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Validating scales for economic upgrading in global value chains and assessing the impact of upgrading on supplier firms' performance

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ABSTRACT

Economic upgrading in global value chains is critical for developing economies, as upgrading enhances supplier firms' performance, employment and economic growth. However, to date there is no valid measure of firm-level upgrading, making it hard to systematically measure and address deficiencies within firms to enhance firms' performance and national economic development. This paper addresses this gap by developing and validating measures of four types of economic upgrading using data from senior executives (n = 350) in Bangladeshi apparel supplier firms. The resulting measures have reliability, convergent and discriminant validity as well as nomological validity. The findings of the assessment of nomological validity suggest that suppliers' manufacturing capability is critical to all four types of upgrading. The four types of upgrading, however, have differing impacts on supplier firms' production and export performance. Suggestions as to how these measures can be used in practice, policy and research to better understand and manage firm-level upgrading are provided.

1. Introduction

Today's global economy relies heavily on international networks of production, frequently referred to as global value chains (GVCs). According to UNCTAD (2013), GVCs account for 80% of world trade, with one-in-five-jobs linked to GVCs (Corley-Coulibaly, Kizu, Kühn, & Viegelahn, 2015). Participation in GVCs is critical to all economies, especially developing countries where supplier firms participating in GVCs benefit from increased learning, competitiveness, and higher income (Gereffi, 1999; Khan, Lew, & Sinkovics, 2015; Schmitz & Knorringa, 2000). The benefits accrued to supplier firms allows for "moving to higher value activities in global supply chains" (Bair & Gereffi, 2003, p. 147). These improvements are referred to as economic upgrading (EU). Despite GVCs' profound impacts on international trade and economic development there is no valid measure for EU in the literature, limiting the systematic assessment of upgrading.

Past research has focused on benefits of EU to the suppliers' home economies, rather than focusing on the benefits to the individual supplier firms (Kaplinsky & Readman, 2005; Milberg & Winkler, 2011). While national economic improvements are critical, they only arise through improvements in individual supplier firms' activities. Thus, it is important to understand how individual supplier firms benefit from participation in GVCs, which requires assessing firm-level value-adding activities. While previous research has often used proxies of national level performance (e.g., export growth) (Kaplinsky & Readman, 2005; Milberg & Winkler, 2011) it did not capture firm-level upgrading of activities. Others have used case study approaches to understand the process of upgrading in supplier firms (Hoque, Sinkovics, & Sinkovics, 2016), without empirically assessing specific drivers. A recent study by Golini, Marchi, Bofelli, and Kalchschmidt (2018) proposes measures for EU, however, they did not undertake a rigorous scale validation process, and suggest further EU scale development is needed (Golini et al., 2018). Having validated scales for measuring firm-level EU is important to understand how specific firm strategies and national policies enhance EU, and bring about improvements in trade through GVCs (Kaplinsky & Readman, 2005; Milberg & Winkler, 2011).

The purpose of this paper is to address the existing gap by developing and validating measures for the four types of EU (product, process, functional and chain). In doing so, this paper makes four important contributions to the literature. First, operationalizing the four upgrading types would allow for a better understanding of the links among different components of EU, strengthening the theoretical foundation of Humphrey and Schmitz (2002) four dimensional EU typology. Second, this paper uses a rigorous six-step scale development process (Cadogan, Diamantopoulos, & De Mortanges, 1999; Churchill, 1979; Papadas, Avlonitis, & Carrigan, 2017) to ensure the reliability, face validity, dimensionality, convergent and discriminant validity. These scales will facilitate objectively assessing the relationships

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between participation in GVCs and EU types as well as the relationships of EU with the broader social and environmental upgrading. Third, firm-level EU data are used rather than relying on country or industry-level proxy variables, overcoming the limitations of using proxies to capture firm-level EU. Fourth, we have assessed the nomological validity by examining the impact of manufacturing capability (Buciuni & Finotto, 2016; Gereffi, 1999; Schmitz & Knorringa, 2000) on the four types of EU, and assessing the impact of each type on supplier firms' performance (using production and exporting measures). The results of nomological validity assessment provides quantitative evidence of manufacturing capability's impact on the four EU types as well as the influences of EU on supplier firms' performance.

The remainder of the paper is structured as follows: the next section presents the literature review, followed by an overview of the research method used. The detailed procedure for the scale validation process is then discussed. The final section discusses the implications for theory and practice, limitations and further research.

2. Background

Global Value Chains (GVCs) are defined as "… linkages between firms and other actors through which this geographical and organizational reconfiguration of global production is taking place" (Gibbon, Bair, & Ponte, 2008, p. 318). GVCs focus on the processes of transforming inputs into outputs to generate higher value. At the firm-level, the value chain comprises upstream (basic R&D, design, logistics), midstream (i.e., manufacturing) and downstream (marketing, advertising, customer services) activities (Mudambi, 2008). Developing country supplier firms typically leverage their cost competitiveness from available cheap labor, by focusing on low value-adding manufacturing activities when integrating into GVCs (Azadegan & Wagner, 2011). However, participation in GVCs provides supplier firms opportunities to gradually improve (i.e., upgrade) from low value-adding activities to higher value-adding activities. These, in turn generate additional income, employment opportunities and economic development in host economies (UNCTAD, 2013).

Three types of upgrading are discussed in the literature – economic upgrading, social upgrading (i.e., workers' wellbeing), and environmental upgrading (i.e., reducing environmental damage) (for details please refer to Barrientos, Gereffi, & Rossi, 2011; Marchi, Maria, & Micelli, 2013). This research focuses on economic upgrading which is defined as "the firm's ability to move up in the value chain, by designing and introducing advanced product lines, superior technological processes and logistics systems and by elevating to become system and advanced design suppliers" (Khan et al., 2015, p. 306). Understanding firm-level economic upgrading is important, as some argue it is a precursor for social or environmental upgrading (Golini et al., 2018; Khattak, Haworth, Stringer, & Benson-Rea, 2017).

Gereffi (1999) has argued that developing country suppliers' participation in GVCs creates opportunities for suppliers to develop their manufacturing capability, resulting in firm-level EU, advancing from simple assembly, to undertaking manufacturing and logistics as well as their own brand development. However, Schmitz (2006) found that buyers support some types of EU (i.e., process and product), but obstruct other types of EU (i.e., functional and chain upgrading). The rationale provided is that supporting process and product upgrading enhances buyers' competitiveness, whereas, functional and chain upgrading turn suppliers into competitors (Hoque et al., 2016; Khan et al., 2015; Wan & Wu, 2017).

Humphrey and Schmitz (2002) suggest there are four types of firm-level EU: process, product, functional and inter-sectoral. However, others have used alternative terminology and classifications of upgrading, including: end markets and channel upgrading, backward linkages and supply chain upgrading, and skill upgrading (e.g., product design) (see Table 1) (Frederick & Gereffi, 2011; Morris & Staritz, 2014).

While Humphrey and Schmitz (2002) four-dimensional upgrading typology has been widely accepted and applied in the literature (e.g., Barrientos et al., 2011; Gereffi & Lee, 2016), there is limited synthesis of how this typology relates to other types or classifications of upgrading within the literature. Table 2 draws together the alternative approaches identified in Table 1, and groups the alternative terminology across studies, based on similarities to Humphrey and Schmitz (2002) four-dimensional typology. The domain of EU, definition of the types and item creation are discussed in more detail in the section 3.1.

3. Research method

We use a six-stage process to develop reliable and valid EU measurement scales (Cadogan et al., 1999; Churchill, 1979; Papadas et al., 2017): (1) domain specification and construct definition; (2) item generation; (3) expert review; (4) a qualitative study; (5) a quantitative study for assessing internal consistency and scale purification; and (6) another quantitative study for scale validation.

3.1. Specifying domains and defining the four upgrading constructs

Appropriately measuring the phenomena (i.e., construct validity) by drawing on the literature is a fundamental prerequisite for developing measurement scales (Cadogan et al., 1999; Churchill, 1979; Dunn, Seaker, & Waller, 1994). Humphrey and Schmitz (2002) four-dimensional typology of EU was selected as the foundation, as it has been widely accepted and applied in the literature (e.g., Barrientos et al., 2011; Gereffi & Lee, 2016).

Process upgrading is defined as "transforming inputs into outputs more efficiently by reorganising the production systems or introducing superior technology" (Schmitz, 2006, p. 554). Reconfiguration of production systems enables firms to respond to customers' orders more quickly (Gereffi, Humphrey, & Sturgeon, 2005; Schmitz, 2006). An improved production system requires adoption of new production machineries to gain higher productivity without increasing the costs (Humphrey & Schmitz, 2002; Schmitz, 2006). Improvements in quality management programs (e.g., total quality management), general organizational management, business process and flexibility to deal with the order size variation (i.e., flexibility) also contribute to enhance a supplier's ability to transform inputs more efficiently into outputs, therefore, considered as valuable indicators of process upgrading (Barrientos et al., 2011; Gereffi, 1999; Humphrey & Schmitz, 2002; Talay, Oxborrow, & Brindley, 2018).

Product upgrading is defined as "shifting to more sophisticated, complex, or better quality products" (Morris & Staritz, 2014, p. 244). A firm's ability to improve product quality (Humphrey & Schmitz, 2002; Morris & Staritz, 2014), the introduction of products with advanced features such as complex design (Hoque et al., 2016; Humphrey & Schmitz, 2002) determines the extent of the firm's product upgrading. Moreover, product designs, sample development and product research, enables suppliers to diversify their product lines as well as allows for suppliers to capture more value, and therefore, are indicators of product upgrading (Frederick & Gereffi, 2011; Gereffi, 1999; Navas-Alemán, 2011; Schmitz, 2006).

