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GLOBALIZATION AND EXECUTIVE COMPENSATION

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ABSTRACT

Employing comprehensive data on top executives at major U.S. companies, we show that their compensation is increasing with exports, as well as firm size and technology. Exogenous export shocks unrelated to managerial decisions also increase executive compensation, and there is little evidence that this is due to increasing returns to talent. We do find that export shocks primarily affect discretionary forms of compensation of more powerful executives at firms with poor corporate governance, as one would expect if globalization has enhanced rent-capture opportunities. Overall, globalization has been more important for the rapid growth of executive compensation and U.S. inequality than previously thought, with rent-capture playing a role.

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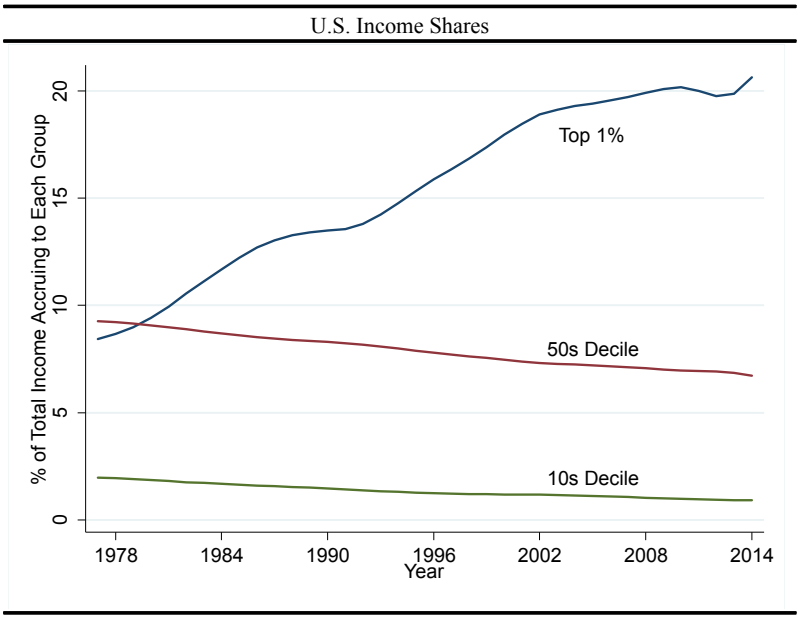
1 Introduction

"American policy has allowed the winners to keep most of the spoils of trade and has given the losers crumbs. This has exacerbated income inequality by raising the profits of big corporations and the salaries of executives and other white collar professionals while leaving blue-collar and lower-skilled workers poorer"
New York Times Editorial April 2, 2016

Globalization and income inequality are currently two of the most important economic issues, with dissatisfaction about both shaping elections throughout the world. While there is a common perception that these issues are related (as illustrated by the quote above), research has tended to focus on the impact of globalization on the low-end of the income distribution. However, it is high incomes, especially the top 1%, that appear to drive U.S. inequality, as Figure 1 shows:[1]

FIGURE 1



Notes: Kernel-weighted local polynomial smoothed data from World Wealth and Income Database (WID; website: wid.world).

This paper examines the relationship between globalization and growing inequality by focusing on the incomes of top business executives. By 2013, the typical top business executive of a Standard and Poor 500 Indexed firm earned more than $4 million a year, while Chief Executive Officers (CEOs) made upwards of $9 million a year, putting both safely within the top 1% of all income earners.[2] Moreover, non-finance

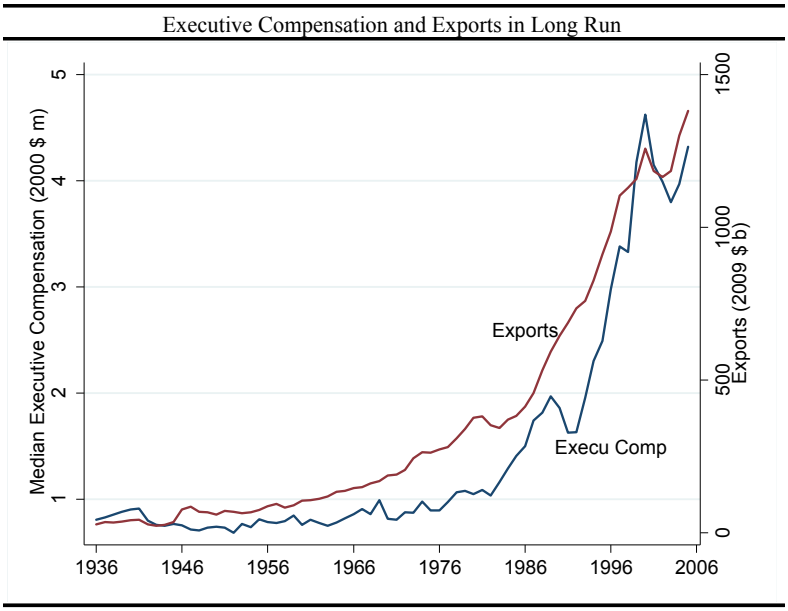
[1] We also show the evolution of all U.S. income deciles in Appendix A.1.

[2] The threshold depends to some extent on whether measures of total income or labor income are employed; Guvenen and Kaplan (2017) discuss a number of major issues. Piketty, Saez, and Zucman (2017) note that $1.3 million is the *average* pre-tax income of the top 1% in 2014, with the cutoff lower than that. Guvenen, Kaplan, and Song (2014) show that the 1% wage and salary threshold in 2012 was $291,000 based on a 10% sample of Social Security Administration data, with wages and salaries accounting for about 60% of total income for the top 1% individuals.

business executives are the largest share of the top 1% and are representative of the top 1% more generally (Bakija et al. 2012, Kaplan and Rauh 2013). Furthermore, executive compensation is rising relatively quickly, with CEO pay increasing more than eight times as fast as average worker pay over the last three and half decades (Edmans, Gabaix, and Jenter 2017). While we study business executives, compensation in other fields like entertainment and sports may be even more susceptible to globalization.[3]

While the income trends of Figure 1 are well-documented and exist in most high-income countries, the causes of this growth in inequality have remained controversial.[4] A variety of explanations have been proposed, but globalization has rarely been a focus (see Bertrand 2009, Kaplan and Rauh 2013, and Edmans, Gabaix, and Jenter 2017). Thus, our first goal is to examine whether globalization is a cause of the rapid increase in top incomes. A preliminary check of the data offers support for this hypothesis. Figure 2 shows that over the last seventy years there has been a rapid increase in both executive compensation and exports, our main measure of globalization:[5]

FIGURE 2



Notes: Data on the median compensation of the three highest paid executives at the 50 largest U.S. firms comes from Frydman and Saks (2010). Total compensation includes salary, bonuses, stocks, and options granted (valued using Black – Scholes). U.S. export data comes from FRED (St. Louis Fed)

[3]Entertainment and sports superstars have benefited from the ability to reach large global audiences (e.g. Gordon and Dew-Becker 2008).

[4]Appendix A.2 shows that the share of income going to the top 1% is increasing in most OECD countries. Gordon and Dew-Becker (2008) and Edmans, Gabaix, and Jenter (2017) examine why the trend is quantitatively stronger in the US.

[5]International trade data is more readily available than other measures of globalization. Exports and imports are likely correlated with other forms of globalization and thus serve as useful proxies for globalization overall. We obtain similar results using information on multinational affiliate sales (section 6.2).

To the extent that globalization matters for executive compensation, our second goal is to understand more fundamentally why exports increase executive pay. First, perhaps market forces reward talented executives who make strategic decisions that expand their firm abroad. Such executives earn more because they successfully navigate the logistics of selling to many markets, deal with the complexity of setting up production stages that span numerous countries, and overcome bargaining and contractual issues in foreign countries. In this case, globalization's effect on pay is the result of the executive's own talent and actions. However, pay increases can also be due to market forces outside the executive's control that increase the importance of top talent. For instance, globalization can increase optimal firm size (Melitz 2003), and it may induce the reassignment of talented managers to stronger firms (Gabaix and Landier 2008, Terviö 2008). Globalization may also increase pay because it generates new competition for managerial talent (Marin and Verdier 2012) or it changes the firm's organizational structure (Rajan and Wulf 2006, Caliendo, Monte, and Rossi-Hansberg 2015). In short, globalization may change the nature of the executive's job which increases the importance of top talent and thus leads to higher pay (see Rosen 1981).[6] We will refer to these components of increasing executive pay as market returns.

Second, globalization can increase executive pay through non-market channels. In particular, rent-capture has been found to be an important determinant of executive pay (see Bebchuk and Fried 2004, Bivens and Mishel 2013) and we investigate if globalization facilitates these activities. The sheer size of global firms alone might enhance rent-capture opportunities, or international transactions might make it harder for shareholders, board members, as well as regulatory and tax authorities to monitor executives. Globalization induced rent-capture activities may be more feasible for certain types of pay, executives, and firms. By intensifying competition for talent, globalization may also make extreme salaries more acceptable by shifting social norms (Piketty and Saez 2003, 2006), which facilitates future rent-capture behavior. Higher levels of competition may also encourage benchmarking executive pay to a relevant peer group, which has been found to inflate corporate pay (Bizjack et al. 2011). We will refer to these pay increases as non-market returns.[7]

Distinguishing between market and non-market returns is crucial because it influences society's willingness to tolerate inequality. If pay reflects market forces that optimally reward the executive's talent and

[6] In addition, there is evidence that executives now have better outside options because they are increasingly externally recruited and have general, not firm-specific, skills (Murphy and Zabojnik 2006, Frydman 2016).

[7] See also Bertrand and Mullainathan (2001) who discuss luck as another non-market channel. In our context this would imply that export shocks outside the executive's control could directly increase pay or alter market characteristics which in turn increase returns to top talent.

actions, inequality will be less objectionable than if executive pay increases due to rent-capture. In addition to the immediate distributional implications, executive compensation has long been a controversial topic with broader ramifications (see Bertrand 2009, Edmans, Gabaix, and Jenter 2017). The reason for the recent increase in executive pay is important because to the extent rent-capture explains rising executive pay it can lead to polarization and undermine social cohesion.[8]

The relationship between globalization and top incomes is studied by examining the impact of exports on the compensation of executives over the years 1993 to 2013. Our analysis focuses on top executives at publicly traded U.S. firms from *Compustat's* comprehensive and well-known *ExecuComp* data set. We examine whether globalization is influencing top incomes, and if so whether this relationship reflects market or non-market returns.

In line with the simple correlation in Figure 2 our first finding is that firm specific exports, identified using detailed product level trade and firm sales data, have a significant positive impact on executive compensation. An important contribution of our paper is that while firm size and technology investments raise executive compensation, exports increase pay holding constant firm size, technology, and other well-established explanations.[9] In addition, a portion of export's impact on executive pay operates through size and technology, indicating that globalization does alter market returns. Quantitatively, we find that the magnitude of globalization's impact on executive compensation is at least as big as that of firm size and technology. This indicates that globalization has been a more important force behind the increase in executive compensation and inequality than generally perceived.

Second, we examine why globalization is increasing executive compensation. We employ a Bartik (1991) style shift-share instrument that identifies exogenous export shocks which are by construction independent of the executive's actions.[10] The results indicate that a 10% exogenous export shock leads to a 4% increase in the compensation of executives. Even though export shocks are not caused by managerial decisions they can nevertheless alter market characteristics which in turn increase executive pay. For instance, a positive shock may encourage firms to match with a better, more highly paid executive, or it may drive up the returns to talent by changing the nature of the manager's job. While possible, we find no evidence that

[8]On the impact of globalization on economic polarization, see Keller and Utar (2016); Autor, Dorn, Hanson, and Majlesi (2016), Dippel, Gold, Heblich, and Pinto (2017), and Che, Lu, Pierce, Schott, and Tao (2017) examine the link between globalization and political polarization.

[9]While executive pay is also increasing in the presence of insider board relationships, interestingly, we do not find that top marginal tax rates are significantly affecting executive compensation in our sample. This may be because we are exploiting variation in state-level tax rates, in contrast to Piketty, Saez, and Stantcheva (2014) who focus on federal rates.

[10]Our instrument is constructed using presample industry-level bilateral export flows and exogenous industry-level export growth in other high-income countries. Examples of instrumental variables strategies based on other countries include Haskel, Pereira, and Slaughter (2007), Autor, Dorn, and Hanson (2013), and Blanchard and Olney (2017).

export shocks lead to executive turnover, increased pay for newly hired executives, or higher returns to more experienced or educated executives.[11]

Lacking compelling evidence for a market returns explanation, we finally turn to the non-market explanation of rent-capture.[12] Evidence of asymmetry, where executive compensation increases with positive shocks but does *not* decrease with negative shocks, suggests that it might be important. We go further by first exploiting the fact that some forms of compensation are set in a more discretionary way than others, and thus are more susceptible to rent-capture. Export shocks are found to strongly increase bonus payments, with little impact on less-discretionary forms of compensation. Second, we exploit the fact that rent-capture is more likely at poorly governed firms and indeed our results show that the impact of exogenous export shocks is stronger at those firms with insider board relationships. Finally, we take into account the fact that some executives have more managerial power to influence pay decisions than others. In particular, we show that the effect of export shocks on bonuses is strongest for CEOs of poorly governed firms. Together these results indicate that rent-capture associated with globalization has been an important factor in the rise of executive compensation.

We show that exports have also raised the executive-to-worker pay ratio, that not only exports but also foreign affiliate sales increase executive pay, and that similar results are obtained using alternate instrumental variable strategies (including a gravity and a world import demand approach). We verify that the results are robust to (i) employing alternate measures of firm size, (ii) addressing possible selection by using different samples of firms and executives, (iii) utilizing alternative measures of executive compensation, (iv) dealing with the potential endogeneity of poor governance, (v) examining more deeply the role of imports, and (vi) controlling for unobserved industry-by-year characteristics.[13] Overall, we show that globalization has contributed to the recent rise in top-incomes by increasing executive compensation.

The paper makes a number of contributions. First, it speaks to important work assessing the impact of globalization on inequality. Early studies concluded that skill-biased technical change may have been more important than globalization in explaining rising inequality (Katz and Autor 1999, Feenstra and Hanson 1999). However, this literature tended to focus on the distinction between skilled and unskilled workers,

[11] Related to this analysis is the concept of relative performance evaluation (RPE; Holmström 1979), which implies that optimal contracts should only reward executives for relative performance differences. The lack of RPE is well documented (Gibbons and Murphy 1990 and others). Under certain conditions, e.g. when there are constraints on the feasible set of contracts, the optimal contract need not satisfy RPE (see Edmans, Gabaix, and Jenter 2017). We have explored this issue and found little evidence that our results are driven by common explanations for why RPE would not hold (results available upon request).

[12] In principle, the stock-option innovation of the 1990s may have been important for diverting additional rents to top executives (Bebchuk and Fried 2004, Bertrand 2009); we will explore this dimension of the data in Appendix A.6.

[13] Like Cuñat and Guadalupe (2009) we also consider import competition, but this has a smaller and insignificant impact on executive compensation compared to exports (see Appendix A.8).

not the role of the top 1% of income earners. More recently there has been a growing consensus that rising import competition, driven in part by the integration of China into the world economy (Krugman 2008), has adversely affected the low-end of the worker distribution (Autor, Dorn, and Hanson 2013, Pierce and Schott 2016). Our analysis complements this work by shifting the focus to exports and the gains experienced by high-income earners.[14] This is important because high-income earners, especially the top 1%, are arguably the most important driver of income inequality (see Figure 1, as well as Piketty and Saez 2003, 2006, Piketty, Saez, and Zucman 2017).

Second, while anecdotal evidence indicates that globalization may be an important driver of executive compensation, to date it has received little attention from researchers studying executive pay. One argument for dismissing globalization as a driver of executive pay is that globalization should be ubiquitous whereas the trends in top income shares across countries differ (Alvaredo, Atkinson, Piketty, and Saez 2013, Piketty, Saez, and Stantcheva 2014).[15] Another is that globalization should affect occupations differently whereas the trends in top incomes across occupations are the same (Kaplan and Rauh 2013). In contrast, our analysis is based on longitudinal, micro-level data that captures many potential sources of spurious results. Perhaps most importantly, globalization is a promising long-run explanation for the changing pattern of executive pay over the last century. Any successful explanation needs to come to grips with why executive pay was relatively flat prior to 1980 and has increased dramatically thereafter (recall Figure 2). It may be tempting to argue that after 1980 executives have increasingly been able to capture rents, however by most measures corporate governance has *strengthened* not weakened since 1980.[16] Growth in firm size is another prominent explanation for the recent increase in executive compensation (Gabaix and Landier 2008). However, firm size also increased from the 1940s to the early 1970s when CEO compensation was almost constant (Frydman and Saks 2010). In contrast, globalization provides a compelling explanation for the evolution of executive compensation because the time series variation in exports and executive compensation track each other closely before *and* after 1980 (see Figure 2).

Third, we provide a unifying analysis of the executives' market and non-market returns, which are often treated as mutually exclusive explanations. Our findings show that executive compensation is increasing

[14] Hummels et al. (2014) study the impact of exports on wages, though these authors do not focus on top incomes.

