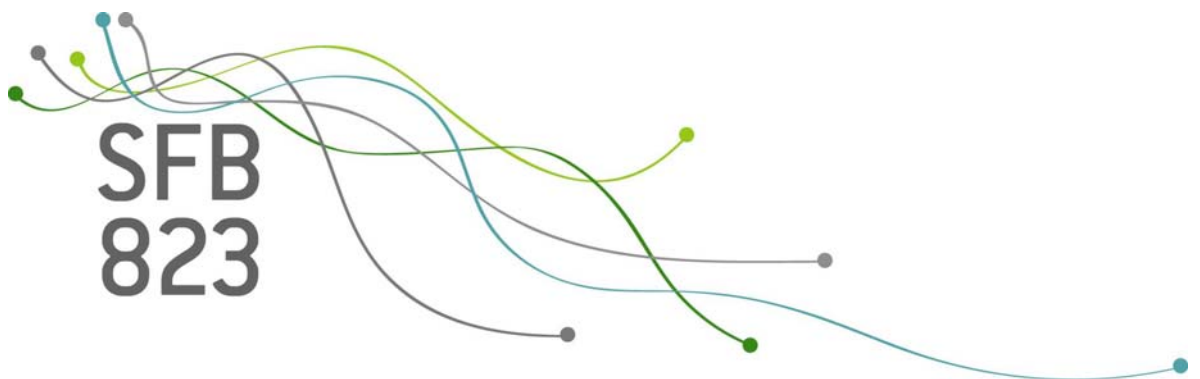# Foreign competition and executive compensation in the manufacturing industry – A comparison between Germany and the U.S.

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Foreign Competition and Executive Compensation in the Manufacturing Industry – A Comparison between Germany and the U.S.

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Abstract:

In this study we use import penetration as a proxy for foreign competition in order to empirically analyze (1) the impact of foreign competition on managerial compensation, (2) differences in the impact between Germany and the U.S and (3) whether the impact of import penetration is driven by implied efficiency effects. We use data from the manufacturing industry covering the period from 1984-2010 for Germany respectively 1992-2011 for the U.S and apply system GMM in order to solve potential endogeneity problems. It turns out that foreign competition leads to an increase of average per capita executive compensation in both countries. The impact of foreign competition on pay-performance sensitivity differs between the US and Germany. A differentiation between imported intermediates (efficient sourcing strategy) and final inputs (competition) reveals that the impact of import penetration is not biased by efficiency effects.

Keywords: Foreign Competition; Outsourcing; Managerial Incentives; International Comparison; System GMM

JEL: F16; F14; G30; J33

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1 Introduction

Although Germany and the U.S. represent similarly developed industries differences in level and design of management remuneration are a well-known phenomenon. Since several decades management compensation and international differences attract the attention in politics, media as well as academics all over the world. In particular, outrageous high remuneration levels and American executives earning up to ten times as much as their German counterpart catches media attention and causes general debates on the proportionality of executive compensation. Thus, a recent study of Fabbri and Marin (2016) for example delivers a descriptive overview of the trend in total per capita executive pay for the U.S. and Germany. Executive pay in the U.S. increased sevenfold (from one million to seven million dollars during 1977-2003) whereas German executive pay only increased by a factor of three and a half (from EUR 200,000 to EUR 700,000 during 1977-2007).

One of the most important corporate governance instruments in order to align interests between shareholders and managers is the implementation of managerial pay incentives. Similarly, competition and the resulting thread of a firm's potential liquidation might exert a disciplining and productivity enhancing impact on managers. Thus, in this study we are focusing on the direct link between competition and managerial pay incentives. However, in times of globalization and increased imports and exports all over the world companies are not only exposed to national product market competition but also to international competition. Thus, analyzing the impact of competition on managerial incentives without considering its international dimension might be incomplete. We therefor argue that foreign competition extents the classic idea of domestic product market competition towards a worldwide competition.

Nonetheless, while considering the degree of foreign competition by for example referring to import penetration rates one has to differentiate whether the imported good is a final good or an intermediate good. Whereas imported final goods might indeed indicate higher competitive pressure literature provides evidence that imported intermediate goods might rather indicate a higher degree of a firm's efficiency and productivity (e.g. Wagner 2011; Schwörer, 2012).

Thus, in this study we (1) empirically consider the impact of foreign competition represented by import penetration rates on managerial pay (sensitivity), we (2) compare the impact within the two different corporate governance systems of the U.S. and Germany, and we (3) disentangle potential productivity effects the impact of import penetration might imply by differentiating between the impact of imported final goods and imported intermediates.

In general theoretical literature points to a direct link between competition and managerial incentives[1]. Eventually, most models predict ambiguous impacts of competition on managerial incentives.

The empirical literature regarding foreign competition mostly considers its impact on firm productivity (Wagner, 2012, Vogel and Wagner, 2010)[2], worker level wages and employment (Autor et al. (2014) for the U.S. and Dauth et al. (2016) or Borrs and Knauth (2016) for Germany), human capital investment (Greenland and Lopresti 2016), workers health (McManus and Schaur 2016) or firms' innovation activities (Autor et al. (2016) for the U.S.). However, except Cunat and Guadalupe (2005, 2009b) who refer to international trade indicators like import penetration or an industry's share of exports as proxy for foreign competition, very little is known about the empirical connection between foreign competition and managerial remuneration respectively incentives[3]. According to Cunat and Guadalupe (2005, 2009b) it turns out that executives in industries with a high degree of foreign competition experience a stronger increase in pay-performance sensitivities, respectively that import penetration leads to an increase in the sensitivity of pay to performance and a lower level of fixed pay[4].

Similar to Cunat and Guadalupe (2009b) we argue that using foreign competition as a general indicator for competition overcomes interpretational problems other typical proxies might deal with[5]. However our study differs from Cunat and Guadalupe (2009b) in several points:

First, our study analyzes the impact of international competition on executive compensation using German data for the first time. Taking into consideration that Germany is one of the most open economies worldwide this research question has a high relevance for the German corporate governance system.

Second, we provide an international comparison in the impact of foreign competition on managerial incentives between the U.S and Germany by using identical estimation specification and techniques based on as homogenous data as possible.

Third, our study is the only study that disentangles potential productivity effects the impact of import penetration might include. Therefor we use German input output tables that provide exact information

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[1] For example Hart (1983), Nalebuff and Stiglitz (1983) and Scharfstein (1988) argue that an increase in competition improves the level of the principal's information such that relative-performance pay sensitivities increase. Hermalin (1992), Schmidt (1997), Ratih (2003) differentiate whether an increase in competition causes an in- or decrease of the value of cost reductions within a firm. While previous models are based on the classical principal agent framework taking competition as an exogenous. component, Aggarwal and Samwick (1999) or Beiner et al. (2011) consider competition as a strategic interaction between firms.

[2] See Wagner (2012) for a survey on the link between international trade and firm performance or Vogel and Wagner (2010) for the relationship between imports and productivity.

[3] Empirical literature that focuses on the impact of product market competition on managerial incentives like for example Aggarwal and Samwick (1999), Karuna (2007), Cunat and Guadalupe (2009a), Beiner et al. (2011) will be presented in the next section.

[4] Autor et al. (2014) mention that imports might be correlated with industry domestic demand or productivity shocks which could cause a simultaneity bias. Cunat and Guadalupe (2005, 2009b) handle potential endogeneity problems international trade data might imply by either using a natural experiment (Cunat and Guadalupe, 2005) or by using imports tariffs and exchange rates as instrumental variables for import penetration (Cunat and Guadalupe, 2009b).

[5] In particular the common use of the concentration index is criticized to be a poor proxy for competition due to an unclear relation between concentration and competition (e.g. Raith, 2003 or Karuna, 2007).

on the value of imported intermediates. Generally, high purchases of imported inputs delivers an indicator for a firm's efficient sourcing strategy. Thus, in order to assure that general import penetration represents an adequate proxy for the degree of foreign competition rather than for productivity we check whether imported intermediates might drive the results. Thus, we re-estimate the impact of import penetration on executive compensation by exclusively considering imported intermediates. Furthermore, we use system generalized moment methods (system GMM) in order to handle potential endogeneity problems.

