

Erasmus University Rotterdam



Master thesis

---

# The Effect of Market Competition on CEO Compensation

A Panel Data Investigation of German Manufacturing Companies

---

Handed in by:

**Jan Martin Rehder**  
**Jr435779**  
**jan.rehder@gmx.net**

Haagseveer 56  
3011 DA Rotterdam  
The Netherlands

Supervision by:

**Dr. Julian Emami Namini**  
**emaminamini@ese.eur.nl**

Department of Economics  
Erasmus School of Economics

PO Box 1738  
3000 DR Rotterdam  
The Netherlands

---

## Abstract

This paper examines the effect of market competition induced by trade liberalisation on CEO compensation. Since economic theory cannot yet provide an explanation for the high level of CEO pay and until now very little empirical research on this topic has been undertaken, this investigation is of high value to shed light on the relation in question. The study uses a new concept to measure competition intensity by distinguishing between competition in goods markets and competition in factor markets. Hence, the amount of imports serves as a proxy for goods market competition, whereas the amount of exports is used as an indicator for competition intensity in factor markets. Additionally, a general equilibrium model is used to theoretically explain the relation between trade liberalisation, competition and management compensation. While the empirical analysis does not find clear evidence to support the a priori hypothesis that CEO compensation increases with the amount of exports and decreases with the amount of imports, the analysis reveals two key insights: (1) competition in goods and factor markets seems to effect CEO compensation in opposite directions, and (2) this result is reversed when bonus payments are observed, suggesting that more flexible elements of compensation react differently to competition intensity compared to more rigid forms of compensation.

---

## Table of Contents

1. Introduction.....	1
2. Literature Review .....	2
2.1. Competition and CEO Compensation.....	3
2.2. Trade Liberalisation, Competition and Executive Pay .....	4
3. Competition, Trade Liberalisation and CEO Compensation .....	5
3.1. The Relation between Market Competition and Trade Liberalization .....	5
3.2. The Relation between Market Competition and CEO Compensation .....	6
3.3. Model: Trade Liberalisation and Manager Compensation .....	7
4. Hypotheses.....	13
5. Data Description .....	13
5.1. CEO Compensation .....	13
5.2. Competition and Trade Liberalization.....	14
5.3. Control Variables .....	15
5.4. Data summary .....	15
6. Empirical Strategy .....	17
7. Results.....	20
7.1. Total CEO Compensation.....	20
7.2. Incentive Pay: Bonus .....	23
7.3. Multicollinearity .....	25
7.4. Robustness .....	27
8. Discussion.....	28
9. Summary and Conclusion.....	30
References.....	32
Appendix.....	36

---

## 1. Introduction

In 2015, the Economic Policy Institute in Washington published a study revealing that the Chief Executive Officers (CEOs) of America's largest firms earn about 300 times the income of an average U.S. household (Mishel and Davis, 2015). A similar high figure has been registered in Germany, where the top management makes 147 times the earnings of an average worker (manager magazine, 2015). Moreover, the growth of CEO and executive compensation has played a crucial part in driving overall inequality of income shares in recent years. While the wage of most workers stagnated in periods of economic boom and often declined during recessions, the earnings of top managers continued to grow despite falling firm performance (Bivens et al., 2014; Gould 2015). This extraordinary pay increase has led to a heated social and political debate. The public believes that managers are overpaid, especially in comparison to occupations perceived to be more socially beneficial, such as those in medicine or politics. Moreover, CEO compensation continues to rise and public perceptions that poor managers do not get penalized for weak firm performance draws further criticism (Shaw and Zhang 2010; Kaplan 2012).

Economic literature explains the high level of CEO compensation either with the managerial power hypothesis or optimal contracting theory. The former argues that the strong position of CEOs enables them to lift themselves above the firm's board to decide their own compensation (Bebchuk and Fried, 2003). The latter maintains that CEO pay is a result of a competitive equilibrium for managerial talent whereby incentives are used to optimize firm value (Murphy, 2012). However, further research has been conducted on the observed level and composition of compensation packages, providing evidence that these theories are unable to give a clear explanation (Frydman and Jenter, 2010). The absence of a clear understanding about the driving mechanism behind CEO compensation makes the topic a fertile ground for further research, particularly given the pertinence of the issue in public and political discourse.

Competition might be one of the reasons explaining high CEO compensation. The mechanism is ambiguous. On one hand, competition in factor markets might lead to a process of outbidding for the best management talent (Murphy, 2012). On the other hand, competition intensity in goods markets puts firms under cost pressure, thus possibly lowering management

---

salaries. In addition, trade liberalisation enhances the competition intensity in goods and factor markets.

The purpose of this study is to extend existing literature on the relation between market competition and CEO compensation. At present, very little empirical research on this topic has been undertaken, and further investigation could be of high value to shed light on this relation. Moreover, existing studies have tended to examine the relationship between competition and managerial remuneration using data from U.S. companies. The paper at hand will be the first study using a sample of German manufacturers, aiming to expand the evidence across countries. In addition, the inclusion of trade liberalisation as an additional factor to explain the underlying mechanism has not previously been done in the literature. It is also a new concept to use the amount of imports and exports as indicators for competition intensity in this context. While the amount of imports to a specific sector will serve as a proxy for competition in goods markets, exports are used as an indicator for the competition intensity in factor markets. Lastly, the results of this study might contribute to the social debate about extraordinarily high CEO compensation, in presenting evidence on whether this compensation is a fair outcome of the market mechanism.

The remainder of this paper is structured as follows: Section 2 gives a brief overview of related literature about research that has been done on the relationship between trade liberalisation, market competition and executive pay. Section 3 outlines the theoretical framework by incorporating a model to underpin the empirical analysis. The hypotheses are stated in section 4. Section 5 explains the data used for this investigation while section 6 explains the empirical strategy employed in this study. Subsequently, the results are summarised in section 7. In section 8, the results will be discussed critically, and finally in section 9, this paper concludes with a summary and suggestions for further research.

## **2. Literature Review**

To the best of our knowledge, there are no existing empirical studies that investigate the relationship between increasing competition induced by trade liberalisation and CEO compensation. However, some research has been conducted on closely related topics that provide relevant insights for this study. Thus, this literature review will first consider evidence on the broader relationship between market competition and CEO compensation,

---

before reviewing studies that consider the effect of trade liberalisation on competition and executive pay.

## **2.1. Competition and CEO Compensation**

The number of empirical studies that focus on the relation between competition and CEO compensation is fairly limited. Alexander and Zhou (1995) present the first study related to this topic. Their paper examines how product market competition affects the compensation level of executives. Using a sample of 174 observations on CEO compensation for the year 1987, their empirical result predict that product market competition has no discernible effect on total executive compensation. However, they also conclude that the incentive component of compensation tends to be higher in more competitive markets. To reflect the intensity of competition, the authors use the Hirschman-Herfindahl Index (HHI) as an explanatory variable.

Karuna (2007) presents an empirical study on the effect of product market competition on incentives provided to CEOs by using a multi-dimensional indicator for competition composed of product sustainability, market size and entry costs. His results provide evidence that product market competition and payment incentives for CEOs are complements, since incentives granted to CEOs increase with competition intensity. A further study by Cuñat and Guadalupe (2008) investigates the effect of product market competition on the compensation packages offered to executives by using panel data of US firms active in the banking and financial sector. They exploit two sector-wide deregulation periods as quasi-natural experiments to serve for increasing competition. Their results indicate that competition may have an impact on the distribution of executive earnings, since total pay only increased moderately following the deregulations, but strong differential trends in the fixed and variable components of pay are observed. Most recently, Sturkenboom (2015) conducts a study to find evidence for the effect of product market competition on CEO compensation by taking large decreases in U.S. import tariffs as an exogenous measure for the intensity of market competition. In conducting this event study, his empirical investigation for U.S. manufacturing companies shows that the level of total CEO compensation does not significantly change when product market competition becomes more intense. However, the study concludes that three years after a large decrease in import tariffs has been implemented, payments significantly change to shorter-term incentives to CEOs instead of longer-term incentives.

---

## 2.2. Trade Liberalisation, Competition and Executive Pay

In an influential paper about trade liberalisation, Melitz (2003) analyses the intra-industry effects of international trade. Important for the study at hand is his finding that exposure to trade forces the least productive firms to exit, concluding that trade liberalisation intensively increases competition. Tybout (2003) and Bernard et al. (2007) support the general consensus that trade liberalisation triggers a significant increase in competition intensity from foreign rivals. Based on this, Amiti and Davis (2012) develop a theoretical model to predict wage consequences of trade liberalisation. According to them, wages vary qualitatively and quantitatively with the nature and magnitude of firms' engagement in export and import activities. Their model supports widespread theory about wages in international economics. Firstly, large firms are more productive, more likely to engage in trade and thus pay higher wages. Secondly, distinguishing between intermediate and final goods engagement is crucial and will influence firm-level wages. This finding is empirically supported with firm-level data for Indonesia in the same paper. Egger and Kreickemeier (2012) theoretically analyse the effect of trade liberalisation on income inequality by building a model consisting of two key groups of individuals in the economy, namely the group of managers and the group of production workers. The model predicts that the average of inequality between these two groups increases, because managers gain disproportionately.

Finally, several studies approach the topic at hand by examining empirical evidence on the impact of trade liberalisation on executive pay, and particularly on CEO compensation. Sanders and Carpenter (1998) find evidence that the degree of a company's internationalization is positively associated with the level of CEO compensation. They measure a firm's degree of internationalization based on three dimensions: foreign sales, foreign production and geographic dispersion. A study by Marin (2009) on firm survey data about executives and their pay in Austria and Germany, finds support that globalisation increases CEO compensation. The reason is that more foreign competition leads firms to rise their activities to attract talent, defined by the author as the 'war for talent'. Lastly, Guadalupe and Wulf (2010) conduct a study on trade liberalization between Canada and the U.S. and the resulting increase in product market competition on corporate hierarchies. However, they also find that compensation of senior managers increases in more competitive environments.

---

### **3. Competition, Trade Liberalisation and CEO Compensation**

This section will be separated into three parts in order to formulate hypotheses about the relation between trade liberalisation, market competition and CEO compensation. Firstly, the relation between trade and competition is explained theoretically. Secondly, the relation between market competition and CEO compensation is discussed. Finally, a model is used to show how management compensation reacts to trade liberalisation.

#### **3.1. The Relation between Market Competition and Trade Liberalization**

In this study, the amount of imports and exports serve as a proxy for trade liberalization. Since trade models with firm heterogeneity in total factor productivity (TFP) predict that trade liberalization forces the least productive firms to exit the market (Melitz, 2003), these proxies also serve to determine changes in the competitive environment of internationally active firms.

In theory, the effect of trade liberalisation on market competition differs between exports and imports. The amount of exports indicates competition in factor markets. Emami Namini et al. (2012; 2013) show that raising sector wide exports increases competition for those factors used intensively by exporters (e.g. skilled labour), hence negatively affecting their profits. An increase in exports raises per-unit costs of all firms by the same proportion, leading the least productive firms to exist.

In contrast, imports to a specific sector can be used as a proxy for goods market competition in the corresponding sector. Due to trade liberalization, foreign firms are more likely to intensify exporting to the target market. Thus, increasing imports will raise the intensity of goods market competition. According to Bernard et al. (2007), a decrease in import tariffs increases imports since it is less costly for foreign companies to enter their target market. Hence, Schott (2010) uses large decreases in U.S. import tariffs as a proxy for goods market competition. Valta (2012) points out that a decrease in import tariffs serves as an appropriate indicator for a changing competitive environment because it also addresses the potential endogeneity of product market competition. Thus, it is unlikely that CEOs are able to influence the introduction of large import tariff reductions, and firms are also not always aware when exactly import tariff reductions take place. Contrary to the U.S. market, detailed import tariff decreases for specific sectors cannot be derived for Germany, or equivalently for the European Union. However, tariff changes represent a potential change in imports whereas changes in the amount of imports reflect real competition. Furthermore, unilateral decreases



---

in import tariffs do not measure competition in factor markets, for which the amount of exports will serve as a proxy in this study. These arguments support an approach of using total numbers of imports and exports to measure market competition.

### **3.2. The Relation between Market Competition and CEO Compensation**

The literature on the relation between market competition and CEO compensation is characterised by competing theories and schools of thought. On one hand, some authors argue that market competition is a substitute for incentive pay. Hart (1983) suggests that CEOs have less opportunity for dysfunctional behaviour in a situation of intense market competition because of fallen prices. In this context, market competition functions as a source of discipline and provides incentives for CEOs to perform well. Consequently, in a situation of intense market competition fewer incentives are necessary in order to encourage CEO performance (Hart 1983; Schmidt 1997). Moreover, stronger competition makes it easier for firms to evaluate CEOs since firms in a highly competitive industry are better informed due to more market players (Marciukaityte & Park, 2009).

