GLOBALIZATION AND THE PROVISION OF INCENTIVES INSIDE THE FIRM:
The Effect of Foreign Competition

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Abstract

This paper studies the effect of changes in foreign competition on the incentives faced by U.S. managers in the form of wage structures, promotion premia, and job turnover. We use a panel of executives and measure foreign competition as import penetration. Using tariffs and exchange rates as instrumental variables, we estimate the causal effect of globalization on the labor market outcomes of these workers. We find that higher foreign competition leads to more incentive provision in a variety of ways. First, it increases the sensitivity of pay to performance and it does so more the higher up the executive is in the firm hierarchy. Second, it raises the return to a promotion and increases pay inequality among the top executives of the firm, with CEOs typically experiencing the largest wage increases, partly because they receive the steepest incentive contracts. Third, we show that higher foreign competition also is associated with a higher demand for talent at the top of the firm. Finally, higher competition is associated with a higher probability of leaving the firm. These results indicate that increased foreign competition can explain some of the recent trends in compensation structures.

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1 Introduction

The structure of wages and compensation in the United States changed substantially over the 1980s and 1990s. Earnings inequality and returns to skill increased (Katz and Autor, 1999), with a particularly dramatic rise in pay at the top of the wage distribution (Autor, Katz and Kearney 2006). Meanwhile, the executive labor market replicated the trends for workers in general, with inequality between executives increasing, CEO pay going up disproportionately, and job mobility being higher than in earlier decades (Frydman 2005). Simultaneously, firms increased their use of performance-related pay (such as piece rates, bonuses, and stock options) in the overall compensation of executives (Murphy 1999), and for workers in general (Lemieux, MacLeod and Parent, 2007), such that the structure of pay and the relative importance of fixed versus variable pay was significantly altered. This last fact has received much less attention, and we have limited knowledge of the causes behind the changes in incentive contracts and compensation structures inside firms.[1] A number of theoretical papers show that product market competition can have a direct effect on the provision of incentives by firms in a principal agent setting, because of its impact on profits and therefore on the returns to effort (Hermalin, 1992; Schmidt, 1997; Raith, 2004). In this paper, we show that a major force behind many of these changes is the increase in competition resulting from reductions in trade barriers and the globalization of economic activity.

The globalization of economic activity and trade is associated with a number of phenomena -higher imports, changes in trade barriers, lower costs of transport, and information diffusion-, all of which tend to increase the degree of competition that firms face.[2] While there are other sources of increased product market competition, in order to identify a clear causal effect that is not confounded by overall trends, we focus on a particular channel through which competition may operate, namely foreign competition, measured as the degree of import penetration faced by U.S. firms. A common problem with other standard measures of competition (such as herfindahl indices and price cost margins) is that they are endogenous, difficult to measure or interpret systematically across firms over time, and their levels are not necessarily indicative of the degree of competition (Schmalensee 1989).

Import competition allows us to overcome some of these problems to the extent that it

[1] Murphy and Zabojnik (2004 a and b), Frydman (2005) and Gabaix and Landier (2006) provide a rationale and evidence on the increase in total CEO pay.

[2] The term Globalization is also sometimes used to refer to things other than the increase in trade, such as higher migration or FDI flows; and even to the trend towards cultural homogeneization across countries. Here we restrict ourselves to its meaning as higher trade integration. See Tybout 2003 for a comprehensive survey on the effect of increased foreign competition on the decrease of domestic markups, and the increase of competition in general.

varies over time and across industries, such that we can assess how different U.S. firms, with different evolutions in their trade exposure in the 1990s, changed the incentive structures they offered their executives.[3] Furthermore, in order to isolate fluctuations in foreign competition that are exogenous to the incentive policies of firms and uncorrelated with potential omitted variables, we use import tariffs and exchange rates as instrumental variables.[4] The use of instrumental variables allows us to provide a causal effect that is possibly a lower bound for the overall contribution of competition to changes in incentives, to the extent that competition may have increased for other reasons uncorrelated with import penetration.

While we restrict the analysis to changes in import penetration to be able to identify a precise causal mechanism, our dataset allows us to be fairly comprehensive in the definition of incentives. Incentives to exert effort and to improve the manager´s contribution to the productivity of the firm can be provided in several ways. Some are explicit and contractual such as agreeing on a bonus or a performance-related pay scheme. Others are implicit (without an explicit written contract) and enforced on the basis of commitment and reputation. These include discretionary bonuses or the commitment of the firm to a given promotion scheme. Finally, some incentives may not be provided directly by firms but rather are implicit in labor market conditions (e.g. the good performance of one executive in a given firm may lead another firm to offer this same executive a better job).[5] We relate changes in foreign competition to a number of measures of incentives in order to allow incentives to be provided through explicit contracts or implicit agreements, through direct rewards on contemporaneous performance or indirect ones based on promotions, and via turnover or career concerns in general.

We use a matched employer-employee panel dataset (Execucomp) with five executives per firm between 1992 and 1999. It contains very detailed information on both firm characteristics and executive pay, providing a fairly comprehensive picture of internal labor markets and incentive provision. One can track executives as the extent of foreign competition faced by the firm evolves, and evaluate how incentives change over time and across industries. The richness of the data allows us to look at a variety of measures that capture incentives, including: 1) fixed and variable pay; 2) within-firm wage inequality and promotion ladders; and 3) turnover. We are also able to assess whether firms seek to hire more "able" or "talented" CEOs and executives as foreign competition changes. These measures

[3] We are able to compute the level of import penetration faced by the firm itself by taking into account the fact that it may have products in different four-digit SIC industries.