Functional upgrading is the most widely discussed type of upgrading in the literature, but is hard to quantify (Milberg & Winkler, 2011). Functional upgrading can be defined as "the change in the activities performed by the supplier firm toward a higher value added combination which includes not only manufacture, but also services" (Rossi, 2013, p. 229). Reliable performance is critical for appropriation of higher value which a supplier can achieve by reducing defection rate that reduces reworking and any associated costs which in turn leads to higher customer satisfaction (Navas-Alemán, 2011; Talay et al., 2018). To undertake higher value activities, a supplier needs skilled workers, necessitating investment in workers' skill development (Humphrey & Schmitz, 2002; Rossi, 2013). A supplier's increased production

Table 1
Summary of the literature on conceptualization of the types of economic upgrading.

Author and studies	Types of upgrading proposed by authors	Definitions	Research context
Wortzel and Wortzel (1981, 52-56)	Stage one	Exporting "is initiated by an importer searching for a low-cost facility capable of performing certain specific operations (…). The importer usually makes all external design decisions, including appearance and packaging, and may also determine the internal design of the product. The importer takes quality control responsibility by inspecting finished goods and, often, work in process. He also arranges for shipping. The local producer is simply a seller of production capacity whose success depends largely on the prices he quotes".	This was proposed based on a comparative study on consumer electronics, footwear and apparel industries in South Korea, Hong Kong, Taiwan, Thailand and the Philippines.
	Stage two	"The Stage II firm has developed some internal design capabilities. It also has some understanding of external design and packaging, but it still needs help from its customers in setting specifications (…). It has begun to develop a rudimentary sales and marketing organization (…). But the Stage II firm is still a seller of production capacity rather than product".	
	Stage three	"The Stage III firm still produces to its customers' orders, but it has developed enough internal design capability to produce export quality merchandise with little or no assistance from its importer customers in setting internal and external design specifications (…) the [Stage III] firm may try to broaden its range of products, to 'trade up' its product line, or to increase the number of customers for its existing list of products. In any event, the Stage III firm begins to take steps to gain more control over its product lines, its sales volume, its customers and the prices it obtains (…). While it may have become an active marketer of its production capabilities, marketing of the goods it produces is still left to its customers. The Stage III firm, then, is a supplier of knowhow as well as of production capacity. While price is still its major competitive weapon, its know-how distinguishes it from the Stage II supplier".	
	Stage four	"While the Stage IV firm may still devote some proportion of its production capacity to contract manufacture, it has begun to produce and market its own products. The Stage IV firm has evolved from a marketer of production capacity to a marketer of products (…). At Stage IV, it is the producer rather than the importer who decides what the firm will produce. The producing firm also becomes responsible for shipping its products to their destination country and then to wholesalers or retailers within that country".	
	Stage five	"[T]he Stage V NIC [newly industrialized countries] firm will be virtually indistinguishable from firms indigenous to the advanced countries to which it exports (…). The Stage V firm will have a marketing and sales organization similar to that of the indigenous firms with which it competes".	
Hobday (1995, 192)	Assembly	Not defined.	This conceptualization was based on a comparative study on computer and consumer electronics industries in Taiwan, South Korea, Singapore and Hong Kong.
	Original equipment manufacturer (OEM)	"Under OEM, the TNCs [transnational corporations] purchased large quantities of goods manufactured by the latecomers. (…) selling the products under well-known foreign brand names the latecomer avoided the need for heavy investments in marketing and distribution. … [T]he foreign corporations [under OEM] frequently supplied training, technical specifications and advice on engineering and capital goods…enabling hundreds of small firms to overcome barriers to entry".	
	Own design manufacturer (ODM)	"…by the late 1980 s foreign buyers and TNCs had begun purchasing goods under so-called ODM, allowing local companies to exploit their design talents and thereby gain more of the added value. Sometimes the latecomers designed goods independently, using their own knowledge of the international market. In other cases they worked closely with foreign buyers' and TNCs…indicating that local firms had internalized much of the ability to understand market needs, then to design, develop and make electronic products for overseas markets".	
	Own brand manufacturer (OBM)	"[Under OEM, suppliers] lacked their own marketing capabilities and brand names…several of the groups had established OBM… [wherein a] local firm designs and conducts R&D for complex products… organizes distribution, own-brand name and captures post-production value-added".	
Gereffi (1999, 52-56)	Assembly	"Manufacturers engaged in production sharing arrangements,…require the lowest level of expertise from their suppliers [for] the assembly of cut parts into finished garments. The knowledge gained is relevant only to the production segment of the commodity chain".	This was proposed based on a multi country study on the apparel industry in Hong Kong, Taiwan, South Korea and China.
	Original equipment manufacturer (OEM)	"[T]he supplying firm makes a product according to the design specified by the buyer; the product is sold under the buyer's brand name; the supplier and buyer are separate firms; and the supplier lacks control over distribution".	
	Original brand manufacturer (OBM)	Under intense competition "it is advantageous to establish forward linkages to developed countries markets, where the biggest profits are made in buyer-driven commodity chains (…). [Suppliers] integrating their manufacturing expertise with the design and sale of their own branded merchandise".	

(*continued on next page*)

Table 1 (*continued*)

Author and studies	Types of upgrading proposed by authors	Definitions	Research context
Humphrey and Schmitz (2002., 1020)	Process upgrading	"Transforming inputs into outputs more efficiently by reorganizing the production system or introducing superior technology".	This conceptualization was based on multiple case studies in different industry sectors and countries.
	Product upgrading	"Moving into more sophisticated product lines (which can be defined in terms of increased unit values)".	
	Functional upgrading	"Acquiring new functions (or abandoning existing functions) to increase the overall skill content of activities".	
	Inter-sectoral upgrading	"Firms of clusters move into new productive activities".	
Humphrey (2004, 8)	Assembly (CMT)	"The focus is on production alone, often following buyers' specifications and using materials supplied by the buyer. In the garments sector, this would be described as "cut-make-and-trim".	This was proposed based on export data and integrating findings from previous case studies on apparel, automobile, horticulture and footwear industries in multiple countries.
	Original equipment manufacturer (OEM)	"The supplier takes on a broader range of manufacturing functions, possibly including the sourcing of inputs and logistics functions. The buyer is still responsible for design and marketing. In the garments sector, this would be described as "full package" production".	
	Original design manufacturer (ODM)	"In addition to manufacturing, the supplier carries out parts of the design process, possibly in collaboration with the buyer. In the most advanced cases, the buyer merely attaches its own brand, or "badge" to a product designed and made by the supplier".	
	Original brand manufacturer (OBM)	"The supplier designs, produces and markets its own products under its own brand. It no longer relies on a buyer for these functions".	
Barrientos et al. (2011. 324)	Chain upgrading	Adopted Humphrey and Schmitz (2002) typology of economic upgrading (i.e., process, product, functional and inter sectoral) but added chain upgrading as the fourth dimension and defined as "shifting to a more technologically advanced production – chain involves moving into new industries or product markets, which often utilize different marketing channels and manufacturing technologies".	This conceptualization was based on a study on upgrading in the Moroccan garment industry.
Frederick and Gereffi (2011, 73–74)	Functional in value chain	"Apparel manufacturers acquire responsibility for more value-adding activities; a switch from manufacturer to service provider may occur: CMT → OEM → ODM → OBM → lead firm". "Assembly/CMT (cut, make trim): the apparel manufacturer is responsible for sewing the garment and may be responsible for cutting the fabric and providing simple trim (buttons, zippers, etc.)". "Original equipment manufacturing (OEM): the apparel manufacturer purchases (or produces) the textile inputs and provides all production services, finishing, and packaging for delivery to the retail outlet". "Original design manufacturing (ODM): the apparel supplier is involved in the design and product development process, including the approval of samples and the selection, purchase and production of required materials". "Original brand manufacturing (OBM): the apparel supplier is responsible for branding and marketing of the final products".	This conceptualization was proposed based on export data that compared upgrading trajectories of leading apparel exporters.
	Integration in supply chain	"Establish backward manufacturing linkages within the supply chain: apparel → textiles → fibres → machinery".	
	Channel	"Market diversification: acquire new skills by serving new buyers' or markets often in emerging domestic or regional markets".	
	Product	"Shift to more complex products or expand capabilities (diversify): basic → fashion (design) or basic → functional (R&D)".	
	Process	"Reduce cost, increase productivity and improve flexibility by investing in new or better machinery or logistics technology".	
Morris and Staritz (2014)	Channel upgrading	Diversifying to new buyers or geographic and product markets.	This conceptualization was based on the investigation of linkages with GVC, market access, ownership structure and upgrading in Madagascar apparel industry.
	Supply chain upgrading	Establishing backward linkages within the supply chain (e.g., establishing linkages from apparel production to textiles, trims, and support services).	
	Skills upgrading	Developing and improving local skills.	

indicates the supplier's business has grown and therefore is an indicator of functional upgrading (Humphrey & Schmitz, 2002). A supplier's ability to introduce new materials into their products enables the supplier to capture higher value therefore is an indicator of functional upgrading (Frederick & Gereffi, 2011; Navas-Alemán, 2011). Undertaking market research enables a supplier to better respond to customer requirements and increases the supplier's ability to attract more business therefore, is also an indicator of functional upgrading (Frederick & Gereffi, 2011; Humphrey & Schmitz, 2002; Navas-Alemán, 2011). Finally, a supplier's ability to provide logistics services is also suggested as an indicator of functional upgrading. At the initial stages of GVC participation suppliers' lack of experience requires that their buyers undertake logistics services. As suppliers become experienced their buyers want suppliers to undertake logistics in addition to production. This is an indication that suppliers have acquired new functions and therefore providing logistics services is another indicator of functional upgrading (Humphrey & Schmitz, 2002; Morris & Staritz, 2014; Rossi, 2013).

Humphrey and Schmitz (2002) typology originally included *inter-sectoral upgrading* as the fourth type of upgrading. However, their definition did not allow investigation of upgrading on firms outside a given industrial cluster. To address this, Barrientos et al. (2011) and Gereffi and Lee (2016) proposed the fourth type of EU be referred to as chain upgrading. Although the distinctions between the more generic term "chain" and some other dimensions of upgrading have not been articulated in the literature, making difficult to objectively assess chain upgrading (Golini et al., 2018). Porter (1985) value chain view and the smiling curve (Mudambi, 2008) suggest that marketing, branding and retailing are part of the same value chain. As such, we argue that firms undertaking chain upgrading will develop their own brand named

Table 2
Linkages to Humphrey and Schmitz's four types of economic upgrading.

