 & 0 
b_{21} & b_{22} & 0 & 0 
b_{31} & b_{32} & b_{33} & 0 
b_{41} & b_{42} & b_{43} & b_{44}
\end{bmatrix} \begin{bmatrix}
u_{IP} 
u_{CPI} 
u_{IR} 
u_{REER}
\end{bmatrix}.$$  \tag{2}

3.1.3 Monetary policy shock identifications. In Model 1 and Model 2 above, MP shock identifications are divided into two blocks.

The first block describes the goods market. Kalyvitis and Skotida (2010) assumed that real activity is not affected contemporaneously by price level, monetary aggregate (Model 1) or interest rate (Model 2) and RX. The reason is that although inflation and finance shocks could influence the real activity, an economy cannot adjust contemporaneously its outputs due to inertia and adjustment costs. The second block describes the finance market. Kalyvitis and Skotida (2010) assumed that the Central Bank sets up the MP, namely money aggregate (Model 1) or interest rate (Model 2) based on the ongoing macro-economic situation. As a forward-looking asset price, the RX is put in the final place in VAR ordering and is affected contemporaneously by other variables’ shocks. In addition to these endogenous variables, Model 1 and Model 2 also take into account of the two more exogenous variables, including the world price of oil and Federal fund rate (Fedfund rate). Kim and Roubini (2000) argued that these exogenous factors should be included.
To sum up, both exogenous variables including oil price and Fedfund rate are placed prior to endogenous variables in Cholesky decomposition. Next orders are two endogenous variables describing the macro-domestic market: output and price level. Following this, other endogenous variables describing the monetary market such as money aggregate (Model 1) or interest rate (Model 2) are placed. The RX, which is put at last in VAR ordering, contemporaneously responds to all variables’ shocks in the system.

3.2 Data
Each model comprises two exogenous and four endogenous variables. The variables’ data are monthly data between M1:2008 and M5:2018 and are adjusted seasonally (except financial variables).

3.2.1 Oil price. In the paper, UK Brent oil price is proxy for the world price of oil and is derived from Federal Reserve Bank (FRB).

3.2.2 Foreign interest rate. The Federal fund rate that is extracted from FRB represents foreign MP shocks.

3.2.3 Real industrial output. Real industrial output is used as a variable in models for three reasons. First, as there are not monthly statistics on gross domestic product, the paper uses monthly industrial production data taken from Vietnam General Statistics Office (GSO) as an alternative variable. Second, it accounts for a significant proportion in total output and as such it represents total output in economic analysis. Finally, it has a close relationship with the RX.

3.2.4 Consumer price index. This is an indicator used to measure inflation in Vietnam. CPI data are extracted from GSO.

3.2.5 Monetary variables. In the paper, interest rate and broad money M2 are both used as MP variables, and these data are extracted from SBV and the International Monetary Fund (IMF). Regarding the interest rate, the paper uses the OMO interest rate rather than the base rate as a MP variable when evaluating the impact of the interest rate on the RX. The OMO interest rate is set up by SBV in open market operations when SBV trades securities with credit institutions. It fluctuates between the floor and ceiling interest rates and reflects monetary market movements, whereas the base rate is held almost constant and does not fluctuate in line with the monetary market.

3.2.6 Exchange rate. The SBV publishes daily the average interbank RX over the period of 2008–2015 and the central RX from 2016 onwards. Although they are the official RX, they are frequency fixed for a long period and does not really reflect economic movements. Therefore, instead of using the official RX, the paper uses the REER to evaluate impacts of the MP on the RX. The data to calculate REER are derived from IMF, GSO and SBV.

The formula to calculate REER is as follows:

$$\text{REER}_j = \prod_{i=1}^{N} \left( \frac{d_{ij} e_{ij}}{d_i} \right)^{W_i}$$

where $N=7$ are Vietnam’s trading partners including the United States, the Euro Union, China, Japan, Korea, Thailand and Singapore; $d_j$ is the CPI of Vietnam; $d_i$ is the CPI of each trading partner; $e_{ij}$ is the RX between Vietnam and each trading partner; and $W_j$ is the trade weight between Vietnam and each trading partner.

Therefore, REER < 100 means depreciation; REER = 100 means unchanged; and REER > 100 means appreciation.

4. Empirical estimations
4.1 Monetary policy shocks: money aggregate
4.1.1 Unit root test. The augmented Dickey–Fuller (ADF) unit root test is used to determine variable stationarity. ADF results show that only broad money M2 is stationary, whereas
other variables are non-stationary. The system then becomes non-stationary, the roots of system are greater than unit. After taking the natural logarithm of variables (except Fedfund rate), the roots of system now are less than unit, but still closer to unit. However, Sims et al. (1990) argued that VAR does not need to be stationary. It means that even if macro-variables are stationary or non-stationary, VAR could be still used to evaluate macro-economic interactions. As a consequence, it is possible to use the level of variables in VAR. In addition, Fujiwara (2003) stated that VAR should be investigated in level instead of taking the first difference. Although taking the first difference is one way to address non-stationarity, this method would throw away important information. Lutkepohl (2005) also confirmed that taking the first difference would eliminate the long-run relationships among variables, which is a great important issue to quantitative analysis. Based on these arguments, the paper takes natural logarithm and uses variable level (except Fedfund rate).

4.1.2 Lag length criteria. Based on criteria AIC, SC, HQ, lag length could be one or two. There are opposing views on how many lag length should be used. On one hand, the lag length is as small as possible because the number of observations is limited, increasing the lag length will make the degree of freedom decrease and then negatively influence the quality of the estimation. This explanation suggests choosing one lag length. On the other hand, Ivanov and Kilian (2005) stated that HQ is more suitable for quarterly data in a large sample size, SC is more suitable for quarterly data in a small sample size, and AIC is more suitable for monthly data. This argument is in favor of two lag lengths. Therefore, in order to decide which lag length is appropriate to the model, the paper runs and compares results between the model with one lag length and the model with two lag lengths. The empirical evidence in the paper shows that the model with one lag length gives more rational and reliable results. It is likely that the model includes broad money M2, which is the operating target of the existing MP as stipulated in the Law on the SBV. Therefore, impacts of broad money M2 on the economy might be quicker. This makes the lag length of system shorter. This is a reason why one lag length for the model would be the best choice.

4.1.3 Impulse responses. In the Cholesky triangle matrix, as the REER is behind the money aggregate, the change of the REER to money aggregate shocks occurs contemporaneously. As expected, the REER decreases immediately (i.e. depreciation) due to broad money M2 shocks, followed by a gradual increase (i.e. appreciation). The interval confidence lines mention that the impulse response of the REER to broad money M2 shocks is significant over 9 months. So if broad money M2 increases, the REER immediately falls out, and this is the peak of depreciation. After that, the REER increases gradually (Appendix 1).

To be more exact, the impulse response of the real effective exchange to money aggregate shocks is significant. In the first month following broad money M2 shocks, the impulse response of the REER is −0.48 percent, meaning that an increase of 1 percent in broad money M2 will cause the REER to decrease by 0.48 percent. Nine months following broad money M2 shocks, the impulse response of the REER is −0.20 percent. These empirical results show that the money aggregate shocks have a significant impact on the REER. They support Dornbusch’s (1976) overshooting hypothesis, the RX changes immediately due to MP shocks, followed by the gradual return toward its original level.

Regarding impulse responses of the real industrial production and the inflation to money aggregate shocks, empirical results of the paper show that though the real industrial production does not respond to MP shocks, the inflation reacts to MP shocks significantly over a 24-month period, refering to Vietnamese research on the MP transmission, in which authors use broad money M2 as proxy for MP shocks. Based on the SVAR approach with quarterly data from 1996 to 2005 and using nine variables, Le and Pfau (2009) found that the MP transmission through the RX channel is considerable. Their results show that: first, money aggregate shocks little impact the REER; second, REER shocks have significant impacts of the monetary policy.
effect on output; and third the relationship between money aggregate and inflation is less clear. Besides, based on the VAR method with quarterly date from 2000 to 2011 and using six variables, Bui and Tran (2015) showed that: first, tightening MP shocks cause output rising in short run, followed by decrease after two quarters, and second, they make price level declining after five quarters as well. Therefore, empirical results of the MP transmission are different as they depend on choosing variables, choosing time periods and choosing quantitative models. Compared to them, empirical results of the paper also are far different due to two reasons: First, the paper focuses on impacts of the broad money M2 shocks, so it includes the money aggregate M2 and excludes the interest rate in the model. Second, the paper focuses on impacts of broad money M2 shocks on the REER, in which the RX is the sole objective of the analysis.

4.1.4 Variance decompositions. The paper uses Cholesky variance over a 24-month period. According to Taylor (2000), it is essential to analyze variance decompositions to reinforce impacts of the MP on the REER, apart from impulse response results. If the impact of MP shocks on the REER is enormous, this implies a strong transmission from money aggregate fluctuations to the REER. However, if broad money M2 impacts negligibly on the variance of the REER, MP shocks are not an important factor to determine the change in the REER. Therefore, analyzing the variance decompositions of the REER is necessary.

The variance decomposition (Appendix 1) shows that among the factors affecting the REER, broad money M2 plays an important role to determine the variance of the REER. Meaning that Vietnam economy has a relatively significant transmission effect from the money aggregate shocks to the REER. Three months following broad money M2 shocks, nearly 10 percent of the REER variance is determined by the broad money M2. One year following broad money M2 shocks, nearly 12.4 percent of the REER variance is determined by the broad money M2. One year following MP shocks is the most significant transmission effect from the money aggregate shocks to the REER. In other words, it confirms the significant role of the MP to the RX.

4.2 Monetary policy shocks: interest rate

4.2.1 Exchange rate puzzle. In this model, two lag lengths gives more rational and reliable results as the model includes the OMO interest rate. This variable plays an increasingly important role in MP, but it still is not an operating target of the existing MP. Therefore, impacts of the OMO interest rate on the economy might be slower. This makes the lag length of system is longer. The paper uses two lag lengths to run impulse responses of the REER. However, empirical results are not expected (Appendix 2). When the OMO interest rate increases due to the tightening MP, the REER decreases (i.e. depreciation). In the literature, this phenomenon refers to the RX puzzle. Compared to other emerging countries, the RX puzzle also appears. Kohlscheen (2014) investigated impacts of the MP on the RX in three developing countries such as Brazil, Mexico and Chile. He finds that there is no empirical evidence to support for Dornbusch (1976) and UIP views that associate interest rate hikes with appreciations.

Regarding impulse responses of the real industrial production and the inflation to OMO interest rate shocks, empirical results of the paper show that though the inflation does not respond to MP shocks, the real industrial production reacts to MP shocks significantly over a 10-month period, from 2nd month to 11th month. Refering to Vietnamese research on the MP transmission, in which authors evaluate the interest rate channel, Le and Pfau (2009) found that the MP transmission through the interest rate channel is small. Their results show that: first, the real output little reacts to interest rate shocks; and second, the inflation increases slightly due to interest rate shocks, followed by decrease after first year. Besides, based on the SVAR method with monthly date from 1998 to 2016 and used four variables, Bach (2017) showed that: first, tightening MP shocks cause output decreasing; however, the impact is temporary and disappears after one year; and second, they make price level
increase slightly in first three months, followed by significant decrease in the next 14 months. Therefore, empirical results of the MP transmission are different. Compared to them, empirical results of the paper are also different due to two reasons: First, the paper focuses on impacts of the interest rate shocks, so it includes the interest rate and exclude the money aggregate M2 in the model. Second, the paper focus on impacts of interest rate shocks on the REER, in which the RX is the sole objective of the analysis.

4.2.2 Exchange rate puzzle explanations. There are several reasons why the impulse responses are puzzles. There are three approaches to address them: sign restrictions, (zero) long-run restrictions and (zero) non-recursive contemporaneous restrictions. The paper focuses on the former due to its advantages over the latter.

Kim and Roubini (2000) also argued that using a recursive model could lead to RX puzzles. Structural shocks are identified by VAR ordering. According to this ordering, in order to evaluate impulse responses of the RX to MP shocks, the latter has to be put ahead of the former. In other words, the interest rate could not react to RX shocks contemporaneously. This is not rational for two reasons. First, small open economies might increase the interest rate very quickly to respond to the RX shocks if these economies are concerned about inflationary pressures due to the depreciation. Secondly, Sims (1992) and Roubini and Grilli (1996) implied that the RX increase in the context of the interest rate increase may be explained as tightening MP is set up when the depreciation is observed. Thus, it is not useful to identify structural shocks that do not allow simultaneous effects between the interest rate and the RX. Bjornland and Halvorsen (2014) also mentioned that when identifying the contemporaneously structural shocks between the RX and the interest rate, studies on traditional VAR usually use recursive restrictions. However, this assumption is not always true. As it prevents the monetary authorities from combining all current information when setting up the interest rate, this is a reason why RX puzzles could appear in the recursive VAR model.

RX puzzles might be less apparent or disappear when identifying structural VAR by (zero) long-run restrictions or (zero) non-recursive contemporaneous restrictions as these methods allow contemporaneous relationships between the MP and the RX (Bjornland 2009, Kim and Roubini, 2000). An alternative method to solve puzzles is sign restrictions (Faust, 1998, Canova and De Nicolo, 2002; Uhlig, 2005; Peersman, 2005). Fisher and Huh (2016) stated that although sign restrictions have a major limitation about multiple shocks that Fry and Pagan (2011) pointed out, they are still more popular than recursive and non-recursive models. The reason is that they avoid strong assumptions in recursive or non-recursive approaches, which require the identification of structural shocks. In addition, at that time there are some approaches to eliminate the limitation of sign restrictions. Due to these above-mentioned arguments, the paper uses sign restrictions in order to address RX puzzle.

4.2.3 Exchange rate puzzle resolution: sign restrictions. Based on arguments of Fisher and Huh (2016), the signs of structural shocks for aggregate supply (AS), aggregate demand (AD), monetary policy (MP) and exchange rate (RX) could be restricted as follows (Table I).

The sign restrictions for AS, AD and MP are standard in studies, for instance, Farrant and Peersman (2006), Finlay and Jaaskela (2014), Jaaskela and Jennings. The lag length for this system is two lags, based on AIC criteria. All shocks, excepting for MP shocks to the

<table>
<thead>
<tr>
<th>Shocks/Variables</th>
<th>Industrial production</th>
<th>Consumer price index</th>
<th>OMO interest rate</th>
<th>Real effective exchange rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS</td>
<td>+</td>
<td>−</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>AD</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>MP</td>
<td>−</td>
<td>−</td>
<td>+</td>
<td>?</td>
</tr>
<tr>
<td>RX</td>
<td>−</td>
<td>−</td>
<td>−</td>
<td>+</td>
</tr>
</tbody>
</table>

Table I. Sign restrictions
RX, are imposed signs. Therefore, sign restrictions remove the problem of multiple shocks and reveal unique structural shocks for the model.

In order to identify the impulse response of the REER to OMO interest rate shocks, the paper does not put any restrictions on the sign of the REER to MP shocks. The paper then would know whether sign restrictions on other macro-economic variables are sufficient to address RX puzzle and give appropriate impulse response of the REER to MP shocks.

In order to identify and distinguish the MP shock from other macro-economic variable shocks, it is essential to restrict signs on other variables to it. For instance, the domestic currency does not depreciate to respond to the REER shocks; therefore, the paper imposes the sign restriction that the OMO interest rate could not rise. The paper then restricts the direction of MP response (i.e. OMO interest rate response) to REER shocks. This separates and distinguishes the MP shocks from the REER shocks.

Impacts of the OMO interest rate to the REER now satisfy the expectation (Appendix 2). When the OMO interest rate increases due to the tightening MP, the REER increases (i.e. appreciation). Specifically, as a result of MP shocks, the impulse response of the REER is 0.19 percent, meaning that an increase of 1 percent in OMO interest rate will cause the REER to increase by 0.19 percent. This is also the peak of appreciation, after that, the REER gradually decreases (i.e. depreciation). This result supports Dornbusch’s (1976) overshooting hypothesis, the RX changes immediately after MP shocks, followed by the return toward its original level. In other words, the RX puzzle that appear in above-said recursive restrictions could disappear in case of using sign restrictions.

Regarding variance decompositions, the results show that among the factors affecting the REER, the OMO interest rate plays an important role to determine the variance of the REER (Appendix 2). This means Vietnam economy has a relatively significant transmission effect from the OMO interest rate to the REER. In first month following MP shocks, 9.68 percent of the REER variance is determined by the OMO interest rate. Six months following MP shocks, 10.26 percent of the REER variance is determined by the OMO interest rate. After that time, 10.25 percent of the REER variance is determined by the OMO interest rate. This transmission effect remains for consecutive times. In general, it confirms the significant role of the MP to the RX.

To sum up, using the sign restriction approach could eliminate the RX puzzle in impulse response of the REER to OMO interest rate shocks. The system is consistent with Dornbusch’s (1976) overshooting hypothesis. Besides, the paper also gets variance decomposition of the REER, showing that the OMO interest rate plays an important role in order to determine the REER fluctuation.

5. Robustness of results
Regarding the Model 1 that considers the monetary aggregate M2 as proxy for the MP, the paper now changes variables in this model. Instead of using the broad money M2 and the REER, the paper uses the narrow money M1 and the nominal effective RX to check robustness. One lag for (zero) recursive contemporaneous restrictions is used to evaluate the impulse response of the nominal effective RX to narrow money M1 shocks in the robustness model. According to results of impulse response of the nominal effective RX to narrow money M1 shocks, the paper shows the “delayed overshooting” RX. It means that following narrow money M1 shocks, the nominal effective RX decreases (i.e. depreciation); however, it takes some months in order to reach the peak, followed by the increase in the nominal effective RX (i.e. appreciation).

In this impulse response, the interval confidence mentions that results are significant over the period of the 3rd month to the 8th month. Three months following narrow money M1 shocks, the impulse response of the nominal effective RX is −0.43 percent, meaning that an increase of 1 percent in the narrow money M1 will cause the nominal effective RX to
decrease by 0.43 percent. Eight months following narrow money M1 shocks, the impulse response of the nominal effective RX is −0.49 percent. The results from variance decomposition of the nominal effective RX also show that the narrow money M1 is the main factor to determine variance of the nominal effective RX; however, its absolute value is less than that of the baseline model.

Regarding Model 2 that considers the OMO interest rate as proxy for the MP, the paper now changes variables in this model. Instead of using the OMO interest rate and the REER, the paper uses the base interest rate and the nominal effective RX to check robustness. In this model, two lags are used to estimate the impulse response of the nominal effective RX to base interest rate shocks. By using (zero) recursive contemporaneous restrictions, RX puzzles also appears in the impulse response of the nominal effective RX to base interest rate shocks. When the base interest rate increases due to the tightening MP, the nominal effective RX decreases (i.e. depreciation).

Because of the “RX puzzle” apperance, the paper also uses sign restrictions for the model. Two lag lengths are used and signs restrictions are similar to the baseline model. Using the sign restriction approach, the RX puzzle still appears. This is not consistent with Dornbusch’s (1976) overshooting hypothesis. Although the paper uses the sign restriction approach to resolve RX puzzle, it fails to address this puzzle. Empirical results of the paper still appear RX puzzle. This might be explained by the base interest rate property. As the paper mentions in the previous part, the base interest rate seems a reference interest rate for credit institutions to set up their interest rates. However, it is almost hold constant and does not move in line with the monetary market. This means that it does not normally react to the monetary market, in particular, and the economy, in general. This might be reason why although the paper uses different methods to estimate impulse responses of the nominal effective RX to base interest rate shocks, it cannot address the RX puzzle.

6. Policy implications

Regarding to the MP, Vietnam’s MP is multi-target framework based on quantitative control (M2). This is a reason why broad money shocks significantly affect the RX as showed in paper’s results. However, volume control policy is consistent with the early stages of Vietnam economy transformation. This now appears limitations in the new context where Vietnam deeply and widely integrates into the world. Therefore, Law on the SBV represents significant change in the MP, thus gradually transforming the MP from quantitative control (M2) to qualitative control (interest rate). Nevertheless, what interest rate could be chosen as a new anchor for MP is key matter. From paper’s results, it is likely that the OMO interest rate would be more efficient than the base interest rate. The OMO interest rate has a significant impact on the RX; it then influences whole economy through the RX transmission mechanism. Consequently, this interest rate would monitor and orient macroeconomics.

Moving onto the RX, paper’s results related to impulse responses and decompositions of the RX indicate that this factor is significantly affected by MP shocks. Therefore, the management of the MP needs be careful and takes into account of the RX effects. As the RX is a sensitive element, if it has to absorb negative shocks, it thus might influence economy negatively. Additionally, when the MP absolutely swifts to qualitative control (interest rate), the RX should to be more flexible under capital transaction liberation (impossible trinity). Since 2008, the RX mechanism is gradually flexible. The central RX may fluctuate in two directions (upward or downward) instead of going in only one direction as before, and this reflects market movements as well. However, in order to guarantee the stability of the flexible RX, it is essential to enhance the development of the derivatives market, hedge the RX risks for credit institutions and enterprises, and increase liquidity for financial market.
7. Conclusion
The study evaluates empirically impacts of MP shocks on the RX in Vietnam over the period 2008–2018. The research focuses on three matters: whether or not effects of MP shocks on the RX in Vietnam are consistent with Dornbusch theory; how significant the impulsive response of the RX to MP shocks is; and how do MP shocks contribute to fluctuations in the RX. To investigate these issues, the paper uses Vector Autoregression to build up two specific models. The (zero) recursive contemporaneous restrictions are applied in the first model to quantify effects of the broad money M2 on the REER. The (zero) recursive contemporaneous restrictions and sign restrictions are applied in the second model to quantify effects of the OMO interest rate on the REER.

The empirical evidence of the paper suggests that in the first model, the REER decreases (i.e. depreciation) as a result of increase in the broad money M2, and then followed by its gradual increase (i.e. appreciation). The result is in line with Dornbusch’s (1976) overshooting hypothesis. In addition, the variance analysis suggests that broad money M2 plays an important role in fluctuations of the REER. Therefore, based on impulse response and variance decomposition findings, it can be seen that money aggregate shocks have a significant impact on the REER.

In the second model, results regarding the impulse response of the REER to OMO interest rate shocks reveal RX puzzles in case of using recursive restrictions. However, empirical evidence from the sign restriction approach reveals the disappearance of RX puzzle. Specifically, when the OMO interest rate increases due to the tightening MP, the REER increases (i.e. appreciation), followed by its decrease (i.e. depreciation). This result is also consistent with Dornbusch’s (1976) overshooting hypothesis. Moreover, based on results regarding variance decompositions, it can be realized that the OMO interest rate greatly contributes to fluctuations in the REER. This shows a relatively significant transmission effect from OMO interest rate shocks to the REER.

7.1 Future work
The paper focuses only on sign restrictions to address RX puzzles. In the next paper, the author will focus on two other methods including (zero) long-run restrictions and (zero) non-recursive contemporaneous restrictions to deal with these puzzles. In addition, in the next study, the author will compare three methods to resolve RX puzzles to have better assessments on impacts of the MP on the RX in Vietnam.

References


Further reading


Figure A1. Impulse responses of Model 1
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**Table AI.** Variance decomposition of LREER
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Impulse responses of Model 2 (recursive approach)
Figure A3. Impulse responses of Model 2 (sign restriction approach)
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Governance quality, foreign direct investment, and entrepreneurship in emerging markets

Nam Hoai Tran and Chi Dat Le
School of Finance, University of Economics Ho Chi Minh City, Ho Chi Minh City, Vietnam

Abstract

Purpose – The purpose of this paper is to thoroughly investigate the interplay between institutions, foreign direct investment (FDI) and entrepreneurship in the context of emerging markets (EMs).

Design/methodology/approach – The authors argue that the impact of FDI on entrepreneurial activity depends on different natures of capital flow and entrepreneurial motivation and relates to the quality of institutional environment. First, the roles of inward and outward FDI are examined in connection with the new firm creation by opportunity- and necessity-motivated entrepreneurs. Second, the integrated influences of (inward/outward) FDI and governance quality (GQ) on (opportunity/necessity) entrepreneurship are tested. This nexus of relationships is analyzed through segmented regressions using the GEM data of 39 EMs over the 2004–2015 period.

Findings – It is evidenced that the quality of governance infrastructure affects the relationship between FDI and entrepreneurship: in emerging countries with low GQ, opportunity entrepreneurship is stimulated by inward FDI and diminished by outward FDI; and in emerging countries with high GQ, necessity entrepreneurship is discouraged by inward FDI and promoted by outward FDI.

Practical implications – This research has implications for the institutional context-based execution of public policy in emerging economies. As the entrepreneurial effects of inward and outward FDI are pronounced differently under the two types of entrepreneurship and the two extremes of GQ, public policy makers who recognize the catalytic role of FDI in domestic business development should take the distinct institutional context of their country into consideration.

Originality/value – The paper contributes to the extant literature on international entrepreneurship in emerging economies by making a breakdown on the roles played by different types of FDI in the entrepreneurial activity, analyzing the mediating effects of GQ on the relationship between inward/outward FDI and entrepreneurship, and interpreting the capital and institutional determinants of entrepreneurship in terms of entrepreneurial motivations by opportunity and necessity.

Keywords Entrepreneurship, Institutions, Emerging markets, Foreign direct investment, Governance quality, Necessity entrepreneurship, Opportunity entrepreneurship

Paper type Research paper

1. Introduction

Modern theories of entrepreneurship from the perspective of economics postulate that institutional conditions can facilitate or hinder entrepreneurial activities which drive a country’s economy (Baumol, 1990; Acs et al., 2008, 2009, 2013). Consequently, variations in the nature and structure of entrepreneurship – for instance, differences in entrepreneurial motivations by opportunity and necessity, should be witnessed across countries (Acs et al., 2008; Stenholm et al., 2013). Despite a large number of studies surveying the relationship between institutions and entrepreneurship, a consensus has been not reached among empirical findings, especially, in emerging markets (EMs) (see Herrera-Echeverri et al., 2014).
Fuentelsaz et al. (2015) show that different formal institutions play distinctive roles in opportunity and necessity entrepreneurship across a large sample of 63 selected countries. In relation to the specific influence of governance institutions on entrepreneurship, typical studies probing into distinct institutional infrastructures in EMs (e.g. Tracey and Phillips, 2011; Herrera-Echeverri et al., 2014) have not drawn a distinction between, for example, opportunity- and necessity-motivated behaviors of entrepreneurship.