[15] While there is certainly variation in top income growth rates across countries, Figure A2 shows a clear upward trend across a diverse set of OECD countries (see Appendix A.2).

[16] For example, due to possible conflicts of interest the Security and Exchange Commission (SEC) started requiring firms in 2006 to disclose the role and identity of all paid compensation consultants, and in 2010 the Dodd-Frank Act strengthened this to stipulate that only independent consultants can be hired. Indeed, Chhaochharia and Grinstein (2009) find strong decreases in CEO compensation at firms affected by Sarbanes-Oxley-inspired legislation which required that the majority of a board's directors be independent. In fact, some argue that higher executive pay should be viewed as compensation for the hassle of increased regulatory requirements (Hermalin 2005). See Murphy and Zabojnik (2004) and Edmans, Gabaix, and Jenter (2017) for more discussion.

with market forces such as firm size and technology investments, consistent with Gabaix and Landier (2008) and Garicano and Rossi-Hansberg (2006), respectively. A portion of globalization's impact on executive pay operates through size and technology, while another portion affects pay after holding size and technology constant, a finding that is new to the literature.[17] We find that executive pay increases with shocks unrelated to executive action, as in Bertrand and Mullainathan (2001), and these export shocks do not alter market returns. Evidence showing that positive shocks increase executive pay but negative shocks do not decrease pay suggests rent-capture may be important.[18] We confirm this by showing that export shocks disproportionately increase discretionary pay to powerful managers at poorly governed firms. More generally, our findings show that both market and non-market forces are important in explaining the rapid rise in executive compensation.

The paper proceeds as follows. In the next section, we begin by discussing the data sources employed in this analysis, provide background information on executive compensation, and describe the main relationship between executive pay and exports. Section 3 tackles our first key question of whether globalization is contributing to the rapid increase in executive compensation. Confirming this to be the case, we then proceed to our second main question: why is this occurring? Specifically, in Section 4 we find that export shocks that are orthogonal to executive actions and other domestic conditions nonetheless increase executive compensation. Furthermore, there is little evidence that these export shocks increase market returns through assortative matching or through increasing returns to talent. We turn our attention to rent-capture in Section 5, where we find that export shocks increase discretionary pay to powerful managers at poor governance firms. We explore a wide variety of extensions in both Section 6 and in the Appendix, which sheds additional light on the relationship between globalization and executive pay as well as demonstrates that the results are robust to other specifications and samples.

2 Data

The empirical analysis utilizes executive compensation data, firm and executive level information, and globalization data from the following sources.

[17] Our results contrast with Ma (2015) who finds no relationship between exports and executive pay once firm size is accounted for.

[18] See also Bertrand and Mullainathan (2001) and Garvey and Milbourn (2006) on this asymmetry.

2.1 Executive Compensation

Compensation information of the top five executives within each Standard & Poor (S&P) firm was obtained from the *Compustat ExecuComp* data set. To the best of our knowledge this is the most comprehensive publicly available data set on executive compensation, with information about each executive, including their name and identifier as well as their company's name and identifier. Importantly, the data set has detailed administrative compensation information based on company filings with the U.S. Securities and Exchange Commission (SEC).

The most commonly used measure of total compensation, TDC2, captures compensation realized by an executive in a given year and is similar in spirit to adjusted gross income (Kaplan and Rauh 2010). Globalization may have a different impact on compensation realized and compensation awarded, given that the executive has more influence over the former than the latter. We therefore also show results utilizing total compensation awarded in a given year, TDC1 (see Table A5).

An appealing feature of this executive compensation data is that it provides detailed information on individual components of compensation, which allows us to examine how globalization affects more and less discretionary types of pay. As in Edmans, Gabaix, and Jenter (2017), we distinguish five important components of executive pay: salary, bonuses, stock options exercised, stock awards, and other compensation. Salary is the executive's base salary while bonuses includes bonuses and long-term non-equity incentive plans. Options give the value of stock options exercised, stocks are the value of restricted stock granted, and other compensation includes personal benefits, 401k plans, life insurance premiums, termination payments, and tax reimbursements, among other components. Note that all nominal compensation values are converted to constant 2014 U.S. dollars using the Consumer Price Index (CPI) provided by the Bureau of Labor Statistics.

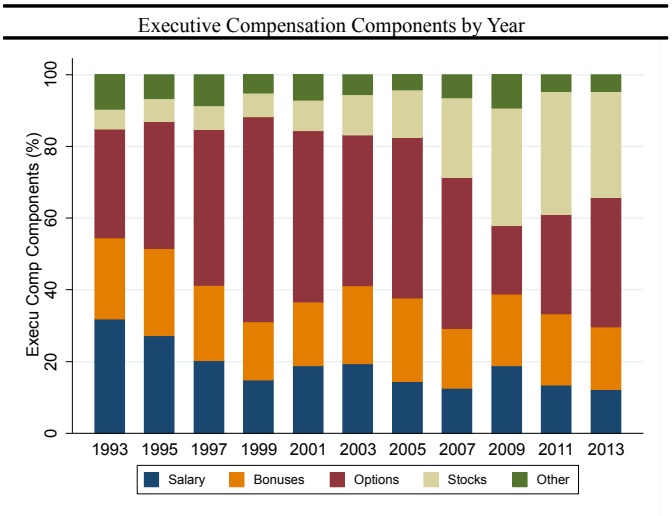
On average in 2013, a top five executive in our sample earned \$4.4 million which consisted of about \$0.6m of salary, \$1.1m of bonuses, \$0.8m of options, \$1.6m of stocks, and \$0.2m of other compensation (in 2014 dollars). By comparison, CEOs earned \$9.1m overall which consisted of \$1.1m of salary, \$2.3m of bonuses, \$2.0m of options, \$3.5m of stocks, and \$0.3m of other compensation. Our subsequent analysis will exploit the fact that export shocks may affect these components of executive pay differentially.

The relative importance of these forms of compensation over time is presented in Figure 3.[19] Consistent with other findings, Figure 3 shows that options represented a larger share of compensation in the late 1990s, while stocks represent a larger share of pay more recently (for additional discussion on the evolution

[19] Given that the SEC changed its reporting rules in 2006, it is important to concord these components across this definitional change.

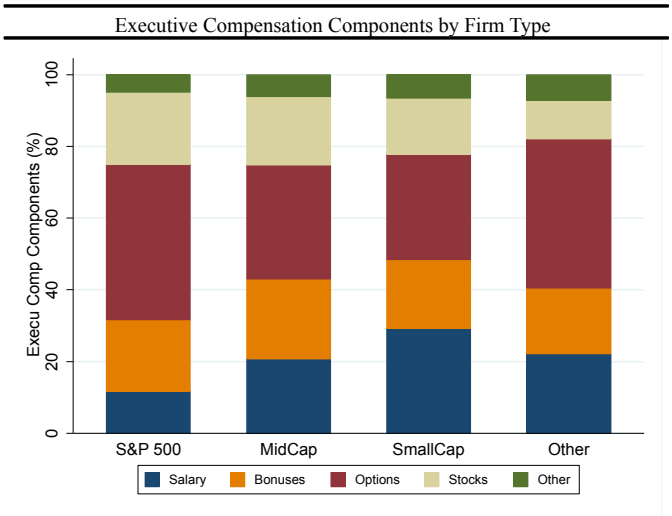
of pay over time, see Frydman and Jenter 2010, Edmans, Gabaix, and Jenter 2017). The growth in the importance of stock options since the 1970s is often emphasized, however cash remunerations such as salary and bonuses have been factors as well (Bertrand 2009).

FIGURE 3



Notes: Salary includes the executive's base salary, Bonuses includes bonuses and long-term non-equity incentive plans, Options are the value of stock options exercised, Stocks are the value of restricted stock granted, and Other is all other compensation received by the executive. Source: *ExecuComp*

FIGURE 4



Notes: Salary includes the executive's base salary, Bonuses includes bonuses and long-term non-equity incentive plans, Options are the value of stock options exercised, Stocks are the value of restricted stock granted, and Other is all other compensation received by the executive. Source: *ExecuComp*

Figure 4 examines the composition of pay across different firm types. Following common distinctions in the literature, we focus on S&P 500 firms, S&P MidCap firms, S&P SmallCap firms, and Other firms. We find that salary, for instance, represents a somewhat lower share of compensation at S&P 500 firms (12%) and a higher share at SmallCap firms (29%) on average in our sample. In contrast, bonuses are fairly consistent across firm type at around 20% of total compensation. While there are some differences, overall we find that the composition of compensation is similar across firm type, which is line with other evidence (see Edmans, Gabaix, and Jenter 2017). Appendix A.4 shows that our results are similar across a variety of different samples of firms.

2.2 Globalization

Our main measure of globalization is international trade, given its excellent coverage and the fact that it is often correlated with other forms of globalization. Detailed U.S. export and import data at the Harmonized System (HS) ten-digit product level for the years 1989-2012 come from the U.S. Census Bureau via Schott's International Economics Resource Page (Schott 2008), since *Compustat* does not report firm exports. These nominal trade flows are converted to constant 2014 U.S. dollars using the consumer price

index (CPI). An appealing aspect of this data set is that the HS ten-digit trade flows are linked to the six-digit industry codes of the North American Industry Classification System (NAICS). This enables us to merge this trade data with the *ExecuComp* data which reports the six-digit NAICS industries of the executive's firm. Furthermore, this data set reports detailed product level trade at the bilateral level (U.S. flows to any particular foreign country), which is used in our instrumental variable analysis. While our focus is on exports we also show results on the relationship between executive compensation and industry imports.

A firm specific measure of exports is constructed as the weighted average of detailed product-level exports, where the weights are the share of sales of the firm's three largest business segments.[20] Accounting for the fact that many firms in our data set operate in several industries improves our ability to measure exports and its impact on executive pay. Since the industry in which the firm operates may evolve endogenously over time, we focus on the firm's composition of sales in the presample years of 1990-1992. This approach exploits the evolution of product-level exports over time which affects some firms more than others based on their presample share of sales. Thus, we follow a long literature that uses industry level trade exposure which disproportionately affects some firms (Cuñat and Guadalupe 2009) and regions (Autor, Dorn, and Hanson 2013) based on their initial industry composition. We confirm that the results are similar when we define export exposure using only the firm's main NAICS industry.

Our analysis also employs an alternate measures of globalization, namely foreign direct investment of U.S multinationals which is measured using firm-level foreign affiliate sales data reported by *Compustat.* Results reported in section 6.2 show that foreign sales also increase executive pay which indicates that globalization broadly defined, and not just exports, is increasing compensation. Although there are data constraints in terms of the years covered (2000-2013 but limited data prior to 2010) and in terms of the lack of detailed bilateral foreign sales data which limits the ability to identify foreign sales shocks, we find these additional results compelling and a valuable complement to our export findings.

2.3 Firm & Executive Information

The *ExecuComp* data set is linked to the companion *Compustat* data set using a unique firm identifier which allows us to merge the executive compensation information with other firm-level measures in the larger *Compustat* data set. In this way we can analyze the role of several factors that have been found to

[20]This utilizes *Compustat*'s Business Segment data and focuses on business segments for which export data is available. Findings are not sensitive to the number of business segments included in the analysis - results are similar using only the firm's top business segment (Table A10) or the top five business segments (unreported).

affect executive pay.

Following the insights of Gabaix and Landier (2008) and others, we include firm size as a predictor of executive compensation. There is some disagreement in the literature on what is the best measure of firm size (Gordon and Dew-Becker 2008, Frydman and Saks 2010, Edmans, Gabaix, and Jenter 2017). Our main measure of size is the firm's number of workers. We prefer to utilize employment rather than market value because both market value and executive compensation are typically a function of the firm's stock price, and thus a positive correlation is not surprising (e.g., Himmelberg and Hubbard 2000). However, we show that our findings are similar if we proxy for size using firm sales, assets, market value, costs, and stock price (see Table A3).

Technological change, in particular in the form of information and communication technology, is also likely to be important for executive compensation (see Antràs and Rossi-Hansberg 2009). We follow the customary method of measuring technology investment using information on the capital expenditures of the firm (Feenstra and Hanson 1999). Alternatively, we can measure technology using R&D expenditures. As shown in Table A10 far fewer firms report information on R&D, yet the estimated impact of exports on executive compensation remains largely unchanged.

By encouraging skimming or rent-capture, poor corporate governance may be an important driver of executive compensation (e.g., Bertrand and Mullainathan 2001). Building on existing approaches, we measure governance using information on the relationship between the executives and the board of directors of the company, whose tasks include making compensation decisions.[21] Specifically, our *interlock* measure is defined as a binary variable indicating whether any executive at the firm (in a given year) serves on the board's compensation committee, or serves on another company's compensation board that has an executive serving on their board. This variable captures the hypothesis that firms that have executives determining their own compensation are more prone to rent-capture. Alternatively, we also utilize a different measure of insider board relationships, *board*, that is defined as a binary variable indicating whether three or more executives serve on the board of directors. This measure does not focus on the compensation committee per se, but rather captures the more general influence of executives on the board of directors.[22]

[21] There is clearly scope for conflicts of interest because, for example, directors receive compensation for serving on the company's board. Bebchuk and Fried (2004) report that directors in the largest 200 firms receive on average $152,000 annually.

[22] We have also considered several corporate governance indices, including the "Governance Index" constructed by Gompers, Ishii, and Metrick (2003) and the "Entrenchment Index" constructed by Bebchuk, Cohen, and Ferell (2008). However the coverage of both of these variables is limited: they are only available every few years between 1990 and 2006. We lose three quarters of our sample when these governance proxies are included and thus strong inferences are not possible. Findings in Appendix A.10 use an alternate measure of poor governance, defined using the co-movement of executive pay and the firm's stock price, and show the results are similar.

We recognize that the corporate governance of the firm may itself be endogenous. To assess the importance of this we define alternate measures of insider relationships which eliminate all short-run potentially endogenous fluctuations in corporate governance. These supplementary findings are reported in Table A7 and show that the results are similar. Also note that the incidence of insider relationships has declined towards the end of the sample period due to the 2002 Sarbanes-Oxley Act and other legislation designed to improve corporate governance.

Executive compensation may also respond to firm markups, which have been steadily increasing since 1980 (De Loecker and Eeckhout 2017). Firms with higher markups are likely to be more profitable and thus may be able to pay their executives more. Along the lines of De Loecker and Eeckhout (2017), we measure markups using information on total sales and the total cost of goods sold from *Compustat*.[23] In Appendix A.4 we also examine the impact of top marginal tax rates in the firm's headquarter state on executive compensation (Piketty, Saez, and Stantcheva 2014).

Finally, we include a number of key executive characteristics in the analysis. While data availability of executive-level variables generally tends to be less comprehensive than firm-level data, we have information on experience, education, and gender. Experience is defined as the number of years the individual has been a top five executive at any firm in the *ExecuComp* data set.[24] Education is defined as whether the executive has a doctorate degree. Another appealing feature of the data is that we can observe individuals entering and exiting the top echelon of a firm, as well as moving between firms. This executive turnover may be important for executive pay given the predictions of competitive assignment models (e.g. Gabaix and Landier 2008).

2.4 Descriptive Statistics

Combining these data sources, Table 1 reports summary statistics of our key variables. For obvious reasons our analysis is restricted to industries for which there is information on trade.[25] Furthermore, the handful of firms that report compensation information for fewer than five executives are dropped from the analysis. For firms that report compensation information for more than five executives, only the top five are included in the sample. This ensures that each firm in the sample has compensation information for exactly their

[23]Firm-specific Markups are calculated as 0.85*(total sales / total costs of goods sold) following De Loecker and Eeckhout (2017) page 37.

[24]The results are similar if experience is defined as the number of years that the executive has been at the firm or the number of years the executive has been the CEO of the firm (see section 4.4).

[25]For instance, services industries are excluded. Note that globalization may have an even stronger impact on service industries such as finance and entertainment, than on the mostly manufacturing industries that are included in our analysis.

five highest paid executives.[26]

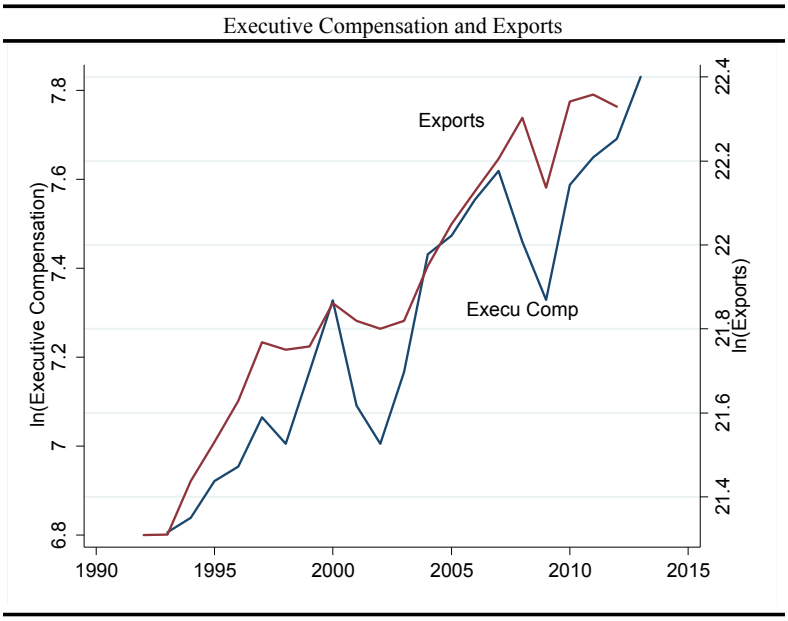
Our sample includes approximately 49,000 observations and covers close to 11,000 executives, 800 firms, 200 six-digit NAICS industries, and roughly two decades (years 1993-2013). As we see in Table 1, the mean natural log of executive compensation across all years is 7.24, which translates into pay of approximately $1.4m per year (in 2014 dollars). For CEO's, executive compensation averages $2.9m across all years (not reported). Both findings are consistent with the 2013 compensation values discussed in the context of Figure 3. We also see that *interlock* relationships occur in 6% of the sample, in 16% of the sample there are three or more executives on the board (*board*), executives have on average five years of experience as a top five manager, the large majority of executives in our sample are male, and a small fraction have a doctoral degree.