Our results reveal that both, in Germany as well as the in the U.S., an increase of foreign competition leads to an increase of total per head executive compensation. Extending the analysis by explicitly modelling the impact of foreign competition on the pay performance sensitivity allows a differentiation between foreign competition's impact on fix respectively variable pay components. In contrast to Cunat and Guadalupe (2009b) for both countries our results reveal no significant impact on fix compensation. However, our results point to international differences in the disciplining effect of foreign competition regarding the pay performance sensitivity. Whereas in Germany foreign competition needs to reach a certain level of intensity until pay performance sensitivity is positive, in the U.S competition increases managerial incentives at any realistic competition intensity. Considering that the overall impact of import penetration on executive compensation is positive, negative pay performance sensitivities for low levels of import penetration in Germany might indicate that in that case fix pay components simply overweight variable pay.

By using German input output table data we additionally present evidence that potential productivity and efficiency effects of imported inputs do not drive general results. In particular it turns out that imported intermediate goods have neither a significant impact on compensation level, nor design.

The layout of this study is as follows. Section 2 gives an overview on theoretical and empirical literature regarding the impact of competition on management compensation. Afterwards, in section 3, we present the German and U.S. sample, followed in section 4 by a short introduction into system GMM estimation techniques. In section 5 we present our estimation results. In section 6 we disentangle the impact of import penetration by splitting import penetration into import penetration based on final goods and outsourcing (import penetration based on imported intermediates). Finally section 7 ends up with a short conclusion.

2   Literature

Regarding management compensation, literature mostly focuses on firm level determinants like performance, firm size and governance mechanisms. However, recently the impact of competition as an industry-level governance mechanism gained in importance. Basically there is a differentiation

between three different types of competition: labor market competition[6], product market competition and foreign competition, whereby the two latter ones are often analyzed simultaneously. Especially in theoretical models the assumption of product substitutability, the growth of market size, entry costs, and concentration could well represent both, product market competition and foreign competition. In the following we will briefly summarize this strand of theoretical and empirical literature.

2.1 Theoretical Contributions

Theoretical literature on the impact of product market competition respectively foreign competition in a principal agent context started in the early 80's with for example Hart (1983), Nalebuff and Stiglitz (1983) or Scharfstein (1988). In general these models reveal that an increase in competition changes the information structure of the agency problem and thus improves the availability of market information resulting in an increase of relative performance based compensation. Subsequently, Hermalin (1992) criticized previous literature as being too narrow by only considering a change-in-information effect. He extends this literature by considering additional effects like income effects, risk-adjustment effects and change-in-relative-value-of-actions effects competition might have on the agency problem. It turns out that all effects have ambiguous impacts on managerial incentives.

Schmidt (1997) focuses on managerial incentives in the case of the "thread of liquidation". The basic assumption in his model is that the probability of a firm's liquidation increases with higher competition resulting in two different effects on managerial incentives:

The first effect is called the "threat-of-liquidation" effect. Given the manager`s participation constraint is binding[7] managerial effort increases intrinsically in order to improve a firm's efficiency and decrease the manager's disutility of liquidation. In that case the model predicts an unambiguous effect, namely that managerial effort increases with an increase in competition.

The second effect is called the "value-of-a-cost-reduction" effect which is of ambiguous sign. Assuming that the participation constraint is not binding, firms would have to pay a rent in excess of the manager's reservation utility. An increase of competition, which induces a decrease of profits, could affect the value of a cost reduction in both directions[8]. Thus, the impact of competition on managerial incentive pay depends on whether the value of a cost reduction in- or decreases. If for example the value of a cost reduction decreases due to a reduction of profits it might well be that the principal's benefits of a higher level of managerial efforts are reduced such that he is less inclined to

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[6] For the impact of an increase in labor market competition on executive compensation in the U.S. market consider Bénabou and Tirole (2016) and for the German market see Fabbri and Marin (2016). In both studies an increase in labor market competition results in an increase of executive compensation.

[7] Market for managers clears because wage equals outside option utility such that there is no involuntary unemployment.

[8] Hermalin (1992) refers to this as the change-in-relative-value-of-actions and Raith (2003) refers to an increase in the value of a cost reduction as a "business stealing effect" and decrease in the value of a cost reduction as a "scale effect".

pay a high rent to the manager in order to induce high effort. Contrary, an increase of the value of a cost reduction would increase the principal's benefits from managerial effort such that it might be beneficial to implement higher rents for the managers.

Contrary to the Schmid (1997), Raith (2003) theoretically derives an unambiguous effect by assuming an endogenous market structure (free entry and exit). In that case competition leads to a decrease of prices and profits such that some firms are forced to leave the market until zero profits are reached. The remaining firms which now have to provide higher amounts of output for relatively low prices the value of a cost reduction automatically increases. As a result managerial incentive pay will increase.

A recent study of Andergassen (2016) theoretically focuses on the impact of product market competition on managerial compensation taking manager's fraudulent behavior into account. The classical asymmetry between principal and agent enables managers to behave fraudulently (e.g. by exerting unobservable cost-cutting effort in order to inflate their wealth) which could be in some cases beneficial and in some cases costly for the firm[9]. In case of the latter one shareholder would gain from managerial effort against fraudulent behavior such that managerial incentive pay increases. In that context, Andergassen (2016) analyzes how the trade-off between fraud and effort changes with an increase in competition. The model predicts that shareholders prefer to endure fraudulent behavior in order to elicit strong managerial effort. Furthermore, fraudulent behavior is more likely in industries with a high degree of competition. Accordingly, the model predicts a positive correlation between managerial incentives and product market competition.

Aggarwal and Samwick (1999) theoretically consider the impact of competition on managerial incentives depending on relative firm performance. This approach is the first one that considers the impact of competition in a strategic interaction between firms. In their model the authors differentiate between product market competition with markets where outputs are either strategic complements or strategic substitutes[10]. In case of strategic complements the model predicts that the ratio of the own-firm pay-performance sensitivity to the rival-firm pay-performance sensitivity is a decreasing function of competition whereas in the case of strategic substitutes this ratio is an increasing function of competition.

As Aggarwal and Samwick (1999) consider strategic interaction between firms and thus ignore the standard principal-agent model, Beiner et al. (2011) present a model on the impact of competition on managerial incentives taking both, strategic competition and the principal-agent model, into account. Regarding the impact of competition on managerial incentives the authors theoretically derive two hypotheses: First, they argue that the impact of competition on incentives is nonlinear (convex) and depends on the degree of competition such that in case of low competition an increase leads to weaker

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[9] For positive effects of fraudulent behavior on profits see Povel et al. (2007) for negative effects see Jensen (2003).

[10] Given the outputs are strategic complements (Bertrand model) and an increase in competition manager receive less incentives to maximize the value of their own firms and more incentives to maximize the value of all firms in the industry when competition increases. Given the outputs are strategic substitutes (Cournot model) and an increase in competition managers are given weaker incentives to maximize the value of their own firm and stronger incentives to minimize the value of other firms (aim is to deter competitors).

incentives. Once competition reached a certain level of intensity an increase leads to stronger incentives. Second hypothesis says that the marginal effect of competition on incentives increases with the level of competition.

Whereas previous literature mostly focuses on competition as product market competition, Gersbach and Schmutzler (2014) is to our best knowledge the only theoretical model that focuses in particular on the impact of globalization on managerial wages and thus considers beside an increase of the market size also an increase of competition in the labor market[11]. It turns out that globalization leads to an increase in the heterogeneity of executive remuneration but not necessarily of the overall wage level. However, the authors argue that this result is still in line with the observed and empirically often discussed increase in average compensation of top executives due to the fact that empirical results usually refer to a small group of top managers.

Eventually, theoretical literature on the impact of competition on managerial incentives predicts ambiguous results. Some authors postulate an unconditional positive impact, other point out that the sign of the impact depends on circumstances like for example the de- or increase of the value of a cost reduction, a high or low level of competition or weather the traded goods are complements or substitutes. Thus, deriving a clear hypothesis regarding the impact of foreign competition on managerial incentives based on theoretical literature is not straightforward. All the more it becomes necessary to investigate the relation between competition and managerial pay incentives empirically.

2.2 Empirical Studies

As we argued earlier, using foreign competition in order to measure the degree of competitive pressure might be in times of globalization a more appropriate indicator than using product market competition. However, as empirical literature on the impact of foreign competition on managerial incentives is only limited to Cunat and Guadalupe (2005, 2009b) we also summarize the highly related literature on product market competition and its impact on managerial incentives. Basically, differences between existing empirical studies are based on differences in the proxy that is used in order to measure the impact of competition

The first group of literature refers to the Herfindahl index as proxy for competition. Thus, Aggarwal and Samwick (1999) test the implications of their own model empirically by using U.S. Data on all S&P 1500 chief executives and executives for 1995. It turns out that an increase in competition increases the sensitivity of compensation to a rival-firm's performance and thus supports the strategic complement model instead of the strategic substitute model described above[12]. Beiner et al. (2011) use hand collected Swiss data from 2002 to 2005 covering 200 firms. Similarly, they also use different

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[11] The authors model globalization as the simultaneous replacement of national markets by one integrated market with higher demand, a larger number of firms and a larger pool of managers.

