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# Interorganizational trust production contingent on product and performance uncertainty

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## Abstract

How do organizations build trust under varying degrees of uncertainty? In this article, we propose that different degrees of uncertainty require different bases of trust. We distinguish between three different forms of trust production (process-based, characteristics-based and institution-based) and develop hypotheses regarding their relative effectiveness under low versus high levels of product and performance uncertainty. Using survey data on 392 interorganizational buyer–seller relationships, we find support for our position that a high degree of uncertainty favours process-based trust production, whereas characteristics-based trust production is relatively more effective when uncertainty is low. The effectiveness of institution-based trust production is not significantly affected by uncertainty. We derive implications for organizational trust production under different degrees of uncertainty, which should encourage new research on trust.

**Key words:** trust, firms, uncertainty, cooperation, social capital, management

**JEL classification:** L20 General, A14 Sociology of Economics, M10 General

## 1. Introduction

Interorganizational relationships between firms, such as long-term buyer–seller relationships and R&D alliances, have become pervasive in today’s networked economy (Powell *et al.*, 2005; Lane, 2008). The globalization of markets, changing technologies and intensifying competition in evolving markets motivate firms to seek out the resources of other organizations in the hope that they will help protect and enhance competitive advantage (Uzzi, 1996).

A key challenge in interorganizational exchange, however, is that of information asymmetries between the partners (Sydow, 1998; Cook *et al.*, 2005). It is difficult for organizations to obtain information about the true quality of potential partners and their products (Akerlof, 1970; Stinchcombe, 1990). For example, as partners often have conflicting interests, this results in a risk of exposure to opportunistic behaviour (Klein *et al.*, 1978; Gulati and Gargiulo, 1999), such as when a seller withholds relevant product-related information from a buyer in a B2B exchange. Moreover, the possibility exists that the partner organization will be unable to deliver the product as expected. Thus, considerable product and performance uncertainty is typically associated with entering cooperative ties.

Sociologists seem to agree that trust is an important mechanism for dealing with this uncertainty (Kollock, 1994; Guseva and Rona-Tas, 2001; Cook, 2005; Schilke *et al.*, 2015). It is well known that trust can increase the predictability of actors and thus may facilitate social exchange (Klein *et al.*, 1978; Muehlberger and Bertolini, 2008; Cook and Schilke, 2010). Trust is thus commonly seen as ‘one of the most important synthetic forces within society’ (Simmel, 1950, p. 318). In particular, trust is often viewed as a substitute for complex, explicit contracts or vertical integration in order to cope with uncertainty (Granovetter, 1985; Uzzi, 1997).<sup>1</sup>

In this study, we aim to add to the literature on trust by arguing that—depending on the *degree of uncertainty*—different *origins of trust* are critical. Our goal is to contribute to a better understanding of the antecedents to interorganizational trust and how they vary across different organizational and institutional contexts. We build on the notion that organizations can choose between distinct modes of trust production (Zucker, 1986; Lane, 1998). As they may incur costs when creating and disseminating the informational cues intended to increase their perceived trustworthiness, organizations’ selection of the mode of trust production will weigh those costs against the added value (Darby, 1976; Zucker *et al.*, 1996; Ehrlich *et al.*, 2008).<sup>2</sup> Investing in adequate and sufficient trust production while avoiding overinvestment in more costly forms is thus often the goal. As such, we expect the effectiveness of different informational cues in increasing interorganizational trust to differ across various contexts. That is, specific efforts of trust production will be more fruitful in some settings than in others.

Specifically, we focus on the degree of uncertainty as an important contingency variable influencing the effectiveness of different modes of trust production. In this study, following Coleman (1990) and DiMaggio and Louch (1998), we investigate the role of two specific types of uncertainty: uncertainty about the quality of a good or service (product uncertainty) and uncertainty about the quality of an exchange partner’s performance (performance uncertainty). We argue that as uncertainty increases, so does the importance of process-based and institution-based trust production modes while characteristics-based trust production becomes comparatively less effective. That is, with information about products and exchange partners’ performance becoming more ambiguous, past interactions and/or societal

- 1 The issue of whether trust and contracts are indeed substitutes rather than complements has received an unprecedented amount of attention following the seminal study by Poppo and Zenger (2002), yet it remains unresolved (Cao and Lumineau, 2015).
- 2 It has been argued elsewhere that this underlying rational expectations process drives the production of other societal structures as well (Tolbert and Zucker, 1996).

institutions will become particularly important sources for inferring trustworthiness, whereas firm characteristics will play a more important role when uncertainty is relatively low.

In developing our hypotheses, we import several relevant insights from information economics (Stigler, 1961; Darby and Karni, 1973; Spence, 1973; Nelson, 1974), which allows us to derive novel predictions about the effectiveness of different trust production modes under varying levels of uncertainty. Information economics is a key approach to understanding various aspects of economic exchange under uncertainty (Fountain, 2005) but has not yet been consistently applied to the analysis of trust (see Zucker *et al.*, 1996 for an exception). Leveraging insights from information economics allows us to better understand how actors form judgements in situations of varying information asymmetry. Based on this approach, we will develop an argument about what type of informational cue will be an effective trust signal under what level of information asymmetry.

We test our predictions empirically with data on interorganizational buyer–seller relationships. Finally, we discuss a research agenda that can build on our findings to further elucidate the role of trust production in interorganizational relationships.

The motivation of this study is to contribute to a deeper understanding of two central issues in contemporary trust research. First, scholars have recently called for more empirical research into the antecedents of interorganizational trust (e.g. Gulati and Sych, 2008; Poppo *et al.*, 2008; Bachmann, 2011; Poppo, 2013). Whereas significant progress has been made in studying the consequences of organizational trust (e.g. Krishnan *et al.*, 2006; Neal *et al.*, 2015), little empirical attention has been paid to investigating where such trust comes from. In particular, there has been only limited research on relevant macro-level antecedents that go beyond the notion that trust tends to increase with more interpersonal interactions and that show how trust is embedded in a socio-economic context as it pertains to the organizations' history and position (Bachmann, 2011; Bachmann and Inkpen, 2011; Schilke and Cook, 2013). Our study directly addresses this research gap by providing new empirical evidence on the importance of three modes of trust production: process-based, characteristics-based and institution-based.

