# The Effects of Market Turbulence on Sourcing Balance and Innovation Performance

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## ABSTRACT

This study analyzes the effects of changes in market turbulence on a firm's sourcing balance and innovation performance. Literature on market turbulence and sourcing balance suggests a positive relationship between these two factors. Moreover, literature describes a negative relationship between market turbulence and innovation performance. This study has examined 56 firms located in the Netherlands and Germany to determine whether existing literature has drawn accurate conclusions. The findings of this research indicate a weak positive relationship between market turbulence and sourcing balance. A weak negative relationship between market turbulence and innovation performance is found. Furthermore, neither of the relationships were found to be statistically significant. This study presents an opportunity for further research to increase the sample size, which may result in relationships that are significant.

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## Keywords

Market environment, market turbulence, sourcing balance, internal sourcing, external sourcing, transformation, innovation performance



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# 1. INTRODUCTION

Many researchers focus their research on a firm's market orientation and its impact on innovation performance (Deshpande et al., 1993; Kohli & Jaworski, 1990; Webster, 1988). Market orientation is an activity which a firm undertakes to explore the market and then make a decision based on the knowledge the firm gathered. Slater & Naver (1995**)** define market orientation as an aspect of organizational culture and inherently a learning orientation. Shapiro (1988) defines it as a basis for decision making. This decision making first affects the knowledge sourcing balance; the ratio of external sourcing to internal sourcing. Many have focused on studying the conditions that firms look for when acquiring knowledge from the outside (Zander & Kogut, 1995; Mowery et al., 1996; Simonin, 1999; Chen & Chuang, 2002). However, there has been little research done on how the market environment influences the sourcing balance and its impact on innovation performance. It is important to know what this effect is because even though environmental factors cannot be controlled, they are present and have a huge influence.

The market environment has an influence on whether a firm decides to go for external or internal sourcing (Chen & Lin, 2004). The market environment can be further divided into the macro, meso and micro environment in which a firm operates (de Man & van den Bosch, 1994). First, the macro environment, is the contextual level, consisting out of global forces. Global forces are economic, social, political, technological and environmental developments. Second, the meso environment, which is transactional level, consists out of market forces. Market forces, for example, are supply, demand, competitors and strategic partners. Third, the micro environment is the organizational level involving forces that addresses the internal environment of a firm. These internal forces include the firm's mission, vision, strategy and resources. When talking about the influence of market environment on a firm's sourcing decisions, the focus lies on the macro and micro environment.

Whether to choose for external or internal sourcing or both depends on the firm's capabilities and its innovation goal. The balance between external and internal sourcing is known as the sourcing balance. External sourcing is acquiring a product or service from outside the firm. Internal sourcing is developing a product or service within the firm. Both sourcing options depend on knowledge. Knowledge is a valuable resource. If knowledge cannot be easily acquired from the outside environment, firms would use their internal mechanisms to develop valuable knowledge critical to their competitiveness and thus their survival. On the other hand, as valuable knowledge becomes more easily available from the outside environment, the incentives for firms to create the valuable knowledge internally appears less important (Chen & Lin, 2004).

Internal and external sourcing are also known as the 'make or buy decision. This decision is regarded as substitution, either one or the other (Coase, 1937, Arrow, 1963). However, arguments stress that the choice between in-house R&D and external know-how should be considered as complementary because internal R&D should be able to effectively absorb the external knowledge which is gained (Veugelers & Cassiman, 1998). Therefore the sourcing balance is never entirely internal or external sourcing as both need each other to work.

Internal and external sourcing can be further extended by three subsequent processes; exploration, exploitation and transformation. Exploration is the development of new knowledge through internal inventions and external acquisitions, which is a short term strategy (Gilsing & Nooteboom, 2005). Firms first explore new knowledge and then consolidate it to exploit it. Exploitation is the efficient employment of current assets and capabilities, which is a long term strategy (Gilsing & Nooteboom, 2005). It is widely accepted that firms need to balance exploration and exploitation (Benner & Tushman, 2002; Ghemawat & Ricart i Costa. 1993, Gupta, Smith & Shalley, 2006; McGrath, 2001). March (1991) states that an overemphasis on exploration, risks spending scarce resources with little payback. On the other hand, an overemphasis on exploitation can reduce the learning of new skills. Transformation is the process of retaining knowledge and reactivating when needed. For example, a firm could offer trainings about new product developments to its employees (retaining). When a firm acquires an innovation, the employees can use their new knowledge for the innovation (reactivating). Although firms can have different emphasizes on the importance of these individual processes, all these processes are complementary and thus equally important for the ability for firms to renew their competences (Lichtenthaler, 2009; Lane et al, 2006).