[12] Further, considering their results the authors refer to previous empirical literature that reveals weak pay-performance sensitivities (e.g. Jensen and Murphy, 1990) and argue that an optimal contract could still exist even in case of small own-firm pay-performance sensitivity as long as the rival-firm performance sensitivity is of similar magnitude.

versions of the Herfindahl index as proxies for competition[13]. The authors provide empirical evidence for a convex relationship between competition and managerial incentives meaning that once a certain degree of competition intensity is reached, competition leads to an increase of managers' pay-performance sensitivity. Chen et al. (2015) is the most recent empirical study that uses the Herfindahl index as proxy for competition. The authors focus on the impact of competition intensity and competition type on managerial incentive contract, in particular the use of customer satisfaction measures in executives' annual bonus contracts[14]. By differentiating between non-price-based and price-based competition, the authors predict that the use of customer satisfaction measures should be stronger in a non-price-based competition because a non-price-based competition increases the salience of customer satisfaction more likely than in in a price-based competition. Using hand collected information on the use of customer satisfaction measure as managerial incentive component in S&P1500 companies and data on executive compensation and company financials for the years 2006 and 2010 the authors find empirical evidence for their hypothesis. In particular it turns out that an increase in competition intensity given non-price based competition increases the probability of the use of customer satisfaction measures as component of managerial incentive compensation.

Karuna (2007) extents previous literature by arguing that competition is multi-dimensional in its relation to incentives and that the simple consideration of concentration indices is insufficient. The author refers to Raith (2003) by arguing that market structures are not exogenous and that competition encompasses other dimensions given a certain level of market concentration, like for example product substitutability, market size and entry costs. Thus he provides three measures of competition in order to differentiate between the incremental effect each determinant might have on incentives[15]. By using U.S. data from 1992-2003 it turns out that overall competition has a positive impact on managerial incentives. In particular, product substitutability and market size have a positive impact whereas entry costs have a negative impact on managerial incentives.

Ko et al. (2016) extents Karuna's (2007) approach. Again, the authors analyze the impact of product substitutability, market size and entry costs but now they also consider the ownership structure. They are especially interested in the impact of the multi-dimension of competition given a certain ownership structure (e.g. widley-held firms vs. family- or state-controlled firms). The authors use a sample including data on China, Hong Kong, Singapore, and Taiwan and covering the period from 2001 to 2012. In contrast to closely held firm it turns out that widely held firms' pay sensitivity increases with higher competition.

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[13] The main proxy in Beiner et al. (2011) is a sales-based Herfindahl idex. As robustness the authors also calculate a Herfindahl index based on assets and employees.

[14] The authors state that customer satisfaction is the most commonly used nonfinancial performance measure.

[15] Product substitutability is represented by the price-cost margin calculated as sales divided by operating costs on industry level, market size is measured as industry sales and entry costs is measured as the weighted average gross value of the cost of property, plant and equipment.

Cunat and Guadalupe (2009a) consider U.S. product market competition in the banking and financial sectors and its effects on executive compensation using yearly data from 1992 to 2002. In contrast to previous literature, they use banking sector deregulation and a financial services deregulation act as quasi-natural experiments in order to model the impact of differences in the degree of competition on managerial pay[16]. For the banking and financial sector it turns out that post deregulation total pay stayed constant whereas the composition of compensation changed essentially with an decrease of fixed components and an increase in performance based pay. Again, the authors conclude that an increase in product market competition causes a stronger incentive orientated executive pay.

Cunat and Guadalupe (2005, 2009b) are the most closely related studies to ours by using international trade shocks as a source of variation in competition and its impact on compensation design. Cunat and Guadalupe (2005) use a sample of UK firms covering the period from 1992 to 2000 and similar to Cunat and Guadalupe (2009a), they consider a natural experiment (the sudden appreciation of the pound in 1996) in order to model exogenous variation in the degree of openness in different sectors. Though, openness is measured on industry level as either import penetration (import at a sector level as a proportion of total output plus net imports) or the share of export in total output (sector export divided by sector output). It turns out that sectors that were more exposed to foreign competition experienced a stronger increase in pay-performance sensitivities for the highest and average paid directors after the appreciation of the pound in 1996 than sectors with relative low levels of foreign competition.

Cunat and Guadalupe (2009b) focus on the impact of foreign competition on changes in executives' incentive structures. Similar to us, they use import penetration as a proxy for competition intensity and argue that this may overcome endogeneity problems that arise by using standard measures of competition like Herfindahl indices or price-cost margins. Furthermore they use exchange rates and tariffs in order to solve potential endogeneity problems when using import penetration as a proxy for competition. Their sample consists of all manufacturing firms in the S&P500 index for the period from 1992 until 2000. A main finding is that an increase in import penetration implied a 23% fall in the fix component of compensation and 3.5% increase in the performance pay sensitivity.

To sum up, empirical literature predominantly reveals that an increase in competition (either measured by product market competition or foreign competition) leads to an increase of managerial pay performance sensitivity. However, only a small fraction considers foreign competition as proxy for competitive pressure. We argue that in particular in times of globalization neglecting international competitive pressure is insufficient. Thus, to the best of our knowledge our study is the first one that analysis the impact of foreign competition on German executive compensation and additionally provides a comparison with the U.S.. Furthermore, in contrast to Cunat and Guadalupe (2005, 2009b) our study is the first one that considers the two dimensions of foreign competition. Literature provides

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[16] First deregulation is the 1994 Riegel-Neal Banking and Branching Efficiency Act and the second ones is the 1999 Gramm-Leach-Biliey Act. Bothe deregulation Acts basically lowered entry barriers such that competition in the North American banking and financial sectors increased.

evidence that a high amount of imported intermediates might rather indicate a company's efficient sourcing strategy respectively productivity instead of competitive pressure[17]. By differentiating between imported final goods and imported inputs we are able to check whether the estimated results are indeed driven by competitive pressure or rather by potential efficiency effects due to imported intermediates.

3   Data

In order to provide an international comparison of the impact of foreign competition on executive compensation between the U.S. and Germany data for both countries is needed. As international trade mostly applies to the manufacturing sector both datasets are restricted to the manufacturing industry. For both countries we had to combine different data sources. Thus, the German sample basically consists out of two different sources. First, the basic information on company financials and average per head executive compensation is provided by a self-compiled unbalanced panel dataset on a huge amount of relevant German manufacturing firms (predominantly stock listed companies). The main sources for this data are Hoppenstedt firm data, "dafne" data compiled by Bureau van Dijk and Kienbaum data on executive compensation. In detail, our dataset covers 316 firms during the periods from 1984 until 2010. Firms are identified by a two-digit industry classification[18]. This is used in order to combine the basic data with foreign trade information on industry level provided by the Federal Statistical Office Germany[19]. In particular we derived industry level information on imports, exports and total sector sales. Furthermore we add yearly data on the CDAX price index and GDP provided by the German central bank.

Regarding the U.S. data our basic data is provided by Compustat's ExecuComp. This dataset provides individual compensation information on the five highest payed executives and on company financials. In order to provide the best possible and thus homogenous comparison between the U.S and Germany we calculate the average total per head executive compensation based on the five highest payed executives[20]. Furthermore we restrict the U.S sample on S&P500 companies from manufacturing sector. Additionally we match import and export data on a three digit industry level[21] provided by

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[17] This strand of literature will be extensively discussed in section 2.6.

[18] The two-digit industry classification refers to the classification of economic activities provided by the Federal Statistical Office Germany. Over the sample period there have been several revisions (WZ93, WZ03, WZ08) which we all accounted for.

[19] We digitalized relevant information from the relevant statistical yearbook. Information on total sector sales is provided in chapter 9 "Industry, Manufacturing" until 2003. From 2004 on this information was provided in chapter 14. Information on the value of imports and exports is provided in chapter 12 "foreign trade". Older editions of statistical yearbooks are available at "DigiZeitschriften".

[20] In order to calculate the average per head executive compensation we use the Compustat variable tdc2. This variable represents the realized compensation including exercised stock options. According to Mishel and Davis (2014) this is the most frequently used indicator for executive compensation used by economists.