Second, and perhaps even more significant to the motivation of this study, trust researchers have started to go beyond a general notion that trust is a context-specific phenomenon (Rousseau *et al.*, 1998) to proposing an agenda oriented around studying how specific contextual factors affect the relevance of different origins of trust (Bachmann, 2010; McEvily, 2011; McEvily and Tortoriello, 2011; Sasaki and Marsh, 2012; Schilke and Cook, 2015; de Jong *et al.*, 2016). This research agenda is driven by the idea that there may be no 'one size fits all' solutions for trust production that would work equally well in all settings; rather, trust production is likely to be very situational, and different trust production modes may be called for under different circumstances. But what trust production modes fit what circumstances? To answer this question, we need to develop a more generalizable theory of context that would help explain the conditions under which different antecedents of trust are more or less relevant (McEvily and Tortoriello, 2011; Sasaki and Marsh, 2012; Schilke and Cook, 2015). By elucidating how product and performance uncertainty affect the effectiveness of three different trust production modes, our research contributes to developing such theory. Our study thus speaks to one of the most critical tasks for trust research identified by de Jong *et al.*'s (2016) comprehensive content analysis of recent scholarly recommendations—the analysis of 'the generalizability (or, conversely, the context-specificity) of current insights on trust' (p. 13).

## 2. Types of trust production

While different disciplines have adopted varying perspectives in studying the phenomenon, trust in interorganizational relationships broadly refers to the trusting organization's willingness to be vulnerable to the actions of the trusted organization (Mayer *et al.*, 1995). Trust is commonly viewed as valuable but difficult to produce (Muehlberger and Bertolini, 2008). In her conceptual article, Zucker (1986) proposes three fundamental types of trust production (see also Zucker, 1987, 1988; Lane, 1998): process-based, where trust stems from past or expected exchange; characteristics-based, where trust is based on firm characteristics and associations with cultural or societal groups and institution-based, where trust is tied to the institutional environment.

### 2.1 Process-based trust production

The process-based trust production mode emphasizes that histories of exchange—whether through reputation or direct experience—result in a perception of trust in the counterpart. That is, the trustor believes that the trustee will continue to demonstrate the same behaviour as in the past (Lane and Bachmann, 1996). When relevant first-hand information is not available (which is not uncommon in interorganizational settings), the trustor obtains a record of prior exchange second-hand or through imputation from outcomes of prior exchange. Reputation is one key process-based mechanism the trustor may use (Zucker, 1986; Guennif and Revest, 2005), basing his assessment of trustworthiness on generalized others' experiences rather than on his own. Research in negotiations shows that especially in the absence of direct prior experience with a specific party, reputational information will determine the perception of trustworthiness (Glick and Croson, 2001). In fact, Lui *et al.* (2006) report a stronger effect of partner reputation than of direct experience on interorganizational trust.

### 2.2 Characteristics-based trust production

The second mode of trust production pertains to the trustee's general characteristics, which will lead the trustor to categorize the trustee. If the trustor generally considers the group or cluster to which the trustee belongs to be trustworthy, she will perceive the trustee to be trustworthy as well. In particular, social similarity in relevant categories tends to be a powerful driver of characteristics-based trust production. The perception of sharing similar characteristics makes the trustor believe that common assumptions, convergent background expectations and like-minded understandings will exist, which in turn can lead to greater anticipation of trustworthiness of the trustee (Zucker, 1986). In other words, trust is generated based on the trustor's confidence in her ability to assess the trustee's intentions (Doney and Cannon, 1997). Among the various facets of social similarity, local proximity tends to be key for organizational trust perceptions, as it supports the assumption of a common cultural background, and Zucker (1986) emphasizes the relevance of 'intra-local ties' as an important source of trustworthiness. Recent empirical evidence suggests that interorganizational trust between geographically close partners exceeds interorganizational trust between distant partners (Bönte, 2008).

### 2.3 Institution-based trust production

The third mode of trust production is institution-based. In this mode, trust is grounded in the 'external world,' including the trustee's institutional embeddedness through associations with

other organizations (Zucker, 1986). At the most general level, institution-based trust ‘is a form of individual or collective action that is constitutively embedded in the institutional environment in which a relationship is placed, building on favourable assumptions about the trustee’s future behaviour vis-à-vis such conditions’ (Bachmann and Inkpen, 2011, p. 284). In particular, the institution-based form of trust production is related to Coleman’s (1988) and Shapiro’s (1987) ‘third-party trust’. In this sense, institutions can be reconstructed as being functionally equivalent to a personal third-party guarantor (Bachmann and Inkpen, 2011). As such, external references can act as endorsements that influence an organization’s perceived trustworthiness (Granovetter, 1985; Uzzi, 1997; Light, 2004). Such external references may include well-reputed customers of the organization, alliance partners or previous employers of key personnel of the organization. According to Strub and Priest (1976), trustworthiness transfers from the better-known party to a closely associated but less well-known entity. Since strong relationships with well-known external references convey the fact that the organization has earned a positive evaluation from experienced and influential actors, these associations elevate the organization’s trustworthiness (Stuart *et al.*, 1999).

### 3. Explaining variation in the effectiveness of different types of trust production

We consider the degree of uncertainty to be a key variable in explaining why certain types of trust production are more effective in some kinds of interorganizational relationships than in others. Research on the role of uncertainty in business exchanges has a long history (Knight, 1921; Thompson, 1967). While the general importance of uncertainty is scarcely debated, many different definitions of uncertainty can be found in the extant literature (see McMullen and Shepherd, 2006 for a recent review). In this article, we follow Duncan (1972), Pfeffer and Salancik (1978) and others in defining uncertainty as the inability to assign probabilities to the likelihood of possible events.<sup>3</sup> Note that this conceptualization is broader than that of Knightian uncertainty (the inability to identify the range of possible events).

Prior research has argued that the uncertainty regarding whether the other intends to and will act appropriately is an important variable when studying trust in economic exchange (Rousseau *et al.*, 1998). For example, Deutsch (1958) brings up the notion of uncertainty as a necessary context for trust to be a significant concept, and Guseva and Rona-Tas (2001) and Yamagishi *et al.* (1998) demonstrate that actors especially rely on trust when facing high uncertainty. Similarly, uncertainty is at the heart of the information economics approach (Darby and Karni, 1973; Spence, 1973; Nelson, 1974), which takes as its starting point the premise that different parties to a transaction frequently have different amounts of information regarding the transaction and that the uncertainty stemming from this information asymmetry has important implications for the relationship between the parties. Importantly, information is seen as highly valuable but costly to obtain, which is why information asymmetries often cannot be fully resolved. Stiglitz (2000) provides an insightful review of the broader information economics literature.

