Globalization and CEO Pay: Good Managers or Good Luck?

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Abstract: Much attention has been given to increasing income shares of top income earners in many advanced economies, an increase partly driven by so-called 'supermanagers', the chief executive officers (CEOs) of the largest firms. What role has globalization, and the attendant increases in scale and complexity, played in this increase? We identify CEOs from matched worker-firm data for Denmark for the period 1995-2012 and construct firm scale and complexity measures related to globalization. We document novel stylized facts and examine whether the rise in CEO compensation can be explained by exogenous changes in firm-level globalization. We find that changes in global exposure that increase firm size strongly increase CEO compensation, both absolutely and relative to other workers, with an especially large effect for bigger firms. Conditional on size, changes in firm complexity measures play little role in affecting compensation, suggesting that managers are being compensated for good luck, and not for doing more demanding jobs. Finally, we show that luck is a two-edged sword, as managers also face a significantly increased chance of being fired in the wake of an adverse global shock. Combining the probability of displacement with the change in pay associated with global shocks enables us to calculate the expected changes in CEO pay in a globalized world.

1. Introduction

The effects of globalization on the distribution of income have traditionally been at the core of international trade theory. The literature has usually been concerned with the relative pay to different production factors, skill groups, or other aggregate quantities. Recently however, much attention has been given to the very top of the income distribution. The economic significance of this rather narrow group of individuals (the 'top one percent' being a notable example) should not be understated: In 2012, the share of total market income (including capital gains, excluding government transfers) earned by individuals in the top percentile of the income distribution in the U.S. was around 22.5 percent (Piketty and Saez, 2003 and Piketty, 2014). Atkinson and Søgaard (2016) report top 1 percent income shares over time for a number of countries including Denmark and show that all countries have exhibited increasing top income shares since the 1980s albeit not with such a dramatic pace as in the U.S.

A large part of these top income earners have been found to consist of the CEOs of the top firms, or 'supermanagers'. Since these changes have occurred at the same time as what is normally perceived as a vast increase in globalization, it becomes natural to ask what, if any, connection there may be between these two phenomena. The literature suggests (at least) three possible connections between rising globalization and increasing returns to CEOs: the growing market for general managerial skill; rent extraction; and risk premia associated with principal-agent contracting.[1]

The market for managerial skill argument suggests that managerial talent is more valuable in large firms and so the most talented CEOs are assigned to the largest firms. If access to export markets enables the best firms to grow in size, compensation paid by these firms will rise as well.

[1] See Edmans and Gabaix (2016) for a survey of the theoretical literature and Bertrand (2009) and Frydmand and Jenter (2010) for reviews of empirical findings.

The rent extraction view holds that contracts are not decided by boards or shareholders but instead set by the CEOs themselves to maximize their own rents. If globalization were to generate rising rents for firms, independent of the quality of CEO decision making, those CEOs might still benefit from their ability to extract a portion of these increasing rents. According to the principal-agent view, shareholders of a firm delegate control of a firm to a CEO, and the agency problem is resolved through an incentive contract that relates pay to firm performance. Because CEO compensation increasingly has been linked to firm performance one would expect to see a rise in CEO effort and pay to compensate for the increasing risks taken on.

In this paper, we explore the channels linking globalization to CEO pay using a panel of matched worker-firm data for Denmark for the period 1995-2012. Uniquely in the literature we are able to identify CEOs and link their hiring, pay, and separation to detailed firm level characteristics, including both endogenous and exogenous exposure to global markets.

Using simple OLS and fixed effect regressions, we show that higher CEO pay is correlated with firm size and complexity. However, conditional on size, complexity has no effect on compensation and the CEO pay, and the firm size correlation weakens when conditioning on CEO job spells. These correlations are consistent with a model of good CEOs sorting into good (big) firms, but they leave open the question of what changes within job spells. Specifically, are firms rewarding their CEOs for good performance or for good luck?

To answer this, we introduce an element of luck in the form of exogenous shocks to each firms' exporting activity. Our approach uses the IV strategy in Hummels, et al. (2014), in which a firm's exports (or sales) are instrumented by changes in world import demand for that firm's products. These demand shocks have a large effect on both exports and firm sales, but they are exogenous to CEO ability and decision making. They also have a dramatic impact on firm

compensation. We show that a 10% exogenous rise in sales increases the level of CEO compensation by 3.6%, with the effects occurring only within larger firms (more than 100 workers). Among the components of compensation by far the largest responses are found in bonus payments made to CEOs, where a 10% rise in exports elicits a 24% increase in bonus payments. Further, this is not part of a generalized rise in compensation throughout the firm, as CEO compensation rises by 6.1-6.3% relative to workers with high-school and vocational education, and by 7% relative to workers with college educations.

These findings suggest that CEOs in large firms are effectively monetizing the good fortune of exogenous increases in export growth. Or put another way, CEO payments are tied tightly to increases (and decreases) in sales driven by changes in global markets that are unrelated to CEO ability or decision making.

Notable in our data, CEO job spells are relatively brief, only five years in duration. This suggests a final question. Is compensation related to increased risk of separation? Again, global shocks are helpful because they enable us to separate firms and CEOs that face a high risk of separation for exogenous reasons from those who face high separation risk due to poor performance. We use our same instrumenting strategy for sales but now examine the probability that a CEO is separated from a firm in a year that a global shock hits. Here we find very different evidence depending on the size of firm. For small firms, a 10% *reduction* in export sales causes a 4.9% increased probability of separation. However for large firms, a 10% *increase* in export sales causes a 7.5% increased probability of separation. By combining this separation probability with the CEO wage premium we can calculate the net effect of global exposure on CEO pay. For small firms we find that the separation probability doubles the effect of the lost wages associated with an

exogenous decline in sales. For large firms, the separation probability drops and this actually mitigates the sizeable wage loss associated with the decline in sales.

The paper is organized as follows. Section 2 describes the related literature. Section 3 describes the matched worker-firm data, how we identify managers and construction of our instrument. Section 4 describes some overall patterns for CEO and firm characteristics. Section 5 presents stylized facts on globalization and CEO compensation. Section 6 examines in more detail the relationship between firm-level globalization, complexity and CEO compensation. Section 7 concludes.

2. Literature

This paper adds to the literature by exploring a rich dataset on firms and employees in the context of top income earners and firm-level globalization. Data on CEOs and top managers in Danish firms have previously been used for other purposes as in Bennedsen et al. (2007) and Smith et al. (2013), but the link to firm exports and related activities is novel.

Several explanations have been proposed for the rising top income shares with the most prominent being principal-agent mechanisms, rent extraction and market-based explanations.[2] According to the principal-agent view, shareholders of a firm delegate control of a firm to a CEO, where the agency problem is resolved through an incentive contract that relates pay to firm performance. Because CEO compensation increasingly has been linked to firm performance one would expect to see a rise in CEO effort and pay to compensate for the increasing risks taken on. This view has been criticized by several authors. For example, Bertrand and Mullainathan (2001)

[2] See Edmans and Gabaix (2016) for a survey of the theoretical literature and Bertrand (2009) and Frydmand and Jenter (2010) for reviews of empirical findings.

argue that according to the principal-agent theory one should not be able to find a relationship between CEO pay and the components of firm performance that are not related to CEO effort. They document a strong correlation between oil prices and performance of large U.S. oil companies and find that CEO pay is equally sensitive to overall firm performance and the component of firm performance that is purely driven by oil prices. This may be taken as evidence that CEOs are not only paid for effort but also for luck.