[21] We refer to the NAICS classification. The three digit NAICS classification resembles the two digit WZ classification.

Schott (2008)[22]. Similar to Schott (2010) we use information on total value of shipment[23] on industry level from the NBER-CES manufacturing industry database provided by Becker et al. (2013)[24]. We obtain yearly GDP data from Federal Reserve Bank of St. Louis and yearly S&P500 price index from boerse.de. Thus, our unbalanced U.S sample covers 180 firms over the period from 1992 until 2011[25]. Table 2.1 and 2.2 presents summary statistics for both, the German and the U.S. dataset[26]. Apparently, the average per head executive compensation is with 4.453 million Dollars higher than the average per head executive compensation in Germany with 377 thousand Euros. Although our sample only focuses on the manufacturing industries, the magnitude of differences in compensation levels is in accordance with Fabbri and Marin (2016) which indicates the representability of both samples. The sales variable is used as a representor for company seize. As expected the average U.S. firm in our sample is with 16.507 billion Dollar net sales obviously bigger than an average German firm with 1.488 billion Euro sales. Regarding the return on equity (ROE) we also observe differences between the two samples. For the German sample the average return on equity lies at almost 7 percent, whereas it is 16 percent for the U.S. sample. Furthermore we provide summary statistics for the yearly GDP (measured in billion Euro respectively in billion Dollar) and the yearly stock CDAX (CDAXPI) respectively S&P500 (S&P500PI) stock price indices (measured in points).

Table 3.1: Summary Statistics – German Sample 1985-2010

	mean	sd
Comp	377.3505	377.5204
Sales	1487.829	5518.051
ROE	6.980323	16.59519
CDAXPI	234.6043	83.6604
GDP	1767.14	286.008
ImportPen	.3548993	.1798333
N	2478	

Due to currency change in 2001 from DMark to Euro all monetary values have been transformed into Euro values by dividing with factor 1.95583. All monetary values are consumer price index deflated and reported in 1995 Euro.

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[22] The data is available at Schott's International Economics Resource Page Trade Data and Concordances (http://faculty.som.yale.edu/peterschott/sub_international.htm, accessed 4th of May 2017)

[23] Total value of shipment is based on net selling values and is thus comparable to the German equivalent, namely total sector sales.

[24] http://www.nber.org/nberces/, accessed 4th of May 2017

[25] Currently the NBER-CES dataset is only available until 2011 such that the whole sample is restricted to 2011.

[26] Because of our estimation specification which will be described later one observation year got lost. Although both samples cover one earlier period, the summary statistics refer to the dataset that was finally used in the following econometric analysis.

Table 3.2: Summary Statistic – U.S. Sample 1993-2011

	mean	sd
Comp	4453.85	5198.874
Sales	16507.33	34052.51
ROE	16.59848	18.29658
S&P500PI	1276.418	311.7273
GDP	13391.5	1554.513
ImportPen	.3039063	.1982494
N	2802	

All monetary values are consumer price index deflated and reported in 2010 Dollar.

The variable of highest interest in both samples is import penetration. As mentioned earlier the construction of our measurement refers to international trade literature like for example Autor et. al. (2014).

For the German data import penetration on the two-digit WZ industry level is defined as:

$$ImportPen_{j,t} = \frac{imports_{j,t}}{total\ sector\ sales_{j,t} + imports_{j,t} - exports_{j,t}} \tag{2.1}$$

The equivalent for the U.S. data on the three digit NAICS industry level is defined as:

$$ImportPen_{j,t} = \frac{imports_{j,t}}{total\ value\ of\ shipment_{j,t} + imports_{j,t} - exports_{j,t}} \tag{2.2}$$

The index j shows that our measurement for foreign competition only varies on industry level. However, as competition takes place in particular within an industry we argue that variation on industry level is sufficient[27]. Table 2.1 and 2.2 reveal that the sample average degree of import penetration in Germany is with 0.35 only slightly higher than in the U.S. with 0.30.

4 Econometric Model

The aim of our study is to evaluate the impact of foreign competition on executive compensation level and pay performance sensitivity. Therefor we set up the two following basic estimation equations:

$$\ln Comp_{i,j,t} = \pi_1 \ln Comp_{i,j,t-1} + \beta_1 \ln Sales_{i,j,t} + \beta_2 ROE_{i,j,t} + \beta_3 \ln ImportPen_{i,j,t} + \lambda_t \\ + \alpha_i + \varepsilon_{i,j,t} \tag{2.3}$$

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[27] Cunat and Guadalupe (2009b) account for the fact that firms might operate in more than just one industry. Thus, they use weights that correspond to the fraction of total sales in which the firm operates in order to calculate a weighted average of import penetration which finally leads to firm level variation. Due to lack of data we are not able to reproduce this measurement. However, we argue that the main industry in which a company operates is still a sufficient representor for the competition intensity. This industry will be most likely the most important one regarding strategic management decisions.

$$\ln Comp_{i,j,t} = \pi_1 \ln Comp_{i,j,t-1} + \beta_1 \ln Sales_{i,j,t} + \beta_2 ROE_{i,j,t} + \beta_3 \ln ImportPen_{i,j,t}$$
$$+ \beta_4 \ln ImportPen_{j,t} * ROE_{i,j,t} + \lambda_t + \alpha_i + \varepsilon_{i,j,t} \tag{2.4}$$

In both models the dependent variable $\ln Comp_{i,j,t}$ represents the log of average per head executive compensation for company i in industry j at time period t. As usually in panel data context our model includes time fixed effects λ_t, company fixed effects α_i, and an idiosyncratic error component $\varepsilon_{i,j,t}$. As the focus of this study lies on the impact of import penetration on management compensation we model the log of import penetration ($\ln ImportPen_{j,t}$) on two digit industry level j at time period t as explanatory variable. Because we are in particular interested on the impact of foreign competition on pay performance sensitivity we extent model (3) by additionally adding an interaction term between our performance indicator return on equity ($ROE_{i,j,t}$) and import penetration in equation (2.4).

Using import penetration as an indicator for foreign competition comes along with endogeneity problems. In particular there might be a correlation between industry imports and industry domestic demand or productivity shocks. Given that these endogenous and unobservable fluctuations in import penetration also influence management compensation there might be a classical omitted variable bias in β_3 (e.g. Cunat and Guadalupe, 2009b), Autor et al. (2014)). In order to account for this kind of bias previous studies use exogenous instruments for import penetration[28]. Blundell and Bond (1998) introduce a system GMM estimation technique which refers to lags of the endogenous variables as internal instruments provided that the error term $\varepsilon_{i,j,t}$ is not serially correlated. Thus, valid instruments outside the dataset are not needed any longer. Unlike former studies, we handle import penetration as an endogenous variable within the system GMM framework where lags of import penetration are used as valid instruments[29].

Apart from endogeneity problems regarding import penetration it might be reasonable to assume further simultaneity problems regarding other control variables. In particular the causality between classical covariates like firm performance ($ROE_{i,j,t}$) and company seize ($\ln Sales_{i,j,t}$) might apply in both directions. Thus, an increase in management compensation might well cause higher firm performance or a growth of company seize. Using system GMM allows controlling for this simultaneity problem as well.

A second advantage of system GMM estimation techniques is the possibility to model dynamic relations, meaning that the current realization of the dependent variable might well be influenced by

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[28] Cunat and Guadalupe (2009b) instrument import penetration by using import tariffs and exchange rates. Autor et al. (2014) instrument changes in U.S. imports from China using import growth in other high income countries.
[29] In Arellano-Bond's difference GMM estimator endogeneity is solved by removing the fixed effect by differencing it out (or by using orthogonal deviations) and instrumenting endogenous differences with levels. Contrary, Blundell and Bond's system GMM approach uses lagged differences as instruments for levels and lagged levels as instruments for equations in first differences such that all regressors are exogenous to the fixed effects. In comparison to difference GMM system GMM produces efficiency gains in particular in autoregressive models with persistent series (e.g. Baltagi, 2013, pp. 167, Blundell and Bond 1998, Roodman 2009).

past ones. Considering the general consistency of management compensation over time it might be useful to insert the lagged dependent variable $\ln Comp_{i,j,t-1}$ as additional explanatory variable in order to control for serial dependences.