3 While our definition implies that uncertainty is different from risk (commonly defined as the degree of variability of events whose probabilities are known; e.g. Das and Teng, 2001), we believe that many of our arguments related to uncertainty may also be applicable to risk.

Advancing this general notion of the importance of uncertainty discussed in different literatures, we suggest that varying levels of uncertainty will make different types of trust production (i.e. process-based, characteristics-based and institution-based trust) either more or less effective. More specifically, we consider two types of uncertainty (Coleman, 1990; DiMaggio and Louch, 1998): uncertainty about the quality of a good or service (product uncertainty) and uncertainty about the quality of an exchange partner's performance (performance uncertainty). Together, these two types of uncertainty capture important contingencies of social exchange that make economic markets precarious arenas of social interaction (Beckert, 2009).<sup>4</sup>

### 3.1 Product uncertainty

Product uncertainty, as understood by information economics, primarily stems from the threat that a seller may withhold relevant product information from the buyer. It can emerge because of product-related information asymmetries between buyer and seller (Akerlof, 1970; Kollock, 1994). That is, product uncertainty reflects a buyer's fear that the seller might talk him into buying a low-quality product even though the seller is fully aware of its true (poor) quality. The potential for the selling agent to do so increases with the degree of information asymmetry.

Research in information economics provides a useful typology for operationalizing such product-related information asymmetries. Building on work by Nelson (1970) and Darby and Karni (1973), we distinguish between search, experience and credence goods. Search goods are products the buyer can fully evaluate prior to purchase, such as commodity products. Consequently, product uncertainty is virtually non-existent in economic relationships involving search goods. Experience goods are products whose characteristics, such as quality, can only be evaluated by the buyer after the purchase through usage or consumption. Thus, some degree of product uncertainty is associated with their purchase. Many products of daily use are experience goods, such as cars or computer software. Finally, credence goods either do not allow for a pre-purchase quality assessment or present the customer with prohibitively high assessment costs. Typical examples are vitamin supplements or repair/maintenance services. Product uncertainty is highest in this category.

Just as the degree of product uncertainty varies between search, experience and credence goods, so should the relevance of different types of trust production, as we discuss in more detail in our hypothesis section. Since search goods usually do not involve long-term buyer-seller relationships but are bought and sold in a spot market, we focus our analysis on experience and credence goods.<sup>5</sup>

### 3.2 Performance uncertainty

Performance uncertainty refers to the possibility that the selling party in an exchange relationship will not deliver the product as expected. As such, performance uncertainty rises with

4 The two types of uncertainty share key features with Das and Teng's (1996) relational and performance risk, with partner opportunism representing a key factor for both product uncertainty and relational risk and hazards that are attributable to market factors causing both performance uncertainty and performance risk.

5 Note that we suggest that uncertainty is lower in the case of experience goods relative to credence goods; however, this does not mean that uncertainty is necessarily low in absolute terms.

increasing fulfilment and default risk associated with the seller. Referring to the concept of liability of newness (Stinchcombe, 1965), we conceptualize performance uncertainty in terms of the life cycle stage of the seller. Liability of newness suggests that selection processes favour older organizations with established routines, making it likely that failure rates will decrease with age. Therefore, the default risk—and thus the fulfilment risk—when placing an order with an established organization is typically lower than with a new entrepreneurial venture (NEV) (Brettel *et al.*, 2011). As such, exchanges with established organizations involve relatively low performance uncertainty, whereas performance uncertainty is higher when doing business with an NEV.

## 4. Hypotheses

Six general hypotheses follow from these arguments, yielding predictions about the effects of product and performance uncertainty on the effectiveness<sup>6</sup> of the three modes of trust production (process-based, characteristics-based and institution-based trust production) in interorganizational buyer–seller relationships. We first discuss how each of the three trust production modes interacts with product uncertainty (Section 4.1) and then turn to the trust production modes' interactions with performance uncertainty (Section 4.2).

### 4.1 Effects of product uncertainty: experience vs. credence goods

Buying organizations may perceive selling organizations to be less likely to take advantage of product-related information asymmetries when those selling organizations have a positive reputation in the market place. Because developing a favourable reputation involves significant investment and represents a valuable asset (Klein *et al.*, 1978), especially in credence markets (Huck and Tyran, 2007), it is rational for selling organizations with a good reputation to behave in a trustworthy manner even when information asymmetries are high, as is the case when credence goods are traded. In these settings, reputation should have a strong signalling value (Darby and Karni, 1973) and thus a particularly strong impact on trust. In contrast, when product-related information asymmetries are comparatively low—such as in the purchase of experience goods, which can be evaluated after purchase—reputation will have a comparatively lower value and lesser impact on trust. Consistent with Sydow (1998), we thus expect the process-based trust production mode to be comparatively more effective when product uncertainty is high.

*Hypothesis 1: The greater the product uncertainty, the stronger the positive effect of the process-based trust production mode on trust.*

Characteristics-based trust production can foster trust through a perception of social similarity between the two organizations involved in the exchange. Perceived social similarity can be particularly helpful in smoothing interorganizational negotiations about potential problems with the product that may arise after the purchase (McGuire, 1969). Negotiations related to product returns and warranties are more likely to occur in the trading of experience goods rather than credence goods, as the latter do not allow for a quality assessment and are thus less likely to be returned than experience goods (Shulman *et al.*, 2010). In other words, the anticipation of post-purchase conflict should make considerations related to social similarity

6 By effectiveness, we mean the degree to which a trust production mode actually increases trust.

and convergent understandings more relevant for settings in which experience goods are traded than for settings in which credence goods are traded. Therefore, we expect a stronger effect of characteristics-based trust production when product uncertainty is comparatively low (rather than high).