The compensation, trade, firm-level, and executive-level variables are similar across different samples and as a consequence it is not surprising that our results are not sensitive to the use of alternate samples (see Table A4). Furthermore, results from Figures 3 and 4 indicate that the executive compensation components in our sample are similar in relative size to those found in the literature (Frydman and Jenter 2010, Edmans, Gabaix, and Jenter 2017).

Figure 5 examines the relationship of interest between executive incomes and globalization using our data set. Clearly, both executive compensation and exports have increased substantially over the sample period 1993-2013. Reassuringly, these results are very similar to the trends over the same period seen in Figure 2, which provides additional external validity for our analysis.

[26]Results reported in section 5.4 examine whether globalization differentially affects executives within this group.

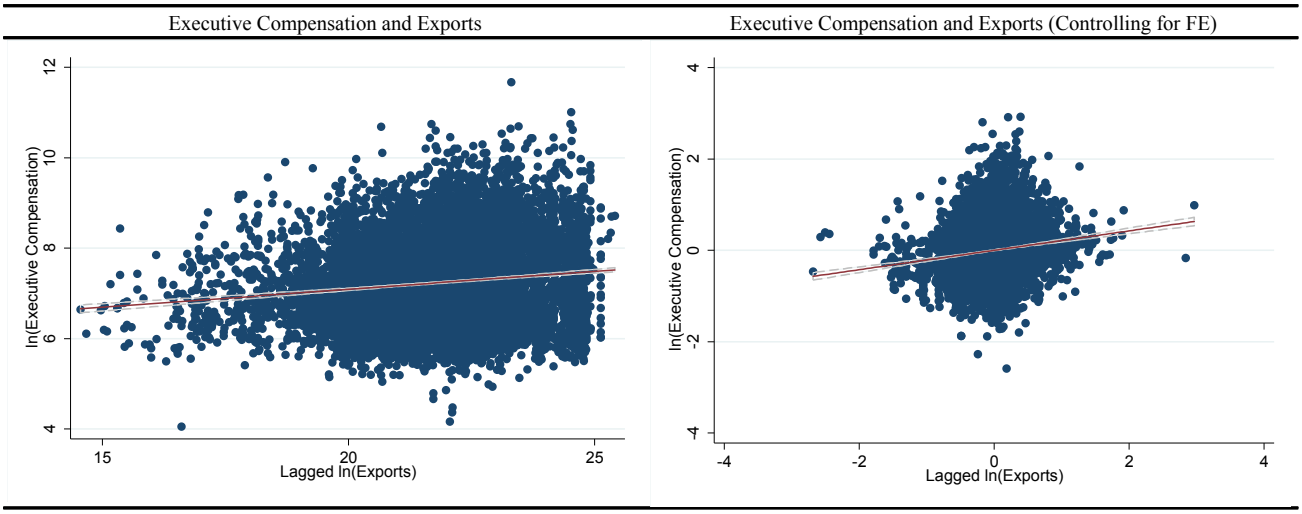
FIGURE 5



Notes: Average executive compensation and average exports over time. Compensation data for top 5 executives is obtained from the Compustat ExecuComp data set. U.S. industry-level export data for firms in the ExecuComp data set are obtained from the U.S. Census Bureau via Schott's International Economics Resource Page (Schott 2008).

To gain further insight into the data, the left panel of Figure 6 plots the average executive compensation at the firm-level against lagged exports. A significant positive relationship emerges (the dotted lines give the 95% confidence interval), which is consistent with the hypothesis that firms that are more integrated into global markets pay their executives more. However, this relationship could arise, for example, because both variables are simply increasing over time (as in Figure 5). To account for these and other factors, the right panel controls for both firm and year fixed effects and plots the residuals. These within-firm changes over time are the variation we exploit in our subsequent analysis, and a significant positive relationship is evident.

FIGURE 6



Notes: Average executive compensation versus lagged firm-specific exports is on the left; an analogous scatter plot is on the right after controlling for firm fixed effects and year fixed effects.

It is encouraging that this finding emerges in such a raw cut of the data. The remainder of the paper examines several key aspects of this relationship in a more rigorous econometric analysis.

3 General Impact of Exports on Executive Pay

This section tackles our first key question of whether globalization influences executive compensation.

3.1 Approach

We adopt a simple framework to examine the relationship between executive compensation and exports, given by the following equation:

$$(1)\quad \ln comp_{ifnt} = \beta_0 + \beta_1 \ln exp_{ft-1} + \beta_2 \ln size_{fnt-1} + \beta_3 \ln tech_{fnt-1} + \beta_4' X_{fnt-1} + \beta_5' E_{ifnt} + \gamma_f + \gamma_t + \varepsilon_{ifnt}.$$

The dependent variable is the total compensation (TDC2) of executive i, at firm f, in industry n, and in year t. On the right side are firm specific exports (exp), firm size ($size$), and technology investments at the firm ($tech$). The vector X includes other firm and industry level characteristics that may influence executive compensation, including measures of insider board relationships, markups, and imports. The vector E includes our executive-level variables, experience, education, and gender. We follow the general practice in the literature and include firm and year fixed effects (γ_f and γ_t, respectively).[27] Robust standard errors clustered at the industry level are reported throughout and estimation is by least squares.

[27] In other specifications we also include industry fixed effects, industry*year fixed effects, and executive*firm fixed effects (see Table A9 and Table A10).

This section examines whether exports increase executive compensation ($\beta_1 > 0$). To the extent that they do, subsequent sections will investigate whether this is driven by market returns to executive talent and actions or non-market returns such as rent capture.

Growth in firm size may increase the scope of the executive's job and thus increase compensation accordingly.[28] Similarly, new technology, particularly in the form of advanced communication equipment, may enable executives to direct a larger workforce, which could increase the importance of the executive and may raise compensation accordingly. Of course it is possible that exports increase firm size and lead to new technology adoption, which means that a portion of the export effect on executive compensation may operate through these other firm characteristics. By including size and technology together with exports in equation (1), we ask whether exports drive up compensation conditional on these and other firm characteristics.

Rising imports have adversely affected some of the employment opportunities of low-skilled U.S. workers. While the implications for executives are less clear, we include imports in this specification too.[29] A large literature shows that executive compensation depends on firm governance, in particular on the composition of the board of directors and its relationship with top executives (see Edmans, Gabaix, and Jenter 2017). We include in equation (1) a measure of interlocked relationships between executives and the compensation committee. Finally, executive pay may also depend on the size of the markup that can be charged, and consequently we include a measure of firm markups as a regressor.

3.2 Findings

Table 2 reports the results from estimating equation (1). We begin by examining whether factors commonly found to affect executive compensation are important in our context. First, the size of the firm has a positive and significant coefficient. This provides evidence that as the firm grows, the scope of the executive's job expands, and compensation rises accordingly. Firm size is measured as the number of employees, although results are similar using a variety of other common measures of firm size.[30] Second, we find that technology investments raise executive compensation (see column 2), indicating that new technologies complement executives in the production process, increase their marginal product, and thus drive up their

[28] The effect that average firm size in the economy has on executive compensation (Gabaix and Landier 2008) is captured by year fixed effects.

[29] Imports competition may adversely effect the firm and thus lower executive compensation but imported inputs may positively affect the firm and thus increase executive compensation. See Cuñat and Guadalupe (2009) for additional details on imports and executive compensation. In our context, we find that imports and exogenous import shocks have no impact on executive compensation (Appendix A.8).

[30] Namely sales, assets, costs, stock price, or market value (see Appendix A.3).

compensation.

The next specification pivots from explanations centered on the changing nature of the job to explanations focused on corporate governance and the degree of competition. In column 3, we see that at poor governance firms, where an executive serves on the board's compensation committee, executives are more generously compensated.[31] In addition, column 4 indicates that executive pay is also increasing with the firm's markup.

We now examine whether globalization affects executive compensation. When only trade is included, exports have a significant positive impact on executive compensation while imports have an insignificant effect (column 5). After adding firm characteristics, including size and technology to the specification, we see that exports still positively impact executive pay (column 6).[32] This is an important empirical finding since it extends an existing result that firm size explains all of the recent growth in executive compensation (Gabaix and Landier 2008). While we confirm that firm size is important, our results show that globalization, as well as technology and corporate governance, affect executive pay conditional on firm size.

Interestingly, the coefficient on exports drops by 33% from column 5 to 6, suggesting that a portion of the impact of exports on executive pay operates through other firm characteristics, such as size. The coefficients on size and technology also drop (relative to columns 1 and 2) which provides further evidence that globalization is a deep determinant of executive compensation. These findings are not surprising, given the abundance of evidence that shows trade liberalization increases firm size.

The results remain unchanged when we add executive-level variables, specifically experience, gender (*male*), and education (*Dr.*). All three have positive point estimates, although only the former two are significant (column 7). Importantly, globalization, size, technology, and corporate governance continue to be significant predictors of executive compensation even after controlling for these executive characteristics. These various results are both plausible and consistent with existing research, which provides support for our empirical approach and makes our new export findings all the more interesting.

To more easily compare economic magnitudes, column 8 reports normalized (beta) coefficients for the column 7 specification. We see that the export beta coefficient is almost twice as large as the size and technology investment coefficients. The beta coefficient for experience is larger than that of exports, while the insider board effect is smaller. Overall, these results indicate that globalization is one of the most

[31] This also includes reciprocal board relationships with another firm. Note that firm governance may be endogenous, which we address in Appendix A.7.

[32] The fact that the results are significant conditional on a variety of firm performance measures indicates that the link between exports and executive compensation is not simply due to a mechanical relationship built into compensation contracts.

important explanations for the rapid increase in executive compensation.

Before proceeding to exogenous export shocks, we pause to explore a number of other dimensions of these results (see Table 3). First, we examine whether domestic industry shocks can explain our findings, by including the industry's value added in column 2.[33] Executive compensation is increasing in the industry's value added, but importantly exports still have a significant positive impact on executive pay conditional on domestic value added. In a similar vein, column 3 includes industry-by-year fixed effects which control for all unobserved domestic industry shocks.[34] Not surprisingly the export coefficient falls, but it remains significant. Column 4 utilizes compensation awarded instead of compensation realized as the dependent variable (*Compustat's* TDC1 instead of TDC2). The export coefficient is slightly smaller which is consistent with the idea that when executives have more discretion over their compensation it is more sensitive to global expansion. The results are not sensitive to our firm size proxy as shown in column 5, which includes firms sales instead of employment (see Appendix A.3 for additional size measures). Furthermore, column 6 eliminates endogenous short-run fluctuations in our insider relationship measure *interlock* and finds similar results. We also confirm the positive impact of globalization on executive compensation using a different measure of globalization, namely the firms' foreign affiliate sales. Furthermore, we estimate that exports not only raise executive compensation but also the executive-to-worker pay ratio, thereby increasing within-firm inequality. Foreign sales and executive-to-worker pay results are shown in sections 6.1 and 6.2, respectively.

4 Export Shocks and Market Returns

Our results indicate that exports are an important driver of executive pay, but can we say more on *why* exports are increasing compensation? We are particularly interested in role of market vs non-market forces in determining executive compensation. Pay may increase simply because the executive's action leads to firm expansion abroad, which clearly would be a market return to executive talent. This section tests this hypothesis by examining whether executive pay responds to exogenous export shocks, which are outside of the executive's control. We then consider the possibility that exogenous export shocks alter market returns, broadly defined, which in turn increases executive pay.

[33] Value added is measured using BEA data which is at the 3-digit NAICS level.

[34] Industry is again measured at the 3-digit NAICS level. Note that the instrumental variable analysis will also address concerns that domestic industry shocks are influencing our results.

4.1 Identification of Shocks

Our strategy draws on the influential Bartik (1991) instrumental variable approach and applies it to our global trade setting. The original Bartik instrument takes presample industry employment within a city and assumes this grows at the same rate as industry employment at the national level. In line with this approach, we use presample U.S. export flows for each detailed industry and allow these trade flows to grow at an exogenous rate. Instead of using the aggregate U.S. growth rate, as suggested by Bartik's approach, we employ industry-level export growth in other high-income countries.[35] Specifically, we multiply presample 1991 bilateral export flows for each detailed industry by the growth in industry exports from eight other countries.[36] These predicted bilateral export flows are then summed across all foreign destination markets to obtain predicted U.S. exports abroad in a particular industry and year:

$$bartik\_exp\_iv_{nt} = \sum_{c} (exp_{nc1991} * (1 + g_{nt})), \tag{2}$$

where g_{nt} is the growth rate of exports from other developed countries from 1991 to year t in industry n.[37]

This approach identifies variation in U.S. exports stemming from common import demand shocks for a particular good, as well as falling trade costs in this sector. For instance, the growth of China would typically lead to an increase in exports of a particular industry from both the U.S. and from other high-income countries. In addition, improvements in transportation and communication would typically make it easier to export particular goods for both the U.S. and other similar countries. Importantly, by relying on variation that is unrelated to executive (or domestic firm or industry characteristics), this method eliminates fluctuations in exports that are due to managerial decisions. Thus, if executives are rewarded solely for their actions, then executive compensation will be unresponsive to exogenous export shocks and our export instrumental-variables (IV) coefficient will be zero. On the other hand, if the export IV coefficient is positive, this will provide evidence that the executive is being rewarded for something other than their actions. Below we will also explore whether export shocks alter other market conditions for executives which then in turn influence their pay.

[35] This approach is preferred to employing aggregate U.S. export growth because patterns of globalization are highly industry-specific.

[36] The eight countries are Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland, as in Autor, Dorn, and Hanson (2013).

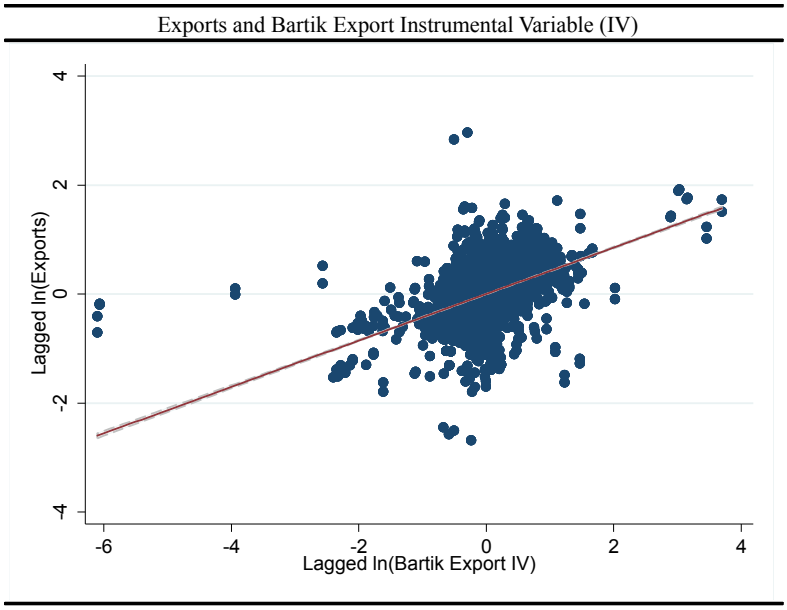
[37] One advantage of this instrument is that it can be constructed for sporadic years in which no bilateral export flows exist, since it only relies on presample bilateral exports and the industry level growth from other developed countries. Thus, the instrument is balanced and does not pick up extensive margin adjustments into or out of foreign destination markets which can occur in the actual data set and could be endogenous. It is possible to further simplify equation 2 by pulling the g term through the summation, but we prefer this notational form given subsequent instrumental variable approaches utilized in the paper.

One important threat to our identification strategy is that exports from the U.S. and other high-income countries might be driven by common domestic export supply shocks rather than common import demand shocks. This would be problematic for our instrumental-variable approach to the extent that these domestic supply shocks are correlated with executive compensation. We address this concern in three ways. First, the construction of the instrument relies on a sample of countries that reduce this risk. For instance, Canada is not included in this comparison group, since the likelihood that it experiences similar export supply shocks as the U.S. is comparatively high. Second, we explicitly control for several of the most plausible domestic supply shocks, such as those related to scale and technological change. Third, we introduce alternate instrumental variable strategies that address this and other threats to identification. The first approach employs a gravity equation method to identify variation in bilateral U.S. exports that is driven by changing economic conditions in the importing country. The second approach constructs the instrumental variable using fluctuations in world import demand. As shown in section 6.3, these alternative instrumental variable approaches based on quite different strategies generate similar results.