Innovation performance can be created through the exploitation or exploration of external or internal sourcing. Only external acquisition or internal invention of new knowledge is not enough to attain innovation performance (Sanchez, 1995). The process of transforming the knowledge is of equal importance (Lichtenthaler, 2009). Innovation performance refers to a firm's activities of leveraging its competences into new products and new services. Organizations must constantly innovate in every aspect of their business operations in order to compete and survive in the competitive market place (Erdil, Erdil & Keskin, 2004). A competitive advantage can be obtained through new products and new services. As stated before, the market environment affects the sourcing balance which then through different mechanisms eventually affects innovation performance. Therefore, there might be an indirect effect of market turbulence on innovation performance. As such, this research extends itself also by investigating whether there is a relation between the market environment and innovation performance.

The purpose of this article is to answer what is the relationship between market turbulence and a firm's sourcing balance and its innovation performance. This leads to the following research question:

*What is the relationship between market turbulence and the sourcing balance and innovation performance?*

This paper consists of five sections. First a literature analysis will be conducted to give a deeper insight on market turbulence, sourcing balance and innovation performance. Second, the hypotheses on the suggested relationships will be presented. Third, the methodology will be discussed. Finally, the results of this research will be presented, which will be followed by the discussion, limitations and conclusion.

# 2. LITERATURE BACKGROUND

## 2.1 Market turbulence

The market environment is defined by market turbulence. Market turbulence has been conceptualized by different authors. Jaworski & Kohli (1993) propose three environmental characteristics: market turbulence, competitive intensity and technological turbulence. Market turbulence and technological turbulence are respectively the rate of change in the market and technology. Competitive intensity is the rate of activities undertaken by the competitors of a firm. Greenley (1995) also includes the modifications in the marketing operations. Hult et al. (2004), defines it as *"market turbulence reflects rapidly changing buyer preferences, wide-ranging needs and wants, ongoing buyer entry and exit from the market place and constant emphasis on offering new products".*

In this research, market turbulence is conceptualized as it measures the rate of change in the composition of customers and their preferences (Jaworki & Kohli, 1993, Slater & Narver, 1994). In this definition, market turbulence also tries to capture the dynamism in the customer base, the needs and the market uncertainty in the rate of change of the firms' competitors (Santos-Vijande & Alvarez-Gonzalez, 2007). Market uncertainty is about predicting the future of the market preference, the state of the competition and the evolution of the environmental forces (Milliken, 1987). In this regard, the market turbulence concept tries to simultaneously assess the change that the companies face in their customer composition and competitors (market dynamism), and the struggle to prepare the organization to deal with the new competitive situations (market uncertainty) (Santos-Vijande & Alvarez-Gonzalez, 2007).

## 2.2 Sourcing balance

Firm-level theories of technical change suggest that a firm's innovativeness is an outcome of increases in its knowledge base (Griliches, 1984, 1990; Pakes & Griliches, 1984; Henderson and Cockburn, 1996). To increase the knowledge base, a firm can seek new knowledge from outside the firm or within. The ratio of external sourcing to internal sourcing is called the sourcing balance.

### *2.2.1 Internal sourcing*

Internal sourcing is developing a product or service within the firm. Internal sourcing is also known as the 'make' decision. A firm can acquire its innovation from in-house mechanisms such as cross-functional teams, R&D, marketing or other functional departments (Chen & Lin, 2004).

Internal sourcing can also be referred to as insourcing. Insourcing has the advantage that the entire company is involved with the creation process and therefore employees are more dedicated and motivated (Lamminmaki, 2011). However, the downside is that the development time of an innovation or new knowledge can take a considerable amount of time. This development time can put stress and pressure on the employees and can also bring along significant costs.

### *2.2.2 External sourcing*

External sourcing is acquiring a product or service from outside the firm. This choice is also known as the 'buy' decision. A firm can acquire new innovation from three sources. First, acquiring an asset through new personnel or other firms or equipment. Second, through acquiring a licensing agreement or by outsourcing from an R&D contractor or consulting agency. Third, obtaining and developing innovation through cooperative agreements between firms or other research institutions (Veugelers & Cassiman, 1998).

External sourcing can also be referred to as outsourcing. Outsourcing has the advantage of using more specialized knowledge. It also leads to time gain and lower development cost in R&D. Furthermore, outsourcing helps reduce the fixed investments made to in-house manufacturing facilities, this lowers the breakeven point. Subsequently helps boost an outsourcing firm's return on equity (Kotabe & Murray, 2004). However, *"external sourcing may create considerable transaction costs, ex ante in terms of search and negotiation costs and ex post to execute and enforce the contract"* (Veugelers & Cassiman, 1998).