[4] These are also firm-specific and weighted by the relative importance of each currency (trading partner) in total industry imports.

[5] See Prendergast (1999), Gibbons (2005) and Gibbons and Waldman (1999) for a broad survey of theoretical and empirical results on the different channels for incentive provision.

taken together give us a comprehensive view of the provision of incentives.

Our results show that higher foreign competition reduces the level of fixed pay and increases the sensitivity of pay to performance. At the same time, it increases the steepness of the promotion ladder and pay inequality within a firm. Higher competition also is associated with higher job turnover, although the causality of this last result is less clear. All of these results suggest that with more competition, firms provide more incentives to executives. Finally, we assess whether the increase in job mobility is associated with firms hiring more "talented" managers. We identify "ability" or "talent" as the permanent unobserved component of wages measured as the estimated individual fixed effects. We find that, as foreign competition increases, firms hire more "talented" executives.

Even though executives are a particular subsample of workers, they are an ideal group to study performance related pay because we have a clear measure of performance: firm performance as reflected by the stock market.[6] Furthermore this particular group of workers allows us to better identify the effect of changes in foreign competition on firm contracting behavior independent of its effects on labor markets. This is because the boundaries of labor and product markets are relatively independent when it comes to executives, who more frequently change firms between industries rather than within industries.[7] Finally, even though executives constitute a very specific subset of highly skilled workers, they are representative of the higher end of the wage distribution and understanding how their contracts have evolved may shed light on the mechanisms behind the polarization of earnings (Autor, Katz and Kearney 2006). In fact, Lemieux, MacLeod and Parent (2007) empirically establish the link between the growing use of performance-related pay and the increase in wage inequality in the U.S. between the 1970s and 1990s, and argue that the increase in performance-related pay accounts for nearly all of the increase in compensation above the 20th percentile of the distribution. Our paper provides a causal explanation for why the use of performance-pay has increased.

This paper also contributes to the literature on the positive relationship between wage inequality and trade openness. We show that foreign competition may affect the provision of incentives within firms in two ways that raise inequality: by increasing wage dispersion within firms; and, through the use of performance-related pay. This is important because most of the mechanisms explored to link inequality and trade have failed to fully account

[6] This is unlike for the average worker, where performance is not only harder to measure, but also harder to obtain data on.

[7] For example, 71% of the transitions of executives between firms included in Execucomp are between sectors when they are defined at a 4-digit SIC code level (64% when defined at a 3-digit level). Moreover, collective bargaining is virtually non-existent among executives. Therefore, it is unlikely that individual executives internalize the effect of their joint compensation packages on firm profits.

for the overall positive correlation, including the effects of openness on total labor supply, total labor demand, skill-biased labor demand, and institutions (Slaughter, 1999). Here we suggest an additional mechanism.

The rest of the paper is as follows: in Section 2, we present the general structure of the paper and the related literature; Section 3 presents the data used; Section 4.1 shows the specification and the results relative to fixed and variable pay; Section 4.2 presents the results on promotion ladders; Section 4.3 explores how firms demand talent differently according to the degree of foreign competition; Section 4.4 presents the results on turnover; and Section 5 provides an overall picture and concludes.

2 Background and Related Literature

The growth of foreign competition, and globalization more generally, implies that firms are increasingly exposed to competitive pressure (Tybout 2003). An increase in import penetration in an industry means that domestic firms are facing more competition because foreign firms have a bigger presence in the market. Furthermore, changes in foreign competition can permanently reshape the general competitive configuration of an industry; that is, if there are some fixed entry costs, once foreign firms decide to enter a market, they are unlikely to exit.[8] Therefore, one can think of the increase in foreign competition as an increase in competitive pressure for the industry.

The effect of competition on incentive provision within the principal-agent framework has been studied in a number of papers (e.g. Schmidt, 1997; Raith, 2003; Vives, 2004). A general result of virtually all competition models is that, with more competition, the residual demand that a firm faces becomes more elastic and shifts down.[9] This generates two counteracting effects in terms of incentives: on the one hand, more competition raises the reward to market stealing activities due to the additional elasticity of market shares to productivity differentials. Everything else equal, this implies a higher marginal return to managerial and workers' effort that leads firms to introduce steeper incentive packages. On the other hand, the residual demand that a firm faces shrinks, reducing markups and the profit value of a given market share, thus making market stealing less attractive. This leads the firm to reduce the steepness of its incentive contracts such that a priori the overall effect is ambiguous.

However, when one allows for endogenous entry of firms into the industry, since firm profits are constant and dictated by a zero-profit condition, the second effect is not present.

[8] See Baldwin (1988), Dixit (1989) and Baldwin and Krugman (1989)

[9] See Vives (2004) and Boone (2000) for an overview on these two effects.

Raith (2003) models competition and incentive pay allowing for free entry and exit of firms and shows that in that case, competition always leads to an increase in the provision of incentives. The paper establishes a clear theoretical mechanism that leads firms to provide more high powered incentives in order to compete in the product market.

Competition may also have other effects on firms. For instance, it may affect implicit incentives to the extent that it increases the risk of the firm going bankrupt, and lead workers to exert more effort to avoid losing their job, thus reducing the need for the firm to provide explicit incentives. Schmidt (1997) explicitly models this incentive, and several empirical papers (Nickell, 1996; Galdon-Sanchez and Schmitz, 2002) show empirically that if additional competition leads to more pressure on profits, employees tend to work harder.