Authors and studies	Types of upgrading			
	Product	Process	Functional	Inter-sectoral/Chain
Humphrey and Schmitz (2002)	Product	Process	Functional	Inter-sectoral
Wortzel and Wortzel (1981)	Stage I and II	Stage III	Stage IV	Stage V
Hobday (1995)	Assembly*	Original equipment manufacturer	Gradual progression from one stage to the next stage	Original brand manufacturer
Gereffi (1999)	Assembly*	Original equipment manufacturer	Progression from CMT to OEM to ODM to OBM	X
Humphrey (2004)	Cut, Make and Trim*	Original equipment manufacturer	Progression from CMT to OEM to ODM to OBM	X
Barrientos et al. (2011)	Product	Process	Functional	Chain
Frederick and Gereffi (2011)	Product	Process	Functional in value chain	Integration in supply chain and Channel
Morris and Staritz (2014)	Channel upgrading	Skill upgrading	Supply chain upgrading	X

Note: *Suggests linear process from this activity to the next.
X indicates the particular type was not captured in the study.

products and internal marketing skills, rather than diversifying into a new sector or industry. Thus, in this research, *chain upgrading* is defined as shifting to higher value activities by diversifying into new but related businesses, developing own brand named products and marketing skills (Barrientos et al., 2011; Gereffi & Lee, 2016). Undertaking marketing independently requires a deliberate strategy and resource commitment towards backward and forward integration (Frederick & Gereffi, 2011; Humphrey & Schmitz, 2002; Morris & Staritz, 2014) as well as brand development (Pietrobelli & Rabellotti, 2011), freeing suppliers from being dependent on buyers and allowing suppliers to capture more benefits (Barrientos et al., 2011; Craig & Douglas, 1997; Humphrey & Schmitz, 2002; Wortzel & Wortzel, 1981). Table 3 summarizes the definition of the four EU types used in this study and provides a list of variables identified by authors that could be used to assess each component. Given that we used Humphrey and Schmitz (2002) four dimensional EU typology in this paper, when there is a lack of consensus in the literature regarding the variables evaluating the domain of each upgrading type, we assessed the appropriateness of variables following their suggestions and our construct definitions.

Based on the review of the literature, an initial set of 22 items was generated for the four types of upgrading (i.e., as identified in Table 3). Table 4 lists the initial items pool of each upgrading construct, which was then presented to academic experts who suggested two additional items (resulting in 24 items (see Section 3.2) and then mangers (see Section 3.3) for feedback, refinement and extension.

3.2. Expert review

We followed Cadogan et al. (1999) and Verreynne, Hine, Coote, and Parker (2016) suggestion for scale refinement. After receiving ethics approval we sent the 22 items, specifying the items measuring each of the four constructs and construct definitions to 10 academics with expertise in GVCs, international business, management and marketing to confirm content and face validity of the measures. Participants reviewed the accuracy of the content and commented on areas of omission or duplication. Participants suggested two additional items to further capture the domain of functional and chain upgrading dimensions. These additional items were also supported in the literature, as indicated in Table 4. The expert review process expanded the measure of the four types of upgrading to 24 items (see Table 4).

3.3. Qualitative study

To further assess content and face validity (Flatten, Engelen, Zahra, & Brettel, 2011), the 24 measures and definitions were sent to a convenient sample of five senior executives of Bangladeshi apparel firms. Respondents participated in a telephone interview and were asked to share their experience of EU, comment on the definition of the EU constructs, to identify any items that were either ambiguous or difficult to answer and suggest any other items that should be considered for inclusion. The interviews were conducted in English, as most garment sector managers are highly educated and conduct business in English when dealing with global buyers. The interviews ranged from 30 to 50 min. The managers' insights assisted in refining the items and resulted in a range of minor wording and terminology changes to make the terms easier for the managers to understand.

3.4. Pre-test and assessment of internal consistency

The target population for this study were Bangladeshi apparel sector manufacturers. They were selected because Bangladeshi apparel suppliers are well integrated into Western GVCs, and account for 84.7% of all Bangladeshi apparel exports (Islam & Stringer, 2018). Additionally, Bangladesh is the second largest apparel exporting country after China (Islam, Khattak, & Stringer, 2017). Drawing the population from a single country and sector controls for variations in environmental forces, and ensures a homogenous economic, political, sociocultural, technological and legal framework across respondents (Jiménez-Barrionuevo, García-Morales, & Molina, 2011).

The contact details of all apparel firms were sourced through the publicly-available Bangladesh Garment Manufacturers and Exporters Association (BGMEA) database, which contains email and telephone numbers of the CEOs, managing directors, directors, and chairpersons for 4222 apparel firms. Senior executives are important key informants and play a major role in setting organizations' strategy development and implementation (Westphal & Fredrickson, 2001). These key informants also have extensive cross-functional knowledge, allowing them to evaluate the organization's EU activities (García-Morales, Ruiz-Moreno, & Llorens-Montes, 2007).

A pre-test sample of 603 firms was selected from the database using a systematic random technique (i.e., every 7th firm). An invitation letter and link to an online English questionnaire was sent to the senior executives listed in the database. The survey asked that managers evaluate their firms' upgrading performance in the last three years. The initial email was received by 301 firms and 30 completed responses were received, for an effective response rate of 9.96%.

The survey items used a 7-point Likert scale, with 1 indicating *totally disagree* and 7 *totally agree,* and included a progress bar to reduce dropout rates (Stieger, Reips, & Voracek, 2007). Cabooter, Weijters, Geuens, and Vermeir (2016) suggest that the unipolar scale format with positive and negative number (responses) covers a wider psychological range and therefore show less extreme responses. Likert type scales

Table 3
Summary of the literature on conceptualization of Humphrey and Schmitz's four economic upgrading types.

Studies	Process upgrading	Product upgrading	Functional upgrading	Inter-sectoral/Inter-chain/Chain upgrading
Humphrey and Schmitz (2002, 1020)	Defined as transforming inputs into outputs more efficiently by reorganizing the production system or introducing superior technology. *Variables suggested* – cost reduction, improving efficiency of production process, improved organizational management processes, quality control and flexibility.	Defined as moving into more sophisticated product lines (which can be defined in terms of increased unit values). *Variables suggested* – product design, product innovation, task complexity and product quality.	Defined as acquiring new functions (or abandoning existing functions) to increase the overall skill content of activities. *Variables suggested* – reducing time to market, production growth, investment in workforce skills development, market research, logistics capacity and product diversification.	*Inter-sectoral* upgrading is defined as firms of clusters move into new productive activities. *Variables suggested* – horizontal integration, marketing and retailing.
Barrientos et al. (2011)	Defined as changes in the production process with the objective of making it more efficient. *Variables suggested* – reducing costs, lead time, flexibility and improved efficiency of the production process.	Product upgrading occurs where more advanced product types are introduced, which often requires more skilled jobs to make an item with enhanced features. *Variables suggested* – improving quality and task complexity.	Functional upgrading occurs where firms change the mix of activities they perform towards higher value added tasks. *Variables suggested* – product-market research, vertical integration, specialization, investment in workers skill development, logistics and own design.	Chain upgrading is defined as shifting to more technologically advanced production chain – involves moving into new industries or product markets, which often utilize different marketing channels and manufacturing technologies. *Variables suggested* – product and market diversification and marketing.
Bernhardt and Pollak (2016)	Defined as increasing efficiency through the reorganization of production or introduction of new technologies. *Used unit values and world market share to capture the broad economic upgrading.*	Defined as the move towards more sophisticated or high-quality product lines. *Used unit values and world market share to capture the broad economic upgrading.*	Defined as increasing the range of functions performed or changing the mix of activities towards higher-value tasks. *Used unit values and world market share to capture the broad economic upgrading.*	Inter-chain upgrading is defined as capitalizing on capabilities acquired in one chain to enter another, technologically more advanced chain. *Used unit values and world market share to capture the broad economic upgrading.*
Gereffi and Lee (2016)	Defined as transforms inputs into outputs more efficiently by reorganizing the product system or introducing superior technology. *No variable suggested.*	Defined as moving into more sophisticated product lines. *No variable suggested.*	Functional upgrading entails acquiring new functions (or abandoning existing functions) to increase the overall skill content of the activities. *No variable suggested.*	*Chain* upgrading is defined as firms move into new but often related industries. *No variable suggested.*
Golini et al. (2018, 14)	Defined as the achievement of efficiency improvements in the production process through the reorganization of productive activities. *Variables suggested* – unit manufacturing cost reduction, ordering cost reduction and manufacturing lead time reduction.	Defined as the move toward more sophisticated products, entailing higher unit-values. *Variables suggested* – product quality and reliability, product customization and new product introduction.	Defined as acquiring (or moving toward) new functions with higher skill content. *Variables suggested* – product assistance and customer service quality.	*Chain* or *inter-sectoral* upgrading is defined as moving toward new (often related) industries. Did not investigate.
Morris and Staritz (2014, 244)	Defined as reorganizing the production system or improving equipment and technology. *Variables suggested* – investments in equipment, process improvement, quality control, flexibility and management efficiency.	Defined as shifting to more sophisticated, complex, or better quality products. *Variables suggested* – product diversification, complex fashion products and higher-quality.	Defined as increasing a firm's range of function or changing the mix of activities to higher-value tasks. *Variables suggested* – logistics, distribution, design, product development and branding.	*Chain* upgrading is defined as moving to higher value industry. *Variables suggested* – backward linkages, end market diversification and developing direct relationships with buyers.
Navas-Alemán (2011, 1388)	Defined as improvements in the production system. *Variables suggested* – acquiring new machinery, implementing a quality control program, new management techniques, introduction of total quality programs, shortening delivery times and reducing waste.	Defined as introducing new products. *Variables suggested* – changing designs, improving quality, introducing new materials and producing more sophisticated final output.	Defined as moving into different stages (or functions) beyond production. *Variables suggested* – original design, branding and marketing.	Not discussed.
Pietrobelli and Rabellotti (2011, 1262)	Defined as transforming inputs into outputs more efficiently by reorganizing the production system or introducing superior technology.	Defined as moving into more sophisticated product lines in terms of increased unit values.	Defined as the acquisition of new, superior functions in the chain, such as design or marketing, or abandoning existing lower-value-added functions to focus on higher-value added activities.	*Inter-sectoral* upgrading is defined as applying the competence acquired in a particular function to move into a new chain.