*Hypothesis 2: The lower the product uncertainty, the stronger the positive effect of the characteristics-based trust production mode on trust.*

Institution-based trust production involves the association of an organization with other trusted organizations, signalling the true intentions of the trustee. It thus generalizes beyond a specific exchange and is considered exterior to the specific situation (Zucker, 1986; Bachmann and Inkpen, 2011). As such, institution-based trust will be particularly valuable when it is impossible for the trusting organization to observe the quality of the delivered product. When transaction-specific information is lacking, the trusting organization will instead watch for clues regarding the general trustworthiness of the exchange partner. Hence, we expect institution-based trust production in the form of external references to be most effective when credence goods are traded. Although the literature on interorganizational relationships is largely silent about the interaction between product uncertainty and external references, a marketing theory study provides relevant insights: Huang *et al.* (2009) found that third-party recommendations (through product reviews) become increasingly important for consumer decision making as product uncertainty increases. Building on this finding and our conceptual considerations, we propose an analogous increase in the effectiveness of institution-based trust production with increasing product uncertainty.

*Hypothesis 3: The greater the product uncertainty, the stronger the positive effect of the institution-based trust production mode on trust.*

#### 4.2 Effects of performance uncertainty: established organizations vs. NEVs

NEVs often face the challenge of convincing customers of their ability to deliver along key dimensions of performance. Research in entrepreneurship has argued that reputation may be one of the most important instruments for these ventures to achieve the goal of creating trust despite high performance uncertainty (Rindova *et al.*, 2007). It has been repeatedly argued and shown that reputation is a crucial variable, especially in the context of entrepreneurial firms (Larson, 1992; Rao, 1994). Investing in reputation may substantially alleviate customers' concerns about performance risks. In line with this theorizing and the prior findings, we expect NEVs to benefit comparatively more from a strong reputation compared with established organizations.

*Hypothesis 4: The greater the performance uncertainty, the stronger the positive effect of the process-based trust production mode on trust.*

Trust can also stem from categorization into specific categories based on what is known about the exchange partner's internal characteristics. However, for NEVs that are not yet fully established and whose performance abilities are uncertain, such a characteristics-based mechanism will not be as strong of a source of trust production. Because of the newness of the organization, partner firms have less experience on which to base their categorical similarity perceptions, making the characteristics of the new venture less 'understandable' for them (Suchman, 1995). Conversely, in the case of established organizations, partner firms should be more

confident about their character assessments. Thus, having been around for a longer period of time facilitates reliable characteristics assessment and thus strengthens the link between characteristics-based trust production and trust.

*Hypothesis 5: The lower the performance uncertainty, the stronger the positive effect of the characteristics-based trust production mode on trust.*

Given that NEVs typically lack financial and human resources (Aldrich and Auster, 1986), they often strive to reach out and establish affiliations with high-status actors, such as venture capitalists (Shane and Stuart, 2002), underwriters (Higgins and Gulati, 2003) and strategic alliance partners (Stuart et al., 1999). Through such associations, NEVs can bring credibility from their environment to the organization (Ali and Birley, 1998). Because NEVs typically have not gained high prominence themselves, we expect such institution-based trust production efforts to be particularly effective for these new ventures as compared with established organizations. This reasoning is consistent with initial evidence provided by Baum and Oliver (1991), who found that younger and smaller childcare organizations benefited more from institutional linkages than did older and larger organizations.

*Hypothesis 6: The greater the performance uncertainty, the stronger the positive effect of the institution-based trust production mode on trust.*

## 5. Method

### 5.1 Sample selection and data collection

We conducted a large-scale questionnaire survey. This method allowed us to test our context-specific hypotheses by systematically comparing inter-construct relationships across subsamples, thus following a contingency logic of interaction whereby the relevant contextual factors (here: product and performance uncertainty) are treated as moderators (Schoonhoven, 1981).

We applied three criteria in selecting a sample for this study. First, because investigators have argued that trust production measures and trust—the focal constructs of this study—should be assessed based on the perceptions of the trustor rather than the trustee (Mayer et al., 1995), we targeted the survey at the buying party. Second, we focused on firms from two different industries: (a) public relations and communications consultancies (PR) and (b) manufacturers of photovoltaic modules. Guiding this selection was our objective to analyse differences between credence and experience good industries. Following the definition by Darby and Karni (1973, p. 69), credence goods are used ‘either in combination with other goods of uncertain properties to produce measurable output or in a production process in which output, at least in a subjective sense, is stochastic, or where both occur’. As the studies by Gabbott and Hogg (1996) and Glückler and Armbrüster (2003) make clear, consulting services, and particularly PR services, are typical credence goods in that managers face significant difficulties in directly judging their quality. Photovoltaic modules, in contrast, feature the typical characteristics of experience goods, as a buyer will be able to judge their output and handling ‘costlessly only after purchase’ (Darby and Karni, 1973, p. 69), given the complexity involved in pre-purchase quality evaluations of photovoltaic solutions (Haller and Grupp, 2009). These two industries are also appropriate for investigating our life-cycle-related hypotheses, as both industries contain a sufficient number of established players and NEVs to allow for a meaningful subgroup comparison. Third, we decided to

ask the participating buying firms to respond to the questionnaire with reference to a specific supplier from a list of firms that we provided. This procedure allowed us to ensure that supplying firms were in the same industry as the customer and that sufficient variance existed regarding the life-cycle stage of the suppliers. To this end, we conducted extensive interviews with several industry experts (such as reporters from major business media as well as practitioners knowledgeable of the PR and the photovoltaic modules industries) in order to compile a comprehensive list of suppliers that could be clearly identified as either established firms or NEVs.<sup>7</sup> We then contacted these suppliers and asked for their consent. This process resulted in the selection of 12 supplier firms in the PR industry (5 established firms and 7 NEVs) and 13 supplier firms in the photovoltaic modules industry (6 established firms and 7 NEVs).

The survey was conducted in Germany, with the underlying list of firms derived from several sources. For the PR industry, we built on a comprehensive inventory of German public relations agencies published in the directory 'Taschenbuch Wirtschaftspressse' (Talanx, 2006). For the photovoltaic modules industry, we compiled a list of firms from various industry-related data sources, such as online and print media, industry associations and yellow pages providers. From these sources, we identified a total of 6887 firms satisfying our selection criteria (PR: 4922; photovoltaic modules: 1965).