In the context of business internationalization, spillover theories of entrepreneurship aim to explain the stimulating effect of foreign direct investment (FDI) on indigenous business development (Markusen and Venables, 1999; Görg and Strobl, 2002; Acs et al., 2009, 2012; Ayyagari and Kosová, 2010). Nevertheless, FDI in actual fact creates both positive and negative externalities in entrepreneurial activity. While the positive FDI-based spillover of entrepreneurship has been well evidenced in emerging, transitional economies (e.g. Ayyagari and Kosová, 2010; Anwar and Sun, 2012; Apostolov, 2017), evidence of negative or neutral spillovers, at least in the short run, has been found in both developing and developed economies (e.g. De Backer and Sleuwaegen, 2003; Albulescu and Tămașilă, 2014, 2016; Apostolov, 2017; Danakol et al., 2017). The nature of spillover effect becomes much more ambiguous when considering FDI characteristics, such as different sources and directions of FDI, and diffusion mechanisms, such as horizontal/vertical spillovers and backward/forward linkages (see Javorcik, 2004; Ayyagari and Kosová, 2010; Anwar and Sun, 2012; Albulescu and Tămașilă, 2014, 2016; Danakol et al., 2017). Albulescu and Tămașilă (2014) show that inward and outward flows of FDI exert opposite spillover impacts on different types of entrepreneurship, namely, opportunity entrepreneurial activity (OEA) and necessity entrepreneurial activity (NEA). Moreover, it is essential to realize that the FDI-based spillover of entrepreneurship becomes complex in connection with differences in institutional framework (Acs et al., 2008, 2009; Meyer and Sinani, 2009; Danakol et al., 2017). Albeit several attempts to deal thoroughly with this nexus in EMs, mainly with regard to the inward or net terms of FDI (typically, e.g. Herrera-Echeverri et al., 2014), international entrepreneurship studies have paid scant attention to co-existent (institutional quality-integrated) effects of different components, including inflows and outflows, of FDI on entrepreneurial activities in this area.

Addressing above-mentioned shortfalls in entrepreneurship research in EMs, this study delves into the linkages between institutions, FDI and entrepreneurship in an as-large-as-possible sample of EMs through a consolidated systematic approach using the Global Entrepreneurship Monitor (GEM) data. Particularly, our research models consider the differences between different types of entrepreneurship (i.e. OEA and NEA), and between different types of FDI (i.e. inward FDI and outward FDI) as well as the impacting nexus among these variables. Our study additionally digs deeper into the entrepreneurship effects of institutional environment by looking at the different levels of national governance quality (GQ). By that way, the study has three key contributions to the entrepreneurship literature in the context of EMs. First, we distinguish different roles played by inward FDI and outward FDI in entrepreneurship (further, by way of an institutional contextualized approach). Second, we explore the moderating effects of GQ on the relationship between inward/outward FDI and entrepreneurship. Finally, we investigate the capital and institutional determinants of entrepreneurship in terms of OEA and NEA.

In particular, we find that the quality of national governance infrastructure plays its role in the entrepreneurial activity through both inward and outward FDI channels. The creation of new firms by opportunity-motivated entrepreneurs (i.e. OEA) in EMs with the lowest GQ is significantly supported by inward FDI whose positive spillover effects on domestic business environment encouragingly pull individuals into self-employment activities realized to help improve their income and increase their independence. At the same time, an increase in outward FDI in these markets tends to erode OEA. This may be a result of a decline in the individuals’ realization of good business opportunities created.
The patterns are reversed in the case of NEA, but only in EMs with the highest GQ. While NEAs in these well-governed economies are discouraged by an increase in inward FDI, they proliferate with the FDI outflow. Possible explanations for these could be borrowed from the ideas of negative FDI spillovers. Increased domestic competition and technological barriers in these advanced EMs may demolish entrepreneurial motivations of indigenous individuals. On the other side, an increase of outward FDI in these markets, implying that capital from home-based multinational corporations leaves home in order to explore overseas investment opportunities, can be a manifestation of reduced opportunities for domestic job creation. In this case, the emergence of necessity-motivated entrepreneurs may be a consequence of attempts at business formation and development made by individuals who lose their jobs and have no other options for work.

In summary, our above contributions to the EMs entrepreneurship literature can be regarded as a complete analytical framework for the nexus between governance infrastructure, FDI, and entrepreneurship. Our approach to decomposing FDI and entrepreneurship into direction-specified and motivation-specified compositions, respectively, helps clarify the essence of these connections and offer compelling explanations for economic relationships among them.

The remainder of the paper is organized as follows. Section 2 presents a literature review on the associations of entrepreneurship with institutions, including governance institutions, and with FDI and develops research hypotheses. Section 3 justifies the selection of research sample and describes the data. Section 4 presents the research methodology. Section 5 reports and discusses the empirical results. Section 6 concludes.

2. Literature review

2.1 Institutions, GQ and entrepreneurship

In this study, we refer to "institutions" as the term defined in institutional economics (North, 1990, 1991, 2005). This institutional framework defines institutions as "the rules of the game in a society" or "humanly devised constraints that shape human interactions" (North, 1990, p. 3). Our study relates to two groups of institutions: formal institutions and governance institutions. Formal institutions are legal rules set up as governmental solutions to societal problems. Precisely, they are structures of systematized and explicit rules and standards that shape interactions among individuals in a society (North, 1990).

Governance institutions which revolve around contractual relations are associated with the function of defining contract laws and enforcing contracts. Governance institutions can be regarded as (national) GQ. According to Kaufmann et al. (2011), a country’s GQ is reflected by its voice and accounting, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law and control of corruption. Herrera-Echeverri et al. (2014) refer to these as six dimensions of institutional quality[1]. In EMs characterized by the high degree of institutional uncertainty, institutional uncertainty can serve as a barrier or an opportunity to entrepreneurship (Tracey and Phillips, 2011). As institutional environment is strongly believed to affect individuals’ motivation to create businesses, our discussion focuses on the association of governance institutions with entrepreneurship. Entrepreneurial activity is also referred to by its behavioral types[2].

Evidence of the influence of institutional quality on entrepreneurial activity has been well established. Herrera-Echeverri et al. (2014) find a significantly positive association of new firm formation with institutional strength in all three groups of countries, namely, low-income, high-income and emerging countries. The detrimental impact of weak governance institutions on entrepreneurship may be typical in EMs like Russia, whose state has a serious level of corruption and a weak enforcement of property rights (Aidis et al., 2008). Studying countries across the world, Aidis et al. (2012) and Estrin et al. (2013) find institutional deficiencies in terms of high corruption, weak property protection rights and
large government size are, to some extent, inversely associated with entrepreneurial aspirations and entry. In general, studies tend to endorse the notion that a higher degree of national GQ is related to a higher level (rate) of domestic entrepreneurial activity.

The nature and structure of entrepreneurship should also matter in association with institutional dimensions. In support of Baumol’s (1990) theory, Sobel (2008) finds that better institutional quality stimulates productive entrepreneurship—which, in turn, creates income and wealth—and discourages unproductive entrepreneurship. Based on Scott’s (1995) “institutional pillars”—regulative, cognitive and normative institutions—Stenholm et al. (2013) show that the regulatory dimension of institutional arrangements (including property rights and business freedom) is positively associated with the rate of entrepreneurial activity (i.e. the entry density), and not related with the type of entrepreneurial activity (i.e. entrepreneurial aspirations). Based on Scott’s (1995) “institutional pillars”—regulative, cognitive and normative institutions—Stenholm et al. (2013) show that the regulatory dimension of institutional arrangements (including property rights and business freedom) is positively associated with the rate of entrepreneurial activity (i.e. the entry density), and not related with the type of entrepreneurial activity (i.e. entrepreneurial aspirations). Broadly, Stenholm et al. (2013) highlight the importance of considering other categorizations of entrepreneurial activity, including OEA vs NEA. Using the GEM data, Fueltelsaz et al. (2015) and Angulo-Guerrero et al. (2017) advocate that more property rights protection encourages OEA—which are believed to contribute much more to economic growth—and discourages NEA.

2.2 FDI and entrepreneurship

2.2.1 Positive FDI-based spillovers of entrepreneurship. It is well recognized in the literature that benefits domestic business development by bringing in the technological know-how of products and services that may be absorbed or imitated by local firms. This is regarded as knowledge spillover or demonstration effect (Markusen and Venables, 1999). As regards entrepreneurship, the positive role of FDI has evidenced in both developed and developing countries (e.g. Görg and Strobl, 2002; Ayyagari and Kosovà, 2010; Anwar and Sun, 2012; Apostolov, 2017).

Other entrepreneurship-impacting channels of FDI relates to human capital spillovers (Meyer, 2004; Acs et al., 2007, 2009, 2013). For example, some well-trained employees in terms of management and business practices could leave MNEs to initiate their own local businesses. In a broader view, inward FDI can play its role as a means of providing knowledge, technology and skills for knowledge-based (i.e. opportunity) entrepreneurial activities (Acs et al., 2013). This argument is supported by empirical evidence from developed and emerging economies (Acs et al., 2007, 2012).

Lastly, it is necessary to realize that positive FDI-based spillovers of entrepreneurship can be observed in the context of export business. For example, De Clercq et al. (2007) suggest that both inward and outward FDI positively affect entrepreneurs’ export orientation. They urge that domestic entrepreneurs can also take advantage of decent transport infrastructure created by and new knowledge about specific foreign markets acquired from the foreign MNEs to become international suppliers or exporters. On the other hand, higher productivity of the host country’s economy brought out by outward FDI may force entrepreneurs to deliver products with higher overall quality and thus increase their probabilities of success in international markets.

2.2.2 Negative FDI-based spillovers of entrepreneurship. Domestic entrepreneurial activities can be impeded by the international market expansion of MNEs. Indeed, the market power of MNEs could displace native entrepreneurs as a consequence of increased competition in the product and factor markets (Grossman, 1984; Markusen and Venables, 1999; Görg and Strobl, 2002; De Backer and Sleuwaegen, 2003). In particular, the market competition effects are reflected in lower product prices and/or higher average labor costs which can crowd out inefficient domestic firms and depress potential entrepreneurs to start their new businesses. There are several empirical studies that detect such negative FDI-based spillovers of entrepreneurship, at least in the short run, in both developing and
developed economies (e.g. De Backer and Sleuwaegen, 2003; Albulescu and Tâmâșilă, 2014, 2016; Apostolov, 2017; Danakol et al., 2017). It should be noted that other studies relate negative spillovers of entrepreneurship to a decrease in market competition due to entry barriers created by MNEs (e.g. Ayyagari and Kosová, 2010). The nature of FDI can also matter in this case because, for instance, the product-market competition can affect the entry mode of MNEs (Caves, 1996). For instance, Danakol et al. (2017) recently find that (inward) FDI via cross-border M&A hinders indigenous entrepreneurial activities across the world, which is exacerbated in developed countries.

Another channel via which FDI spills a negative impact over entrepreneurship is the labor market. Acs et al. (2008) argue that an increase in capital stock (e.g. through inward FDI) should bring individuals back to wage work, and a negative relation between FDI and entrepreneurial activity could be observed. Grossman (1984) theoretically implies the crowding-out effect that relates to changes in relative income, which can be exacerbated if there exist differences in worker skills and/or gaps in technology (De Backer and Sleuwaegen, 2003). The crowding-out effect has been found in developed countries (e.g. De Backer and Sleuwaegen, 2003) and especially manifested in developing countries (e.g. Apostolov, 2017).

2.3 GQ, FDI and entrepreneurship

In summary, FDI can spill over entrepreneurship in both positive and negative ways. These spillovers may even be different via horizontal and vertical channels and/or backward and forward linkages and across industries (Javorcik, 2004; Ayyagari and Kosová, 2010; Anwar and Sun, 2012), while negative spillovers are often short-run effects and moderated or even reversed in the long-run (De Backer and Sleuwaegen, 2003). The type (nature) of FDI also matters because it can lead to divergent paths of the spillovers (of different types of entrepreneurship) (Acs et al., 2008, 2012; Albulescu and Tâmâșilă, 2014, 2016; Danakol et al., 2017). Among the most typical studies of the decomposing approach, Albulescu and Tâmâșilă (2016) differentiate the effects between OEA and NEA and between inward and outward FDI. They find the European context interesting that both inward and outward FDI increase domestic NEA and reduce OEA. Demanding for the differentiation approach, claimed by Albulescu and Tâmâșilă (2016), is visible as they find no empirical effect of FDI on overall entrepreneurial activity.

Moreover, the connection between FDI and entrepreneurship (with different types of both) may be more complicated because it may be mediated by institutional factors, public policy and economic development (Acs et al., 2008, 2009; Meyer and Sinani, 2009; Danakol et al., 2017). Herrera-Echeverri et al.’s (2014) approach on such a nexus in EMs contends that entrepreneurial activity is positively associated with the product of FDI (in net terms) and institutional quality (institutions of governance). Their evidence shows that the spillover impact of FDI on new business creation is significant in EMs with higher quality of institutions and largest in frontier EMs. Our study, which distinguishes between the inflow and outflow of FDI, would shed another light on this perspective of the literature.

2.4 Hypothesis development

Figure 1 illustrates the potential relationships between any two concepts relating to entrepreneurship and institutional/investment factors. Based on the theoretical arguments discussed so far, we develop three main research hypotheses as follows:

H1. Entrepreneurship in EMs is associated with institutional environment (i.e. national GQ in particular).

H2. Entrepreneurship in EMs is contingent upon the direction of FDI (i.e. inward FDI and outward FDI).
3. Sampling and data

3.1 Why emerging markets?
Traditionally, advanced economies with the prominent role played by European countries are regarded as the major source and destination of FDI (Carril-Caccia and Pavlova, 2018). It may be one of the reasons the international research on structural determinants of entrepreneurship has paid much attention to the European landscape (e.g. Albulescu and Tămășilă, 2014, 2016; Wach and Wojciechowski, 2016; Rusu and Roman, 2017). However, these studies either ignore or underestimate the importance of institutional quality. EMs which are playing an increasingly important role in the global economy are considered as an excellent ground for scholarly researchers digging deeper into the entrepreneurship effects of FDI and institutions as well as for the theoretical development of entrepreneurship. At a first glance, we justify broadening the research landscape of entrepreneurship to EMs, which is not indicated by Herrera-Echeverri et al. (2014).

There are some reasons why the expansion of the study sample from advanced economies such as European countries to emerging countries is critical and necessary. First, it is far from sufficient to understand the essentials of entrepreneurial activity in EMs. While the literature on empirical determinants of European entrepreneurship has been well established, it could not be generalized to EMs. Indeed, EMs provide distinctive and dynamic settings for the international entrepreneurship research because this area has diversified characteristics in terms of different historical backgrounds, cultural norms, institutional heritages, and political processes (Kiss et al., 2012). Second, entrepreneurial motivations coupled with the recent fast growth of EMs should get heavier weights on capital and institutional factors. In fact, EMs are characterized by a higher degree of institutional uncertainty which could lead to more amplified effects on – both detrimental and beneficial to – entrepreneurship (Tracey and Phillips, 2011). As regards the capital factor, the global FDI landscape in the twenty-first century has witnessed a reverse in the dominant role as both the source and destination of FDI from advanced economies including European countries to EMs. Carril-Caccia and Pavlova (2018), for example, draw an illustrative comparison: By 2014, EM economies represented 41 and 56 percent of global...
outward FDI and inward FDI, respectively, while the Europe's share of outward FDI and inward FDI had shrunk to only 15 and 18 percent, respectively. Finally, the prior studies on the European context opt to examine entrepreneurship determinants separately and incomprehensively. Our study tries to take the nexus of entrepreneurship effects into consideration in a single framework.

3.2 Data and sample selection

We use the GEM data for studying on the entrepreneurial activity in EMs. Our sample consists of 39 EMs whose entrepreneurship data are available in the GEM data over the period of 2004–2015. Table I shows all selected markets which are divided into three groups of EMs: advanced emerging, secondary emerging and frontier emerging (based on the Financial Times and the London Stock Exchange classification).

Data for institutional variables come from two sources. Measures of formal institutions (i.e. business freedom, fiscal freedom and trade freedom) are from the Index of Economic Freedom of the Heritage Foundation. Components of governance institutions (i.e. dimensions of institutional quality) are sourced from the Worldwide Governance Indicators of the World Bank. The six dimensions of institutional quality have values ranging from −2.5 to 2.5. Similar to Herrera-Echeverri et al. (2014), we take the arithmetic average of these six factors in each year to make a new variable measuring the strength of governance. We rescale the new variable on the value range from 0 to 100.

Similar to Albulescu and Tămasilă (2014), data for inward and outward FDI, GDP growth rate and GDP per capita are collected from the United Nations Conference on Trade and Development statistics. Entrepreneurial control variables, fear of failure and entrepreneurial intentions, are extracted from the same GEM data, whereas macroeconomic control variables, excluding GDP growth rate and GDP per capita, are from the World Development Indicators of the World Bank. For more details, the definitions and sources for all variables are described in Table AI.

4. Methodology

We establish empirical models based on the panel data approach in order to test $H_1$ and $H_2$. Fixed effects (FE) and random effects (RE) regressions are commonly employed to control

<table>
<thead>
<tr>
<th>Advanced emerging</th>
<th>Secondary emerging</th>
<th>Frontier emerging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>Chile</td>
<td>Argentina</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>China</td>
<td>Bangladesh</td>
</tr>
<tr>
<td>Hungary</td>
<td>Colombia</td>
<td>Botswana</td>
</tr>
<tr>
<td>Malaysia</td>
<td>Egypt</td>
<td>Bulgaria</td>
</tr>
<tr>
<td>Mexico</td>
<td>India</td>
<td>Croatia</td>
</tr>
<tr>
<td>Poland</td>
<td>Indonesia</td>
<td>Estonia</td>
</tr>
<tr>
<td>South Africa</td>
<td>Morocco</td>
<td>Ghana</td>
</tr>
<tr>
<td>Thailand</td>
<td>Pakistan</td>
<td>Jordan</td>
</tr>
<tr>
<td>Turkey</td>
<td>Peru</td>
<td>Lithuania</td>
</tr>
<tr>
<td>The Philippines</td>
<td>Russia</td>
<td>Macedonia</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td></td>
<td>Nigeria</td>
</tr>
</tbody>
</table>

Table I. Sampled emerging markets
unobserved heterogeneity. We use the Hausman specification test to determine whether the FE model (1) or RE model (2) is appropriate for analytical inference:

\[ \text{Entre}_{it} = \beta_1 F_{I t} + \beta_2 G_{ov t} + \beta_3 F_{DI t} + \beta_4 Z_{it} + \alpha_i + \epsilon_{it}, \quad (1) \]

\[ \text{Entre}_{it} = \beta_1 F_{I t} + \beta_2 G_{ov t} + \beta_3 F_{DI t} + \beta_4 Z_{it} + \alpha_i + \mu_i + \epsilon_{it}, \quad (2) \]

where \( \text{Entre}_{it} \) is a measure of entrepreneurial activity, total entrepreneurial activity (TEA), opportunity-motivated entrepreneurial activity (OEA) or necessity-motivated entrepreneurial activity (NEA); \( F_{I t} \) is a vector of formal institutions, business freedom, fiscal freedom and trade freedom; \( G_{ov t} \) is GQ; \( F_{DI t} \) refers to both inward and outward FDI; \( Z_{it} \) is a vector of controls for macroeconomic conditions and entrepreneurs’ characteristics; \( \alpha_i \) is the unobserved time-invariant individual effect; \( \mu_i \) is the unobserved country-specific RE; and \( \epsilon_{it} \) is the idiosyncratic error term.

We run three groups of regressions in reference to the three measures of entrepreneurial activity, \( \text{Entre}_{it} \). The results from the modified Wald test of the existence of heteroscedasticity indicate that variances of estimated errors from all regressions are non-constant. Thus, we re-estimate the specifications with estimated standard errors being clustered at a country level. By doing so, our estimates are robust to heteroskedasticity and autocorrelation.

To investigate the moderating roles of GQ in the influence of FDI on entrepreneurship (H3), we allow both inward and outward FDI to interact with the different groups of GQ. Equations (1) and (2), respectively, become:

\[ \text{Entre}_{it} = \beta_1 F_{I t} + \beta_2 G_{ov t} + \beta_3 F_{DI t} \times \text{Gov} \_\text{dum}_{it} + \beta_4 Z_{it} + \alpha_i + \epsilon_{it}, \quad (3) \]

\[ \text{Entre}_{it} = \beta_1 F_{I t} + \beta_2 G_{ov t} + \beta_3 F_{DI t} \times \text{Gov} \_\text{dum}_{it} + \beta_4 Z_{it} + \alpha_i + \mu_i + \epsilon_{it}, \quad (4) \]

where \( \text{Gov} \_\text{dum}_{it} \) is a set of dummies that indicates specified value intervals of \( G_{ov t} \). To construct these dummies, we divide sorted values of \( G_{ov t} \) into two intervals and then into three intervals (see Table AI for definitions of these dummies).

Finally, for robustness check, we use the first differencing approach to alleviate endogenous problems between FDI and institutions. Although FEs’ model can help mitigate unobserved heterogeneity – which is one source of endogeneity – it is potential that there are endogenous relations between FDI and formal institutions, or FDI and governance institutions. Accordingly, first differences of the variables are employed to estimate the specifications. In this case, results of specification tests as shown in Table VII indicate that the OLS model is more appropriate than FE and RE models.

5. Results
5.1 Descriptive statistics

Table II provides descriptive statistics for the variables. The average percentage of individuals (aged between 18 and 64) getting involved in early-stage entrepreneurial activities is 12.84 percent. The proportion of opportunity-motivated entrepreneurs (8.52 percent) is substantially larger than that of necessity-motivated counterparts (5.16 percent), implying OEA is dominant in EMs. Statistic values of the indexes for formal institutions and GQ in our sample are quite similar to those in Herrera-Echeverri et al.’s (2014) group of EMs. For FDI patterns, inward FDI is predominant in EMs. While outward FDI in these markets accounts for 10.53 percent of GDP on average, FDI flowing into this area is much larger – at 36.73 percent of GDP on average. The correlation matrix, presented in Table III, indicates no serious correlation between explanatory variables.
5.2 Empirical results

Table IV describes the empirical results for estimating the influences of institutions and FDI on entrepreneurship. Business freedom and GQ negatively affect overall entrepreneurial activity (TEA)\[7\]. However, the effects of institutions on OEA and NEA are statistically insignificant. Both inward and outward FDI do not offer a significant explanation for TEA. As expected, the relation between inward FDI and OEA is significantly positive. This is in line with many findings of the stimulating role of inward FDI in opportunity entrepreneurship (Acs et al., 2007, 2012; Albulescu and Tâmâsiă, 2014). It is argued that the presence of MNEs in EMs encourages opportunity-motivated entrepreneurs to initiate their own businesses. The effect of outward FDI on this type of entrepreneurs is also positive but weak— just at the 10 percent level of significance. Meanwhile, neither inward FDI nor outward FDI shows an explanatory power to variations in NEA.

<table>
<thead>
<tr>
<th>Table II. Descriptive statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Entrepreneurship</strong></td>
</tr>
<tr>
<td>TEA</td>
</tr>
<tr>
<td>OEA</td>
</tr>
<tr>
<td>NEA</td>
</tr>
<tr>
<td><strong>Formal institutions</strong></td>
</tr>
<tr>
<td>Business freedom</td>
</tr>
<tr>
<td>Fiscal freedom</td>
</tr>
<tr>
<td>Trade freedom</td>
</tr>
<tr>
<td><strong>Governance quality (Gov)</strong></td>
</tr>
<tr>
<td>Control of corruption</td>
</tr>
<tr>
<td>Rule of law</td>
</tr>
<tr>
<td>Regulatory quality</td>
</tr>
<tr>
<td>Government effectiveness</td>
</tr>
<tr>
<td>Political stability and absence of violence</td>
</tr>
<tr>
<td>Voice and accountability</td>
</tr>
<tr>
<td>Governance quality (average)</td>
</tr>
<tr>
<td>Governance quality (scaled)</td>
</tr>
<tr>
<td><strong>Foreign direct investment (FDI)</strong></td>
</tr>
<tr>
<td>Inward FDI</td>
</tr>
<tr>
<td>Inward FDI×Gov (upper half)</td>
</tr>
<tr>
<td>Inward FDI×Gov (lower half)</td>
</tr>
<tr>
<td>Inward FDI×Gov (&lt; q1)</td>
</tr>
<tr>
<td>Inward FDI×Gov (q1–q3)</td>
</tr>
<tr>
<td>Inward FDI×Gov (&gt; q3)</td>
</tr>
<tr>
<td>Outward FDI</td>
</tr>
<tr>
<td>Outward FDI×Gov (upper half)</td>
</tr>
<tr>
<td>Outward FDI×Gov (lower half)</td>
</tr>
<tr>
<td>Outward FDI×Gov (&lt; q1)</td>
</tr>
<tr>
<td>Outward FDI×Gov (q1–q3)</td>
</tr>
<tr>
<td>Outward FDI×Gov (&gt; q3)</td>
</tr>
<tr>
<td><strong>Control variables</strong></td>
</tr>
<tr>
<td>Financial development</td>
</tr>
<tr>
<td>Trade</td>
</tr>
<tr>
<td>GDP growth</td>
</tr>
<tr>
<td>GDP per capita</td>
</tr>
<tr>
<td>Unemployment</td>
</tr>
<tr>
<td><strong>Fear of failure</strong></td>
</tr>
<tr>
<td>Entrepreneurial intentions</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>TEA</td>
</tr>
<tr>
<td>OEA</td>
</tr>
<tr>
<td>NEA</td>
</tr>
<tr>
<td>Business freedom</td>
</tr>
<tr>
<td>Fiscal freedom</td>
</tr>
<tr>
<td>Trade freedom</td>
</tr>
<tr>
<td>Governance quality</td>
</tr>
<tr>
<td>Inward FDI</td>
</tr>
<tr>
<td>Outward FDI</td>
</tr>
<tr>
<td>Financial development</td>
</tr>
<tr>
<td>Trade</td>
</tr>
<tr>
<td>GDP growth</td>
</tr>
<tr>
<td>GDP per capita</td>
</tr>
<tr>
<td>Unemployment</td>
</tr>
<tr>
<td>Fear of failure</td>
</tr>
<tr>
<td>Entrepreneurial intentions</td>
</tr>
</tbody>
</table>