There are two types of outsourcing, arm's length and strategic partnership. The arm's length type is only a contractual relationship, in which a firm buys an innovation from another firm. Strategic partnership is more than just a contractual relationship, both firms cooperate intensively together on the innovation. If firms utilize both types, firms are able to gain economies of scale (Kotabe & Murray, 2004). The types of outsourcing needs to be carefully balanced to attain sustainable competitive advantage.

## 2.3 Innovation Performance

The term innovation is formulized by Afuah (1998) and Garcia and Calantone (2002) as invention + commercialization. In the strategic management literature innovation is of utmost importance for firms to create value and sustain competitive advantage in the already complex and fast changing environment (Madhavan & Grover, 1998; Subramaniam & Youndt, 2005). Innovation performance can be defined as the sum of a firm's innovations (Salomo, Strecker & Talke, 2007). Another definition entails a firm's activities of leveraging its competences into new products and new services.

Innovation performance can be divided into two categories; incremental (derivative) or radical (breakthrough). Incremental innovation performance entails the refinement and reinforcement of existing products, processes, technologies, organizational structure and methods (Chandy & Tellis, 1998; Dosi, 1988; OECD, 2005). In contrast, radical innovation performance is that which produces fundamental changes in the firm's products, processes, technologies, organizational structure and methods (Dewar & Dutton, 1986; Meyers & Tucker, 1989; OECD, 2005; Song & Montoya-Weiss, 1998). To survive, firms need innovation performance, whereby they need to balance both radical and incremental innovation performance (Farjoun, 2010; He & Wong, 2004; March, 1991; Probst & Raisch, 2005).

Innovation performance has a number of ways it can be measured. It can be measured in terms of innovative inputs such as R&D expenditures, or innovation outputs such as patenting frequency (Griliches, 1984; Henderson & Cockburn, 1996). Coorper & Kleinschmidt (1995) present a large range of collective measures for innovation performance: profit impact, profitability relative to competitors, success rate, sales percentage, sales impact, profitability relative to spending, technical success rating, success in meeting sales objectives and overall success. Firms which are more innovative will be more successful in adapting to the changing environment which allows them to perform better (Montes, 2004).

## 2.4 Transformation

A control variable is a variable that is held constant in order to assess or clarify the relationship between two other variables. The control variable within this study is transformation. Transformation is the process of retaining knowledge and reactivating when needed. Retaining internal knowledge and internalizing external knowledge is vital for sustained competitive advantage. The process of knowledge retention is critical as sometimes it might take years before new knowledge is attained and internalized (Lichtenthaler, 2009). The process of transformation consists of three tasks: (1) choice of technology or knowledge, (2) maintain them over time and (3) reactivate and synthesis them with ongoing development efforts (Garud & Nayyar, 1994). Maintaining knowledge over a length of time is costly because firm's resources must be used to keep the knowledge or technology 'alive' (Levitt & March, 1988; Wilson & Hlavacek, 1984). Easy-to-create knowledge does not need to be maintained, however, in contrast difficult-to-create must be maintained. In addition, firms must decide which difficult-to-create, and thus costly, knowledge to maintain given a firm's resources. Therefore transformation capabilities have significant impact on a firm's performance.

Firms with better transformation capabilities are better capable of retaining relevant technological knowledge and are subsequently also better at reactivating the knowledge when

needed. Companies with a greater and more relevant knowledge base can easier adapt to changing market conditions (Lichtenthaler, 2009), which will lead to a higher innovation performance (Zaadnoordijk, 2012).

## 2.5 Theoretical Framework

### *2.5.1 Influence of market turbulence on the sourcing balance*

The sourcing balance is the ratio of external sourcing to internal sourcing. Over the last decades the view on outsourcing has changed (Kotabe & Murray, 2004). Firms used to see outsourcing for basic needs in which cost-savings should be applied. However, over time firms changed the way they think about outsourcing, as it could be used to gain competitive advantage. Especially, nowadays as business markets are more complex, outsourcing has become significantly more important (Kotabe & Murray, 2004). An increasing market turbulence includes amplified variance over time of key market variables and increased unpredictability of changes (Grant & Cibin, 1995). When firms have to cope with a high level complexity, meaning that there are many firms competing in the market, firms are more inclined to making outside acquirement decision to cope with the high intensity of rivalry (Chen & Lin, 2004).

Firms will adopt a more flexible strategy when the environmental changes are more unpredictable (Chen & Lin, 2004). If the market turbulence is high, firms do not have to luxury to take their time to develop their innovations. For example, in the first stage of knowledge development, it is uncertain whether there will be enough market demand. Only when the market demands becomes clear, firms may devote themselves to internal development (Chen & Lin, 2004). Firms would need quick innovation to engage with within their firm. Therefore, the sourcing balance would be high thus having the tendency towards external sourcing compared to internal sourcing.