We contacted each firm by e-mail, using purchasing decision makers as key informants who were provided with a link to an online questionnaire. We closely followed the procedures described by Dillman (2000) to maximize the number of responses. Specifically, we outlined the general purpose and need for our study in a way that was accessible to practitioners (without revealing our specific hypotheses), promised a management summary of the study results as an incentive for participation, guaranteed the confidential treatment of all data and kept the time needed to respond relatively low (10–15 min).

A total of 1178 firms responded to our inquiry, for a response rate of 17.1%. Given the high confidentiality of information on interorganizational relationships, this can be considered a satisfactory response rate; it is also in line with comparable studies using managers as key informants (e.g. Tsang, 2002). Reasons given for declining to participate included legal issues, general firm policies and lack of support from the executive board.

The first question in the survey asked the participant to rate his or her familiarity with each of the suppliers on the specified list. The five-point answer scale ranged from 1 = 'I don't know this supplier' to 5 = 'We have used this supplier.' When the participant gave a response of 3 ('I know and have detailed knowledge about this supplier') or higher for at least one of the suppliers from the list, an algorithm<sup>8</sup> selected one supplier that was used for the rest of that particular participant's survey. In total, 436 firms qualified to complete the entire questionnaire. We dropped 44 cases from further analysis, primarily because of incomplete responses, leaving 392 observations in the final sample.

7 In brief, to clearly differentiate between established firms and NEVs, we conducted personal interviews with senior management of the suppliers. We considered a firm to be an NEV if the interviews indicated that the firm was in one of the first three life-cycle phases described by Kazanjian (1988): conception and development, commercialization or growth. Suppliers that had reached the fourth phase—stability—were considered to be established firms.

8 The algorithm accounted for both the respondent's degree of familiarity with a supplier and our objective to produce an approximately equal number of responses for each supplier from the list.

**Table 1.** Sample composition

	%
Industry	
PR	55.1
Photovoltaic modules	44.9
Life-cycle stage	
NEV	43.4
Established firm	56.6
Firm size (number of employees)	
<5	19.5
5–9	12.2
10–19	11.4
20–99	16.6
100–249	9.4
250–999	9.6
1000–4999	10.9
>4999	10.4
Firm age (number of years)	
<5	6.8
5–9	19.0
10–19	27.3
20–49	23.6
>49	23.4

## 5.2 Data evaluation

Table 1 presents firm characteristics of the final sample. Following the recommendations of [Armstrong and Overton \(1977\)](#), we first assessed non-response bias by comparing the responses of early and late participants. Specifically, we tested the first and last quartiles of the sample for significant differences across means for each of the constructs. The results of the *t* tests indicated no significant differences ( $P > 0.05$ ) between early and late respondents, suggesting that non-response bias is not a problem in the data. We also examined whether the firms we initially addressed differed from the responding firms in terms of size and age; again, we found no significant differences.

Since we obtained information on multiple constructs from the same informants, common method bias could be present in the data. We used two post hoc procedures to assess the potential effect of common method bias.<sup>9</sup> The results of these tests suggest that common method variance has not biased the measurement.

9 Employing Harman's one-factor test, we found no single dominant factor in the measurement model ([Podsakoff and Organ, 1986](#)). Moreover, we applied the partial correlation adjustment procedure suggested by [Lindell and Whitney \(2001\)](#). Consistent with [Krishnan et al. \(2006\)](#), we used tenure of the respondent as the marker variable, as it was theoretically unrelated to the constructs in the study. Most significant zero-order correlations between the constructs remained significant after the partial correlation adjustment.

### 5.3 Measures

The measurement instrument was developed using a multi-stage process (Hinkin, 1995). First, we conducted an extensive literature review to identify existing scale items that measure the constructs of interest to our research. Seven-point Likert-type answer scales were used for all indicators. We initially asked a group of 25 senior managers and scholars to assess the face validity of each item (Bohrnstedt, 1970). On the basis of their comments, we modified some of the items and included new items that the interviewees considered to be important.

Two types of measurement models—reflective and formative—were used in the survey (Bollen, 1989). When items were manifestations of underlying constructs, we used a reflective measurement model; when a construct was a summary index of its indicators, we employed a formative measurement model.

Consistent with our conceptual considerations, process-based trust production was approximated with the construct of reputation (Zucker, 1986, p. 62), which can generally be defined as a publicly held perception of a specific referent (Rindova *et al.*, 2007). The construct was measured using four reflective items that we adapted from Ganesan (1994). Characteristics-based trust production was operationalized in terms of perceived similarity between the exchange partners (Zucker, 1986, p. 63). The similarity measure that we used is based on the work of Doney and Cannon (1997). Finally, to capture institution-based trust production, we measured a construct labelled ‘external references’ using three formative items that captured the degree to which the trustee is associated with renowned other firms (Zucker, 1986, p. 60).

Trust, our focal dependent variable, was measured using six reflective items that were adopted from the work of Ferrin and Dirks (2003) and Mayer and Gavin (2005). To assess the nomological validity of this trust measure, we correlated it with a measure for purchase intentions. Prior research has argued that trust, once established, will lead to risk taking—and in particular to a higher willingness to engage in future exchange (Gulati and Gargiulo, 1999). As such, if measured validly, one would expect a strong positive and significant relation between trust and purchase intention. We thus included a reflective three-item purchase intention scale based on the work of MacKenzie *et al.* (1986) in our questionnaire. After averaging the items for trust and purchase intention, respectively, we found a correlation of 0.60 ( $P \leq 0.001$ ), supporting the validity of our trust measure.

### 5.4 Estimation approach

We used covariance-based structural equation modelling—more specifically, the software AMOS 16.0 (Arbuckle, 2007)—to first assess the measurement model and subsequently estimate structural relationships (Anderson and Gerbing, 1988). We chose a structural equation modelling approach as it is a powerful generalization of earlier statistical approaches, with the key benefit being that each explanatory and dependent variable is associated with measurement error, in contrast to OLS regression, for example, which is based on the assumption that variables are measured perfectly (Bollen, 1989).