Note: *, **, ***Significant at 10, 5 and 1 percent, respectively
<table>
<thead>
<tr>
<th>Explanatory variables</th>
<th>TEA</th>
<th>OEA</th>
<th>NEA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fixed effects</td>
<td>Random effects</td>
<td>Fixed effects</td>
</tr>
<tr>
<td>Business freedom</td>
<td>-0.1235 (-1.71)*</td>
<td>-0.1127 (-2.08)**</td>
<td>-0.0250 (-0.48)</td>
</tr>
<tr>
<td>Fiscal freedom</td>
<td>0.0099 (0.10)</td>
<td>-0.0210 (-0.36)</td>
<td>-0.1705 (-1.48)</td>
</tr>
<tr>
<td>Trade freedom</td>
<td>-0.0510 (-0.70)</td>
<td>0.0311 (0.46)</td>
<td>0.0406 (0.47)</td>
</tr>
<tr>
<td>Governance quality</td>
<td>-0.3422 (-2.33)**</td>
<td>-0.1135 (-1.22)</td>
<td>-0.2147 (-1.63)</td>
</tr>
<tr>
<td>Inward FDI</td>
<td>0.0445 (0.82)</td>
<td>0.0198 (0.62)</td>
<td>0.1010 (2.76)**</td>
</tr>
<tr>
<td>Outward FDI</td>
<td>0.0426 (0.63)</td>
<td>0.0735 (1.29)</td>
<td>0.0715 (1.95)*</td>
</tr>
<tr>
<td>Financial development</td>
<td>0.0393 (1.13)</td>
<td>0.0051 (0.36)</td>
<td>-0.0105 (-0.36)</td>
</tr>
<tr>
<td>Trade</td>
<td>1.0637 (0.38)</td>
<td>0.2880 (0.24)</td>
<td>1.7003 (0.59)</td>
</tr>
<tr>
<td>GDP growth</td>
<td>-0.0603 (-0.85)</td>
<td>-0.0545 (-0.84)</td>
<td>-0.1163 (-1.05)</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>0.7216 (0.63)</td>
<td>-0.3798 (-0.47)</td>
<td>4.5624 (2.48)**</td>
</tr>
<tr>
<td>Unemployment</td>
<td>-0.0421 (-0.31)</td>
<td>-0.1385 (-1.45)</td>
<td>-0.4066 (-2.53)**</td>
</tr>
<tr>
<td>Fear of failure</td>
<td>-0.0534 (-1.32)</td>
<td>-0.0661 (-1.31)</td>
<td>0.0286 (0.57)</td>
</tr>
<tr>
<td>Entrepreneurial intentions</td>
<td>0.1769 (1.00)**</td>
<td>0.2530 (2.03)**</td>
<td>0.0659 (1.37)</td>
</tr>
<tr>
<td>Intercept</td>
<td>25.0219 (1.07)</td>
<td>23.3731 (2.71)***</td>
<td>-19.2233 (-0.92)</td>
</tr>
<tr>
<td>R²</td>
<td>0.2792</td>
<td>0.2474</td>
<td>0.2367</td>
</tr>
<tr>
<td>Within</td>
<td>0.2792</td>
<td>0.2474</td>
<td>0.2367</td>
</tr>
<tr>
<td>Between</td>
<td>0.3498</td>
<td>0.7108</td>
<td>0.0119</td>
</tr>
<tr>
<td>Overall</td>
<td>0.3548</td>
<td>0.6518</td>
<td>0.0299</td>
</tr>
<tr>
<td>No. of countries</td>
<td>39</td>
<td>39</td>
<td>37</td>
</tr>
<tr>
<td>No. of observations</td>
<td>390</td>
<td>390</td>
<td>152</td>
</tr>
<tr>
<td>Specification tests</td>
<td>t-statistic</td>
<td>p-value</td>
<td>t-statistic</td>
</tr>
<tr>
<td>F-test (all u_i = 0)</td>
<td>8.47</td>
<td>0.0000</td>
<td>9.47</td>
</tr>
<tr>
<td>Breusch–Pagan (LM)</td>
<td>94.01</td>
<td>0.0000</td>
<td>58.24</td>
</tr>
<tr>
<td>Hausman</td>
<td>69.34</td>
<td>0.0000</td>
<td>42.33</td>
</tr>
</tbody>
</table>

Notes: The coefficients are based on the robust errors estimation in which standard errors are adjusted for clustering at the country level. *,**,***Significant at 10, 5 and 1 percent, respectively.
It is possible that the relation between FDI and entrepreneurship is mediated by institutional factors. Tables V and VI show our results obtained by using interactions of inward/outward FDI with indicators of GQ. Obtained results using the two-interval Gov approach in Table V indicate a relationship pattern resembling those in Table IV. Institutions are negatively related to TEA, and FDI promotes OEA. The picture of FDI-OEA relation is now more illustrative. Inward FDI produces productive effects on OEA in both group of EMs. At the same time, the positive relation between outward FDI and OEA only occurs in the group with higher GQ. The outward FDI-OEA relation now appears to be negative, albeit statistically insignificant, in the group with lower GQ. Again, the presence of NEA in all EMs, regardless of GQ, is found irrelevant to both inward and outward FDI.

Table VI shows estimated results using the more segmented categorization of GQ. The influence of FDI on entrepreneurship now appears to be significant in all models with TEA, OEA, and NEA. The relation, however, varies across the three different groups of countries. The positive effect of inward FDI on OEA is strongest in economies with the lowest GQ (lying below the first quartile of the GQ distribution). A positive, but weaker, relation is also found in economies with the medium GQ (between the first and third quartiles). The role of inward FDI in OEA is inconclusive for economies with the highest GQ (above the third quartile). The positive influence found here serves as an evidence of the positive spillover effect induced by inward FDI.

For outward FDI, OEA is only positively related to the outflow of FDI in EMs with the GQ above the first quartile. In the group with the lowest institutional quality, a strongly negative relation is witnessed, implying that outward FDI damages OEA. Such a negative impact is also found by Albulescu and Tâmășilă (2014) and Albulescu and Tâmășilă (2016) for European economies. They argue that this is the consequence of a reduction in collaboration opportunities created by international enterprises for indigenous businesses once such enterprises decide to find better opportunities abroad.

The approach with three intervals of GQ now uncovers the influence of FDI on NEA in EMs with the highest GQ. However, the effects of inward and outward FDI are in opposite directions. In better governed EMs, outward FDI stimulates and inward FDI discourages NEA. The promoting effect of outward FDI can be explained by the fact that the outward movement of capital investments by home-based MNEs leads to a decline in the supply of jobs, and, consequently, unemployed individuals are pulled into NEA. In addition, export-oriented NEA is widely opened up by such a movement of investment capital. The negative effect of inward FDI on NEA may be through the channel of job demand creation, by both international entrants and new domestic businesses born by perceiving new opportunities (i.e. evidently, start-ups emerging as a result of OEA). An increase in the availability of wage work reduces jobless individuals’ attempts on seeking income from NEA (i.e. they now have more than one option for work).

5.3 Robustness checks

Table VII reports estimates from the first differencing approach. As shown, the most important impacts of FDI on entrepreneurship remain significantly robust through all panel estimations, except for the case of TEA. Plainly, changes in OEA in EMs with the lowest GQ are explained by changes in both inward and outward FDI. Variations in (inward and outward) FDI also lead to differences in NEA, but only in EMs with the highest GQ. It is critical to note that the effects of FDI on entrepreneurship are inversely different between the two types of FDI and between the two types of entrepreneurship, which is in the same pattern with our FE results in Table VI.

Controlling the endogenous relation between FDI and institutions wipes out the significance of some other variables in our models. The entrepreneurship-related roles of business freedom and FDI in other EMs become inconclusive. Noticeably, all estimates in the model of TEA become insignificant. Variations in entrepreneurial intentions, notably,
Table V. Governance quality, FDI and entrepreneurship: the two-interval Gov approach

<table>
<thead>
<tr>
<th>Explanatory variables</th>
<th>TEA</th>
<th>Random effects</th>
<th>OEA</th>
<th>Random effects</th>
<th>NEA</th>
<th>Random effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fixed effects</td>
<td></td>
<td>Fixed effects</td>
<td></td>
<td>Fixed effects</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td></td>
<td>(4)</td>
<td></td>
</tr>
<tr>
<td>Business freedom</td>
<td>-0.1293 (-1.90)*</td>
<td>-0.1067 (-2.08)**</td>
<td>-0.0259 (-0.50)</td>
<td>-0.0372 (-0.77)</td>
<td>-0.0010 (-0.02)</td>
<td>-0.0616 (-2.67)***</td>
</tr>
<tr>
<td>Fiscal freedom</td>
<td>0.0193 (0.23)</td>
<td>-0.0210 (-0.12)</td>
<td>-0.1708 (-1.48)</td>
<td>-0.0882 (-1.15)</td>
<td>0.0231 (0.38)</td>
<td>0.0259 (-1.07)</td>
</tr>
<tr>
<td>Trade freedom</td>
<td>-0.0522 (-0.72)</td>
<td>0.0230 (0.44)</td>
<td>0.0333 (0.41)</td>
<td>-0.0044 (-0.05)</td>
<td>0.0255 (0.30)</td>
<td>0.0193 (0.52)</td>
</tr>
<tr>
<td>Governance quality (Gov)</td>
<td>-0.3377 (-2.14)**</td>
<td>-0.1472 (-1.54)</td>
<td>-0.2119 (-1.60)</td>
<td>-0.0228 (-0.32)</td>
<td>-0.0686 (-0.67)</td>
<td>-0.0170 (-0.53)</td>
</tr>
<tr>
<td>Inward FDI×Gov_upper half</td>
<td>0.0571 (1.31)</td>
<td>0.0311 (0.99)</td>
<td>0.0696 (2.67)**</td>
<td>0.0455 (1.69)*</td>
<td>-0.1323 (-0.54)</td>
<td>-0.0023 (-0.18)</td>
</tr>
<tr>
<td>Inward FDI×Gov_lower half</td>
<td>0.0256 (0.51)</td>
<td>-0.0038 (-0.09)</td>
<td>0.1312 (2.29)**</td>
<td>0.0664 (2.02)**</td>
<td>-0.0029 (-0.09)</td>
<td>-0.0310 (-2.16)**</td>
</tr>
<tr>
<td>Outward FDI×Gov_upper half</td>
<td>0.0528 (0.88)</td>
<td>0.0611 (1.04)</td>
<td>0.0786 (2.14)**</td>
<td>0.0568 (1.58)</td>
<td>-0.0115 (-0.40)</td>
<td>-0.0037 (-0.19)</td>
</tr>
<tr>
<td>Outward FDI×Gov_lower half</td>
<td>-0.0757 (-0.45)</td>
<td>0.0996 (0.76)</td>
<td>-0.0111 (-0.10)</td>
<td>0.0441 (0.43)</td>
<td>0.0315 (0.29)</td>
<td>0.0684 (1.70)*</td>
</tr>
<tr>
<td>Financial development</td>
<td>0.0480 (1.43)</td>
<td>0.0070 (0.51)</td>
<td>-0.0069 (-0.22)</td>
<td>-0.0115 (-0.74)</td>
<td>-0.0495 (-2.26)**</td>
<td>-0.0078 (-1.15)</td>
</tr>
<tr>
<td>Trade</td>
<td>0.0702 (0.26)</td>
<td>0.2678 (0.27)</td>
<td>1.7816 (0.63)</td>
<td>-0.0096 (-0.43)</td>
<td>-0.6225 (-0.36)</td>
<td>0.1419 (1.02)</td>
</tr>
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<td>-0.1030 (-0.88)</td>
<td>-0.1152 (-1.23)</td>
<td>-0.0883 (-0.73)</td>
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<td>GDP per capita</td>
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<td>-0.3377 (-0.43)</td>
<td>4.6915 (2.59)**</td>
<td>0.5275 (0.73)</td>
<td>-3.1191 (-1.72)*</td>
<td>-0.7928 (-1.76)*</td>
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<tr>
<td>Unemployment</td>
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<td>-0.1335 (-1.37)</td>
<td>-0.4462 (-2.55)**</td>
<td>-0.3372 (-1.42)**</td>
<td>0.1339 (1.37)</td>
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<td>-0.0477 (-1.83)**</td>
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<td>Entrepreneurial intentions</td>
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<td>0.0643 (1.32)</td>
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<td>15.4854 (3.37)***</td>
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F-test of joint significance (p-value)

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R^2

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(Indicated model) (Fixed effects) (Fixed effects) (Fixed effects) (Fixed effects) (Fixed effects)

Notes: Estimated coefficients are reported with t-statistics in parentheses. The coefficients are based on the robust errors estimation in which standard errors are adjusted for clustering at the country level. *, ***, ***Significant at 10, 5 and 1 percent, respectively
### Table VI

#### Explanatory variables

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<td>Trade freedom</td>
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<td>Inward FDI×Gov_&lt;q1</td>
<td>0.2373 (2.75)***</td>
<td>0.1444 (0.51)**</td>
<td>0.2742 (2.64)***</td>
<td>0.1327 (1.85)**</td>
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<td>Inward FDI×Gov_&gt;q3</td>
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<td>-0.2701 (-2.00)**</td>
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<td>0.0542 (1.81)*</td>
<td>-0.0286 (-0.94)</td>
<td>0.0225 (1.32)</td>
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<td>Financial Development</td>
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<td>-0.0104 (-0.62)</td>
<td>-0.0523 (-2.75)**</td>
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<td>Trade</td>
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<td>GDP growth</td>
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<td>GDP per capita</td>
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<td>4.5790 (2.68)**</td>
<td>0.9350 (1.17)</td>
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<td>Unemployment</td>
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<td>-0.2701 (-1.87)**</td>
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<td>0.1845 (0.23)**</td>
<td>0.0218 (0.59)</td>
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<td>Fear of failure</td>
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<td>Entrepreneurial intentions</td>
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<td>0.2310 (6.52)***</td>
<td>0.0355 (1.12)</td>
<td>0.1292 (2.81)***</td>
<td>0.0670 (1.75)*</td>
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<td>40.4847 (1.64)</td>
<td>16.9242 (3.12)***</td>
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| F-test of joint significance (p-value) | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

**R²**
- Within: 0.3425
- Between: 0.3806
- Overall: 0.4319

| No. of countries | 39 | 39 |
| No. of observations | 240 | 240 |

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<td>Hausman</td>
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Notes: Estimated coefficients are reported with t-statistics in parentheses. The coefficients are based on the robust errors estimation in which standard errors are adjusted for clustering at the country level. *, **,**,**Significant at 10, 5 and 1 percent, respectively.
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<td>ΔBusiness freedom</td>
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<td>ΔGovernance quality (Gov)</td>
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<td>0.2653 (2.62)**</td>
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<td>GDP per capita</td>
<td>0.3649 (0.29)</td>
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<td>0.4831 (1.09)</td>
<td>-2.7036 (-0.64)</td>
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<tr>
<td>Unemployment</td>
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<td>-0.6021 (-2.18)**</td>
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<td>Fear of failure</td>
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Notes: Estimated coefficients are reported with t-statistics in parentheses. The coefficients are based on the robust errors estimation in which standard errors are adjusted for clustering at the country level. *, **, ***Significant at 10, 5 and 1 percent, respectively.
have a positive effect on changes in total new firm formation, yet at the 10 percent level of significance. Apart from interactions of FDI differials and GQ, dynamics in financial development (measured by domestic credit) are found significantly associated with fluctuations in business development by NEA. It is plausible that the process of financial development leads to a decrease in unemployment and thus reduces NEA. Finally, the direct influence of fluctuations in GQ on changes in TEA disappears.

5.4 Additional discussions
Robust results[10] show that FDI has both positive and negative spillover effects on entrepreneurship in EMs. However, such effects on the different types of entrepreneurial activity depend on the strength of GQ. First, in EMs with the lowest GQ, inward FDI has a positive spillover impact and outward FDI has a negative spillover impact on OEA. The pronounced influence of inward FDI we find in EMs is consistent with the knowledge spillover theory of entrepreneurship (Acs et al., 2009, 2012, 2013)[11]. This theory argues that new knowledge created by the process of inward FDI spills over to would-be entrepreneurs who recognize and exploit potential opportunities in order to create new firms. This knowledge-driven entrepreneurial activity becomes stronger under the less efficient process of exploiting knowledge flows which may arise in economies with weaker governance infrastructure. Regarding the OEA-reducing effect of outward FDI in this institutional context, an inverted interpretation should be only fair[12].

Second, in EMs with the highest GQ, NEA is discouraged by the entrance of FDI but supported by the outflow of FDI. As regards the diminishing effect of inward FDI on NEA, one possible explanation is that job demand created by the increased presence of foreign firms recalls wage work (Acs et al., 2008), which brings about a discouragement of NEA. This is consistent with the analyses of the crowding-out effect of FDI in the labor market by Grossman (1984) and De Backer and Sleuwaegen (2003). A reversed trend of such labor mobility is observable in the case that home-based MNEs increasingly make overseas investments resulting in less domestic employment. Along with this outflow of FDI, export-oriented NEA can emerge. It is plausible to think that these situations should occur in markets with better governance infrastructure[13].

Ultimately, this study sheds new light on the understanding of the role of FDI in entrepreneurial activity in connection with institutional factors. In the context of EMs, our findings are complementary to results by Herrera-Echeverri et al. (2014). More specifically, our study clarifies the essence of the compound impact of GQ and FDI on entrepreneurship by delving into different natures of FDI and of entrepreneurial motivation. Our results suggest a much more complex mechanism of interaction: the strength of governance infrastructure shapes the FDI-based spillovers of entrepreneurship in ways that hinge on whether FDI is inward or outward and entrepreneurship is opportunity-motivated or necessity-motivated. Figure 2 illustrates the mechanism through our empirical confirmations of the hypothesized relationships.

6. Conclusion
We further investigate the interplay of institutions, FDI and entrepreneurship in EMs. Our empirical results affirm that governance institutions and FDI play significant roles in entrepreneurial activity. National governance infrastructure facilitates FDI-based spillover effects of entrepreneurship. In particular, empirical patterns of the relationship between direction-specified FDI and motivation-specified entrepreneurship vary across the spectrum of GQ. That is, in EMs with different levels of GQ, the effects of inward FDI and outward FDI on OEA and NEA are in opposite directions. Inward FDI stimulates OEA in markets with the lowest GQ and discourages NEA in markets with the highest GQ and, at the same time, outward FDI diminishes OEA in markets with the lowest GQ and promotes NEA in markets with the highest GQ.
Our findings have implications for the institutional context-based execution of public policy in EMs. It is a fact that countries with better governance infrastructure attract more FDI. It is also observable that the efflux of capital is stronger for countries with higher GQ. Our research demonstrates that inward FDI itself is both beneficial and detrimental to entrepreneurial activity which, in turn, promotes economic growth, and so is outward FDI. Such effects of inward FDI and outward FDI are pronounced differently under the two types of entrepreneurship and the two extremes of GQ. Once public policy makers recognize the catalytic role of FDI in new firm formation, the distinct institutional context of their country should be taken into consideration. As OEA, for instance, has been proved more contributory to economic performance, attracting the inflow of FDI should be an economic development policy at the top of the agenda for governments of countries with weak GQ. When the governance infrastructure improves sufficiently to be advanced, the development policy framework conducive to, for example, export-oriented entrepreneurial activities encouraged by outward FDI should be well established in order to take advantage of NEA’s (presumed) marginal contributions toward intensifying economic growth.

Our study has limitations. First, we do not consider informal institutions such as social norms which may be potentially related to entrepreneurial activity in EMs. This may be a potential direction for future research. Second, the research sample which is limited to a finite, small number of EMs might be confronted with some estimation problems of biasedness and inconsistency. Also, there is a potential issue of data incompatibility and irrelevance since our data come from different sources.

Notes
1. Throughout this study, the two terms ‘(national) governance quality’ and ‘institutional quality’ are used interchangeably.
2. A brief review of the literature on entrepreneurship with its two types and the entrepreneurial role of formal institutions is introduced in Appendix 2.
3. Regarding the FDI direction, Albulescu and Tămășilă (2014) and Albulescu and Tămășilă (2016) report empirical evidence from European economies on the contemporaneous existence of both negative and positive effects with respect to different types of FDI (inward vs outward) and of entrepreneurial motivation (necessity vs opportunity). Regarding the FDI source, Anwar and Sun (2012) show that FDI inflows from Hong Kong, Macau and Taiwan increase the exit rate of domestic firms located in mainland China. At the same time, the influx of FDI from the rest of the world increases the entry rate. These effects are through both backward and forward linkages of FDI spillovers.
4. A majority of the studies mentioned above relates to inward FDI. As one of very few exceptions, the work of Albulescu and Tămășilă (2014, 2016) considers both inward and outward FDI, merely for European countries. However, Albulescu and Tămășilă (2014, 2016) do not examine the role of institutional quality.

5. Each of six aggregate governance indicators is constructed by averaging data from underlying sources that correspond to the concept of governance being measured. The obtained governance measures are in standard normal units (i.e., units of a standard normal distribution with a mean of 0 and a standard deviation of 1) ranging from approximately −2.5 to 2.5. Higher values correspond to better governance.

6. In fact, we implement estimating three approaches in terms of panel data regression (i.e., OLS, FE, and RE) and use specification tests to determine which is appropriate. For all clustered regressions, results of the F-test (FE vs OLS) are in favor of FE model; results of the Breusch–Pagan LM test (random effects vs OLS) are in favor of RE model; and results of the Hausman test (FE vs RE) are in favor of FE model. Thus, the FE model is the most appropriate in all cases and the eventual reference to our analysis. For the sake of comparison, we report estimated results for both FE and RE models.

7. A negative effect of institutional quality on entrepreneurship is striking but not too strange. However, the effect is often predicted/found for a certain type of entrepreneurship such as unproductive entrepreneurship (Baumol, 1990; Sobel, 2008) and necessity entrepreneurship (Fuentelsaz et al., 2015; Angulo-Guerrero et al., 2017). We argue that the negative effect on overall entrepreneurial activity found here may be a manifestation of the dominant effect of a certain type of entrepreneurship. Also, we empirically perceive that using different data sources of entrepreneurship may reach opposite conclusions on the relation between institutional quality and entrepreneurship. For example, authors studying the level (rate) of entrepreneurial activity or business density tend to find a positive impact of institutional quality (e.g., Stenholm et al., 2013; Herrera-Echeverri et al., 2014). Studies that use the data distinguishing entrepreneurial activity based on its nature tend to find both positive and negative effects (e.g., Sobel, 2008; Fuentelsaz et al., 2015; Angulo-Guerrero et al., 2017). We suggest that this phenomenon should necessitate a consolidation of the empirical evidence on the entrepreneurship impact of institutional quality in the future.

8. For brevity, we do not report RE results whose patterns are similar to both FE and OLS ones through all panels relating to the three alternative measures of entrepreneurship. It should be noticed that the Breusch–Pagan (LM) test cannot be conducted after the RE estimation in this first differencing approach. Also, the Hausman test is not available for the case of NEA panel.

9. A mostly similar phenomenon is also observed in robust results by Albulescu and Tămășilă (2016) for European economies.

10. Our main results are not driven by the potential endogeneity of inward/outward FDI, trade, and GDP growth. (Results from further robustness checks through 2SLS and GMM estimators – as tabulated in Table AII – indicate that the empirical patterns of inward/outward FDI interacting with institutional quality in the OEA and NEA models are unchanged.) We would like to thank an anonymous reviewer for pointing out this issue.

11. Basically, this result from our study is also consistent with empirical evidence on the positive externalities of FDI that benefit entrepreneurial activity, which is found by some country-specific studies (Görg and Strobl, 2002; Ayyagari and Kosová, 2010; Anwar and Sun, 2012; Apostolov, 2017). Also, the rationale of this finding can be augmented by De Clercq et al.’s (2007) analysis of the positive relationship between inward FDI and entrepreneurs’ export orientation.

12. This result is in line with European evidence of Albulescu and Tămășilă (2014, 2016), who advocate that outward FDI reduces OEA as a consequence of having no new opportunities in the market anymore.

13. Indeed, for European economies, Albulescu and Tămășilă (2014, 2016) relate their findings of the negative relation between outward FDI and NEA to the argument that job loss that is related to a heightened local competition induced by the presence of foreign MNEs will encourage NEA.
References


**Corresponding author**

Nam Hoai Tran can be contacted at: tranhoa1am.ueh@gmail.com

(The Appendix follows overleaf.)
Appendix 1

<table>
<thead>
<tr>
<th>Variables</th>
<th>Definition and data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEA</td>
<td>Total early-stage entrepreneurial activity; percentage of the adult population between the ages of 18 and 64 years who are in the process of starting a business (a nascent entrepreneur) or owner-manager of a new business which is less than 42 months old</td>
</tr>
<tr>
<td>OEA</td>
<td>Opportunity-motivated entrepreneurial activity; percentage of improvement-driven TEA of the adult population aged 18–64 years old who are pulled into entrepreneurship because they recognize an opportunity that can improve their income or increase their independence</td>
</tr>
<tr>
<td>NEA</td>
<td>Necessity-motivated entrepreneurial activity; percentage of improvement-driven TEA of the adult population aged 18–64 years old who have started a business out of necessity because they had no other option for work</td>
</tr>
<tr>
<td>Business freedom</td>
<td>Composite measure of the extent to which the regulatory and infrastructure environments constrain the efficient operation of businesses. The quantitative score is derived from an array of factors that affect the ease of starting, operating and closing a business</td>
</tr>
<tr>
<td>Fiscal freedom</td>
<td>Composite measure that reflects marginal tax rates on both personal and corporate income and the overall level of taxation (including direct and indirect taxes imposed by all levels of government) as a percentage of gross domestic product (GDP)</td>
</tr>
<tr>
<td>Trade freedom</td>
<td>Composite measure of the extent of tariff and non-tariff barriers that affect imports and exports of goods and services</td>
</tr>
<tr>
<td>Control of corruption</td>
<td>It captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as “capture” of the state by elites and private interests</td>
</tr>
<tr>
<td>Rule of law</td>
<td>It captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police and the courts, as well as the likelihood of crime and violence</td>
</tr>
<tr>
<td>Regulatory quality</td>
<td>It captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development</td>
</tr>
<tr>
<td>Government effectiveness</td>
<td>It captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation and the credibility of the government’s commitment to such policies</td>
</tr>
<tr>
<td>Political stability and absence of violence/terrorism</td>
<td>It measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism</td>
</tr>
<tr>
<td>Voice and accountability</td>
<td>It captures perceptions of the extent to which a country’s citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association and a free media</td>
</tr>
<tr>
<td>Governance quality (Gov)</td>
<td>Rescaled average measure of the six WGI indexes of institutional quality; control of corruption, rule of law, regulatory quality, government effectiveness, political stability and absence of violence/terrorism, and voice and accountability</td>
</tr>
<tr>
<td>Gov_dum</td>
<td>Binary indicator of the institutional state of FDI corresponding to a specified value interval of Gov. For the two-interval Gov approach to the segmented linear specifications (i.e. Equations (3) and (4)), there</td>
</tr>
</tbody>
</table>

Table AI. Variables’ definition and data source (continued)
Appendix 2. A brief review on entrepreneurship and formal institutions

Entrepreneurship and the two types of entrepreneurship: opportunity and necessity
Entrepreneurship in general terms is usually regarded as an essential determinant of economic growth or literally, the main engine of economic growth. In fact, Reynolds et al. (2002) argue that entrepreneurial activity is a major mechanism leading to economic growth in the way that intensive levels of entrepreneurship are connected to higher growth rates of national economy. For four last decades, extensive theoretical models have been built on the associations of entrepreneurship with different aspects of economic performance (e.g., Wilken, 1979; Birch, 1987; Audretsch and Feldman, 1996; Minniti and Lévesque, 2010; Colino et al., 2014). A positive entrepreneurship–growth relationship has often been well established among empirical studies (Audretsch and Keilbach, 2004, 2005; Baptista et al., 2007; Neumark et al., 2011; Urbano and Aparicio, 2016). Another stream of entrepreneurship research has focused on its determinants. Well-recognized factors determining entrepreneurship should be those coming out from institutional theories of entrepreneurship (North, 1990; Baumol, 1990, 1993; and for a review, see Bruton et al., 2010) and the spillover theories of entrepreneurship (Markusen and Venables, 1998; Görg and Strobl, 2002; Audretsch and Lehmann, 2005; Ayyagari and Kosová, 2010; Acs et al., 2009, 2013).
One classification distinguishing opportunity- and necessity-based entrepreneurial activities has been widely recognized in the recent literature of entrepreneurial research. According to Fuentelsaz et al. (2015), this classification is early advocated by Shane et al. (1991), Reynolds and Miller (1992) and Krueger and Brazeal (1994). Reynolds et al. (2002) give out a clear analysis in their report for the Global Entrepreneurship Monitor (GEM) laying a stress on initiating motivations to involve individuals in entrepreneurial activities. Accordingly, individuals who are labeled as "opportunity-driven" entrepreneurs opt to start their own companies because they perceive a business opportunity. These opportunity-driven entrepreneurs see entrepreneurship as one of several possible career options. Meanwhile, individuals who are labeled as "necessity-driven" entrepreneurs are themselves forced to initiate their own companies because they have no other options for work. For these necessity-driven entrepreneurs, participating entrepreneurial activities is their last resort. Apparently, motivations behind opportunity and necessity entrepreneurship are different, leading to different productive orientations between them and thus different consequent contributions to national economic vigor.