On the other hand, some authors argue that market competition and incentive compensation are complements. Scharfstein (1988) predicts that stronger incentives are needed in a situation of intense market competition, because cost reduction initiatives raise the attractiveness of the firm. In addition, Raith (2003) points out that organizations provide more incentives to CEOs when market competition is higher, intending to encourage decision-makers to reduce costs. According to this argument a more intense market competition will result in stronger incentives provided to CEOs.

The relation between goods market competition and CEO compensation can also be explained from an agency theory perspective. According to this theory, the agent (in this context, the CEO) is only willing to exert minimum effort when incentives are absent because exerting effort is costly (Baiman, 1990). Furthermore, agency theory assumes that agents are risk averse (Haubrich, 1994), leading to a higher risk premium paid by the principal (in this context, the firm) in a situation of risk.

As such, incentive pay might be a source of risk to a CEO, since this element of compensation is usually based on imperfect indicators of effort. Eisenhardt (1989) emphasis that effort is difficult or expensive to measure, and thus organisations take performance or output figures to indicate effort. It may well be assumed that performance or output are imperfect indicators since they depend on both effort and random components (Bonner and Sprinkle, 2002). Taking the example of a firm's stock price as a performance based measurement, the random

---

component is obvious since firms' stock prices are also influenced by external factors like market sentiments (Dechow, 2006). Consequently, performance or output based incentive pay implies a risk to the agent. As a result, CEO compensation increases in the presence of these types of incentives (Sturkenboom, 2015).

Finally, the relation between CEO turnover, competition and CEO compensation is of great importance. Fee and Handlock (2004) show that fired CEOs remain unemployed for a long time and typically earn less when reemployed. Peters and Wagner (2014) support this finding and additionally find evidence that CEO turnover risk is positively associated with compensation. Thus, dismissal serves as a further source of risk to increase compensation.

DeFond and Park (1999) and Core and Guay (2013) conduct empirical studies on the relation between CEO turnover and competition. DeFond and Park (1999) conclude that CEO turnover is higher in industries with intense market competition by arguing that relative performance evaluation is more appropriate in competitive industries because of an easier identification of poorly performing CEOs. Guay et al. (2013) argue that industry shocks like globalisation or changes in goods market competition intensity are responsible for dismissal of CEOs since companies need a change in management skills. Thus, as intense goods market competition increases CEO turnover, and higher dismissal risk for CEOs positively affects CEO compensation, it can be concluded that CEO compensation increases with market competition.

### **3.3. Model: Trade Liberalisation and Manager Compensation**

In their paper, Chisik and Emami Namini (2015) develop a general equilibrium model to show how trade liberalization impacts bonus payments to managers. For the purpose of this study, this model is simplified and focuses only on the derivation of management pay. Ultimately, the model will be expanded to the additional effects of trade liberalisation.

The economic environment in the model consists of two sectors. First, the numeraire sector produces perfectly substitutable goods with constant returns to scale technology using only labour. Second, the monopolistically competitive sector produces differentiated goods with a constant elasticity of substitution technology using labour and manager. Preferences over the goods of the two sectors are represented by a Cobb-Douglas utility function:

$$U(C_M, C_0) = C_M^\alpha C_0^{1-\alpha} . \quad (1)$$

---

Preferences over the manufactured goods in the monopolistically competitive sector are given by a constant elasticity of substitution sub-utility function.<sup>1</sup>:

$$C_M = \left( \sum_{z=0}^{\infty} C_z^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}. \quad (2)$$

The same technology for each firm producing in the monopolistically competitive sector is given by:<sup>2</sup>

$$l_z = \begin{cases} q_z & \text{if } m_z = 1 \\ \xi q_z & \text{if } m_z = 0 \end{cases}, \quad (3)$$

where  $l_z$  denotes all labour used in producing good  $z$ ,  $q_z$  is the quantity of good  $z$ ,  $m_z$  is a manager for the firm that produces good  $z$ , and  $\xi$  is an arbitrary large constant making production unfeasible if firm  $z$  is unable to hire a manger.

The technology for each firm producing the numeraire good is  $l_0 = q_0$ , and total labour supply is denoted by  $L$ . Labour supply is assumed to be large enough in order to have a positive numeraire production.

The model focuses on the monopolistically competitive sector, since we are interested in the compensation of firms and the payment to managers in equilibrium. The number of potentially active firms is denoted by  $N$ , and is assumed to be exogenous. Firms in the monopolistically competitive sector will produce product  $z$  only if they are able to hire a manager. Because only a small fraction of companies will be successful in hiring a manger, the number of firms actually producing good  $z$  is denoted by  $M$  and is derived endogenously.<sup>3</sup>

For each firm that is successful in hiring a manager, the product market is described by monopolistic competition. Dixit and Stiglitz (1977) show that the set of purchased manufactured goods can be characterized as a composite good  $C_M$  with corresponding aggregate price:

---

<sup>1</sup> With the elasticity of substitution between varieties  $\sigma$  with  $\sigma > 1$ . This implies that none of these varieties is essential to consumption. Only a finite number of varieties will be available to consume.

<sup>2</sup> In this regard we deviate from Chisik and Emami Namini (2015) and remove fixed costs for simplicity.

<sup>3</sup> We assume that the size of the economy is large enough so that the number of firms is high in order to be able to ignore the effect of each manufacturing firm's output on the price and quantity for other firms.

---


$$P_M = \left( \sum_{z \in M} p_z^{1-\sigma} \right)^{\frac{\sigma}{1-\sigma}} . \quad (4)$$

Consumer maximization of the first stage utility function yields the following demand functions:

$$C_M = \frac{\alpha I}{P_M} ; \quad C_0 = \frac{(1-\alpha)I}{P_0} , \quad (5)$$

where  $I$  denotes aggregate income which will be derived shortly. Consumer maximization of the sub-utility function leads to the demand for each variety:

$$C_z = C_M \left( \frac{P_z}{P_M} \right)^{-\sigma} = \frac{\alpha I}{M p_z} . \quad (6)$$

Each manufacturing firm takes the output of other firms, the aggregate price index and  $C_M$  as given and chooses output to maximize profits. This yields the following pricing rule:  $p_z = \frac{\sigma}{\sigma-1}$ . Thus,

$$C_z = \frac{\alpha I}{M \frac{\sigma}{\sigma-1}} . \quad (7)$$

Gross profits, i.e. profits disregarding bonus payments to a manager, of an operating firm  $z$  are given by:

$$\pi_z = r_z - w_z = p_z q_z - q_z = p_z q_z - q_z p_z \frac{\sigma-1}{\sigma} = \frac{r_z}{\sigma} = \frac{\alpha I}{M \sigma} . \quad (8)$$

where  $r_z$  denotes firm revenues which are given by  $\frac{\alpha I}{M}$ , and  $w_z$  denotes costs.

All workers in the economy are considered as agents looking for a job to receive income. Agents are either normal skilled or highly skilled workers. Normal skilled workers are employed either as labourers in the numeraire sector or as labourers in the manufacturing sector.<sup>4</sup> Highly skilled workers can either work as a manager if offered a managerial position, or if not, they can still work in both sectors as normal skilled workers.

---

<sup>4</sup> The wage of normal skilled workers is equal to one and identical to the price of the numeraire good.

---

The labour supply of the entire country is given by  $L$ . The number of highly skilled workers is labelled  $H$ . Thus, the total number of normal skilled workers is therefore given by  $L - H$ . Only a subgroup  $M$  of all highly skilled workers'  $H$  will find a job as a manager in the manufacturing sector and the remainder will work as normal skilled labourers in either sector. The term 'bonus' is used for payment to managers in order to distinguish it from payment to labourers (i.e. their wage).

The time sequence and information structure of the model is as follows. Initially, each of the  $N$  firms announce a bonus,  $b_z$ , for a manager. Subsequently, highly skilled workers decide where to apply while observing the vector of announced bonuses,  $\mathbf{b} = \{b_z\}$ . The collection of probabilities that a manager will apply to firm  $z$  is denoted as  $\alpha_z(\mathbf{b})$ .<sup>5</sup> Finally, the  $M$  firms that successfully attracted an applicant will produce and sell their goods in the market. Firms that fail to attract managers will not produce. Unmatched highly skilled workers and all other normal skilled workers will be employed in the manufacturing sector or numeraire sector and earn a regular wage.

The strategy of each firm  $z$  consists of announcing a bonus and choosing output. The collection of all agents' strategies is a vector of application probabilities  $\mathbf{a}(\mathbf{b}) = \{\alpha_z(\mathbf{b})\}$ . If all highly skilled workers use the same strategy, the number of workers applying as managers to firm  $z$  is given by:

$$\lambda_z = \alpha_z(\mathbf{b})H . \quad (9)$$

Now we will be interested in the limiting case when  $N$  and  $H$  become very large but the ratio  $\theta$  is still finite. Since we implement the condition that a manufacturing firm will only produce if it hires a manager, the probability that it receives at least one applicant is important. This probability is  $1 - (1 - \alpha_z)^H$  and converges to:

$$1 - Pr(\lambda_z = 0) = 1 - (1 - \alpha_z)^H \rightarrow 1 - e^{-\alpha_z H} = 1 - e^{-\lambda_z} , \quad (10)$$

if  $H$  and  $N$  are large. A firm's expected profit net of payment to a manager is:

$$E(\pi_z^{net}) = (1 - e^{-\lambda_z})(\pi_z - b_z) , \quad (11)$$

---

<sup>5</sup> The parameter  $\alpha$  contains all factors which influence the application of a highly skilled worker except for its payment. Thus, the higher the bonus  $b$  and  $\alpha$ , the higher the probability a highly skilled worker will apply.

the probability that at least one applicant applies multiplied by the net profit of producing one unit of good  $z$ , where  $b_z$  donates the bonus paid to a manager.<sup>6</sup>

Accordingly, the probability that an applicant is hired by a firm  $z$  is the product of the probability that it receives at least one applicant and the probability that an applicant is selected to be a manager.<sup>7</sup> Hence, from the perspective of an applicant the probability to get hired from a single firm  $z$  is:

$$\Pr(\text{hired}) = h(\lambda_z) = \frac{1 - (1 - \alpha_z)^H}{\alpha_z H} \rightarrow \frac{1 - e^{-\lambda_z}}{\lambda_z} . \quad (12)$$

Consequently, if a high skilled worker applies to firm  $z$ , his or her expected bonus is given by:

$$V_z = b_z h(\lambda_z) . \quad (13)$$

Given the relationships between  $\lambda_z$  and  $b_z$ , it is now possible to solve for the equilibrium of the wage-posting game by determining the firms' optimal bonus offers. For the solution to the entire sub-game perfect monopolistic competitive equilibrium (SPMCE), we refer to the paper of Chisik and Emami Namini (2015). At this stage, let us take the solutions as given to show the aim in the study at hand regarding how trade liberalisation affects the derived equilibrium bonus.

Chisik and Emami Namini (2015) show that in the unique symmetric SPMCE all firms offer an identical bonus (i)  $b_E = \frac{\pi_E \lambda_E}{e^{\lambda_E} - 1}$ , the single highly skilled worker's expected bonus results as (ii)  $V_E = \pi_E e^{-\lambda_E}$ , profits in simplified form of each operating firm are given by (iii)  $\pi_E = \frac{\alpha I_E}{M_E \sigma}$ , expected profits of each firm net of bonus payments are given by (iv)  $E(\pi_E^{net}) = [1 - (1 + \lambda_E)e^{-\lambda_E}] \pi_E$ , national income is (v)  $I_E = \frac{\sigma}{\sigma - \alpha} (L - M_E)$ , and the number of producing firms are (vi)  $M_E = H \frac{1 - e^{-\lambda_E}}{\lambda_E} = N(1 - e^{-\lambda_E})$ .<sup>8</sup>

For this paper, we pay particular attention to the relation between the bonus (i)  $b_E$  paid to managers and the profit of each operating firm (iii)  $\pi_E$  in equilibrium. It can be seen that bonus payments to a manager increase with profits. In addition, we see that firms' profit is a

<sup>6</sup> The equilibrium bonus  $b_z$ , that maximizes  $E(\pi_z^{net})$  is shown below.

<sup>7</sup> We already know that the total amount of applicants to firm  $z$  is  $\alpha_z H$ , thus the probability that one manger is the chosen one is  $\frac{1}{\alpha_z H}$ .

<sup>8</sup> The subscript  $E$  indicates all solutions in equilibrium.

---

function of total income  $I$  and the number of  $M$  firms offering their varieties to the domestic market. If we allow for international trade, the equilibrium profit  $\pi_E$  can be derived as follows:

$$\pi_E^{trade} = \frac{\alpha(I_h + I_f)}{(M_h + M_f)\sigma}, \quad (14)$$

with  $I_h$  as the total income of the home country and  $I_f$  as the additional income from foreign households. Thus,  $M_h$  donates all home firms offering to the home market and  $M_f$  all foreign firms additionally offering their products to the home market.