Due to the fact that there is no trade-off between lag length and sample length in GMM estimation technique, theoretically one could include all valid lags as instruments. However, in order to limit the weak instrument problem we restrict the lag range for our endogenous variables to lag two for the transformed equation and lag one for the levels equation[30]. As mentioned earlier a necessary condition for the validity of the system GMM approach is the absence of second order autocorrelation. Therefor we present the Arellano-Bond autocorrelation test results for second order serial correlation. Furthermore, we test the validity of our instruments by presenting Hansen test statistics indicating whether the overidentification moment conditions in the presence of robust standard errors are valid. Additionally, we apply robust two-step estimation with Windmeijer-corrected standard errors[31]. Furthermore we include time dummies in order to remove universal time-related shocks from the error preventing contemporaneous correlations between individuals[32]. As it is standard in GMM estimation techniques we assume time dummies to be strictly exogenous.

5   Econometric Results

Table 2.3 and 2.4 present estimation results for the German respectively the U.S sample. Due to the dynamic model specification it has to be considered that all presented coefficients represent short run coefficient[33]. In both tables column (1) matches our first basic specification in equation (2.3). For both countries it turns out that import penetration has a significant positive impact on total average per head executive compensation. Thus, in German manufacturing industry an increase of import penetration of 1% leads to a short run increase of average per head executive compensation of 0.0989%. In comparison to Germany the impact in the U.S manufacturing industry is with an short run elasticity of 0.184% almost twice as high.

Column (2) in both tables, matches our second basic specification from equation (2.4). By adding an interaction term between import penetration and ROE this specification reveals weather the increasing impact of competition on total level of executive compensation is due to an increase in the fix or the incentive based component. The estimated coefficients of import penetration and the interaction term present ambiguous signs in both countries. In particular, the coefficient of the interaction term turns out to be significant positive whereas the coefficient of the pure import penetration variable stays

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[30] As a rule of thumb Roodman (2009) reports that the number of instruments should not outnumber individual units in the panel. We aime to fulfill this rule. Furthermore

[31] Windmeijer (2005) presents a finite-sample correction to the standard errors which leads to more accurate estimations in comparison to cluster-robust one-step estimations (e.g. Roodman, 2009).

[32] Roodman (2009) mentions that no correlation across individuals are basic assumptions on the autocorrelation test and the robust estimates of the standard errors. Thus, implementing time dummies makes this assumption more reliable.

[33] In order to receive long run coefficients each coefficient has to be divided by $(1 - \pi_1)$ in equation (2.3) respectively (2.4).

insignificant. Hence, in contrast to Cunat and Guadalupe (2009b) we first conclude that there is no significant impact of foreign competition on fixed components, but that the in column (1) observed increasing overall effect might be basically driven by changes in the performance-based part of executive compensation.

As stated earlier the performance sensitivity in in model (2) is now depending on a given level of import penetration. Thus, in order to quantify the performance sensitivity we first have to derive the marginal effect of ROE on the dependent variable:

$$\frac{\partial lnComp_{i,j,t}}{\partial ROE_{i,j,t}} = \beta_2 + \beta_4 * \ln ImportPen_{j,t} \qquad (2.5)$$

Due to the fact that import penetration is measured as a ratio, equation (2.5) reveals that the marginal effect of ROE on executive compensation for the German case only turns out to be positive for a degree of import penetration that is higher than 0.3769[34]. Thus, given the degree of import penetration is lower than 0.3796 (which is quite realistic considering that the sample mean of import penetration is 0.356) the marginal effect of the performance indicator is negative. However, given the degree of import penetration is higher than 0.3796 the marginal effect of ROE is positive and increases with a higher degree of competition. Such a nonlinear relationship between competition and managerial pay performance sensitivity is consistent with the theoretical model derived by Beiner et al. (2011). In particular the authors postulate that "a higher intensity of product market competition […] leads to weaker incentive schemes for the manager if the intensity is weak, and a higher intensity of product market competition leads to stronger incentive schemes for the manager in case the intensity exceeds a certain level" (Beiner et al., 2011, p. 339). Additionally, the authors state that the impact of competition on pay sensitivity increases with the intensity of product market competition. Beiner et al. (2011) already provide empirical support for their hypothesis by analyzing the impact of product market competition on managerial incentives using Swiss data. In particular the authors provide evidence for a convex relationship between competition intensity and the strength of managerial incentives. Our results in table 2.3 provide further empirical support for their hypotheses by revealing that pay performance sensitivity only exerts an wage increasing impact given a certain degree of competition intensity is reached. However, considering that the elasticity of import penetration in column (1) is significant positive we conclude that at the average the increasing impact of foreign competition on managerial incentives must outweigh the decreasing. In particular the negative pay performance sensitivity for low levels of import penetration and at the same time the positive overall effect of import penetration on executive compensation might indicate that the fix component of executive compensation plays a dominant role in cases of low competition levels.

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[34] $\beta_2 + \beta_4 * \ln ImportPen_{j,t} \geq 0 \Leftrightarrow ImportPen_{j,t} \geq e^{-\frac{\beta_2}{\beta_4}}$

Considering the U.S. case, the marginal effect in column (2) of table 2.4 turns out to be positive for a level of import penetration that is higher than 0.0522. As the minimum value of import penetration for the U.S. sample lies at 0.033 (table 2.2) it is reasonable to presume a general positive marginal effect of ROE on executive compensation even for small degrees of competition intensities. Thus, the pay performance sensitivity in the U.S. case is positive and additionally increasing with a higher degree of competition.

Accordingly a quantitative comparison of the marginal effect of ROE at any given level of import penetration reveals that the magnitude of the pay performance sensitivity is always higher in the U.S case than in the German case. In contrast to the U.S. market, German stock listed companies are often controlled by families or dominant legal entities (e.g. Becht and Boehmer, 2003)[35]. The high degree of shareholder voting concentration in Germany provides better monitoring possibilities such that high incentive pay packages in Germany might be less necessary. Contrary, the widely spread share ownership structure in the U.S intensives the agency problem such that high pay performance incentives are needed in order to align the interests between owner and manager. These differences in ownership structures between the two countries might explain the differences in the impact of foreign competition on the pay performance sensitivity. The lower the possibility for an intense monitoring the stronger the disciplining impact of foreign competition on executive compensation. Whereas in Germany there is only a need for the disciplining effect in cases of relative high competition levels, U.S executives need to be incentivized much earlier[36]. Furthermore the here determined international difference regarding the impact of competition on managerial incentives are partly in line with Ko et al. (2016) who provide empirical evidence for an increasing impact of competition on managerial incentives given a widely held ownership structure.

Previous literature[37] points out that a basic difference between German and U.S. compensation practices is the stock based component which is much more distinctive in the U.S. case. Thus, U.S. studies, like Cunat and Guadalupe (2009b) for example, mostly refer to performance indicators based on the market value of the firm. Unfortunately, such information is not available for the German dataset. Nonetheless, in order to maintain comparability of the estimation specification between the two countries and yet control for stock market performance we decided to include in column (3) and (4) the yearly price index of CDAX for Germany and the yearly price index of S&P500 for the U.S as additional explanatory variable. As expected, variation in a stock based indicator has a stronger positive short run impact on executive compensation in the U.S. (0.483 respectively 0.429 percent)

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[35] For an international comparison of blockholdings see Becht and Röell (1999)

[36] The just identified international differences regarding the impact of competition on managerial incentives are partly in line with Ko et al. (2016). Ko et al (2016) provide empirical evidence for an increasing impact of competition on managerial incentives given a widely held ownership structure. However, the authors also state that competition has no impact if the firm is family- or state-controlled. By generalizing and assuming that the U.S sample represents widely held firms and that the German sample represents family- or state-controlled firms we indeed observe that managerial incentives increase stronger in the U.S. However, we also observe an increasing impact in Germany given a certain level of competition intensity is reached.

[37] Abwod and Bognanno (1995), Kaplan (1999) or Fernandes et al. (2012)

than in Germany (0.191 respectively 0.154 percent). Furthermore, the results reveal that the former observed impact of import penetration stays robust regarding magnitude, sign and significance. As an alternative and probably as a higher aggregated indicator for cyclical trends including fluctuations on the capital market, column (5) and (6) present estimation results using GDP as additional explanatory variable. The results are very similar to model (3) and (4). Again we find support for a higher positive short run impact of cyclical trends in the U.S. than in Germany. The impact of import penetration in column (5) and (6) stays robust for both countries.

All specifications include a full set of time dummies. As we define the base year to be in 2007 the coefficients of dyear_08 and dyear_09 represent the impact of the recent financial crisis. In almost all specifications we find a significant negative impact of the crises on executive compensation. However, the short run magnitude of the crises effect is in general higher in the U.S. than in Germany.