***H1: Market turbulence positively affects the sourcing balance***

### *2.5.2 Influence of market turbulence on innovation performance*

The ability to monitor and adapt to the environmental trends determines the survival of a firm (Keats & Hitt, 1988). When a firm is faced with substantial market turbulence and other types of environmental disturbances, innovativeness is deemed to be particularly important (Hult et al., 2004). In a dynamic environmental setting product preferences are constantly changing. Firms should be aware of this and be able to adapt to the situation.

Moreover, under uncertain market conditions, the identification of customers' changing needs and the environmental forces' evolution becomes more difficult (Santos-Vijande & Alvarez-Gonzalez, 2007). This increases the probability that a firm's products and services will become incompatible with the customers' needs and preferences over a period of time. To avoid this situation, firms may try to have a proactive behavior trying to anticipate and steer the new demands (Miles & Snow, 1978). However, if this fails, a firm's innovation performance will diminish, thus no competitive advantage will be gained.

March (1991) also stated that high market turbulence may increase the uncertainty and the risk of innovation investment and, as a consequence, reduce the innovation activity of firms. Therefore, if firms are faced with high market turbulence, the successfulness of a firm's activities of leveraging its competences into new products and new services will be negatively affected.

***H2: Market turbulence negatively affects innovation performance***

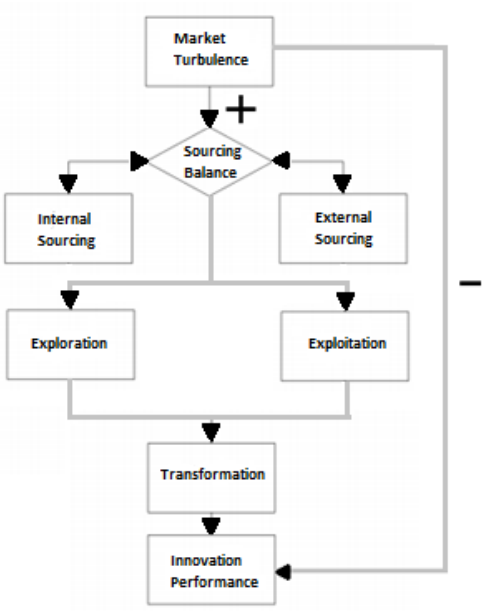


**Figure 1: Model of innovation performance**

# 3. METHODOLOGY

## 3.1 Operationalization

The survey was adopted from Zaadnoordijk (2012). Zaadnoordijk (2012) developed the survey based on an extensive literature review. Wherever possible Zaadnoordijk (2012) used existing scales. For this research, the variables market turbulence, sourcing balance, innovation performance and transformation were used. The questionnaire was administered through an on-line survey.

### *3.1.1 Independent Variable*

Market Turbulence is adopted from Hofman (2010). The scales consists of three items. The items are measured by means of a seven-point Likert scale (strongly disagree, moderately disagree, slightly disagree, neutral, slightly agree, moderately agree, strongly agree). It measures the amount of uncertainty in the environment. A higher score on the market turbulence scale means that the environment is more uncertain.

### *3.1.2 Dependent Variables*

The sourcing balance scale was adopted from Jones et al. (2001). Sourcing balance measures the tendency to acquire new technological knowledge from outside the company compared to acquiring new technological knowledge from inside the company. A high sourcing balance means that companies relatively depend more on external sources for new technologies than internal sources. High sourcing balance does not mean that firms only source externally.

Innovation performance is divided into two components; incremental and radical innovation performance. In this research, the survey does not include the direct use of the variable innovation performance. Therefore, the items of incremental and radical innovation performance are summed up to create the variable innovation performance. Both components make use of the measures adopted from Song et al. (2006). This scale uses both relative and firm specific performance measures. The items are measured by means of a five-point Likert scale. The variable innovation performance consists of four items (see Table 1).

**Table 1: Items of Innovation Performance**

| | |
|---|---|
| Incremental Innovation Performance | 1. This firm frequently introduced incremental new products into new markets in the last three years. |
| | 2. Compared to our major competitor, this firm introduced more incremental new products in the last three years. |
| Radical Innovation Performance | 1. Compared to our major competitor, this firm introduced more radical new products in the last three years. |
| | 2. This firm frequently introduced radical new products into markets totally new to the firm in the last three years. |

### *3.1.3 Control Variable*

The scales for transformation are based on the work of Lichtenthaler (2009). A higher transformation score means that a firm is better able to maintain and reactivate it's knowledge. There are eight items which are divided over two constructs; maintain and reactivate. All the items use a five-point Likert scale. These constructs together form the variable transformation.