4.2 Export Shocks and Executive Pay: Findings

Figure 7 illustrates a strong positive relationship between actual exports and the instrumental variable after accounting for firm and year fixed effects:

FIGURE 7



Notes: Lagged exports are plotted against the lagged Bartik export IV, controlling for firm and year fixed effects.

More formally, Table 4 reports the first-stage results of the instrumental-variable estimation. Consistent with Figure 7, we see that the instrumental variable is a strong predictor of actual export flows. The coefficient on the export instrument is positive and changes little with the inclusion of additional variables. Furthermore, the robust (Sanderson-Windmeijer, SW) F-statistic on the excluded instrument is well above 10 in all specifications, which indicates a relatively strong first-stage.

Table 5 reports the corresponding second-stage instrumental variable results. With only exports and imports included in column 1, the coefficient on the former is 0.46 while the coefficient on the latter is essentially zero. That exports increase executive pay while imports do not is the same pattern we saw in the OLS results.[38] Adding firm characteristics reduces the export coefficient to about 0.36, see column 2, and it stays roughly at this level when our executive-level measures are included (column 3). By construction these fluctuations in exports are not driven by executive, firm, or domestic industry characteristics. If executives were only rewarded for their performance, then their compensation would be unresponsive to these exogenous export shocks. In contrast, the findings in Table 5 show that executives are rewarded for factors that are unrelated to their actions. Furthermore, we find that the effect is sizable: a 10% export shock leads to a 4% pay increase for executives (column 3).[39]

If it is not returns to executive actions, then why do export shocks increase executive pay? One possibility is that executives reap non-market returns, in particular the exogenous export shock provide a rent-capture opportunity that savvy executives exploit. But this is not the only possible explanation. Even if the export shock is not caused by executive actions, it may influence executive pay through other components of what we think of more broadly as market returns. For instance, a positive export shock may cause the firm to match with a more talented and highly paid executive. Relatedly, a positive export shock may cause the nature of the executive's job to change which in turn drives up compensation. While we control for some components of the executive's job, including firm size and technology, it is still possible that the nature of the job is changing in other, less observable ways. These channels will be explored in the subsequent sections.

[38] We have also explored an analogous instrumental-variable approach on the import side, but there is no evidence that import shocks significantly affect executive compensation (reported in Appendix A.8).

[39] In the context of the optimal-contracts literature, our instrumental-variables finding is at odds with the result that optimal contracts should typically reward executives only for relative performance differences (relative performance evaluation, RPE; Holmström 1979), because, by construction, the shock was not caused by an individual executive. While in principle pay-for-shocks can be consistent with an optimal contractual compensation scheme (see Edmans, Gabaix, and Jenter 2017), our subsequent results suggest this is not driving our findings. Generally, it is worth keeping in mind that only about half of executives even have an explicit written employment contract detailing the extent of their compensation (Gillan, Hartzell, and Parrino 2009).

Before proceeding, note that these instrumental variable point estimates are somewhat larger than the analogous OLS coefficients of Table 2. Taken at face value, one possible explanation is that foreign-born executives are more successful at expanding abroad given their familiarity with other countries even though they may be less generously compensated. More generally, while it is tempting to make inferences about the relative importance of returns to managerial decisions versus other types of returns by comparing the magnitudes of the OLS and IV estimates, the instrumental variable approach eliminates not only the endogenous returns but also measurement error and omitted variable bias. This complicates attempts to interpret the difference between the OLS and IV results.

4.3 Market Returns through Re-Assignment

Assignment models predict positive assortative matching where talented workers are hired by better firms (Sattinger 1975, Rosen 1981).[40] Gabaix and Landier (2008) and Terviö (2008) have shown that the insights from the assignment model are useful in explaining CEO compensation. While certainly important, we are asking a more nuanced question about whether the impact of globalization on executive pay is driven by this type of assortative matching.

This section introduces elements of Gabaix and Landier (2008) to fix ideas about export shocks and market returns in a multi-executive setting. Let there be a continuum of firms (n) and potential executives (m) that are matched together. Low n denotes a larger firm and low m a more talented executive. In other words, n and m can be thought of as the rank of the firm and the rank of an executive, respectively. Firm n has size $S(n)$ and executive m has talent $T(m)$, where $S'(n)<0$, $T'(m)<0$. The executive's talent increases firm value according to:

$$V = S(n) + c \times S(n)^{\gamma} T(m), \tag{3}$$

where c $>$ 0 is a constant. For present purposes, the key is that the multiplicative structure of firm size $S(n)$ and executive talent $T(m)$ in equation (3) implies that the productivity of talent increases with firm size.[41] In our context this means that if a positive export shock increases firm size it leads to higher executive pay because the productivity of talent has increased. This structure implies that, at any point in time, a more talented executive should run a larger firm. Consequently, any changes in the relative size of the firm should lead to executive turnover. Firms that see their exports grow relative to others should

[40] For a recent analysis of trade and inequality, see Monte (2011).

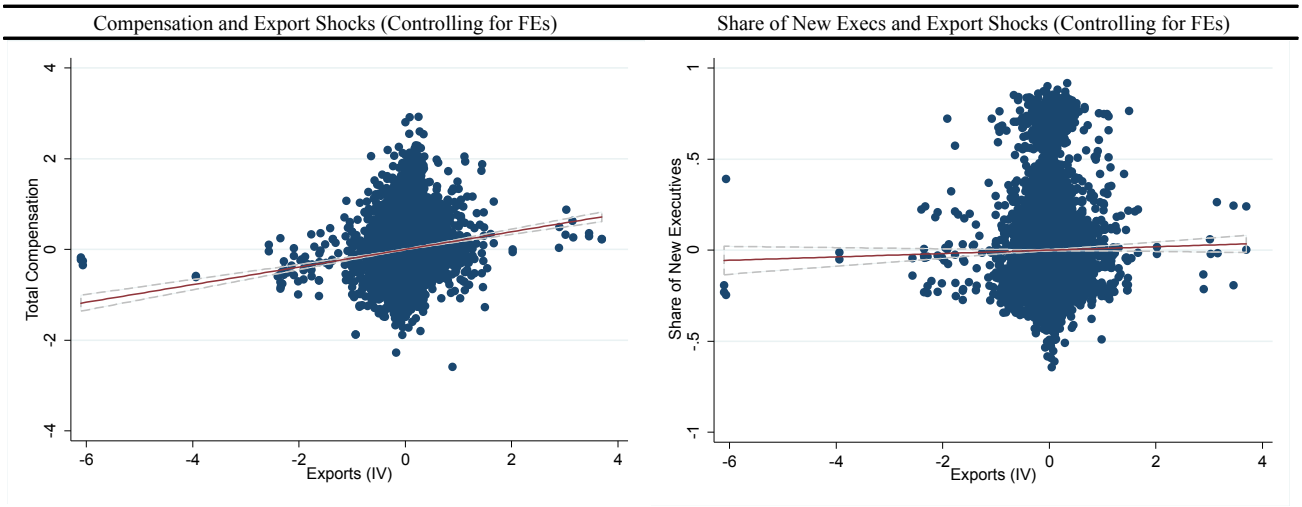
[41] Gabaix and Landier (2008) show that if $\gamma = 1$ then there should be a unit elasticity of firm size and CEO pay.

attract top talent, while firms that expand more slowly should lose talented executives.[42]

We begin by examining the frequency of executive turnover, which is an important element of the assignment model hypothesis. Table 6 reports simple descriptive statistics, using all of the top executives in the *ExecuComp* data set from 1992 through 2014. We see that the vast majority of executives (92%) work at only one firm. Put another way, less than one percent of executives work at three or more firms.[43] These finding are consistent with other studies that show top managers often stay at one firm for several years and rarely move directly from the top position at one firm to another (Frydman and Jenter 2010; Edmans, Gabaix, and Jenter 2017).

While executive turnover is infrequent, the most important question for our analysis is, do export shocks increase the likelihood of executive turnover in a way that explains our pay findings? As a point of reference, the left hand side of Figure 8 shows the positive relationship between export shocks and executive compensation. Then the right hand side of Figure 8 shows the relevant relationship between export shocks and the share of new executives at the firm. While there is a slight positive relationship it is less positive and less significant than the relationship between export shocks and compensation on the left. Ultimately, there is little evidence that export shocks lead to executive turnover, which means it is unlikely that matching is key to the relationship between export shocks and executive pay.[44]

FIGURE 8



Notes: Average executive compensation (left side) and share of new top executives at the firm (right side) are plotted against lagged exports (IV). Both scatterplots control for firm and year fixed effects and plot the residuals.

[42]Note that our regression specification conditions on employment, so this mechanism would have to operate through a broader notion of firm size.

[43]Of course, if executives are switching to and from firms that are outside this large Compustat sample, then this number could be higher.

[44]It is possible that although executive turnover is actually quite rare, simply the threat of turnover may raise executive compensation. Formally, this contestable market argument would require an extension of the basic assignment model where increasing compensation is only forthcoming if the executive actually moves. Furthermore, the threat of leaving is only credible if the executive has skills that are in demand at other firms, such as education or experience. We turn to these next.

Econometric results on the importance of the assignment model mechanisms in our context are reported in Table 7. Column 1 re-reports the key relationship between export shocks and executive compensation while column 2 includes a binary variable indicating whether the executive is a new top five executive at the firm in the given year. New executives tend to earn less than their more seasoned colleagues but importantly this has no bearing on the estimated impact of exports. Column 3 explores an even more specific test of matching, by examining whether newly hired executives are more talented and thus earn more after a positive export shock. The coefficient on the *Export*New Exec* interaction term is insignificant, which indicates that executives hired after an export shock do not earn more than other newly hired executives. While the assignment model is important in many settings, we conclude based on a variety of pieces of evidence that it is not central in explaining the observed relationship between export shocks and executive compensation.

4.4 Market Returns through Changing Nature of the Job

Export shocks may also change the nature of the executive's job, thereby altering the market returns to executive talent. While we control for some market factors, such as size and technology, it is possible that globalization could affect other, less observable market forces, including increasing the complexity of the job, increasing competition, or changing the organizational structure of the firm. These changing job characteristics are not driven by the executive's actions but they may nonetheless increase the demand for talented executives which will raise compensation accordingly.

The remaining columns of Table 7 test these predictions by examining whether global shocks disproportionately raise the compensation of the more experienced and educated executives. The coefficients on the interaction terms in columns 4-7 are insignificant which indicates that export shocks do not disproportionately increase pay to these types of workers. The limited evidence in Table 7 for increasing market returns in response to exogenous export shocks shows that reassignment and returns to experience and education are not explaining our findings.[45] Of course, it is possible that export shocks alter other unobservable dimensions of executive talent. For instance, perhaps the executives that benefit from export shocks are the ones that speak foreign languages, have connections abroad, or are familiar with foreign business practices. Another possibility is that globalization increases executive compensation because of non-market forces which we examine in the next section.

[45] Additional interaction results (i.e. *Exports*Employment* and *Exports*Cap_Exp*) show that export shocks do not disproportionately increase the pay of executives at larger or more technologically advanced firms (unreported).

5 Export Shocks and Non-Market Returns

After finding that the impact of global shocks on executive pay is not primarily driven by market returns, we are left with non-market returns, and in particular rent-capture, as a potential explanation. Perhaps globalization is increasing the pay of executives precisely because these workers are uniquely placed to benefit from rent-capture opportunities. Distinguishing between market and non-market returns is important both because it informs public attitudes about rising executive compensation and because the policy response to these alternate explanations differs.

5.1 Asymmetry

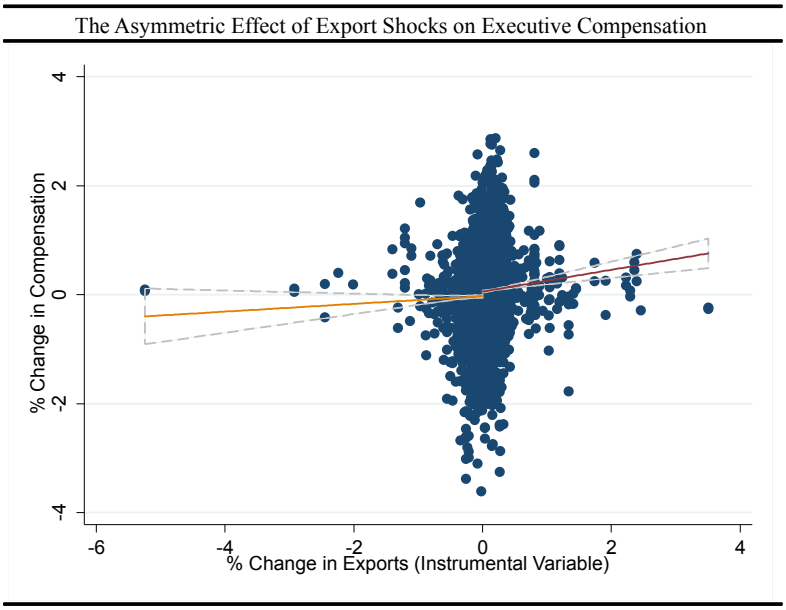
We know from Table 5 that executives are rewarded for external export shocks that are unrelated to their actions. However, if positive export shocks and negative export shocks are equally likely and their impact symmetric, then globalization alone can not explain the dramatic increase in executive compensation. It turns out that positive export shocks are much more common than negative ones, in line with the dramatic increase in exports over this period (see Figures 2 and 5).[46] Furthermore, there is evidence that the response of compensation to positive and negative export shocks is not symmetric. Figure 9 plots the percent change in firm-level executive pay against the percent change in our export instrumental variable.[47] There is an overall positive relationship, consistent with the results from Table 5.[48] However, this relationship differs depending on the sign of the shock. The kinked fitted line in Figure 9 illustrates that positive export shocks have a stronger impact on executive compensation than negative export shocks. In fact, there is no evidence that negative export shocks lower compensation at all (the slope of this line is 0.07 but it is not statistically different from zero). Positive shocks, however, do significantly raise executive compensation (the slope is 0.20 and significant at the one percent level).

[46] This is confirmed in Figure 9 below, where a disproportionate share of export shocks are positive (72%) compared to negative (28%).

[47] By using average firm-level executive pay, we address concerns that negative shocks could cause executives to exit the sample due to termination.

[48] While not shown in the figure, this relationship is positive and significant at the one percent level.

FIGURE 9



Notes: Annual percent change in average firm-level total compensation plotted against the annual percent change in the export instrument. Fitted lines show how compensation responds to positive and negative export shocks.

The asymmetry raises the possibility that rent-capture is playing a role in the relationship between exports and executive pay. In fact, executives benefiting from positive shocks but not suffering the consequences of negative shocks is exactly what one would expect if rent-capture is important. Executives successfully capture a portion of the proceeds associated with positive shocks but adverse shocks do not lead to rent-capture opportunities and thus do not affect executive pay.

In the subsequent sections, we examine more formally whether rent-capture is contributing to this observed relationship between globalization and executive compensation. We employ three approaches to shed light on rent-capture, which admittedly is challenging given that it is an inherently secretive affair. First, we examine whether exogenous export shocks disproportionately affect more discretionary types of compensation that are conducive to rent-capture. Second, we ask whether the impact of export shocks on executive pay is stronger at poor governance firms where rent-capture is more likely. Finally, we exploit the fact that some executives, in particular CEOs, have more managerial power to influence pay decisions.

5.2 Discretionary versus Non-Discretionary Pay

We focus on the following compensation categories: salary, bonuses, options, stocks, and other forms of compensation (as seen in Figures 3 and 4). We hypothesize that forms of compensation that can be adjusted in the short term in relatively discretionary ways will be more prone to rent-capture. Thus, exogenous

export shocks will tilt compensation towards less-structured and more discretionary components of pay if rent-capture is important.

Salaries are considered to be the "fixed component" in executive contracts (Murphy 1999), and in comparison bonus payments are more flexible. In Murphy's (1999) analysis the share of firms employing discretionary elements in their bonus payments was up to 52%, depending on industry (his Table 4). Furthermore, even when bonus plans are based on performance measures, performance can be subjective and based on qualitative evaluations (Edmans, Gabaix, and Jenter 2017), boards can make discretionary adjustments to performance measures, boards also have discretion in allocating a fixed bonus pool across executives, and there is discretion associated with which performance measure among several will be used (Murphy 1999). In addition to bonuses, stock options are discretionary in that executives choose when to exercise this component of compensation. Furthermore, rent-capture is common in termination payments (e.g. the 'golden handshake') and personal benefits (e.g. use of company aircraft for family travel), see Edmans, Gabaix, and Jenter (2017). Both termination payments and personal benefits are in our 'other compensation' category. Overall, these types of compensation arrangements are often camouflaged to appear as if they reward performance when in practice they may not (Bivens and Mishel 2013).