The categorization of entrepreneurial behaviors like opportunity and necessity motivations is aptly needed because potential effects of different types of entrepreneurs on economic activities may differ considerably. For instance, Reynolds et al. (2002) find the correlation of economic growth with necessity entrepreneurship is stronger than that with opportunity entrepreneurship. Wennekers et al. (2005) indicate a negative relation between necessity entrepreneurship and economic performance in terms of per capita GDP and innovations and a positive relation for the case of opportunity entrepreneurship. Other studies show that entrepreneurship based on knowledge (i.e. opportunity entrepreneurship), rather than entrepreneurship without a knowledge base (i.e. necessity entrepreneurship), has a larger impact on economic growth (Audretsch et al., 2008; Acs et al., 2012). In this strand of the literature, higher economic growth is presumably attributed to wider spillovers of knowledge and technology generated by heightened levels of opportunity entrepreneurship (Wong et al., 2005; Audretsch et al., 2008; Valliere and Peterson, 2009; Acs et al., 2012; Noseleit, 2013; Aparicio et al., 2016).

It is obvious to realize that entrepreneurship research has focused on both causes and consequences of entrepreneurship (Carlsson et al., 2013). Because of the possible dissimilar effects of different types of entrepreneurial motivation such as opportunity and necessity on economic development (for evidence, see Urbano and Aparicio, 2016), an insightful understanding of specific determinants of each type of entrepreneurship should be critical to delving into the essence of entrepreneurial activities.

**Formal institutions and entrepreneurship**

Gnyawali and Fogel's (1994) framework classifies five dimensions of entrepreneurial environments believed to conducive to new business creation process. Similar to Álvarez et al. (2014) and Fuentelsaz et al. (2015), our study uses this approach to define compositions of formal institutions. We examine the first two dimensions in Gnyawali and Fogel's (1994) classification framework: government policies and procedures, and socioeconomic conditions. Following Herrera-Echeverri et al. (2014), our study in the context of EMs considers business freedom as a representative of the first demission and fiscal freedom and trade freedom as representatives of the second dimension.

The idea that freedom to create and close businesses promotes entrepreneurial activity is clear. That is because regulatory flexibility in a government's administrative processes helps reduce fears of penalty and encourage its citizens to formally register their businesses. On the contrary, regulatory complexity and strict administrative requirements can deteriorate entrepreneurial activities because they create an entry barrier (Klapper et al., 2006; Fuentelsaz et al., 2015). Herrera-Echeverri et al. (2014) find that entry density of firms in all EMs significantly increases with freedom to establish businesses. Distinguishing the two types of entrepreneurs, Fuentelsaz et al. (2015) show that more business freedom is related to more opportunity-based entrepreneurial activities but less necessity-based entrepreneurial activities. Similarly, recent results of Angulo-Guerrero et al. (2017) for the OECD countries imply that more flexible regulation of business (including the ease of starting a business) will encourage opportunity entrepreneurship and discourage necessity entrepreneurship. Thus, the distinct motivations of entrepreneurship imply different responses of differently-motivated entrepreneurs to institutional environments. Furthermore, Djankov et al. (2002) argue that the relative scale of informal economy is larger in countries with heavy regulations, that is, less business freedom – where small businesses may prefer operating without registration (Fuentelsaz et al., 2015).
Fiscal freedom reflects the flexibility of tax barriers that businesses face. High marginal tax rates imposed on individual and corporate incomes as well as complex procedures relating to tax payment should negatively affect entrepreneurial behaviors. Researchers refer to such a negative effect as the demotivating effect (Djankov et al., 2002; Dean and McMullen, 2007; McMullen et al., 2008). Although a positive relation between fiscal freedom and entrepreneurship is usually found, a negative relation is also evidenced by several studies (e.g., Gordon and Cullen, 2002). Herrera-Echeverri et al. (2014) show that the effect of fiscal freedom on entrepreneurship in emerging markets might be insignificant because small firms in this area are less beneficial from tax savings and more vulnerable to bureaucracy costs than large firms. Also, Herrera-Echeverri et al. (2014) find no substantial relation between trade freedom and entrepreneurial activity in their selected group of emerging markets. The irrelevance of fiscal freedom (i.e., relating to top marginal tax rates) to business development seems to be a case of the OECD economies as Angulo-Guerrero et al.’s (2017) results indicate. However, Angulo-Guerrero et al. (2017) show that the significance of the effect of trade freedom in these countries depends on the type of entrepreneurial motivation. In particular, they testify that higher freedom to trade significantly diminishes necessity entrepreneurship, whereas the tested relation between trade freedom and opportunity entrepreneurship is negative insignificantly.
### Table AI

FDI and Governance Quality: JABES and GMM approaches

<table>
<thead>
<tr>
<th>Explanatory variables</th>
<th>TEA 2SLS (1)</th>
<th>GMM (2)</th>
<th>OEA 2SLS (3)</th>
<th>GMM (4)</th>
<th>NEA 2SLS (5)</th>
<th>GMM (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business freedom</td>
<td>-0.0841 (-1.74)*</td>
<td>-0.1590 (-0.84)</td>
<td>-0.0324 (-1.40)</td>
<td>-0.0239 (-0.15)</td>
<td>-0.0355 (-0.89)</td>
<td>-0.0921 (-1.83)*</td>
</tr>
<tr>
<td>Fiscal freedom</td>
<td>0.0546 (0.67)</td>
<td>-0.0061 (-0.04)</td>
<td>-0.0113 (-0.47)</td>
<td>0.2153 (0.64)</td>
<td>-0.1440 (-2.38)**</td>
<td>-0.0715 (-0.49)</td>
</tr>
<tr>
<td>Trade freedom</td>
<td>-0.0708 (-0.62)</td>
<td>0.1625 (0.58)</td>
<td>0.0847 (1.44)</td>
<td>0.1253 (0.44)</td>
<td>0.2016 (1.45)</td>
<td>0.2387 (1.38)</td>
</tr>
<tr>
<td>Governance quality (Gov)</td>
<td>-0.4381 (-3.61)**</td>
<td>-0.2442 (-0.31)</td>
<td>-0.1074 (-1.89)**</td>
<td>0.0681 (0.38)</td>
<td>0.1483 (1.05)</td>
<td>0.1941 (1.15)</td>
</tr>
<tr>
<td>Inward FDI x Gov &lt; q1</td>
<td>0.0336 (0.42)</td>
<td>0.3604 (0.92)</td>
<td>0.1110 (1.83)*</td>
<td>0.2714 (1.71)*</td>
<td>-0.0325 (-0.36)</td>
<td>0.1200 (0.40)</td>
</tr>
<tr>
<td>Inward FDI x Gov q1-q3</td>
<td>-0.0032 (-0.08)</td>
<td>0.0144 (0.08)</td>
<td>-0.0179 (-1.03)</td>
<td>-0.1031 (-0.88)</td>
<td>-0.0360 (-1.17)</td>
<td>-0.0427 (-0.52)</td>
</tr>
<tr>
<td>Inward FDI x Gov &gt; q3</td>
<td>0.0610 (1.39)</td>
<td>0.0058 (0.02)</td>
<td>0.0072 (0.39)</td>
<td>-0.1726 (-0.98)</td>
<td>-0.0874 (-3.10)**</td>
<td>-0.2060 (-1.72)**</td>
</tr>
<tr>
<td>Outward FDI x Gov &lt; q1</td>
<td>-0.6692 (-3.70)**</td>
<td>-0.7288 (-0.82)</td>
<td>-0.3351 (-2.29)**</td>
<td>-1.0956 (-2.19)**</td>
<td>0.7291 (1.47)</td>
<td>-0.484 (-0.24)</td>
</tr>
<tr>
<td>Outward FDI x Gov q1-q3</td>
<td>-0.1811 (-0.21)</td>
<td>0.2246 (0.68)</td>
<td>0.0092 (0.34)</td>
<td>0.0670 (0.21)</td>
<td>0.1298 (2.79)**</td>
<td>0.1736 (1.33)</td>
</tr>
<tr>
<td>Outward FDI x Gov &gt; q3</td>
<td>0.0656 (0.89)</td>
<td>0.1933 (0.33)</td>
<td>0.0582 (1.29)</td>
<td>0.3708 (1.00)</td>
<td>0.3790 (6.22)**</td>
<td>0.7661 (2.08)**</td>
</tr>
<tr>
<td>Domestic credit</td>
<td>0.0175 (1.21)</td>
<td>0.0139 (0.28)</td>
<td>-0.0035 (-0.51)</td>
<td>0.0101 (0.41)</td>
<td>-0.0354 (-2.94)**</td>
<td>-0.0532 (-2.10)**</td>
</tr>
<tr>
<td>Trade</td>
<td>1.2336 (0.83)</td>
<td>-1.7084 (-0.21)</td>
<td>-1.9125 (-2.96)**</td>
<td>-1.0798 (-0.35)</td>
<td>-3.9346 (-3.77)**</td>
<td>-3.3827 (-1.01)</td>
</tr>
<tr>
<td>GDP growth</td>
<td>0.0063 (0.02)</td>
<td>-1.0394 (-0.79)</td>
<td>0.1703 (1.39)</td>
<td>-0.3357 (-0.59)</td>
<td>-0.0925 (-1.00)</td>
<td>-0.2068 (-0.73)</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>2.3419 (2.29)**</td>
<td>-1.4447 (-0.20)</td>
<td>-0.8861 (-0.61)</td>
<td>-1.6853 (-0.29)</td>
<td>-6.8616 (-3.17)**</td>
<td>-9.4339 (-2.02)**</td>
</tr>
<tr>
<td>Unemployment</td>
<td>-0.0684 (-0.72)</td>
<td>-0.4956 (-2.20)**</td>
<td>0.0698 (1.80)*</td>
<td>-0.1232 (-0.55)</td>
<td>-0.3284 (-5.06)**</td>
<td>0.1047 (0.73)</td>
</tr>
<tr>
<td>Fear of failure</td>
<td>-0.0742 (-1.41)</td>
<td>-0.1368 (-0.77)</td>
<td>0.0170 (0.40)**</td>
<td>-0.0793 (-1.56)</td>
<td>-0.0068 (-0.17)</td>
<td>0.0492 (0.81)</td>
</tr>
<tr>
<td>Entrepreneurial intentions</td>
<td>0.3888 (9.05)***</td>
<td>0.5017 (1.08)</td>
<td>0.0410 (1.56)</td>
<td>0.0627 (0.22)</td>
<td>0.1957 (7.37)**</td>
<td>0.0213 (0.16)</td>
</tr>
<tr>
<td>Prob.</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.7975</td>
<td>0.7936</td>
<td>0.9205</td>
<td>0.425</td>
<td>0.425</td>
<td>0.0889</td>
</tr>
<tr>
<td>AR(2) test (p-value)</td>
<td>0.966</td>
<td>0.619</td>
<td>0.425</td>
<td>0.0889</td>
<td>0.0889</td>
<td>0.0889</td>
</tr>
<tr>
<td>Hansen J-test (p-value)</td>
<td>0.865</td>
<td>0.871</td>
<td>0.0889</td>
<td>0.0889</td>
<td>0.0889</td>
<td>0.0889</td>
</tr>
</tbody>
</table>

**Notes:** Estimated coefficients are reported with t-statistics in parentheses. The coefficients are based on the robust errors estimation in which standard errors are adjusted for clustering at the country level. 2SLS and system GMM estimators are used to deal with the potential endogeneity of inward/outward FDI, trade and GDP growth. Estimates for the intercept and lagged dependent variable (in the dynamic GMM approach) are not reported. *, **, ***Significant at 10, 5 and 1 percent, respectively.
Enrolment by academic discipline in higher education: differential and determinants

Geetha Rani Prakasam  
National Institute of Educational Planning and Administration, New Delhi, India

Mukesh  
Ministry of Statistics and Programme Implementation, New Delhi, India, and

Gopinathan R.  
Shri Mata Vaishno Devi University, Jammu, India

Abstract

Purpose - Enrolling in an academic discipline or selecting the college major choice is a dynamic process. Very few studies examine this aspect in India. This paper makes a humble attempt to fill this gap using NSSO 71st round data on social consumption on education. The purpose of this paper is to use multinomial regression model to study the different factors that influence course choice in higher education. The different factors (given the availability of information) considered relate to ability, gender, cost of higher education, socio-economic and geographical location. The results indicate that gender polarization is apparent between humanities and engineering. The predicated probabilities bring out the dichotomy between the choice of courses and levels of living expressed through consumption expenditures in terms of professional and non-professional courses. Predicted probabilities of course choices bring in a clear distinction between south and west regions preferring engineering and other professional courses, whereas north, east and NES prefer humanities.

Design/methodology/approach – The present paper follows the same approach as that of Turner and Bowen (1999). The Multinomial regression is specified as $P(M_i = j) = \frac{\exp(b_j \times X_i)}{\sum_{j=1}^{5} \exp(b_j \times X_i)}$, where $P(M_i = j)$ denotes the probability of choosing outcome $j$, the particular course/major choice that categorizes different disciplines. This response variable is specified with five categories: such as medicine, engineering, other professional courses, science and humanities. The authors' primary interest is to determine the factors governing an individual's decision to choose a particular subject field as compared to humanities. In other words, to make the system identifiable in the MLR, humanities is treated as a reference category. The vector $X_i$ includes the set of explanatory variables and $b_j$ refers to the corresponding coefficients for each of the outcome $j$. From an aggregate perspective, the distribution of course choices is an important input to the skill (technical skills) composition of future workforce. In that sense, except humanities, the rest of the courses are technical-intensive courses; hence, humanities is treated as a reference category.

Findings - The results indicate that gender polarization is apparent between humanities and engineering. The predicted probabilities bring out the dichotomy between the choice of courses and levels of living expressed through consumption expenditures in terms of professional and non-professional courses. Predicted probabilities of course choices bring in a clear distinction between south and west regions preferring engineering and other professional courses, whereas north, east and NES prefer humanities.

Research limitations/implications – Predicted probabilities of course choices bring in a clear distinction between south and west regions preferring engineering and other professional courses, whereas north, east and NES prefer humanities. This course and regional imbalance need to be worked with multi-pronged strategies of providing both access to education and employment opportunities in other states. But the
predicted probabilities of medicine and science remain similar across the board. Very few research studies on
the determinants of field choice in higher education prevail in India. Research studies on returns to education
by field or course choices hardly exist in India. These evidences are particularly important to know which
course choices can support student loans, which can be the future area of work.

**Practical implications** – The research evidence is particularly important to know which course choices can
support student loans, which can be the future area of work, as well as how to address the gender bias in the
course choices.

**Social implications** – The paper has social implications in terms of giving insights into the course choices of
students. These findings bring in implications for practice in their ability to predict the demand for course
choices and their share of demand, not only in the labor market but also across regions. India has 36 states/UTs
and each state/UT has a huge population size and large geographical areas. The choice of course has
state-specific influence because of nature of state economy, society, culture and inherent education systems.
Further, within the states, rural and urban variation has also a serious influence on the choice of courses.

**Originality/value** – The present study is a value addition on three counts. First, the choice of courses
includes the recent trends in the preference over market-oriented/technical courses such as medicine,
engineering and other professional courses (chartered accountancy and similar courses, courses from
Industrial Training Institute, recognized vocational training institute, etc.). The choice of market-oriented
courses has been examined in relation to the choice of conventional subjects. Second, the socio-economic
background of students plays a significant role in the choice of courses. Third, the present paper uses the
latest data on Social Consumption on Education.

**Keywords** Higher education, Gender, Region, Enrolment choice, Multinomial regression,
Technical and non-technical stream

**Paper type** Research paper

1. Introduction

Selecting the best possible course, given the individual endowments, is a challenging key
decision in a youth’s life, because students have imperfect information and beliefs about
probability of success, match or mismatch between ability and effort, enjoyability of a
course, knowledge requirements of jobs, peer and family pressure, expected earnings,
employment rates, etc. Choice of major is a critical decision that determines many future
outcomes. Understanding these factors involves a series of processes that impinges
on the private and social returns to human capital investment (Turner and Bowen, 1999).
Studying the relationship between major choice and labor market outcomes is equally
important from a societal perspective. The present paper makes an effort to understand the
various factors that influence the choice of course using the available data sources.

In India, 27.29m students were enrolled in various undergraduate courses in 2015–2016.
This number constitutes 80 percent of total enrollment in higher educational institutions
(AIHES, 2017). This statistic depicts a gross enrollment ratio (GER) of 25 percent, which is
considerably low in comparison to developed nations. The young India combined with low
GER clearly indicates the prospects of students’ enrollment growth. Nonetheless, students’
decisions about whether to enroll in college, where to enroll in college, what to study in
college, how long and how to finance college are the sequential complex questions on which
the students have very limited information. The choice of major or course is one of the
important determinants of the labor market outcomes of students. It is also the other way
round that the choice of a major plays a critical role in determining the future earnings.
These two decisions reinforce each other[1]. When students and families make their choice,
very little is known about various factors that influence the choice.

Students may make their major choice decisions partly due to the expected (lifetime)
earnings, information on earnings and its lagged response, employment rates, and
probability of success, either constant or perceived association with different majors. There
are many other elements entering the choice of concentration of college students, namely,
students’ tastes and preferences[2], high school curriculum/preparedness, cognitive and
non-cognitive ability, expected benefits of alternative courses of study, exposure to different
fields of study, knowledge content required in job market, and business cycle-related
choices, besides the heterogeneous personal and family background characteristics including social and parental expectations and attitudes and interests stimulated by faculty and peer groups. Major/choice selection further reflects a variety of underlying factors, such as affordability, social status, etc.

In this backdrop, the objective of the present paper is to identify the determinants on the probability of students’ enrollment of courses in higher education. In this endeavor, we examine the most popular choice of subjects among students, namely, medicine, engineering, other professional courses, science and humanities. It can be noted from the review of earlier studies in the next section that there hardly exist studies that examine the course choices in India. This paper makes an effort to fill this gap. It is expected that the estimated probability of course choices can inform the policy on the initiatives toward science, technology, engineering and mathematics (STEM), job-oriented and skill development courses, the balance between market and non-market-oriented courses, etc.

2. Review of select earlier studies

There exists a huge literature dealing with different aspects on the study of major choice. The present review restricts itself to studies that deal with factors that determine the major choice. In the economic literature, estimates on the returns to education prevail since 1960s (Becker, 1975; Mincer, 1974; Schultz, 1961). One of the earliest studies examined how mathematical ability influences subject choice in explaining the differences in earnings across disciplines. This differential return is found to be on account of the quantitative abilities in the production of human capital (Paglin and Rufolo, 1990). On these lines, many papers examined linking the choice of courses and their earning differentials. For instance, in analyzing the demand for and return to education, Altonji (1993) developed a model in which higher education involves a chain of sequential decisions about whether to attend college and then what subject to major, based on expected economic returns. In this framework, he explored the effects of ability, high school preparation, preferences for schooling and the borrowing rate in two periods. He further estimated the effects of gender, aptitude, high school curriculum and family background on the expected returns.

Using data from the National Longitudinal Survey of Young Men, Berger (1988) examined the relationship between predicted future earnings for five broad fields and choice of major. Following Heckman selection framework, he estimated the short-term expected future earnings from each degree. The predicted future earnings for each major are subsequently included in a conditional logit model of college choice, which is found to be a significant factor in students’ decisions. Controlling for family background characteristics, he found that individuals are likely to choose those majors that offer better future earning flow and not based on the entry level salary. Later, Montmarquette et al. (2002) examined that the choice of a major depends on students’ perceived probability of success and the predicted earnings of graduates and a counterfactual if students fail to complete the degree. Using a mixed multinomial logit model, they found that expected earnings are the most significant variable. However, they reported significant differences in the impact of expected earnings by gender and race.

Adopting experimental approach, Arcidiacono et al. (2010) collected information from students about their expected earnings in the current chosen majors and in counterfactual majors, and subjective assessments of their abilities in chosen and counterfactual majors. Using this panel of beliefs, they estimated a model of college major choice that incorporates these subjective expectations and assessments. They found that both expected earnings and students’ abilities in different majors are important determinants of student’s choice of a major. They further estimated that 7.5 percent of students would switch majors if they did not make any forecast errors. They also found if expected earnings were equal across
majors, students would switch over for humanities and social sciences to the tune of 17 percent and choosing economics would fall by 16 percent.

Taking further, Long et al. (2015) tried to find out the time lag or lagged response of completed major response in a field in year \( t+y \) and its relation to wages in the associated occupations in year \( t \). This is explored by estimating the causality and correlation between majors produced in year \( t \) and associated occupational wages in year \( t-y \). Further, they assessed whether choice of majors responds to national and local labor market wages, how responsive are the tightly connected majors and occupation to wages, and existence of heterogeneity in response by student characteristics. They found that college majors are most strongly related to wages observed three years earlier, when students were college freshmen. The responses to wages vary depending on the extent to which there is a strong mapping of majors into particular occupations. Yet, another important finding is that majors respond more strongly in disciplines wherein information is more salient and applicable. Differences in student ability and aptitudes have been found to influence choice of college majors. For example, Turner and Brown (1999) provided evidence of ability sorting across majors by SAT scores. Cognitive and non-cognitive abilities play a large role in the choice of college major (Heckman and Mosso, 2014).

As can be noted, very few studies examine the choice of course (major) in India. One such study is Chakrabarti (2009), which estimated the factors that explain choice of different stream of studies such as Arts, Commerce, Science and Technical Education as compared to not enrolling in higher education using the 52nd round NSSO data. She first estimated the demand for higher education by considering its social composition, gender-related aspects, economic background and cost of education. Since then, the deepening of globalization brought about many changes across the higher education system in countries, such as reduction in the size of the government, government-funded systems including education, more specifically higher education. Paralleled is the attraction of the skilled individuals, which led to the increase in the social demand for professional higher education.

3. The present study

In this light, the present paper attempts to explore the determinants on the probability of students’ enrollment of courses. One major difficulty in the estimation of choice of course is the selection issue, as we do not get information on choice of subjects for students, who drop out from higher education. Even among those who continue to pursue higher education, what is available is the realized choices of major and not the initial choices. It is quite possible that there could be a difference between the initial and realized choices, due to many reasons. Such information on the initial or ex ante choice of courses is not available. Hence, many choice path determinants could not be measured also due to the uncertainty involved in each stage of decision making. The paper notes the major data gap in directly studying the course choice in India, given the available data. This has been further discussed in the agenda for future research. Hence, the paper attempts to examine the enrollment by academic discipline in a multinomial logistic regression (MLR) and thereby examines the causal relationship between the set of select explanatory variables.

We are motivated to examine the choice (enrollment) of selected subjects that are most popular among students. Accordingly, the paper focuses on the subject choices of medicine, engineering, other professional courses, science and humanities. Given the categorical nature of course choice, MLR is estimated. The present study is a value addition on three counts. First, the choice of courses includes the recent trends in the preference over market-oriented/technical courses such as medicine, engineering and other professional courses (chartered accountancy and similar courses, courses from Industrial Training Institute (ITI), recognized vocational training institute, etc.). The choice of market-oriented courses has been examined in relation to the choice of conventional subjects. Second,
socio-economic background of students plays a significant role in the choice of courses. Third, the present paper uses the recent 71st round NSSO data on Social Consumption on Education. It is pertinent to note that no earnings data are available from this survey and the same is supplemented with the earning data from IHDS-II.

Much of the literature on choice of major utilizes individual survey data; multinomial logit (MLR) is used to estimate choices among a limited number of broad fields of study. The present paper follows the same approach as that of Turner and Bowen (1999). It is specified as follows:

\[ P(M_i = j) = \frac{\exp(\beta_j X_i)}{\sum_{j=1}^5 \exp(\beta_j X_i)}, \]

where \( P(M_i = j) \) denotes the probability of choosing outcome \( j \), the particular course/major choice that categorizes different disciplines. This response variable is specified with five categories: such as medicine, engineering, other professional courses, science and humanities. Our primary interest is to determine the factors governing an individual’s decision to choose a particular subject field as compared to humanities. In other words, to make the system identifiable in the MLR, humanities is treated as a reference category. The vector \( X_i \) includes the set of explanatory variables and \( \beta_j \) refers to the corresponding coefficients for each of the outcome \( j \). From an aggregate perspective, the distribution of course choices is an important input to the skill (technical skills) composition of future workforce. In that sense, except humanities, the rest of the courses are technical-intensive courses; hence, humanities is treated as a reference category.

4. Data and variables
The present paper uses the 71st Round data of NSSO on “Participation and Expenditure on Education”. The survey covered the whole of India, and the period of survey was of 6-month duration, starting on January 1, 2014 and ending on June 30, 2014. A stratified multi-stage design was adopted for the survey. A total of 4,577 villages were surveyed in rural India and the number of urban blocks surveyed was 3,720 as first-stage units in urban areas. The total number of households surveyed was 36,479 and 29,447 in rural and urban India, respectively. The total number of individuals covered were 178,331 in rural and 132,496 in urban India (Government of India, 2015). The present paper uses extensively the information from Block 5 of the schedule 25.2 in understanding the central question of the paper, namely, factors that influence the enrollment choice of course in higher education.