Hence, trade liberalisation has two effects on the compensation to managers: (a) additional profit opportunities abroad occur because total income increases since additional income from foreign households  $I_f$  will be added ( $I_h$  is unaffected). Therefore, additional demand increases sales of home firms and eventually their exports; and (b) the number of firms offering to the home market increases, since foreign firms import their products to home or even invest at home by establishing production facilities, leading to a decrease of home firms' profits. The former effect implies an increase in factor market competition while the latter effect implies an increase in competition intensity in goods markets.<sup>9</sup>

However, both effects influence CEO compensation in opposite directions. On one hand, the export opportunities cause an increase in profits, thus positively affecting CEO compensation. Moreover, the additional profit opportunities intensify competition in factor markets since firms enter in a process of outbidding for the best management talent as shown by Emami Namini et al. (2012).<sup>10</sup> On the other hand, the increase in goods market competition negatively affects profits, and finally leads to a lower bonus paid to managers.

The model shows that the overall effect of trade liberalisation on the compensation for managers is ambiguous. However, a clear effect of exports and imports on CEO compensation can be deducted from the model in order to formulate hypotheses.

---

<sup>9</sup> In this context it is important to note two aspects: First, for simplicity the model at hand assumes that labour is the only factor of production. Thus, the effect of factor market competition on wages and bonus payments is eliminated, as the wage is kept equal to one and the bonus payment is pinned down by firm profits. Second, the model assumes that all firms export, thus we ignore the effects that result if only the most skilled labour intensive firms export and, thus, increase competition for the highly skilled workers, raising their bonus payments (see Emami Namini et al., 2012).

<sup>10</sup> Even though this mechanism is not incorporated in the model as explained above, in the further course of this study an increase in factor markets is assumed.

---

## 4. Hypotheses

As demonstrated by the theoretical framework, a clear hypothesis about the effect of increasing competition induced by trade liberalisation on CEO compensation can be defined. The theoretical model suggests that factor market competition and additional profit opportunities, indicated by the amount of exports, have a positive effect on CEO compensation while imports, reflecting competition in goods markets, negatively affect CEO compensation. Taking these effects into consideration, two hypotheses are formulated.

First, it is expected that CEO compensation (bonus payment) increases significantly with additional profit opportunities and factor market competition measured by sector specific exports (H1).

Second, it is expected that CEO compensation (bonus payment) decreases significantly with goods market competition measured by sector specific imports (H2).

## 5. Data Description

This section describes the data needed to investigate the relation between market competition induced by trade liberalisation and CEO compensation. The dependent variable CEO compensation is explained first, followed by the measure for competition and trade liberalisation. Additionally, data for all control variables is presented. The section closes with a data summary to give a statistical overview about the dataset.

### 5.1. CEO Compensation

The CEO compensation data for this study is derived from the Compustat Capital IQ People Intelligence database<sup>11</sup> and exists for the years 2002 until 2014. The data for total CEO compensation consist of base salary, bonuses, and all other forms of remuneration, denoted in current prices.<sup>12</sup> The data can be considered as valid and reliable since it is taken directly from financial statements.

The dataset comprises all German publicly listed manufacturing companies according to the Standard Industry Classification (20 to 39 of two-digit SIC codes) for which compensation data are available. Companies with less than two CEO compensation observations are taken

---

<sup>11</sup> [https://wrds-web.wharton.upenn.edu/wrds/query\\_forms/navigation.cfm?navId=63](https://wrds-web.wharton.upenn.edu/wrds/query_forms/navigation.cfm?navId=63).

<sup>12</sup> Further elements of the total CEO compensation according to the database Compustat are restricted stock grants, options granted, and long-term incentive plan pay outs, among others.



---

out of the dataset. In total, a maximum of 952 company-year observations of 205 individual CEO's from 123 different companies are obtained. Since all companies are classified within 72 different SIC sectors, an industry based average of CEO compensations is not applicable. On one hand, this study does not take an industry-year level approach because it would strongly decrease the number of observations and some sectors do not consist of more than one firm. On the other hand, differences in firm as well as CEO characteristics within industries would lead to immense bias. Therefore, this study will be conducted on an individual CEO compensation and year basis.

## **5.2. Competition and Trade Liberalization**

As already discussed in the theoretical framework, the amounts of imports and exports will serve as proxies for increased competition in factor markets and for increased competition in goods markets, respectively. To obtain accurate estimators, it is important to assign the amounts of imports and exports to each specific industry in which the company and respective CEO is active.

Since firms' specific industry activity has to be identified according to SIC codes but trading data for Germany can only be derived for SITC (Standard International Trade Classification) codes, it is necessary to manually match similar industries and products. The Orbis database<sup>13</sup> is used to identify the primary SIC codes of the companies in this study. This financial database contains extensive information about companies worldwide. The primary SIC code serves as the identifier for the main products produced by each company. In addition, the SIC codes on industry level have to be converted to SITC codes on product level. This has also been done manually since no converting tables exist for this specific case. Therefore, all appropriate SITC codes for each company have to be chosen out of the entire product code list of the United Nations Statistical Division<sup>14</sup>. The self-developed converting table from industry to product codes for all companies with detailed product description can be found in the Appendix (Table 1). Finally, import and export data in current U.S. dollar prices for SITC codes are derived from the OECD Trade Statistics<sup>15</sup>. For firms produce more than one product group, imports and exports of all corresponding SITC codes for each company are cumulated. The described method aims to generate an accurate indicator of market competition for each company (and respective CEO) and reflects the intensity of trade liberalisation.

---

<sup>13</sup> <https://orbis.bvdinfo.com/version-201689/home.serv?product=orbisneo&loginfromcontext=ipaddress>.

<sup>14</sup> <http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=14>.

<sup>15</sup> [http://www.oecd-ilibrary.org/trade/data/international-trade-by-commodity-statistics\\_its-data-en](http://www.oecd-ilibrary.org/trade/data/international-trade-by-commodity-statistics_its-data-en).

---

### 5.3. Control Variables

Data that serves for control variables can be separated into the three subgroups: firm characteristics, individual CEO characteristics, and macro data. First, total assets, total sales, earnings before interest and taxes (EBIT), and the number of employees are used to control for differences in firm characteristics. This data is derived from the Compustat Global Fundamentals Annual database<sup>16</sup> which contains extensive data about financial statements. Second, the variables tenure, age, and gender reflect differences in CEO characteristics. This data is retrieved from the Compustat Capital IQ People Intelligence database<sup>17</sup>. This data source can be considered to be valid since the data comes directly from the financial statements of the corresponding companies. The variable gender is taken out of the regression since only one CEO of the entire dataset is female. Finally, GDP in current prices and also GDP per capita of Germany are used as typical variables to control for the general economic situation of Germany. Furthermore, the average of GDP in current prices of the European Union (without Germany), the United States, and China, representing 72 % of Germany's imports and exports, controls for the economic performance of Germany's most important trading partners (WTO Country Profile). All macro data is derived from the OECD statistics database<sup>18</sup>. The motivation for choosing these particular variables and the expected effect of each control variable on CEO compensation will be discussed in part 6 of this paper.

### 5.4. Data summary

Table 2 summarizes the data on CEO compensation of this sample by listing the three most important elements of CEO compensation. It can be seen that the dependent variable total compensation varies significantly in level and composition. As a consequence, total CEO compensation and the three main elements are not distributed normally.<sup>19</sup> The maximum amount of yearly total compensation is 18.3 million U.S. dollars, received by the CEO of Volkswagen AG. On average, a CEO in this dataset earns over 1.6 million U.S. dollars yearly. Only two CEO observations have a negative value for the element 'all other compensations', however this should not lead to problems regarding parameter estimation since the total compensation is positive for all CEOs. Finally, the variation of bonus payments is notably much higher than that of total salaries.

---

<sup>16</sup> <https://wrds-web.wharton.upenn.edu/wrds/ds/comp/gfunda/index.cfm?navId=74>.

<sup>17</sup> [https://wrds-web.wharton.upenn.edu/wrds/query\\_forms/navigation.cfm?navId=63](https://wrds-web.wharton.upenn.edu/wrds/query_forms/navigation.cfm?navId=63).

<sup>18</sup> <http://stats.oecd.org/Index.aspx?DatasetCode=HS1988>.

<sup>19</sup> The histogram for the variable total CEO compensation has a strong skewed right distribution.

**Table 2: Summary Statistics CEO Compensation**

Variable	Mean	Standard Deviation	Min.	Max.	Observations
Total Compensation	1.661.012	2.304.226	1.765	18.300.000	952
Salary	533.893	433.683	0	3.200.000	869
Bonus	731.509	1.096.105	0	11.040.000	814
All Other Compensations	242.444	482.571	-1.671.000	6.575.800	654

A statistical summary of CEO and firm characteristics is presented in table 3. The age of all CEOs in this dataset is normally distributed with 34 years for the youngest and 74 years for the oldest CEO. The average age is 53 years. The average tenure for a CEO in this dataset is around 7.6 years. The distribution of the values for CEO tenure is skewed right, reflecting the fact that only a small number of CEOs have a longer tenure.

**Table 3: Summary Statistics CEO and Firm Characteristics**

Variable	Mean	Standard Deviation	Min.	Max.	Observations
Age	53,2352	7,2007	34	74	706
Tenure	7,6187	6,1816	0	41	779
Total assets (in million)	11.147	33.105	3	351.209	952
Sales (in million)	8.479	22.905	0	202.458	944
EBIT (in million)	652	1.785	-1.511	13.518	951
Employees	37.400	84.027	1	574.127	739

Furthermore, the summary statistics show that companies differ strongly in firm specific characteristics. Whereas the smallest firm had a value of total assets of 3 million U.S. dollar, Volkswagen AG possessed assets worth over 351 billion U.S. dollars in 2014. The automobile enterprise also achieved peak values of sales and number of employees in 2014, and its highest EBIT in 2011. Values of employees range from a minimum number of 1 employee to a maximum of over 574 thousand employees, demonstrating strong differences among firms in this dataset.

---

**Table 4: Summary Dataset**

Number of companies	123		
Number of CEO's	205		
Number of SIC codes	72		
Number of SITC codes	93		
	Mean	Min.	Max.
CEO-year observations per company	7,7561	2	24

---

Table 3 summarizes the number of observations for the different dimensions. In total, the dataset consists of 205 different CEOs from 123 companies. The number of CEOs exceeds the number of firms since it is possible that companies have replaced their CEO over the sample period of 12 years. Firms are active in 72 different manufacturing industries. All primary industry codes are converted to 93 different product groups. It is important to notice that the number of CEO-year observations for each firm varies, leading to an unbalanced panel. For 12 firms only 2 observations are available. The highest number of 24 observations could be obtained for Bayer AG since CEO information for all 12 years and for both CEOs in charge is available. On average, firms have 7.7 CEO-year observations reflecting missing observations within a company's time series.

## 6. Empirical Strategy

This study aims to estimate a panel regression equation relating CEO compensation to the presented competition indicators and control variables. In its most general form, the model specification of interest is:

$$\ln CEO_{comp_{it}} = \ln Imp_{kt} + \ln Exp_{kt} + X_{ijkt} + Y_{jt} + Z_t + \delta_i + \gamma_t + \varepsilon_{it} \quad (15)$$

where total CEO compensation is the dependent variable for each CEO  $i$  in year  $t$ . The variables of interest  $Imp_{kt}$  and  $Exp_{kt}$  are imports and exports across product group  $k$  and year  $t$ . The matrix  $X$  contains all CEO specific control variables for each CEO  $i$  of company  $j$  in product sector  $k$  for year  $t$ , while  $Y_{jt}$  captures all firm specific characteristics for company  $j$  in year  $t$ .

---

Finally,  $Z_t$  controls for macroeconomic factors.<sup>20</sup> The element  $\delta_i$  denotes CEO fixed-effects while  $\gamma_t$  are time fixed-effects in order to capture time invariant differences in compensation between individual CEO's. The error term  $\varepsilon_{it}$  captures everything that is not included in the regression.

The CEO specific characteristics ( $X$ ) *Tenure* and *Age* are included in the regression to capture differences in human capital, which could be an important factor to explain variations in CEO compensation. Alexander and Zhou (1995) argue that the expected impact of how long an executive has been with the current firm is uncertain. On one hand, it is possible that compensation increases with the time an executive works for a firm. They argue that a manager accumulates more firm-specific capital the longer he or she has been with the firm, thus increasing productivity and hence salary. On the other hand, the accumulation of firm-specific capital might restrict the managers' mobility, resulting in a reduction of his or her marketability in alternative employment opportunities. Furthermore, they anticipate that if an executive already has been in the position of a CEO, earnings are likely to be greater the longer he or she has been in this position. Dechow and Sloan (1991) and Gibbons and Murphy (1992) also confirm in their studies that CEO tenure affects incentive provisions to CEOs. However, Marin (2009) finds that the number of years in office does not increase executive compensation. In the study at hand, *Tenure* measures only the years a CEO has been working for the company and does not control for the period actually being in the position of a CEO. As such, the measure does not reflect CEOs' previous experience with other firms. However, *Age* might control for total working experience, anticipating that experience increases with age. The study of Dechow and Sloan (1991) also points in this direction by arguing that CEOs face even greater incentives to increase their earnings in the later years of their career because executive retirement benefits are based on the compensation received in executives' final years.