All in all from a quantitative perspective we observe that the impact of stock price index, GDP, as well as time dummies is higher in the U.S. than in Germany. This in turn might provide evidence for the fact that executive compensation in the U.S. is in general more sensitive to long run performance due to higher share of stock based components than in Germany.

The variable lnSales measures the short run impact of company size on executive compensation. Contrary to Abowd and Bognanno (1995) we find evidence for the fact that quantitatively both countries have (at least in the short run) similar pay sensitivities. Depending on the specification the pay sensitivity ranges in the U.S. from 0.10% to 0.07% and in Germany from 0.10 to 0.05%. Calculating the long run effects reveals that the size coefficient for the German case varies between 0.17 and 0.28 whereas the range for the U.S. case is slightly lower with 0.14 until 0.22.

However, considering that the average U.S. firm is at the average more than 9 times as big as the average German firm (increase in sales from 1.8 billion Euros[38] to 16.507 billion Dollar), illustrates the huge differences in company size between these two countries. Based on the estimated long term size coefficient of 0.24 for the German data in the base model (table 2.3 column 2), an increase of sales by a factor of 9 would lead to an increase of average executive compensation by 69 percent[39]. Thus, in absolute values the current average German executive compensation of 432.524 thousand Euros would increase to a value of 730.966 thousand Euros. Assuming that German firms would be as big as U.S. firms our estimates reveal that the relation between average U.S. and German compensation would decrease from the 10 fold to the 6 fold.

Similar calculations regarding the impact of the performance indicator ROE reveals less explanatory power for international pay differences: The average value of ROE in the German subsample is 9.319

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[38] In order to provide a better comparison in absolute effects we restricted the German sample to a comparable time period (1993 to 2010).

[39] For large changes in log transformed explanatory variables the approximate interpretation saying that a percentage change in the dependent variable corresponds to a β percent change in the dependent variable does not hold. In cases of a large change δ the dependent variable would increase by $\exp(\beta \log(1 + \delta)) = (1 + \delta)^{\beta}$. In our example sales is increasing by a factor of 9 which results in an increase of executive compensation to the $9^{\beta} = 9^{0,24} = 1.69$.

percentage points lower than the average value of ROE in the U.S. sample (from 7.28 percent to 16.6 percent). Calculating the impact of such an increase at the sample mean of import penetration based on German estimates in table 2.3 column 2 (long term effects) reveals that executive compensation would only increase by 0.4 percent[40]. As discussed above and contrary to the size effect there is a systematic difference in the pay performance sensitivities between the U.S. and Germany. As an alternative we therefore calculate the wage impact a decrease of the U.S. ROE to the German ROE level would have on the U.S. compensation level. Based on the estimates in table 2.4 column 2 it turns out that a decrease of the U.S ROE of 9.319 percentage points would decrease the U.S. compensation level by 17%[41].from 4,453 to 3,697 thousand dollars). Provided that U.S. firms would have similar ROE like German firms, the relation between average U.S. and German compensation would decrease from the 10 fold to the 8.5 fold.

Hence, we conclude that systematical differences in company size between the U.S and Germany serve as one of the predominant explanation for the often discussed huge differences in total per head compensation. However, although we observe systematical differences in company performance (represented by ROE), this differences are not able to explain much of international wage differences.

Finally, we model dynamic models by including the lagged dependent variable as explanatory variable in order to control for serial dependences. In both tables the lagged dependent variable is highly significant. Thus, our model supports our specification. Furthermore the magnitude of the coefficient of the lagged dependent variable is higher in the German sample than in the U.S sample. This might be interpreted as a hint for the fact that in Germany executive compensation is stronger depending on (previous) fix components and less on variable performance based components.

The Arellano-Bond autocorrelation test results for second order serial correlation in table 2.3 and 2.4 reveal the absence of second order serial correlation at a significant level of at least 5%. Thus the necessary condition for the validity of our estimation technique is fulfilled. Also the Hansen test p value of overidentified restrictions reveals that the null hypothesis cannot be rejected and thus supports the validity of our instruments.

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[40]The German marginal impact of ROE on lnComp at the German subsample mean of import penetration is calculated by: $\frac{\partial lnComp_{i,j,t}}{\partial ROE_{i,j,t}} = 0.0187 + 0.01915 * \ln(0.386) = 0.00047$.

[41] The U.S. marginal impact of ROE on lnComp at the U.S. subsample mean of import penetration is calculated by: $\frac{\partial lnComp_{i,j,t}}{\partial ROE_{i,j,t}} = 0.0318 + 0.0110 * \ln(0.3039) = 0.01868$.

Table 5.1: System GMM – German Manufacturing Industry 1985-2010

	(1)	(2)	(3)	(4)	(5)	(6)
lnComp$_{t-1}$	0.695***	0.657***	0.670***	0.656***	0.670***	0.652***
	(11.58)	(11.35)	(12.12)	(11.59)	(12.12)	(12.18)
lnSales	0.0520**	0.0816***	0.0782***	0.0995***	0.0782***	0.0995***
	(2.52)	(3.67)	(3.75)	(4.45)	(3.75)	(4.52)
ROE	0.000334	0.00641**	-0.00101	0.00539**	-0.00101	0.00531**
	(0.25)	(2.07)	(-0.82)	(2.26)	(-0.82)	(2.20)
lnCDAXPI			0.191***	0.154***		
			(4.89)	(4.49)		
lnGDP					0.149***	0.125***
					(4.89)	(5.04)
lnImportPen	0.0989**	0.0523	0.0847**	0.0360	0.0847**	0.0444
	(2.50)	(1.35)	(2.32)	(0.99)	(2.32)	(1.22)
lnImportPen* ROE		0.00657**		0.00650***		0.00648***
		(2.37)		(3.02)		(2.96)
dyear_08	-0.180***	-0.191***	-0.0665	-0.0946*	-0.182***	-0.193***
	(-3.31)	(-3.85)	(-1.15)	(-1.76)	(-3.70)	(-4.02)
dyear_09	-0.105	-0.116*	-0.0457	-0.0692	-0.120*	-0.136**
	(-1.57)	(-1.74)	(-0.70)	(-1.11)	(-1.92)	(-2.22)
N	2478	2478	2478	2478	2478	2478
ar2p	0.133	0.0846	0.111	0.0718	0.111	0.0686
hansenp	0.331	0.411	0.424	0.900	0.424	0.876

Dependent variable is *logCEOComp*, *t* statistics in parentheses, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, robust standard errors, two-step estimation, instruments restricted to second lags. Due to currency change in 2001 from DMark to Euro all monetary values have been transformed into Euro values by dividing with factor 1.95583. All monetary values are consumer price index deflated and reported in 1995 Euro. A full set of time dummies is used but only a selection of time dummy coefficients is presented.

Table 5.2: System GMM – U.S. Manufacturing Industry 1993-2011

	(1)	(2)	(3)	(4)	(5)	(6)
$lnComp_{t-1}$	0.523***	0.528***	0.528***	0.542***	0.528***	0.542***
	(7.68)	(8.48)	(8.22)	(8.59)	(8.21)	(8.59)
lnSales	0.103***	0.0831***	0.0699**	0.0796***	0.0699**	0.0796***
	(2.77)	(2.69)	(2.18)	(2.65)	(2.19)	(2.65)
ROE	0.00802***	0.0150***	0.00625***	0.0148***	0.00626***	0.0148***
	(3.80)	(3.36)	(3.07)	(3.62)	(3.14)	(3.62)
lnS&P500PI			0.483***	0.429***		
			(7.42)	(6.73)		
lnGDP					0.369***	0.327***
					(7.36)	(6.73)
lnImportPen	0.184***	0.0795	0.156***	0.0275	0.160***	0.0275
	(3.29)	(1.19)	(3.13)	(0.47)	(3.21)	(0.47)
lnImportPen* ROE		0.00508**		0.00591***		0.00591***
		(2.02)		(2.83)		(2.83)
dyear_08	-0.310***	-0.275***	-0.0477	-0.0787	-0.291***	-0.296***
	(-3.91)	(-3.44)	(-0.59)	(-0.97)	(-3.93)	(-3.78)
dyear_09	-0.345***	-0.311***	-0.223***	-0.208***	-0.356***	-0.328***
	(-4.81)	(-4.47)	(-3.28)	(-3.03)	(-5.17)	(-4.61)
N	2802	2802	2802	2802	2802	2802
ar2p	0.0687	0.0612	0.0550	0.0511	0.0556	0.0511
hansenp	0.359	0.707	0.464	0.972	0.458	0.972

Dependent variable is *logCEOComp*, *t* statistics in parentheses, $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, robust standard errors, two-step estimation, instruments restricted to second lags. All monetary values are consumer price index deflated and reported in 2010 Dollar. A full set of time dummies is used but only a selection of time dummy coefficients is presented

6 Offshoring and International Outsourcing

One might argue that the measurement of import penetration and its exclusive interpretation as an indicator for the degree of foreign competition might ignore the fact that a certain share of import could well indicate efficiency, in particular in case of imported intermediate goods. The fact that imports could well include intermediates and thus represent a firm's efficient sourcing strategy, has recently gained in importance. Literature calls this phenomenon "offshoring" or "international

outsourcing"[42]. In order to show, that our measurement of foreign competition represented by import penetration including all imported goods is adequately we use a German subsample that allows us to separate imported final goods from imported intermediates. Like this we are able to separate potential efficiency effects which might be included in the measurement for foreign competition that is commonly used.