An increase in competition also may increase the available information about market conditions and help firms to better assess the contribution of an executive to profits (Hart, 1983; Scharfstein, 1988; and Hermalin, 1992). This may lead to a change in the steepness of incentive schemes, and more generally to increased use of relative-performance evaluation. However, in this literature the overall predicted effect on the relationship between competition and incentives is also ambiguous.

Overall, the total effect of competition on incentive pay is theoretically ambiguous, which makes this an interesting empirical question.[10] Our analysis asks what is the net effect that dominates empirically for various ways in which firms provide incentives. We explicitly study the sensitivity of pay to performance (Section 4.1), the returns to a promotion in the firms' wage ladder (Section 4.2) and turnover probabilities (Section 4.4).

To the extent that firms can increase performance (cut marginal costs of production) either by eliciting more effort of by hiring a more skilled/talented manager, many of the arguments for rewarding managerial effort are also valid for rewarding skill (Guadalupe, 2007) and managerial talent. Marin and Verdier (2003) present a model in which globalization affects the hierarchical structure of the firm and the reward for talent. Firms change their hierarchical structure, and thus the explicit and implicit incentives that executives face, and increase their demand for talented CEOs. Murphy and Zabojnik (2004 a and b) and Frydman (2005), argue that the increase in CEO pay is due to higher demand for general skills; and Gabaix and Landier (2006) suggest that the increase in firm size has increased the impact of CEO skills and therefore small differences in skill can lead to large differences in compensation. Our analysis is complementary to theirs since foreign competition could be a reason for why general skills are more important, and for which small differences in talent matter more. In this paper, we analyze the empirical effect of competition on within

[10] Cuñat and Guadalupe (2005) find evidence for U.K. workers and managers that competition, induced by a sharp currency appreciation, raised performance-pay sensitivities

firm inequality (section 4.2) and the reward for talent (section 4.3).[11]

The present paper is related to several others that associate foreign competition with the *level* of wages for regular workers. For workers in general, there is evidence that higher foreign competition leads to higher unemployment and lower wages (Revenga 1992), and to a replacement of implicit contracts by spot contracting (Bertrand 2004). There is also evidence of rent sharing between workers and firms. Abowd and Lemieux (1993) on Canadian data, and Abowd and Allain (1996) and Kramarz (2006) on French data, find a positive elasticity of salaries to firms' quasi-rents, when the latter are instrumented using shocks to foreign competition. The idea behind these articles is that foreign competition modifies exogenously the rents available to be split in the industry, and therefore affects collective-bargaining conditions and labor market institutions. Our article departs from this perspective because, by concentrating on executives, labor market considerations and changes to labor market institutions are less likely to play a role, while issues related to product market competition and governance may be more relevant. However, we will explicitly address possible rent-sharing or rent-extraction considerations between firms and executives in our empirical analysis. Bebchuk and Fried (2005) argue that the observed increase in incentive pay is due to an increase in rent extraction on the part of managers, camouflaged as incentive provision (although the reason why the incentives to extract rents from the firm have changed is unclear). Bertrand and Mullainathan (2001) show that executives' incentive pay is partly pay for 'luck'. We will discuss this hypothesis in relation to our empirical analysis later.

We also depart from the papers mentioned above because we not only study pay levels, but also changes in the structure of compensation within firms (we estimate explicitly performance-related pay), changes in the structure of hierarchies, executive turnover, and the demand for talent. To the best of our knowledge there is no paper that systematically explores how all these aspects of employment contracts have changed over time with competition. We also extend the identification strategy in Revenga (1992) and Bertrand (2004) by using tariffs as an additional instrument of import penetration and by calculating *firm-specific* import penetration, exchange rates, and tariffs.

[11] A related argument on globalization and pay can be found in Feenstra and Hanson (1997). They show that an increase in foreign direct investment increases the returns to skill in Mexican firms.

3 Data

3.1 Compensation Data

We use the Standard&Poor's Execucomp dataset. This is a panel (starting in 1992) of all firms in the S&P 1500 index.[12] Each firm reports detailed yearly information on the pay structure of the five most highly paid executives in the firm (ranked by salary and bonus) as well as some individual characteristics. The data also contain information from financial statements on firm characteristics and performance. For our purposes, one unique feature of this data is that it allows us to follow firms and executives over time, in a panel setting. We use yearly data from 1992 to 1999 for all manufacturing sectors. The Execucomp data start in 1992, and 1999 is the last year for which we are able to compute import penetration. Manufacturing is the sector for which we have trade data. This leaves us with 731 firms and 6,240 executives (22,899 unique observations).

From this data, we use a comprehensive measure of total yearly compensation for each executive, including the components of pay that are related to performance and those that are not (in particular, we are able to include stock options and long-term incentive plans).[13] This is the natural logarithm of the sum of salary, bonus, total value of stock options granted (valued using the standard Black-Scholes formula), total value of restricted stock granted, long-term incentive payouts and other annual compensation.

3.2 Discussion of Foreign Competition and its Instruments: Identification

The data analysis in the next section evaluates the effect of foreign competition (imp_{fjt}) on firm f in industry j at time t (imp_{fjt}) on a number of aspects of compensation and incentives, for individual i. To evaluate the effect of import penetration and eventually its interaction with some variables X_{ifjt},[14] we estimate regressions of the form:

$$\ln(W_{ifjt}) = \alpha + \gamma_1 imp_{fjt} + imp_{fjt} * X'_{ifjt}\gamma_2 + X'_{ifjt}\gamma_3 + z'_{ifjt}\beta + u_{ifjt} \qquad (1)$$

where W_{ifjt} is total compensation and z'_{ifjt} are control variables such as firm size or CEO status. We allow for different specifications of the error term u_{ifjt} that include firm and individual fixed effects (see each individual model below). Standard errors are clustered

[12] The index includes firms in the S&P 500, S&P MidCap 400, and S&P SmallCap 600 indices, so it represents a stratified sample of listed firms of all sizes.