The rent extraction view on CEO compensation holds that contracts are not decided by boards or shareholders but instead set by the CEOs themselves to maximize their own rents. Bertrand and Mullainathan (2001) provide some evidence consistent with this view as better governed oil companies pay their CEOs less for luck. On the other hand, the rent extraction view has also been questioned on the grounds that CEOs should have been interested in extracting rents always, so rent extraction is unable to explain the recent surge in CEO compensation (Murphy and Zabojnik, 2004).

Murphy and Zabojnik (2004) propose a market-based explanation behind the rising top income share relying on increasing importance of general managerial skills. They argue that general managerial skills have become more important relative to firm-specific managerial skills, which is consistent with improving outside options for CEOs and that CEO openings increasingly are filled through external hires rather than through internal promotions. Gabaix and Landier (2008) analyze a competitive assignment model where CEOs are heterogenous in their talents. Talent is more valuable in large firms and so the most talented CEOs are assigned to the largest firms. As a result CEO compensation rises with firm size. Gabaix and Landier (2008) show that increase in CEO pay in the U.S. since 1980 can be fully attributed to the corresponding growth in firm size. However, the

Gabaix and Landier (2008) model has also been criticized for not fitting the data well before 1980 and for being sensitive to sample selection and variable definition issues (Bertrand, 2009).

A small number of papers link increased globalization to the market-based explanations behind rising CEO pay. Marin and Verdier (2012) set up a theoretical model to show that increasing international trade leads foreign firms to enter a war for managerial talent, which in turn puts upward pressure on compensation. Cunat and Guadalupe (2009) use data for a panel of U.S. firms and find that import competition increases the sensitivity of pay to performance and that CEOs experience the largest pay increases in the management team. Chakraborty and Raveh (2015) study managerial wages in a developing country, India, and find that input tariff liberalization increases the compensation share of managers via imports-triggered quality upgrading.

Guadalupe and Wulf (2010) consider a sample of 230 large U.S. manufacturing firms and find that trade liberalization and increased import competition induces firms to remove layers between the CEO and division managers, to increase the number of positions that report directly to the CEO, and that the opportunity to sell in more markets may lead to more management layers (although this finding is weaker). Related to this, Caliendo and Rossi-Hansberg (2012) set up a theoretical model assuming that firms are organized in layers and show that trade liberalization leads expanding exporters to add layers if the expansion is large enough. Caliendo, Monte, and Rossi-Hansberg (2015) use French firm level data, which allows them to distinguish three layers of management (supervisors, senior staff and CEOs), clerks and production workers. They then find that expanding firms reorganize by adding layers, pay the new top manager more and reduce wages in existing layers. They also find that firms who start exporting are more likely to reorganize than domestic firms, and new exporters that add layers decrease wages in existing layers. These results

are broadly consistent with the view that general managerial skills become more valuable due to increased firm complexity when firms expand.

Ma (2015) builds a Melitz (2003)-type model with individuals heterogeneous in human capital endowments choosing career paths as either workers or CEOs. The human capital of a CEO translates directly into the productivity of the firm. In equilibrium, the most productive individuals become CEOs of the most productive firms. Since these firms are also top exporters, they make the highest profits and subsequently pay their CEOs relatively more than less exporting or domestic-only firms. He then uses a new dataset on U.S. firms covering around half of firms required to report executive compensation to show that the CEO-to-worker pay ratio within exporters is more than 40% higher than in domestic firms. However, once firm size is controlled for, the difference in CEO-to-worker pay ratio between exporters and non-exporters vanishes. Ma (2015) supplements the analysis with a calibration exercise for the U.S. economy to examine influence of globalization on top income shares with simulations. It is found that globalization can potentially explain around half of the observed surge in top income shares in the U.S. between 1988 and 2008.

Finally, the paper most closely related to ours is Keller and Olney (2017), who use data for executive compensation at publicly traded U.S. firms combined with industry level export data to show that exports have a positive impact on compensation. To distinguish between different channels behind this result they pursue an instrumental variable approach to show that exogenous shocks to industry-level exports lead to higher compensation thus lending support to the idea that luck play a role in executive salaries.

The literature is still silent about the exact mechanism behind the relationship between firm-level export activity, firm complexity and CEO compensation as no study uses exogenous variation in the data to pin down possible channels at work at this level. We first provide a set of stylized facts

for Danish exporters and compensation of their CEOs. We then move on to identify exogenous shocks that lead to increased exports and examine the implications for CEO pay and separations.

3. Data

In this section we explain our data sources, how CEOs are defined and how we construct various firm complexity measures related to globalization. We also define an instrumental variable for firm exports, which we use to estimate the causal impact of exports on CEO compensation.

3.1 Data Sources

The dataset employed covers the universe of Danish firms and the entire population of individuals in Denmark for the years 1995-2012. Data is drawn from administrative registers in Statistics Denmark and combines firm data from the Firm Statistics Register (FirmStat) and worker data from the Integrated Database for Labor Market Research (IDA). We use the so-called FIDA link to match workers to firms using the workers' main employment relationships. From IDA we obtain information on several individual characteristics such as education, occupation and annual labor market income. From FirmStat we use information about industry codes (NACE six digit), number of full time employees and total sales, and from the Account Statistics Register we read the value of the firms' capital stock.

The data on CEOs in Danish firms (PERSBEST) comes from administrative data collected by the Danish Business Authority (Ervhervs- og Selskabsstyrelsen) and requires all firms to report, among other things, which individuals are members of the board or management of the firm. From this file we select all records where the individual is a member of a firm's management and match them via the person and firm identifier to the matched worker-firm data set. Firms may have several

managers, but in our baseline specification we retain only the top manager using the following algorithm: For the first year a firm is observed, we pick the highest earning manager as CEO. The CEO status is retained as long as that individual stays in the firm without breaks, regardless of whether that individual continues to be the top earner or not. If the individual is not observed in a year, the top earner in that year is selected as CEO and retains CEO status in subsequent years unless there is a new break etc. We provide some summary statistics for this in the next section.

Data on firm-level trade flows broken down by eight-digit product codes (CN8) and origin or destination countries comes from the Danish Foreign Trade Statistics Register. These data allow us to define a number of firm-level globalization variables of interest. First, our main variable of interest is the total value of exports of goods across destinations and product categories for each firm-year combination. As a measure for the complexity of the firm we also define variables measuring the number of export markets served by a firm and the number of unique HS8 products exported in a given firm-year combination. Using the matched worker-firm data, we construct a variable measuring number of unique four-digit ISCO88 codes present in a given firm in a given year. Finally, we also follow Caliendo, Monte, and Rossi-Hansberg (2015) and define five different layers in the organization of the firm (CEOs, senior staff, supervisors, clerks and production workers).[3] We use the number of layers as another firm-level complexity variable.