There were 93,513 individuals in 5–29 age group in the survey who were then attending any educational institution. Among these individuals, our variable of interest was students who were enrolled in graduate and above courses. Considering the dependent response variable, our analysis was based on the 17,235 students in this age group who were then attending any higher educational institution in the major courses such as medicine, engineering (includes IT and computer courses), other professional courses (chartered accountancy and similar courses and courses from ITIs), science (including agriculture) and humanities. Table I report the variables included in the multinomial logistic regression. They are grouped as follows: expected income, ability, cost of education, personal, socio-economic and location factors.

Expected Earnings are proxied by the wage rate of individuals by discipline and states. Since earnings (wage rate) of individuals are not available in the NSSO 71st round, the same is taken from the India Human Development Survey- II, 2012. It is jointly conducted by the University of Maryland and the National Council of Applied Economic Research, New Delhi. It covers all states and union territories of India, with the exception of Andaman/Nicobar and Lakshadweep. The survey covers 42,152 households in 384 districts, 1,420 villages
and 1,042 urban blocks located in 276 towns and cities across India. The villages and urban blocks are the primary sampling unit from which the rural sample was drawn using stratified random sampling and the urban sample from a stratified sample of towns and cities within states (or groups of states) selected by probability proportional to population (Desai et al., 2015).

Education variable collected in IHDS-II survey comprises of various degrees and majors in higher education. The various degrees consist of graduate degree in general/professional education (BA, BSc, BCom, etc.); graduate degree in engineering (BE, BTech.); graduate degree in medicine (MBBS/BAMS); post-graduate and above degree in general/professional education (Masters, PhD); post-graduate degree in professional education (MD, Law, MBA, CA, etc.); and diploma in vocational education (Diploma < 3 years; Diploma 3+years). Another category is incomplete, that is non-graduates (a completed higher secondary level). Using this available information, we create a new variable, the subject choice consisting of the subjects humanities (including science), engineering, medicine and other professional courses. This categorization is followed so as to align with course choices that we categorized using the NSSO 71st round data. The column 2 in Table II exhibits the categorization.

Within humanities, we extracted science graduates using the information in the variable on the subject studied after high school. The data are inflated to 2014 using the per captia

data.
income growth across states. The mean earnings of the working age population 15–65 across states and subject groups are used as a proxy for expected earnings. This information is triangulated to NSSO 71st survey data using a cluster variable of states and subjects choices. To get an idea of the earnings differential, Table II reports the mean earnings of individuals with highest degree among the working age population. It can be noted the highest earning is among the MBBS/BAMS and least earning is among the BA/BSc/BCom categories, besides others.

### Table II.

<table>
<thead>
<tr>
<th>Highest degree Subject choice</th>
<th>Mean earning</th>
<th>Freq.</th>
<th>% Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>BA, BSc, BCom, etc. Humanities</td>
<td>150,833</td>
<td>7,654</td>
<td>63.95</td>
</tr>
<tr>
<td>BE, BTech. Engineering</td>
<td>273,827</td>
<td>383</td>
<td>3.20</td>
</tr>
<tr>
<td>MBBS/BAMS Medicine</td>
<td>306,088</td>
<td>109</td>
<td>0.91</td>
</tr>
<tr>
<td>Masters, PhD</td>
<td>NA</td>
<td>190,982</td>
<td>2.29</td>
</tr>
<tr>
<td>MD, Law, MBA, CA, etc. Other Professional</td>
<td>226,354</td>
<td>486</td>
<td>4.06</td>
</tr>
<tr>
<td>Diploma &lt; 3 years</td>
<td>-do-</td>
<td>158,353</td>
<td>705</td>
</tr>
<tr>
<td>Diploma 3+ years</td>
<td>-do-</td>
<td>209,523</td>
<td>189</td>
</tr>
<tr>
<td>Others(b)</td>
<td>NA</td>
<td>107,518</td>
<td>182</td>
</tr>
<tr>
<td>Total</td>
<td>169,450</td>
<td>11,968</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Notes: \(a\) 15–65 age group (Based on IHDS-II); \(b\) Excluded as there are no subject details available

4.1 Ability

The acquired ability\(\cite{7}\) variables seek to determine whether different types of cognitive capabilities affect the probability of success and expected earnings of graduates in different major choices. The unobservable characteristics of ability measures enter into the choice models as SAT scores, mathematical ability, high school academic preparation, cognitive and non-cognitive abilities, etc. In the absence of such information, the present paper attempts to include three proxy ability dummy measures, namely, language spoken at home and school is the same or different, ability to operate computer and the private coaching opted by the student. The language spoken at home and college is used as indicators of unobserved ability. Introducing language ability into the analysis is important, since it is essential for explaining college selection and also has a significant impact on college choice and earnings after college graduation. If language spoken at home is the same as studied in school, it indicates a higher acquired ability to speak, read and write another language (English). Most of the college/university courses use textbooks written in English and the medium of instruction is likely to be English. However, language spoken at home is likely to be the regional language. When medium of instruction is other than the one spoken at home (English), it brings in an additional acquired ability for the student to the selection of choice of courses. It can reflect the economic conditions of the family, which is a well-known positive relationship between education and income. Studying the influence language spoken at home and school over the course choice brings out some interesting findings. The connection between language and cognitive ability and earnings is analyzed by a number of studies. For instance, Azam et al. (2011) estimated the effects of English language skills on wages. They found that hourly wages are on average 34 percent higher for men who speak fluent English and 13 percent higher for men who speak a little English compared to men who do not speak English. The return to fluent English is as large as the return to complete secondary school and half as large as the return to complete a Bachelor’s degree.

Similar argument can be made for ability to operate computer. The digital technologies have spread rapidly across the world. Adapting workers’ skills to the demands of the new...
economy is a challenge and responding to the fast-changing information and communication technology (ICT) and their adoption requires multiplicity of skills. Hence, this acquired ability to operate computer is used as yet another proxy for ability in the paper.

4.2 Descriptive statistics

Table III reports descriptive statistics of the variables used in the paper. The mean earnings for graduates with humanities are Rs.190,466, whereas they are Rs.249,919 for medical graduates.

<table>
<thead>
<tr>
<th>Medicine</th>
<th>Engineering</th>
<th>Other Prof. courses</th>
<th>Science</th>
<th>Humanities</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected Earnings (in Rs)</td>
<td>249,919</td>
<td>272,890</td>
<td>241,555</td>
<td>190,466</td>
<td>164,282</td>
</tr>
<tr>
<td>Lang_Same</td>
<td>0.97</td>
<td>4.96</td>
<td>29.54</td>
<td>10.87</td>
<td>53.86</td>
</tr>
<tr>
<td>Different</td>
<td>7.23</td>
<td>40.72</td>
<td>27.18</td>
<td>12.23</td>
<td>12.64</td>
</tr>
<tr>
<td>ABLE_OPERATE_COMP</td>
<td>5.76</td>
<td>34.18</td>
<td>28.88</td>
<td>11.30</td>
<td>19.88</td>
</tr>
<tr>
<td>NO</td>
<td>2.65</td>
<td>2.17</td>
<td>20.86</td>
<td>15.25</td>
<td>59.08</td>
</tr>
<tr>
<td>PRIVATE_COACHING</td>
<td>6.13</td>
<td>31.19</td>
<td>27.14</td>
<td>10.87</td>
<td>24.67</td>
</tr>
<tr>
<td>NO</td>
<td>1.66</td>
<td>24.27</td>
<td>31.08</td>
<td>16.29</td>
<td>26.70</td>
</tr>
<tr>
<td>HH Exp. Higher Education (in Rs.)</td>
<td>112,891</td>
<td>75,598</td>
<td>41,617</td>
<td>25,862</td>
<td>11,675</td>
</tr>
<tr>
<td>Free_education</td>
<td>5.46</td>
<td>31.33</td>
<td>28.02</td>
<td>11.50</td>
<td>23.69</td>
</tr>
<tr>
<td>Govt</td>
<td>6.80</td>
<td>44.84</td>
<td>27.90</td>
<td>9.12</td>
<td>11.34</td>
</tr>
<tr>
<td>Non_Govt</td>
<td>4.48</td>
<td>21.08</td>
<td>27.79</td>
<td>13.43</td>
<td>33.22</td>
</tr>
<tr>
<td>Male</td>
<td>3.75</td>
<td>37.60</td>
<td>27.70</td>
<td>10.92</td>
<td>20.04</td>
</tr>
<tr>
<td>Female</td>
<td>7.57</td>
<td>19.42</td>
<td>28.00</td>
<td>13.07</td>
<td>31.94</td>
</tr>
<tr>
<td>SC/ST</td>
<td>6.14</td>
<td>23.53</td>
<td>26.51</td>
<td>11.50</td>
<td>32.31</td>
</tr>
<tr>
<td>OBC</td>
<td>5.13</td>
<td>32.15</td>
<td>25.27</td>
<td>13.83</td>
<td>23.63</td>
</tr>
<tr>
<td>Others</td>
<td>5.12</td>
<td>31.51</td>
<td>30.96</td>
<td>10.11</td>
<td>22.30</td>
</tr>
<tr>
<td>Islam</td>
<td>5.98</td>
<td>25.40</td>
<td>27.71</td>
<td>11.51</td>
<td>29.40</td>
</tr>
<tr>
<td>Christianity</td>
<td>10.64</td>
<td>23.08</td>
<td>24.80</td>
<td>11.72</td>
<td>29.76</td>
</tr>
<tr>
<td>All Other Religions</td>
<td>7.38</td>
<td>29.53</td>
<td>30.22</td>
<td>9.33</td>
<td>23.54</td>
</tr>
<tr>
<td>Hinduism</td>
<td>4.73</td>
<td>31.16</td>
<td>27.96</td>
<td>12.00</td>
<td>24.15</td>
</tr>
<tr>
<td>Q1</td>
<td>2.72</td>
<td>15.75</td>
<td>23.61</td>
<td>13.72</td>
<td>44.20</td>
</tr>
<tr>
<td>Q2</td>
<td>3.63</td>
<td>20.22</td>
<td>26.10</td>
<td>13.69</td>
<td>36.36</td>
</tr>
<tr>
<td>Q3</td>
<td>4.27</td>
<td>26.00</td>
<td>29.56</td>
<td>12.88</td>
<td>27.28</td>
</tr>
<tr>
<td>Q4</td>
<td>5.31</td>
<td>34.21</td>
<td>27.72</td>
<td>12.08</td>
<td>20.68</td>
</tr>
<tr>
<td>Q5</td>
<td>8.63</td>
<td>42.67</td>
<td>29.96</td>
<td>8.61</td>
<td>10.13</td>
</tr>
<tr>
<td>Self-employed</td>
<td>4.72</td>
<td>28.60</td>
<td>27.78</td>
<td>11.78</td>
<td>27.11</td>
</tr>
<tr>
<td>Salary earning</td>
<td>6.77</td>
<td>33.19</td>
<td>27.42</td>
<td>11.45</td>
<td>21.18</td>
</tr>
<tr>
<td>Casual labor</td>
<td>2.99</td>
<td>22.03</td>
<td>30.53</td>
<td>11.64</td>
<td>32.81</td>
</tr>
<tr>
<td>Other labor</td>
<td>5.42</td>
<td>32.27</td>
<td>27.36</td>
<td>13.79</td>
<td>21.16</td>
</tr>
<tr>
<td>Illiterate</td>
<td>5.34</td>
<td>21.69</td>
<td>27.65</td>
<td>12.32</td>
<td>34.70</td>
</tr>
<tr>
<td>Primary/U Priy</td>
<td>4.36</td>
<td>25.38</td>
<td>28.05</td>
<td>12.13</td>
<td>30.07</td>
</tr>
<tr>
<td>Sec/Hr Sec</td>
<td>4.81</td>
<td>32.16</td>
<td>27.63</td>
<td>11.43</td>
<td>23.97</td>
</tr>
<tr>
<td>Grad&amp;above</td>
<td>8.16</td>
<td>36.77</td>
<td>27.93</td>
<td>11.71</td>
<td>15.43</td>
</tr>
<tr>
<td>Marginal</td>
<td>4.56</td>
<td>34.80</td>
<td>31.76</td>
<td>9.46</td>
<td>19.43</td>
</tr>
<tr>
<td>Small</td>
<td>5.88</td>
<td>36.19</td>
<td>28.84</td>
<td>10.85</td>
<td>18.24</td>
</tr>
<tr>
<td>Medium</td>
<td>5.14</td>
<td>27.27</td>
<td>27.08</td>
<td>13.02</td>
<td>27.50</td>
</tr>
<tr>
<td>Large</td>
<td>4.78</td>
<td>21.07</td>
<td>26.40</td>
<td>11.98</td>
<td>35.77</td>
</tr>
<tr>
<td>Rural</td>
<td>5.42</td>
<td>26.89</td>
<td>24.86</td>
<td>12.24</td>
<td>30.60</td>
</tr>
<tr>
<td>Urban</td>
<td>5.30</td>
<td>32.46</td>
<td>30.21</td>
<td>11.48</td>
<td>20.54</td>
</tr>
<tr>
<td>South</td>
<td>6.01</td>
<td>44.67</td>
<td>28.50</td>
<td>13.81</td>
<td>7.01</td>
</tr>
<tr>
<td>West</td>
<td>5.44</td>
<td>25.33</td>
<td>33.93</td>
<td>9.11</td>
<td>26.19</td>
</tr>
<tr>
<td>East</td>
<td>3.24</td>
<td>29.21</td>
<td>26.23</td>
<td>7.58</td>
<td>33.75</td>
</tr>
<tr>
<td>NES</td>
<td>10.20</td>
<td>23.24</td>
<td>20.50</td>
<td>13.25</td>
<td>32.82</td>
</tr>
<tr>
<td>North</td>
<td>4.13</td>
<td>25.89</td>
<td>27.28</td>
<td>12.72</td>
<td>29.98</td>
</tr>
<tr>
<td>Total</td>
<td>5.35</td>
<td>29.98</td>
<td>27.83</td>
<td>11.82</td>
<td>25.02</td>
</tr>
</tbody>
</table>

Table III.
Summary statistics of attending students by major choice (in %)
In the total sample of students, 30 percent of them speak the same language both at home and in their colleges. Among them, the humanities major constitutes 50 percent, followed by 30 percent enrolled in other professional courses. On the contrary, majority of the students, 70 percent, speak different languages than the ones they speak at home. Different language share is the highest among engineering course, followed by other professional courses. Another proxy for ability considered here is the dummy variable ability to operate computers. In the overall sample, more than 80 percent of the students are able to operate computers. As expected, the highest share of students in this category chooses engineering courses, followed by other professional courses. However, 60 percent of the students enroll in humanities, followed by other professional courses among the 20 percent who are not able to operate computer. Another effort promoting activity to enhance ability is private coaching. In the overall sample, more than 80 percent students take private tuition. Unlike other two ability proxies, here, it can be noted that private tuition is common across all course groups except medicine.

4.2.1 Cost of education. Invariably almost all earlier studies indicate the direct link between the choice of majors and the expected earnings. It may be noted this is the direct benefit of selecting a particular major, though realizable in the future. In other words, the returns to education have been implicitly the underlying factor in the choice of major. However, studies rarely examined the influence of cost of education on the choice of major. Cost of education is a significant predictor of the course enrollment. The proxy for cost of education available in the NSSO data is the household expenditure on higher education by the broad disciplinary choices. It ranges from Rs. 11,675 for humanities to Rs. 112,891 for medical courses (Table III). Yet, another cost of education proximate variable used here is whether education is free or not. Almost 90 percent of the total sample report education is free. Among them, the highest share of free education is availed by engineering, other professional and humanities students. On the contrary, no free education is available to humanities, followed by other professional courses. It is important to note that engineering students get the highest share of free education. Another cost-related factor is whether the students study in government or non-government institutions. It is well known that cost of higher education in government institutions is much lower than in non-government or private institutions. More than 60 percent of the total sample students are enrolled in government institutions. Among this, the highest share is in engineering, followed by other professionals, whereas in non-government institutions, the highest share is among humanities, followed by other professional and engineering courses.

4.2.2 Personal characteristics. The personal variables included in the model are gender, caste and religion. The gender variable, for example, seeks to determine whether women are (as is generally believed) less likely than men to choose science or engineering subjects. Similarly, the caste and religious affiliation influence the choice of course in college. With regard to the gender composition, around 60 percent of the sample constitutes male students enrolled in higher education. Among this, the highest preference is for engineering, followed by other professional and humanities courses. Among female students, highest preference is humanities, followed by other professional and engineering courses. The same pattern is found across Christian students. With regard to social category, in the total sample, 40 percent belong to general or forward category, another 40 percent OBC, and the rest 20 percent belong to SC/ST category. Among the privileged and OBC groups, the most preferred course is engineering, other professional courses, followed by humanities. A similar pattern is found across Hindus, which constitute 80 percent of the sample, whereas among SC/ST students, the first preferred courses is humanities, followed by other professional courses. This pattern is similar to the preferences of Islamic students.
4.2.3 Socio-economic variables. Family expenditures, the education and occupational levels of parents, as well as elements of family structure such as the size of the family enter the model as socio-economic variables. Historically, education and income are positively related. With rising cost of professional as well as general higher education, the economic condition of family is one of the decisive factors for the course choices. The present paper uses two economic indicators, occupation and the level of living of family (proxied by quintiles of monthly per capita consumption expenditures), as predictors to investigate the quantitative impact of different categories on selection of courses. It is argued that a more privileged background would enable a student to take risk by entering a more demanding course in science. Similarly, the parental education variables measure potential educational advantages or disadvantage due to a student’s educational background of family, which may influence him or her to choose a major with a higher risk.

In case of economic factors, among the lowest level of living quintile, 44.20 percent are enrolled in humanities, followed by other professional and engineering courses (Table III). Similar is the pattern across the low or Q2 quintile. In the middle quintile Q3, the highest share of students prefer other professional courses, followed by humanities and engineering courses. In the upper middle quintile Q4, students first prefer engineering, followed by other professional courses and humanities courses. In the top quintile Q5, engineering, other professional courses and humanities occupy the major shares. Interestingly, medicine and sciences occupy the same shares across quintiles. A clear division is apparent between the least Q1 and the top Q5 in terms of course choices. With regard to occupation, 50 percent of the students’ families are engaged in self-employment, followed by another 34 percent in salaried earnings. Among the self-employed, most preferred course is engineering, and equal preference is between other professional and humanities, whereas among the salaried, the first preferred course is engineering, followed by other professional and humanities courses.

Educational attainment of the head of the household is classified as no literate, primary, secondary and graduate and above levels of education. In the total sample, 34 percent of the students’ head of the family attains secondary education, ranging from 9 to 12 years of schooling. Another 30 percent are with 5–8 years of schooling. Another 24 percent of students’ head of the family has graduate and above educational attainment. When education of the head of household is secondary and above, the most preferred course is engineering, followed by other professional and humanities courses. When education of the head of household is below elementary levels, the most preferred course is humanities, followed by other professional courses and engineering.

In the case of family size, majority, almost 70 percent, of the sample students belong to either small or medium family size, including marginal families, the highest preferences are towards engineering, followed by other professional and humanities as in the case of rich quintile Q5, male and Hindu students. Among the large family size, most preferred course is humanities, followed by other professional and engineering courses as found in poorest quintile Q1 and in below elementary levels of education of the head of the households.

4.2.4 Geographical. The choice of major depends not only on the costs, expected earnings, and household characteristics but also on differences in regions. The regional variables considered in the analysis are location and regions. Locations measure college education received in urban areas as rural areas is treated as the reference category. Regions measure the students belonging to different regions of the country, namely, south, north, east, west and NES. In the analysis, the region south is treated as reference category (see Table I). India has 36 states/UTs and each state/UT has a huge population size and large geographical areas. The choice of course has region and state-specific influence because of the vast variation in the nature of state economy, society, culture and inherent education systems.
In this direction, the variable regions as one of predictor is included in the model. South is a reference category, as it depicts faster educational development compared to the rest of the regions, more so among the market-oriented professional courses. It is in this context, one needs to think south versus the rest of the regions in India. This is one of the few papers that examine the regional variations in India in this fashion.

With regard to location, among the rural students, the most preferred course is humanities, followed by engineering and other professional courses. Urban areas mirror the preferences of rich quintile Q5 and marginal, small and medium family sizes. With regard to regions, in the total sample, 40 percent belong to northern regions, followed by 22 percent from south. Among the North, the highest preferred course is humanities, followed by other professional and engineering courses. In the NES and Eastern regions, the first preferred course is humanities, followed by engineering and other professional courses. In the West, the first preferred course is other professional courses, followed by humanities and engineering. Whereas in the South, the top most preferred course is engineering, followed by other professional and science courses. Including the variable “Regions” becomes significant, as it depicts contrasting pattern in the enrollment preferences. All factors considered here relate to demand side. Equally important are the supply side factors, namely, access to and availability of seats in higher educational institutions. The present paper does not focus on the supply side factors, as there is no information directly available from the survey[8]. Nonetheless, the role of supply side factors does play a role on subject choice.

5. Discussion
Table IV reports the marginal effects from estimating the MLR on the enrollment by disciplinary choices relative to the base category, humanities. How these different factors determine the probability of selecting different courses is examined by estimating the MLR. The preliminary analysis such as correlation coefficient matrix indicates that there is no multicollinearity among the selected variables (Table AI). The overall test of model in LR $\chi^2$ and its probability values are found to be satisfactory. As Cameron & Trivedi (p. 333) noted, “a marginal effect, or partial effect, most often measures the effect on the conditional mean of $y$ of a change in one of the regressors, say $X_k$. In the linear regression model, the marginal effect equals the relevant slope coefficient, greatly simplifying analysis. For nonlinear models, this is no longer the case, leading to remarkably many different methods for calculating marginal effects.” The marginal effect for categorical variables shows how $P(Y = 1)$ changes as the categorical variable change from 0 to 1, after controlling in some way for the other variables in the model[9]. The marginal effects are preferred in the present paper, as they are the same as the slope coefficients and hence easy to interpret.

The proxy for expected earning is dropped from the model, as it did not report expected results, as it could be probably due to limitations in the data. The ability to speak another language than the one spoken at home is more likely of choosing engineering with humanities as the base category. This predictor is highly significant across all course choices, albeit a declining probability of choosing other professional courses and science[10]. But this finding is contradictory to Jain (2016), who examined the impact of official language policies using historical data. He found that linguistically mismatched districts have 18 percent lower literacy rates and 20 percent lower college graduation rates, driven by difficulty in acquiring education due to a different medium of instruction in schools. It could be because in Jain's study, literacy rates are analyzed with languages, whereas the present study focuses on course choices in higher education. The ability to operate computer increases with 13 percentage points, and the students are more likely to choose the sciences courses, followed by 11 percentage points for other professional courses,
<table>
<thead>
<tr>
<th>Explanatory variables</th>
<th>Medicine</th>
<th>Engineering</th>
<th>Other Prof</th>
<th>Science</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dummy</td>
<td>LANG_INSTU_HOME</td>
<td>0.0660*** (0.007)</td>
<td>2.9537*** (0.169)</td>
<td>−0.3195*** (0.013)</td>
</tr>
<tr>
<td>Dummy</td>
<td>ABLE_OPERATE_COMP = 2</td>
<td>0.0029 (0.007)</td>
<td>−0.3496* (0.165)</td>
<td>0.0145*** (0.018)</td>
</tr>
<tr>
<td>Dummy</td>
<td>PRIVATE_COACHING</td>
<td>0.0655*** (0.007)</td>
<td>0.9467*** (0.171)</td>
<td>−0.0574*** (0.012)</td>
</tr>
<tr>
<td>Lhhxed</td>
<td>0.0107*** (0.002)</td>
<td>3.4302*** (0.079)</td>
<td>0.2201*** (0.008)</td>
<td>−0.1098*** (0.007)</td>
</tr>
<tr>
<td>Dummy</td>
<td>FREE_EDUCATION</td>
<td>−0.0034 (0.008)</td>
<td>−0.2453 (0.180)</td>
<td>0.0285 (0.020)</td>
</tr>
<tr>
<td>Dummy</td>
<td>type_insn_2cate</td>
<td>0.0169*** (0.004)</td>
<td>1.4241*** (0.106)</td>
<td>−0.0067 (0.010)</td>
</tr>
<tr>
<td>Dummy</td>
<td>GENDER_STUDENTS</td>
<td>−0.400*** (0.004)</td>
<td>−0.194*** (0.094)</td>
<td>−0.0423*** (0.010)</td>
</tr>
<tr>
<td>Dummy</td>
<td>ST/SC Base</td>
<td>−0.0001 (0.006)</td>
<td>0.1651 (0.134)</td>
<td>−0.0383*** (0.014)</td>
</tr>
<tr>
<td>Islam Base</td>
<td>−0.0214* (0.010)</td>
<td>−1.1077*** (0.225)</td>
<td>−0.0043 (0.028)</td>
<td>0.0248 (0.023)</td>
</tr>
<tr>
<td>Dummy</td>
<td>Q1 Base</td>
<td>−0.0209* (0.010)</td>
<td>−1.3741*** (0.253)</td>
<td>−0.0686* (0.027)</td>
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<tr>
<td>Hinduism</td>
<td>−0.0206*** (0.007)</td>
<td>−0.2539 (0.149)</td>
<td>−0.0584*** (0.016)</td>
<td>0.0328* (0.013)</td>
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<tr>
<td>Q2</td>
<td>0.0070 (0.006)</td>
<td>−0.0055 (0.191)</td>
<td>−0.0079 (0.019)</td>
<td>−0.0011 (0.017)</td>
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<tr>
<td>Q3</td>
<td>0.0068 (0.006)</td>
<td>0.1291 (0.188)</td>
<td>0.0118 (0.018)</td>
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<tr>
<td>Q4</td>
<td>0.0159*** (0.006)</td>
<td>0.5176*** (0.185)</td>
<td>−0.0234 (0.018)</td>
<td>−0.0457*** (0.016)</td>
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<tr>
<td>Q5</td>
<td>0.0458*** (0.008)</td>
<td>1.3420*** (0.196)</td>
<td>0.0034 (0.019)</td>
<td>−0.1006*** (0.017)</td>
</tr>
<tr>
<td>Dummy</td>
<td>Edn_hoh</td>
<td>0.0079 (0.004)</td>
<td>0.5149*** (0.105)</td>
<td>−0.0342** (0.011)</td>
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<tr>
<td>Self-Employed Salary</td>
<td>0.0059 (0.004)</td>
<td>0.0402 (0.107)</td>
<td>−0.0231* (0.011)</td>
<td>0.0077 (0.010)</td>
</tr>
<tr>
<td>Base</td>
<td>Casual labor</td>
<td>−0.0154* (0.007)</td>
<td>−1.1946*** (0.214)</td>
<td>0.0237 (0.023)</td>
</tr>
<tr>
<td>Other labor</td>
<td>−0.0017 (0.007)</td>
<td>0.1035 (0.183)</td>
<td>−0.0358 (0.019)</td>
<td>0.0652*** (0.018)</td>
</tr>
<tr>
<td>Small</td>
<td>0.0121 (0.008)</td>
<td>0.6588*** (0.265)</td>
<td>−0.0348 (0.028)</td>
<td>0.0222*** (0.023)</td>
</tr>
<tr>
<td>Medium</td>
<td>0.0097 (0.009)</td>
<td>0.5105 (0.291)</td>
<td>−0.0494 (0.028)</td>
<td>0.0225** (0.023)</td>
</tr>
<tr>
<td>Large</td>
<td>0.0243* (0.010)</td>
<td>0.8979*** (0.305)</td>
<td>−0.0356 (0.030)</td>
<td>0.0262 (0.025)</td>
</tr>
<tr>
<td>Rural Base</td>
<td>Urban</td>
<td>−0.0252*** (0.004)</td>
<td>−0.3337*** (0.009)</td>
<td>0.0717*** (0.010)</td>
</tr>
<tr>
<td>South Base</td>
<td>West</td>
<td>0.0217*** (0.006)</td>
<td>−1.5936*** (0.166)</td>
<td>0.0313* (0.016)</td>
</tr>
<tr>
<td></td>
<td>East</td>
<td>−0.0099 (0.007)</td>
<td>−2.4489*** (0.213)</td>
<td>0.0026 (0.019)</td>
</tr>
<tr>
<td></td>
<td>NES</td>
<td>0.0373*** (0.009)</td>
<td>−2.2271*** (0.181)</td>
<td>−0.0988*** (0.019)</td>
</tr>
<tr>
<td></td>
<td>North</td>
<td>0.0165 (0.003)</td>
<td>−1.6760*** (0.154)</td>
<td>−0.0063 (0.014)</td>
</tr>
<tr>
<td></td>
<td>Constant</td>
<td>−36.44*** (0.990)</td>
<td>−36.238*** (0.714)</td>
<td>−36.238*** (0.714)</td>
</tr>
<tr>
<td></td>
<td>Pseudo $R^2$</td>
<td>0.3002</td>
<td>0.3002</td>
<td>0.3002</td>
</tr>
<tr>
<td></td>
<td>LR $\chi^2$ (124)</td>
<td>16,763.35</td>
<td>16,763.35</td>
<td>16,763.35</td>
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<tr>
<td></td>
<td>$N$</td>
<td>17,235</td>
<td>17,235</td>
<td>17,235</td>
</tr>
</tbody>
</table>

Notes: dy/dx for factor levels is the discrete change from the base level. Estimates on standard error are in parentheses. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$
whereas the same variable surprisingly shows that students are significantly less likely to choose engineering course. The students attending any private coaching are more likely of enrolling in engineering with a 95 percentage higher points, whereas the same tend to less likely enroll in other professional and science courses[11]. Ability factors considered here could probably capture the unobservable such as hard work or any other innate abilities. The results indicate that the higher the ability (proxies[12]), more apparent will be the preference for engineering. In other words, the more able students are crowded in engineering courses.