[13] This is the standard measure of total executive compensation as in Murphy, 1999; and Jensen and Murphy, 1990; among many others.

[14] These depend on the outcome of interest. It can be firm performance (Section 4.1) or hierarchical level (Sections 4.2 and 4.3).

by firm in all specifications (to allow for autocorrelation of the error term within firms across years, and since the import penetration variables is defined at the firm level).

The measure of import penetration imp_{fjt} used in what follows is defined at the firm level, and takes into account that one firm may operate in different industries. To derive this firm-specific measure of import penetration, we first define industry-level import penetration (at 4-digit SIC) as imports divided by the total value of internal production plus imports, and take its deviation with respect to the industry mean for all years. This measures the extent to which foreign competitors penetrate the local market. Taking the deviation and including industry dummies in all the regressions ensures that $\widehat{\gamma_1}$ or $\widehat{\gamma_2}$ do not capture unobserved differences by industry that are correlated with import penetration. Over the sample period, average import penetration goes from 0.16 to 0.21, but it increases for some sectors and decreases for others such that, in a given year, we may find a rich combination of changes for different sectors. As an example, Figure 1 shows this variation for three selected industries.

However, since many firms sell goods in more than one industry, import penetration into the firm's main industry may be a misleading measure of the actual import penetration that the firm faces. To account for this, we define a firm-specific import penetration measure, imp_{fjt}, as the weighted average of the industry-level import penetration (computed as above) that the firm faces in all of the industries in which it operates. The weights are constructed as the fraction of total sales associated with each SIC4 industry in which the firm operates (declared business segments from Compustat Segments data). Because the industries the firm operates in may change endogenously over time, the weights used correspond to the firm's operations in 1991. Here the identification arises from import penetration changing within a firm over time. The advantage of this choice is that it is immune to endogenous production decisions; the disadvantage is that, by the end of the sample (1999), and given the fixed 1991 weights, variations in this measure may not be highly correlated with the actual import penetration that the firm faces in a particular year. We ran all of the specifications using the industry-based measure,[15] and our results were qualitatively very similar to the ones using the firm-based variable. Since the latter is not subject to endogenous changes of industry of operation, we only show the results using this measure.[16]

Notice that we will be exploiting the panel nature of the dataset, such that we can include

[15] Where each firm is assigned the import penetration of its primary SIC4 code.

[16] The results are not substantially different if we use "running" firm-specific weights (where the weights vary as the firm changes its product mix). However, since product mix is endogenous, we favor the fixed-weight measure.

firm and individual fixed effects to control for unobserved heterogeneity. However, no matter how rich the variation of import penetration is in the panel, its use still can be subject to a number of criticisms in terms of possible endogeneity problems. These problems either could be the result of reverse causality or omitted explanatory variables that affect both pay policies and import penetration. For example, in terms of reverse causality, one could argue that changes in compensation structure may drive the behavior of executives and, therefore, the degree of competition in the market (Aggarwal and Samwick, 1999) and the extent to which foreign firms enter. A more aggressive (more performance related) compensation policy of existing firms could prevent new foreign firms from entering the US market, such that we would underestimate the effect of foreign competition on incentives. This problem should be solved by using instruments that are correlated with import penetration and exogenous to the firm´s pay policies.

Furthermore, there may be omitted variables that are correlated with import penetration and not captured by the controls, such as exports or other dimensions of trade. It is also possible that to some extent, import fluctuations are foreseen by firms and anticipated, so changes observed in a given year under-estimate the actual reaction. Finally, import penetration may be measured with error, thus leading to attenuation bias.

For all of the reasons listed above, the effect of import penetration on our measures of compensation and incentives might be underestimated, and therefore the results biased towards zero. To deal with these endogeneity concerns, and in order to evaluate the effect of purely exogenous fluctuations in import penetration, we use instrumental variables.

The first instrument used follows Bertrand (2004), who constructs a measure of industry-specific import-weighted exchange rates. The weights on the bilateral exchange rates between the U.S. and its trading partners are the average proportion in total imports from each country in the years 1990 and 1991. The weighted exchange rates are recalculated at the firm-level using the weights from the Compustat segments data, as we did with the import penetration measure. This instrument is arguably exogenous because exchange rates are determined in international financial markets and therefore are uncorrelated with firms' compensation policy. By choosing static weights, we avoid any possible endogeneity that could arise from the joint determination of the weights and exchange rates. We use both current and one-lag exchange rates.

As a second instrument, we use import tariffs faced by firms wanting to enter the U.S. market. Tariff data come from the UNCTAD TRAINS dataset. We define the average tariff of a particular industry as the weighted average of tariffs set by the U.S. on imports from each country. To avoid endogeneity, the weights are the proportion of imports from each country measured in the dataset's base year (1993). Then we calculate the firm-specific

tariff using segment data. Tariffs are arguably exogenous because they are determined either at trade negotiation rounds (WTO) or by federal policy, and thus independent of firm's compensation policies and incentives. Indeed, most of our tariff variation is around 1995, when the Uruguay round was implemented. However, we might still be concerned about endogeneity if executives in firms could lobby for increases in tariffs when imports go up; to deal with this issue, we use the lagged value of the tariff measure such that we predict this year's imports with the previous year tariffs. Since tariff data is available only from 1993 onwards, and because we use lagged tariffs, our instrumented regressions effectively cover the period 1994-1999. All of the tariff and trade information comes from the NBER database[17] and the UNCTAD TRAINS dataset. Total production at the industry level comes from the Bureau of Economic Analysis Industry Shipments data. Further details of all the variables and their construction can be found in the appendix.