Table 8 reports results showing the impact of exogenous export shocks on different components of executive pay. For ease of comparison, column 1 re-reports the earlier results which use total compensation as the dependent variable, while columns 2-6 decompose compensation into salary, bonuses, options exercised, stocks, and other compensation. We see that exogenous export shocks have no impact on salary (column 2). In contrast, we find that exogenous export shocks have a strong, significant, and positive impact on bonuses (column 3). Moreover, export shocks significantly increase options *exercised* (column 4). It is interesting to contrast this finding with the impact of export shocks on options *awarded*, which we find to be smaller and insignificant (see column 4 of Table A5). These results indicate the executive's ability to choose when to exercise options means that this component of pay is more sensitive to export shocks. Column 5 shows that restricted stock grants are not sensitive to export shocks, while column 6 confirms that other forms of compensation (including personal benefits) do positively respond to export shocks. Overall, these results are consistent with the hypothesis that export shocks should have a stronger impact on short-run, flexible forms of compensation that are more prone to rent-capture.

The presence of executives on the compensation committee (i.e. *interlock*)[49] significantly increases bonus payments with little impact on other forms of compensation, such as salary (not reported due to

[49] Or a reciprocal relationship with another firm.

space constraints). The fact that poor governance at the firm is associated with larger bonuses reinforces the idea that bonuses are more susceptible to rent-capture. It is possible that poor governance may be correlated with unobserved firm characteristics that could influence executive pay. However, one would expect that the direction of this endogeneity bias would attenuate the positive effect of poor governance.[50] Nevertheless, the question of whether endogeneity of firm governance affects our results is pursued in an additional analysis in Appendix A.7, and shows little evidence that this is the case.

Overall, these results indicate that the impact of export shocks on executive pay depends strongly on the specific form of compensation. Discretionary pay categories such as bonuses are increasing in the presence of export shocks, which is what one would expect if executives engage in rent-capture activities. Of course there are other reasons discretionary pay may increase in response to export shocks (i.e. the executive strategically decides to exercise their option), so additional tests for rent-capture are pursued next. Because we find the strongest effect for bonus payments, we extend this analysis in the subsequent sections. Additional results for options and other executive pay are shown in Appendix A.6.

5.3 Poor Governance

If rent-capture is important, the impact of export shocks on bonuses should be stronger at firms with poor corporate governance. This section examines this hypothesis as another means to assess the importance of rent-capture in driving globalization's impact on executive pay.

To formally test this idea we interact exogenous export shocks with measures of poor corporate governance. Recall that our measures of poor governance include whether a firm has an executive that serves on the compensation committee (*interlock*)[51] and whether a firm has at least three executives on the board of directors (*board*). The first of these measures more directly reflects the executive's impact on the pay process itself, while the second captures the general executive influence on the board.

Column 1 of Table 9 re-reports our earlier bonus result, while column 2 includes the interaction of exports with *interlock*. We instrument for both exports and the export interaction term (using the interaction of the export instrumental variable and *interlock*). The positive and significant interaction coefficient indicates that export shocks disproportionately increase bonuses at firms with executives on the compensation committee. A 10% export shock raises bonuses by 5.0% in general, but at poor governance firms bonuses increase by about 6.6%. In other words, the impact of export shocks on executive bonuses is much

[50] Poor governance is likely correlated with poor firm performance which all else equal (i.e. in the absence of rent-capture) will lower executive compensation. Thus, to the extent that endogeneity is an issue one would expect a negative bias in our results, which would work against our findings.

[51] Or a reciprocal relationship with another firm.

stronger at firms where rent-capture is likely.

Exogenous export shocks also disproportionately increase bonuses at firms where many executives are on the board of directors, as seen in column 3. Specifically, a 10% export shocks raises bonuses by 6.7% at these poor governance firms, compared to about 5.0% at other firms. Finally, column 4 shows that the two poor governance measures are largely orthogonal to each other because both are significant when included simultaneously. This further reinforces the importance of poor governance. As noted earlier, our findings in Table A.7 show that the endogeneity of these poor governance measures is not behind our results. Furthermore, we confirm these results with a poor governance measures that does not rely on board structure but rather on whether average pay rises when the firm's stock price falls (see Table A10). Overall, these findings provide further evidence that rent-capture plays a role in globalization's impact on executive compensation.

5.4 Managerial Power

Our final piece of evidence on the importance of rent-capture focuses on whether more powerful executives are the ones that disproportionately benefit from export shocks at poor governance firms. Relative to their less influential colleagues, powerful managers, such as CEOs, should be well placed to capture the rents from unexpected shocks.

The results from this analysis are presented in Table 10. In columns 1 and 2, we begin by splitting the sample into CEOs and non-CEOs and find that the linear coefficient on exports is larger for CEOs (0.65 versus 0.47).[52] This indicates that managerial power matters in the context of globalization shocks.[53] However, we are interested in whether export shocks at poor governance firms disproportionately affect CEO pay. We see that the coefficient on the *export*interlock* interaction term is 0.38 for CEOs (column 1), which is significantly larger than the 0.11 coefficient for non-CEOs (in column 2). In other words, a 10% export shock increases CEO bonuses by 10% at poor governance firms but increases non-CEO bonuses by 5.7% at these same firms. In columns 3 and 4, we use the alternative *board* measure of poor governance instead. Again the results show that CEOs disproportionately benefit: a 10% export shock increases CEO bonuses by 8.9% at poorly governed firms but increases non-CEO bonuses by only 6.2% at poorly governed firms. This provides further evidence that it is powerful executives who benefit most from globalization, due to their rent-capture opportunities.

[52]Note that non-CEOs are still among the top 5 highest paid executives at the firm.

[53]This is not true for all firm characteristics; for example, CEOs benefit less from growth in firm size than Non-CEOs according to our results (unreported).

Interestingly, the magnitude of the interaction effect in columns 1 and 3 indicates that having an executive on the compensation committee is more conducive to the CEO capturing rents than simply having many executives on the board of directors.[54] Furthermore, our results regarding the importance of managerial power in influencing pay in poor-governance firms hold when comparing the top two executives versus the remaining three executives (unreported), although clearly the power of the CEO stands out.

In sum, our findings present compelling evidence that rent-capture is playing an important role in the link between globalization and executive compensation. First, we find in Table 8 that exogenous export shocks exclusively increase more discretionary forms of compensation (in particular bonuses), which are more conducive to rent-capture. Second, we see in Table 9 that the impact on bonuses is strongest at poor governance firms where rent-capture is more likely. Finally, the results in Table 10 show that, at these poor governance firms, it is the executives with more power that are the ones that disproportionately reap the rewards from exogenous export shocks.

6 Extensions

6.1 Executive - Worker Pay Gap

Our results indicate that exogenous export shocks increase executive compensation, but broader implications for inequality hinge on executives disproportionately benefiting from globalization. To the extent that exports increase the wages of other workers within the firm in the same way, then there would be no effect on within-firm inequality (see work by Song, Price, Guvenen, Bloom, and von Wachter 2015). Of course not all firms are equally exposed to globalization, but those that are would experience little within-firm inequality growth. One way to address this issue is by studying whether exports increase the executive-to-worker pay ratio. Another rationale for focusing on the executive-to-worker pay ratio is that globalization is unlikely to increase average worker wages through rent-capture. Unlike executives, rank and file workers do not have managerial power and are unlikely to personally benefit from insider relationships. Thus, to the extent that rent-capture is important, we should see a similar impact of export shocks on the executive-worker pay ratio as on the level of executive pay, which provides another check of our results.

Since U.S. firms are not required to report non-executive compensation in SEC filings, *Compustat* does not include a direct measure of wages. We therefore define average wages at the firm as labor expenses per

[54] In unreported results (not included due to space constraints), we find that both interaction coefficients remain positive and significant predictors of CEO pay when included simultaneously, with the *export*interlock* again being larger in magnitude.

employee, as in Bertrand and Mullainathan (1999). Unfortunately, not all firms in *Compustat* report labor expenses. In cases where this variable is missing, we use average labor expenses per employee at other similar firms within the same industry and year.[55] This approach takes advantage of the fact that firms in the same year and within an industry tend to pay similar wages. While this is not a perfect method, it provides an opportunity to maintain a consistent sample of firms in light of data constraints.[56]

Table 11 reports our instrumental-variables specification using the executive to worker compensation ratio as the dependent variable. In the first specification, exports enters with a positive coefficient. As we see in the subsequent columns of Table 11, this finding does not change with the inclusion of firm or executive level variables often found to be important predictors of executive compensation. This shows that executives disproportionately benefit from exogenous export shocks relative to the average worker. In other words, globalization is leading to within-firm inequality. Based on this finding, it is plausible that globalization is also increasing inequality between executives and the population at large.

Technology investment also has a strong positive impact on the executive-worker pay gap. This is consistent with existing evidence that indicates skill-biased technical change and globalization are two of the most prominent explanations for rising inequality in the U.S. However, in contrast to many existing studies the results in Table 11 focus on top incomes earners (i.e. executives) who are driving inequality through within-firm adjustments. Interestingly, employment has a significant positive impact on executive compensation (Table 5) but has no positive effect on the executive-worker pay gap (Table 11). One interpretation of these findings is that firm size increases not only executive compensation but also average worker compensation, so that the executive-worker pay gap does not change. Thus, unlike globalization and technological change, increasing firm size does not lead to within-firm inequality. Overall, these results support our existing findings and provide evidence that exports have led to within-firm inequality.

6.2 Foreign Affiliate Sales

Given the availability of detailed trade data, we have thus far focused on exports and imports as our measures of globalization. Another component of globalization that may be important for executive compensation is foreign direct investment (FDI). Foreign affiliate sales provide an alternate way for multinational firms to sell to foreign markets. Unfortunately, data on foreign sales in *Compustat* is limited in terms of

[55]Specifically, if firm-level average wage is missing then we use average wages at other firms within the same six-digit NAICS industry and year. If this industry-level wage is also missing, then we use average wage at the five-digit NAICS industry and so forth. Of the estimated average wage data, 22% use the six-digit NAICS average, 16% use the five-digit average, 7% use the four-digit average, 33% use the three-digit average, and 22% use the two-digit average.

[56]Note that the results could be attenuated because executive pay is also included in the average worker compensation in the denominator.

the years covered and the destination of these sales (which makes it impossible to identify foreign affiliate sales shocks using our instrumental-variable approach). However, *Compustat* does measure foreign sales at the firm-level from 2000-2013, and especially post-2010. Given the importance of multinational firms for globalization, we investigates the link between foreign affiliate sales and executive compensation using this data.

Table 12 reports the relationship between foreign affiliates sales and executive compensation. The results in column 1 show that foreign sales raise executive compensation, after accounting for firm and year fixed effects. Adding firm size, technology investment, insider relationships, markups, and even domestic sales increases the magnitude and significance of the foreign sales coefficient (column 2). Interestingly the point estimate for domestic sales (0.02) is significantly smaller than that of foreign sales (0.06). This reinforces earlier findings that conditional on firm size, here measured using employment and domestic sales, globalization is an important driver of executive compensation. Finally, we see that the inclusion of executive-level variables (i.e. experience, gender, and education) do not change the finding that foreign affiliate sales raise executive compensation (column 3). Due to limited data, these results should be interpreted with caution. However, they provide another piece of evidence that globalization, broadly defined, is indeed playing a role in the growth of executive compensation.

6.3 Alternate IV Approaches

This section examines the robustness of our results to two alternate methods of measuring exogenous export variation. While these additional approaches are conceptually distinct from our earlier instrumental variable, they all share the common goal of identifying exogenous variation in exports that is uncorrelated with executive behavior.

Our first alternate instrumental-variable approach uses bilateral export flows and insights from the gravity equation of trade to identify an exogenous source of variation in U.S. exports. This approach builds on the insights of Frankel and Romer (1999) and applies these ideas to industry-level exports, as in Blanchard and Olney (2017). Specifically, this method utilizes variation in bilateral exports driven by changing economic conditions in the foreign importing country and time-invariant geographic characteristics. The predicted bilateral export flows are then summed across all of the U.S. trading partners within that industry. This generates an instrument for industry-specific exports that is by construction exogenous to changing domestic conditions in the U.S. Additional details about the construction of this instrument are reported in Appendix A.11.

Like the Bartik instrumental variable strategy, the goal of this approach is to construct an instrument that identifies an exogenous source of variation in exports. However, unlike the Bartik instrument, this method does not rely on exports from other high-income countries to identify import demand shocks. Instead this approach identifies the shock in the foreign country, using variation in foreign GDP, to predict changes in demand for U.S. exports.

Column 1 of Table 13 re-reports our earlier instrumental variable analysis for comparison purpose, while column 2 reports results using this gravity instrumental variable approach. The first-stage results reported in the bottom panel show that the gravity instrument is a significant predictor of actual export flows with the first-stage F-statistic above 10. The second-stage results indicate that these exogenous export shocks have a positive and significant impact on executive compensation. Furthermore, the export point estimate (in column 2) is similar to that obtained using the Bartik instrument (reported in column 1). Thus, our main findings are confirmed using an entirely different identification strategy that identifies changes to foreign import demand using bilateral trade data and the gravity equation.

Our second alternate instrumental-variable approach uses world import demand (WID) shocks to identify an exogenous source of variation in U.S. exports (similar to Hummels et al. 2014). This method exploits the fact that shocks in a particular country likely affect the demand for goods from both the U.S. and other foreign countries. These shocks could include changes in foreign demand (due to evolving preferences or input use) or productivity shocks that alter the countries comparative advantage. Specifically, this instrument is constructed by allowing presample bilateral U.S. exports to grow at the exogenous rate at which non-US imports into a foreign country increased within an industry. Like the Bartik and gravity instruments this approach identifies shocks to U.S. exports driven by changing foreign conditions but it identifies these shocks in a different way using different data.[57] Details about the construction of this WID instrument are discussed in Appendix A.11.

Results using the this WID instrument are reported in column 3 of Table 13. The first-stage results, reported in the bottom panel, show that world import demand shocks are a strong positive predictor of actual U.S. export flows. The second-stage results, reported above, show that exogenous export shocks, driven by world import demand fluctuations, have a significant positive impact on executive compensation. The magnitude of this effect is similar to our Bartik and gravity instrumental variable results, reported in columns 1 and 2. Overall, the results in Table 13 are reassuring since they indicate that our findings hold

[57]The Bartik instrument uses UN Comtrade data on exports from 8 high-income countries, the gravity instrument uses bilateral U.S. export data from the U.S. Census, and the WID instrument uses UN Comtrade import data reported by the foreign country.

using a variety of different methods of identifying exogenous export shocks.

6.4 Additional Results

The online appendix reports a number of additional results of interest, which due to space constraints we do not discuss in detail here. Specifically, Appendix A.1 shows the evolution of all U.S. income deciles over the last four decades, while Appendix A.2 shows that the increase in the top 1% observed in the U.S. is also qualitatively occurring in other OECD countries. We address concerns about the measurement of firm size by showing that our results are robust to a wide variety of other definitions in Appendix A.3. Section A.4 examines the effect of top marginal tax rates on executive pay and uses an alternate balanced sample of firms. We use an alternate measure of compensation in section A.5, and interestingly find that while export shocks increase options exercised it has no bearing on the less-discretionary options awarded. While the impact of export shocks on executive bonuses is an important focus, section A.6 instead examines the impact on options exercised and other compensation particularly at poor governance firms. To address concerns about the endogeneity of corporate governance, Appendix A.7 shows that the results are similar using long-run averages of our poor governance measures. Findings presented in Appendix A.8 show that import shocks, constructed in an analogous way as export shocks, have no impact on executive compensation. The inclusion of industry*year fixed effects in section A.9 illustrate that it is not broader industry-level shocks that are leading to rising executive compensation. Results using alternate measures of the firm's main industry, an alternate rent-capture measure, an alternate technology measure, and executive*firm fixed effects are reported in section A.10, while section A.11 presents additional details on the alternate instrumental variable approaches.

7 Conclusion

We construct a panel data set spanning thousands of executives working at hundreds of major U.S. firms over the last twenty years to examine the influence of globalization on the rising compensation of business executives. Our analysis generates a number of key findings. First, through the growth in top incomes, globalization is playing a more important role in inequality than previously thought. We show that rising exports, along with firm size and technology investments, has a positive impact on executive compensation. While past studies have focused on imports or dismissed globalization's impact on top incomes based on cross-country or cross-occupation comparisons, we show using a comprehensive data set and a rigorous empirical analysis that globalization is actually one of the important drivers of the recent growth of executive

compensation.

Second, this finding is not simply due to talented executives successfully expanding their firms abroad and thus being more highly compensated in return. Our instrumental-variable results demonstrate that even export shocks, which by construction are unrelated to managerial decisions, significantly increase executive pay. While export shocks could in principle increase pay by altering the nature of the executive's job or improving the executive-firm match, we do not find evidence that globalization increases the returns to talent or executive turnover. We conclude that changing market conditions, either caused by the executive or by external forces, are not the only explanation for why globalization increases executive pay.