## 3.2 Statistical methods

To analysis the relationship between the variables, the statistical program SPSS will be used on the database which will be enlarged. The independent variable is market turbulence and the dependent variables are the sourcing balance and innovation performance. The control variable is transformation. The data will be analyzed through General Linear Model (GLM). General Linear Model plots two variables in a graph, which then generates a straight line that goes through the data points to effectively describe the pattern in the bivariate plot. The generality of this model fits well with this research as the focus is on the general relationships between the variables. Furthermore, General Linear Model is divided into univariate or multivariate analysis. Univariate analysis is using an independent variable. The independent variable has three or more categories. Multivariate analysis is using multiple independent variables. In this research, only one independent variable, market turbulence, is analyzed so univariate analysis will be used. The data will be further analyzed by analysis of variance (ANOVA).

## 3.3 Data collection

The original sample consisted of 350 medium sized High Tech firms located in the Netherlands and Germany. The companies were selected through the database "company.info". The firms had to have an in-house innovation department and have at least 100 FTE. The criterion of at least 100 FTE was set because these firms are likely to have a department focused on innovation. The firms were refined through a telephone interview asking if an R&D manager or someone in the R&D department would be willing to participate. Approximately 300 firms agreed to participate in our research.

The data should have been collected in the March 2016. Due to time limitations within the study, the new data could not be analyzed. Therefore the data of Zaadnoordijk (2012) was used to test the hypotheses. The sample consisted of 600 medium High Tech firms located in the Netherlands and Germany of which 218 agreed to participate. The data was collected using the following procedure:

*"The firms were sent a personalized paper invitation which was directly followed up by a personal invitation email. The first wave resulted in 27 usable responses. After one month a reminder was sent yielding another 19 responses. The third wave was a follow up by phone yielding 10 additional responses. Finally, 56 responses were received which is a 25% response rate, which is deemed quite high for studies directed at top managers (Gruber et al., 2010). The data was collected from November 2011 until January 2012. The firms all originate from one of the following industries; Chemicals, Pharmaceuticals, Metals, electronic devices, and computers and optical devices. Firm size varied from less than 150 (19,6%), 150 to 300 (24,8%), 300 to 500 (27%) and more than 500 employees (28,6%)."* (Zaadnoordijk, 2012, p. 17)

## 3.4 Data analysis

Some issues with the data set exist. The measured variables transformation, market turbulence and sourcing balance are not entirely normally distributed. A few variables tested significantly not normal for the Kolmogorov-Smirnov test. Although, those variables are significantly normal for the Shapiro-Wilk test using an alpha of 0,05. For example, transformation measured significant not normal with the Kolmogorov-Smirnov test and significant normal for Shapiro-Wilk test (respectively 0,005 and 0,087). As the Shapiro-Wilk test is generally more acknowledged, all the variables are accepted as normally distributed. Only the variable Innovation Performance tested significantly normal on both test (respectively 0.2 and 0,838).

**Table 2: Normality statistics**

| | Kolmogorov-Smirnov | Shapiro-Wilk |
|---|---|---|
| **Transformation** | 0,005 | 0,087 |
| **Market Turbulence** | 0,002 | 0,053 |
| **Sourcing Balance** | 0,058 | 0,012 |
| **Innovation Performance** | 0,2 | 0,838 |

Table 3 presents validity determinants and Kaiser-Meyer-Olkin Measure of Sampling Adequacy, in short KMO. Table 4 represents the composite reliability and the Cronbach's Alpha. These tables are used for checking on validity and reliability of the variables.

Validity was checked by a factor analysis through the determinants and KMO. The KMO statistics is a Measure of Sampling Adequacy, both overall and for each variable (Kaiser, 1970; Cerny & Kaiser, 1977; Dziuban & Shirkey, 1974). KMO by rule should at least be higher than 0,5 and is considered good when the value is greater than 0,8. If a KMO value is less than 0,5 it requires action, either by deleting a variable or adding another variable.

The determinants of the correlation matrix measure whether there is multicollinearity. Multicollinearity is a phenomenon in which two or more independent variables in a multiple regression model are highly correlated. The determinants should be higher than 0,00001. Table 3 shows no problems concerning the validity as all variables exceed the threshold of the determinant and Kaiser-Meyer-Olkin Measure of Sampling Adequacy.

**Table 3: Validity statistics**

| | Determinant | KMO |
|---|---|---|
| **Transformation** | 0,01 | 0,762 |
| **Market Turbulence** | 0,636 | 0,58 |
| **Sourcing Balance** | 0,036 | 0,778 |
| **Innovation Performance** | 0,327 | 0,662 |

Reliability was checked through the composite reliability and Cronbach's Alpha. The composite reliability should be higher than 0.7 (Hair et al. 2010) and Cronbach's Alpha should also be higher than 0.7 (Peterson, 1994). The difference between the two tests is that Cronbach's Alpha uses equal weights on each construct while composite reliability includes factor weighting. Only the Cronbach's Alpha of market turbulence does not meet the threshold of 0,7. However, the composite reliability score does meet the threshold and the measure has been successful in an earlier study (market turbulence $\alpha = 0.70$ in Hofman (2010)), so the construct was kept. All other variables scored above the threshold of composite reliability, which means that there are not any problems concerning the reliability (see table 4).