We restrict the sample to large (in a Danish context) exporting firms in the manufacturing sector for the following reasons: Most of the analysis is concerned with the intensive margin of exporting using within-firm time variation in export volumes and so attention is limited to firms that export at least 5% of their sales. To avoid irregularities associated with small firms, we restrict

[3] Caliendo et al. (2015) use the PCS classification to define layers. We use the concordance from EurOccupations.org Stateof-the-art report (First Reporting Period-D35) to map our ISCO88 codes into PCS codes. As in Caliendo et al. (2015) we collapse the layers for clerks and production workers and operate with only four layers.

the sample to firms with more than 50 employees. We implement these restrictions such that once a firm meets the requirements it stays in the sample. After cleaning the data and imposing these restrictions, we are left with a panel of 11,722 CEO-year observations spanning 1,416 firms and 2,529 different CEOs over the 17-year period 1996 to 2012.

3.2 Construction of Instrumental Variable

Examination of the link between firm-level exports and CEO compensation is challenged by the fact that firm-level exports are endogenous to CEO performance. Specifically, high-ability managers make their firms more productive and raise exports and sales. If high-ability managers are paid well, this induces a correlation between unobserved manager ability and firm exports. If the associated effects are time invariant (i.e. ability, pay and exports are all high throughout the period in question), this type of endogeneity is alleviated by including CEO-firm (job spell) fixed effects in our analysis. However, if a high ability CEO institutes changes within the firm that lead to rising exports and sales, and are subsequently rewarded for this outcome, this will not be captured by job spell fixed effects.

To confront this endogeneity problem, we pursue an IV identification strategy as in Hummels et al. (2014) and use world import demand (WID) as instrument for firm exports and sales. The key idea is to isolate changes in exporting and sales activity that arise from external shocks affecting the firm that are exogenous to the ability or decision making of the CEO.

A detailed discussion of this IV and its validity is found in Hummels et al (2014). Briefly, the instrument is defined in the following way. We use the COMTRADE database to get the import demand of country *c* of product *k* at time *t* from the rest of the world except Denmark, WID_{ckt}. We aggregate these product-country specific world import demands to the firm level by weighting with

the presample shares of firm j's products in the total exports of the firm. That is, the instrument for firm j at time t is $I_{jt} = \sum_{c,k} s_{jck} WID_{ckt}$, where s_{jck} is the share of product k exported to country c in total exports for firm j in the pre-sample year, 1995.

This instrument exploits heterogeneity across firms in their initial product-level export mix. Hummels et al. (2014) show that the initial product-country export mix of a firm is fairly stable over time and that Danish firms have only few product-country exports in common. This means that time changes in world import demand at the product-country level will affect firms differently. For example, exogenous changes in an importing country's production costs or consumer demand will be reflected in changing imports from the world as a whole by that country, and so a Danish firm that exports to this country more than others will benefit disproportionately from these changes.

4. CEO Characteristics and Firm Characteristics

In this section we provide descriptive statistics for the data on CEOs and their firms, as captured in Table 1. Our regression analyses will draw important contrasts between firms above/below 100 employees and we provide sample statistics for each of these sets. As mentioned in the previous section, some firms have several managers, but of all the firm-year observations, 75% are recorded with only one manager.[4] In the following we restrict attention to CEOs (the highest paid among the set of managers) so that we have one observation per firm-year.

[4] Unsurprisingly, there is a clear positive relationship between the number of managers and the number of employees. For example the average size of firms with only one manager is 143 employees, while the average size of firms with 5 managers is 1586 employees. However, among managers in multi-manager firms the difference in annual income of the top earner (the CEO) and other managers is modest. For the median multi-manager firm the CEO earns 19% more than other managers and this premium is fairly stable over time.

The average CEO is a 50 year old male with 23.7 years of experience in the workforce, and 8.5 years of tenure within the specific firm. Restricting attention to job spells as a CEO in a given firm, the duration is shorter. For the 2,785 CEO job spells in the data, 7.6% last only one year with a median spell duration of four years and an average duration of five years. Average earnings of the CEOs in the sample is 1.2 million DKK in 2000 prices (corresponding to about 180,000 USD), about 3.5 times the income of the average worker in the firm. These numbers rise sharply with firm size. CEOs for firms with at least 500 employees earn an average of 2.8 million DKK or about 430,000 USD, 7.6 times the income of the average worker in the firm.[5] Annual earnings can be decomposed into labor income, fringe benefits, bonuses and exercised stock options. While labor income accounts for the major part of total earnings, bonuses and options exhibit considerably greater year to year variation within job spells, which will be useful for identifying changes in compensation over time.

The occupation is observed for most of the CEOs, and as expected most (82%) are assigned the one-digit ISCO88 classification for managers. One reason why 18% are not managers according to the occupation code could be measurement error. It is well known that occupation codes in administrative data may show persistence in the sense that firms tend to report the same code for each employee even if the employee is assigned new tasks. Related to this, 74% of CEOs are promoted internally. The tendency to hire CEOs from internal candidates is interesting in light of the market-based explanation behind rising CEO compensation mentioned in the introduction.

[5] How do these numbers compare to US data? Frydman and Saks (2008) report that by 2005 the ratio of top manager pay to that of average worker earnings was as much as 110 times higher, while in the 1970s it was considerably lower at 30 but still much higher than in our data. Several factors may explain these differences. First, low-paid workers earn considerably more in the Danish labor market due to stronger influence by unions in wage formation. As a result, the income of the average worker is higher. Second, the firms are on average smaller in Denmark than in the U.S. economy and CEO pay correlates positively with firm size.

Murphy and Zabojnik (2004) report that the 14.9% of newly appointed CEOs of large U.S. firms were recruited from other firms in the 1970, while this rate increased to 17.2% in the 1980s and 26.5% in the 1990s. This can be interpreted as reflecting an increasing importance of general skills versus firm-specific skills. When firm-specific skills decline in importance external candidates increasingly should be considered, and as a result a larger market for CEOs emerge. The number reported from the 1990s in the U.S. data is in line with the 27% of the CEOs being hired from outside in our data. However, there is no clear time trend in the rate of externally hired CEOs from 1995 and onwards in our data.

The firms in the sample are export oriented with 51% of the sales shipped to markets abroad. We are interested in ways to measure firm complexity because more complex firms may be more difficult to manage and require more talented CEOs. To this end, we define two 'international' complexity measures: the diversity of products exported and the number of export destination markets serviced. The number of products is the total number of unique CN8 product categories exported for each firm-year combination. The number of export destinations is the total number of unique export destinations for each firm-year combination. We also employ three 'domestic' complexity measures: the number of four-digit occupations, the number of layers as defined by Caliendo et al. (2015) and the share of workers with a college degree employed for a given firm. The international complexity measures show a clear rising trend over the sample period, see Figure 1. By contrast, the number of occupations in the firms shows a declining trend, which could be a reflection of the finding in Guadalupe and Wulf (2010), where firms are flattening their organizational structure in response to globalization and increasing product market competition.