Third, we find that rent-capture plays a prominent role in the impact of globalization on executive compensation. Exogenous export shocks primarily affect discretionary, less-structured forms of compensation (i.e. bonuses), which are more conducive to rent-capture. In addition, export shocks have a larger effect on executive bonuses at poor governance firms where rent-capture is prevalent. Finally, at these poor governance firms, it is the CEOs with more managerial power that disproportionately benefit from export shocks.

Our finding that recent globalization trends have increased U.S. inequality by disproportionately raising top incomes represents an important step forward. At the same time, our results might help to explain the apparent gap between the public perception of globalization and research on globalization. In recent elections, anger about globalization has led to a populist resurgence. To the extent that top income earners disproportionately benefit from globalization through the exploitation of poor governance settings, these attitudes are understandable. However, our findings should not be interpreted as a rationale for protectionist policies since globalization has generated large increases in the overall standard of living. The key question for policy makers is to devise ways to address the distributional implications of globalization, such as those identified in this paper, without compromising aggregate welfare gains.

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TABLE 1

Summary Statistics

	Obs	Mean	Std. Dev.
Compensation Variables:			
ln (Executive Compensation)	49,301	7.24	1.12
ln (Salary)	49,375	6.10	0.61
ln (Bonus)	49,375	5.02	2.24
ln (Options)	49,375	2.75	3.28
ln (Stocks)	49,375	2.63	2.98
ln (Other Compensation)	49,375	3.57	1.67
Independent Variables:			
ln (Exports)$_{t-1}$	49,375	21.84	1.56
ln (Imports)$_{t-1}$	48,875	22.06	2.24
ln (Employment)$_{t-1}$	49,005	8.38	1.67
ln (Capital Expenditure)$_{t-1}$	48,905	18.14	1.89
Interlock	49,375	0.06	0.24
ln (Markups)$_{t-1}$	49,335	0.95	0.33
Board	49,375	0.16	0.36
Experience	49,375	4.65	3.65
Male	49,375	0.96	0.19
Dr.	49,375	0.03	0.17
# of Executives	10,855		
# of Firms	798		

Notes: Total Executive Compensation (TDC2) includes Salary, Bonus + Long Term Incentive Plans (LTIP), Options Exercised, Stocks, and Other types of compensation. Exports and Imports are measured at the 6-digit NAICS level. Employment, Capital Expenditure, Interlock, Markups, and Board are measured at the firm level. Experience, Male, and Dr. are measured at the executive level.

TABLE 2
The Impact of Exports on Executive Compensation

	Executive Compensation							Beta Coeff.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exports-1					0.206***	0.137***	0.143***	0.200***
					[0.045]	[0.037]	[0.034]	[0.048]
Imports-1					0.026	0.017	0.021	0.043
					[0.019]	[0.017]	[0.018]	[0.036]
Employment-1	0.203***					0.110***	0.069**	0.103**
	[0.021]					[0.027]	[0.027]	[0.040]
Capital Expenditure-1		0.144***				0.081***	0.066***	0.112***
		[0.018]				[0.016]	[0.015]	[0.025]
Interlock			0.120**			0.100**	0.102**	0.022**
			[0.053]			[0.048]	[0.048]	[0.010]
Markups-1				0.195***		0.135*	0.118*	0.035*
				[0.065]		[0.070]	[0.060]	[0.018]
Experience							0.090***	0.295***
							[0.003]	[0.008]
Male							0.148***	0.025***
							[0.028]	[0.005]
Dr.							0.078	0.012
							[0.048]	[0.007]
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	48,935	48,831	49,301	49,261	48,801	47,990	47,990	47,990
R-squared	0.495	0.496	0.489	0.490	0.496	0.503	0.568	0.568

Notes: The dependent variable is the log of total compensation (TDC2) of the executive. Estimation by OLS. Exports, imports, employment, capital expenditure, and markups are all in logs. Column 8 reports the Beta Coefficients after standardizing all variables to have a mean of 0 and a standard deviation of 1. Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 3
The Impact of Exports on Executive Compensation - Extensions

	Baseline	Industry VA	Industry*Year FE	TDC1	Sales	Poor Gov
	(1)	(2)	(3)	(4)	(5)	(6)
Exports-1	0.143***	0.095***	0.070*	0.123***	0.139***	0.142***
	[0.034]	[0.030]	[0.037]	[0.032]	[0.033]	[0.034]
Industry VA -1		0.255***				
		[0.061]				
Sales-1					0.090***	
					[0.023]	
Interlock Average						0.163*
						[0.094]
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Executive Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry*Year FE	No	No	Yes	No	No	No
Observations	47,990	47,750	47,990	46,553	48,326	47,990
R-squared	0.568	0.570	0.588	0.597	0.569	0.568

Notes: Estimation by OLS. Column 1 rereports the baseline findings from Table 2. Column 2 includes industry value added while column 4 includes industry*year fixed effects (where both measure industry at the 3-digit NAICS level). Column 4 uses an alternate executive total compensation measure (TDC1) as the dependent variable also in logs. Column 5 uses sales to measure firm size, rather than employment. Column 6 uses the firm-level average of Interlock over a seven year period to address short run endogenous fluctuations in poor governance. All specifications include a full set of firm and executive controls. Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 4
The First Stage Estimation Results

	Exports$_{-1}$		
	(1)	(2)	(3)
Export IV$_{-1}$	0.404***	0.376***	0.376***
	[0.072]	[0.068]	[0.068]
Imports$_{-1}$	0.064	0.058	0.058
	[0.039]	[0.038]	[0.038]
Employment$_{-1}$		0.035	0.036
		[0.023]	[0.023]
Capital Expenditure$_{-1}$		0.050**	0.050**
		[0.022]	[0.022]
Interlock		0.071**	0.071**
		[0.030]	[0.030]
Markups$_{-1}$		0.022	0.022
		[0.059]	[0.058]
Experience			0.000
			[0.001]
Male			-0.004
			[0.008]
Dr.			0.021
			[0.014]
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	47,398	46,612	46,612
SW F-Stat on Instrument	31.32	30.69	30.61

Notes: First stage of two-stage least squares regressions. Dependent variable is log exports lagged by one year. The export instrument, imports, employment, capital expenditure, and markups are all in logs. Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 5
The Impact of Export Shocks on Executive Compensation

	Executive Compensation		
	(1)	(2)	(3)
Exports$_{-1}$	0.456***	0.359***	0.373***
	[0.066]	[0.070]	[0.051]
Imports$_{-1}$	0.002	-0.001	0.003
	[0.013]	[0.013]	[0.014]
Employment$_{-1}$		0.103***	0.060**
		[0.026]	[0.026]
Capital Expenditure$_{-1}$		0.057***	0.041***
		[0.014]	[0.013]
Interlock		0.064	0.066
		[0.051]	[0.050]
Markups$_{-1}$		0.105	0.087
		[0.074]	[0.066]
Experience			0.091***
			[0.003]
Male			0.160***
			[0.029]
Dr.			0.070
			[0.049]
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	47,398	46,612	46,612
R-squared	0.491	0.498	0.565
SW F-Stat on Instrument	31.32	30.69	30.61

Notes: Second stage of two-stage least squares regressions. The dependent variable is the ln of total compensation (TDC2) of the executive. Exports, imports, employment, capital expenditure, and markups are all in logs. Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 6
Executive Turnover

# of Employers per Executive	# of Executives	Percent of Sample
1	37,816	92.22
2	2,812	6.86
3	323	0.79
4	46	0.11
5	8	0.02
6	2	0.00
	41,007	100

Notes: This table shows the number of S&P firms that each of the executives in the full ExecuComp sample have worked at.

TABLE 7
Impact of Export Shocks on Executive Compensation - Turnover and Market Returns

	Executive Compensation						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Exports$_{-1}$	0.373***	0.379***	0.379***	0.386***	0.379***	0.373***	0.374***
	[0.051]	[0.051]	[0.052]	[0.050]	[0.071]	[0.070]	[0.051]
Exports$_{-1}$*New Exec			0.001				
			[0.008]				
Exports$_{-1}$*Experience				-0.003			
				[0.003]			
Exports$_{-1}$*Firm Experience					0.002		
					[0.001]		
Exports$_{-1}$*Firm CEO Experience						0.003	
						[0.002]	
Exports$_{-1}$*Dr.							-0.028
							[0.041]
New Exec		-0.157***	-0.182				
		[0.015]	[0.180]				
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Executive Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	46,612	46,612	46,612	46,612	46,612	46,612	46,612
R-squared	0.565	0.568	0.568	0.566	0.539	0.558	0.565
SW F-Stat on Instrument	30.61	30.59	34, 192	54, 91	65, 112	131, 92	34, 126

Notes: Second stage of two-stage least squares regressions. The dependent variable is the log of total compensation (TDC2) of the executive. Column 1 re-reports results from column 3 of Table 5. Column 2 includes a binary variable ('New Exec') identifying whether the individual is a new top 5 executive at the firm this year. Columns 3 includes the interaction between the export IV and the New Exec variable. Column 4 includes the interaction between the export IV and experience (measured as the number of years the executive has worked for any S&P firm). Columns 5-6 instead measure experience as the number of years the executive has been at the firm and the number of years the executive has been CEO at the firm, and includes the analogous interaction terms. Finally, column 7 includes an interaction between exports and education (measured as whether the executive has a doctorate). Exports, imports, employment, capital expenditure, and markups are all in logs. Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 8
The Impact of Export Shocks on Alternate Compensation Measures

	Total Comp.	Salary	Bonus	Options Exercised	Stocks	Other
	(1)	(2)	(3)	(4)	(5)	(6)
Exports-1	0.373***	0.039	0.509**	0.554*	0.328	0.174**
	[0.051]	[0.039]	[0.206]	[0.336]	[0.223]	[0.081]
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Executive Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	46,612	46,680	46,680	46,680	46,680	46,680
R-squared	0.565	0.503	0.388	0.223	0.556	0.463
SW F-Stat on Instrument	30.61	30.63	30.63	30.63	30.63	30.63

Notes: Second stage of two-stage least squares regressions. Column 1 re-reports the baseline results from column 3 of Table 5. Columns 2-6 use salary, bonuses+long term incentive plans, options (exercised), stocks, and other compensation as the dependent variable (in logs). Exports, imports, employment, capital expenditure, and markups are all in logs. Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 9
The Impact of Export Shocks on Bonuses at Poor Governance Firms

	Executive Bonuses			
	(1)	(2)	(3)	(4)
Exports-1	0.509**	0.505**	0.501**	0.493**
	[0.206]	[0.203]	[0.205]	[0.203]
Exports-1*Interlock		0.156**		0.128*
		[0.067]		[0.065]
Exports-1*Board			0.170**	0.160*
			[0.078]	[0.082]
Firm Controls	Yes	Yes	Yes	Yes
Executive Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	46,680	46,680	46,680	46,680
R-squared	0.388	0.388	0.388	0.388
SW F-Stat on Instrument	30.63	32, 230	32, 77	36, 304, 99

Notes: Second stage of two-stage least squares regressions. Dependent variable in all columns is the log of bonuses. Exports and the interaction terms are instrumented throughout using the Bartik style instrument and the interaction of this instrument and the poor governance variables. Exports, imports, employment, capital expenditure, and markups are all in logs. Column 3 includes *Board* instead of *Interlock* and column 4 includes both *Board* and *Interlock* . Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 10
The Impact of Export Shocks on Powerful Managers at Poor Governance Firms

	Executive Bonuses			
	CEOs	Non-CEOs	CEOs	Non-CEOs
	(1)	(2)	(3)	(4)
Exports$_{-1}$	0.649***	0.472**	0.637**	0.467**
	[0.248]	[0.208]	[0.257]	[0.209]
Exports$_{-1}$*Interlock	0.381***	0.106*		
	[0.122]	[0.060]		
Exports$_{-1}$*Board			0.253***	0.156**
			[0.094]	[0.079]
Firm Controls	Yes	Yes	Yes	Yes
Executive Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	8,874	37,806	8,874	37,806
R-squared	0.427	0.396	0.427	0.395
SW F-Stat on Instrument	30, 203	32, 231	30, 74	31, 77

Notes: Second stage of two-stage least squares regressions. Dependent variable in all columns is the log of bonuses. Exports and the interaction terms are instrumented throughout using the Bartik style instrument and the interaction of this instrument and the poor governance variables. Exports, imports, employment, capital expenditure, and markups are all in logs. Columns 3 and 4 include *Board* instead of *Interlock* . Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 11
The Impact of Export Shocks on Executive to Average Worker Compensation Ratio

	Executive / Worker Compensation		
	(1)	(2)	(3)
Exports-1	0.739***	0.591***	0.605***
	[0.220]	[0.224]	[0.221]
Imports-1	-0.038	-0.035	-0.032
	[0.049]	[0.050]	[0.049]
Employment-1		-0.044	-0.086*
		[0.049]	[0.052]
Capital Expenditure-1		0.191***	0.175***
		[0.038]	[0.039]
Interlock		0.069	0.071
		[0.086]	[0.087]
Markups-1		-0.122	-0.140
		[0.145]	[0.146]
Executive Controls	No	No	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	46,993	46,227	46,227
R-squared	0.371	0.381	0.422
SW F-Stat on Instrument	31.37	30.67	30.60

Notes: Second stage of two-stage least squares regressions. Dependent variable is the log of the ratio of total executive compensation (TDC2) to average worker compensation at the firm. Average worker compensation is measured by the firm's labor expenses per employee, and if this data is missing, by the detailed industry average of compensation per employee. Exports, imports, employment, capital expenditure, and markups are all in logs. Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 12
The Impact of Foreign Affiliate Sales on Executive Compensation

	Executive Compensation		
	(1)	(2)	(3)
Foreign Sales$_{-1}$	0.034**	0.056***	0.059***
	[0.017]	[0.018]	[0.017]
Employment$_{-1}$		-0.070	-0.120
		[0.078]	[0.078]
Capital Expenditure$_{-1}$		0.021	0.008
		[0.031]	[0.029]
Interlock		0.081	0.157
		[0.105]	[0.136]
Markups$_{-1}$		-0.051	-0.05
		[0.130]	[0.094]
Domestic Sales$_{-1}$		0.017***	0.017***
		[0.004]	[0.004]
Executive Controls	No	No	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	11,979	11,878	11,878
R-squared	0.564	0.567	0.646

Notes: Dependent variable is log total executive compensation (TDC2). Estimation by OLS. Years included are 2000-2013 based on available foreign sales data (pre-2010 data is more limited). Foreign sales, employment, capital expenditure, markups, and domestic sales are all in logs. Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 13
The Impact of Export Shocks on Executive Compensation - Alternative Instrumental Variable Models

	Bartik IV	Gravity IV	World Import Demand IV
	(1)	(2)	(3)
Exports$_{-1}$	0.373***	0.438***	0.572***
	[0.051]	[0.086]	[0.200]
Firm Controls	Yes	Yes	Yes
Executive Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	46,612	47,090	46,642
R-squared	0.565	0.562	0.555
First Stage Results:			
Bartik IV$_{-1}$	0.376***		
	[0.068]		
Gravity IV$_{-1}$		0.527***	
		[0.154]	
WID IV$_{-1}$			0.065***
			[0.019]
SW F-Stat on Instrument	30.61	11.79	11.16

Notes: First and second stage results of two-stage least squares regressions. The dependent variable in the second stage is the log of executive compensation (TCD2) and in the first stage it is the lagged log of exports. Column 1 re-reports the baseline results using the Bartik instrument. Column 2 uses an instrument that identifies, using the gravity equation, shocks to bilateral export flows driven by conditions in the foreign importing country. Column 3 uses an instrument that is constructed using world import demand (excluding U.S. imports) and presample bilateral export flows. Exports, imports, employment, capital expenditure, and markups are all in logs. Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

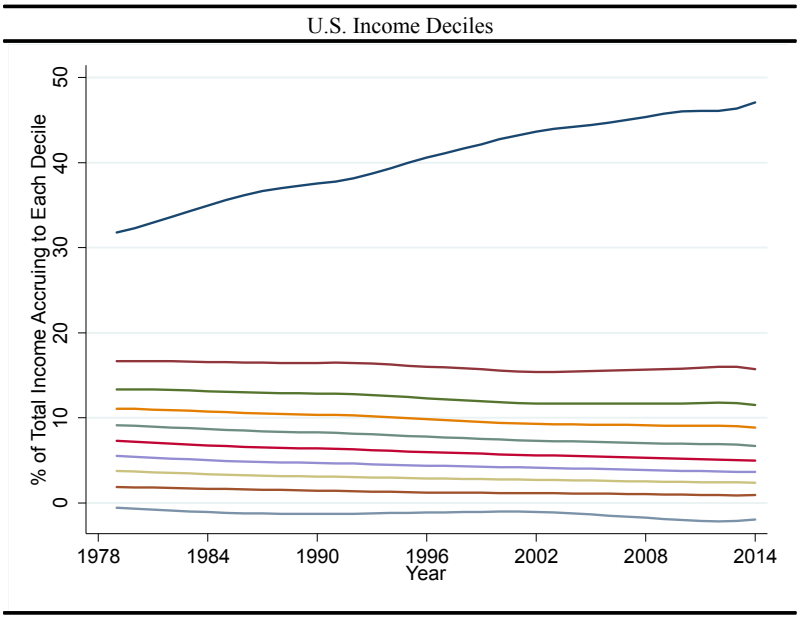
ONLINE APPENDIX FOR REFEREES ONLY

A Appendix Table of Contents

A.1 Evolution of All U.S. Income Deciles

Figure 1 illustrates a dramatic increase in the share of total U.S. income going to the top 1% of earners over the last four decades, while the other two deciles remain essentially flat. To ensure these relationships are not an artifact of the income groups selected, in Figure A1 we report all the U.S. income deciles. We see that the share of income going to the top decile of U.S. earners has increased from about 30% to almost 50% over the last forty years. The other nine deciles all have income shares that are well below 20% and they have experienced a similar decline over the last forty years. We conclude that regardless of how one calculates it, growth in inequality in the U.S. is driven by the rapid increase in top incomes.