(*continued on next page*)

Table 3 (*continued*)

Studies	Process upgrading	Product upgrading	Functional upgrading	Inter-sectoral/Inter-chain/Chain upgrading
	Variables suggested – monitor product quality and producing to buyers' specification.	*Variables suggested* – produces samples, capabilities to interpret design, product innovation and improved product quality.	*Variables suggested* – meet buyers' price and time conditions and investment in human capital development.	*Variables suggested* – own design and branded products, marketing and sales, horizontal and vertical integration.
Rossi (2013, 223-231)	Defined as improvements in the efficiency of the production process, through the introduction of new technology and/or through increased productivity.	Defined as the ability to undertake specialized production for luxury brands and/or respond to buyers demand on a range of products.	Defined as the change in the activities performed by the supplier firm toward a higher value added combination which includes not only manufacture, but also ser-vices.	*Chain* upgrading is defined as moving to a higher value added production chain altogether.
	Variables suggested – lower production costs, faster delivery times and introduction of new technologies.	*Variables suggested* – product range and introduced new product mix.	*Variables suggested* – investment in workforce skills development, developing logistics capacity, speed and flexibility of production and delivery, quality of production process.	*No variable suggested.*

with strongly agree and strongly disagree are frequently used in measuring organizational strategy actions (Kumar, Aaker, & Day, 2002). The reliability of the constructs was assessed through Cronbach's α, and all of the alphas exceeded the recommended value of 0.70 (Hair, William, Barry, & Rolph, 2010), suggesting that the constructs have high reliability and internal consistency (Dunn et al., 1994; Hair et al., 2010). The small pre-test sample, precluded more complex assessment of items (e.g., factorial structure), which as assessed within the validation process.

4. Validation of the scales

To validate the measures, the survey questionnaire was sent to the remaining 3619 firms in the database. In this stage we distributed the invitation in both Bengali and English and the survey was also available in both languages, to ensure no potential respondents were excluded because of language issues, even though most interactions between GVC buyers and suppliers are conducted in English. To ensure consistency between the two versions, the Bengali version was back translated using two independent bilingual (English and Bengali) academics (Del Greco, Walop, & Eastridge, 1987).

The email was received by 2354 firms (65.05%). Following three email reminders and two follow-up phone calls, a total of 386 (357 English and 29 Bengali) completed surveys were received, for an effective response rate of 16.40%. This is similar to other business surveys in developing country contexts (Rho & Yu, 1998) and other online organizational surveys (Flatten et al., 2011). A test of Chi Square differences of the four EU types between the item values for responses received in Bengali and English suggested no significant difference (see Table 5), therefore, the responses of the two survey versions were merged (Sireci & Berberoglu, 2000).

Overall, 97.1% of respondents were male with the majority (74.1%) aged between 31 and 50 years. The majority (89.4%) had an undergraduate qualification or above, and 43% had practical experience of between 5 and 10 years in the apparel industry, followed by 11–20 years' experience (32.9%), with 29.7% of respondents being managing directors and 64% being senior managers. In terms of their firms' size, 73.2% had between 500 and 4000 employees, with the remainder (26.8%) having 4001 or more employees. The majority of firms (76.9%) produced between 10 million and 40 million pieces garments annually, with the majority of total production (98.57%) was exported (see Table 6 for details).

4.1. Data cleaning

The online survey required forced responses thus there were no missing data. We removed 21 'speeders', who completed the survey in less than half of the median completion time (i.e., 26 min) (Scott, Schumayer, & Gray, 2012). We also removed 15 outliers (with a z-score ± 3.29 and a corresponding p-value of less than 0.001 (Hair et al., 2010; Tabachnick & Fidell, 2001). This left 350 usable responses for the final analysis.

The last 10% of respondents were compared with the first 10% of respondents and there were no significant differences between the two groups, indicating non-response was not an issue (Rogelberg & Stanton, 2007; Stinchcombe, Jones, & Sheatsley, 1981). We used Herman's single factor method (Hair et al., 2010) to test for common method bias, (Podsakoff, MacKenzie, & Podsakoff, 2012; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). The results indicated that only 28.82% of variance was explained by a single factor which was much lower than the suggested 50% threshold, indicating that common method variance was not an issue (Chang, Van Witteloostuijn, & Eden, 2010; Podsakoff et al., 2003).

The data used were found to have slight non-normality, but were within the acceptable range of ± 2 (George & Mallery, 2003; Hair et al., 2010). Nevertheless, the bootstrapping technique with 5000 bootstrap

Table 4
Items measuring the four types of economic upgrading.

Constructs	Items description	Variables	Source
Product upgrading	PRU1: In our firm, product quality has improved.	Product quality	Barrientos et al. (2011), Frederick and Gereffi (2011), Gereffi (1999), Golini et al. (2018), Humphrey and Schmitz (2002), Kishimoto (2004), Morris and Staritz (2014), Navas-Alemán (2011), Schmitz and Knorringa (2000), Pietrobelli and Rabellotti (2011), Schmitz (2006), Wortzel and Wortzel (1981).
	PRU2: We have improved technical characteristics of the product (e.g., complexity of design).	Task complexity	Barrientos et al. (2011), Frederick and Gereffi (2011), Gereffi (1999), Gereffi and Lee (2016), Humphrey and Schmitz (2002), Navas-Alemán (2011), Morris and Staritz (2014), Schmitz (2006).
	PRU3: We have developed or improved our own product design team.	Product design capacity	Barrientos et al. (2011), Frederick and Gereffi (2011), Gereffi (1999), Gereffi and Lee (2016), Humphrey and Schmitz (2002), Kishimoto (2004), Navas-Alemán (2011), Schmitz (2006), Talay et al. (2018).
	PRU4: We have developed or improved product research and development capacity.	Product research	Frederick and Gereffi (2011), Gereffi (1999), Kishimoto (2004), Navas-Alemán (2011), Schmitz and Knorringa (2000), Schmitz (2006).
	PRU5: We have developed or improved product sample development capabilities.	Product sample development	Frederick and Gereffi (2011), Gereffi and Lee (2016), Navas-Alemán (2011).
Process upgrading	PSU1: We have introduced new production machinery to reduce costs and increase productivity.	Adoption of new manufacturing technology	Barrientos et al. (2011), Frederick and Gereffi (2011), Gereffi (1999), Gereffi and Lee (2016), Golini et al. (2018), Humphrey and Schmitz (2002), Morris and Staritz (2014), Navas-Alemán (2011), Rossi (2013), Schmitz (2006), Talay et al. (2018).
	PSU2: We have introduced or improved total quality programs.	Adoption of quality management	Azmeh and Nadvi (2014), Barrientos et al. (2011), Frederick and Gereffi (2011), Gereffi (1999), Gereffi and Lee (2016), Humphrey and Schmitz (2002), Morris and Staritz (2014), Navas-Alemán (2011), Schmitz (2006), Talay et al. (2018).
	PSU3: We have introduced new organizational or management techniques.	Adoption of organizational management	Azmeh and Nadvi (2014), Barrientos et al. (2011), Frederick and Gereffi (2011), Gereffi (1999), Gereffi and Lee (2016), Humphrey and Schmitz (2002), Morris and Staritz (2014), Navas-Alemán (2011), Schmitz (2006), Wortzel and Wortzel (1981).
	PSU4: We have increased the use of internet and intranet for business purposes.	Business process improvement	Frederick and Gereffi (2011), Gereffi and Lee (2016), Navas-Alemán (2011), Talay et al. (2018).
	PSU5[a]*: We have increased our efficiencies to work on different order size of buyers* (i.e., *large* vs. *small).*	*Flexibility*	Barrientos et al. (2011), Humphrey and Schmitz (2002), Talay et al. (2018).
Functional upgrading	FNU1: In our firm, product defection/reworking rates have decreased.	Reliable quality performance	Frederick and Gereffi (2011), Gereffi and Lee (2016), Navas-Alemán (2011), Talay et al. (2018).
	FNU2[b]: We have introduced new materials/production inputs (e.g., organic fabric).	Product diversification	Frederick and Gereffi (2011), Gereffi and Lee (2016), Morris and Staritz (2014), Navas-Alemán (2011).
	FNU3: We have invested to enhance workers' skills.	Workers skills development	Barrientos et al. (2011), Frederick and Gereffi (2011), Gereffi (1999), Gereffi and Lee (2016), Humphrey and Schmitz (2002), Navas-Alemán (2011), Pietrobelli and Rabellotti (2011), Schmitz (2006), Talay et al. (2018).
	FNU4: We have improved our market research capacity.	Market research skill	Humphrey and Schmitz (2002), Talay et al. (2018).
	FNU5: We have improved our logistics capacity.	Logistics capacity	Barrientos et al. (2011), Humphrey and Schmitz (2002), Morris and Staritz (2014), Rossi (2013), Talay et al. (2018).
	FNU6[c]*: We have reduced production and delivery lead-time.*	*Reduction of production and delivery time*	Azmeh and Nadvi (2014), Barrientos et al. (2011), Frederick and Gereffi (2011), Gereffi (1999), Gereffi and Lee (2016), Humphrey and Schmitz (2002), Navas-Alemán (2011), Schmitz (2006), Talay et al. (2018).
	FNU7[d]*: In our firm, we have increased production volume.*	*Production growth*	Barrientos et al. (2011), Frederick and Gereffi (2011), Gereffi (1999), Gereffi and Lee (2016), Humphrey and Schmitz (2002), Navas-Alemán (2011), Schmitz (2006), Talay et al. (2018), Wortzel and Wortzel (1981).
	FNU8[e]*: We have shifted from producing basic garments to manufacturing high quality fashion garments.*	*Product diversification*	Frederick and Gereffi (2011), Gereffi (1999), Gereffi and Lee (2016), Humphrey and Schmitz (2002), Navas-Alemán (2011).