Firm characteristics ( $Y$ ) are composed of variables to control for the performance and size of a firm. Hence, *Sales* and *EBIT* control for the performance of a firm. It stands to reason that the more successful a company is, the higher the compensation to each CEO. Jensen and Murphy (1990) support this assertion by finding empirical evidence that CEO compensation rises with

---

<sup>20</sup> All macroeconomic factors will be incorporated in the model without time fixed-effects. However, when the model also controls for time fixed-effects, all macro variables are removed from the regression since they are the same for each observation in a given year. Consequently, the macro variables are perfectly collinear with the time-fixed effects and thus have to be omitted.

---

a company's earnings. In addition, bonus payments are usually linked to company performance indicators such as sales and profits.

*Total Assets* and the number of *Employees* account for the size of a firm. It can be assumed that the more employees working at a firm and the higher the value of assets owned by a company, the bigger is the firm. Murphy (1999) and Lee (2009) predict in their studies that levels of pay are higher in larger firms, because larger firms generally have greater financial resources to support higher salaries.

The macro variables control for demand differences that may also influence executive compensation indirectly because they affect firm profitability (Alexander and Zhou 1995). Consequently, the sign for all three macro variables *GDP\_ger*, *GDPavg\_tp*, and *GDPpc\_ger* is expected to be positive.

Total CEO compensation and all independent variables are transformed to a logarithm. This approach is appropriate because the variables are substantially skewed (see section 4. Data Description). The skewness is accounted for by taking the natural logarithm to achieve a more normal distribution of the variables. In addition, interpretation of the regression results becomes clearer since coefficients can be translated directly as elasticities.

The variables of interests, all firm characteristics and macroeconomic control variables are lagged for one year since effects on CEO compensation are assumed to be time-delayed. Thus, it is expected that CEO compensation adjusts to changes in market competition, represented by variations in imports and exports, one year after the change has occurred. The same holds for all control variables accounting for firm size and performance as well as economic trends. This approach requires that contracts of CEOs are adjusted annually. In reality this assumption might give ground for concerns since contracts are usually not flexibly adaptable and transaction costs are involved in contract amendments. However, at this stage the difference between individual elements of total compensation becomes important. Salary can be characterized as more difficult to adjust yearly whereas bonus payments are considered as incentive pay and thus directly or indirectly linked to the variables in question.

All panel data regressions will be estimated with robust standard errors accounting for heteroskedasticity and autocorrelation. As the pooled panel technique assumes similarity between CEOs and their companies, all regressions allow for CEO fixed cross-section effects

---

in the estimation.<sup>21</sup> In addition, all regressions will be estimated with time-fixed effects. To check for the robustness of the import and export coefficients and also for the expected sign and significance of control variables, all regressions will be performed with the modification of incorporating different control variables.

## **7. Results**

This section presents the empirical results of this study. First, several regressions with the dependent variable total CEO compensation are estimated to find evidence for the two hypotheses that CEO compensation increases with exports (H1) and decreases with imports (H2). Second, the same regressions will be conducted with the compensation element bonus as the dependent variable. Subsequently, the main regressions will be modified in order to account for the multicollinearity problem as well as for assumed outliers and heterogeneity of the dataset. These modifications aim to check robustness of the initial results.

### **7.1. Total CEO Compensation**

The results of the panel data estimations with CEO fixed-effects are summarized in Table 5. From model 1 to 5, the regressions are estimated by gradually incorporating more control variables. Model 1 contains only the variables of interest, whereas the following models incorporate CEO characteristics, firm size variables, firm performance indicators, and macro variables, respectively.

In model 1, the number of exports significantly affects total CEO compensation at the 10 per cent significance level. Since elasticities are observed, the result suggests that a one percent increase in the amount of exports is associated with an increase of 0.47 percent in total CEO compensation, holding all other variables constant. This finding supports the hypothesis that total CEO compensation increases with factor market competition induced by trade liberalisation. However, the result is not robust since the estimated coefficient of exports loses its significance as soon as control variables are incorporated in the model. Additionally, the effect becomes negative in model 5 and 6. Furthermore, it can be noticed that the coefficients of the import variable are insignificant in every model. Thus, the estimations suggest that the

---

<sup>21</sup> The use of OLS estimators is not appropriate since the OLS regressions show that coefficient signs change significantly between OLS and fixed-effects regressions. This implies that unknown CEO and company specific characteristics matter.

competition indicators chosen do not affect total CEO compensation significantly in this sample.

**Table 5: CEO fixed-effects Regressions – Total CEO Compensation**

Dependent Variable					
Total CEO Compensation	(1)	(2)	(3)	(4)	(5)
logImports(-1)	-0.260 (0.286)	-0.442 (0.282)	-0.369 (0.301)	-0.056 (0.186)	-0.046 (0.193)
logExports(-1)	0.467 <sup>*</sup> (0.260)	0.155 (0.248)	0.084 (0.257)	-0.214 (0.214)	-0.040 (0.234)
logAge		2.145 (1.533)	1.307 (2.212)	3.198 <sup>**</sup> (1.269)	11.937 <sup>**</sup> (4.748)
logTenure		0.191 (0.146)	0.256 (0.178)	0.141 (0.108)	0.119 (0.105)
logAssets(-1)			0.216 <sup>*</sup> (0.123)	-0.002 (0.207)	-0.017 (0.205)
logEmployees(-1)			-0.142 (0.220)	-0.175 (0.193)	-0.233 (0.195)
logEBIT(-1)				0.108 <sup>**</sup> (0.053)	0.112 <sup>**</sup> (0.051)
logSales(-1)				0.068 (0.220)	0.184 (0.225)
logGDP_GER(-1)					-3.291 (2.280)
logGDPavg_TP(-1)					-2.073 (1.529)
logGDPpc_GER(-1)					2.452 (2.843)
CEO fixed-effects	Yes	Yes	Yes	Yes	Yes
Time fixed-effects	No	No	No	No	No
Number of Observations	732	531	451	390	390
Number of Groups <sup>°</sup>	176	116	108	100	100
R-squared	0.01	0.10	0.10	0.22	0.25

Standard errors in parentheses.

\*Significant at 10%; \*\*Significant at 5%; \*\*\*Significant at 1%.

<sup>°</sup> Refers to the number of different CEOs observed in the corresponding regression.

As predicted, the effects of imports and exports appear to influence total CEO compensation in opposite directions. The coefficients for imports repeatedly have a negative sign, indicating that total CEO compensation decreases with an increase of competition in goods markets. On the contrary, intense competition in factor markets tends to increase CEO compensation, indicated by the positive sign for most export coefficients. This finding seems to comply with the model presented in 3.3. However, the coefficient estimates for exports change substantially with the number of control variables, suggesting that the estimated parameters



---

are not robust. Overall, the estimators are not significant and thus cannot be interpreted accurately.

At first glance, the estimated coefficients of some control variables indicate unexpected results and fail to be continuously significant. However, the age of the CEO seems to significantly increase total compensation in model 4 and 5 at the 5 per cent significance level. The coefficient estimate for *Age* in model 5 indicates that a one percent increase in the age of a CEO is associated with a 11.94 percent increase in total CEO compensation, holding all other variables constant. This finding is in line with Dechow and Sloan (1991) and suggests that CEOs face even greater incentives to increase their earning in their late years. Intuitively, it shows that working experience positively affects total CEO compensation.

Furthermore, the coefficient estimate of the performance variable *EBIT* suggests that higher company earnings significantly increase CEO compensation. In model 5, the coefficient estimate is statistically significant at the 5 per cent level, indicating that a one percent increase in the company's earnings is associated with a 0.11 percent rise in total CEO compensation. This result coincides with Jensen and Murphy (1990) and supports the evidence that compensation is positively linked to performance-based indicators.

In model 3, total assets of a firm are positively associated with total CEO compensation at the 10 per cent significance level. Consistent with most literature, this result confirms that CEO compensation is usually higher in larger firms. However, this finding loses its relevance by incorporating performance and macro variables. The number of employees, also accounting for the size of a firm, is insignificant in all models. Thus, it seems that the size of a firm does not affect CEO compensation significantly over this sample in the performed specifications.

Additional regressions performed with time fixed-effects are presented in table 6. Apart from the fact that the estimations yield similar results to the model without time fixed-effects, it is worth pointing out that the variable *Exports* loses its only significance in model 1. This strengthens the conclusion that the only significant finding for this key variable of interest is not robust to changes in model specification and estimation technique.

**Table 6: CEO fixed-effects + time fixed-effects Regressions – Total CEO Compensation**

Dependent Variable				
Total CEO Compensation	(1)	(2)	(3)	(4)
logImports(-1)	-0.313 (0.272)	-0.382 (0.261)	-0.283 (0.262)	-0.078 (0.195)
logExports(-1)	0.338 (0.292)	0.260 (0.360)	0.213 (0.382)	-0.136 (0.232)
logAge		14.592 (9.089)	15.087 (10.871)	11.102 <sup>**</sup> (5.139)
logTenure		0.121 (0.139)	0.193 (0.162)	0.075 (0.099)
logAssets(-1)			0.305 <sup>***</sup> (0.147)	0.006 (0.200)
logEmployees(-1)			-0.193 (0.166)	-0.215 (0.199)
logEBIT(-1)				0.088 <sup>*</sup> (0.053)
logSales(-1)				0.221 (0.221)
CEO fixed-effects	Yes	Yes	Yes	Yes
Time fixed-effects	Yes	Yes	Yes	Yes
Number of Observations	732	531	451	390
Number of Groups <sup>°</sup>	176	116	108	100
R-squared	0.09	0.15	0.15	0.30

Standard errors in parentheses.

\*Significant at 10%; \*\*Significant at 5%; \*\*\*Significant at 1%.

<sup>°</sup> Refers to the number of different CEOs observed in the corresponding regression.

In summary, the results fail to provide convincing evidence that exports and imports significantly affect CEO compensation. However, the outcome supports the a priori hypothesis that there is a negative relation between imports and CEO compensation, while the predicted positive relation between exports and CEO compensation cannot be supported in all models.

## 7.2. Incentive Pay: Bonus

In this part of the study, the same regressions outlined in 7.1 will be estimated with the compensation element bonus as the dependent variable. All regression results are presented in table 7.

**Table 7: CEO fixed-effects Regressions – Bonus**

Dependent Variable	(1)	(2)	(3)	(4)	(5)
Bonus					
logImports(-1)	-0.019 (0.390)	0.217 (0.422)	0.308 (0.424)	0.353 (0.341)	0.320 (0.368)
logExports(-1)	-0.216 (0.344)	-0.584 (0.404)	-0.719 <sup>*</sup> (0.406)	-0.794 <sup>*</sup> (0.430)	-0.398 (0.404)
logAge		0.743 (2.107)	1.279 (2.351)	2.006 (3.067)	16.450 (13.327)
logTenure		0.200 (0.195)	0.148 (0.195)	0.070 (0.206)	0.050 (0.200)
logAssets(-1)			0.248 (0.233)	-0.008 (0.379)	-0.047 (0.310)
logEmployees(-1)			-0.183 (0.204)	-0.003 (0.331)	-0.085 (0.294)
logEBIT(-1)				0.102 (0.130)	0.124 (0.118)
logSales(-1)				-0.001 (0.388)	0.213 (0.381)
logGDP_GER(-1)					-6.370 <sup>*</sup> (3.818)
logGDPavg_TP(-1)					-2.931 (3.413)
logGDPpc_GER(-1)					3.174 (4.320)
CEO fixed-effects	Yes	Yes	Yes	Yes	Yes
Time fixed-effects	No	No	No	No	No
Number of Observations	550	435	385	343	343
Number of Groups <sup>°</sup>	144	106	98	91	91
R-squared	0.01	0.03	0.05	0.05	0.10

Standard errors in parentheses.

\*Significant at 10%; \*\*Significant at 5%; \*\*\*Significant at 1%.

<sup>°</sup> Refers to the number of different CEOs observed in the corresponding regression.

Evidently, most signs of the estimates of interest change in comparison to the previous results. This might be an indication that more flexible elements of compensation react differently to competition intensity compared to the more rigid elements of total CEO compensation. This finding is in line with Cuñat and Guadalupe (2008), who suggest that competition has an impact on the distribution of fixed and variable components of CEO earnings. Model 3 and 4 indicate that bonus payments are negatively associated with export volumes, and these results are statistically significant at the 10 per cent level. Model 4 suggests that a one percent increase in export intensity is related to a 0.79 percent decrease in bonus payment to CEOs. Thus, according to model 3 and 4 the hypothesis that competition in factor markets increases bonus payments to CEOs cannot be supported. A possible interpretation of this result could be

---

explained with a mechanism beyond the model presented in 3.3. Hence, exports increase the domestic wage level and thus firms' per-unit costs. However, this has an opposite effect on bonuses paid to managers because the rising wage level set firms under cost pressure at the expense of bonus payments to CEOs. Nevertheless, this result is not robust throughout all models and loses its significance entirely when time-fixed effects are used (see table 8 in the appendix). The results also suggest a positive effect of goods market competition on CEO bonus payments, conflicting with the prior hypothesis. A possible interpretation of this outcome might be that bonus payments function as incentive pay to managers in the situation of intensive market competition, intending to encourage decision-makers to reduce costs. This outcome coincides with Scharfstein (1988) and Raith (2003) arguing that market competition and incentive compensation are complements.