5. Stylized Facts About Globalization and CEO Compensation

In this section we focus on partial correlations between CEO earnings and firm characteristics as revealed by simple OLS and fixed effect regressions. Table 2 displays coefficient estimates from regressions of CEO earnings on firm scale and complexity measures controlling for industry and year fixed effects. We separately examine the full sample (the top panel) and a sub-sample of larger firms (bottom panel), and columns 2-4 add in firm size and/or CEO-firm (job spell) fixed effects. Within an industry and year (column 1), CEOs are paid more in firms that export more and have more complex exports as measured by the number of exported products and destinations. Similarly, CEOs are paid better in firms with more occupations, more layers of management, and a higher share of high skilled workers.

Some of these correlations may simply be picking up scale effects – larger firms pay better, and also have more exports and a greater variety of products, destinations, occupation, and layers. In the second column we control for the number of workers employed by the firm and total firm sales. The correlations are weaker but still (except for exports) significantly positive. In the third column we include CEO-firm fixed effects (but leave out firm size controls) such that only time variation within CEO job spells is used to identify the correlation. In this case, only exports and the number of occupations show a significant positive correlation. In the last column we also include firm size controls but here all correlations are insignificantly different from zero.

To better understand which export and complexity variables drive CEO compensation, we include in Table 3 all variables in fixed effects regressions. The three scale variables (exports, sales, employees) all correlate positively with CEO earnings, as does the share of high skill workers. However, when we condition on only larger firms, these effects go away.

Note that most of the control variables included in Table 3 capture variation related to both the scale of the firm and the composition of its activities. For example, the number of products sold can be decomposed into total sales and the number of products per dollar sold.[6] To examine which components drive CEO compensation, we group the variables into scale and composition variables and into input and output variables.

In Table 4 we condition on CEO job spell fixed effects and examine the relationship between changes in CEO compensation and variables measuring firm output activities, using sales as a scale measure. When examining the whole sample, scale and CEO earnings are positively correlated but firm complexity matters little. When conditioning on only small firms, the variation needed to identify even the scaling effect is lost in the regression. Table 5 repeats this approach, now using employment as a scaling variable and capturing various input complexity measures. The same pattern holds, with scale and not complexity correlated with changes in CEO pay within job spell.

Taken at face value, the results in Tables 3-5 suggest that CEOs may be hired to manage complex firm environments and paid accordingly. However, changes in CEO salary within the current job spell are not correlated with complexity, they correlate only with changes in firm scale. But that correlation does not address a fundamental question: what is the causal link between rising scale and compensation? Are CEOs being rewarded for good decisions and their ability to deliver improved sales performance, or are they the recipient of good luck? We tackle this problem in the next section.

[6] This can be easily seen by rewriting the number of products sold, N, in the following way: Log(N)=log(sales)+log(N/sales).

6. Are CEOs Rewarded for Luck in Export Markets?

In sorting out the effects of good management versus good luck, it is quite difficult to econometrically identify instances of good management that translate to improved sales. But it is possible to identify instances of good luck arising from shocks to external markets. This is particularly important in a Danish context because exports comprise nearly half of sales for Danish manufacturing firms.

We follow the literature (e.g. Hummels et al. 2014 and Munch and Skaksen 2008) and estimate individual level Mincer earnings regressions of the form

$$\log \mathrm{Y}_{ijt} = \beta_1 \log \mathrm{EXP}_{jt} + \beta_2 x_{it} + \beta_3 z_{jt} + \varphi_{IND,t} + \alpha_{ij} + \varepsilon_{ijt},$$

where Y_{ijt} is the CEO earnings measure of CEO *i* in firm *j* at time *t*. We use either CEO earnings in levels or relative to the average worker in the firm. EXP_{jt} is firm *j*'s total exports at time *t*, x_{it} captures CEO control variables (labor market experience and experience squared), and z_{jt} contains firm-level variables. As mentioned above we will estimate versions of equation (2) with and without these firm controls. $\varphi_{IND,t}$ denotes industry-year fixed effects while α_{ij} represents CEO-firm fixed effects. Including CEO-firm fixed effects means that we only rely on time variation within CEO job spells to identify the coefficient of interest, β_1.

We experiment with using either exports or sales in the estimation, and also include an interaction between these variables and a dummy for whether the firm is above or below 100 employees in the base year. We instrument these variables and their interactions using our world import demand instrument.

We report the results from the first stage regressions in Table 6. Column 1 reports the first stage on exports; columns 2 and 3 include exports and exports * size 100+ dummy interacted. Columns 4-6 repeat this with sales in place of exports. The world import demand instrument enters in all cases with a positive sign and it explains a sufficiently large portion of the variation in exports as indicated by the F-statistic.

Table 7 reports the results from the second stage IV regressions using CEO earnings in columns 1-4. Instrumented exports and sales enter with positive signs in all specifications, and effects are stronger for big firms than for small. For example the coefficient estimate of column (2) means that if the firm increases its exports by 10% for exogenous reasons, CEO compensation rises by 11.3% in large firms, but doesn't change in small firms. Similarly, a 10% rise in sales due to foreign demand shocks leads to a 10.6% increase in CEO compensation in large firms.

In previous research it has been documented that exports tends to raise wages of all workers (e.g. Hummels et al. 2014). The subsequent columns of Table 7 report CEO earnings relative to average wages for other worker groups within the same firm, including high school, vocational, and college educated workers. In each comparison set, an exogenous rise in exports sharply increases CEO compensation relative to other workers within the same firm.

This finding is important because it sheds light on why CEO compensation is changing. If changes within the firm are believed to be tied to changing 'economies of superstars', we would expect to see increases in both absolute and relative CEO pay since the CEO belongs to a particular group of workers. On the other hand, if CEO wages reflect the general wage trend in the firm, we

would expect CEO relative to average worker earnings to remain constant while absolute CEO pay is changing.[7]

To further shed light on how and why CEO compensation is changing in the face of exogenous foreign shocks, we split compensation into a salary component and a bonus component, including anniversary bonuses + fringe benefits + exercised stock options. Table 8 reports the results. Whether we use changes in exports and sales, we find an elasticity three times larger on bonus payments than on salary payments. This suggests that the highly variable component of compensation is being exercised in response to exogenous changes in sales, i.e. in response to good luck.

An important question regarding the CEO wage premium is the extent to which the premium reflects a risk-reward tradeoff for individuals willing to take the job. Because CEO behavior is difficult for corporate boards to oversee, incentives may be written into contracts that provide enhanced payoffs for good outcomes as well as enhanced penalties for poor outcomes. One such penalty could be subjecting the CEO to an enhanced risk of firing.

Our focus in this paper is on how globalization affects the wage premium paid to CEOs. We can therefore assess the risk-reward tradeoff for a CEO who chooses to take a position in a firm that is more versus less exposed to global shocks. In a future version of this paper, we will provide a dynamic assessment of this tradeoff that enables the CEO to use ex-ante information on the distribution of shocks to assess risk-reward in deciding to take a position. For this draft we provide

[7] Note that this implicitly assumes a constant number of workers of various wage levels in the firm. If changes in the environment of the firm means that e.g. the lower paid workers are laid off to reduce the total employment in the firm, lower relative CEO earnings may result even with rising absolute CEO wages and constant wages among the remaining employees.

a simple back of the envelope calculation to assess the combined effects of globalization via the wage premium and a change in the probability of separation from the firm.