Using firm-specific exchange rates and tariffs has two important advantages. First, different currency mixes across industries and firms imply that, in any given year, one firm may be subject to an appreciation while another may be subject to a depreciation. This allows for richer variation in instrumented import penetration than if we were using a single exchange rate for all sectors. A similar argument applies to tariffs. Second, using static import weights increases the explanatory power of exchange rates and tariffs for imports and reduces their explanatory power for potential confounding factors (to the extent that the firm weights are uncorrelated to these other factors), which is helpful for the exclusion restriction. For an instrument to be valid, we require that it is exogenous, but also that it satisfies the exclusion restriction, in our case this is that the instruments only have an effect on the dependent variable through import penetration. To evaluate this, we regress export openness (that is, exports over total production at 4-digit SIC, demeaned by industry) at the industry-level on our three instrumental variables in a regression that controls for year and industry dummies (see Column 2 of Table 2). We find that import-weighted exchange rates and tariffs are poorly related to export openness, such that our instrumented regressions are unlikely to be capturing an indirect effect through changes in exports, which lends some support to the exclusion restriction.

For each of our specifications, we provide two-stage least-squares estimates of equation 1, where imp_{fjt} and $imp_{fjt} * X_{ifjt}$ are instrumented with the source-weighted exchange rate (current and lagged), lagged tariffs for industry j in year t, and the interaction of these terms with the relevant X_{ifjt} variables.

Column 1 of Table 2 shows the basic first-stage underlying the paper and in particular

[17] "US Imports, Exports and Tariff Data, 1989-2001 (NBER 9387)". See Feenstra et al (2002) for a detailed description of the construction of each of these variables.

the hierarchy specification in section 4.2; it regresses import penetration on current exchange rate, lagged exchange rate, and lagged tariffs.[18] Import penetration and the instruments are defined by firm using the business segments weights. The effect of exchange rates and tariffs is highly significant. The results with respect to the exchange rate indicate that a depreciation of the dollar by one standard deviation would lead to a 3 percent percentage point increase in import penetration after one-year lag; i.e. almost half of a full standard deviation of import penetration (the contemporaneous effect is smaller, just half a percentage point). The effect of tariffs is smaller but highly significant and has the expected sign, with lower tariffs leading to increases in import penetration (one standard deviation increase in tariffs leads to a 0.1 percentage points fall in import penetration, or a fall of a third of a standard deviation). The joint significance of all the instruments and control variables is quite high, with an R^2 around 27%. Moreover, Shea partial R^2 (that reflects the variation explained by the instrumental variables taking their correlation into account) is around 2%. The test of the excluded instruments shows that their joint explanatory power is statistically significant. Because we have 3 instruments, we test for overidentification in all the regressions and cannot reject the null, that they are valid instruments (uncorrelated with the error and therefore excluded correctly from the regression). Columns 3 and 4 of Table 2 show the first stage of the first specification in the paper, which includes performance as one of the regressors, with similar results and diagnostics on the goodness of the IV.

Even though globalization is a pervasive trend, the effect identified here is deliberately much narrower than the overall trend, so we can confidently say something about causality. To avoid capturing a spurious trend, we exploit the panel, where import penetration varies in different directions in different industries (and firms), and we include year and either industry dummies or firm in all the regressions, in addition to individual fixed effects. Furthermore, the instrumental variables results capture changes in the structure of compensation as a response to unexpected shocks –which by their nature are not spurious– to import penetration. Focusing on this narrow channel has the advantage that we know where the variation is coming from, and it provides a clear channel for the effect. The cost of this strategy is that globalization may operate through various other channels, and our results may be a lower bound of the overall effect of globalization on compensation structures. There are many reasons why competition may increase, and foreign competition is just one that we can easily identify, measure, and find instrumental variables for. Simultaneously American firms have experienced the pressure of market deregulation, direct entry of domestic and foreign firms into the market and reductions in information and communication

[18] Since strictly speaking this is the first stage for equation (3) in the paper, the first stage also includes hierarchy dummies and their interactions with the IV, plus ln assets and year dummies as regressors.

costs. While these may be important, our identification strategy remains silent about these channels.

4 Results

4.1 Pay Structure

Executive pay typically has a fixed part and a component that is related to performance. In order to estimate the structure of the incentive contract, and the effect of foreign competition on that structure, we begin by modelling incentive contracts as follows. Total compensation for each executive i in firm f, in industry j, in year t, can be written as

$$ln(W_{ifjt}) = A_{ft} + B_{ft} \ln Perf_{ft} + \sum \delta_s X^s_{ifjt} + d_t + d_f + \eta_i + \epsilon_{ifjt} \quad (2)$$