Furthermore, the effect of *Age* on bonus payments is not significant in any model, indicating that experience of CEOs is less relevant for bonus payments. This is a reasonable outcome, since bonus payments are more likely to be performance-based and only basic salary usually increases with working experience. Surprisingly, bonus payments seem not to be significantly related to the performance measures *EBIT* or *Sales*.

Finally, it is striking that bonus payments are negatively associated with German GDP at the 10 per cent significance level. However, it is possible that contrary to the general economic trend, bonus payments to top managers increase.<sup>22</sup>

Overall, the results fail to provide evidence that supports the a priori hypotheses that competition in factor markets measured by exports leads to higher bonus payments to CEOs and competition in goods markets measured by imports causes falling bonus payments. The outcome even shows opposite signs as initially predicted. Moreover, all estimated coefficients lose their significance when using time-fixed effects.

### **7.3. Multicollinearity**

The correlation matrix (see Appendix Table 9) shows that multicollinearity is likely to be a problem in the full model (model 5). In particular, strong collinearity among the variables that are accounting for firm characteristics can be observed. The performance variables *EBIT* and *Sales* as well as the size variables *Assets* and *Employees* are highly correlated with each other. In addition, correlation is also determined between performance and size variables, suggesting

---

<sup>22</sup> We have to be careful with this interpretation since German GDP per capita has the opposite sign in the same regression but actually measures the same as German GDP. However, by removing GDP per capita from this regression, the sign remains negative but the coefficient estimate for *GDP\_ger* becomes insignificant.

---

that larger firms have higher sales and profits. In general, a high correlation among predictor variables leads to unreliable estimates of regression results.

Arguing that profits and sales are likely to be collinear in their paper, Ciscel and Carroll (1980) develop an empirical strategy to overcome this multicollinearity problem. The study at hand follows a modified version of this strategy, also used by Alexander and Zhou (1995) in their regression on executive compensation. First, the variable *EBIT* will be regressed on *Sales* and the competition indicators *Imports* and *Exports*. The residuals of this auxiliary regression are used as an explanatory variable. The new variable *Profits(residuals)* can be interpreted as profits realized only through cost reductions and is therefore uncorrelated with sales and the competition indicators (Donald and Zhou, 1995). Second, to eliminate any potential collinearity between firm size and sales, the variable *Sales* will be regressed on *Assets* and *Employees* to obtain the new variable *Sales(residuals)*. Intuitively, this variable is interpreted as a firm's achieved sales resulting from factors other than firm size.

To account for the collinearity between macro variables, the average GDP of the largest trading partners and the GDP per capita of Germany are simply removed from the regression.

Table 10 summarises the results of the modified regression for total CEO compensation as the dependent variable. However, there are no substantial changes in the coefficient estimates for the variables of interest compared to the results of the main specification. All coefficient estimates for exports and imports are insignificant and do not seem to be robust throughout the different models, making an interpretation of the effect of competition on total CEO compensation difficult.

However, the coefficient estimates for the new variable *Profits(residuals)* are positively associated with CEO compensation at least at the 10 per cent significance level in all regressions that additionally account for time fixed-effects. For example, model 5 shows that a one percent increase in profits resulting from any cost reduction leads to a 0.09 percent rise in CEO compensation. Evidently, the results for *Profits(residuals)* are also consistent without time fixed-effects.

For the variable *Sales(residuals)* the regression output shows that as soon as time fixed-effects are used, the coefficient estimates become significant at the 10 and the 5 per cent level. Thus, model 6 suggests that a one percent rise of sales resulting from factors other than the mere size of the firm is associated with an increase in total CEO compensation of 0.25 percent. However, the effect of sales on total CEO compensation does not remain significant when the model is estimated without time fixed-effects.

---

As in the previous main specification, the age of a CEO positively affects total CEO compensation over all models at least at the 5 percentage significance level.

In addition, results for the modified model with managerial bonus as the dependent variable do not show significant changes to previous estimations, therefore not contributing new insights to this study (see table 11 in appendix).

#### **7.4. Robustness**

To check whether previous results are robust, the main model will be estimated again by dropping particular observations. Considering the difficulties that could arise to measure competition with the amount of imports and exports of specific product groups, it might be useful to drop outlying values.<sup>23</sup> This approach could ensure that the dataset, and respectively the companies and its industries, become more homogeneous. These dropped values should not be necessarily considered as outliers, but rather as values that might contain measurement errors or as values of product groups that hamper the analysis at hand.

A scatter plot illustrating the relation between exports and total CEO compensation shows that some export values lie well away from the fitted values (see Appendix). Accordingly, all export values above the natural logarithm of 25.7 and below 18 will be dropped from the dataset. The upper limit excludes all observations in the automotive industry, which includes precisely 33 CEO observations from BMW, Daimler, Porsche and Volkswagen. This might be appropriate since the high exports recorded in the automotive industry hamper comparability with the rest of the dataset. Furthermore, the business model of these large automobile companies is focussed on achieving a large market share in total exports. Consequently, an increase in exports would indicate an increase in production rather than an increase in competition intensity.<sup>24</sup> The lower limit excludes one company with 8 CEO observations. Evidently, all observations for this company lie well away from the fitted values.<sup>25</sup>

A scatter plot showing the relation between imports and CEO compensation is also presented in the Appendix. In this case, identification of outliers is more difficult. Moreover, potential outlier observations belong to different companies within different industries. Hence, an exclusion of possible outlier import observations seems not to be appropriate.

---

<sup>23</sup> See section 8 for discussion about these difficulties.

<sup>24</sup> See section 8 for further discussion.

<sup>25</sup> The observations belong to the company K+S AG that is active in the phosphatic fertilizers industry.

---

The results of all regressions for total CEO compensation with excluded observations are presented in Table 12 and 13 in the appendix. The results do not change significantly compared to the model with full data. However, the negative effect of imports on total CEO compensation becomes significant at the 10 per cent level in model 2 and remains significant with time fixed-effects.<sup>26</sup> This is in line with the prior hypothesis that an increase in imports, indicating higher competition intensity in goods markets, leads to an decrease in total CEO compensation. However, this finding is not robust throughout the different model specifications.

Overall, the exclusion of the automotive industry and of the assumed outliers does not affect the results significantly. In general, this study fails to provide evidence to support the initial hypotheses. Nevertheless, this does not necessarily imply that neither goods market nor factor market competition induced by trade liberalisation have no significant effect on total CEO compensation. The empirical outcome will be discussed in the following section.

## **8. Discussion**

This section discusses potential weaknesses of the empirical research at hand. The results should be considered cautiously since the regressions might suffer from weaknesses in data availability and the concept of competition measurement. In addition, this study takes an approach not previously performed in corresponding literature and therefore provides a useful platform for discussion and further research.

It can be assumed that the use of imports and exports as proxies for competition intensity lead to measurement errors. Firstly, the assumption that all companies have a substantial small market share to ensure that trade variables serve as indicators for market competition does not necessarily hold. For example, the dataset includes firms in the automotive industry like Volkswagen, Porsche, BMW, and Daimler. Due to the market structure, these firms are likely to have a large market share on total exports in their specific sector. Although, companies of the automotive industry are removed during the robustness checks, the sample might contain additional firms for which this assumption is violated. However, the assumption is of great importance because without it, increasing exports are more likely to affect a firm's own

---

<sup>26</sup> Although outliers are just identified for export values, the exclusion still influences the effect of imports because both variables are estimated in the same regressions. However, the import values for the automotive industry as well as for the other outlying values have similar positions in both scatter plots.

---

increase in production rather than an increase in competition. Consequently, the measure for competition in factor markets might be biased.<sup>27</sup>

Further, the assumption that all manufacturers have more or less the same degree of internationalization is important to ensure comparability among companies and thus an accurate indicator for competition intensity. However, it is likely that businesses in this dataset differ in their penetration of international markets. Some manufactures are more affected by foreign competition than others, and some also have production facilities outside of Germany. The latter might have the effect that a particular share of imports corresponds to products produced by a home company, reflecting own productions abroad but not competing products.

Moreover, businesses and products differ by nature, exacerbating the already difficult task of comparing companies on a like-for-like basis, and taking imports and exports as accurate proxies for competition across product groups. On one hand, some products in Germany like apparel and accessories are more likely to be imported. This makes imports more appropriate as an indicator for goods market competition compared to using exports as a proxy for factor market competition. On the other hand, some products like pharmaceuticals are likely to be heavily orientated toward exporting since those production facilities are more likely based in Germany. Accordingly, the measurement of competition in factor markets might be more accurate than in goods markets.<sup>28</sup>

Furthermore, measurement errors might have occurred in the process of matching industry sectors with firm specific product codes. Although, this has been done with the utmost of care, it is possible that the allocation of corresponding products is more precise for some companies than for others. As a consequence, the measured imports and exports for the primary product group of each company might partly express a biased indicator for competition.

Finally, issues with data availability and omitted variable bias might also cause biased results. One particular point to mention is that some companies are missing a number of compensation observations, making it even more difficult to provide a liner relationship over time. Furthermore, the highly unbalanced dataset causes problems in panel estimations.

---

<sup>27</sup> From this perspective, the consistency of imports as an indicator for goods market competition might not be affected since a high market share of a home firm on imports is more unlikely.

<sup>28</sup> Provided that the assumption that companies have a substantial small market share holds.



---

## 9. Summary and Conclusion

This paper aimed to analyse the relation between market competition induced by trade liberalisation and CEO compensation. For this purpose, a panel data investigation is conducted over a sample of 205 CEOs from German manufacturing companies, spanning the years from 2002 to 2014. In doing so, this study uses a new approach by distinguishing between competition in goods and factor markets. While imports measure competition in goods markets, exports are used as an indicator for competition intensity in factor markets and additional profit opportunities. Additionally, a general equilibrium model is used to theoretically explain the effect of competition and trade liberalisation on management compensation.

In general, the empirical analysis does not find evidence to support the a priori hypothesis that CEO compensation significantly increases with the amount of exports and significantly decreases with the amount of imports. Some results suggest a significant effect of goods as well as factor market competition on CEO compensation, but these results do not remain significant in robustness tests. Moreover, the magnitude and sign of imports and exports vary between the different models estimated. While this study does not find a clear pattern for the effect of competition intensity on CEO compensation, it still provides two key insights into the relation investigated. First, the results suggest that competition intensity on product and factor markets seems to effect CEO compensation in opposite directions. While imports, which represent competition in goods markets, are mostly associated with a decrease in CEO compensation, competition in factor markets measured by the amount of exports increases CEO compensation. This finding is supported by the theoretical model presented in this study. Second, this result is reversed when the bonus payments are the dependent variable, suggesting that more flexible elements of compensation react differently to competition intensity as rigid elements incorporated in total CEO compensation.

Some previous research can be supported by this empirical analysis. Over the sample, the age of a CEO and the profits of a firm have significant positive effects on CEO compensation. This finding provides further evidence that CEO compensation increases with management experience and performance of a firm. However, in contradiction to most literature, CEO compensation seems to be relatively unaffected by firm size indicators like total assets or the number of employees of a firm. In addition, the sample shows that gender inequality in top management is still an issue since only one female CEO exists over the entire sample.

---

Overall, the results contribute to the social debate of extraordinary high CEO compensations by providing empirical evidence that competition intensity induced by trade liberalisation does not significantly increase CEO compensation. This might be an indication that the high CEO compensation is caused by factors other than increased competition due to international trade. Hence, further research is necessary to the drivers of high CEO compensation.

Moreover, there are a number of issues that cannot be appropriately addressed in this study and that therefore leave room for further research. First, the different effects of goods and factor market competition remain unclear. In order to answer this question, it would be necessary to examine more in depth the mechanisms behind those types of competition and their impact on total CEO compensation and the compensation element bonus payment. Second, the novel approach of using the amount of imports and exports as indicators for competition has produced ambiguous results. For further research, it is recommended to comply with the assumptions made in the discussion section. Third, the outcome of the relations observed is likely to be affected by country and industry differences. For instance, the contract structure of CEO's differs across countries, while cultural differences may drive various behaviour patterns. These are just two factors that might affect the relationship between CEO remuneration and market competition. A cross-country panel investigation might lead to new insights. Another factor that may affect the results is the type of industry. The German manufacturing industry is likely to be mature and rich in tradition. It can be assumed that the effect of competition intensity on CEO compensation is different for younger faster-growing industries or, of course, in sectors other than the manufacturing industry. Finally, this study is done on a relatively weak dataset which is highly unbalanced. Unfortunately, detailed data about CEO compensation is difficult to obtain at present, complicating a comprehensive analysis about the relation in question.