In order to underline the relevance of imported intermediates in current developed economies Miroudot et al. (2009) summarize that 56% (73%) of trade in goods in OECD countries is trade with intermediate goods (services). However, Dustmann et al. (2014) argue that considering the fact that in 2007, 70 percent of overall inputs in Germany's manufacturing sector are still domestically produced one should not assume that especially Germany is an assembly place for foreign produced inputs[43].

Most of existing literature regarding offshoring focuses on its impact on labor market outputs in particular on labor market demand[44]. However, a firm's motivation to increase offshoring could aim to lower costs, acquire higher quality and eventually improve its own competitiveness. Thus increasing the substitution of expensive domestic inputs by cheaper foreign inputs could be an appropriate measurement for the efficiency respectively productivity within an industry. Though, a much smaller part of literature is concerned with the productivity effects of offshoring. Wagner (2011) and Schwörer (2012) provide an overview on theoretical and empirical literature focusing on productivity effects of offshoring. All in all existing literature provides evidence for small positive productivity effects. However, Schwörer (2012) points out that the effects are heterogeneous and highly depend on the country, the type of firms and the type of offshored inputs. Wagner (2011) in particular focuses on German studies and summarizes that offshoring indeed causes positive productivity effects in Germany. A recent study of Dustman et al. (2014) point out that Germany's manufacturing industry improved its competitiveness between 1995 and 2007 by: (1) using inputs from other domestic industries with lower real wages, (2) declining unit labor costs and increasing mean real wages in the manufacturing industry indicating higher productivity increases than wage increases and (3) increasing the amount of imported intermediates from especially the Eastern European countries in order to increase the competitiveness of its own final products.

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[42] The differentiation between offshoring and international outsourcing is depending on the ownership and location of production. In case of offshoring a firm derives its intermediates from abroad independent of weather the provider is external or affiliate to the firm. In case of international outsourcing a firm assigns the production of the intermediate input to an independent supplier abroad. Thus, the term "offshoring" includes the term "international outsourcing" (Wagner, 2011, p. 218). As the location being the crucial aspect of our offshore resp. international outsourcing indicator we will use both terms as synonyms.

[43] The authors point out that 51% of inputs used in domestic manufacturing industry are domestic inputs from other domestic sectors which stayed relatively stable over the period from 1995 to 2007. However, there has been an increase in foreign inputs.

[44] A survey study of Crinó (2009) reviews this empirical literature. The author concludes amongst other things that especially low-skilled workers are negatively affected from material offshoring such that wage inequalities increase. Furthermore there is a tendency (though not definite conclusion) for higher volatility of unemployment due to a more flexible labor demand. In case of service offshoring Crinó (2009) states that it has a small negative effect on total employment and a strong impact on the composition of workforce due to an increase in the share of high-skilled white-collar employees. However, he also mentions that the overall labor effects are rather modest and mostly concentrated on special workforce groups.

As literature finds evidence for positive productivity effects due to outsourcing, we now aim to check whether the former observed positive impact of import penetration on management compensation is driven by productivity effects due to outsourcing. In order to do so appropriate data on imported intermediates is needed. For the German case we use annual German input-output tables from German national accounts data allowing a separation between imported inputs and final imports on a two digit industry level. Unfortunately such a separation is not possible for the U.S. data due to a lack of adequate and publicly available data[45]. Therefor we restrict our analysis of the impact of international outsourcing on executive compensation and the pay incentives to a German subsample.

As an appropriate measurement of outsourcing intensity we basically refer to Geishecker (2006) or Schwörer (2013) who define international outsourcing as the sum of a two-digit industry's purchases of imported goods form all manufacturing industries abroad as a share of the domestic industry's production value.[46].

$$OUTSOURCING_{jt} = \frac{\sum_{j^*=1}^{J^*} IMPINPUT_{j^*t}}{Y_{jt}} \tag{2.6}$$

In contrast to only focus on inputs from manufacturing industry abroad (e.g. Campa and Goldberg, 1997) we consider a "broader" definition by calculating the sum of all imported intermediates ($IMPINPUT_{j^*t}$) from industry j^* abroad as a share in domestic production value Y_{jt} in the domestic industry j.[47]. Besides calculating an indicator for the international outsourcing intensity on industry level, German input-output tables also deliver information on imported final goods which we use to

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[45] The value of imported intermediates in U.S. input-output accounts is not available due to data limitations such that the information has to be imputed from data of annual input-output tables. In particular the imputed values are based on a so called "import comparability" resp. "proportionally" assumption assuming that the share of imported intermediates from all intermediates equals the ratio of imports to domestic supply. By using such an proportional assumption Feenstra and Hanson (1999) find that in the U.S. between 1979 and 1990 outsourcing could explain 15% of the increase in relative wages of nonproduction workers. However, the validity of such results is questionable and the National Research Council (2006) critiqued Feenstra and Hansons's (1999) assumption as significant limitation of current data collection and analysis. Winkler and Milberg (2012) use German data in order to test the employment effects of offshoring using the direct measures and the proxy measure calculated by using the proportionality assumption. It turns out that the impact highly depends on whether they use the direct measure or the proxy. Thus, using the direct measure indicates a significant negative impact of service offshoring on employment whereas by using the proxy the impact turns out to be insignificant and sometimes even of opposite sign. Consequently Winkler and Milberg (2012) recommend cautiousness with the use of proxy measurements for imported intermediates. Even Feenstra and Jensen (2012) discuss critiques on their proportionally assumption and evaluate alternative methodologies using firm level trade data which are not publicly available.

[46] An alternative measurement for the outsourcing intensity would be to measure imported intermediates as a share in total non-energy inputs like in Feenstra and Hanson (1999) or Amiti and Wei (2009). However, Schwörer (2013) and Geishecker (2007) argue that scaling by non-energy inputs is hard to interpret due to the fact that non-energy inputs might be also affected by changes from internal production to domestic outsourcing and thus do not represent a measure of the importance of international versus domestic outsourcing.

[47] Generally, literature on international outsourcing (e.g. Feenstra and Hanson (1999), Geishecker (2006), Winkler and Milberg (2012)) focuses on the share of manufactured imported intermediates as a share of production value when analyzing potential labor demand or inequality effects. As we are interested on the impact of outsourcing on managerial compensation as a general efficiency dimension we use a slightly different measurement by considering all imported intermediates as a share of production value (in particular imported intermediates from service sectors are additionally considered). Thus we do not interpret outsourcing as a "make-or-buy" decision more like a "does the industry prefer imported intermediates over domestically produced intermediates" in general.

calculate the import penetration defined as above[48]. Hence, the input-output table delivers two measurements which adequately differentiate between general import penetration as a measurement for foreign competition and outsourcing as a measurement for efficiency.

Due to the fact that input-output tables are currently only consistently available for the period from 1996 until 2007 the following analysis is based on a subsample of the original German database used before[49]. Table 2.5 represents summary statistics for this subsample. Thus, in the unbalanced subsample we observe 237 firms over the period from 1996 until 2007 such that total firm-year observation is 1117. In comparison to the full sample (table 2.1) the mean values of the variables only change marginally. Thus, the average per head executive compensation increased to 453 thousand Euros which is manly caused by the younger time period the subsample is in contrast to the full sample covering. Similar development hold for the other variables. Regarding the measurement of import penetration we observe that the mean value is with 0.39 slightly higher in comparison to the full sample which might be well caused by the more recent time period of the sub sample. However, considering that the construction of import penetration in the subsample is based on a different data base the value is close to the one of our subsample representing consistencies of our different data sources. Unsurprisingly the sample mean for the outsourcing variable is with 0.16 smaller than the import penetration rate.