**Table 4: Reliability statistics**

| | CR | Cronbach's Alpha |
|---|---|---|
| **Transformation** | 0,9262 | 0,887 |
| **Market Turbulence** | 0,7948 | 0,635 |
| **Sourcing Balance** | 0,8631 | 0,864 |
| **Innovation Performance** | 0,8147 | 0,706 |

# 4. RESULTS

An overview of the descriptive statistics can be found in Table 5. Table 5 summarizes the mean, standard deviation and correlations of the variables transformation, market turbulence, sourcing balance and innovation performance. The means for the previously named variables are respectively 4,96; 4,06; 4,10 and 4,15. The means imply that the respondents are either neutral or positive around the variables, but not negative. Kendall's Tau was used for the non-parametric correlation. It is better to use Kendall's Tau instead of Spearman's Rho due to the fact that a small data set was used in this research (Fredricks & Nelsen, 2007). Reviewing the Kendall's Tau, all correlation scores are below 0,3 or negative. This indicates a weak correlation between the variables or even a negative correlation.

**Table 5: Correlations**

| Kendall's Tau (n=56) | Mean | SD | Min | Max | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|---|
| **1. Transformation** | 4,9643 | 1,13152 | 1,71 | 7 | 1 | | | |
| **2. Market Turbulence** | 4,0595 | 1,29818 | 1 | 7 | 0,17 | 1 | | |
| **3. Sourcing Balance** | 3,0565 | 1,34024 | 1 | 5,67 | -0,136 | 0,055 | 1 | |
| **4. Innovation Performance** | 4,1518 | 1,20197 | 1 | 6,75 | 0,287 | 0,134 | -0,205 | 1 |

## 4.1 Hypotheses Test

Hypotheses 1 proposes that market turbulence positively affects the sourcing balance. Figure 2 shows direct evidence for a positive relationship of the variables mentioned above. Therefore, the hypothesis is supported. In other words, higher market turbulence causes a higher sourcing balance meaning more external sourcing compared to internal sourcing. However, the relationship is very weak as the gradient is only 0,16.

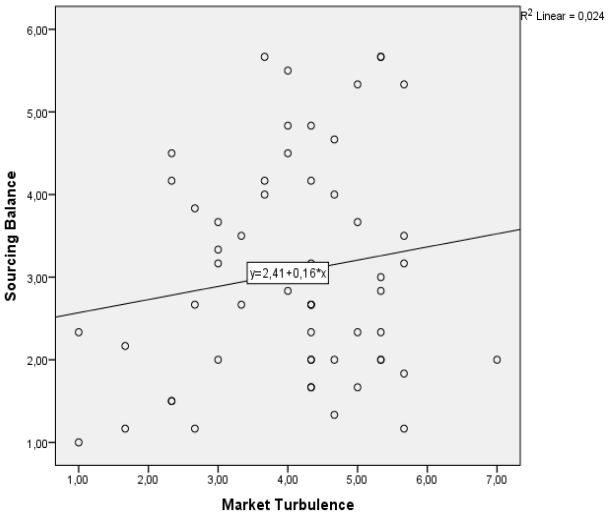


**Figure 2: Influence of market turbulence on the sourcing balance**

Table 6 analyzes the variance of the variables 'market turbulence' and 'sourcing balance', which are included in hypothesis 1. The significant level is 0,256 against an alpha of 0,05, which means that the relationship is not significant. This suggests that the outcome of the previously defined relationship is not reliable.

**Table 6: ANOVA Hypothesis 1**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 2,349 | 1 | 2,349 | 1,315 | ,256[b] |
| | Residual | 96,444 | 54 | 1,786 | | |
| | Total | 98,793 | 55 | | | |

a. Dependent Variable: Sourcing Balance

b. Predictors: (Constant), Market Turbulence

Hypothesis 2 proposed a negative effect of market turbulence on innovation performance. The results show (see Figure 3) that there is a positive relationship between the variables, due to the fact that the coefficient is positive. Therefore, the hypothesis is rejected. Figure 3 shows that higher market turbulence increases innovation performance. However, in this relationship the coefficient is very weak as it is 0,23.