The cost of education is proxied by the reported household expenditure on education for all enrolled children by discipline. The log of this expenditure has more likelihood for engineering courses, followed by other professional and medical courses. But the likelihood is significantly less likely in science course by 11 percentage points. The results indicate that increasing the cost of higher education by charging higher fees, as a method of generating resources, can have serious welfare implication, especially for science courses, reporting 0.042 percentage points, with students more likely choosing science courses than others. One main reason could be that fees and other payments in any courses are higher in non-government institutions. This is further shown that provision of free education improves the likelihood of enrolling in science courses. Studying in government institutions increases the likelihood of enrolling in engineering and medicine courses as well. This might be the case for students for high preference to enroll in government intuitions for engineering and medical courses.

The likelihood of enrolling in engineering courses of female students (compared to male and humanities) declines by 19 percentage points among engineering, declines by 5 percentage points among science courses and 4 percentage points in medicine and other professional courses each. This is a serious concern, as the expected earnings or, in other words, the economic returns to such courses are higher. This can have a bearing on the economic freedom that would have accrued to women in future. Such gender disparity begins at the higher secondary level. Sahoo and Klasen (2018) found that there is substantial intra-household gender disparity in the choice of study stream at the higher secondary level of education. They reported that girls are 20 percentage points less likely than boys to study in technical streams as compared to arts or humanities.

Among the caste groups, keeping SC/ST and humanities as the base category, the likelihood of OBC students is less likely by 4 percentage points of enrolling in other professional courses, whereas the likelihood improves by 5 percentage points in science courses. In the case of general category, the likelihood increases by 3 percentage points in other professional courses. The non SC/ST students’ preference for other professional course is lesser than the preference of SC/ST students. This indicates the preference over other skill orientations, apart from the conventional professional courses of engineering, medicine and sciences, is more among SC/ST students. This could be on account of the cost and time duration (opportunity cost) of other professional courses that are lesser than the conventional professional courses that normally range from a minimum four to six years in India.

With regard to religious group, keeping Islam and humanities as the base category, the likelihood of enrolling is less likely by the Christian students in engineering and medicine by 2 and 11 percentage points, respectively. With Hindu students, the likelihood declines by 2 percentage points in medicine and by 5 percentage points in other professional courses (Table IV). Hindu students, the majority student population, prefer engineering courses.

Expenditure groups or the level of living quintiles with the poorest quintile as the base category is statistically insignificant at Q2 and Q3 across courses. Among Q4 quintiles, the likelihood of enrolling in engineering and medicine courses is increased by 5 percentage points and 1 percentage point, respectively. With regard to Q5 quintile, the same pattern continues; however, the percentage point augments over quintiles. In other words, an incremental effect is visible: the gap between Q4 and Q5 quintiles in medicine and engineering courses widens at
an increasing level. On the contrary, the likelihood declines by 5 percentage points in Q4 and 10 percentage points less likely in Q5 quintiles among science courses. Income inequity widens in the case of medicine, engineering and science courses.

Similar to family economic status, parental education plays a crucial role in children’s choice of subjects. Education of the head of the household with the base category of elementary and below levels, the likelihood of enrolling in other professional courses declines by 3 percentage points and improves by 5 percentage points in engineering. It is noticed that as education level of head of family goes up, shift from non-technical to technical courses is observed. This shows a considerable positive externality or spillover effect by promoting greater educational achievements of the successive generations when parents are better educated.

For occupation category with self-employed as the base category, the probability of enrolling in other professional courses declines by 2 percentage points for the children of salaried parents. For the children of casual labor families as compared to the self-employed families, the increase in probabilities is 6 percentage points for choosing science courses against humanities. Family size plays an important role in quantity quality trade off, particularly at the school education, the choice between schooling and work, that is the higher the family size, the lesser will be the chances for the children to continue schooling than participating in work. For family size with marginal as the base category, the likelihood increases by 6 percentage points among small, increases by 5 percentage points among medium family size in science, and 3 percentage points more likely among large families enrolling in medicine and 9 percentage points more likely among large families in engineering.

Location advantages or disadvantages of students for deciding the courses are mainly because of better infrastructure, teacher quality, cost of education and the quality of peer groups. The social and economic difference that we have in terms of rural/urban and different regions of the country has inherent influence on the choice of courses. Rural as the base category indicates probability by 2 percentage points less likely in enrolling in medicine; and 3 percentage points less likely in engineering among urban students. For other location characteristic regions, with South as reference category, the West indicates that there is a likelihood of 2 percentage points that students will be more likely enrolled in medicine and 3 percentage points that students will be more likely enrolled in other professional courses, whereas the students are less likely to be enrolled in engineering and science courses, whereas in Eastern region, the same less likely in engineering and science courses continues. In the NES, the pattern is less likely found in engineering and other professional courses but more likely in medicine courses. In the North, the probability of enrolling in engineering is less likely. But the likelihood of enrolling in science courses is 3 percentage points more likely in north.

The logit regressions reveal that for India, ceteris paribus, an individual residing in South India has a significantly higher probability of attending engineering courses than an individual from other regions of India. In order to understand the south and preference for engineering phenomenon, an attempt is made to estimate the predicted average probabilities of subject choice by regions[13]. The same has been pursued for knowing about the wealth effect across course choices in the subsequent section.

5.1 Predicated probabilities
Figure 1 plots the predicted probabilities of subject choice by levels of living quintiles. The probability of selecting humanities and medicine remain around the same till quintile Q4; the choice of medicine surpasses humanities at quintile Q5. But the pattern between the choice of humanities and medicines varies. The pattern is similar across medicine and engineering; a clear shift can be seen as levels of living quintiles move from Q4 and Q5. Parallel to this, the predicted probabilities of humanities and science depict the same
patterns but on the reverse (decline) as levels of living quintiles move from Q4 and Q5. On the contrary, predicted probability of selecting other professional courses is highest across quintiles. On similar lines, Geetha Rani (2015) lamented that professional courses, namely medical and engineering not only have a long duration and high cost courses but also they are also high paying degrees. This tilted allocation of talent indeed perpetuates the inequality across life time earnings. This would result in imbalance in the course structure, as able and talented students would opt for market-oriented courses than the conventional courses, creating an imbalance. Further, these potential inefficiencies in the allocation of talent could impede innovation at the top of the socio-economic pyramid. The analysis here brings out the hierarchical preferences of courses across assorted expenditure levels of families, which intend to generate earning inequality in the future.

A similar analysis is attempted to estimate the predicated probabilities of subject choices across regions (Figure 2). In this figure, we try to answer the question as to what extent the place of studying matters from where a student graduates. In other words, are students with a degree from one of the institutions in the south are more likely to be choosing engineering than any other subject choice as compared to other regions of India, north, east, west and north east.

The predicted probabilities for medicine remain almost the same across regions. The predicated probabilities of engineering are the highest in the South, followed by East, West, North and the least in the NES regions. The average predicted probability of enrolling in other professional courses is the highest across all regions, except NES. This pattern is similar to the predicted probabilities of engineering courses, that is the predicated probabilities are the highest in the south and least in the NES. Followed by South, the highest probabilities of enrolling in other professional courses are found to be in West, North and Eastern regions. Yet another interesting trend predicted is the probability of enrolling in science almost remains the same across regions, except a lesser probability in the Eastern region. The likelihood of enrolling in humanities is the highest in the NES, followed by East, North, West and least predicted probability in the Southern regions.

This clearly brings out the preferences of technical and non-technical courses between different regions. Why is it so? One of the reasons could be the growth of private
institutions in few states accentuated after the adoption of the neo-liberal policies. This period coincides with macro economic reforms in major policy changes at both macro and sub-sectoral levels. These reform packages imposed decline on the public budgets on education, more specifically on higher and technical education. These economic reforms resulted in several policy directions, paved way for several alternatives, including rapid expansion of the private sector in higher and technical education. Some states managed to face these challenges and opportunities. It would be appropriate to quote the Perroux (1950)[14]; he was one of the first who asserted that growth does not appear everywhere at the same time and manifests itself in points or poles of growth. The enrolment patterns across regions would further widen the regional disparity in terms of employment and income generation. Policy implication is that initiatives are to be in place to promote education, and employment in other regions is equally important, so that regional balance is maintained and movement of labor, capital and trade is avoided from backward to developed regions as development takes place.

6. Concluding remarks
In this section, we summarize the major findings, suggestions and policy implications. The paper brings out interesting results, albeit there are few concerns. It can be said that course choices are influenced by knowing another language that is different from the one spoken at home, private coaching, cost of higher education, type of institution, gender, better-off economic status, urban locations and regions. The consumption expenditure quintiles reinforce the relationship between earnings and course of choices. The dichotomy is clear between the choice of courses and expenditure or levels of living quintiles in terms of technical and non-technical streams. This would further widen the existing inequalities by adding yet another dimension of inequality. Although the choice-based credit system[15] makes an effort to reduce this divergence, it is not yet permeated in the higher education system.

Gender polarization is very clear between humanities and engineering. The analysis of choice of individual discipline reveals that female youths have significantly higher
likelihood of attending humanities courses as compared to their male counterpart. However, for every other stream, that is, science, medicine, engineering and other professional courses, there is a strong gender bias against female even after controlling for social and economic background of the household. The same holds good with SC/ST, Islam, students belonging to the poorest to middle expenditure quintiles Q1 through Q3, large family size and education of the head of household with below elementary levels, whereas male, OBC, other caste groups, Hindus, rich quintiles Q4 and Q5, marginal, small and medium family size and education of head of the household with secondary and above levels prefer engineering and other professional courses.

Predicted probabilities of course choices bring in a clear distinction between south and west regions preferring engineering and other professional courses, whereas north, east and NES prefer humanities. The findings of the paper suggest that course and regional imbalance needs to be worked with multi-pronged strategies of providing both access to education and employment opportunities in other states to maintain regional balance. However, the predicted probabilities of medicine and science remain similar across the board. These findings bring in implications for practice in their ability to predict the demand for course choices and their share of demand, not only in the labor market but also across regions. Further, within the states, rural and urban variation can have serious influence on choice of courses. In this direction, analysis at state levels related to choice of courses can be further examined.

6.1 Agenda for future research
As noted earlier, very few studies on the determinants of field choice in higher education prevail in India. It is primarily because of lack of such data. More in-depth surveys are required to study the course choice problem in India, as the existing NSSO data inform only the realized choice of courses but not the actual choice and whether actual choice is the same as realized choice. Yet, another significant data gap in this area is the information on expected earnings from taking up this course, the preparedness of students at the senior secondary level, the institution type, quality of education at the school level, marks obtained at school leaving board examination, etc. Hence, there is a need for sample surveys to include such information in the collection of data. Equally important are the cost studies on higher education, more specifically what is the relationship between cost of higher education across courses and demand for student loans? This evidence is particularly important to know which course choices can support student loans. Is demand for student loans higher as cost of higher education is increasing? Does it vary between public and private institutions of higher education and its relationship with course choices? What is the relationship between course choices and the demand for skills and skill content in the labor market? What is the match or mismatch between skill content of courses and their choices with regard to the demand for skills in the labor market? On the distributional aspect, a number of research questions arise: how course choices either maintain the status quo or how they have helped in the redistribution and social mobility among students? How do they widen the earning inequality, is there any inter-generational mobility across course choices? How similar professions are flocked or sorted together in terms of marital relationship?

Notes
1. Separating the effects of wages on career choices versus career choices on wages is a challenging task, owing to basic identification issues with regard to not only quantity and price but also the ex ante and ex post realization of both quantity and price (Freeman and Hirsch, 2008).
2. These individual characteristics determine how much students enjoy their coursework and how much time and effort they invest towards their degree.
3. Course choice here refers to the realized course choice of the students.

4. Not relating to India.

5. Borrowing rate or interest rate compared between ex post or realized returns to college on the probability of various post-secondary college outcomes and the *ex ante* or expected return to starting college.

6. The Indian way of saying a major is course. Hereafter, major is referred as course.

7. Studies generally use SAT scores or grade points, but there is hardly any information available on the innate or acquired ability of students like marks obtained, etc., in these survey data.

8. One way may be to calculate a ratio of capacity/college going population in each district/state and controlling the same. This can be further examined with district and or state fixed effects, which will be the future area of work for the authors.

9. In other words, with a dichotomous independent variable, the marginal effect is the difference in the adjusted predictions for the two groups.

10. Only the statistically significant parameters are discussed.

11. It can be argued that one of the determinants, not taking private coaching, which may perhaps mean that the child has more help at home, may be because parents are able to help or the child has better ability, for which there is no information available. However, it may also mean that the child has less ability, so parents do not want to invest on him/her, or parents have less ability to offer extra support or the child not interested in studies. It can be argued that although taking private tuition is an indicator of economic conditions, the rationale to include it under ability is because taking private tuition is expected to enhance the quality of learning of the students. But, the purpose of taking private tuition is unknown, as this information is unavailable. Hence, the channels could not be explored further. Since this information is not available, there could be reverse causality when one looks at the relationship between subject choice and spending on private tuition, because choosing science subject perhaps mean students need to spend more on private tuition as compared to humanities. However, the underlying reasons are unobservable.

12. Ability to operate computers.

13. The prediction of outcomes on the basis of current characteristics is possible without regard to the causal relationships among variables (Constantine, 2012). Although it can be argued that these interpretations are merely association, one cannot ignore that potential power and added complexity of regression analysis are best reserved for either predicting outcomes or explaining relationships.

14. One of his main contribution was the concept of *poles de croissance* or “growth poles.” It implied that Government policies aimed at the regeneration of a specific local region were critically dependent upon the input–output linkages associated with the industry. It uncovers regional inequalities and focuses the direction on propulsive and propelled units. Further, it offers a dynamic image of the regions, which is invariably based on a general tendency to spatial focus of manufacturing facilities; and it presents a basis for an alternative for centralization by supporting the creation of new development poles, namely, the decentralized focus.

15. The most important recommendation of the Yashpal Committee (Government of India, 2009).

References


Further reading
# Appendix

## Table A4

Correlation matrix of dependent variable and selected predictors.

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**Note:** *Statistically significant at 95 percent level*
About the authors

Dr Geetha Rani Prakasam is Professor at National Institute of Educational Planning and Administration (NIEPA), New Delhi. She was the Professor and Head, Department of Economics, Central University of Tamil Nadu on Deputation from NIEPA. She has contributed to the financial memorandum for Right to Education Bill under Central Advisory Board on Education (CABE), the highest advisory body to advise the Central and State Governments in the field of education, constituted by the Ministry of Human Resources Development (MHRD) and the financial implications of national and state wise estimates of Right to Education (RTE) Act, submitted to the 13th Finance Commission. Her core competencies include research, teaching, training and consultancy in the area of Economics and financing of education. She has been organizing the training programs on school finances and higher education finances for more than a decade at NIEPA. She co-edited a volume on Right to Education in India published by Routledge, UK. She has published more than 60 research papers in the area of Development Economics and Economics and Financing of Education. She teaches courses such as Educational Planning and Economics and Financing of Education at the University. Dr Geetha Rani Prakasam is the corresponding author and can be contacted at: geethselva@gmail.com

Mukesh is Joint Director, Department of Fisheries, Ministry of Fisheries, Animal Husbandry & Dairying, Government of India and belongs to the Indian Statistical Service 2007 batch. As a statistician with nearly 12 years of experience, he specializes in handling large scale data, analysis and application of econometric methods for policy formulation. He completed his MSc (Statistics) from the University of Delhi and BSc in Statistics from Banaras Hindu University. He is a notable research scholar who has published 40 papers in diverse areas of Agriculture, Poverty, Consumer Expenditure, Health, Inequality, Price, Income, Women and Gender, Education, Employment-Unemployment, Rural development, Food Security, Water and Sanitation in renowned journals.

Gopinathan R. received a Doctoral Degree from the Department of Economics, Pondicherry University. His area of specialization is Financial Economics, Development Economics and Applied Econometrics. He has worked as Faculty Member in the Department of Economics at Central University of Rajasthan and Central University of Tamil Nadu. Gopinathan has also worked in S&P Global GRA CRISIL India. He has presented research papers at various National and International Conferences and has published research papers in academic journals. He is currently Assistant Professor in School of Economics, Shri Mata Vaishno Devi University, Jammu & Kashmir, India.

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Transformational leadership, customer citizenship behavior, employee intrinsic motivation, and employee creativity

Le Minh-Duc
School of Management,
University of Economics Ho Chi Minh City, Ho Chi Minh City, Vietnam, and
Nguyen Huu-Lam
Centre for Excellence in Management and Development,
University of Economics Ho Chi Minh City, Ho Chi Minh City, Vietnam

Abstract

Purpose – The purpose of this paper is to investigate the simultaneous relationships among transformational leadership (TFL), customer citizenship behavior (CCB), employee intrinsic motivation (IM) and employee creativity (EC).

Design/methodology/approach – This study was conducted in companies (hotels and tour operators) from the hospitality sector in Vietnam. The respondents were selected based on convenience sampling. A cross-sectional survey design and questionnaire method was used for data collection.

Findings – The results of the empirical analysis suggest that: employee IM is significantly associated with EC, both TFL and CCB are positively related to employee IM and EC and employee IM positively mediates the effects of both TFL and CCB on EC.

Practical implications – The results may help managers focus on TFL behavior, CCB and employee IM to achieve higher EC.

Originality/value – This investigation is expected to be new and valuable. Research on relationships of CCB, employee IM and EC is of significant importance but has not been examined to date. It is hoped that this study addresses this important gap in the marketing literature.

Keywords Transformational leadership, Employee creativity, Customer citizenship behaviour, Value co-creation, Employee intrinsic motivation

Paper type Research paper

1. Introduction

The business environment has become increasingly more uncertain, complex and turbulent (Tidd, 2001; Wiggins and Ruefli, 2005; Nilsson, 2006; Mason et al., 2007; Hormiga et al., 2013), causing organizations to seek innovation to improve their responsiveness to environmental changes. According to West and Farr (1990), creativity is best conceptualized as a first step necessary for subsequent innovation. Creative employees are considered a crucial element in the process of innovation (Amabile, 1988). Klijn and Tomic (2010) define creativity as the production of new and useful ideas or solutions by one or more individuals within a work environment. Employee creativity (EC) plays a critical role in organizations’ long-term survival by enabling them to achieve competitive advantage and growth (Amabile, 1988; Oldham and Cummings, 1996; Shalley et al., 2004).
The tourism industry has been determined to become the spearhead of Vietnam’s economic sector (Foreign Press Center, 2018). According to the 2018 World Travel and Tourism Council’s report, the total contribution of travel and tourism to the GDP in Vietnam was $20.61bn, which is 9.4 percent of the total GDP in 2017 (WTTC, 2018). The total contribution of travel and tourism to employment was 4.1m jobs (including jobs indirectly supported by the industry), which is 7.6 percent of Vietnam’s total employment (WTTC, 2018). Vietnam is considered one of the favorite and most attractive tourist destinations among many international travelers. In 2017, Vietnam registered more than 12.9m international visitors, an increase to 29.1 percent from 2016, and shares 4.0 percent of international tourism receipts (UNWTO, 2018). Vietnam recorded the fastest growth in arrivals in South East Asia in 2017 (UNWTO, 2018) and has been ranked fourth in tourism among 10 of the world’s countries, recording the largest increase in international tourist arrivals in 2017 compared with 2016.

To continue enhancing the sector’s competitiveness and reach long-term and sustainable development, Vietnam tourism firms not only should focus on environmental sustainability and tourist service infrastructure (WEF, 2017) but also promote tourism products and service innovation (Foreign Press Center, 2018). Several studies have examined growth promotion (Kumar, 2014; Hampton et al., 2018), poverty alleviation (Truong et al., 2014), environmental management (Le et al., 2006; Luu, 2017), sustainable development (Di Giovine, 2009; Long and Nguyen, 2018; Nguyen et al., 2019), education (Buzinde et al., 2018) and customer satisfaction and loyalty (Cong, 2016; Le and Dong, 2017; Truong et al., 2017) in Vietnam’s hospitality and tourism industry. While creativity is necessary to create a unique impression of emotion for visitors that grabs their attention and creates high added value (Foreign Press Center, 2018), little research has focused on the context of Vietnam’s hospitality and tourism industry. Therefore, the need for research in a Vietnam hospitality and tourism context is accentuated in this transition economy, which is different from the western market.

Although previous evidence consistently supports the view that intrinsic motivation (IM) among service employees leads to higher levels of EC (e.g. Amabile, 1997; Amabile et al., 1990; Tierney et al., 1999), some studies have found a non-significant relationship (e.g. Perry-Smith, 2006). Perry-Smith (2006) found that IM was not significantly associated with individual creativity of research scientist. Therefore, George (2007, p. 445) suggests that “rather than assume that IM underlies creativity, researchers need to tackle this theorized linkage more directly and in more depth.” In light of the aforementioned information, there is still a need to empirically investigate the relationship between IM and EC to generalize the results.

In the literature, many scholars have pointed to transformational leadership (TFL) as one a particular factor that influences follower creativity (Bass, 1985; Mayer et al., 1995). However, meta-analyses report mixed results regarding the relationship between the two constructs. Some scholars have found a typically positive relationship between TFL and EC (Gumusluoglu and Ilsev, 2009; Jaiswal and Dhar, 2015; Jyoti and Dev, 2015; Mittal and Dhar, 2015; Khalili, 2016), whereas other scholars report no positive effect (Kim and Lee, 2011). Jaiswal and Dhar (2015) find a positive relationship between TFL and individual creativity in tourist hotel customer-contact employees in India. Kim and Lee (2011) demonstrate that the relationship between leadership and employees’ creative behavior should not be seen as straightforwardly causal. They demonstrate that TFL indirectly affects employees’ creative behavior through individual- and work-related mediating variables, such as work motivation and job satisfaction, in the semiconductor industry in Korea. This research is continuing to investigate the effects of TFL on EC.

The literature reveals the positive effect of TFL on IM (e.g. Charbonneau et al., 2001; Kim and Lee, 2011) in the semiconductor industry and in the sports sector in developed countries. However, the effects of TFL on IM in the hospitality and tourism setting have not yet been investigated in Vietnam, where there still exists a need to study this relationship.
Anderson et al. (2014) comment that little attention has been paid to how actors outside of the organization as customers influence EC and innovation. Their review reveals a dearth of studies that have examined the causes, processes or effects of cross-boundary innovation from the outside in; hence, they propose that future studies could examine these outside-in influences regarding how and why employees engage in creativity and innovation while paying particular attention to the role of customers in this process. Grissemann and Stokburger-Sauer (2012) call for further research on customer co-creation in a service and tourism service context. In the service context, the effects of customer activities that support the social and psychological context as customer citizenship behavior (CCB) on psychological behavioral responses of the service employee remain largely unknown (Yi et al., 2011; Limpanitgul et al., 2013) and Balaji (2014) and Shannahan et al. (2017) suggest further examination of CCB. The relationship between CCB and EC remains largely unexplored. In this vein, this paper focuses on the role of CCB in the value co-creation influence on EC in the hospitality sector. The results of this investigation are expected to be new and valuable.

When customers perform citizenship behaviors, it has a positive effect on employee morale and job satisfaction (Garma and Bove, 2009, 2011). Supportive behaviors help employees feel interested and excited (Coelho et al., 2011). Job satisfaction is considered a pleasurable or positive emotional state (Locke, 1976; Limpanitgul et al., 2013). Positive mood is likely to give the person pleasure (Isen et al., 1976; Garma and Bove, 2011) and, thus, is likely to enhance employees’ IM. Research on the relationship between CCB and IM is of significant importance but has not been examined to date. Hence, this study tries to explore the influence of CCB on IM. It is hoped that this study addresses this important gap in the marketing literature.

Overall, very few studies have investigated the interactions among leadership, customers and employees to promote EC in Vietnam’s hospitality and tourism sector. This study attempts to fill this gap. Specifically, the purpose of this research is to analyze the impact of TFL and CCB on IM and EC in the hospitality and tourism sector in Vietnam. The results of this research may help service providers understand how leaders and customers can contribute to EC in the co-creation process and, thereby, create tools, programs, and policies to promote these important behaviors.