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Table 4 (*continued*)

Constructs	Items description	Variables	Source
Chain upgrading	CNU1: We have expanded businesses into processing yarn into fabric.	Vertical integration	Frederick and Gereffi (2011), Navas-Alemán (2011), Pietrobelli and Rabellotti (2011), Talay et al. (2018).
	CNU2: We have expanded business into logistic services such as freight forwarding, insurance, shipping, IT.	Horizontal integration	Barrientos et al. (2011), Frederick and Gereffi (2011), Gereffi (1999), Gereffi and Lee (2016), Humphrey and Schmitz (2002), Navas-Alemán (2011), Pietrobelli and Rabellotti (2011), Schmitz (2006).
	CNU3[b]: We have developed our own brand named product.	Brand development	Barrientos et al. (2011), Frederick and Gereffi (2011), Gereffi (1999), Gereffi and Lee (2016), Humphrey and Schmitz (2002), Kishimoto (2004), Morris and Staritz (2014), Navas-Alemán (2011), Pietrobelli and Rabellotti (2011), Schmitz (2006), Wortzel and Wortzel (1981).
	CNU4: We have opened our own retail stores and/or collaborated with other retailers to sell our own brand named product(s) within the domestic/local market.	Marketing and retailing	Barrientos et al. (2011), Frederick and Gereffi (2011), Gereffi (1999), Gereffi and Lee (2016), Humphrey and Schmitz (2002), Navas-Alemán (2011), Schmitz (2006), Tewari (1999), Wortzel and Wortzel (1981).
	CNU5: We have opened our own retail stores and/or collaborated with other retailers to sell our own brand named product(s) within international markets.	Marketing and retailing	Barrientos et al. (2011), Frederick and Gereffi (2011), Gereffi (1999), Gereffi and Lee (2016), Humphrey and Schmitz (2002), Navas-Alemán (2011), Schmitz (2006), Tewari (1999), Wortzel and Wortzel (1981).
	*CNU6[f]: We have expanded businesses (*i.e., *printing, packaging, making button, making zipper etc.).*	*Horizontal integration*	Frederick and Gereffi (2011), Gereffi and Lee (2016), Humphrey and Schmitz (2002), Navas-Alemán (2011), Pietrobelli and Rabellotti (2011), Talay et al. (2018).

Note:
[a] *Loaded with lower (0.26) than the recommended score (0.50), thus, dropped after EFA.*
[b] *Suggested by experts in the review stage.*
[c] *Cross loaded with lower (0.30) than the recommended score (0.50), thus, dropped after EFA.*
[d] *Loaded with lower (0.28) than the recommended score (0.50), thus, dropped after EFA.*
[e] *Cross loaded with lower (0.29) than the recommended score (0.50), thus, dropped after EFA.*
[f] *Loaded with lower (0.28) than the recommended score (0.50), thus, dropped after EFA.*

samples at 95% confidence intervals was used to ensure that any non-normality did not affect the results (Byrne, 2013; Hayes, 2009).

4.2. Scale refinement

The scale refinement followed a two-step procedure where an exploratory factor analysis (EFA) was undertaken, followed by confirmatory factor analyses (CFA). We followed Churchill (1979) and Hair et al. (2010) *split-half* technique, where the cleaned data set was split into two samples. The first dataset, with a sample size of 150, was used for EFA. The second dataset, with a sample size of 200, was used for CFA and scale validation. Although there is no consensus in the literature as to the minimum sample size required for structural equation modelling (SEM), a sample size of a case-per-item ratio of 5:1 is suggested (Bentler & Chou, 1987). Based on a case-per-item ratio, both subsamples exceed the minimum required sample for EFA 120 (5 × 24), CFA 95 (19 × 5) and structural model for the assessment of nomological validity 135 (27 × 5). Given that EU is a multi-dimensional construct, only reflective measures are suitable to validate the scale properties (Flatten et al., 2011).

4.3. Exploratory factor analysis

SPSS 23 was used to undertake EFA, applying principal component analysis with promax rotation. Table 7 summarizes the results of EFA, which shows that the Kaiser-Meyer-Olkin estimate was 0.82, significant at p-value < 0.001, indicating that the data were suitable for factor analysis (Jiménez-Barrionuevo et al., 2011). The initial analysis generated five factors with Eigen values > 1, and these explained 66.69% of the variance in the data, which exceeds the standard cut-off point of 50% (Flatten et al., 2011).

Items that had communality below 0.50 or loaded highly on more than one component were excluded (Bernstein, 2012). After two cycles of reduction for low loadings or high cross loadings, five items were removed. The remaining 19 items loaded on the four factors, with loadings above the standard threshold 0.50, and explained 61.07% of the variance in the data, indicating uni-dimensionality of the four constructs (Flatten et al., 2011; Hair et al., 2010; Papadas et al., 2017).

4.4. Assessment of reliability

After identification of the factorial structure of the measures, the second dataset with a sample size of 200 was used for reliability assessment. Table 8 summarizes the results of scale reliability. We report Cronbach's α coefficient (Churchill, 1979) and Hancock and Muller's coefficient to assess the reliability of the final scales (Hancock & Mueller, 2001). All constructs had an α and composite reliability (CR) greater than 0.70, indicating good reliability and internal consistency (Cronbach, 1951; Hair et al., 2010; Nunnally, 1979) – Process upgrading (4 items) α = 0.74, CR = 0.85; Product upgrading (5 items) α = 0.75, CR = 0.85; Functional upgrading (5 items) α = 0.74, CR = 0.85; Chain upgrading (5 items) α = 0.87, CR = 0.92.

Table 5
Results of the Chi square difference test for the four economic upgrading types on Bengali and English versions.

Economic upgrading types	Pearson χ^2	Degrees of freedom	Asymptotic significance at 95% confidence interval (2 Tailed)
Process upgrading	22.68	20	0.31
Product upgrading	24.35	19	0.18
Functional upgrading	24.22	18	0.15
Chain upgrading	25.24	21	0.13

Table 6
Sample characteristics.

Characteristics	Categories	Frequency (%) Pre-test (n = 30)	Frequency (%) Final survey (n = 350)
Gender	Male	30 (100%)	340 (97.1%)
	Female	0 (0%)	10 (2.9%)
Age	20–30 years	8 (26.7%)	39 (11.1%)
	31–40 years	14 (46.7%)	147 (42%)
	41–50 years	6 (20%)	113 (32.3%)
	51–60 years	1 (3.3%)	43 (12.3%)
	61 and above	1 (3.3%)	8 (2.3%)
Education	Technical	1 (3.3%)	29 (8.3%)
	Higher secondary	0 (0%)	8 (2.3%)
	Undergraduate and above	29 (96.7%)	313 (89.4%)
Experience	Less than five years	5 (16.7%)	44 (12.6%)
	5–10 years	15 (50%)	151 (43%)
	11–20 years	9 (30%)	115 (32.9%)
	21–30 years	1 (3.3%)	30 (8.6%)
	Above 30 years	0 (0%)	10 (2.9%)
Position served	Managing directors/ directors	8 (26.7%)	104 (29.7%)
	Chairman/proprietor	0 (0%)	22 (6.3%)
	Senior level managers	22 (73.3%)	224 (64%)
Firm size	< 500–2000 employees	17 (50%)	155 (44.3%)
	2001–4000 employees	8 (26.7%)	101 (28.9%)
	4001 and above	7 (23.3%)	94 (26.8%)
Type of garments specialized in	Knitwear	16 (53.3%)	186 (53.2%)
	Woven-wear	8 (26.7%)	89 (25.4%)
	Both	6 (20%)	75 (21.4%)
Export intensity mean (stdv.)	Percent of production exported	95.93% (stdv. 13.14)	98.57% (stdv. 7.91)
Annual production	< 10 million to 20 million	10 (33.3%)	107 (30.6%)
	21 million to 40 million	14 (46.7%)	161 (46.3)
	41 million to 80 million	6 (20%)	81 (22.8)
	81 million and above	0 (0%)	1 (0.3)

4.5. Confirmatory factor analysis

The CFA and nomological validity were assessed using AMOS 23 with the second subsample of 200 responses. All items loaded on their respective constructs with a loading of greater than 0.50 threshold (see Fig. 1), suggesting uni-dimensionality of the four constructs (Bagozzi & Yi, 1988; Byrne, 2013; Hair et al., 2010).

The multifactor CFA assessed the four dimensions identified above. The fit statistics (χ^2 = 390.79; *p*-value ≤0.05; degrees of freedom = 131; χ^2/df = 2.98; GFI = 0.96; CFI = 0.98; IFI = 0.97 and RMSEA = 0.06) demonstrate acceptable fit except for the χ^2 value. Where the χ^2 value is larger than desired, this can arise due to a larger sample size (i.e., larger than 50) and is deemed to be acceptable (Bernard & Jensen, 1999).

4.6. Convergent and discriminant validity

Hair et al. (2010) suggest that a CFA standardized factor loading of 0.50 or higher, with Cronbach's α coefficient, and CR of 0.60 (for new scales) and AVEs 0.50 or higher, indicate that the measures have accomplished convergent validity. The measures identified with the second subsample meet all these criteria (see Table 8), indicating that the items have acceptable convergent validity to measure their underlying constructs (Churchill, 1979; Hair et al., 2010). As discussed in section 3.1, despite the four upgrading types assessing the same underlying construct (i.e., economic upgrading) these are conceptually distinct. A comparison of the square root of AVEs and the squared correlation between constructs provides additional support of the discriminant validity of these constructs (Hair et al., 2010). As reported in Table 9, the AVEs are greater than the squared multiple correlation estimates.