To begin, write the expected wage premium from working as a CEO as

$$E\left(\frac{w^*}{w}\right) = (1-P) + P\frac{w^*}{w}$$

where *P* is the probability of continuing as CEO and earning a wage premium of $\frac{w^*}{w}$, and (1-*P*) is the probability of losing the position and reverting back to a non-ceo wage of w. In this simple version, a person is strictly better off choosing to be a CEO so long as the wage premium is positive ($\frac{w^*}{w} > 1$). Now suppose that the individual has a choice of working in a firm that is subject to global shocks g. How does this change the expected return? Differentiating with respect to g and rearranging we get

$$\partial E\left(\frac{w^*}{w}\right)\Big/_{\partial g} = {}^{\partial P}\Big/_{\partial g}\left(\frac{w^*}{w} - 1\right) + P\,{}^{\partial \frac{w^*}{w}}\Big/_{\partial g}$$

To get the baseline continuation probability, note that the mean duration of CEO job spells is five years, so (1-*P*) = 1/5 = .2. Table 7 reports our estimates of the changing wage premium associated with an exogenous global shock. We just need an estimate of the level of the wage premium, and the change in the probability of separation arising from a global shock ${}^{\partial P}\Big/_{\partial g}$.

Table 9 provides estimates of the premium associated with serving as a CEO. The first three columns report a common estimate for all firms, the next three columns include an interaction term for firm size, and the last three condition contain an additional interaction for whether the CEO has

a college degree (65% of our sample). Within each set we provide industry-year fixed effects throughout, and also include worker and job-spell fixed effects. Worker fixed effects incorporate the entire work history of the CEO, both inside and outside the current firm. Job-spell fixed effects incorporate the work history of the CEO at the firm in which the person eventually became CEO. (Recall, nearly 75% of CEOs in our sample are internally promoted, so a job spell fixed effect is identified from the time at the same firm spanning pre/post appointment as CEO.)

The most relevant estimate for our purpose are the estimates that look at changes in wages for the same worker. That is, rather than comparing an eventual CEO (who is presumably relatively high ability) to the entire set of other workers, our calculation focuses on the same individual and the wage premium they receive from elevation to CEO. To incorporate internal and external promotions we prefer the specification that includes worker but not job spell fixed effects. Focusing on column (5), a CEO in a small firm earns a 22.0% wage premium over what they previously earned and a CEO in a large firm earns a 35.8% premium. These are much smaller than what one might find when comparing the CEO to the workforce as a whole. (As a side note, we are unaware of estimates in the literature that track workers before and during CEO spells and enable a calculation of an individual specific CEO premium.)

To get at separation probabilities we use a specification similar to that in Tables 6 and 7. Again we instrument exports or sales with world import demand shocks, but now the dependent variable is a dummy that takes a value of 1 if the CEO is separated from a firm in a given year. Focusing on column 4 in Table 10 we find a plausible estimate for small firms: a 10% drop in sales increases the probability of a small firm CEO separating by 4.9%. The large firm result is puzzling, as it indicates a reverse sign pattern. Here a 10% increase in sales is associated with a 7.5% increase in separation. One possible explanation is that our data do not distinguish between voluntary and

involuntary quits. In a future draft we will examine whether the separation for large firms is followed by an increase or a decrease in that individual's wages. In other words, it may be that a sharp increase in sales enables a CEO to signal value to competitor firms and get hired away. We will, uniquely in this literature, be able to track this outcome.

Taking these point estimates, and those from Table 7, and plugging them into the above equation enables us to calculate the change in the expected premium from being in a firm subject to globally induced sales changes. For a small firm the change in wage premium associated with being in a firm with a globally induced 10% sales loss is

$$\partial E\left(\frac{w^*}{w}\right)\Big/_{\partial g} = -.049*(.220) + .8*(-.008) = 1.7\% \text{ wage loss.}$$

For a large firm

$$\partial E\left(\frac{w^*}{w}\right)\Big/_{\partial g} = +.075*(.358) + .8*(-.106) = 4.1\% \text{ wage loss}$$

In the case of the small firm, the separation probability doubles the effect of the lost wages associated with an exogenous decline in sales. For a large firm, the separation probability drops and this actually mitigates the sizeable wage loss associated with the decline in sales. We suspect this inaccurately reflects an assumption about the change in wages post separation for these individuals and this will be tackled in future work.

7. Conclusions

Much attention has been given to increasing income shares of top income earners in many advanced economies, particularly in the U.S. This increase is partly driven by so-called 'supermanagers', the chief executive officers (CEOs) of the largest firms. In this paper, we identify CEOs from matched worker-firm data for Denmark for the period 1995-2008 and construct firm complexity measures related to globalization.

Consistent with the literature we find a strong correlation between firm scale and CEO pay. Conditioning on scale, complexity of operations is not associated with increased pay, and the scale-pay connection is present but weakened when looking within CEO job spells. This is consistent with a view that there is a market for CEOs in which high ability individuals sort into better firms.

We next assess whether higher pay within firms and within CEO job-spells is due to good management or good luck in growing sales of the firm. To evaluate this we examine changes in firm exports and firm sales arising from world import demand shocks that are plausibly exogenous with respect to the ability or decision making of individual CEOs. We find a large explanatory role for luck – a 10% exogenous rise in sales translates to a 7.9% rise in CEO income, and a 24.5% rise in bonus payments made to the CEO. While rising exports and sales tend to raise wages throughout the firm (see Hummels et al 2014), CEO wages rise 6.1% relative to high school workers, 6.3% relative to vocationally educated workers and 7.0% relative to college educated workers.

In a final exercise we calculate the expected returns to working as a CEO in a globally engaged firm, which includes both wage effects and the likelihood of separation. This requires us to estimate a worker-specific CEO premium for a given individual, which is novel in the literature. We find that global shocks induce sharp changes in continuation probabilities for CEOs which either magnify the effects of the shocks (for small firms) or mitigate the effect of shocks (for large firms).

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Appendix: Tables and Figures