To test the moderating hypotheses, we applied multi-group structural equation modelling (Hair *et al.*, 2006). That is, two subsamples were created for each proposed moderating factor. To test Hypotheses 1–3, we split the sample into photovoltaic modules ( $n_1 = 176$ ) and PR firms ( $n_2 = 216$ ). For the purpose of testing Hypotheses 4–6, we separated established firms ( $n_1 = 222$ ) from NEVs ( $n_2 = 170$ ). We then compared a constrained model in which the

path of interest is set equal across subgroups with an unconstrained case. If the introduction of the equality constraint resulted in a significant decrease in model fit, we inferred that moderation was present. In that case, we analyzed whether the respective values of the path coefficients in the two models were in line with our hypotheses.

## 6. Results

### 6.1 Measurement model

The measures were subjected to an evaluation process involving a series of reliability and validity assessments. First, the psychometric properties of the constructs were evaluated simultaneously in one measurement model, and the goodness-of-fit indices indicated that the measurement model fit the data well ( $\chi^2 = 235.41$ ;  $df = 82$ ;  $\chi^2/df = 2.87$ ;  $CFI = 0.97$ ;  $NFI = 0.95$ ;  $TLI = 0.96$ ;  $SRMR = 0.05$ ).

For all reflective constructs, item loadings were significantly greater than zero ( $P \leq 0.01$ ) (Table 2). Cronbach's  $\alpha$ s and composite reliabilities were greater than 0.70, indicating excellent reliability of the study measures. We also assessed the average variance extracted

**Table 2.** Reflective measures

Measurement items	Cronbach's $\alpha$	Composite reliability	AVE	Loading
Reputation	0.80	0.81	0.53	
1. xyz has a reputation for being honest				0.85
2. xyz has a bad reputation in the market (reverse)				0.52
3. Most of our competitors would say that xyz has a reputation for being fair				0.88
4. Most of our competitors would like to deal with xyz				0.65
Social similarity	n/a	n/a	n/a	
1. People at xyz share similar interests with people in our firm				
Trust	0.93	0.93	0.71	
1. I would consider xyz's suggestions when making important decisions				0.82
2. I would be cautious with xyz (reverse)				0.63
3. I trust xyz				0.93
4. If someone questioned xyz's motives, I would give xyz the benefit of the doubt				0.85
5. I believe in the information that this vendor provides us, even if I cannot double check it				0.88
6. I can rely on xyz				0.91
Purchase intention	0.93	0.94	0.84	
Will you make purchases from xyz in the future?				
1. Impossible—possible				0.83
2. Improbable—probable				0.94
3. Unlikely—likely				0.96

Note: Cronbach's  $\alpha$ , composite reliability and AVE not available for single-item measures.

**Table 3.** Formative measures

Measurement items	Condition index	VIF
External references	13.08	
1. xyz can refer to renowned customers		2.21
2. xyz has renowned partners in the business community		2.44
3. Xyz's management has experience with renowned companies		1.70

**Table 4.** Descriptive statistics and discriminant validity

Factor	Mean	Standard deviation	Correlation				
			1.	2.	3.	4.	5.
1. Reputation	4.44	1.22	<b>0.73</b>				
2. Social similarity	3.71	1.42	0.46	<b>n/a</b>			
3. External references	4.94	1.33	0.55	0.23	<b>n/a</b>		
4. Trust	4.54	1.29	0.71	0.50	0.51	<b>0.84</b>	
5. Purchase intention	4.23	1.84	0.48	0.44	0.24	0.60	<b>0.92</b>

Notes: Bold numbers on the diagonal show the square root of AVE, numbers below the diagonal the correlations. Correlations are significant at the 1% level.

(AVE) for each reflective construct and found that all AVEs exceeded the cut-off value of 0.50. Thus, the individual scales exhibited strong reliability and validity.

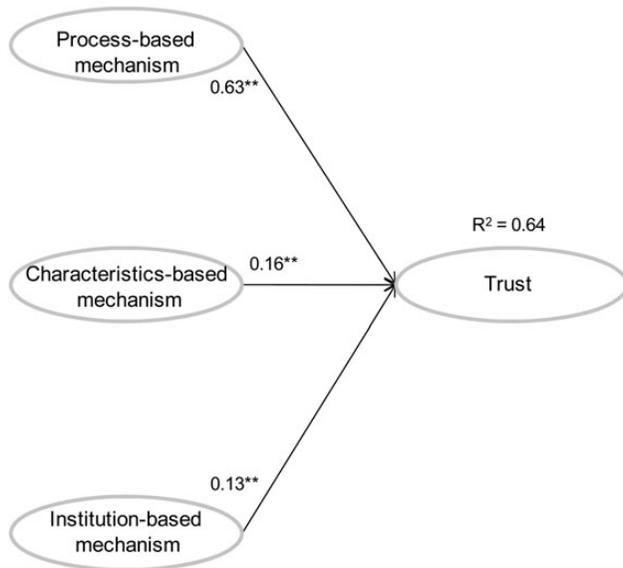
The formative index—external references—was tested for multicollinearity using variance inflation factors (VIFs) (Diamantopoulos and Winklhofer, 2001) and the condition index (Belsley, 1984). Observed values were well below the suggested thresholds of 10 and 30, respectively (see Table 3).<sup>10</sup>

Discriminant validity was established by calculating the square root of the variances extracted for the individual constructs (Table 4) and verifying that it was greater than the correlations between pairs of constructs (Fornell and Larcker, 1981). In addition, we tested discriminant validity by performing a series of  $\chi^2$ -difference tests between the unrestricted model and a model in which the factor correlation is fixed at 1 (Anderson and Gerbing, 1988). Every restricted model exhibited a significantly worse fit than the unrestricted model. On the basis of these findings, we conclude that there are no problems with the data with respect to discriminant validity.

## 6.2 Structural model

After establishing confidence in the appropriateness of the measures, we examined the structural model. The fit measures for the structural model showed satisfactory values ( $\chi^2 = 142.24$ ;  $df = 50$ ;  $\chi^2/df = 2.85$ ; CFI = 0.97; NFI = 0.96; TLI = 0.96; SRMR = 0.05). Figure 1 presents the estimates obtained from AMOS.

10 For the purpose of hypothesis testing, we computed a factor score for the formative construct by calculating the average of the individual indicators.



Notes: standardized path coefficients are shown; \* $p \leq 0.05$ , \*\* $p \leq 0.01$ .