Table 7
Rotated component matrix for the four types of economic upgrading constructs.

Pattern matrix (n = 150)				
Items initial	Components			
	Product upgrading	Process upgrading	Functional upgrading	Chain upgrading
PRU1	0.81			
PRU2	0.68			
PRU3	0.83			
PRU4	0.69			
PRU5	0.82			
PSU1		0.80		
PSU2		0.85		
PSU3		0.87		
PSU4		0.81		
FNU1			0.74	
FNU2			0.67	
FNU3			0.68	
FNU4			0.82	
FNU5			0.79	
CNU1				0.70
CNU2				0.89
CNU3				0.91
CNU4				0.88
CNU5				0.92

5. Nomological validity

Nomological validity was assessed based on the theoretical relationships of the scales' constructs with other predictor and outcome constructs (Iacobucci, Ostrom, & Grayson, 1995; Papadas et al., 2017). In assessing nomological validity, this research investigates the role of manufacturing capability (Buciuni & Finotto, 2016; Gereffi, 1999; Schmitz & Knorringa, 2000) as an antecedent to the four EU types, and whether in turn, the four EU types lead to improvements in suppliers' annual production and export intensity (Frederick & Gereffi, 2011; Schmitz, 2006).

GVC buyers usually contract out work to suppliers who undertake production activities based on their ability to meet buyers' expectation in terms of cost, quality, delivery and flexibility, the domain of a supplier's manufacturing capability (Ferdows & De Meyer, 1990). As such, developing manufacturing capability to initiate upgrading is an important strategic decision that a supplier can make (Craig & Douglas, 1997; Gereffi, 1999; Hoque et al., 2016; Kishimoto, 2004; Schmitz & Knorringa, 2000). Additionally, Gereffi (1999) and Wan and Wu (2017) suggested that any improvements across the four EU types affect both the supplier's overall production as well as their export performance and that the effects of dimensions of upgrading may differ between these outcomes. Therefore, to assess the nomological validity for the four upgrading types, manufacturing capability has been used as the predictor, with annual production and export intensity included as separate performance measures, where all constructs are measured subjectively (see Fig. 2).

The scales for measuring manufacturing capability have been adapted from Swink, Narasimhan, and Kim (2005), capturing the aspects, costs, quality, flexibility and delivery speed of manufacturing strategy (Ferdows & De Meyer, 1990; Skinner, 1966). Firms' annual

Table 8
Final scale items, descriptive statistics and standardized factor loadings for the four types of economic upgrading (n = 200).

Factor items	Mean	Stdv.	Factor loadings
Process upgrading (α = 0.74; CR = 0.85; AVE = 0.58)			
PSU1: We have introduced new production machinery to reduce costs and increase productivity.	5.13	1.78	0.77
PSU2: We have introduced or improved total quality programs.	5.78	0.99	0.68
PSU3: We have introduced new organizational or management techniques.	4.92	1.69	0.89
PSU4: We have increased the use of internet and intranet for business purposes.	5.51	1.47	0.69
Product upgrading (α = 0.75; CR = 0.85; AVE = 0.54)			
PRU1: In our firm, product quality has improved.	6.18	0.71	0.87
PRU2: We have improved technical characteristics of the product (e.g., complexity of design).	5.58	1.15	0.83
PRU3: We have developed or improved our own product design team.	4.56	1.79	0.75
PRU4: We have developed or improved product research and development capacity.	4.77	1.48	0.58
PRU5: We have developed or improved product sample development capabilities.	5.73	1.02	0.61
Functional upgrading (α = 0.74; CR = 0.85; AVE = 0.54)			
FNU1: In our firm, product defection/reworking rates have decreased.	5.88	1.26	0.69
FNU2: We have introduced new materials/production inputs (e.g., organic fabric).	4.62	1.85	0.61
FNU3: We have invested to enhance workers' skills.	6.05	0.86	0.74
FNU4: We have improved our market research capacity.	5.72	1.23	0.73
FNU5: We have improved our logistics capacity.	5.76	1.05	0.87
Chain upgrading (α = 0.87; CR = 0.92; AVE = 0.69)			
CNU1: We have expanded businesses into processing yarn into fabric.	4.08	2.07	0.57
CNU2: We have expanded business into logistic services such as freight forwarding, insurance, shipping, IT.	2.92	1.87	0.76
CNU3: We have developed our own brand-named product.	2.56	1.77	0.89
CNU4: We have opened our own retail stores and/or collaborated with other retailers to sell our own brand-named product(s) within the domestic/local market.	2.45	1.71	0.95
CNU5: We have opened our own retail stores and/or collaborated with other retailers to sell our own brand-named product(s) within international markets.	2.49	1.62	0.93

production has been operationalized as a firm's performance, and measured by a single item capturing the number of garments suppliers manufactured. Export intensity has been operationalized as the percentage the firms are exporting, relative to overall production, and is measured by a single item (i.e., 1–100%).

Using the hold-out subsample (n = 200), a structural model was estimated and had an acceptable fit across the major fit indices (χ^2 = 1195.13; degrees of freedom = 314; p-value ≤0.001; χ^2/df = 3.81; GFI = 0.96; CFI = 0.98; IFI = 0.95 and RMSEA = 0.07) (see Table 10), except for the χ^2 value (see explanation in Section 4.5) indicating a good fit of the model to data (Byrne, 2013; Hair et al., 2010). A bootstrap sample of 5000 was also used to ensure robustness (Hayes, 2009) and the results of the overall model are summarized in Table 11. These show a supplier's manufacturing capability significantly impacts all four EU types (process upgrading β = 0.58, p = 0.001; product upgrading β = 0.44, p = 0.01; functional upgrading β = 0.76, p = 0.001; and chain upgrading β = 0.25, p = 0.002), while product upgrading (β = 0.25, p = 0.049) and process upgrading (β = 0.22, p = 0.050) have a positive impact on overall production. However, functional upgrading has a significant negative effect (β = −0.28, p = 0.048) on the firm's annual production. The significant negative effect of functional upgrading on annual production is possibly linked to supplier firms' focus on capturing more economic value through functional upgrading, rather than being concerned about enhancing production volume (Coe & Yeung, 2015; Mudambi, 2008).

Chain upgrading did not have a significant impact on annual production (β = 0.05, p = 0.969). This could possibly result from suppliers focusing more on developing their own brand and marketing skills to achieve chain upgrading, which could result in their being less concerned with simply increasing production volume (Navas-Alemán, 2011; Schmitz, 2006; Wortzel & Wortzel, 1981).

In testing the effects of the four upgrading types on export intensity (i.e., percent of exports), functional upgrading shows a significant positive impact (β = 0.30, p = 0.045), whereas, chain upgrading exhibits a significant negative impact (β = −0.16, p = 0.050). Meanwhile, product (β = 0.07, p = 0.499) and process upgrading (β = −0.09, p = 0.923) have no significant impacts on the firm's export intensity. Supplier firms undertaking product and process upgrading tended to rely primarily on low labor costs and production efficiencies (Azadegan & Wagner, 2011). As a result, increasing export performance is likely to depend on buyers' willingness to provide more orders to a supplier, therefore, there is no significant impact on export performance. However, functional upgrading allows supplier firms to achieve efficiencies, and gain market knowledge and management expertise, that in turn result in higher export activity (Kishimoto, 2004; Navas-Alemán, 2011; Schmitz & Knorringa, 2000; Tewari, 1999). In chain upgrading, supplier firms mainly focus on achieving marketing skills and developing their own brand name product to sell directly to customers, which would potentially divert the supplier's attention from exporting to marketing (Craig & Douglas, 1997; Navas-Alemán, 2011; Schmitz, 2006; Wortzel & Wortzel, 1981). Therefore, functional upgrading should significantly improve a supplier's export performance, while chain upgrading would result in a decrease in the supplier's export performance.

It is important to acknowledge that the relationships identified in assessing nomological validity only indicate a positive link, and longitudinal research is needed to establish the causal relationships (Bagozzi & Yi, 2012). However, the SEM technique used in assessing the nomological validity does show whether the causal assumptions embedded in a structural model fit the data (Bollen, 1989). Papadas et al. (2017) suggest that significant correlations among the constructs (see Table 8) provide additional support for nomological validity.

6. Discussion, limitations and further research

6.1. Discussion

"Much of business and the environment of business have become global in the last decade or two" (Tallman & Pedersen, 2011, p. 2). This has triggered the spread of value-adding activities across national borders (Connelly, Ketchen, & Hult, 2013), creating opportunities in developing economies for increased income and employment through GVCs. Participation in GVCs provides developing country suppliers the opportunity for learning and accumulation of product-market knowledge, technology and management skills. These enable suppliers to develop manufacturing capability, which results in upgrading value