Table 1. Sample Means, 1996-2012

	Full sample			Size>=100			Size<100		
	No. of obs.	Mean	Std. Dev.	No. of obs.	Mean	Std. Dev.	No. of obs.	Mean	Std. Dev.
CEO characteristics:									
Age	11.722	50,028	8,015	5.438	49,566	7,517	6.284	50,428	8,401
Female	11.722	0,025	0,155	5.438	0,020	0,140	6.284	0,029	0,167
Experience	11.722	23,702	9,664	5.438	22,554	10,104	6.284	24,696	9,152
Tenure	11.692	8,525	7,311	5.419	6,908	6,442	6.273	9,922	7,719
College degree	11.722	0,662	0,473	5.438	0,731	0,443	6.284	0,602	0,490
Total annual income, 1,000 DKK	11.722	1.171	1.270	5.438	1.513	1.740	6.284	875	450
- Labor income, 1,000 DKK	11.722	1.075	1.083	5.438	1.384	1.468	6.284	808	413
- Anniversary bonuses, 1000 DKK	11.722	6,18	105,24	5.438	10,66	145,07	6.284	2,30	49,16
- Fringe benefits, 1000 DKK	11.722	70,30	46,52	5.438	80,42	44,25	6.284	61,55	46,66
- Stock options, 1000 DKK	11.722	19,05	467,51	5.438	38,27	677,54	6.284	2,42	99,46
Internally promoted	11.722	0,74	0,44	5.438	0,69	0,46	6.284	0,79	0,41
ISCO one-digit occupations:									
Legislators, senior officials and managers	10.344	0,82	0,38	4.904	0,82	0,38	5.440	0,82	0,39
Professionals	10.344	0,07	0,26	4.904	0,08	0,27	5.440	0,07	0,26
Technicians and associate professionals	10.344	0,06	0,24	4.904	0,06	0,24	5.440	0,06	0,24
Other occupations	10.344	0,04	0,20	4.904	0,04	0,19	5.440	0,05	0,21
Firm Characteristics:									
Employees	11.712	193,91	482,71	5.434	337,72	679,58	6.278	69,43	39,90
Share with college degree	11.718	0,20	0,15	5.436	0,22	0,16	6.282	0,19	0,14
Wage bill, 1,000 DKK	11.675	68.447	210.100	5.418	120.961	299.519	6.257	22.975	15.315
Number of occupations	11.722	27,57	17,92	5.438	37,75	20,62	6.284	18,76	7,99
Capital stock, 1,000 DKK	11.675	93.000	491.619	5.418	174.363	712.003	6.257	22.547	36.688
Total sales, 1,000 DKK	11.694	532.172	10.300.000	5.427	888.161	14.300.000	6.267	223.897	4.514.889
Exports, 1,000 DKK	11.480	168.210	604.571	5.354	305.403	862.108	6.126	48.306	67.948
Exports/Total sales	11.459	0,51	0,35	5.344	0,54	0,34	6.115	0,49	0,35
Exported products	11.480	27,27	38,09	5.354	37,61	48,36	6.126	18,24	22,37
Export destinations	11.480	26,04	21,27	5.354	33,16	24,58	6.126	19,82	15,39
Demeaned log(exports) within job spells	11.480	0,00	0,62	5.354	0,00	0,58	6.126	0,00	0,66

Notes: Experience is measured as time spent employed since 1980. Tenure is measured as time spent at the current firm. Annual income is labor income including bonuses. Internally promoted is a dummy indicating if the CEO is hired by the firm before the CEO is registered as a CEO. All nominal variables are measured in year 2000 DKK using the GDP deflator.

Table 2. Exports, firm complexity and CEO earnings.

Full sample				
Log CEO Earnings:				
Log Exports	0.1377 ***	0.0053	0.0169 ***	0.0027
Log Products	0.1695 ***	0.0212 ***	-0.0026	-0.0105
Log Destinations	0.2024 ***	0.0495 ***	0.0179	-0.0016
Log Occupations	0.4476 ***	0.0874 ***	0.0528 ***	0.0004
Share of high skilled workers	1.2019 ***	0.7307 ***	-0.0475	0.1512
Layers of Management	0.1722 ***	0.0379 ***	0.0079	-0.0005
Sample initial firm size >=100 employees				
Log CEO Earnings:				
Log Exports	0.1249 ***	0.0039	0.0185 *	0.0087
Log Products	0.1393 ***	0.0222 **	-0.0040	-0.0119
Log Destinations	0.1810 ***	0.0523 ***	0.0065	-0.0059
Log Occupations	0.3935 ***	0.0696 **	0.0294	0.0010
Share of high skilled workers	0.9697 ***	0.7451 ***	0.1738	0.1679
Layers of Management	0.1896 ***	0.0525 ***	0.0023	-0.0025
Industry and year fixed effects	yes	yes	yes	yes
Firm size controls	no	yes	no	yes
CEO-Firm fixed effects	no	no	yes	yes

Notes: The coefficient estimates are from regressions of CEO earnings on the variables listed in the first column. *** Significant at the 1 percent level, ** Significant at the 5 percent level, * Significant at the 10 percent level.

Table 3. CEO earnings, exports and firm complexity

	Full sample			Size >=100 employees		
	(1)	(2)	(3)	(4)	(5)	(6)
Log CEO earnings						
log Exports	0.0141**			0.0216*		
	(0.0063)			(0.0123)		
Log Sales		0.0543***			0.0314	
		(0.0117)			(0.0235)	
Log Employees			0.1204***			0.0396
			(0.0169)			(0.0332)
Log Products	-0.0115	-0.0101	-0.0113	-0.0147	-0.0093	-0.0121
	(0.0086)	(0.0085)	(0.0085)	(0.0160)	(0.0159)	(0.0158)
Log Destinations	0.0058	0.0154	0.0058	-0.0022	0.0122	0.0096
	(0.0141)	(0.0128)	(0.0128)	(0.0263)	(0.0251)	(0.0250)
Log Occupations	0.0325**	0.0207	-0.0126	0.0201	0.0153	0.0040
	(0.0146)	(0.0152)	(0.0160)	(0.0279)	(0.0290)	(0.0309)
Share of high skilled workers	0.1842**	0.2278**	0.3147***	0.3910**	0.3859**	0.3939**
	(0.0888)	(0.0944)	(0.0912)	(0.1711)	(0.1800)	(0.1769)
Layers	0.0046	0.0041	0.0028	-0.0002	-0.0002	-0.0011
	(0.0091)	(0.0091)	(0.0091)	(0.0179)	(0.0180)	(0.0179)
Log Imports	0.0021	0.0013	0.0006	-0.0019	-0.0008	-0.0004
	(0.0023)	(0.0023)	(0.0023)	(0.0083)	(0.0083)	(0.0082)
Observations	9,908	9,891	9,893	4,678	4,671	4,673
R-squared	0.050	0.053	0.056	0.066	0.066	0.066
Number of job spells	2,525	2,522	2,523	1,295	1,293	1,294

Notes: The coefficient estimates are from regressions of CEO earnings on the listed variables. Industry, year and job spell fixed effects are included. *** Significant at the 1 percent level, ** Significant at the 5 percent level, * Significant at the 10 percent level.

Table 4. CEO earnings and firm output activities

	Full sample			Size >=100 employees		
	(1)	(2)	(3)	(4)	(5)	(6)
Log CEO earnings:						
Log Sales	0.0739***	0.0823***	0.0805***	0.0547***	0.0565**	0.0604***
	(0.0113)	(0.0129)	(0.0099)	(0.0209)	(0.0243)	(0.0186)
Log (Products/Sales)	-0.0065			-0.0056		
	(0.0074)			(0.0139)		
Log (Destinations/Sales)		0.0045			-0.0027	
		(0.0106)			(0.0208)	
Log (Exports/Sales)			0.0075			0.0122
			(0.0049)			(0.0094)
Observations	11,456	11,456	11,456	5,343	5,343	5,343
R-squared	0.071	0.071	0.071	0.092	0.091	0.092
Number of job spells	2,762	2,762	2,762	1,403	1,403	1,403

Notes: The coefficient estimates are from regressions of CEO earnings on the listed variables listed. Industry, year and job spell fixed effects are included. *** Significant at the 1 percent level, ** Significant at the 5 percent level, * Significant at the 10 percent level.