The dependent variable $ln(W_{ifjt})$ is a comprehensive measure of compensation (it includes salary, bonus, Black-Scholes value of stock options granted, value of restricted stock granted, long-term incentive payouts and other annual compensation), X^s_{ifjt} are other determinants of the structure of pay, d_t and d_f are time and firm dummies; η_i are individual fixed effects, and ϵ_{ifjt} is a white noise.[19] The structure of the incentive contract contains a fixed component, A_{ft}, and a variable component ($B_{ft} \ln Perf_{ft}$), that is a function of performance and where the performance-pay sensitivity is defined by B_{ft}. Firm performance is measured as the logarithm of the total market value of the firm, when this value includes the reinvestment of dividends and excludes mergers, share buyouts, spin-offs, and seasoned equity offerings.[20] Since all regressions include firm (and individual) dummies the estimated coefficient $\widehat{B_{ft}}$ captures the elasticity of pay to firm performance, or the percentage change in compensation from a percentage change in firm performance. Ideally, one would like to have direct measures of A and B, but these are not available even when we have detailed information on the different components of compensation (salary, bonus etc.) because even though salaries are conventionally considered as fixed, raises and promotions are performance related, and while bonuses are considered as variable, it has been shown that most executive contracts have a guaranteed bonus. So estimating equation 2 lets the data speak and provides us with direct estimates of the fixed component and the slope of the incentive contract.

[19] This specification is similar to the ones in Bertrand and Mullainathan (2001) and Murphy (1986) among others.

[20] Given that the estimation includes firm fixed effects this performance measure is equivalent to using the log of total annual shareholder returns including dividends.

Before analyzing the effects of changes in foreign competition on components A and B we estimate directly equation 2. Column 1 of Table 3 shows our estimate for the average performance pay sensitivity in the data, which has an elasticity $\widehat{B_{ft}}$ of 0.255 (notice that the since the regression includes individual and firm fixed effects, the fixed component of pay A_{ft} is included in the individual fixed effects and could be calculated as the sum of the executive and firm specific components).

When analyzing the effect of foreign competition on pay, we need to rule out that a systematic effect of changes in imports, exchange rates or tariffs on firm profits could be driving the results. This could arise if, for example, rent extraction is a significant determinant of pay, and executives are paid for changes in firm value beyond the contribution of their effort (an effect known as "pay-for-luck" as in Bertrand and Mullainathan, 2001). To assess how much of the estimated elasticity is rewarding executive performance and how much is a result of shocks to foreign competition (that should not be rewarded), we instrument the performance measure with our instrumental variables (tariffs and exchange rates). A positive sign on the instrumented performance coefficient would capture the *non*-effort related component of performance (the predicted change in performance from the exogenous change in tariffs and exchange rates), which is exactly the *non*-performance-related component of pay, but rather the 'rent-sharing' or 'rent-extraction' component. Similarly, if log pay were a concave transformation of returns (as with bonus) or a convex one (as in options), then any systematic effect of exchange rates or tariffs on firm value would change the sensitivity of pay to performance. Again, a coefficient on instrumented performance not distinguishable from zero would indicate that exogenous changes to performance are not reflected on compensation due to the functional form used.

We therefore re-estimate equation 2 and instrument performance using different specifications. These are shown in Columns 2, 3 and 4 of Table 3.[21] All the coefficients are statistically insignificant, suggesting that we can rule out that changes in $\widehat{A_{ft}}$ and $\widehat{B_{ft}}$ are driven by systematic changes in performance associated to the shocks to competition. In particular, the absence of a positive coefficient on the performance measure once this is instrumented with exchange rates and tariffs that are beyond the control of the executives of the firm rules out that our estimates of the changes in performance-related pay are driven by "pay for luck" or changes in rent extraction. Furthermore, the absence of pay for luck in the relevant dimensions strengthens the interpretation the non-instrumented $\widehat{B_{ft}}$ as a

[21] Columns 2 and 3 estimate equation 2 and instrument performance with current and lagged exchange rate, as well as with lagged tariffs. Column 3 uses import penetration as an additional instrument. Column 4 -discussed in the next section- estimates equation 3 and instruments $\ln Perf_{ft}$ in addition to imp_{ft} and $imp_{ft} \ln Perf_{ft}$.

classic performance-pay sensitivity.[22]

In what follows we take $\widehat{A_{ft}}$ and $\widehat{B_{ft}}$ as defining the structure of the incentive contract and since our objective is to evaluate the effect of competition on the structure of incentive contracts we specify:

$$A_{ft} = a_0 + a_1 imp_{ft} \quad ; \quad B_{ft} = b_0 + b_1 imp_{ft}$$

where the term imp_{ft} is a measure of import penetration (by firm). The reduced-form specification that we estimate is therefore:

$$\ln(W_{ifjt}) = a_0 + a_1 imp_{ft} + b_0 \ln Perf_{ft} + b_1 imp_{ft} \ln Perf_{ft} + \sum a_s X^s_{ifjt} + d_t + d_f + \eta_i + \epsilon_{ifjt} \tag{3}$$

The main coefficients of interest are a_1, which measures the effect of foreign competition on the fixed component of pay, and b_1, which captures the differential slope of the performance-related-pay agreement with respect to different levels of import penetration. From now on the performance measure is not instrumented, precisely because we want that the changes in performance induced by the effort of executives are part of the variation, the evidence in Table 3 also guarantee that our results are not driven by systematic changes in profits due to import penetration fluctuations

Foreign competition, measured as described in the previous section, is demeaned such that $\widehat{b_1}$ does not capture any unobserved cross-sectional differences at the sector level that could be correlated with compensation. Controls for firm size (logarithm of assets), year dummies, industry dummies, and a CEO dummy –in the regressions that pool all executives– [23], are included in all regressions. Standard errors are clustered at the firm level.