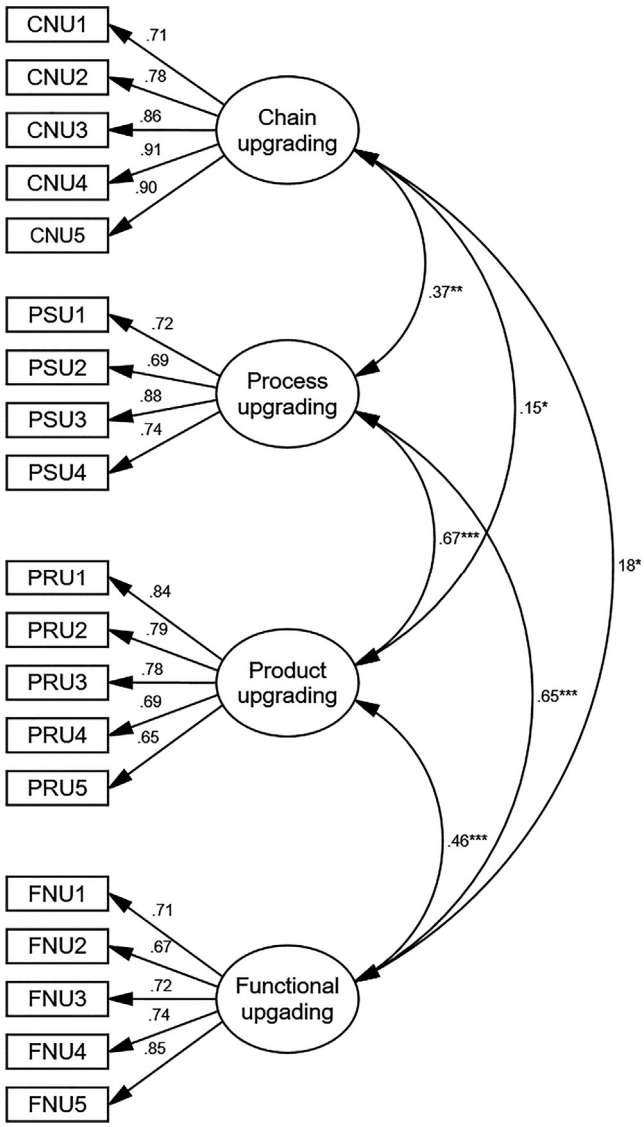

Fig. 1. CFA Model and results for the four economic upgrading types. Note: All coefficient values are standardized and above the associated path. ***Indicates $p < 0.001$; **indicates $p < 0.01$; and *indicates $p < 0.05$.

chain activities (Ernst & Kim, 2002; Frederick & Gereffi, 2011; Gereffi, 1999; Navas-Alemán, 2011; Schmitz, 2006) and, in turn, improved performance.

Previous GVC research, based on case studies, has argued there are relationships between manufacturing capability and an aggregate national or sectoral level of EU (Gereffi, 1999; Schmitz & Knorringa, 2000). The impacts of manufacturing capability on each of the four types of firm-level EU, and the effects of each EU on a supplier firm's performance, have not previously been explicitly explored. The results of this research indicate that the four types of firm-level EU have differing effects on a supplier firm's performance (i.e., production and export intensity). This provides managers of supplier firms with important insights about which types of EU are strategically important.

Previous case studies have argued that supplier firms change their focus from low value-adding manufacturing activities to more value-adding marketing activities to achieve higher EU in GVCs (Schmitz & Knorringa, 2000; Schmitz, 2006). This research provides managers with more empirical evidence about the relationships between different EU types and their impacts on firms' performance, thereby facilitating better decision making (Gunasekaran, Patel, & McGaughey, 2004). The findings of this research indicate that supplier firms which upgrade their performance in the product and process categories and incorporate cost competitiveness through efficiency, significantly affect their access to international markets through buyers' value chains. Accumulated capability enables a supplier to focus on more value-adding types of functional and chain upgrading, and significantly influences the supplier's ability to gain direct entry to international markets (Wan & Wu, 2017). In achieving functional upgrading a supplier firm is likely to focus less on cost competitiveness and more on managing the value chain efficiently, which would result in higher export intensity but lower overall production. Meanwhile, suppliers' chain upgrading would result in a reduced focus on manufacturing for buyers' orders but would focus on producing own brand-named products. Resources need to be committed to independently undertake marketing and distribution activities in international markets which, in turn, would result in reduced exporting to buyers' orders. This finding provides critical insights for supplier firms' managers about the impacts of alternative EU types on a firm's international marketing activities. To be effective in any of the four types of EU requires that suppliers invest in appropriate activities such as organization, management, workforce development, product and process improvement, marketing and distribution (Craig & Douglas, 1997; Ernst & Kim, 2002; Gereffi, 1999; Wan & Wu, 2017).

The theoretical and empirical contributions of this paper are important. The paper developed and validated measurement scales which will enable academics, managers and governmental bodies to objectively measure EU as a firm-level phenomenon. The paper, drawing on

Table 9
Assessment of discriminant validity (n = 200).

Constructs	Mean	Standard deviation	Inter-construct correlations				
			1	2	3	4	5
Manufacturing capability	5.91	0.79	***0.74***[a]				
Product upgrading	5.50	0.87	0.28**	***0.73***[a]			
Process upgrading	5.25	1.20	0.47**	0.50**	***0.76***[a]		
Functional upgrading	5.66	0.82	0.55**	0.46**	0.70**	***0.73***[a]	
Chain upgrading	2.59	1.46	0.25**	0.28**	0.39**	0.31**	***0.83***[a]
Annual production	29.36[b]	17.86	0.22**	0.31**	0.28**	0.33**	0.14*
Export intensity	98.54[c]	8.06	0.12	0.16*	0.16*	0.24**	−0.06

Note:
[a] The numbers along the diagonal (bold and italicized) indicate square root of the average variance extracted (AVE).
[b] Indicates the values are in million pieces.
[c] Indicates the values are in percentage of total production.
** Indicate Pearson two-tailed correlation with significance level at $p < 0.01$.
* Indicates Pearson two-tailed correlation with significance level at $p < 0.05$.

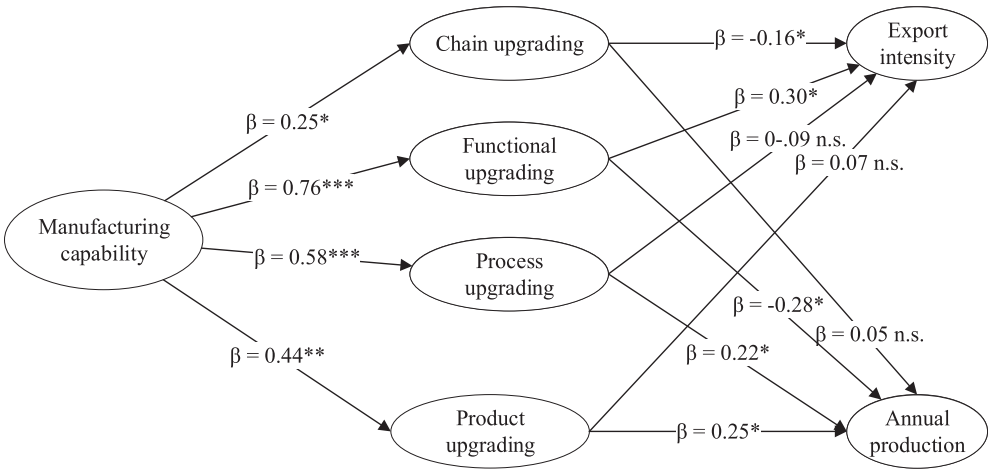

Fig. 2. Assessment of nomological validity of the scales (n = 200). Note: ***Indicates the results are significant at < 0.001. **Indicates the results are significant at < 0.01. *Indicates the results are significant at < 0.05.

Table 10
Model fit statistics.

Models	χ^2	DF	χ^2/df	GFI	CFI	IFI	RMSEA
Process upgrading	8.98	2	4.49	0.97	0.95	0.95	0.09
Product upgrading	16.49	5	3.30	0.97	0.95	0.95	0.08
Functional upgrading	17.36	5	3.47	0.98	0.99	0.99	0.05
Chain upgrading	21.22	5	4.24	0.97	0.98	0.98	0.06
Multifactor CFA model	390.79	131	2.98	0.96	0.98	0.97	0.06
Structural model (nomological validity test)	1195.13	314	3.81	0.96	0.98	0.95	0.07

an extensive review of the literature and subsequent item purification measures, ensures face validity, convergent and discriminant validity as well as nomological validity, and, therefore, responds to Golini et al. (2018) call for developing reliable measures of EU.

There are four areas that the scales developed in this paper can contribute to extend the GVC upgrading literature. First, the benefits of participation in GVCs in terms of all four EU types are equivocally argued in the GVC literature (e.g., Gereffi, 1999; Schmitz, 2006). To address this contrasting views, a valid measure for EU was essential, therefore these scales will facilitate assessing the relationships between GVC's participation and the four EU types. Second, the relationships among the three broad upgrading – economic, social and environmental – as some have argued EU being the precursor to the other two categories (e.g., Barrientos et al., 2011). However, due to the lack of valid measures of EU, the links between these alternative types are unexplored, which this paper has undertaken. As such, the scales of EU provided in this paper will enable researcher to better understand the relationships between alternative types of upgrading. Third, the impacts of different EU upgrading types on firm performance have not been adequately explored rather remains at conceptual level only (e.g., Schmitz, 2006; Navas-Alemán, 2011). This study provides some initial support, at least using production and export as measures of firm performance. Finally, the scales developed based on the functional characteristics of apparel industry therefore have greater implications to investigate upgrading within apparel GVC. These measures, however, can also be beneficial to other similar GVCs such as footwear, computer, semiconductor and automobiles with appropriate adaptation of wording to capture the nature of those GVCs activities.

The measures of the four types of EU can help managers determine whether additional investments should be made to achieve a particular upgrading type (Ernst & Kim, 2002; Gereffi, 1999; Hoque et al., 2016; Khan et al., 2015; Khattak et al., 2017). Consequently, suppliers can enhance their competitiveness, capture more economic returns and establish better control across chain activities (Azmeh & Nadvi, 2014; Hoque et al., 2016; Khan et al., 2015), as well as drive economic development in developing economies (Khan et al., 2015).

These measures will also help buyer firms assess the extent of their suppliers' alternative types of EU, and identify appropriate governance

Table 11
Statistics for the paths of nomological validity test (n = 200).