**Figure 1.** Results for the structural model.

The results for the overall sample indicate that all three trust production modes have a positive and highly significant ( $P \leq 0.01$ ) relationship with trust. Ceteris paribus, the strongest effect was found for reputation ( $\beta = 0.63$ ), followed by social similarity ( $\beta = 0.16$ ) and external references ( $\beta = 0.13$ ).

### 6.3 Moderation analyses

Before comparing the structural relationships between the subgroups, we followed the recommendation by Davidov *et al.* (2014) to test for measurement invariance by equating the factor loadings. Examining the effect of this constraint, we found that it did not lead to a significant decrease in model fit for either the comparison between public relations and photovoltaic modules firms ( $\chi^2_{diff} = 13.95$ ;  $\Delta df = 8$ ) or the comparison between established firms and NEVs ( $\chi^2_{diff} = 2.69$ ;  $\Delta df = 8$ ). These results support measurement equivalence.

Subsequently, we analyzed the differences between structural estimates in different subsamples. Hypothesis 1 stated that the positive relation between process-based trust production (reputation) and trust is stronger when product uncertainty is high—that is, in constellations involving credence goods. The results suggest a significant difference in the effect of reputation between public relations firms (credence goods) and photovoltaic modules firms (experience goods) ( $\chi^2_{diff} = 3.69$ ;  $\Delta df = 1$ ;  $P \leq 0.05$ ), with reputation being more strongly linked to trust in the context of credence goods ( $\beta_2 = 0.68$ ;  $P \leq 0.01$ ) than in the context of experience goods ( $\beta_1 = 0.59$ ;  $P \leq 0.01$ ), supporting Hypothesis 1.

Hypothesis 2 predicted a stronger positive relationship between characteristics-based trust production (social similarity) and trust when product uncertainty is low than when it is high.

In line with this hypothesis, we find that the effect of social similarity as a driver of trust is greater in the subsample of photovoltaic modules firms ( $\beta_1 = 0.25$ ;  $P \leq 0.01$ ) than in the subsample of public relations firms ( $\beta_2 = 0.10$ ;  $P > 0.05$ ) and that the difference between these effects is significant ( $\chi^2_{\text{diff}} = 4.84$ ;  $\Delta\text{df} = 1$ ;  $P \leq 0.05$ ).

Hypothesis 3 proposed that the positive relationship between the institution-based trust production mode (external references) and trust is stronger when product uncertainty is high. However, we did not find a significant difference in the effect of external references between the subsample containing public relations firms and the subsample containing photovoltaic modules firms ( $\chi^2_{\text{diff}} = 0.36$ ;  $\Delta\text{df} = 1$ ;  $P > 0.1$ ). Thus, Hypothesis 3 is rejected.

Hypothesis 4 concerned differences in the relationship between process-based trust production mode and trust under different degrees of performance uncertainty. In line with our hypothesis, we find a stronger effect of reputation on trust among NEVs ( $\beta_2 = 0.79$ ;  $P \leq 0.01$ ) than among established firms ( $\beta_1 = 0.59$ ;  $P \leq 0.01$ ). The difference between these effects is significant ( $\chi^2_{\text{diff}} = 6.32$ ;  $\Delta\text{df} = 1$ ;  $P \leq 0.05$ ), providing empirical support for Hypothesis 4.

Next, Hypothesis 5 predicted that the positive relationship between the characteristics-based trust production mode and trust will be stronger under low performance uncertainty. We find support for this hypothesis. The effect of social similarity on trust is stronger in the subsample of established firms ( $\beta_1 = 0.23$ ;  $P \leq 0.01$ ) than in the subsample of NEVs ( $\beta_2 = 0.05$ ;  $P > 0.1$ ), and the difference between these effects is significant ( $\chi^2_{\text{diff}} = 4.81$ ;  $\Delta\text{df} = 1$ ;  $P \leq 0.05$ ).

Finally, Hypothesis 6 proposed that the positive relationship between the institution-based trust production mode and trust will be stronger when performance uncertainty is high. This hypothesis was not supported in our data, as the difference in the effects of external references on trust between NEVs and established firms was not found to be significant ( $\chi^2_{\text{diff}} = 0.59$ ;  $\Delta\text{df} = 1$ ;  $P > 0.1$ ). The results of our hypothesis tests are summarized in Table 5.

## 7. Discussion

Trust is an important lubricant of cooperation (Arrow, 1974) that increases the effectiveness of both formal and informal transactions (Coleman, 1988). While the beneficial consequences of trust are well known, empirical knowledge of how trust can be produced is still comparatively limited (Gulati and Sych, 2008; Poppo *et al.*, 2008; Bachmann, 2011; Poppo, 2013). In particular, there have been recent calls to identify relevant contextual conditions that determine when certain modes of trust production are more or less effective (Bachmann, 2010; McEvily, 2011; McEvily and Tortoriello, 2011; Sasaki and Marsh, 2012; Schilke and Cook, 2015; de Jong *et al.*, 2016).

Our study makes a significant contribution on this front, as it not only investigates three central interorganizational trust production modes and increases empirical knowledge about their consequences but also explores the contingent effects of two types of uncertainty, product and performance. We argued that different types of trust production will be differentially effective depending on the degree of uncertainty. Therefore, this study offers novel insights regarding important boundary conditions of trust production modes. Identifying such boundary conditions is central to theory development, as it increases conceptual precision (Leavitt *et al.*, 2010). Our study thus constitutes an important step in the development of a more generalizable theory of context that would help to explain the conditions under which different trust production modes are effective (McEvily, 2011; McEvily and Tortoriello,