Table 6.1: Summary Statistics – German Subsample 1996-2007

	mean	sd
Comp	453.6056	464.8054
Sales	1913.981	6908.315
ROE	8.567502	18.95925
CDAXPI	306.4637	73.80555
GDP	1988.792	56.90253
ImportPen	.398065	.2194701
Outsourcing	.1637348	.0663212
N	1117	

Due to currency change in 2001 from DMark to Euro all monetary values have been transformed into Euro values by dividing with factor 1.95583. All monetary values are consumer price index deflated and reported in 1995 Euro.

Table 2.6 presents system GMM estimation results based on the German subsample. For clarity we only present the estimation results of our basic specification (equation 2.3 and 2.4) including import penetration based on input output tables (column (1) and (2)) on the one side and outsourcing (column (3) and (4)) on the other side[50].

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[48] In particular the definition for import penetration for the subsample is: $ImportPen_{j,t} = \frac{imported\ final\ goods_{j,t}}{final\ output\ value_{j,t} - exports_{j,t}}$, whereas "final output value" already includes all the imports.

[49] Due to new revisions input-output tables from after 2007 are not easily comparable with input-output tables from former periods. The input-output tables used in this analysis are based on revision 2005.

[50] We also estimated the other specifications using GDP or CDAX price index as additional explanatory variable (table 2.3, column (3)-(6)). The results are similar to the one in table 2.3 and available upon request.

Table 6.2: System GMM – Germany Manufacturing Industry – Subsample 1996-2007 - Outsourcing

	(1)	(2)	(3)	(4)	(5)	(6)
lnComp$_{t-1}$	0.733***	0.687***	0.720***	0.687***	0.749***	0.733***
	(10.83)	(10.18)	(10.94)	(11.16)	(12.72)	(12.65)
lnSales	0.0899***	0.0998***	0.0692***	0.0836***	0.0759***	0.0817***
	(3.46)	(3.72)	(3.15)	(3.84)	(3.49)	(3.56)
ROE	-0.00226	0.00339	-0.00211	0.00239	-0.000647	0.00106
	(-1.11)	(1.59)	(-1.11)	(0.44)	(-0.37)	(0.19)
lnImportPen	0.200**	0.116			0.300**	0.318**
	(2.28)	(1.46)			(2.42)	(2.32)
lnImportPen*ROE		0.00566**				
		(1.97)				
lnOusourcing			0.0501	0.0356	0.238	0.227
			(0.58)	(0.46)	(1.60)	(1.41)
lnOutsourcing*ROE				0.00239		0.000961
				(0.69)		(0.27)
lnImportPen*lnOutsourcing					0.187**	0.190**
					(2.34)	(2.10)
N	1117	1117	1117	1117	1117	1117
ar2p	0.257	0.252	0.261	0.269	0.259	0.262
hansenp	0.118	0.322	0.0959	0.368	0.163	0.658

Dependent variable is *logCEOComp*, *t* statistics in parentheses, $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, robust standard errors, two-step estimation, instruments restricted to second to forth lags for model (1) to (4), instruments restricted to second to third lags for model (5) and (6). Due to currency change in 2001 from DMark to Euro all monetary values have been transformed into Euro values by dividing with factor 1.95583. All monetary values are consumer price index deflated and reported in 1995 Euro. A full set of time dummies is used but not presented.

The impact of import penetration is similar to the previous ones in table 2.3 regarding sign and significance. Although based on a different data source column (1) in table 2.6 still reveals that an increase in the import penetration rate has a significant positive impact on the total average per head executive compensation[51]. Again, the second column of table 2.6 presents the basic model extended by an interaction term between ROE and import penetration in order to model the impact of import penetration on managerial incentives. Also in this specification the results stay robust. Thus, we observe that the interaction term is significant whereas the coefficient of import penetration is insignificant indicating that the increasing impact of import penetration is most likely driven by changes in managerial incentives. Also in line with former results the marginal effect of ROE only turns out to be positive given import penetration exceeds a value of 0.54.

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[51] Though, the elasticity is with 20 percent bigger than the equivalent elasticity in table 2.3 column (1) with 10%. One reason for this difference might be the more recent time period that is used in table 2.6 indicating that the impact of import penetration increased over the years.

Contrary, the impact of outsourcing in column (4) of table 2.6 turns out to be insignificant. This indicates that an increase in international outsourcing and thus a more efficient sourcing strategy has no influence on the level of management compensation. Even extending the model by implementing the interaction between ROE and outsourcing (column (4)) does not change the result. An increase of international outsourcing does not per se influence the pay-performance sensitivity of executive compensation.

However, as mentioned earlier Raith (2003) and Schmid (1997) state theoretically that the impact of competition leads to an increase of managerial pay in case the value of a cost reduction is high. Considering outsourcing intensity as an indicator for the value of a cost reduction our setting allows checking whether the impact of competition on managerial pay indeed depends on the value of a cost reduction. Thus, in column (5) respectively (6) of table 2.6 we extend model (3) respectively (4) by adding import penetration and the interaction between import penetration and outsourcing as additional explanatory variables[52]. In line with Raith (2003) and Schmid (1997) the coefficient of the interaction term between outsourcing and import penetration turns out to be significant positive. Thus, the stronger a company's effort to substitute expensive domestic inputs by cheaper foreign inputs the higher the positive impact of competition on managerial pay.

To sum up, disentangling the impact of imports on executive compensation into a competition measurement represented by import penetration based on final goods and into an efficiency measurement represented by outsourcing yields heterogeneous results. In particular these results reveal that the impact of import penetration on executive compensation respectively on managerial incentives is most likely driven by the competition effect rather than by a potential efficiency effect. Furthermore, based on theoretical assumptions it turns out that the positive impact of competition on managerial pay intensifies with the degree of outsourcing.

Thus, the results of the German subsample based on input-output tables provide evidence that the former observed positive impacts of import penetration in the German sample as well as in the U.S sample (table 3 and 4) are most likely driven by competition effects.

7 Conclusion

With the liberalization of global financial markets, the foundation of the world trade organization or the introduction of free-trade agreements the relevance of globalization increased rapidly since the early 90's. Accordingly, in particular increased imports intensify competitive pressure companies are exposed to.

This study provides empirical evidence on the impact of foreign competition on managerial pay incentives using German and U.S. data. For both countries it turns out that an increase in foreign competition, represented by import penetration rates, increase average per head executive

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[52] In order to avoid excessive additional interaction variables we consider in the following the impact on total pay as this consists out of the fix and variable component. If the variable component raises it is also reflected in the total pay.

compensation. However, being more detailed by focusing on the impact of foreign competition on the pay performance sensitivity reveals international differences: In the U.S. an increase of foreign competition leads to a general increase of pay performance sensitivity. However, for the German case such a general interpretation is not possible. Only if a certain degree of competition intensity is reached pay performance sensitivity turns out to be positive and increasing. In turn, in case of low levels of competition intensity the model predicts negative pay performance sensitivities. Considering that the general impact of foreign competition leads to an increase of total compensation we argue that negative pay sensitivities in case of low competition level might indicate the overweight of fix compensation components.

A potential reason for international differences in the impact of foreign competition on pay performance sensitivity might be the fact that in the U.S share ownership is typically more widely spread which makes the agency problem more severe. This might explain why our results indicate that competition as a governance instrument and thus its impact on managerial incentives applies earlier and more intense in the U.S. than in Germany.

However, using import penetration rates as indicator for the degree of foreign competition raises the question whether the estimated impact indeed represents the impact of competitive pressure or whether it rather represents efficiency effects. In detail, literature argues that imported intermediates indicate a firm's efficient sourcing strategy aiming to lower costs, acquire higher quality and improve competitiveness.

Thus, in a next step this study checks whether the estimated impact is driven or biased by potential efficiency affects. In order to do so, we use German input output table data that allows for a precise differentiation between imported final goods and imported inputs. Re-estimating the model reveals, that former results only reappear in case of estimates based on final imported goods. Outsourcing, respectively an increase in imported intermediates, turns out to have no significant impact on managerial compensation. Hence, this study provides empirical evidence that the positive impact of managerial pay incentives is driven by competitive pressure from abroad.

Acknowledgments

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