Columns 1 to 6 of Table 4 show the effect of foreign competition on performance-pay sensitivities. Increases in import penetration are associated with a lower fixed component of pay ($\widehat{b_0} < 0$) and a variable component of pay that is more sensitive to firm performance ($\widehat{b_1} > 0$). Columns 1 to 4 pool all executives while columns 5 and 6 restrict the analysis to company CEOs. All regressions include firm fixed effects, columns 2 and 5 include individual fixed effects and columns 3, 4 and 6 include firm-specific individual fixed effects

[22] It is important to emphasize that instrumenting performance with exogenous shocks does not lead to an estimate of the sensitivity of pay to individual performance, but to an estimate of the sensitivity of pay to a component of firm performance that is outside the control of the manager, and hence this is a measure of pay-for-luck, rent sharing or rent extraction, and not what we want which is a measure of incentive provision, estimated as how sensitive pay is to performance.

[23] Unfortunately, there is only limited biographical information about the executives in the data. Data items such as gender, age, or tenure are only available for a subset of individuals. The fixed-effect regression will capture gender, education, and other time-invariant characteristics, but there is little we can do about the time-varying variables like tenure.

so that it only identifies the coefficients from firm stayers. Columns 4, and 6 also control for time variation in the slope of compensation by interacting time dummies (3 time periods are defined: 1992-1994, 1995-1997, and 1998-2000) with the performance measure, and also allowing for differential slopes across industries (interacting industry dummies with performance).

The effect of import penetration is sizeable. For all executives (Column 2), a 1 percentage point increase in import penetration (one half of a standard deviation) generates an average drop in fixed pay of 4.2 percent and an increase in the sensitivity of pay to performance of 2.5 percent relative to the baseline sensitivity (that is an increase of 0.0064 percentage points in the slope). For CEOs only (Column 5), the changes are similar and correspond to a 3.6 percent fall in fixed pay and a 0.007 percentage point increase in the sensitivity of pay to performance. The magnitudes are very similar (not statistically different) when we look at "stayers" (Column 3), which indicates that the effect we are capturing operates mostly within firms and is not the result of individuals changing between firms with different compensation structures. The results are also similar, although somewhat larger, when we saturate the model allowing for time trends and permanent cross-industry differences in the slope (Column 4).

To have a sense of the contribution of import penetration to the increase in performance pay sensitivities over the sample, we evaluated the total contribution of import penetration to changing performance-pay sensitivities (unreported results). In the simple OLS regressions, import penetration explains around 40 percent of the overall increase in performance-pay sensitivities over this period.

Going back to the potential alternative interpretation of the results as reflecting rent-extraction, notice that the argument is that rent extraction is camouflaged in the variable component of pay, so that executives appear to get paid for luck (Bebchuk and Fried, 2005; Bertrand and Mullainathan, 2001). However, an increase in competition tends to increase transparency and lower the availability of rents (it is a "bad luck" shock in Bertrand and Mullainathan, 2001); we would therefore expect that the extent of rent extraction via camouflage is lower, but we find the opposite. If present, the rent-extraction mechanism actually would tend to reduce the size of our incentive-related coefficients, thus pushing our results downwards. In any case, Table 3 showed that this sort of rent-extraction mechanism is unlikely to be at work and column 4 actually instruments performance and its interaction with imports with the three instruments, confirming the insignificance of the results.

Because potential endogeneity is always a concern in these regressions, either because different pay structures lead to management strategies that may preempt foreign competition or because both may be co-determined by some omitted variable, we go on to provide

instrumental variable results in Table 5. The instruments are the weighted real exchange rate of the dollar (current and lagged) and the lagged tariff.

The effect of a 1 percentage point increase (half a standard deviation) in import penetration coming from changes in the exchange rate and tariffs is to reduce the average intercept by 11 percent and to increase the slope of contracts by 0.025 or 10 percent of the baseline sensitivity (Columns 1 for all executives and Column 2 for CEOs). The IV effects are larger than the OLS results, which is what we would expect, given that all the sources of bias mentioned would tend to attenuate the coefficient. In the saturated model (Columns 3 and 4) the point estimates are also larger.

This is an important result: when firms face additional foreign competition, their pay structure shifts towards more performance-related pay and less fixed pay. That is, competition leads to an increase in incentives, and firms shift the components of pay in a way that should induce executives to increase firm performance. This is true if we control for individual fixed effects as well as if we saturate the model with interactions of year and industry dummies with performance. The use of instrumental variables deals with the endogeneity concerns and allows us to confirm that the causality of this effect goes from foreign competition to pay, not the other way around. This is consistent with the predictions in Raith (2003). We also tested the robustness of the results to the inclusion of a number of mechanisms, none of which altered our results: allowing for relative performance evaluation, and looking at firms with different leverage, made little difference. We also looked for differential effects in firms with different levels of anti-takeover protection, or with large institutional investors, and found no systematic differences.

4.2 Promotion and Wage ladders

Just as tying pay to performance can provide incentives for executives to exert effort and act in the interest of owners, so can the expectation of a promotion and its associated wage increase after good performance. Conversely, the expectation of a potential demotion or firing after poor performance can play the same role (see Eriksson, 1999; and Main et al., 1993; for papers that explore the use of wage differentials and the tournament nature of executive promotions as a way to provide them with incentives). In this section, we analyze how the wage ladder –that is, the wage differentials between executives within a firm that reflect the expected premium associated with a promotion– evolves with foreign competition.[24]

[24] We investigated whether higher foreign competition led to changes in the probability of a promotion/demotion by studying internal rank mobility. Our regressions related the effect of foreign competition on the probability of an executive changing rank within the firm. We found no significant effects, suggesting

We evaluate changes in pay differentials between the executives of the firm in order to measure whether, as foreign competition increases, executives can expect higher wage increases from moving up the firm's compensation hierarchy.