**Table 5.** Results of multi-group analyses

Hypothesis	Independent variable	Moderator variable	$\chi^2$ difference ( $\Delta df = 1$ )	Trust production mode $\rightarrow$ trust	
				Low value of moderator	High value of moderator
H <sub>1</sub>	Process-based trust production	Product uncertainty	$\chi^2_{diff} = 3.69$ ( $P \leq 0.05$ )	$\beta_1 = -0.59$ ( $P \leq 0.01$ )	$\beta_2 = 0.68$ ( $P \leq 0.01$ )
H <sub>2</sub>	Characteristics-based trust production	Product uncertainty	$\chi^2_{diff} = 4.84$ ( $P \leq 0.05$ )	$\beta_1 = -0.25$ ( $P \leq 0.01$ )	$\beta_2 = 0.10$ ( $P > 0.05$ )
H <sub>3</sub>	Institution-based trust production	Product uncertainty	$\chi^2_{diff} = 0.36$ ( $P > 0.1$ )	$\beta_1 = -0.09$ ( $P > 0.1$ )	$\beta_2 = -0.14$ ( $P \leq 0.05$ )
H <sub>4</sub>	Process-based trust production	Performance uncertainty	$\chi^2_{diff} = 6.32$ ( $P \leq 0.05$ )	$\beta_1 = -0.59$ ( $P \leq 0.01$ )	$\beta_2 = 0.79$ ( $P \leq 0.01$ )
H <sub>5</sub>	Characteristics-based trust production	Performance uncertainty	$\chi^2_{diff} = 4.81$ ( $P \leq 0.05$ )	$\beta_1 = -0.23$ ( $P \leq 0.01$ )	$\beta_2 = 0.05$ ( $P > 0.1$ )
H <sub>6</sub>	Institution-based trust production	Performance uncertainty	$\chi^2_{diff} = 0.59$ ( $P > 0.1$ )	$\beta_1 = 0.12$ ( $P > 0.1$ )	$\beta_2 = 0.06$ ( $P > 0.1$ )

2011). Specifically, we show that organizations investing in trust production modes need to consider the degree of product and performance uncertainty. They would be well advised to rely on characteristic-based trust production when uncertainty is low, whereas they may want to focus on process-based trust production at higher levels of uncertainty. Given the importance of uncertainty as a key characteristic of interorganizational relationships, these insights should have broad applicability.

Our empirical findings largely supported our initial conceptual ideas. The effectiveness of different informational cues in increasing interorganizational trust was found to vary significantly, with lower cost characteristic-based trust sufficing when uncertainty is low but more costly process-based trust production being needed when uncertainty is higher, whether the source of the uncertainty is product or performance quality. We did not find significant effects of uncertainty for institutional trust production that rested upon external references.

We can re-interpret these findings in a costly information framework. Organizations can choose between distinct modes of trust production (Zucker, 1986) and in doing so, they may incur differential costs of creating and sharing the informational cues intended to increase their perceived trustworthiness. Uncovering information about the actual behaviour of the other party in an exchange involving process-based reputational information is often difficult and costly for both parties. As uncertainty increases, demand for information-based trust increases, such that more costly methods will be used to increase the reliability of trust indicators or measures produced. The added value or payoff offsets the higher costs incurred (Burt, 2004). Such cost-related ideas from information economics are almost unheard of in the sociology of trust, although we of course do have a very active research stream on issues surrounding uncertainty. Conversely, the information economics literature is largely silent about relational concepts such as trust. The theoretical synthesis developed here integrates both fields and sheds new light on the contingent sources of trust.

It is worth noting that the one non-confirming case in our empirical study, institutional trust, is significantly related to trust in the overall sample, as were the other two trust production modes; however, contrary to our prediction, institution-based trust production was not more effective when uncertainty was higher. External references are pre-packaged, generic indicators of trust that are low-cost relative to process-based means of establishing reputation but also possibly less predictive of actual outcomes expected in an exchange. External references increase trust, but perhaps our logic was faulty in predicting stronger effects under conditions of high uncertainty. Or, reflecting on this further, it may be that an additional condition is operating: external references provide information that is less tightly coupled to actual behaviour in the next transaction, hence providing only a rough guide to expectations. If the trust-based inputs to the company are indeed critical to its success, then more proximate and task-specific information may be desired, even if it is more costly to acquire. It is likely that uncertainty might not have strong effects in such a case. Testing this conjecture would require data beyond the survey used in this study.

Additionally, further research on the modes used to establish trust under different degrees of uncertainty, taking into account the relative value of more costly methods of trust production, seems warranted. In general, we expect that as uncertainty increases, so does the payoff from collecting information about the trustworthiness of potential exchange partners. Generic signals may be less reliable, and more easily gamed, than trust that is specific to the exchange.

Although this study provides unique insights into the contingent link between distinct trust-production modes and trust, it is limited, like prior studies, by its conceptual focus

and the methods employed. While this study explored the moderated effects of three trust production modes, its findings are constrained to the particular set of variables examined. Specifically, we focused on reputation, similarity, and external references as proxies for the three trust production modes, mostly because these concepts were prominent in Zucker's (1986) original discussion and because we believe it is hard to empirically measure trust production modes on a more abstract, general level. This is not to say, however, that no other variables could be used to represent the individual trust production modes. For example, process-based trust production could alternatively be approximated through direct experience (e.g. the number of previous exchanges), characteristics-based trust production could be proxied through position in product space and institution-based trust production could be captured through formal accreditations. We encourage future research that starts to investigate the relative importance of these different representations of the trust production modes in various settings.

Moreover, we followed Coleman (1990) and DiMaggio and Louch (1998) in focusing on product and performance uncertainty while bracketing other types of uncertainty, such as technological and market uncertainty (Jaworski and Kohli, 1993; Kemper *et al.*, 2013), whose relevance for the effectiveness of trust production modes could be investigated in future inquiries. Finally, our study focused on the individual effects of trust production modes while not investigating the possibility that such modes may sequentially build on each other. We encourage future research to advance our findings using longitudinal data, which would allow for greater insight into process mechanisms and temporal order.

## 8. Summary and implications

The results of our research show that uncertainty is an important moderator affecting the type of trust origin that is most effective in a given exchange. Our approach provides a more nuanced view compared with those of prior studies, which have only argued that trust is an important mechanism to cope with uncertainty. We take into account that the degree of uncertainty varies between interorganizational relationships and find that different trust sources are needed contingent on this degree of uncertainty.

Comparing the relative effects of process-based, characteristics-based and institution-based trust production in the entire sample, process-based trust production has the strongest effect by far, whereas there is not a substantial difference in the effects of characteristics-based and institution-based trust production. Perhaps more importantly, we present novel evidence that the relevance of these trust production modes is a function of uncertainty, with characteristic-based cues being particularly effective under low uncertainty levels and process-based trust production being key when uncertainty is high.

Overall, our results focus attention on the modes of trust production as a crucial component of unravelling the role of trust in decisions that affect the likely outcome, especially when that outcome is uncertain and the partner may not be able to assess it well even after the good or service is delivered.

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