---

## References

- Alexander, D. L., & Zhou, H. (1995). Product-market competition and executive compensation. *Journal of Economics and Business*, 47(5), 441-456.
- Amiti, M., & Davis, D. R. (2012). Trade, firms, and wages: Theory and evidence. *The Review of economic studies*, 79(1), 1-36.
- Baiman, S. (1990). Agency research in managerial accounting: A second look. *Accounting, Organizations and Society*, 15(4), 341-371.
- Bebchuk, L., & Fried, J. M. (2003). Executive compensation as an agency problem. *The Journal of Economic Perspectives*, 17(3), 71-92.
- Bernard, A. B., Jensen, J. B., Redding, S. J., & Schott, P. K. (2007). Firms in international trade. *The Journal of Economic Perspectives*, 21(3), 105-130.
- Bivens, J., Gould, E., Mishel, L. R., & Shierholz, H. (2014). Raising America's Pay: Why It's Our Central Economic Policy Challenge. *Economic Policy Institute*. Briefing Paper 378. Washington.
- Bonner, S. E., & Sprinkle, G. B. (2002). The effects of monetary incentives on effort and task performance: theories, evidence, and a framework for research. *Accounting, Organizations and Society*, 27(4), 303-345.
- Chisik, R., & Emami Namini, J. (2015). International Trade and Labor Market Discrimination. In *Annual Conference 2015 (Muenster): Economic Development-Theory and Policy (No. 113074)*. Working Paper, German Economic Association.
- Ciscel, D. H., & Carroll, T. M. (1980). The determinants of executive salaries: An econometric survey. *The Review of Economics and Statistics*, 61(1), 7-13.
- Cuñat, V., & Guadalupe, M. (2009). Executive compensation and competition in the banking and financial sectors. *Journal of Banking and Finance*, 33(3), 495-504.
- Core, J., & Guay, W. (2002). Estimating the value of employee stock option portfolios and their sensitivities to price and volatility. *Journal of Accounting Research*, 40(3), 613-630.
- Dechow, P. M., & Sloan, R. G. (1991). Executive incentives and the horizon problem: An empirical investigation. *Journal of accounting and Economics*, 14(1), 51-89.

- 
- Dechow, P. M. (2006). Asymmetric sensitivity of CEO cash compensation to stock returns: A discussion. *Journal of Accounting and Economics*, 42(1), 193-202.
- DeFond, M. L., & Park, C. W. (1999). The effect of competition on CEO turnover. *Journal of Accounting and Economics*, 27(1), 35-56.
- Dixit, A. K., & Stiglitz, J. E. (1977). Monopolistic competition and optimum product diversity. *The American Economic Review*, 67(3), 297-308.
- Egger, H., & Kreickemeier, U. (2012). Fairness, trade, and inequality. *Journal of International Economics*, 86(2), 184-196.
- Eisenhardt, K. M. (1989). Agency theory: An assessment and review. *Academy of Management Review*, 14(1), 57-74.
- Emami Namini, J., Facchini, G., & Lopez, R. A. (2012). Export growth and factor market competition.
- Emami Namini, J., Facchini, G., & López, R. A. (2013). Export growth and firm survival. *Economics Letters*, 120(3), 481-486.
- Fee, C. E., & Hadlock, C. J. (2004). Management turnover across the corporate hierarchy. *Journal of Accounting and Economics*, 37(1), 3-38.
- Frydman, C., & Jenter, D. (2010). CEO Compensation. *Annual Review of Financial Economics*, 2010(2), 75-102.
- Gibbons, R., & Murphy, K. J. (1992). Does executive compensation affect investment? *NBER Working Paper*, (w4135).
- Guadalupe, M., & Wulf, J. (2010). The flattening firm and product market competition: The effect of trade liberalization on corporate hierarchies. *American Economic Journal: Applied Economics*, 2(4), 105-127.
- Hart, O. D. (1983). The market mechanism as an incentive scheme. *The Bell Journal of Economics*, 14(2), 366-382.
- Haubrich, J. G. (1994). Risk aversion, performance pay, and the principal-agent problem. *Journal of Political Economy*, 102(2), 258-276.
- Jensen, M. C., & Murphy, K. J. (1990). Performance pay and top-management incentives. *Journal of political economy*, 98(2), 225-264.

- 
- Kaplan, S. N. (2012). Executive compensation and corporate governance in the US: perceptions, facts and challenges. *National Bureau of Economic Research, No. w18395*.
- Karuna, C. (2007). Industry product market competition and managerial incentives. *Journal of Accounting and Economics, 43(2)*, 275-297.
- Lee, J. (2009). Does size matter in firm performance? Evidence from US public firms. *international Journal of the economics of Business, 16(2)*, 189-203.
- Manager Magazin (2015). Faktor 300 - Was Chefs in USA und Deutschland verdienen. Derived on 31/07/2016 from <http://www.manager-magazin.de/unternehmen/karriere/ceos-verdienen-300-mal-so-viel-wie-arbeiter-a-1041409.html>.
- Marciukaityte, D., & Park, J. C. (2009). Market competition and earnings management. *Available at SSRN 1361905*.
- Marin, D. (2009). The battle for talent: globalization and the rise of executive pay. *Bruegel Working Paper, (1)*, February 2009.
- Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica, 71(6)*, 1695-1725.
- Mishel, L. R. & Davis, A. (2015). Top CEOs make 300 Times more than typical Workers. *Economic Policy Institute, Issue Brief 399*, Washington.
- Murphy, K. J. (1999). Executive Compensation. *Handbook of Labor Economics, 3*, 2485-2563.
- Murphy, K. (2012). Executive Compensation: Where We Are, and How We Got There, [in:] G. Constantinides, M. Harris, R. Stulz (ed.), *Handbook of the Economics of Finance*.
- Peters, F. S., & Wagner, A. F. (2014). The executive turnover risk premium. *The Journal of Finance, 69(4)*, 1529-1563.
- Raith, M. (2003). Competition, risk, and managerial incentives. *American Economic Review, 93(4)*, 1425-1436.
- Sanders, W. G., & Carpenter, M. A. (1998). Internationalization and Firm Governance: The Roles of CEO Compensation, Top Team Composition, and Board Structure. *Academy of Management journal, 41(2)*, 158-178.

- 
- Scharfstein, D. (1988). Product-market competition and managerial slack. *The RAND Journal of Economics*, 19(1), 147-155.
- Schmidt, K. M. (1997). Managerial incentives and product market competition. *The Review of Economic Studies*, 64(2), 191-213.
- Schott, P. (2010). US manufacturing exports and imports by SIC or NAICS category and partner country, 1972 to 2005.
- Shaw, K. W., & Zhang, M. H. (2010). Is CEO cash compensation punished for poor firm performance? *The Accounting Review*, 85(3), 1065-1093.
- Sturkenboom, E. (2015). The Effect of Product-Market Competition on CEO Compensation. Master Thesis. Erasmus School of Economics.
- Tybout, J. R. (2003). 'Plant-and Firm-level Evidence on the 'New' Trade Theories, [in:] E. Kwan Choi and James Harrigan, (ed.), *Handbook of International Trade*.
- Valta, P. (2012). Competition and the Cost of Debt. *Journal of Financial Economics*, 105(3), 661-682.

## Appendix

**Table 1: Company Converting Table – From SIC Sector Codes to SITC Product Codes (author’s own compilation)**

Company Name	Number of observations	Sector (primary SIC code)	SIC description	Product (SITC Rev. 3 code)	SITC description
AAP Implantate AG	6	3842	Orthopedic, Prosthetic, and Surgical Appliances and Supplies	7853	Invalid carriages, whether or not motorized or otherwise mechanically propelled
				8996	Orthopaedic appliances
Adidas AG	10	3021	Rubber and Plastics Footwear	8510	Footwear
ADVA Optical Networking SE	11	3861	Photographic equipment and supplies	8810	Photographic apparatus and equipment, n.e.s.
				8820	Photographic and cinematographic supplies
Aixtron SE	10	3674	Semiconductors and Related Devices	7763	Diodes, transistors and similar semiconductor devices; photosensitive semiconductor devices
				7764	Electronic integrated circuits and microassemblies
Alno AG	7	2434	Wood Kitchen Cabinets	82153	Furniture, n.e.s., of wood (kitchen)
Alphaform AG	10	3089	Plastic products, not elsewhere specified	5800	Plastics in non-primary forms
BASF SE	11	2899	Chemicals and chemical preparations, not elsewhere specified manufacturing	5980	Chemical products and preparations
Basler AG	9	3823	Industrial instruments for measurement, display and control of process variables and related products	8710	Optical instruments and apparatus
				8740	Measuring, checking, analysing and controlling instruments and apparatus
Bayer AG	24	2834	Pharmaceutical preparations	5400	Medicinal and pharmaceutical products

Bayerische Motoren Werke AG	9	3711	Motor vehicles and passenger car bodies	7810	Motor cars and other motor vehicles principally designed for the transport of persons
				7820	Motor vehicles for the transport of goods and special-purpose motor vehicles
				7830	Road motor vehicles
				7840	Parts and accessories of the motor vehicles
Beiersdorf AG	10	2844	Perfumes, cosmetics and other toilet preparations	5530	Perfumery, cosmetic or toilet preparations
Bijou Brigitte modische Accessoires AG	9	3911	Jewelry, precious metal	8973	Jewellery of gold, silver or platinum group metals (except watches and watch-cases)
Biotest AG	11	2834	Pharmaceutical preparations	5400	Medicinal and pharmaceutical products
bmp Holding AG	8	2499	Wood products, not elsewhere classified	8215	Furniture of wood
Böwe Systec AG	3	3559	Special industry machinery, not elsewhere classified	7284	Machinery and mechanical appliances specialized for particular industries, n.e.s.
Brenntag AG	6	2899	Chemicals and chemical preparations, not elsewhere specified manufacturing	5980	Chemical products and preparations
Carl Zeiss Meditec AG	10	3827	Optical instruments and lenses	8710	Optical instruments and apparatus
CENTROTEC Sustainable AG	8	3089	Plastic products, not elsewhere specified	5800	Plastics in non-primary forms
co.don AG	12	2834	Pharmaceutical preparations	5400	Medicinal and pharmaceutical products
Continental AG	11	3011	Tires and inner tubes	6250	Rubber tyres, interchangeable tyre treads, tyre flaps and inner tubes for wheels of all kinds
Curasan AG	7	2834	Pharmaceutical preparations	5400	Medicinal and pharmaceutical products



Daimler AG	9	3711	Motor vehicles and passenger car bodies	7810	Motor cars and other motor vehicles principally designed for the transport of persons
				7820	Motor vehicles for the transport of goods and special-purpose motor vehicles
				7830	Road motor vehicles
				7840	Parts and accessories of the motor vehicles
Data Modul AG	11	3577	Computer peripheral equipment, not elsewhere specified	7520	Automatic data-processing machines and units thereof; magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data, n.e.s.
Deutz AG	9	3519	Internal combustion engines, not elsewhere specified	7130	Internal combustion piston engines, and parts thereof
DMG Mori AG	10	3541	Machine tools, metal cutting types	7300	Metalworking machinery
Dragerwerk AG & Co. KGaA	8	3826	Laboratory analytical instruments	7418	Other machinery, plant and similar laboratory equipment
Dürr AG	4	3559	Special industry machinery, not elsewhere classified	7284	Machinery specialized for particular industries
Edel AG	3	3652	Phonograph Records and Prerecorded Audio Tapes and Disks	8980	Musical instruments and parts and accessories thereof; records, tapes and other sound or similar recordings
Einbecker Brauhaus AG	5	2082	Malt beverages	1123	Beer made from malt
ElringKlinger AG	10	3714	Motor vehicle parts and accessories	7840	Parts and accessories of the motor vehicles of groups
Epigenomics AG	9	2834	Pharmaceutical preparations	5400	Medicinal and pharmaceutical products
Evonik Industries AG	3	2899	Chemicals and chemical preparations, not elsewhere specified manufacturing	5980	Chemical products and preparations

Evotec AG	7	2834	Pharmaceutical preparations	5400	Medicinal and pharmaceutical products
First Sensor AG	7	3679	Electronic components, not elsewhere specified	7722	Printed circuits
				7768	Piezoelectric crystals, mounted; parts, n.e.s., of the electronic components
				7649	Parts and accessories suitable for use solely or principally with the apparatus of division 76
Firsttextile AG	4	2389	Apparel and accessories, not elsewhere classified	8412	Suits and ensembles
Fresenius SE & Co KGaA	9	3841	Surgical and medical instruments and apparatus	8720	Instruments and appliances for medical, surgical, dental or veterinary purposes
Gerresheimer AG	3	3221	Glass containers	6651	Containers, of glass, of a kind used for the conveyance or packing of goods; stoppers and closures, of glass; glass inners for vacuum vessels
Gerry Weber International AG	10	2339	Women's, misses' and juniors' outerwear not elsewhere classified	8420	Women's or girls' coats, capes, jackets, suits, trousers, shorts, shirts, dresses and skirts, underwear, nightwear and similar articles of textile fabrics, not knitted or crocheted
				8440	Women's or girls' coats, capes, jackets, suits, trousers, shorts, shirts, dresses and skirts, underwear, nightwear and similar articles of textile fabrics, knitted or crocheted
Grammer AG	9	3714	Motor vehicle parts and accessories	7840	Parts and accessories of the motor vehicles of groups
Greiffenberger AG	6	3569	General industrial machinery and equipment, not elsewhere specified	7400	General industrial machinery and equipment, n.e.s., and machine parts
H&R AG	8	2899	Chemicals and chemical preparations, not elsewhere specified manufacturing	5980	Chemical products and preparations