Paths	Path coefficient (β)	Standard error	*t*-values	Lower bound C.I.	Upper bound C.I.	*p*-Values
Manufacturing capability → Process upgrading	0.58	0.06	5.03	0.26	0.89	0.001***
Manufacturing capability → Product upgrading	0.44	0.10	4.49	0.10	0.72	0.01**
Manufacturing capability → Functional upgrading	0.76	0.05	5.80	0.46	0.99	0.001***
Manufacturing capability → Chain upgrading	0.25	0.10	3.18	0.10	0.40	0.02*
Product upgrading → Annual production	0.25	0.02	2. 78	0.01	0.47	0.049*
Process upgrading → Annual production	0.22	0.03	2.31	0.20	0.57	0.050*
Functional upgrading → Annual production	−0.28	0.02	−2.69	−0.91	0.01	0.048*
Chain upgrading → Annual production	0.05	0.01	0.07	−0.14	0.16	0.969(n.s.)
Product upgrading → Export intensity	0.07	0.14	0.84	−0.12	0.33	0.499 (n.s.)
Process upgrading → Export intensity	−0.09	0.19	−0.10	−0.32	0.24	0.923 (n.s.)
Functional upgrading → Export intensity	0.30	0.18	2.92	0.08	0.70	0.045*
Chain upgrading → Export intensity	−0.16	0.08	−2.25	−0.50	0.02	0.050*

Note: All path coefficients are standardized estimates.
n.s. indicates the path is not statistically significant.
* Indicates $p < 0.05$.
** Indicates $p < 0.01$.
*** Indicates $p < 0.001$.

Table 12
Future research areas where the scale can contribute: The "5Ws and H" approach.

	What	Who	Where	Why	When	How
Key concepts	Functions and dimensions of EU in different industry sectors.	Supplier firms and countries, global buyers, international governments and institutes.	Contextual factors: socio-economic dimensions, institutions, environmental dynamism and uncertainty.	Importance of EU for GVCs overall performance.	Temporal factors: upgrading is a dynamic process that influenced by GVCs relationships dimensions.	Ways to develop and implement upgrading mechanisms and strategies.
Possible research questions	• How do different dimensions of EU impact on GVCs overall financial and operational performance? • How does aggregate EU influence relationship dynamics (e.g., opportunism) and outcomes (e.g., innovation)? • How does the nature of GVCs (e.g., labour intensive vs. capital intensive) influence buyer–supplier relationships and upgrading outcomes?	• How do senior executives' preference at supplier firms' impact EU types? • How do GVCs governance types influence suppliers EU outcomes? • How does involvement of governance institutes (e.g., World Bank, ILO) influences power asymmetries between buyer–supplier relationships and the upgrading outcomes?	• How and why do governance and EU interact differently in specific context? • How does cultural distance between buyer and supplier countries influence governance-upgrading relationships? • How do local and international institutional conditions affect GVCs location decisions and upgrading?	• What is the mechanism to transform EU into social (e.g., workers wellbeing) and environmental (e.g., pollution control) upgrading? • How does EU strengthen GVCs overall competitiveness? • How does integration in GVCs influence suppliers' capabilities for value creation and capturing? • How does EU influence power asymmetries in buyer–supplier relationships?	• How do relationship length and contracting experience affect the governance-upgrading relationships? • How does trust and commitment develop over time in buyer–supplier relationships which in turn influence upgrading in GVCs? • How do different forms of power (e.g., coercive power vs. reward power) affect GVCs upgrading outcomes? • How does integration in regional and local value networks influence EU?	• What is the role of suppliers' home country government's industrial and human resource development policies in economic, social and environmental upgrading? • How do global buyers sourcing strategies impact on suppliers' capabilities development and upgrading? • How does technology adoption influence governance-upgrading relationships? • How do home and host country government relationships affect upgrading outcomes? • How do suppliers' strategies affect capabilities development and upgrading?

strategies (Wan & Wu, 2017). Suppliers' enhanced alternative types of upgrading would enable them to create value more efficiently for their buyers. Therefore, by identifying areas where suppliers need assistance, buyers could minimize the costs of replacing new suppliers which limit GVCs' competitiveness (Azmeh & Nadvi, 2014; Humphrey & Schmitz, 2002; Navas-Alemán, 2011; Schmitz, 2006). Finally, from a broader economic policy perspective, the measures would also assist governments, international organizations and non-government organisation (NGOs) in identifying policies that assist in developing specific aspects of EU, thus enhancing economic development in host economies.

6.2. Limitations and future research

A key limitation of this research is that the results only draw on data from one industry in one country. This creates an opportunity for further research to assess whether the measures of firm-level EU developed in this paper are replicable to other sectors, or national contexts (Cadogan et al., 1999; Churchill, 1979). Additional research could also work with longitudinal data to overcome the inherent limitations of the data having been collected at one time (Flatten et al., 2011; Jiménez-Barrionuevo et al., 2011).

In terms of future research directions Table 12 poses six non-exclusive questions, relating to *what*, *who*, *where*, *why*, *when* and *how* to identify potential issues that might be further examined (Cao & Lumineau, 2015). It appears that the extant GVC literature considers upgrading as the final outcome that limits exploration of the implications of EU types on different performance outcomes. As such, managers have inadequate information to make a decision which particular upgrading type would be strategically important for their firms' overall performance. Within this research we have provided some initial findings of the impacts, by using annual production and exporting as outcome variables and future research can use other performance measures to strengthen the findings of this research. Future research can also examine how EU strengthens buyer-supplier relationships, generates higher relationship outcomes as well as the nature of GVCs (Gereffi, 1999) might influence buyer-supplier relationships and thus upgrading outcomes, addressing *what* questions.

A growing body of literature on GVCs' governance has argued that governance types have differing impacts on suppliers' upgrading (see Gereffi et al., 2005; Gereffi & Lee, 2016). The interaction between governance and upgrading has been unevenly reflected in different national context (Bair & Gereffi, 2003). Additionally, governance literature in other domains (e.g., marketing) has found that the length of relationships engenders trust and commitments between partners which in turn impact on the firms' performance (Cao & Lumineau, 2015; Wortzel & Wortzel, 1981). GVC upgrading literature has lagged in this later area where future research can contribute. Further research can investigate the associations between different governance types and GVCs upgrading outcomes. Research is also needed to explore how suppliers' firm-level factors including strategic priorities on various upgrading types, top management team's entrepreneurial orientation, absorptive capacity and dynamic capabilities influence GVCs upgrading outcomes (Khan, 2019). Additional research can also examine the impacts of alternative governmental, international bodies (e.g., World Bank) or NGO activities to identify how their initiatives impact on suppliers upgrading (Islam et al., 2017). Further research may also explore the influences of spatial and cultural dimensions on GVCs relationships and upgrading (Khan, 2019). Past qualitative case studies found suppliers who were integrated in multiple chains outperformed their competitors who were only integrated in GVCs (Hobday, 1995; Navas-Alemán, 2011). This research, however, lacks quantitative evidence where future research can contribute, addressing *who, where, why* and *when* types questions.

By initiating EU, suppliers can enhance their efficiency, which is argued to have a positive impact on their competitiveness (Khan et al., 2015). However, it remains unclear if EU also has implications for the

GVCs overall competitiveness and future research should explore this. Bilateral and multilateral trade agreements between buyer and supplier countries also facilitate supplier countries integration in the GVCs (Gereffi, 1999; Khan, 2019), which creates opportunities for suppliers for knowledge acquisition (Ernst & Kim, 2002), learning (Schmitz & Knorringa, 2000) and innovation (Pietrobelli & Rabellotti, 2011). Research is needed to investigate the mechanism that transforms the knowledge and resources that suppliers' can access by participating in GVCs into upgrading (Khan, 2019), therefore, addressing *why* and *how* type questions.

In addressing the *why* question, within the test of nomological validity we only assess the impact of one type of firm capability, but other capabilities such as relational (Azmeh & Nadvi, 2014; Gereffi, 1999; Schmitz & Knorringa, 2000), learning (Gereffi et al., 2005; Schmitz & Knorringa, 2000), manufacturing (Gereffi, 1999) and innovation capabilities (Ernst & Kim, 2002) have also been linked to EU and should be explored in the future.

Buyer-supplier relationships in GVCs have been argued to be dynamic, as suppliers have the opportunity to move from an asymmetric relationship to a more collaborative form of relationships with their buyers (Benito, Petersen, & Welch, 2019; Gereffi et al., 2005). While within this research suppliers EU was examined based on their last three years activities, more systematic assessment of ongoing changes over times, that is, longitudinal research is needed. Within the GVC domain, relative *power* has been strongly advocated as influencing buyer-supplier relationships which in turn affect suppliers upgrading (Gereffi & Lee, 2016), however, researchers have not sought to examine the influence of various alternative types of power (e.g., coercive power vs. reward power) on GVCs upgrading outcomes, which should also be examined in the future, addressing another *when* type question.

The relationships between alternative governance types as well as economic, social and environmental upgrading also remain under researched in the GVC literature (Bernhardt & Pollak, 2016; Marchi et al., 2013) and this *why* type question can be examined in the future.

Buyers sourcing strategies influences suppliers' capability development as well as upgrading (Talay et al., 2018), thus additional modelling could assess the impacts of buyers' sourcing strategies and the mediation role of capabilities on firm-level EU. Similarly, suppliers can pursue capabilities development or cutting costs to achieve desired EU (Islam & Stringer, 2018) therefore opportunities remain for future research to explore the interrelationships between supplier strategies-capabilities and upgrading. Further research can also investigate how local government's industrial and human resource development policies influence GVCs upgrading outcomes. Suppliers' technology adoption results in higher productivity, warranting additional research to explore its impact on upgrading (Khan, 2019). Finally, this research has validated measures of EU, and future research should also look to validate measures of social and environmental upgrading (i.e., addressing the *how* question).

7. Conclusion

Economic upgrading has received increasing attention from, academics, practitioners and national governments. However, valid and reliable measures for the four types of EU were previously lacking in the literature, thus limiting the objective assessment of EU as a firm-level phenomenon. This paper has developed and validated measures for the four types of EU following the scale development procedures suggested in the literature. The measures have demonstrated acceptable reliability, uni-dimensionality, convergent and discriminant validity as well as nomological validity. The measures have been validated in the context of the apparel industry in Bangladesh and they can be adapted to suit other industrial sectors in other countries. Objectively assessing firm-level EU will facilitate more accurate management decisions and government policy-making for achieving targeted EU within a country or an industry sector.

Declaration of Competing Interest

The authors declared that there is no conflict of interest.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jbusres.2020.01.010.

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