Table 5. CEO earnings and firm input activities

	Full sample			Size >=100 employees		
	(1)	(2)	(3)	(4)	(5)	(6)
Log CEO earnings:						
Log Employees	0.1271***	0.1236***	0.1180***	0.0720***	0.0696***	0.0477
	(0.0127)	(0.0130)	(0.0255)	(0.0240)	(0.0245)	(0.0530)
Log High skilled workers	0.0287*			0.0172		
	(0.0149)			(0.0345)		
Log (Occupations/Employees)		-0.0143			-0.0151	
		(0.0141)			(0.0279)	
Log(Layers/Employees)			0.0112			0.0145
			(0.0254)			(0.0521)
Observations	11,585	11,692	10,072	5,412	5,427	4,731
R-squared	0.071	0.073	0.055	0.088	0.088	0.063
Number of job spells	2,778	2,782	2,535	1,416	1,417	1,301

Notes: The coefficient estimates are from regressions of CEO earnings on the listed variables. Industry, year and job spell fixed effects are included. *** Significant at the 1 percent level, ** Significant at the 5 percent level, *Significant at the 10 percent level.

Table 6. First-stage FE-IV regressions

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Log Exports	Log Exports	Log Exports * Size 100+	Log Sales	Log Sales	Log Sales * Size 100+
Log WID	0.1570***	0.1620***	0.0086	0.1153***	0.1243***	0.0126
	(0.0391)	(0.0428)	(0.0278)	(0.0165)	(0.0179)	(0.0124)
Log WID * Size 100+		-0.0160	0.1107***		-0.0310	0.1245***
		(0.0554)	(0.0360)		(0.0243)	(0.0168)
Experience	0.0050	0.0052	0.0170**	0.0252***	0.0255***	0.0131***
	(0.0111)	(0.0111)	(0.0072)	(0.0046)	(0.0046)	(0.0032)
Experience squared	0.0718***	0.0715***	0.0525***	0.0098	0.0092	0.0181***
	(0.0171)	(0.0172)	(0.0111)	(0.0075)	(0.0075)	(0.0052)
Log Imports	0.1064***	0.1064***	0.0439***	0.0534***	0.0534***	0.0228***
	(0.0047)	(0.0047)	(0.0031)	(0.0019)	(0.0019)	(0.0013)
Observations	11,477	11,477	11,477	11,679	11,679	11,679
Number of job spells	2,764	2,764	2,764	2,781	2,781	2,781
R-squared	0.213	0.213	0.165	0.397	0.398	0.353
F-statistic for instruments	16.11	8.093	6.184	49.05	25.34	36.39

Notes: The table shows first stage regressions of log exports, log exports interacted with a dummy for at least 100 employees, log sales or log sales interacted with a dummy for at least 100 employees with world import demand (WID) and/or WID interacted with a dummy for at least 100 employees as instruments. The firm size dummy is measured in the first year the firm is observed. All specifications include industry-year fixed effects and CEO-firm fixed effects. *** Significant at the 1 percent level, ** Significant at the 5 percent level, * Significant at the 10 percent level.

Table 7. CEO earnings IV regressions.

	Log CEO earnings				Log CEO relative earnings to Low edu			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log Exports	0.2401**	-0.0732			0.0738	-0.1464		
	(0.1213)	(0.2227)			(0.1056)	(0.1352)		
Log Sales			0.3567**	-0.0882			0.1082	-0.2116
			(0.1434)	(0.1736)			(0.1520)	(0.1646)
Log Exports * Size 100+		1.1311***				0.5641***		
		(0.3920)				(0.1538)		
Log Sales * Size 100+				1.0582***				0.6107***
				(0.2091)				(0.1453)
Experience	0.0333***	0.0145	0.0294***	0.0255***	0.0392***	0.0401***	0.0438***	0.0442***
	(0.0054)	(0.0112)	(0.0058)	(0.0068)	(0.0063)	(0.0072)	(0.0057)	(0.0060)
Experience squared	-0.0969***	-0.1313***	-0.0803***	-0.0925***	-0.0844***	-0.0991***	-0.0827***	-0.0863***
	(0.0123)	(0.0242)	(0.0077)	(0.0093)	(0.0111)	(0.0134)	(0.0090)	(0.0095)
Log Imports	-0.0210	-0.0372	-0.0098	-0.0103	-0.0016	-0.0001	0.0009	0.0027
	(0.0131)	(0.0230)	(0.0079)	(0.0092)	(0.0086)	(0.0099)	(0.0053)	(0.0055)
Observations	11,477	11,477	11,679	11,679	9,892	9,892	10,016	10,016
Number of job spells	2,764	2,764	2,781	2,781	2,521	2,521	2,527	2,527
R-squared	0.155	0.168	0.283	0.164	0.111	0.140	0.137	0.137

Notes: The table shows the results from second-stage CEO-level earnings regressions. All specifications include industry-year fixed effects and CEO-firm fixed effects. *** Significant at the 1 percent level, ** Significant at the 5 percent level, * Significant at the 10 percent level.

Table 7 (cont.). CEO earnings IV regressions.

	Log CEO relative earnings to Vocational edu				Log CEO relative earnings to High edu			
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Log Exports	0.1717*	-0.0213			0.1986**	0.0040		
	(0.1009)	(0.1282)			(0.0939)	(0.1191)		
Log Sales			0.3021**	0.0399			0.3216***	0.0451
			(0.1535)	(0.1632)			(0.1241)	(0.1322)
Log Exports * Size 100+		0.5111***				0.5950***		
		(0.1532)				(0.1627)		
Log Sales * Size 100+				0.6320***				0.6995***
				(0.1586)				(0.1482)
Experience	0.0307***	0.0197**	0.0299***	0.0197**	0.0307***	0.0238***	0.0274***	0.0176**
	(0.0067)	(0.0081)	(0.0068)	(0.0079)	(0.0066)	(0.0080)	(0.0066)	(0.0075)
Experience squared	-0.0827***	-0.0899***	-0.0796***	-0.0828***	-0.0875***	-0.1083***	-0.0807***	-0.0869***
	(0.0102)	(0.0116)	(0.0088)	(0.0094)	(0.0110)	(0.0143)	(0.0088)	(0.0095)
Log Imports	-0.0094	-0.0080	-0.0058	-0.0057	-0.0117	-0.0152	-0.0063	-0.0085
	(0.0080)	(0.0090)	(0.0057)	(0.0060)	(0.0081)	(0.0097)	(0.0048)	(0.0052)
Observations	9,896	9,896	10,039	10,039	9,855	9,855	9,990	9,990
Number of job spells	2,523	2,523	2,530	2,530	2,529	2,529	2,540	2,540
R-squared	0.164	0.166	0.167	0.161	0.146	0.147	0.203	0.146

Notes: The table shows the results from second-stage CEO-level earnings regressions. All specifications include industry-year fixed effects and CEO-firm fixed effects. *** Significant at the 1 percent level, ** Significant at the 5 percent level, * Significant at the 10 percent level.