FIGURE A1



Notes: Kernel-weighted local polynomial smoothed data from World Wealth and Income Database (WID; website: wid.world).

A.2 Top 1% in Other OECD Countries

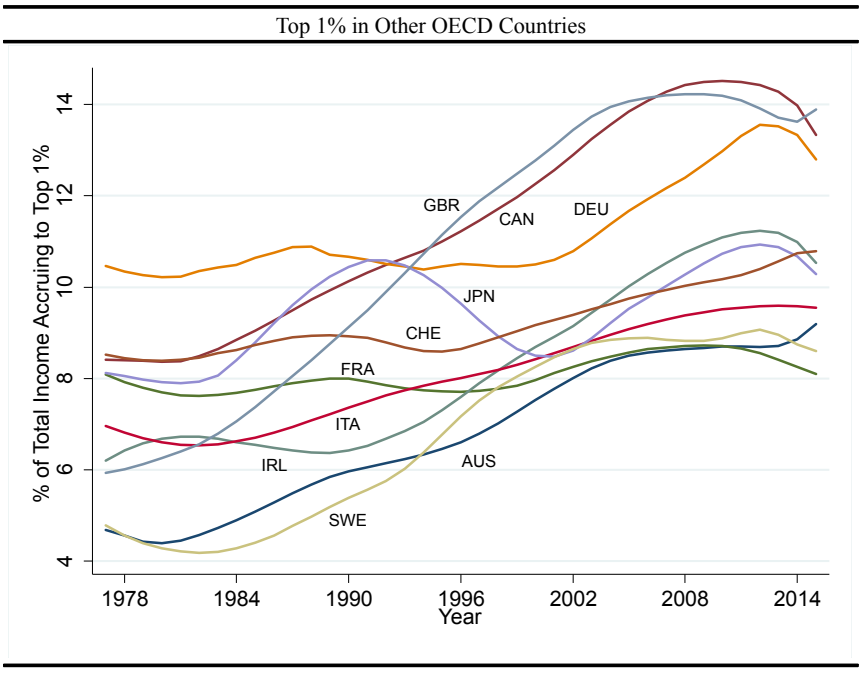
Our analysis examines why top incomes in the U.S. have increased so dramatically, as illustrated in Figure 1. This section provides some evidence on trends in top incomes in other high-income countries.

Employing data from the World Wealth and Income Database (WID: Alvaredo, Chancel, Piketty, Saez, and Zucman), the evolution of the top 1% fiscal income shares for a variety of OECD countries is shown in Figure A2. The share of income going to the top 1% has increased in all ten of these countries.[58]

[58]We focus on OECD countries that have available data, that are similar to the U.S., or that have been examined for comparison purposes in the literature (Piketty and Saez 2006; Alvaredo et al. 2013).

While the share of income going to top earners has evolved in different ways across these countries, a clear upward trend is evident in Figure A2. In particular, the share of income going to the top earners ranged from 4-10% early in the sample but by the end of the sample it was in the 8-14% range. The growth in top incomes is not a phenomenon specific to the U.S. and while there are institutional differences across countries, we see little reason to believe that the forces that affect the relationship between globalization and executive compensation identified in this paper do not apply to other countries as well.

FIGURE A2



Notes: Kernel-weighted local polynomial smoothed data from World Wealth and Income Database (WID; website: wid.world).

A.3 Measuring Firm Size

This section demonstrates that our findings are not sensitive to alternate measures of firm size. As in Edmans, Gabaix, and Jenter (2017, Table 2), we examine the relationship between firm size and executive compensation using an OLS specification that includes executive characteristics and year fixed effects. Instead of industry fixed effects, to be conservative we utilize firm fixed effects. Columns 1-6 of Table A3 show how executive compensation varies with a variety of firm size measures, in particular employment, sales, assets, costs, stock price, and market value. All variables enter with a positive and significant coefficient and the magnitudes are similar (with a narrow range of 0.13 to 0.27 across six measures). Note that the latter two measures have the largest coefficients, which is consistent with the observation that executive compensation and these two size proxies are closely related to the firm's stock price.

Next we examine whether exports matter for executive compensation above and beyond firm size. We begin by including exports without controlling for size (see column 8), finding that a ten percent increase in exports is associated with a 2.1% increase in executive compensation. In columns 9 to 14 we add one size measure at a time to the specification, while in column 15 all size measures are included jointly. Including exports in the specification causes every one of the size coefficients to fall (compare columns 1 to 9, 2 to 10, etc.). Furthermore, the inclusion of each of the size measures causes the export point estimate to decrease too (compare columns 8 to 9, 8 to 10, etc). These results provide additional confirmation that a portion of globalization's effect on executive pay operates through firm size.

Importantly the magnitude of the export coefficient is remarkably stable after the inclusion of a variety of different proxies for firm size. Specifically, there is no statistical difference between the export coefficients using any or all of the size measures. The fact that the export coefficient is positive, significant, and similar in magnitude in every specification indicates that our finding that globalization increases executive pay conditional on size is robust. We conclude from Table A3 that all measures of firm size generate similar results.

TABLE A3
The Impact of Firm Size on Executive Compensation - Without and With Exports

	Executive Compensation														
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Exports-1								0.205***	0.175***	0.164***	0.157***	0.174***	0.141***	0.108***	0.121***
								[0.044]	[0.044]	[0.043]	[0.037]	[0.041]	[0.032]	[0.029]	[0.031]
Employment-1	0.148***						-0.013		0.127***						-0.002
	[0.023]						[0.037]		[0.022]						[0.036]
Sales-1		0.143***					0.039*			0.124***					0.03
		[0.022]					[0.020]			[0.021]					[0.019]
Assets -1			0.174***				-0.111**				0.149***				-0.126***
			[0.024]				[0.047]				[0.019]				[0.043]
Costs-1				0.131***			0.034					0.113***			0.036*
				[0.021]			[0.022]					[0.020]			[0.021]
Price-1					0.264***		0.154***						0.254***		0.162***
					[0.020]		[0.039]						[0.018]		[0.034]
Market Value-1						0.272***	0.167***							0.261***	0.155***
						[0.017]	[0.042]							[0.016]	[0.038]
Executive Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	48,935	49,266	49,271	49,261	49,069	48,390	48,126	49,301	48,935	49,266	49,271	49,261	49,069	48,390	48,126
R-squared	0.561	0.562	0.562	0.561	0.578	0.581	0.584	0.56	0.563	0.564	0.564	0.563	0.579	0.582	0.585

Notes: Dependent variable is log of total executive compensation (TDC2). Estimation by OLS. Exports, employment, sales, assets, costs, price, and market value are all in logs. Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

A.4 Top Tax Rates and Sample Selection

Recent work indicates that top marginal tax rates are an important driver of executive compensation. For example, a lower top marginal tax rates may provide incentives for the executive to bargain more aggressively over pay (Piketty, Saez, and Stantcheva 2014). Using data from the *Taxsim* database we measure top marginal income tax rates in the state in which the firm is headquartered. While all executives in our data set face the same marginal federal (U.S.) income tax rate, many also pay state income taxes which can vary significantly across states and over time. For instance, the top marginal income tax rate has increased in California from 9.3% in 1990 to 14.1% in 2014, has remained at 0% in Texas, and has decreased from 8.5% to 5.1% in New Mexico. We examine whether these changes in top marginal state tax rates can explain part of the growth in top incomes.

As a point of reference, columns 1-3 of Table A4 re-report our main results that include approximately 47,000 observations and do not include top marginal tax rates. Then in columns 4-6, we include our top marginal tax rate variable, which due to limited information on the headquarter state of the firm restricts the sample to 29,000 observations. We find that the top marginal tax rates have an insignificant impact on total compensation (column 4) and bonuses (columns 5 and 6).[59] Importantly the inclusion of *Top Tax Rate* and the associated loss of observations has no qualitative effect on the export coefficients of interest which remains positive and significant throughout.

Columns 7-9 then go one step further by only including firms that span the entire 21 years of the sample. This alleviates concerns that firm entry or exit from the sample may be influencing the results. By restricting the sample in this way, the number of observations falls to approximately 19,000 observations. Despite the loss of sample size, the export coefficients of interest remain positive and significant. For instance, in column 9 we see that a 10% export shock increases executive bonuses by 4% in general but by 9% at firms with poor governance (which is a bit larger than the analogous 6.5% found using the full sample in column 2 of Table 9). Overall the results in Table A4 indicate that top marginal tax rates are playing a limited role in determining executive compensation and that our results are consistent across a variety of different samples.

[59] This insignificant result may in part be due to our reliance on state tax variation.

TABLE A4
The Impact of Export Shocks on Executive Compensation -Tax Rate and Alternate Samples

	Main 47k Sample			29k Sample (w/ Tax Rate)			Balanced 19k Sample (w/ Tax Rate)		
	Total Comp	Bonus	Bonus	Total Comp	Bonus	Bonus	Total Comp	Bonus	Bonus
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Exports-1	0.373***	0.509**	0.505**	0.262***	0.431***	0.439***	0.223***	0.386**	0.393**
	[0.051]	[0.206]	[0.203]	[0.053]	[0.156]	[0.153]	[0.079]	[0.194]	[0.186]
Exports-1*Interlock			0.156**			0.231**			0.515***
			[0.067]			[0.100]			[0.127]
Top Tax Rate-1				0.003	0.025	0.017	-0.122	-0.141	-0.169
				[0.151]	[0.255]	[0.253]	[0.170]	[0.329]	[0.316]
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Executive Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	46,612	46,680	46,680	28,609	28,660	28,660	19,043	19,045	19,045
R-squared	0.565	0.388	0.388	0.564	0.356	0.356	0.58	0.327	0.329
SW F-Stat on Instrument	30.61	30.63	32, 230	18.93	18.95	19, 49	14.06	14.06	14, 40

Notes: Columns 1-3 use the main sample with 47k observations. Columns 4-6 include the Top Marginal Tax Rate variable which has more limited coverage. Columns 7-9 also include Top Marginal Tax Rates but uses a balanced sample (i.e. restricts the sample to firms that span all years). Exports and the interaction terms are instrumented throughout using the Bartik style instrument and the interaction of this instrument and interlock. Exports are in logs. Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

A.5 Other Types of Compensation

Following the existing literature, our main analysis relies on a measure of total compensation awarded in a given year (TDC2). In this section we focus on an alternate compensation measure produced by *ExecuComp* (TDC1), which captures pay awarded but not necessarily realized in a given year using a Black-Scholes calculation.[60]

In column 1 of Table A5 exogenous export shocks have a positive and significant impact on this alternate TDC1 measure of total compensation. The magnitude of this effect (0.30) is similar to the analogous export coefficient of 0.37 from column 1 of Table 8 which uses TDC2. The results in columns 2, 3, 5, and 6 are the same as those from Table 8 since both TDC1 and TDC2 rely on the same definitions of salary, bonuses, stocks, and other compensation. The key difference between these aggregate compensation measures is that TDC1 includes options awarded rather than options realized. As seen in column 4, export shocks have an insignificant impact on options awarded which is in contrast to the significant positive impact it has on options exercised found in Table 8. Given that the executive's decision to exercise these options adds another element of control and discretion, it is not surprising that this type of compensation is more sensitive to export shocks. Overall, we conclude that our results are robust to other definitions of total compensation and when they differ they do so in intuitive ways.

TABLE A5
The Impact of Export Shocks on Alternate Compensation Measures

	Total (TDC1)	Salary	Bonus	Options Awarded	Stocks	Other
	(1)	(2)	(3)	(4)	(5)	(6)
Exports$_{-1}$	0.303***	0.039	0.509**	0.205	0.328	0.174**
	[0.037]	[0.039]	[0.206]	[0.253]	[0.223]	[0.081]
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Executive Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45,213	46,680	46,680	46,680	46,680	46,680
R-squared	0.594	0.503	0.388	0.312	0.556	0.463
SW F-Stat on Instrument	30.69	30.63	30.63	30.63	30.63	30.63

Notes: Second stage of two-stage least squares regressions. Column 1 reports results using the alternate measure of total compensation TDC1 (in logs). Columns 2-6 use the components of TDC1 as the dependent variable which include: salary, bonuses+long term incentive plans, options awarded, stocks, and other compensation (in logs). Exports are in logs. Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

[60] See Kaplan and Rauh (2010) for more discussion on how TDC2 and TDC1 differ and why TDC2 is the preferred measure.

A.6 Poor Governance: Options and Other Compensation

Given that export shocks have a positive impact on executive bonuses (see Table 8), our subsequent analysis focused more carefully on this important component of discretionary compensation (see Tables 9-10). However, we saw that export shocks also have a positive impact on 'options exercised' and 'other compensation' (Table 8). In this section, we examine whether export shocks have a more positive impact on these other types of compensation at poorly governed firms.

Column 1 of Table A6 confirms that export shocks have a positive and significant impact on options exercised. Given the discretionary nature of these options, namely that the executive chooses when to exercise them, it is not surprising that they are sensitive to export shocks. Columns 2 and 3 replicate our poor governance specifications from Table 9 but now using options exercised as the dependent variable. We find in column 2 that a 10% export shock leads to a 5.5% increase in executive compensation but about an 8% increase at poorly governed firms with *interlock* relationships. The relationship is less strong for the sheer quantity of executives that are board members (column 3). In column 4 we confirm that other compensation (such as personal benefits and termination payments), given its discretionary nature, are also relatively sensitive to export shocks. However, there is no evidence that this effect is stronger at poorly governed firms (see columns 5 and 6). Overall, while there is some evidence that export shocks disproportionately effect other types of compensation (options exercised) at poorly governed firms, this link is stronger for executive bonuses.

TABLE A6
The Impact of Export Shocks on Options and Other Compensation at Poor Governance Firms

	Options Exercised			Other Compensation		
	(1)	(2)	(3)	(4)	(5)	(6)
Exports-1	0.554*	0.548*	0.542	0.174**	0.173**	0.176**
	[0.336]	[0.330]	[0.336]	[0.081]	[0.082]	[0.081]
Exports-1*Interlock		0.231**			0.025	
		[0.109]			[0.043]	
Exports-1*Board			0.110			-0.033
			[0.092]			[0.058]
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes
Executive Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	46,680	46,680	46,680	46,680	46,680	46,680
R-squared	0.223	0.223	0.223	0.463	0.463	0.463
SW F-Stat on Instrument	30.63	32, 230	32, 77	30.63	32, 230	32, 77

Notes: Second stage of two-stage least squares regressions. The dependent variable in columns 1-3 is the log of options exercised and in columns 4-6 it is the log of other compensation. Exports and the interaction terms are instrumented throughout using the Bartik style instrument and the interaction of this instrument and the poor governance variables. Exports are in logs. Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

A.7 Endogeneity of Poor Governance

Our results indicate that poor corporate governance allows executives to benefit from exogenous export shocks through higher compensation. However, one concern is that poor governance itself is not exogenous and could be correlated with unobserved firm characteristics. If these firm characteristics are in turn correlated with executive compensation, this could influence our results.

This section examines this issue by constructing measures of poor governance that are less susceptible to endogeneity. Specifically, we calculate firm-level averages of our *interlock* and *board* variables over time in order to break the potential link between governance and short-run fluctuations in firm performance.[61] The results from interacting these alternate poor-governance measures with export shocks are reported in Table A7. Consistent with our earlier results (see Table 9), we find that exogenous export shocks disproportionately increase executive bonuses at poor-governance firms. These interaction results hold when defining poor governance using the *interlock* average (column 1), the *board* average (column 2), or to a lesser extent with both measures simultaneously (column 3). The important message from Table A7 is that the potential endogeneity associated with poor governance measures does not seem to be a main driver

[61] Firm-level averages over the entire sample are time-invariant and thus subsumed by the firm fixed effects. We split the sample into thirds by taking seven year averages of *interlock* and *board* over the periods 1993-1999, 2000-2006, and 2006-2013. The results are similar using different subperiod definitions.

of our findings. If anything, the point estimates on these interaction coefficients are larger in magnitude than the analogous coefficients reported in Table 9.