The remainder of this paper is organized as follows. In the first section, based on previous research, the authors formulate the research hypotheses development. In the second section related to the methodology, the authors present, among others, the data collections methods and measures. The third section reports the data analysis and main research results. Finally, the authors discuss the theoretical and pragmatic implications of the study’s findings for management scholars as well as managers, highlight the limitations of the research and suggest avenues for future research.

2. Hypotheses development

2.1 TFL and employee IM

Previous research indicates that TFL is related to employee IM. For instance, Avolio et al. (2004) and Joo and Lim (2013) find that TFL is significantly associated with psychological empowerment. Thomas and Velthouse (1990) define empowerment (sense of impact, competence, meaningfulness and choice) as increased intrinsic task motivation. Other studies, such as Hetland et al. (2011) and Kovjanic et al. (2012), show that TFL and followers’ fulfillment of the three basic psychological needs at work are positively related. Goldman et al. (2017) point out that fulfillment of students’ psychological needs (i.e. autonomy, competence and relatedness) has a positive relationship on IM to learn. Moreover, Schneider and Kwan (2013) reported that IM for exercise among adolescents may be enhanced when the environment supports perceived competence, relatedness and autonomy. Jõesaar et al. (2011) demonstrated that youth athletes’ perceived needs for satisfaction of autonomy, competence and relatedness are directly related to their IM. In addition, Nielsen et al. (2008)
indicated that TFL improves employee well-being. Specifically, studies by Kim and Lee (2011) showed that TFL is positively related to employees’ IM in the semiconductor industry. In the sports context, TFL is particularly suited to predicting IM in task performance (Charbonneau et al., 2001). These arguments lead to the following hypothesis:

**H1.** TFL has a positive effect on employee IM.

### 2.2 CCB and employee IM

CCB can enhance customers’ benefits (Lengnick-Hall et al., 2000) and is a determinant that has a significant relationship to customer satisfaction (Groth, 2005; Garma and Bove, 2011; Fatima and Razzaque, 2013; Limpanitgul et al., 2013; Vega-Vazquez et al., 2013). When customers are more satisfied, they experience an increased positive effect that is expressively communicated to employees through the process of emotional contagion in satisfactory encounters (Pugh, 2001; Homburg and Stock, 2004; Rego et al., 2014); thus, the employee experiences “positive affectivity” (Homburg et al., 2009; Barnes et al., 2015; Hur et al., 2015). Positive affectivity is the “extent to which a person feels enthusiastic, active, and alert” (Watson et al., 1988, p. 1063). Isen and Reeve (2005) demonstrated that positive affectivity fosters IM. Consequently, the following hypothesis attempts to synthesize the previous arguments:

**H2.** There is a positive association between CCB and employee IM.

### 2.3 Employee IM and EC

The relationship between IM and EC has received much conceptual attention in the marketing literature (e.g. Amabile, 1988, 1997; Hennessey and Amabile, 2010; Shalley et al., 2004). IM has a corresponding effect on creativity, cognitive flexibility and conceptual learning (Deci and Ryan, 2000).

This conceptual evidence is also supported by empirical research. For example, Coelho et al. (2011) find that IM exerts a significant positive effect on creativity of FSEs and Kim and Lee (2011) also demonstrated that IM encourages employees’ creative behavior. Consistent with the literature, the following hypothesis is formulated:

**H3.** Employee IM positively influences EC.

### 2.4 Transformational leadership and employee creativity

There is evidence to support the relationship between TFL and EC. Conceptual evidence indicates that TFL promotes EC (Bass, 1985; Zhou and Shalley, 2003). Previous empirical studies have emphasized the relationship between TFL and creativity behaviors through such mediating mechanisms as follows: psychological empowerment (Gumusluoglu and Ilsev, 2009); psychological safety and reflexivity (Carmeli et al., 2014); employee creative self-efficacy (Mittal and Dhar, 2015); promotion focus (Henker et al., 2015); employees’ perceptions of a supportive climate for innovation (Khaliili, 2016); innovation climate (Jaiswal and Dhar, 2015); and job satisfaction and employee intrinsic work motivation (Kim and Lee, 2011). Empirical evidence also reveals that TFL has a significant positive effect on the creativity of employees (Gumusluoglu and Ilsev, 2009; Jyoti and Dev, 2015; Mittal and Dhar, 2015; Khalili, 2016). Hence, the following hypothesis is proposed:

**H4.** TFL is positively related to EC.

### 2.5 Customer citizenship behavior and employee creativity

Contextual factors refer to work environment dimensions that potentially influence an employee’s creativity (Shalley et al., 2004; Coelho et al., 2011). Feedback has a direct relation
with creativity (Anderson et al., 2014). Co-operation, helpfulness and kindliness behaviors promote a positive social environment (Yi and Gong, 2006). CCB enhances the roles and provides clarity and emotional support for employees. CCB also lower employees’ work stress. “A supportive work environment helps employees feel interested in and excited about the content of their work and this excitement translates into increased creativity” (Coelho et al., 2011, p. 32). The present study expects that CCB will have a positive effect on EC through a supportive work environment. Thus, the following hypothesis investigates the previous arguments:

H5. CCB has a direct positive influence on EC.

Figure 1 summarizes the proposed model and hypotheses to be tested.

3. Methodology

3.1 Research setting, sample, and procedures

This study was conducted in companies (hotels and tour operators) from the hospitality sector in Vietnam. The study sample comprised FSEs from the front office, customer-contact employees (housekeeping, food and beverage, restaurant, gym, and sales) and tour guides.

The respondents were selected based on convenience sampling technique due to the busy schedules of FSEs as well as costs in time and money. A cross-sectional survey design and a questionnaire method were used for data collection. All measures used in the survey were initially prepared in English and afterwards carefully translated into Vietnamese. The measures were back translated and pretested to ensure lingual equivalence. From the 350 questionnaires that were distributed, 288 were returned (responses rate of 82 percent). Due to outliers and missing data, the total number of usable questionnaires was 279, resulting in a response rate of 80 percent.

3.2 Respondent profiles

Of the 279 respondents, 35 percent were male and 65 percent female. Nearly 80 percent were aged less than 30 years and more than 90 percent had been working with companies for less than 7 years. Finally, regarding education level, approximately 42 percent had bachelor degrees, about 36 percent had college-level degrees, 14 percent had vocational level training and 8 percent had high school diplomas.

3.3 Measurement scale

All items were measured using five-point Likert scales.
3.3.1 Transformational leadership. TFL was assessed using nine items adopted from the measures of Carless et al. (2000). This scale has been used extensively in previous research to measure TFL (e.g., Overstreet et al., 2013). Respondents were asked to rate their opinion on several items of the TFL measurement scale (1 = completely disagree and 5 = fully agree).

3.3.2 Customer citizenship behavior. CCB was measured using an existing scale developed by Yi and Gong (2013) according to four dimensions: feedback, helping, tolerance and advocacy (13 items) with two additional items based on Garma and Bove (2009) and one item based on Garma and Bove (2011). Items were modified to suit service employees' views. Respondents were asked to indicate their agreement or disagreement with each item of the CCB measurement scale (1 = completely disagree and 5 = fully agree).

3.3.3 Employee IM. Regarding IM, this study used Guay et al. (2000) and added two items from Coelho et al. (2011) that were originally developed by Sujan (1986). Respondents were asked the following question: “Why are you currently engaged in this job?” The possible responses ranged from 1 (“completely disagree”) to 5 (“fully agree”).

3.3.4 Employee creativity. EC was measured using the three items from Coelho et al. (2011) that were originally developed by Ganesan and Weitz (1996), with one additional item based on Ganesan and Weitz (1996) and one item based on Amabile (1997). The five items were measured on a scale ranging from 1 (“completely disagree”) to 5 (“fully agree”).

4. Results
4.1 Preliminary reliability evaluation of the scales
Cronbach’s α coefficients were employed as a preliminary reliability evaluation of the scales. The item-total correlation of all items of the scales was above 0.3. The coefficients of the three unidimensional constructs, i.e., TFL, IM and EC, were 0.93, 0.89 and 0.85, respectively. The coefficients of the four dimensions of CCB were as follows: feedback α = 0.83; advocacy α = 0.86; helping α = 0.79; and tolerance α = 0.86. Accordingly, these scales satisfied the requirements for internal consistency and homogeneity.

4.2 Preliminary validity evaluation of the scales
Following preliminary reliability evaluation, the measures were subjected to exploratory factor analysis in SPSS 20. The sample size of this study reached the ratio of 7.75 cases for each of the items. The best fit of data was obtained with principal axis factoring analysis utilizing Promax rotation. The result showed that all measures loaded on the expected factors with loadings above 0.4 and with a total variance explained of 58.9 percent. Furthermore, the overall Kaiser–Meyer–Olkin (KMO) value was 0.929 and Bartlett’s test of sphericity was significant at the 0.000 level. Consequently, the overall validity of the construct is supported.

4.3 Model assessment
4.3.1 Measurement model. The measurement model comprising all constructs was analyzed using confirmatory factor analysis (CFA) in AMOS 20 software to verify the convergent validity, reliability, unidimensionality and discriminant validity of the constructs in the psychometric structure.

The measurement model provides a reasonable fit to the data (χ² (df = 584, N = 279) = 965.95, p = 0.000, χ²/df ratio = 1.65, GFI = 0.85; CFI = 0.93; TLI = 0.93; RMSEA = 0.049), with all fit indicators within the acceptable range (Hair et al., 2006).

The reliability of the scales was evaluated through two normal indicators: the Bagozzi and Yi (1988) composite reliability index and Fornell and Larcker (1981) AVE index. Composite reliability values of all constructs range from 0.83 to 0.93, above the minimum acceptable value 0.6 (Bagozzi and Yi, 1988). Meanwhile, all the AVE values from 0.54 to
0.50 are in excess of the 0.5 recommended threshold (Nunnally, 1978; Bagozzi and Yi, 1988; Hair et al., 1998). All these results imply that the conditions for reliability are fulfilled for the constructs.

All estimated loadings of the indicators are greater than 0.5 (ranging from 0.695 to 0.829) and significant \((t > 1.96; \ p < 0.05)\), indicating an acceptable convergent validity for all measures (Anderson and Gerbing, 1988).

Table I presents the correlation factors and the square root of the AVE. All correlation coefficients between the variables in the model are below 0.9 and significant \((p < 0.01)\). Further, the square root of the AVE for each construct was greater than its correlation with other constructs, demonstrating the discriminant validity of the model (Fornell and Larcker, 1981).

4.3.2 Structural model. AMOS 20.0 software was used to test the research hypotheses of the model through structural equation modeling. The hypothesized model provides an acceptable fit to the data \((\chi^2 = 1,053.55, \text{df} = 585, \chi^2/\text{df ratio} = 1.80, \ p = 0.000, \text{GFI} = 0.84, \text{CFI} = 0.92, \text{TLI} = 0.91, \text{RMSEA} = 0.054)\).

Figure 2 shows the standardized coefficients of the path model. \(H1\) states that the relationship between TFL and IM. As expected, the effect of TFL on IM was positive and significant \((\beta = 0.60; \ p < 0.001)\). Hence, \(H1\) is supported. \(H2\) expects that CCB will be positively related to IM. The results show that CCB has a direct, positive, and significant effect on IM \((\beta = 0.43; p < 0.001)\); thus, \(H2\) is supported. \(H3\) predicts a positive relationship between IM and EC. The results show a positive and significant relationship between IM and EC \((\beta = 0.32; p < 0.01)\), supporting \(H3\). \(H4\) asserts that TFL has a positive association

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Transformational leadership</td>
<td>0.767</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Customer citizenship behavior</td>
<td>0.615**</td>
<td>0.738</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Employee intrinsic motivation</td>
<td>0.726**</td>
<td>0.700**</td>
<td>0.754</td>
<td></td>
</tr>
<tr>
<td>4. Employee creativity</td>
<td>0.669**</td>
<td>0.669**</td>
<td>0.709**</td>
<td>0.735</td>
</tr>
</tbody>
</table>

Table I. Correlations and discriminant validity of the measurement model

Notes: \(n = 279\). The square root of the average variance extracted (AVE) for each construct are presented in the diagonal (italic). Correlations are below the diagonal. **Correlation is significant at the 0.01 level (two-tailed)

Notes: \(H\): Hypotheses; Satorra-Bentler-scaled \(\chi^2\) (df = 585, \(n = 279\)) = 1,053.55, \(p = 0.000\), \(\chi^2/\text{df ratio} = 1.80, \text{GFI} = 0.84, \text{CFI} = 0.92, \text{TLI} = 0.91, \text{RMSEA} = 0.054; **p<0.01, ***p<0.001

Figure 2. Standardized coefficients of the path analysis model
with EC. Similarly, there is a significant and positive association between TFL and EC ($\beta = 0.34; p < 0.001$). Therefore, $H4$ is supported. $H5$ assumes that CCB has a direct positive relationship with EC. The results of the study indicate a highly significant relationship ($\beta = 0.29; p < 0.001$). Therefore, $H5$ is supported.

Furthermore, indirect impacts were examined. The mediation effects were also conducted based on the Sobel test (see Baron and Kenny (1986) and Bollen (1989) for calculation). The indirect impact of TFL on EC through IM was assessed. TFL predicted IM ($\beta = 0.60$, SE = 0.055, $p < 0.001$) and IM predicted EC ($\beta = 0.32$, SE = 0.095, $p < 0.01$). There was an indirect effect of TFL on EC through the mediation of IM ($\beta = 0.60 \times 0.32 = 0.192$, $z = 3.218$, SE = 0.059, $p < 0.01$).

Finally, the indirect impact of CCB on EC through IM also was assessed. CCB predicted IM ($\beta = 0.43$, SE = 0.067, $p < 0.001$) and IM predicted EC ($\beta = 0.32$, SE = 0.095, $p < 0.01$). There was an indirect effect of CCB on EC through the mediation of IM ($\beta = 0.43 \times 0.32 = 0.14$, $z = 2.982$, SE = 0.046, $p < 0.01$).

5. Discussion
The creativity and innovation of FSEs are important for firms. Examples of these creative activities in the tourism sector include welcoming guests, applying new methods to room cleaning, creating new dishes to serve, finding new destinations and journeys, organizing new games, handling work in a more flexible way and applying modern digital technology. This creativity delivers an intriguing, joyful, exciting, attractive, hypnotizing and novel tourism experience for visitors. Thus, this study investigates the relationship between TFL and CCB on frontline employees’ IM and EC in the hospitality industry.

The findings of this study are useful additions to the existing knowledge base and hold interesting consequences for managerial implications.

5.1 Theoretical contributions
Creativity has become a priority for companies and firms around the world are sharpening their focus on employees’ creative activities. However, previous empirical research examining the relationship between IM and EC has produced inconsistent evidence. This finding suggests that high levels of IM lead to an increase in the creativity of frontline hospitality employees. This is consistent with the findings of Tierney et al. (1999) and inconsistent with that of Perry-Smith (2006) and Dewett (2007), and may explain why FSEs, especially the hospitality and tourism industry, require more IM than other industries (e.g. engineering, research) that require high levels of job independence. FSEs in the hospitality and tourism sector experience elevated levels of psychological demands to promote creativity.

In addition, the results of the path analysis indicate that TFL has a significant positive effect on frontline employees’ IM. This is concordant with prior conceptual and empirical evidence (e.g. Charbonneau et al., 2001) and indicates the core role of TFL in the promotion of IM in FSEs.

As discussed earlier, empirical studies have produced mixed results regarding the relationship between TFL and EC (Gumusluoglu and Ilsev, 2009). The present analysis result reveals that TFL has a positive direct effect on EC and that TFL is among the significant determinants of EC. This is in line with the study of Jaiswal and Dhar (2015) in the hospitality and tourism sector but contradicts the study of Kim and Lee (2011) in the semiconductor industry. According to this study result, TFL is considered a key factor with regard to fostering the implementation of innovative ideas and behavior of FSEs in hospitality and tourism firms. Thus, the findings of this study also provide insights into understanding the effect of TFL on EC.
Especially, we also found that CCB leads to IM and EC. The importance of CCB has been emphasized in the literature but its specific role in IM and EC has not received enough attention. This result is a new and useful addition to the existing literature base. Various characteristics of CCB, namely, feedback, advocacy, helping, tolerance help increasing IM of employees and the promotion of employees’ creativity.

In addition, this paper has integrated and tested the conjoint impact of TFL, CCB, IM and EC, demonstrating the leading role of TFL and CCB in enhancing EC. The result showed that IM mediates the influence of TFL and CCB on EC. The result suggests that TFL and CCB are important resources (internal and external) that influence IM and enhance creativity among FSEs (boundary-spanning positions) in the hospitality and tourism sector. This is an interesting and new finding of the paper.

5.2 Practice implications

From a practical viewpoint, this study also has the following interesting implications for managers. First, the results suggest that TFL has a positive direct impact on IM and EC. TFL also has an indirect effect on EC through IM. Therefore, managers need to embody TFL qualities and styles. For example, a leader who engenders emotion and identification (Elkins and Keller, 2003), articulates a compelling vision for the future, encourages a two-way exchange in communication, builds a secure climate, provides coaching, support and development, and empowers followers and listens to their ideas is likely to enhance IM and contribute to improving EC.

Second, this research also demonstrates that CCB affects IM and EC positively. CCB plays a particularly important role in that it fosters EC. In apparent recognition of these findings, organizations need to take specific actions, such as creating a customer feedback mechanism through their website that allows customers to provide useful ideas about improving the service and about their desires. Service providers can create unique and unforgettable programs with high-quality services and individualized customer to create unique, authentic and memorable travel experiences for customers (Prebensen et al., 2013; Johnson and Neuhofer, 2017) such that they return and recommend the business to others. Organizations must provide customers with empowerment (Yi et al., 2011) in order to foster their helping behavior. Managers should provide a physically comfortable and emotionally engaging environment to arouse customer tolerance and promote overall CCB. Organizations must invest in interactive technology, such as tools that diffuse engagement behaviors, connective tools, feedback tools, creative tools (see Harmeling et al., 2017 for more detail), to identify, acquire and leverage customer-owned resources (e.g. customers’ knowledge, persuasion capital/skills, creativity and network-assets/connectedness) and customer motivation (trustworthiness, commitment, passion about the brand) in order to facilitate improvement for customers to contribute CCB to the firm (Harmeling et al., 2017; Merz et al., 2018). The organization also must use the internet and mobile social media to extend the connection between customer and employee and other customers to spread the CCB wider. The organization must establish and introduce reward and incentive programs for customers who are more involved in the CCB. The manager must develop friendly and resourceful work environments to foster creativity. Organizations need to learn about the wants and needs of CCB to uncover the value customers seek (Jaakkola and Alexander, 2014) and that promote creativity.

Third, organizations need also to take action on employee-related efforts to facilitate the opening of CCB from customers and must train staff to adapt to CCB. Managers should incentivize employees to display a cheerful, polite, friendly, empathetic, attentive and thoughtful demeanor with customers to drive customer involvement in CCB. Managers should encourage and acknowledge employees that spend time listening to customers and support employees to acquire, share and use knowledge effectively from their customers.
Fourth, the results of this study confirm that IM positively affects EC and demonstrates that employees’ IM is an important issue that managers must address (Bande et al., 2016). Thus, managers should provide employees autonomy, competence and relatedness to stimulate creativity (Grant and Berry, 2011). In addition, it should be noted that managers should provide symbolic public recognition, individual praise, appreciation, reward and incentives for employees’ creative efforts as well as IM to foster EC (Fischer et al., 2019).

Finally, managers should create high standards of excellence for organizational culture, build trust in FSEs, encourage CCB and emphasize TFL to promote improved IM and, thus, enhance EC.

5.3 Limitations and further research
There are several limitations that warrant further research. First, this research examines the relationships from the employees’ perspective. Service delivery is a process that involves multiple stakeholders in a service ecosystem. Thus, future research should apply a methodology to collect a matched triadic sample (from managers, employee and customer) to prevent the potential for common method bias. Second, the study collected cross-sectional data at a singular point in time, making it difficult to provide strong causal explanations regarding the relationships tested. Therefore, in the future, studies might use longitudinal studies in order to gain a deeper understanding of these relationships and explore how relationships evolve over time. Third, this study built on purely declarative answers. Future research may wish to use focus group discussions and in-depth interviews as a supplement approach in order to provide richer insights into EC that are associated with TFL and CCB. Fourth, the data were collected in the hospitality industry of an emerging economy. To increase the generalizability of the findings, future research could be conducted in restaurants, wedding party restaurants, airlines and retail service, and in the context of Western culture. Finally, this research focused on TFL and CCB as an antecedent of creativity. Future research might investigate other factors such as other leadership behaviors and cocreation behavior on social media networks.

References


Further reading

Corresponding author
Le Minh-Duc can be contacted at: lmduc505@gmail.com

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Dividend policy and earnings quality in Vietnam

Trang Thi Ngoc Nguyen
School of Finance,
University of Economics Ho Chi Minh City, Ho Chi Minh City, Vietnam, and
Phuong Kim Bui
School of Finance and Accounting,
Van Lang University, Ho Chi Minh City, Vietnam

Abstract
Purpose – The purpose of this paper is to examine the relationship between dividend policy and earnings quality of Vietnamese listed firms.
Design/methodology/approach – The sample includes firms listed on Vietnam stock exchange during the period between 2010 and 2016. Two measures of earnings quality are the annual firm-specific absolute value of residuals from Dechow and Dichev’s (2002) model and from Dechow and Dichev (2002) as modified by McNichols’s (2002) model. The firms’ dividend policy is captured by dividend paying status. This is a dummy variable that takes the value of 1 if the firm pays dividends and 0 otherwise. In addition, dividend yield and dividend payout ratio, which are continuous variables, are also used in this paper as alternative proxies for dividend policy.
Findings – Using panel data analysis, this paper documents that dividend payers have higher earnings quality than dividend non-payers. Dividends are an indicator of earnings quality. These findings are consistent with prior studies. After controlling for variables that may be related to earnings quality as well as for the year and industry fixed effects, this relation remains unchanged. In addition, this result is also robust after controlling for firm fixed effects.
Originality/value – This paper offers the empirical evidence on the relation between dividend policy and earnings quality in Vietnam, which is a frontier market.
Keywords Earnings management, Vietnam, Earnings quality, Dividend policy, Frontier market
Paper type Research paper

1. Introduction
There are various theories developed to explain the reason why firms pay dividends. One of these explanations is signaling theory which proposes that firms pay dividends to signal favorable information to the capital market. Because of asymmetric information, the managers can access information that the market cannot. To reduce these information asymmetries, the managers can send signal to investors through corporate financial decisions. Dividend policy is a signaling device that the managers can use to convey information about firms’ prospects to investors. However, the empirical evidence on this theory is mixed (Bernartzi et al., 1997; Nissim and Ziv, 2001; Grullon et al., 2002; Grullon et al., 2005). Recent studies investigate the information content of dividends by examining dividends-earnings quality association and find that dividends provide information about earnings quality (Tong and Miao, 2011; Skinner and Soltes, 2011; He et al., 2017; Deng et al., 2017). Using data of developed and emerging markets, these studies show that dividend payers’ earnings quality is higher than that of dividend non-payers.
This paper examines the relation between dividend policy and earnings quality in Vietnam. There are several reasons why we use Vietnamese data. First, examining this relation may be more significant in Vietnam because Vietnamese firms’ reported earnings quality is lower than that in developed markets. Second, dividend policy is less stable in Vietnam, especially a substantial decrease in the proportion of dividend payers from 2010 onward. Third, Vietnam’s investor protection environment is weaker than developed markets. Therefore, whether dividends are an indicator of earnings quality in Vietnam is an important question.

Moreover, this paper is also motivated by the fact that prior studies on the relation between dividend policy and earnings quality are mostly conducted in developed and emerging markets. Thus, examining this relation in a different institutional setting such as Vietnam, which is a frontier market, might provide further evidence on the information content of dividends and help generalize the results.

Specifically, Vietnamese financial market is dominated by debt. Banks are the largest suppliers of capital for firms and thus they have a great influence on the firms’ decision making. The average debt-to-market equity ratio of the sample firms over the study period is 3.18, which is very high. Thus, debt is significantly higher than equity in the firms’ capital structure. Additionally, the equity market is thin and illiquid. The yearly proportion of days with no trading volume, which is an inverse measure of trading activity, increases substantially from 3 percent in 2010 to 31 percent in 2016. Consequently, the transaction costs are so high that investors want to receive income from dividends but capital gains.

In addition, because of the negative impacts of the global financial crisis, the average reported earnings of the sample firms decrease in the period 2010–2012 but these numbers have increased from the year 2013 onward. Moreover, the average percentage of firms that report losses is only 6 percent. However, there is a significant change in the proportion of the firms paying dividends over the sample period. At the beginning of this period, 85 percent of listed firms pay dividends whereas only 65 percent of firms do so in 2016. Therefore, examining whether dividend payers have higher earnings quality in Vietnam during this period is of interest.

In this paper, the annual firm-specific absolute value of residuals from Dechow and Dichev’s (2002) model and from Dechow and Dichev (2002) as modified by McNichols’s (2002) model are two measures of earnings quality. To capture dividend policy, both dummy and continuous variables are used. Specifically, dividend paying status, dividend yield and dividend payout ratio are used as independent variables. In addition, other factors that may affect the earnings quality including earnings quality of the previous year, firm performance, growth, firm size, firm age and financial leverage are also controlled.

Based on the sample of the firms listed on Vietnam stock exchange during the period between 2010 and 2016, this paper finds the positive relation between dividend policy and earnings quality. This means that dividend payers have higher earnings quality than that of dividend non-payers. This empirical evidence indicates that dividends are informative about earnings quality and is in line with Tong and Miao (2011), Skinner and Soltes (2011), He et al. (2017) and Deng et al. (2017).

While a growing empirical research has focused on the relation between financing/investment decisions and earnings quality, there is limited evidence on dividends-earnings quality association. This paper contributes to the literature on the relation between dividend policy and earnings quality by providing empirical evidence on this relation from a frontier market in which the earnings quality is not high and thus dividends can deliver more significant information content.