Table 8. CEO earnings component IV regressions

	(1) Salary	(2) Bonus	(3) Salary	(4) Bonus
Log Exports	-0.0277	-0.0997		
	(0.1898)	(0.4520)		
Log Sales			-0.0214	0.1088
			(0.1737)	(0.4269)
Log Exports * Size 100+	0.8192**	2.3504***		
	(0.3334)	(0.7809)		
Log Sales * Size 100+			0.7909***	2.4499***
			(0.2098)	(0.5317)
Experience	0.0193**	-0.0429	0.0264***	-0.0209
	(0.0095)	(0.0340)	(0.0069)	(0.0222)
Experience squared	-0.1141***	-0.1959***	-0.0847***	-0.1287***
	(0.0208)	(0.0431)	(0.0094)	(0.0225)
Log Imports	-0.0278	-0.0792*	-0.0078	-0.0313
	(0.0197)	(0.0441)	(0.0093)	(0.0219)
Observations	11,458	11,090	11,660	11,262
Number of job spells	2,761	2,708	2,778	2,724
R-squared	0.153	0.0427	0.148	0.0415

Notes: The table shows the results from second-stage CEO-level earnings component regressions. Bonusses include anniversary bonusses, fringe benefits and exercised stock options. All specifications include industry-year fixed effects and CEO-firm fixed effects. *** Significant at the 1 percent level, ** Significant at the 5 percent level, * Significant at the 10 percent level.

Table 9. CEO premium regressions.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No interactions			Size 100+ interaction			College degree interaction		
Log Earnings:									
CEO Dummy	1.2812***	0.2968***	0.2324***	1.0644***	0.2199***	0.2108***	1.1558***	0.2757***	0.1956***
	(0.0050)	(0.0064)	(0.0074)	(0.0069)	(0.0091)	(0.0109)	(0.0082)	(0.0111)	(0.0119)
CEO Dummy * Size 100+				0.4600***	0.1379***	0.0403***			
				(0.0100)	(0.0117)	(0.0148)			
CEO Dummy * College Degree Dummy							0.1985***	0.0315**	0.0603***
							(0.0103)	(0.0135)	(0.0152)
Experience	0.0673***	0.0640***	0.0757***	0.0673***	0.0640***	0.0757***	0.0673***	0.0640***	0.0757***
	(0.0001)	(0.0003)	(0.0004)	(0.0001)	(0.0003)	(0.0004)	(0.0001)	(0.0003)	(0.0004)
Experience squared	-0.1364***	-0.1241***	-0.1128***	-0.1364***	-0.1241***	-0.1128***	-0.1363***	-0.1241***	-0.1128***
	(0.0003)	(0.0004)	(0.0005)	(0.0003)	(0.0004)	(0.0005)	(0.0003)	(0.0004)	(0.0005)
Observations	2,029,458	2,029,458	2,029,458	2,029,458	2,029,458	2,029,458	2,029,458	2,029,458	2,029,458
R-squared	0.194	0.128	0.112	0.195	0.128	0.112	0.194	0.128	0.112
Number of industry-years	2,972			2,972			2,972		
Number of workers		461,567			461,567			461,567	
Number of job spells			588,283			588,283			588,283
Industry-year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Worker fixed effects	NO	YES	NO	NO	YES	NO	NO	YES	NO
Job-spell fixed effects	NO	NO	YES	NO	NO	YES	NO	NO	YES

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 10. Separation regressions

	(1)	(2)	(3)	(4)
VARIABLES	OLS		IV	
log exports	-0.0144**		-0.4732***	
	(0.0069)		(0.1358)	
log exports * size100	-0.0274**		1.3464***	
	(0.0109)		(0.2557)	
log sales		-0.0821***		-0.4910***
		(0.0143)		(0.1742)
log sales * size100		0.0076		1.2401***
		(0.0203)		(0.2275)
log imports	0.0013	0.0042*	-0.0118	-0.0073
	(0.0025)	(0.0022)	(0.0127)	(0.0107)
experience	0.0035	0.0034	-0.0141**	-0.0046
	(0.0056)	(0.0052)	(0.0065)	(0.0059)
experience squared	-0.0226**	-0.0224**	-0.0738***	-0.0309***
	(0.0089)	(0.0088)	(0.0158)	(0.0093)
Observations	10,719	10,903	10,719	10,903
R-squared	0.147	0.150	0.147	0.148
Number of job spells	2,649	2,667	2,649	2,667
F-statistic for instruments			11,46	20,26
			7,89	23,87

Notes: The table shows the results from separation regressions. All specifications include industry-year fixed effects and CEO-firm fixed effects. *** Significant at the 1 percent level, ** Significant at the 5 percent level, * Significant at the 10 percent level.

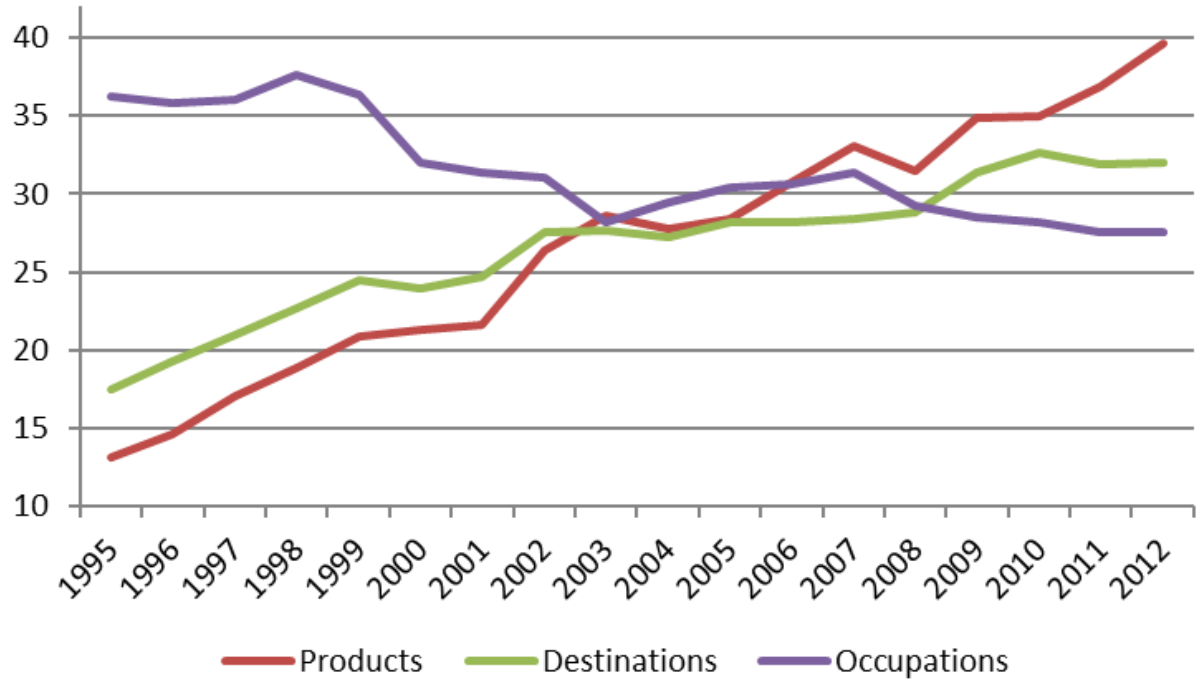

Figure 1. Firm-level average number of products, destinations and occupations.