HeidelbergCement AG	4	3241	Cement, hydraulic	2731	Building or monumental (dimension) stone, not further worked than roughly trimmed or merely cut, by sawing or otherwise, into blocks or slabs of a rectangular (including square) shape
				6610	Lime, cement, and fabricated construction materials (except glass and clay materials)
				6612	Portland cement, aluminous cement, slag cement, supersulphate cement and similar hydraulic cements, whether or not coloured or in the form of clinkers
Heidelberger Druckmaschinen AG	11	3555	Printing trades machinery and equipment	7260	Printing and bookbinding machinery, and parts thereof
Henkel AG & Co. KGaA	11	2841	Soap and other detergents, except specialty cleaners	5540	Soap, cleansing and polishing preparations
Infineon Technologies AG	10	3674	Semiconductors and Related Devices	7760	Thermionic, cold cathode or photo-cathode valves and tubes (e.g., vacuum or vapour or gas-filled valves and tubes, mercury arc rectifying valves and tubes, cathode-ray tubes, television camera tubes); diodes, transistors and similar semiconductor devices; photosensitive semiconductor devices; light-emitting diodes;
InTiCa Systems AG	7	3669	Communications equipment, not elsewhere specified	7648	Telecommunications equipment, n.e.s.
Isra Vision AG	4	3569	General industrial machinery and equipment, not elsewhere specified	7400	General industrial machinery and equipment, n.e.s., and machine parts

ItN Nanovation AG	9	3826	Laboratory analytical instruments	7436	Filtering or purifying machinery and apparatus, for liquids or gases
Jenoptik AG	9	3827	Optical instruments and lenses	8710	Optical instruments and apparatus
Joh. Friedrich Behrens AG	2	3315	Steel wiredrawing and steel nails and spikes	6940	Nails, screws, nuts, bolts, rivets and the like, of iron, steel, copper or aluminium
Joyou AG	5	3260	Pottery and Related Products	6660	Products out of pottery
				8122	Ceramic sinks, wash-basins, wash-basin pedestals, baths, bidets, water-closet pans, flushing cisterns, urinals and similar sanitary fixtures
K+S AG	8	2874	Phosphatic fertilizers	5622	Mineral or chemical fertilizers, phosphatic
KAP - Beteiligungs - AG	8	2300	Apparel and other Finished Products Made from Fabrics and Similar Materials	8400	Articles of apparel and clothing accessories
KHD Humboldt Wedag International AG	5	3531	Construction machinery and equipment	7234	Construction and mining machinery, n.e.s.
				7239	Parts, n.e.s., of the machinery of group 723 (excluding heading 723.48) and of subgroup 744.3
				7233	Moving, grading, levelling, scraping, excavating, tamping, compacting, extracting or boring machinery, for earth, minerals or ores, self-propelled, n.e.s.
				7281	Machine tools specialized for particular industries; parts and accessories
Kontron AG	15	3571	Electronic computers	7520	Automatic data-processing machines and units thereof; magnetic or optical readers, machines for transcribing data onto data-

KROMI Logistik AG	8	3549	Metalworking machinery, not elsewhere specified	7300	Metalworking machinery
KUKA AG	9	3565	Packaging machinery	74523	Machinery for cleaning or drying bottles or other containers
Kunert AG	6	2252	Hosiery, not elsewhere classified	8462	Pantihose, tights, stockings, socks and other hosiery (including stockings for varicose veins and footwear without applied soles), knitted or crocheted
Lanxess AG	10	2820	Plastics materials and synthetic resins, synthetic rubber, cellulosic and other manmade fibers, except glass	5700	Plastics in primary forms
LEONI AG	10	3357	Drawing and Insulating of Nonferrous Wire	6780 6931	Wire of iron or steel Stranded wire, ropes, cables, plaited bands, slings and the like, of iron, steel, copper or aluminium, not electrically insulated
LEWAG Holding AG	4	3559	Special industry machinery, not elsewhere classified	7284	Machinery and mechanical appliances specialized for particular industries, n.e.s.
Linde AG	9	2813	Industrial gases	3400	Gas, natural and manufactured
LPKF Laser & Electronics AG	18	3674	Semiconductors and Related Devices	7763 7764	Diodes, transistors and similar semiconductor devices; photosensitive semiconductor devices Electronic integrated circuits and microassemblies
M.A.X. Automation Ag	2	3569	General industrial machinery and equipment, not elsewhere specified	7400	General industrial machinery and equipment, n.e.s., and machine parts
MAN SE	9	3710	Motor Vehicles and Motor Vehicle Equipment	7916 7917	Railway or tramway coaches, vans and trucks, self-propelled Railway or tramway passenger coaches, not self-propelled; luggage-vans, post office coaches and other special-purpose railway or tramway coaches

				7918	Railway or tramway freight and maintenance cars
Manz AG	7	3679	Electronic components and accessories	7610	Television receivers, colour (including video monitors and video projectors), whether or not incorporating radio-broadcast receivers or sound- or video-recording or reproducing apparatus
Masterflex SE	11	3089	Plastic products, not elsewhere specified	5800	Plastics in non-primary forms
MediGene AG	12	2834	Pharmaceutical preparations	5400	Medicinal and pharmaceutical products
Merck KGaA	6	2834	Pharmaceutical preparations	5400	Medicinal and pharmaceutical products
MIFA Mitteldutsche Fahrradwerke AG	2	3751	Motorcycles, bicycles and parts	7852	Bicycles and other cycles (including delivery tricycles), not motorized
Ming Le Sports AG	3	2300	Apparel and other Finished Products Made from Fabrics and Similar Materials	8400	Articles of apparel and clothing accessories
Mobotix AG	2	3577	Computer peripheral equipment, not elsewhere specified	7520	Automatic data-processing machines and units thereof; magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data, n.e.s.
MTU Aero Engines AG	17	3724	Aircraft Engines and Engine Parts	7131	Internal combustion piston engines for aircraft, and parts thereof, n.e.s.
				7149	Parts of the engines and motors of heading 714.41 and subgroup 714.8
Mühlbauer Holding AG & Co. KG	2	3679	Electronic components, not elsewhere specified	7700	Electrical machinery, apparatus and appliances, n.e.s., and electrical parts thereof (including non-electrical counterparts, n.e.s., of electrical household-type

Neschen AG	6	2670	Converted paper and paperboard products, except containers and boxes	6419	Converted paper and paperboard, n.e.s.
OSRAM Licht AG	2	3648	Lighting equipment, not elsewhere specified	7782	Electric filament or discharge lamps (including sealed-beam lamp units and ultraviolet or infrared lamps); arc lamps; parts thereof
Panamax AG	4	3661	Telephone and telegraph apparatus	7641	Electrical apparatus for line telephony or line telegraphy (including such apparatus for carrier-current line systems)
Park & Bellheimer AG	3	2082	Malt beverages	1123	Beer made from malt
Pfeiffer Vacuum Technology AG	10	3561	Pumps and pumping equipment	7420	Pumps for liquids, whether or not fitted with a measuring device; liquid elevators; parts for such pumps and liquid elevators
Plan Optik AG	2	3827	Optical instruments and lenses	8710	Optical instruments and apparatus
Porsche Automobil Holding SE	5	3711	Motor vehicles and passenger car bodies	7810	Motor cars and other motor vehicles principally designed for the transport of persons
				7820	Motor vehicles for the transport of goods and special-purpose motor vehicles
				7830	Road motor vehicles
				7840	Parts and accessories of the motor vehicles
Powerland AG	4	3199	Leather goods, not elsewhere specified	83111	handbags with outer surface of leather, of composition leather or of patent leather
Probiodrug AG	2	2836	Biological products, except diagnostic substances	5400	Medicinal and pharmaceutical products
Progress-Werk Oberkirch AG	9	3460	Metal forgings and stampings	6992	Chain (other than articulated link chain), and parts thereof, of iron or steel
				7499	Machinery parts, n.e.s.

PUMA SE	2	3021	Rubber and Plastics Footwear	8510	Footwear
R. Stahl AG	10	3600	Electronic and other Electrical Equipment and Components, except Computer Equipment	7750	Household-type electrical and non-electrical equipment, n.e.s.
RENK AG	8	3566	Speed changers, industrial high-speed drives, and gears	7840	Parts and accessories of the motor vehicles
Rheinmetall AG	9	3714	Motor vehicle parts and accessories	7840	Parts and accessories of the motor vehicles
Ropal Europe AG	2	2899	Chemicals and chemical preparations, not elsewhere specified manufacturing	5989	Chemical products and preparations, n.e.s.
Salzgitter AG	11	3312	Steel works, blast furnaces (including coke ovens) and rolling mills	6750	Flat-rolled products of alloy steel
Sartorius AG	9	3820	Laboratory Apparatus and Analytical, Optical, Measuring, and Controlling Instruments	7418	Other machinery, plant and similar laboratory equipment, whether or not electrically heated, for the treatment of materials by a process involving a change of temperature, not being
Schlott Gruppe AG	3	2750	Commercial Printing	6411	Newsprint, in rolls or sheets
Schumag AG	6	3542	Machine tools, metal forming types	7310	Machine tools working by removing metal or other material
Schwabenverlag AG	3	2731	Books : publishing or publishing and printing	8921	Books, pamphlets, maps and globes, printed (not including advertising material)
SFC Energy AG	9	3690	Miscellaneous electrical machinery, equipment and supplies	7700	Electrical machinery, apparatus and appliances, n.e.s., and electrical parts thereof (including non-electrical counterparts, n.e.s., of electrical household-type equipment)
SGL Carbon SE	11	3299	Nonmetallic mineral products, not elsewhere specified	6633	Manufactures of mineral materials, n.e.s. (other than ceramic)
SHW AG	4	3714	Motor vehicle parts and accessories	7840	Parts and accessories of the motor vehicles
Siemens AG	12	3510	Engines and turbines	7100	Power-generating machinery



Singulus Technologies AG	14	3559	Special industry machinery, not elsewhere classified	7284	Machinery and mechanical appliances specialized for particular industries, n.e.s.
SKW Stahl-Metallurgie Holding AG	8	2869	Industrial organic chemicals, not elsewhere specified manufacturing	5100	Organic chemicals
SLM Solutions Group AG	5	3499	Fabricated metal products, not elsewhere specified	6995	Miscellaneous articles of base metal
SMA Solar Technology AG	8	3674	Semiconductors and related devices	7763	Diodes, transistors and similar semiconductor devices; photosensitive semiconductor devices
Snowbird AG	2	2399	Fabricated textile products, not elsewhere classified	8212	Mattress supports; articles of bedding or similar furnishings (e.g., mattresses, quilts, eiderdowns, cushions, pouffes and pillows) fitted with springs or stuffed or internally fitted with any material or of cellular rubber or plastics, whether or not cov
Solar-Fabrik AG	9	3612	Power, distribution and specialty transformers	7763	Diodes, transistors and similar semiconductor devices; photosensitive semiconductor devices
Stada-Arzneimittel AG	10	2834	Pharmaceutical preparations	5400	Medicinal and pharmaceutical products
STRATEC Biomedical AG	4	3826	Laboratory analytical instruments	7436	Filtering or purifying machinery and apparatus, for liquids or gases
Surteco SE	5	2670	Converted paper and paperboard products, except containers and boxes	6419	Converted paper and paperboard, n.e.s.
Suss MicroTec AG	13	3559	Special Industry Machinery, not elsewhere classified	7284	Machinery and mechanical appliances specialized for particular industries, n.e.s.
Symrise AG	9	2844	Chemicals and chemical preparations, not elsewhere specified manufacturing	5510	Essential oils, perfume and flavour materials
ThyssenKrupp AG	16	3312	Steel works, blast furnaces (including coke ovens) and rolling mills	6750	Flat-rolled products of alloy steel

Tom Tailor Holding AG	5	2300	Apparel and other Finished Products Made from Fabrics and Similar Materials	8400	Articles of apparel and clothing accessories
Transtec AG	7	3571	Electronic computers	7520	Automatic data-processing machines and units thereof; magnetic or optical readers, machines for transcribing data onto data media in coded form and machines for processing such data, n.e.s.
VanCamel AG	2	2300	Apparel and other Finished Products Made from Fabrics and Similar Materials	8400	Articles of apparel and clothing accessories
VERBIO Vereinigte BioEnergie AG	10	2990	Miscellaneous Products of Petroleum and Coal	3400	Gas, natural and manufactured
				3300	Petroleum, petroleum products and related materials
VITA 34 AG	8	2834	Pharmaceutical preparations	5400	Medicinal and pharmaceutical products
Vivanco Gruppe AG	3	3669	Communications equipment, not elsewhere specified	7649	Parts and accessories suitable for use solely or principally with the apparatus of division 76 (telecommunication)
Volkswagen AG	10	3711	Motor vehicles and passenger car bodies	7810	Motor cars and other motor vehicles principally designed for the transport of persons
				7820	Motor vehicles for the transport of goods and special-purpose motor vehicles
				7830	Road motor vehicles
				7840	Parts and accessories of the motor vehicles