The remainder of this paper is structured as follows. The next section presents the literature review on the association between dividend policy and earnings quality. Data and methodology are described in Section 3. Section 4 provides the results and discusses the findings. Robustness tests are presented in Section 5. Finally, Section 6 concludes the paper.
2. Literature review

Earnings quality is an indicator of the quality of financial reporting. The quality of earnings consists of a discretionary and a nondiscretionary component (Francis et al., 2004). The nondiscretionary component of the earnings quality is determined by the business model and environment, while the discretionary component depends on the financial reporting process. Earnings quality is both a good indicator of future operating performance, and a useful measure of firm valuation. High-quality earnings accurately reflect the current operating performance or intrinsic value of a firm. Thus, high-quality earnings are also called sustainable earnings. On the contrary, earnings have low quality when they are managed. Managed earnings are the result of management’s purposeful intervention in the process of financial reporting to obtain some private benefits (Schipper, 1989). Healy and Wahlen (1999) mention three groups of incentives underlying earnings management including capital market incentives, contractual incentives and anti-trust or government regulation incentives. Earnings management occurs when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or influence contractual outcomes that depend on reported accounting numbers. Therefore, earnings management decreases earnings quality. In Dichev et al.’s (2013) survey, CFOs believe that it is difficult for outside observers to unravel earnings management. In any given period, about 20 percent of the firms manage earnings to misrepresent economic performance, and for such firms 10 percent of EPS is managed. Only about 60 percent of earnings management is income increasing, while 40 percent relates to income-decreasing activities.

Many studies consider earnings management around corporate events such as initial public offerings (Teoh et al., 1998a), seasoned equity offerings (Teoh et al., 1998b; Shivakumar, 2000) and acquisitions (Bergstresser et al., 2006; Louis, 2004; Karim et al., 2016) while other studies explore managerial incentives for earnings management (Healy, 1985; Burns and Kedia, 2006). Another strand of literature examines whether earnings management is affected by dividend policy.

Following Lintner (1956), managers are reluctant to increase dividends unless they believe that dividends can be sustained at the new level. Therefore, they want to maintain a constant stream of dividends over time. By paying dividends, managers can convey information to investors about the quality of the earnings numbers reported in their financial statements. In their survey of CFOs, Brav et al. (2005) support this argument as they indicate that the stability of future earnings and a sustainable change in earnings are two of the most important factors in determining the firms’ dividend policies. Because fraudulently reported earnings typically reverse in future periods (Dechow et al., 1996), they are not sustainable earnings. Thus, firms that manage earnings are less likely to increase dividends.

According to the information content of dividends hypothesis, dividends could convey information about the firms’ earnings prospects. Specifically, dividend increases signal good news while dividend decreases signal bad news. Brav et al. (2005) find that managers believe dividend decisions convey information to investors, however, they do not use dividends explicitly and deliberately as a costly signal to change market’s perceptions concerning future earnings prospects.

The first evidence on the relation between dividend policy and earnings management is provided by Kasanen et al. (1996). They find that the firms manage earnings upwards in response to pressure from large institutional shareholders to pay dividends. In addition, Daniel et al. (2008) and Atieh and Hussain (2012) support the hypothesis that the firms manage earnings to meet dividend thresholds. Both dividend payers and dividend non-payers manage earnings, however, the likelihood of upward earnings management is significantly greater in dividend payers than dividend non-payers. Using earnings persistence as a proxy for earnings quality, Skinner and Soltes (2011) find that dividend payers have more persistent earnings...
than non-dividend payers. Tong and Miao (2011) also document that dividend paying status is indicative of firms’ earnings quality thus a potential piece of information provided by dividends is related to earnings quality. Although dividends are informative about earnings quality, they do not ensure that a firm is not overstating earnings. Caskey and Hanlon (2013) find that among 330 fraud-accused firms, 72 dividend-paying firms paid out $20bn in ordinary cash dividends. However, firms accused of fraud are less likely to pay dividends relative to non-fraud firms and are less likely to increase dividends or maintain a consistent relation between earnings and dividends while committing fraud. The evidence on the positive relation between dividend policy and earnings quality is also found in emerging markets such as China and Indonesia (Deng et al., 2017; Sirait and Siregar, 2014). Furthermore, this relation varies across countries with different institutional strength and transparency (He et al., 2017).

Overall, these studies find evidence that is consistent with the information content of dividends hypothesis. This paper examines whether dividend policy provides information about earnings quality within Vietnam’s institutional setting. Using a sample of the firms listed on Vietnam stock exchange, this paper documents that dividend policy is an indicator of earnings quality. This finding is in line with those prior studies.

3. Data and methodology

3.1 Data

This paper examines the relation between dividend policy and earnings quality of the firms listed on Vietnam stock exchange. Two measures of earnings quality are absolute value of the regression residuals from models (1) and (2). These two models are estimated annually by the Industry Classification Benchmark (ICB) 10-industry classifications. Following Daniel et al. (2008), Skinner and Soltes (2011), Tong and Miao (2011) and Atieh and Hussain (2012), financial firms and utilities are excluded from the sample. In addition, following Daniel et al. (2008), this paper requires at least five observations for each year and each industry. To meet this requirement, two Industries of oil and gas and telecommunications are also excluded thus the number of industries is 6. Panel A of Table I reports the number and percentage of observations per industry. Data are extracted from Datastream. The final sample includes listed firms from 2010 to 2016, resulting in 2,727 firm-year observations.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variables</strong></td>
<td></td>
</tr>
<tr>
<td>EQDD</td>
<td>Absolute value of the regression residuals estimated using Dechow and Dichev’s (2002) model</td>
</tr>
<tr>
<td><strong>Independent variables</strong></td>
<td></td>
</tr>
<tr>
<td>DIV</td>
<td>Dividend paying status that takes the value of 1 if a firm pays cash dividends in year t and 0 otherwise</td>
</tr>
<tr>
<td>DY</td>
<td>Dividend yield defined as dividends per share scaled by stock price</td>
</tr>
<tr>
<td>DVE</td>
<td>Dividend payout ratio defined as dividends per share scaled by earnings per share</td>
</tr>
<tr>
<td><strong>Control variables</strong></td>
<td></td>
</tr>
<tr>
<td>ROA</td>
<td>Return on assets defined as net income plus interest expense scaled by total assets</td>
</tr>
<tr>
<td>SALESG</td>
<td>Sales growth defined as change in sales scaled by previous year sales</td>
</tr>
<tr>
<td>BEME</td>
<td>Book value of equity scaled by market value of equity</td>
</tr>
<tr>
<td>LNME</td>
<td>Natural logarithm of market capitalization</td>
</tr>
<tr>
<td>AGE</td>
<td>Number of years since a firm has been listed on Vietnam stock exchange</td>
</tr>
<tr>
<td>LTDA</td>
<td>Long-term liabilities scaled by total assets</td>
</tr>
</tbody>
</table>

Table I. Variables definition
3.2 Earnings quality

Earnings quality is a multi-dimensional concept. Francis et al. (2004, 2005) identify seven measures of earnings quality, including accruals quality, persistence, predictability, smoothness, value relevance, timeliness and conservatism. Based on the underlying assumptions about the function of financial reporting, these seven measures of earnings quality are classified into accounting-based and market-based measures. The accounting-based measures are accruals quality, persistence, predictability and smoothness, which are estimated using accounting data. The market-based measures are value relevance, timeliness and conservatism. These measures are estimated using both accounting data and returns data. Specifically, accounting-based earnings quality measures assume that the function of earnings is to allocate cash flows to reporting periods via accruals, while market-based earnings quality measures assume that the function of earnings is to reflect economic income as represented by stock returns. In addition, Francis et al. (2004, 2005) distinguish between innate and discretionary determinants of earnings quality. Innate determinants derive from business models and operating environments, whereas discretionary determinants are associated with accounting choices, implementation decisions, managerial error, auditing, governance and enforcement. CFOs believe that about half of earnings quality is determined by business model, industry and macroeconomic conditions (Dichev et al., 2013).

Due to the availability of data, this paper uses accruals quality as a measure of earnings quality. This measure is based on the view that earnings that map more closely into cash flows are of better quality. Dechow and Dichev’s (2002) measure of earnings quality captures the mapping of working capital accruals into last-period, current-period and next-period cash flows from operations. Specifically, the first measure of earnings quality (EQDD) is the absolute value of the residuals from Dechow and Dichev’s (2002) model:

\[ \Delta WC_{i,t} = \gamma_0 + \gamma_1 CFO_{i,t-1} + \gamma_2 CFO_{i,t} + \gamma_3 CFO_{i,t+1} + \eta_{i,t}, \]  

where \( \Delta WC_{i,t} \) is the change in working capital, \( CFO_{i,t-1} \), \( CFO_{i,t} \) and \( CFO_{i,t+1} \) are cash flow from operations of firm \( i \) for year \( t-1 \), year \( t \) and year \( t+1 \), respectively. All variables are deflated by average total assets.

In additional, McNichols (2002) suggests adding variables capturing the change in current period sales and level of property, plant and equipment to increase the explanatory power of Dechow and Dichev’s (2002) model. Specifically, the second measure of earnings quality (EQDDM) can be estimated from the following model:

\[ \Delta WC_{i,t} = \gamma_0 + \gamma_1 CFO_{i,t-1} + \gamma_2 CFO_{i,t} + \gamma_3 CFO_{i,t+1} + \gamma_4 DSales_{i,t} + \gamma_5 PPE_{i,t} + \eta_{i,t}, \]  

where \( DSales_{i,t} \) is the change in sales and \( PPE_{i,t} \) is property, plant and equipment. All variables in Equation (2) are also deflated by average total assets. The firm-specific absolute value of the residuals is estimated annually by the ICB from both Equations (1) and (2). Larger values of residuals imply lower earnings quality because there is less precision about the mapping of current accruals into current-period, last-period and next-period operating cash flows.

Because each measure has both strengths and weaknesses (Dechow et al., 2011), almost studies that examine the effect of dividend policy on earnings quality use various measures of earnings quality simultaneously. The measures of earnings quality estimated from the Dechow and Dichev (2002) model and the Dechow and Dichev (2002) model as modified by McNichols (2002) are used in many studies, such as Daniel et al. (2008), Tong and Miao (2011), He et al. (2017) and Deng et al. (2017). Therefore, this paper also uses these two measures to proxy for earnings quality.

3.3 Dividend policy

The main independent variable is dividend policy. It is proxied by dividend paying status (DIV), which is a dummy variable that takes the value of 1 if the firm pays dividends,
In robustness tests, two alternative continuous proxies for dividend policy are used instead of dividend paying status (DIV). Specifically, those are dividend yield (DY) and dividend payout ratio (DIVE).

### 3.4 Control variables

In addition to dividend policy, other factors might also affect earnings quality. Following previous studies, firm performance (ROA), growth (SALESG, BEME), firm size (SIZE), financial leverage (LTDA) and firm age (AGE) are included in the model. Specifically, Doyle et al. (2007) document that firms with poor performance will have incentives to manage earnings. However, DeAngelo et al. (1994) suggest that poor performance can limit opportunities to manage earnings whereas Francis et al. (1996) do not find an association between poor performance and write-offs.

Besides that, Dechow et al. (2011) show a negative relation between growth and earnings quality. In addition, Watts and Zimmerman (1990) argue that larger firms might have more incentives to manage earnings than smaller firms. Therefore, larger firms are expected to have higher earnings quality. According to DeFond and Jiambalvo (1994), managers in firms with high leverage have incentives to manage earnings to avoid violating debt covenants. Such actions can reduce earnings quality. LaBelle (1990) also shows that debt levels are associated with earnings quality.

Furthermore, McNichols (2002) argues that growth firms have lower earnings quality than mature firms. The maturity of the firms is positively related to earnings quality. He et al. (2017) and Deng et al. (2017) support this argument whereas Sirait and Siregar (2014) find that the relation between firm age and earnings quality is negative. Finally, following He et al. (2017), prior year’s earnings quality is positively related to current year’s earnings quality. Thus, the lagged dependent variable (EQ\(_L\)) is also included in the regression model.

In addition, all regressions include industry and year fixed effects.

### 3.5 Empirical model

To examine the relation between dividend policy and earnings quality, two measures of earnings quality (EQDD and EQDDM) are regressed on dividend policy (DIV), while controlling other variables that may affect earnings quality including earnings quality of the previous year (EQ\(_L\)), firm performance (ROA), growth (SALESG and BEME), firm size (SIZE), firm age (AGE) and financial leverage (LTDA).

In addition, to mitigate the potential endogeneity concerns, all other independent variables are lagged by one year, following Skinner and Soltes (2011), Atieh and Hussain (2012), Caskey and Hanlon (2013) and He et al. (2017). Thus, the empirical model takes the following form:

\[
EQ_{it} = \beta_0 + \beta_1 DIV_{it-1} + \beta_2 EQ_{it-1} + \beta_3 ROA_{it-1} + \beta_4 SALESG_{it-1} + \beta_5 BEME_{it-1} + \\
\beta_6 SIZE_{it-1} + \beta_7 AGE_{it-1} + \beta_8 LTDA_{it-1} + \mu_{it}.
\]  

Table I presents definitions of all variables used in this paper.

To eliminate the influence of outliers, all variables are winsorized at the top and bottom 1 percent.

### 4. Empirical findings

The structure of the sample, by number and percentage of observations per industry, is provided in Panel A. Panel B presents descriptive statistics of all variables used in the regression model. The mean of DIV shows that the average percentage of observations paying dividends is 70.1 percent. Additionally, Panel B of Table II shows that earnings quality (EQDD) has an average value of 0.072. Compared with prior studies of Tong and Miao (2011),
He et al. (2017) and Deng et al. (2017), Vietnamese firms’ earnings quality is lower than US firms but higher than Chinese firms. The range of variation of most variables is not wide. Thus, the dispersion is relatively narrow among all firms in the sample.

Table III compares dividend payers to dividend non-payers using univariate tests of the difference between these two groups of firms. Means and medians of earnings quality (EQDD), as well as other control variables including firm performance (ROA), sales growth (SALESG), book-to-market equity ratio (BEME), firm size (LNME), firm age (AGE) and financial leverage (LTDA) are reported in Table III. Table III shows the p-values of the t-test for the difference in mean values and the Wilcoxon test for the difference in median values between dividend payers and dividend non-payers.

Both the t-tests and Wilcoxon tests show that earnings quality (EQDD), firm performance (ROA), sales growth (SALESG), book-to-market equity ratio (BEME), firm size (LNME) and financial leverage (LTDA) are significantly different across dividend payers and dividend non-payers. Specifically, Table III shows that means and medians of earnings quality (EQDD)

<table>
<thead>
<tr>
<th>Panel A: number and percentage of observations per industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
</tr>
<tr>
<td>Technology</td>
</tr>
<tr>
<td>Industrials</td>
</tr>
<tr>
<td>Consumer services</td>
</tr>
<tr>
<td>Health care</td>
</tr>
<tr>
<td>Consumer goods</td>
</tr>
<tr>
<td>Basic materials</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B: descriptive statistics of variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>EQDD</td>
</tr>
<tr>
<td>DIV</td>
</tr>
<tr>
<td>ROA</td>
</tr>
<tr>
<td>LNME</td>
</tr>
<tr>
<td>SALESG</td>
</tr>
<tr>
<td>BEME</td>
</tr>
<tr>
<td>AGE</td>
</tr>
<tr>
<td>LTDA</td>
</tr>
<tr>
<td>No. of observations</td>
</tr>
</tbody>
</table>

Table II. Summary statistics

<table>
<thead>
<tr>
<th>Measure of earnings quality</th>
<th>Dividend payers</th>
<th>Dividend non-payers</th>
<th>Tests for differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>Nobs</td>
<td>Mean</td>
<td>Median</td>
</tr>
<tr>
<td>EQDD</td>
<td>1,912</td>
<td>0.070</td>
<td>0.049</td>
</tr>
<tr>
<td>ROA</td>
<td>1,912</td>
<td>11.530</td>
<td>9.324</td>
</tr>
<tr>
<td>SALESG</td>
<td>1,912</td>
<td>14.776</td>
<td>10.346</td>
</tr>
<tr>
<td>BEME</td>
<td>1,912</td>
<td>1.500</td>
<td>1.305</td>
</tr>
<tr>
<td>LNME</td>
<td>1,912</td>
<td>11.908</td>
<td>11.792</td>
</tr>
<tr>
<td>AGE</td>
<td>1,912</td>
<td>5.565</td>
<td>5.000</td>
</tr>
<tr>
<td>LTDA</td>
<td>1,912</td>
<td>8.029</td>
<td>2.381</td>
</tr>
</tbody>
</table>

Notes: The sample includes 2,727 firm-year observations in the period from 2010 to 2016. Nobs is the number of firm-year observations. **,***Statistical significant at the 5 and 1 percent levels, respectively.
of dividend payers are significantly smaller than those of dividend non-payers. Both dividend payers and dividend non-payers manage their earnings, however, dividend payers have higher earnings quality than dividend non-payers.

In addition, Table III also presents other differences between dividend payers and dividend non-payers. Dividend payers’ financial leverage (LTDA) is much lower than that of dividend non-payers. In contrast, firm performance (ROA) and firm size (LNME) of dividend payers are significantly higher than those of dividend non-payers. This means that dividend payers are larger, more profitable and less leveraged than dividend non-payers, consistent with Tong and Miao (2011) and He et al. (2017). However, dividend payers have higher sales growth (SALESg) and lower book-to-market equity ratio (BEME) than dividend non-payers whereas these two groups of firms have no difference in age (AGE).

Table IV presents the correlation coefficients of all variables used in this paper. The measure of earnings quality (EQDD) is negatively correlated with dividend policy (DIV). Similarly, earnings quality (EQDD) is also negatively correlated with book-to-market equity ratio (BEME), firm size (LNME), firm age (AGE) and financial leverage (LTDA). In contrast, earnings quality (EQDD) is positively correlated with sales growth (SALESg). Additionally, the correlation coefficients between the remaining variables are relatively low. Thus, it can be concluded that multicollinearity is not a concern in the model.

To examine the relation between dividend policy and earnings quality, this paper uses two measures of earnings quality, these are the absolute value of the residuals from the Dechow and Dichev (2002) model and from the Dechow and Dichev (2002) model as modified by McNichols (2002). These two measures of earnings quality (EQDD and EQDDM) are regressed on dividend paying status (DIV). In addition, other determinants of earnings quality are also controlled, including prior year’s earnings quality (EQ), firm performance (ROA), growth (SALESg and BEME), firm size (LNME), firm age (AGE) and financial leverage (LTDA).

Table V presents the relation between dividend policy and earnings quality. In the first column, the absolute value of the residuals from the Dechow and Dichev (2002) model is regressed on dividend paying status. The coefficient of DIV is negative and statistically significant at 1 percent level. This negative relation between DIV and EQDD implies that dividend payers’ reported earnings quality is higher. Dividend payers often have a more stable cash flow, resulting in higher earnings quality. Therefore, dividends can convey additional information to investors about earnings. The similar results are obtained for the residuals from the Dechow and Dichev (2002) model as modified by McNichols (2002) in the second column. These results are consistent with Tong and Miao (2011), Sirait and Siregar (2014), He et al. (2017) and Deng et al. (2017).

This paper finds evidence that dividend payers’ earnings quality is higher than that of dividend non-payers. Dividends are an indicator of earnings quality in Vietnam, which is a more opaque information environment than in developed markets. Therefore, dividend policy can be a reliable information source in decision making for investors.

<table>
<thead>
<tr>
<th></th>
<th>EQDD</th>
<th>DIV</th>
<th>ROA</th>
<th>SALESg</th>
<th>BEME</th>
<th>SIZE</th>
<th>AGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIV</td>
<td>-0.056***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROA</td>
<td>-0.028</td>
<td>0.431***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SALESg</td>
<td>0.101***</td>
<td>0.065***</td>
<td>0.153***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BEME</td>
<td>-0.034*</td>
<td>-0.286***</td>
<td>-0.334***</td>
<td>-0.054***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LNME</td>
<td>-0.041***</td>
<td>0.162***</td>
<td>0.283***</td>
<td>0.105***</td>
<td>-0.449***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGE</td>
<td>-0.065****</td>
<td>-0.010</td>
<td>-0.067***</td>
<td>-0.067***</td>
<td>0.020</td>
<td>0.119***</td>
<td></td>
</tr>
<tr>
<td>LTDA</td>
<td>-0.045***</td>
<td>-0.081***</td>
<td>-0.176***</td>
<td>0.031</td>
<td>0.035*</td>
<td>0.357***</td>
<td>-0.055***</td>
</tr>
</tbody>
</table>

Table IV. Correlation matrix

Notes: ***, **** Statistical significant at the 10, 5 and 1 percent levels, respectively
In addition, the coefficients of EQ are positive at the 1 percent level, meaning that the prior year’s earnings quality is closely related to the current year’s earnings quality. Besides that, the results on the other control variables are consistent with previous studies such as Barth et al. (2008), Tong and Miao (2011), He et al. (2017) and Deng et al. (2017). Specifically, the coefficients of book-to-market equity ratios (BEME), firm size (LNME) and financial leverage (LTDA) are negative. Correspondingly, the firms that have higher book-to-market equity ratios, larger and highly leveraged have higher earnings quality. However, the coefficients of firm performance (ROA), sales growth (SALESG) and firm age (AGE) are statistically insignificant. Therefore, this paper finds no relation between these firm characteristics and earnings quality.

5. Robustness tests
To test whether the above results are robust and reliable, two alternative proxies for dividend policy are used as explanatory variables. Specifically, two measures of earnings quality (EQDD and EQDDM) are regressed on dividend yield (DY) and dividend payout ratio (DIVE), respectively. The results presented in Table VI are obtained by replicating the baseline regressions in Table V. In Tables VI and VII, only coefficients of dividend policy are presented for conserving space.

Table VI presents the results where dividend yield (DY) and dividend payout ratio (DIVE) are used to proxy for dividend policy. As reported in Table VI, both coefficients of

<table>
<thead>
<tr>
<th></th>
<th>EQDD</th>
<th>EQDDM</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIV</td>
<td>-1.204***</td>
<td>-1.551***</td>
</tr>
<tr>
<td>EQ</td>
<td>0.092***</td>
<td>0.129***</td>
</tr>
<tr>
<td>ROA</td>
<td>-0.016</td>
<td>-0.020</td>
</tr>
<tr>
<td>SALESG</td>
<td>0.008</td>
<td>0.008</td>
</tr>
<tr>
<td>BEME</td>
<td>-0.473***</td>
<td>-0.324*</td>
</tr>
<tr>
<td>LNME</td>
<td>-0.370***</td>
<td>-0.399***</td>
</tr>
<tr>
<td>AGE</td>
<td>-0.067</td>
<td>-0.111*</td>
</tr>
<tr>
<td>LTDA</td>
<td>-0.035***</td>
<td>-0.029**</td>
</tr>
<tr>
<td>Constant</td>
<td>0.154***</td>
<td>0.147***</td>
</tr>
</tbody>
</table>

F       | 32.62***     | 11.71***    |
R^2     | 14.52%       | 8.36%       |
Industry fixed effects | Yes | Yes |
Year fixed effects | Yes | Yes |
No. of observations | 2,727 | 2,727 |

Notes: The values in parentheses are standard errors clustered by firm. **,**,**,** Statistical significant at the 10, 5 and 1 percent levels, respectively

Table V. The relation between dividend policy and earnings quality

<table>
<thead>
<tr>
<th></th>
<th>EQDD</th>
<th>EQDDM</th>
</tr>
</thead>
<tbody>
<tr>
<td>DY</td>
<td>-0.045**</td>
<td>-0.058***</td>
</tr>
<tr>
<td>DIVE</td>
<td>-1.147***</td>
<td>-1.354***</td>
</tr>
<tr>
<td>F</td>
<td>32.54***</td>
<td>12.11***</td>
</tr>
<tr>
<td>R^2</td>
<td>14.23%</td>
<td>7.67%</td>
</tr>
<tr>
<td>Industry fixed effects</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year fixed effects</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Number of observations</td>
<td>2,727</td>
<td>2,727</td>
</tr>
</tbody>
</table>

Notes: The values in parentheses are standard errors clustered by firm. **,**,**,** Statistical significant at the 5 and 1 levels, respectively

Table VI. The regression results with other two proxies for dividend policy
DY and DIVE are negative, consistent with the results presented in Table V. Thus, the positive relation between dividend policy and earnings quality is robust when two continuous explanatory variables are used instead of dividend paying status (DIV).

In addition, to obtain consistent estimates for regression parameters, the panel data methodology is used in this paper to control unobservable heterogeneity. By including the individual effect into the regression (unobservable firm characteristics), fixed-effects models mitigate the omitted variable problem by capturing unobservable firm characteristics.

Table VII presents the results when the firm fixed effects are controlled. The research results are robust with three proxies for dividend policy (DIV, DY and DIVE) as well as two measures of earnings quality (EQDD and EQDDM). Therefore, both the original tests and the robustness tests find the positive relation between dividend policy and earnings quality in Vietnam.

In summary, the above results find that the relation between dividend policy and earnings quality is positive and statistically significant at 1 percent level. Specifically, firms paying dividends have higher earnings quality. After controlling for variables that may be related to earnings quality as well as for the year and industry fixed effects, this relation remains unchanged. In addition, the findings are not affected by the firm fixed effects.

6. Conclusions

Almost investors pay close attention to firms’ earnings, however, this number can be distorted by management. In those cases, the earnings cannot reflect firms’ performance accurately. A high-quality earnings number which accurately reflects the firm’s current operating performance is a good indicator of future operating performance. It is also a useful summary measure for assessing firm value. Earnings quality can vary among the firms as a function of accruals even in the absence of intentional earnings manipulation. Unlike the determination of cash flows, the determination of earnings requires estimations and judgments, and some firms require more forecasts and estimates than others. Those firms in growing industries will typically have high accruals. However, accruals are likely to contain estimation errors, which reduce earnings quality because they must be corrected in future earnings and are irrelevant for valuation. Therefore, large accruals can indicate great underlying volatility in the firm’s operations and low-quality earnings.

Most of the existing literature focuses on the relation between financing or investment decisions and earnings quality of the firms. However, the evidence on the dividends-earnings quality relation is limited. Prior studies find that dividend payers’ earnings quality is higher than that of dividend non-payers. These results are obtained by examining the relation between dividend policy and earnings quality in developed and emerging markets.

This paper investigates whether dividend policy is related to earnings quality in Vietnam, which is a frontier market, during the period between 2010 and 2016. The empirical evidence indicates that dividend payers have higher earnings quality than dividend payers. Although Vietnam’s institutional settings are different from those of developed markets, the positive

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<td>-0.118***</td>
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<td>DIV</td>
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<td>-2.681***</td>
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<td>DIVE</td>
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<td>$R^2$</td>
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<td>6.39%</td>
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<td>effects</td>
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<tr>
<td>No. of</td>
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<td>observations</td>
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Table VII.
The regression results with firm fixed effects

Notes: The values in parentheses are robust standard errors. ***,***Statistical significant at the 5 and 1 percent levels, respectively.
relation between dividend policy and earnings quality still holds. This result is robust with three proxies for dividend policy and remains unchanged after controlling other factors as well as the firm fixed effect. The reported earnings of dividend payers are more reliable than that of dividend non-payers, thus, investors can refer to dividend policy for assessing financial health of firms. Therefore, understanding the relation between dividend policy and earnings quality can help investors make right decisions.

References


Further reading


Corresponding author

Phuong Kim Bui can be contacted at: buikimphuong@vanlanguni.edu.vn

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ISSN 2515-964X
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