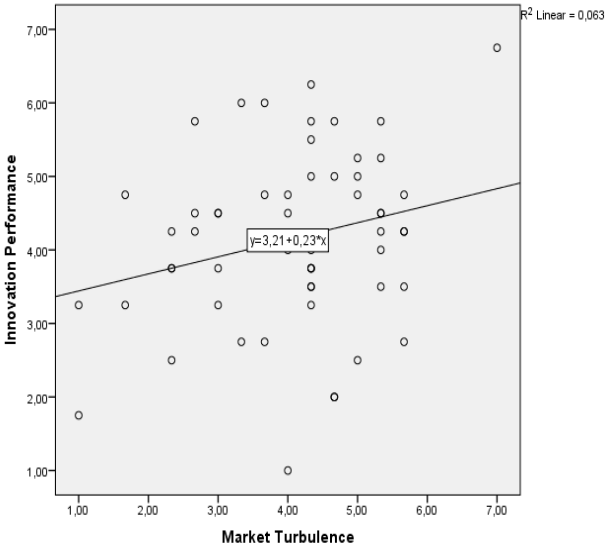

**Figure 3: Influence of market turbulence on innovation performance**

Table 7 shows the analysis of variance of the variables 'market turbulence' and 'innovation performance', which are included in hypothesis 2. With an alpha of 0,05 acting as threshold, the proposed relationship is not significant (see Table 7) because the significance level is higher than the alpha. This suggest that the outcome of the negative relationship between market turbulence and innovation performance is not reliable.

**Table 7: ANOVA Hypothesis 2**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 4,984 | 1 | 4,984 | 3,614 | ,063[b] |
| | Residual | 74,476 | 54 | 1,379 | | |
| | Total | 79,460 | 55 | | | |

a. Dependent Variable: Innovation Performance

b. Predictors: (Constant), Market Turbulence

## 4.2 Additional Analyses

To further examine the relationship between market turbulence and innovation, the control variable transformation was used. Through the general linear model by univariate analysis of variance, it was examined whether the relationship between transformation and innovation performance improved or not when an extra variable was added. A comparison will be made between the R-squared excluding market turbulence and the R-squared including market turbulence. If the R-squared including market turbulence increases then there is a positive influence, otherwise there is a negative influence of the independent variable. Using this analysis on the independent variable transformation and dependent variable innovation performance, R-squared is 0,410 which means that there is a strong interaction. By adding the independent variable market turbulence, R-squared increased to 0,423. This means that market turbulence has a positive effect and slight increase on the relationship of the already positive existing relationship between transformation and innovation performance.

# 5. DISCUSSION

Through the increasing unpredictability of change (Grant & Cibin, 1995) and complexity in the market (Kotabe & Murray, 2004; Chen & Lin, 2004), firms are more inclined to outsource their activities therefore resulting in a higher sourcing balance. This study investigated whether market turbulence has a positive effect on sourcing balance. This indicates that a higher rate of change within the market would push a firm more towards external sourcing therefore having a higher sourcing balance. This analysis presented evidence that this relationship does exist, although it was not statistically significant. Furthermore, the relationship was very weak and a very weak correlation was found between the variables. This raises the question why the statistical analysis is weak even though literature has suggested that this relationship does exist.

To improve this research and to draw statistically grounded conclusions from it, the population size needs to be higher. Using the central limit theorem, a higher population size makes variables more normally distributed increasing the chance that variables become significant. As the relationships become significant, profound conclusions can be drawn from it. This study speculates that a market with high turbulence will cause firms to outsource more. This in its turn will then diminish in-house creation thereby causing a higher sourcing balance. This study further speculates that in-house sourcing will become more focused on assimilation capabilities and that there will be a greater emphasizes on transformation.

Simultaneously, this study analyzed whether market turbulence negatively affects innovation performance. Scholars have argued that under uncertain market conditions, the identification of customers' changing needs becomes more difficult (Santos-Vijande & Alvarez-Gonzalez, 2007) and innovation performance is deemed to be particular important (Hult et al, 2004; Miles & Snow, 1978). March (1991) stated that high market turbulence may increase the uncertainty and the risk of innovation investment and, as a consequence, reduce the innovation activity of firms. This study observed that contrary to expectation, not a negative but positive relationship between the two variables was found. This means that a more turbulence market increases a firm's activities of successfully leveraging its competences into new products and new services. However, the relationship was not statistically significant.

An additional analysis was also performed with the control variable transformation and the variables market turbulence and innovation performance. First of all, it should be mentioned that the mean of the variable transformation is 4,9. Nearly all firms are proactive in maintaining and reactivating knowledge. Firms with better transformation capabilities are better capable of retaining relevant knowledge base can easier adapt to changing market conditions (Lichtenthaler, 2009), which will lead to a higher innovation performance (Zaadnoordijk, 2012). This positive relationship has been conformed and adding market turbulence to this relationship increases the effect a bit. Therefore there is an underlying effect of market turbulence on innovation. Again firms should beware of this influence.