TABLE A7
The Impact of Export Shocks on Bonuses at Poor Governance Firms - Average Definition

	Executive Bonuses		
	(1)	(2)	(3)
Exports-1	0.496**	0.483**	0.471**
	[0.203]	[0.208]	[0.207]
Exports-1*Interlock Average	0.271*		0.145
	[0.141]		[0.174]
Exports-1*Board Average		0.346**	0.327**
		[0.140]	[0.162]
Firm Controls	Yes	Yes	Yes
Executive Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	46,680	46,680	46,680
R-squared	0.388	0.388	0.389
SW F-Stat on Instrument	32, 314	30, 61	33, 335, 74

Notes: Second stage of two-stage least squares regressions. Dependent variable in all columns is the log of bonuses. Exports and the interaction terms are instrumented throughout using the Bartik style instrument and the interaction of this instrument and the poor governance variables. *Interlock* and *Board* are now firm-level averages over seven year periods. Exports are in logs. Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

A.8 Import Shocks

Our analysis has focused on the impact of exports on executive compensation, while adding imports as a regressor throughout. Import competition may adversely affect firm performance which in turn could reduce executive compensation. However, imported inputs may increase firm profits and thus increase executive compensation. While recent studies have found an adverse impact of imports on workers, this may not be the case for top-level executives (Cuñat and Guadalupe 2009). This section extends our analysis by examining the impact of exogenous import shocks on executive compensation.

We construct an analogous Bartik style instrumental variable for imports. Specifically, this import instrument is constructed using presample bilateral import flows and the growth in industry-level imports in other high-income countries.[62] Column 1 of Table A8 reports our main results that instrument for exports. Column 2 then instruments for imports instead, using a Bartik inspired import IV analogous to

[62]Note that we prefer not to construct import exposure using business segment data, since doing so would cause exports and imports to be highly correlated due to mechanical reasons (i.e. they both would be functions of the same underlying business segment shares). Results are similar if both export and import exposure are measured at the main industry level (see Appendix A.10).

equation (2). While the import instrument successfully predicts actual import flows (the SW first stage F-statistic is large), the second stage coefficient on imports is close to zero, indicating that exogenous import shocks have no effect on executive compensation. Notice that the uninstrumented export coefficient remains positive, significant, and similar in magnitude to the uninstrumented export coefficient from column 7 of Table 2. Column 3 then simultaneously instruments for both exports and imports and finds that both first stages are strong. However, in the second stage, only the export coefficient is statistically significant and the magnitude of this coefficient increases relative to column 1. Imports do have a negative point estimate, but in our analysis it is not significantly different from zero. Overall, we find that exports and export shocks both significantly increase executive compensation, while imports and import shocks have little effect on top incomes.

TABLE A8
The Impact of Export and Import Shocks on Executive Compensation

	Export IV	Import IV	Export and Import IV
	(1)	(2)	(3)
Exports-1	0.373***	0.131***	0.447***
	[0.051]	[0.041]	[0.109]
Imports-1	0.003	0.056	-0.092
	[0.014]	[0.037]	[0.085]
Firm Controls	Yes	Yes	Yes
Executive Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	46,612	46,602	46,602
R-squared	0.565	0.569	0.56
SW F-Stat on Instrument	30.61	100.50	28, 19

Notes: Second stage of two-stage least squares regressions. Column 1 reports the baseline export IV results. Instead, column 2 instruments for imports using an analogous Bartik style import instrument. Finally, column 3 instruments for both exports and imports simultaneously. Exports and imports are in logs. Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

A.9 Industry Shocks

One might be concerned that our findings are in part due to domestic industry level shocks. It may be that the variation in exports is inadvertently picking up broader industry level changes in production and not just the impact of globalization. Note that the instrumental variable analysis addresses this concern by identifying variation in exports that is unrelated to domestic industry conditions. In addition to our results from Table 3, this section further explores the sensitivity of our results to the inclusion of industry*year fixed effects which capture all unobserved industry-time specific shocks that could influence executive pay.

Table A9 shows the instrumental variable results after including industry*year fixed effects, where the industry is defined at the 3-digit NAICS level. The coefficient on exports is positive and significant throughout which alleviates concerns that our results are driven by unobserved industry shocks. Since domestic export shocks have already been discarded by the instrumental variable approach, it is reassuring that the inclusion of industry*year fixed effects has little bearing on the export coefficient in column 1 (now 0.32 versus 0.37 in column 3 of Table 5). The linear impact of export shocks on executive bonuses are a bit larger now (see columns 3 and 4) but the coefficients on the *export*interlock* interaction term remain similar to the analogous coefficients from before (0.14 versus 0.16 in column 2 of Table 9 and 0.35 versus 0.38 in column 1 of Table 10) . Overall we conclude from Table A9 that it is exports in particular and not domestic industry shocks that are driving our results.

TABLE A9
The Impact of Export Shocks on Executive Bonuses - Industry*Year FE

	Total Comp	Bonus	Bonus	CEO Bonus
	(1)	(2)	(3)	(4)
Exports$_{-1}$	0.319***	0.849***	0.849***	1.179***
	[0.094]	[0.328]	[0.323]	[0.433]
Exports$_{-1}$*Interlock			0.141**	0.351***
			[0.064]	[0.121]
Firm Controls	Yes	Yes	Yes	Yes
Executive Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Industry*Year FE	Yes	Yes	Yes	Yes
Observations	46,612	46,680	46,680	8,872
R-squared	0.586	0.422	0.422	0.475
SW F-Stat on Instrument	13.55	13.55	14, 233	12, 198

Notes: Second stage of two-stage least squares regressions. The dependent variable in columns 1 is the log of total compensation (TDC2) and in columns 2-4 it is the log of bonuses. Column 5 only includes CEOs. All specifications include industry*year fixed effects where the industry is defined at the 3-digit NAICS level. Exports are in logs. Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

A.10 Additional Sensitivity Findings

Table A10 presents a number of additional sensitivity checks. Column 1 re-reports our earlier results from the main text for comparison purposes, which shows the impact of export shocks on total compensation. Columns 2-4 then explore alternate ways of defining exports and export shocks. Specifically, column 2 uses product level exports in the firm's largest industry (which is defined by *ExecuComp*) rather than using firm specific exports which is constructed as the weighted share of exports across the firms top 3 business

segments. The export coefficient is now estimated to be 0.29 (versus 0.37 from column 1). It is possible that the additional information on the business segments of the firm allow us to more clearly estimate the pay responses to exogenous export shocks. Despite this alternate method of constructing exports, we see that the results are similar.

Returning to our preferred firm specific export measure, column 3 explores an alternate method of linking the firm to industry level export shocks. Specifically, in the baseline analysis each firm is exposed to industry export shocks in its time-invariant main industry as defined by *ExecuComp*. In contrast, column 3 uses a time-varying measure of the firm's main NAICS industry from *Compustat*. The benefit of using this time-varying industry shock is that it accounts for the possibility that a firm's primary industry may change over the sample. The downside is that potentially small changes in a firm's composition of production, which shift it from one NAICS primary industry to another, could translate into large changes in measured global exposure. This may generate noisy swings in the data, when in fact the firm's switch from one NAICS industry to another may represent a rather small readjustment of the firm's activities.[63] Column 3 uses this time-varying measure of the firm's export shock, it includes industry fixed effects, and we see that the impact of export shocks on compensation remains largely unchanged.

Column 4 also uses our firm specific export variable, but defines the firm's time invariant main industry using average sales from the firm's different business segments rather than using the *ExecuComp* definition. As we see, the coefficient on exports remains virtually unchanged. Overall, columns 2-4 indicate that the results are not sensitive to how export exposure is defined.

Rather than relying on board-based measures of poor governance, column 5 uses an entirely different measure based directly on the co-movement of the firm's stock price and executive compensation. Specifically, we define the binary variable *rent* to equal one if the firm's stock price fell but average executive compensation at the firm rose in a given year. In some sense, this is an *ex-post* measure of poor governance. The results indicate that defining poor governance in this way also generates a significant positive coefficient and does not alter the coefficient on export shocks that is of particular interest. Thus, we see that our results are robust to using proxies for poor governance that are not based on the structure and composition of the board of directors at the firm.

Column 6 employs an alternate measure of technology investment. Rather than including capital expenditures which are used elsewhere in our analysis, we now include R&D expenditures. Unfortunately the data coverage of the R&D variable is limited and thus we lose almost a quarter of the observations.

[63] See Keller and Yeaple (2009) on the consequences of this in the context of FDI spillovers.

Perhaps as a result, R&D expenditures do not have a significant impact on executive compensation. However, importantly the inclusion of R&D and the subsequent loss of sample size does not alter the export coefficient of interest.

Also of interest is whether globalization increases executive pay by increasing the complexity of an executives job. We measure complexity using the number of destination markets that the firm's main industry exports to, with the idea that a manager's job is more complex if they serve more foreign markets. In column 7, we find that complexity has little bearing on executive pay, while the impact of export shocks remains an important predictor of compensation.

Finally, we explore the sensitivity of the results to the inclusion of executive*firm fixed effects in column 7. This more demanding specification controls for all time-invariant differences across executive-firm matches and thus allows us to identify the effects of export shocks within a given executive-firm relationship. We see that the export coefficient in column 7 remains positive and significant. If anything, the estimated impact of export shocks on executive compensation is now a bit larger. Because these results exploit only variation in a given executive-firm relationship, they confirm our results from section 4 that executive turnover does not play a major role in our findings. We conclude that our main results are robust to a variety of different empirical specifications.

TABLE A10
The Impact of Export Shocks on Executive Compensation - Sensitivity

	Baseline	Main Ind. Exports	NAICS$_t$ Exports	BS Main Exports	Rent	R&D	Complexity	Exec*Firm FE
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exports$_{-1}$	0.373***		0.399***	0.371***	0.369***	0.368***	0.371***	0.564***
	[0.051]		[0.060]	[0.053]	[0.051]	[0.067]	[0.051]	[0.086]
Main Industry Exports$_{-1}$		0.292***						
		[0.049]						
Rent Capture					0.148***			
					[0.017]			
R&D$_{-1}$						-0.019		
						[0.026]		
Complexity$_{-1}$							-0.014	
							[0.056]	
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Executive Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	Yes	No	No	No	No	No
Exec*Firm FE	No	No	No	No	No	No	No	Yes
Observations	46,612	46,612	44,350	45,602	46,612	36,352	45,340	44,405
R-squared	0.565	0.563	0.572	0.567	0.567	0.561	0.565	0.196
SW F-Stat on Instrument	30.61	19.43	55.95	63.44	30.69	56.41	29.58	10.62

Notes: Second stage of two-stage least squares regressions. Column 1 reports the baseline results. Column 2 uses exports in the firms main industy rather than a weighted average of exports using the business segments of the firm. Column 3 uses a time-varying measure of the firm's main NAICS industry to allocate export shocks. Column 4 uses the business segment data to identify the firm's main industry rather than relying on the Execu Comp definition. Column 5 uses a measure of rent-capture that equals one in a given year if the firm's stock price fell while the average compensation of executives rose, rather than interlock. Column 6 uses r&d rather than capital expenditures to identify technology. Column 7 includes a measure of complexity based on the average number of foreign markets the industry sells to. Finally, column 7 includes spell fixed effects (i.e. executive*firm fixed effects. Exports, R&D, and complexity are in logs. Robust standard errors clustered at the industry level in brackets. *** p<0.01, ** p<0.05, * p<0.1.

A.11 Additional Instrumental Variable Details

This section provides additional details and results on the construction of the gravity and world import demand instrumental variables. First, to reiterate the gravity approach identifies variation in bilateral exports driven by changing economic conditions in the foreign importing country. More specifically, U.S. exports for each six-digit NAICS industry are regressed on real GDP in the foreign country and on geographic characteristics as follows:

$$ln(x_{nct}) = \alpha_1 ln(rgdp_{ct}) + \alpha_2 ln(dist_c) + \alpha_3 contig_c + \varepsilon_{nct}, \tag{4}$$

where x_{nct} is the bilateral U.S. export flows in industry n to foreign country c in year t. The key independent variable is the real GDP ($rgdp$) in foreign country c in year t. In addition, the specification includes the population-weighted distance ($dist$) between the U.S. and the foreign country and an indicator for whether they share a border ($contig$).[64] These time-invariant factors will not affect changes in executive compensation over time and thus do not pose a problem for the exclusion restriction.

To eliminate extensive margin entry or exit into foreign markets that could be driven by endogenous factors, the bilateral pair sample of foreign countries is restricted in two ways to reduce the sporadic exports of goods to some small foreign countries. First, the sample only includes the top 40 foreign trading partner countries. Second, within each industry, the sample only includes foreign countries to which the U.S. exports a positive amount in all years.[65] This ensures that the set of foreign trade partners does not change over time within an industry.[66]

The ability to use the same foreign shock to separately identify industry fluctuations in exports implicitly takes advantage of two important sources of variation. First, the U.S. does not export all goods to all countries. Consequently, a shock in a foreign country may affect exports in one industry but not in another. Second, the impact of the shock could be very different across industries. For instance, economic growth in one foreign country may increase U.S. exports of medicine more quickly than it increases U.S. exports of asphalt shingles.

Equation (5) is separately estimated for each six-digit NAICS industry. Reporting results from all

[64] GDP data comes from the World Bank and distance and contiguous data comes from the French Centre d'Etudes Prospectives et d'Informations Internationales (CEPII).

[65] Unlike the Bartik and World Import Demand instruments, this approach does not make out-of-sample predictions and thus it is necessary to first balance the bilateral trade sample.

[66] However, the set of foreign countries can vary across industries. For instance, one industry may export to 40 foreign countries in all years but another may only export to 37 foreign countries in all years. This variation is not problematic, and is actually, useful for the subsequent analysis.

of these individual regressions is impractical given the large number of industries but Table A11 reports findings from a few industries. Two things are noteworthy. First, the number of observations varies by good, which indicates that the U.S. exports different goods to different sets of countries. Thus an import demand shock in one particular foreign country will affect U.S. exports of good x but may not affect exports of good y. Second, Table A11 shows that there is variation across industries in terms of how responsive they are to changing economic conditions in the foreign country. For instance, exports in some industries, such as soft drinks, asphalt shingles, and small arms, are relatively less responsive to growth in GDP in the foreign country. However, the exports of other types of goods, such as medicine, semiconductors, and medical instruments, increase by more in response to foreign GDP growth. Table A11 confirms that there is variation across industries in terms of how they respond to foreign import demand shocks.

The fitted values from each of these regressions are captured and used to construct the instrument. Note, by construction these fitted values are not a function of conditions in the U.S. Since the unit of observation in the main analysis (equation 1) is at the industry-year level, the final step is to sum these fitted values across all of the U.S.'s trade partners. The unlogged bilateral fitted values are summed to construct an instrument that varies by industry and year:

$$Gravity\_exp\_iv_{nt} = \sum_c e^{\widehat{\alpha_1} ln(rgdp_{ct}) + \widehat{\alpha_2} ln(dist_{ct}) + \widehat{\alpha_3} contig_c} \tag{5}$$

Second, the World Import Demand (WID) instrument identifies variation in U.S. exports using information on foreign important demand conditions. To reiterate, this instrument is constructed by allowing presample bilateral U.S. exports to grow at the exogenous rate at which non-US imports into a foreign country increased within an industry. Formally, the WID instrument is constructed in the following way:

$$WID\_exp\_iv_{nt} = \sum_c (exp_{nc1991} * (1 + g_{cnt}^{WID})). \tag{6}$$

Like the Bartik approach, we use presample 1991 U.S. bilateral export flows in industry n and to foreign country c (see equation 2). The difference is that now we multiply presample export flows by the growth rate of world imports of good n into country c between 1991 and year t. To ensure that we are identifying an exogenous source of variation in world imports, we exclude any imports coming from the U.S. Unlike the Bartik instrument, this WID instrument uses an exogenous growth rate g that varies by foreign country

c.[67] The final step is to sum across foreign trade partners to generate an industry-year specific World Import Demand instrument.

TABLE A11

The Construction of Gravity Instrument using U.S. Bilateral Trade Data

	Exports					
NAICS Code:	312111	324122	325411	332994	334413	339112
NAICS Description:	Soft Drinks	Asphalt Shingles	Pharmaceutical & Medicine	Small Arms	Semiconductors	Surgical & Medical Instruments
	(1)	(2)	(3)	(4)	(5)	(6)
GDP	0.298***	0.294***	0.975***	0.490***	0.625***	0.807***
	[0.060]	[0.041]	[0.026]	[0.029]	[0.054]	[0.024]
Distance	-0.302**	-0.266**	-0.842***	0.405***	1.329***	-1.274***
	[0.141]	[0.122]	[0.089]	[0.112]	[0.201]	[0.104]
Contiguous	3.785***	3.278***	-0.357**	2.025***	4.467***	-0.208
	[0.294]	[0.284]	[0.150]	[0.245]	[0.285]	[0.162]
Observations	588	630	819	756	819	819
R-squared	0.368	0.370	0.617	0.333	0.324	0.552

Notes: The dependent variable is the log of exports in that particular six-digit NAICS industry. Estimation by OLS. Both GDP and distance are in logs as well. Only six industries are reported in this table due to space constraints but this same analysis is repeated for all of the six-digit NAICS industries in the sample. Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

[67] Similar to the Bartik IV, we can construct the instrument for years in which there are no bilateral trade flows (assuming of course that bilateral exports exist in the presample year). However, world import demand growth rates (g) do need to be restricted to country-industry pairs that span all the years in the sample to ensure that the instrument is based on a balanced sample. Industry n is defined at the 4-digit NAICS level.