Vossloh AG	9	3743	Railroad equipment	7919	Railway or tramway track fixtures and fittings; mechanical (including electromechanical) signalling, safety or traffic control equipment for railways, tramways, roads, inland waterways, parking facilities, port installations or airfields; parts of the loc
Vtion Wireless Technology AG	8	3669	Communications equipment, not elsewhere specified	7648	Telecommunications equipment, n.e.s.
Wacker Chemie AG	10	2821	Plastics Materials, Synthetic Resins, and Nonvulcanizable Elastomers	5740	Polyacetals, other polyethers and epoxide resins, in primary forms; polycarbonates, alkyd resins, polyallyl esters and other polyesters, in primary forms
				5750	Other plastics, in primary forms
Washtec AG	16	3559	Special industry machinery, not elsewhere classified	72474	Machinery for washing (other than household or laundry-type machines), cleaning (other than dry-cleaning machines), wringing, pressing (including fusing presses), bleaching, dyeing, dressing, finishing (other than machines for the finishing of felt), coat
Wilex AG	8	2834	Pharmaceutical preparations	5400	Medicinal and pharmaceutical products
Zhongde Waste Technology Ag	8	3567	Industrial Process Furnaces and Ovens	7413	Industrial or laboratory furnaces and ovens, etc., and parts thereof

**Table 8: CEO fixed-effects + time fixed-effects Regressions – Bonus**

Dependent Variable	(1)	(2)	(3)	(4)
Bonus				
logImports(-1)	0.012 (0.318)	0.017 (0.397)	0.149 (0.414)	0.171 (0.322)
logExports(-1)	-0.375 (0.348)	-0.226 (0.339)	-0.325 (0.363)	-0.329 (0.347)
logAge		11.572 (15.198)	17.143 (14.060)	18.302 (15.836)
logTenure		0.130 (0.196)	0.071 (0.189)	-0.003 (0.207)
logAssets(-1)			0.316 (0.232)	-0.081 (0.321)
logEmployees(-1)			-0.184 (0.226)	-0.045 (0.329)
logEBIT(-1)				0.056 (0.129)
logSales(-1)				0.286 (0.354)
CEO fixed-effects	Yes	Yes	Yes	Yes
Time fixed-effects	Yes	Yes	Yes	Yes
Number of Observations	393	435	385	343
Number of Groups <sup>°</sup>	115	106	98	91
R-squared	0.14	0.11	0.14	0.16

Standard errors in parentheses.

\*Significant at 10%; \*\*Significant at 5%; \*\*\*Significant at 1%.

<sup>°</sup> Refers to the number of different CEOs observed in the corresponding regression.

**Table 9: Correlation Matrix**

	Compen- sation	Imports	Exports	Age	Tenure	Assets	EBIT	Employees	Sales	GDP_ GER	GDP_ TP	iDPpc_ GER
Compensation	1,00											
Imports	0,27	1,00										
Exports	0,42	0,79	1,00									
Age	0,27	0,13	0,22	1,00								
Tenure	0,15	0,01	0,06	0,31	1,00							
Assets	0,69	0,42	0,66	0,29	0,07	1,00						
EBIT	0,68	0,34	0,54	0,28	0,07	0,87	1,00					
Employees	0,62	0,31	0,46	0,29	0,02	0,88	0,75	1,00				
Sales	0,68	0,36	0,57	0,30	0,08	0,97	0,89	0,92	1,00			
GDP_GER	0,13	0,08	0,09	0,15	0,17	0,02	0,05	-0,07	-0,01	1,00		
GDP_TP	0,12	0,08	0,09	0,16	0,17	0,02	0,04	-0,06	-0,01	0,98	1,00	
GDPpc_GER	0,12	0,08	0,09	0,15	0,17	0,01	0,05	-0,08	-0,01	0,99	0,99	1,00

**Table 10: Regressions Accounting for Multicollinearity – Total CEO Compensation**

Dependent Variable	(1)	(2)	(3)	(4)	(5)
Total CEO Compensation					
logImports(-1)	-0.041 (0.175)	-0.037 (0.179)	-0.002 (0.171)	-0.137 (0.169)	-0.057 (0.183)
logExports(-1)	0.252 (0.209)	-0.233 (0.204)	-0.094 (0.219)	-0.051 (0.218)	-0.162 (0.217)
Profits(residuals)	0.085 (0.054)	0.113 <sup>**</sup> (0.052)	0.115 <sup>**</sup> (0.050)	0.117 <sup>**</sup> (0.056)	0.092 <sup>*</sup> (0.052)
Sales(residuals)	0.243 (0.186)	0.170 (0.147)	0.247 (0.150)	0.394 <sup>**</sup> (0.181)	0.251 <sup>*</sup> (0.151)
logAge		3.322 <sup>***</sup> (1.085)	6.414 <sup>***</sup> (1.365)		11.327 <sup>**</sup> (5.107)
logTenure		0.148 (0.102)	0.141 (0.096)		0.078 (0.096)
logGDP_GER(-1)			-2.936 <sup>***</sup> (1.015)		
CEO fixed-effects	Yes	Yes	Yes	Yes	Yes
Time fixed-effects	No	No	No	Yes	Yes
Number of Observations	485	390	390	485	390
Number of Groups <sup>°</sup>	134	100	100	134	100
R-squared	0.04	0.22	0.24	0.21	0.30

Standard errors in parentheses.

\*Significant at 10%; \*\*Significant at 5%; \*\*\*Significant at 1%.

<sup>°</sup> Refers to the number of different CEOs observed in the corresponding regression.

**Table 11: Regressions Accounting for Multicollinearity – Bonus**

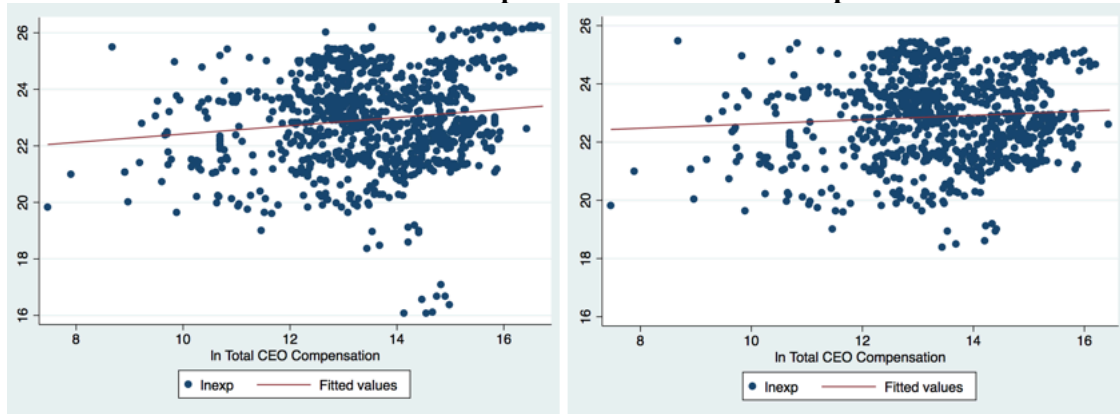
Dependent Variable	(1)	(2)	(3)	(4)	(5)
Bonus					
logImports(-1)	0.201 (0.341)	0.374 (0.330)	0.387 (0.302)	0.012 (0.318)	0.198 (0.306)
logExports(-1)	-0.427 (0.375)	-0.803 <sup>*</sup> (0.426)	-0.475 (0.393)	-0.375 (0.348)	-0.336 (0.351)
Profits(residuals)	0.138 (0.113)	0.101 (0.129)	0.121 (0.119)	0.129 (0.114)	0.051 (0.133)
Sales(residuals)	-0.003 (0.200)	0.055 (0.226)	0.207 (0.245)	0.156 (0.199)	0.215 (0.232)
logAge		2.404 (2.312)	8.465 <sup>**</sup> (3.569)		20.059 (14.830)
logTenure		0.063 (0.209)	0.068 (0.189)		-0.022 (0.201)
logGDP_GER(-1)			-5.818 <sup>**</sup> (2.219)		
CEO fixed-effects	Yes	Yes	Yes	Yes	Yes
Time fixed-effects	No	No	No	Yes	Yes
Number of Observations	393	343	343	393	343
Number of Groups <sup>°</sup>	115	91	91	115	91
R-squared	0.02	0.05	0.09	0.14	0.16

Standard errors in parentheses.

\*Significant at 10%; \*\*Significant at 5%; \*\*\*Significant at 1%.

<sup>°</sup> Refers to the number of different CEOs observed in the corresponding regression.

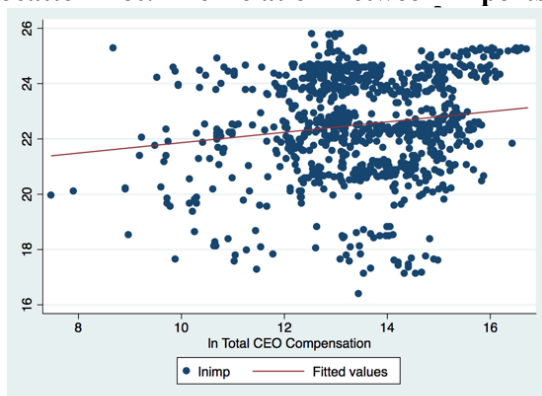
### Scatter Plots: The Relation Between Exports and Total CEO Compensation



Left: Full dataset.

Right: With excluded values.

### Scatter Plot: The Relation Between Imports and Total CEO Compensation



Full dataset.



**Table 12: CEO fixed-effects Regressions with Dropped Values – Total CEO Compensation**

Dependent Variable	(1)	(2)	(3)	(4)	(5)
Total CEO Compensation					
logImports(-1)	-0.273 (0.300)	-0.488* (0.291)	-0.434 (0.305)	-0.104 (0.199)	-0.074 (0.206)
logExports(-1)	0.489* (0.272)	0.211 (0.262)	0.159 (0.272)	-0.136 (0.230)	0.028 (0.256)
logAge		2.311 (1.577)	1.368 (2.392)	3.373** (1.328)	12.487** (5.059)
logTenure		0.146 (0.142)	0.200 (0.177)	0.135 (0.109)	0.120 (0.107)
logAssets(-1)			0.240* (0.129)	0.055 (0.217)	0.025 (0.220)
logEmployees(-1)			-0.120 (0.240)	-0.106 (0.199)	-0.165 (0.200)
logEBIT(-1)				0.136** (0.055)	0.135** (0.054)
logSales(-1)				-0.127 (0.208)	0.001 (0.220)
logGDP_GER(-1)					-2.738 (2.371)
logGDPavg_TP(-1)					-2.287 (1.620)
logGDPpc_GER(-1)					2.393 (2.824)
CEO fixed-effects	Yes	Yes	Yes	Yes	Yes
Time fixed-effects	No	No	No	No	No
Number of Observations	697	496	416	359	359
Number of Groups <sup>o</sup>	170	110	102	95	95
R-squared	0.01	0.09	0.09	0.22	0.24

Standard errors in parentheses.

\*Significant at 10%; \*\*Significant at 5%; \*\*\*Significant at 1%.

<sup>o</sup> Refers to the number of different CEOs observed in the corresponding regression.

**Table 13: CEO fixed-effects + time fixed-effects Regressions with Dropped Values – Total CEO Compensation**

Dependent Variable	(1)	(2)	(3)	(4)
Total CEO Compensation				
logImports(-1)	-0.360 (0.283)	-0.443* (0.257)	-0.359 (0.250)	-0.115 (0.204)
logExports(-1)	0.392 (0.302)	0.343 (0.370)	0.312 (0.388)	-0.095 (0.258)
logAge		18.123* (9.413)	19.091* (11.449)	10.833* (5.595)
logTenure		0.073 (0.130)	0.133 (0.152)	0.079 (0.099)
logAssets(-1)			0.330** (0.149)	0.095 (0.204)
logEmployees(-1)			-0.164 (0.176)	-0.160 (0.203)
logEBIT(-1)				0.113** (0.055)
logSales(-1)				0.036 (0.214)
CEO fixed-effects	Yes	Yes	Yes	Yes
Time fixed-effects	Yes	Yes	Yes	Yes
Number of Observations	697	496	416	359
Number of Groups <sup>o</sup>	170	110	102	95
R-squared	0.09	0.15	0.16	0.29

Standard errors in parentheses.

\*Significant at 10%; \*\*Significant at 5%; \*\*\*Significant at 1%.

<sup>o</sup> Refers to the number of different CEOs observed in the corresponding regression.