There is an opportunity to further explore this relationship. Market turbulence is at the beginning of the innovation performance model. Next is the sourcing balance followed by the mechanisms of exploration and exploitation. Finally the mechanism transformation comes which affects the innovation performance. There are numerous steps between market turbulence and innovation performance. What exactly the relationship is between these two variables and how big the influence is, still needs to be researched. This is interesting for research because there has not been much research done about this topic therefore there is still much to be discovered.

## 5.1 Managerial Implications

The results have hinted that companies should acknowledge that environmental factors are present and influence a firm. For firms this implies that they should not forget the environmental influence on the sourcing balance. Especially the acknowledgement is of utmost importance as firms should always remain in control. Having control over the sourcing balance dictates the firm's activities. For this reason, control should not be given away to the environmental forces but it should be kept in a firms own hands to steer its own direction. Furthermore, firms should be aware of the fact that environmental forces even affect innovation performance. Environmental forces have an underlying effect which must not be ignored. The strength of these environmental forces is uncertain therefore firms should tread with caution.

# 6. LIMITATIONS

Some limitations need to be taken into account in this research. First of all, the sample size was small (n=56). This decreased the extent to which profound conclusion could be drawn. The sample size also caused issues with the normal distribution. None of the variables, except innovation performance, tested above the threshold of both the Kolmogorov-Smirnov test and the Shapiro-Wilk test. This should also improve with a higher sample size.

Another limitation is that the data was collected in 2012 from Dutch and German companies during and before the economic

crisis. This might have affected the investments decisions firms made regarding innovation. The precise effect of the global recession will be unclear as the data was collected from different industries. For this reason, discovering the exact impact of the global crisis on the different industries is an impossible task. To measure the impact of market turbulence on the sourcing balance and innovation performance, one should collect data over several years. This would ensure that any large worldly impacts would be kept to minimum of influence.

The next limitation is that the new data could not be used as it was not collected in time. This new data should result into interesting insights for a number of reasons. The sample size would most definitely increase if combined with the current data. This would strengthen the discovered relationships and the performed tests of normality, reliability, validity and significance. As the statistical analysis would increase of strength, better conclusions could be drawn from it.

A potential threat to the validity of this research is the common method bias. Common method bias arises when a person fills in a Likert-scale survey, at first honestly. However, due to the length of a survey, near the end a person might repeat its answers. This study used self-reports to obtain information about both the independent and dependent variable. This might result in a common method bias (Podsakoff, 2003). It is unlikely that this happened as the survey only took 10-15 min and the participants were directly contacted whether they wanted to fill-in the survey. This caused the participants to be more motivated to fill-in the survey, which diminishes the effect of the common method bias.

The final limitation of this study regards the causality. In this study market turbulence is the cause and the effect is either sourcing balance or innovation performance. Although this research shows no significant relationship between market balance and sourcing balance, theory shows that there could be a relationship between the two variables. It is unlikely to think that the ratio of the sourcing balance would affect market turbulence.

The other relationship is between market turbulence and innovation performance. Arguments could be given for either market turbulence or innovation performance being the cause within the cause-effect relationship. In this study market turbulence is the independent variable, the cause, which influences the dependent variable innovation performance, the effect. Innovation performance is the output of the firm, by delivering new products and new services into the world, to the market. This slowly changes the market consequently influencing it. The causality between these variables should be further investigated and the current influence of it should be checked in this study.

For further research, attention should go to what the relationship between the variables market turbulence, sourcing balance and innovation is exactly when both the population size is larger and the variables become significant. Furthermore a more extensive study with more control variables might yield better results. Especially now that the world is becoming more intertwined, environmental market forces will increase the grip and influence they have on a firm.

# 7. CONCLUSION

This study made an attempt to investigate whether market turbulence directly affects a firm's sourcing balance and indirectly affects its innovation performance. Literature describes that firms will adopt a more externally sourced focus when the environmental changes are more unpredictable. If the market turbulence is high, firms experience time pressure to perform thus obtaining innovations through an external source. Relying more on external sourcing causes a higher sourcing balance. Literature on market balance and innovation performance describes a negative relationship. Literature states that high market turbulence may increase the uncertainty and the risk of innovation investment and, as a consequence, reduce the innovation performance of firms.

The variables of the hypotheses were tested for normality, reliability and validity. The relationships as described in the two hypotheses were tested with the general linear model. The results indicate a weak positive relationship between market turbulence and sourcing balance. Furthermore, the results indicate a weak negative relationship between market turbulence and innovation performance. The results of both hypotheses did not pass the threshold for significance. For this reason, no statistically grounded conclusion could be drawn. This study had a small sample size which affected the results and the significance. For future research, a larger sample size is needed. One conclusion which might be drawn is that environmental forces affects firms in unknown ways.

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