To measure the changes in the promotion ladder, we rank each executive within the firm according to salary and bonus in a given year. Unfortunately, since we do not have a precise description of job titles or promotion profiles, our data are insufficient to assess potential changes in organizational structure -such as "delayering"- induced by competition (Rajan and Wulf, 2006), and one must keep this in mind when interpreting the hierarchy results. However, we are able to analyze the pay hierarchy. We construct five dummy variables, h_k with $k \in \{1, 2, .., 5\}$, where h_1 takes value 1 if the executive is the highest paid executive in the firm on a given year and zero otherwise, h_2 takes value 1 if the executive is the second highest paid executive in the firm on that year, and so on up to h_5. We then run regressions with the following specification.

$$\ln(W_{ifjt}) = a_0 + \sum_{k=2}^{5} \beta_k h_k + \sum_{k=2}^{5} \theta_k h_k imp_{ft} + \sum b_s X^s_{ifjt} + d_t + d_f + \eta_i + \epsilon_{ifjt} \qquad (4)$$

where imp_{ft} is import penetration, X^s_{ifjt} are control variables (firm size), and the rest of variables are as described in Section 4.1. The coefficients β_k represent the average wage differential between the highest paid and the k^{th} executive. Given that the pay measure is in logs, these differentials should be interpreted as ratios of the total pay of one executive to another. Therefore they do not capture the fact that pay increased for all executives during the period. The coefficients of interest are θ_k, a measure of the change in these differentials with competition. If the difference in pay between executives increases with imp_{ft}, we would expect to find that θ_k is negative and decreases in k (increases in absolute value); this indicates that the wage differentials are more marked with high foreign competition, conditional on controls and unobserved heterogeneity. Notice that the inclusion of individual fixed effects in these regressions implies that the estimated differences between pay levels, β_k, are not attributable to the different abilities of executives in the hierarchy. That is, if the highest paid worker ($k = 1$) receives a higher wage than the others (reflected by $\beta_k < 0$), it is not because he or she is the most talented individual, since unobserved ability, that we can think of as "talent", is accounted for in the fixed effect. We present and discuss the results with and without individual fixed effects. Section 4.3 exploits information in the individual fixed effects about the "talent" of the executives that firms hire, and how this changes with competition.

that the probability did not change; and therefore, the change in incentives comes from changes in the level of compensation associated with each level in the hierarchy, not from changes in promotion probabilities.

Table 6 shows the results of this specification. The dependent variable in columns 1 to 6 is the log of total compensation, which reflects overall differences in realized pay. This will include differences in pay levels and differences in variable pay resulting from effort and from the change in compensation structures shown in the previous section. The omitted category is always the highest paid executive. Before studying the effects of import penetration on wage differentials within the firm, we analyze the wage ladder itself (coefficients of variables second, third, fourth and fifth). The coefficients are all negative and increasing in absolute value as one goes down the wage ladder.[25] A comparison of Columns 1 and 2 shows that the wage ladder is less steep when one controls for individual unobserved heterogeneity: the difference between the top and the fifth executive is reduced by almost half (from 1.11 to 0.47) when controlling for differences in ability. This indicates that one of the reasons for existing wage differentials among executives is that different levels in the hierarchy are occupied by workers with different ability levels. However, ability (talent) is only part of the explanation, since Column 2 still shows significant and sizable differences between the different levels. Therefore, "advancing in the pay hierarchy" is associated with a wage increase and thus provides incentives (so long as promotion is tied to performance). All regressions include firm fixed effects and control for firm size so our coefficients do not capture the fact that some firms may pay higher wages on average, or a firm size wage effect.

In regard to import penetration, the results on θ_2 to θ_5 show how imports affect on the differential between the executive layers, net of all characteristics that are controlled for in X_{ifjt} and individual unobserved heterogeneity. In columns 1 to 6, the coefficients are negative and generally increasing in absolute value with respect to the import penetration measure. As import penetration increases, the wage schedule becomes steeper, with the highest paid executive earning proportionally more than the second highest paid executive, and so on, for all 5 categories.

Again, the effect is sizeable: for the highest paid executive, a single standard deviation increase in foreign competition generates a 2% increase in total pay. It also leads to an additional wage differential –after controlling for ability in Columns 2 and 3– between the highest and the fifth highest paid executive of 2% in total compensation.

Comparing Columns 1 and 2 also shows that the increase in the top executive pay with imports is slightly higher if we do not include individual fixed effects (in Column 1). This suggests that some of the increase in CEO pay is a result of firms in more competitive industries hiring more skilled/talented CEOs. Column 3 controls for firm specific individual

[25] This is almost by construction as the dependent variable (log of total pay) is highly correlated with salary and bonus (used to rank the executives).

fixed effects that would capture a match specific component of pay, the results are identical to those of column suggesting that there is no significant firm specific individual return. Finally, the estimates are also similar -although less precise- in column 4 that saturates the model with time trends in the returns to hierarchical positions (hierarchy dummies interacted with time dummies), suggesting that the result is not due to time trends in returns to hierarchies.

To assess the causal effect of foreign competition, we use instrumental variables as before. Columns 5 and 6 mirror the specifications in columns 3 and 4 (with instrumented imports) and yield a similar pattern, although the magnitude of the effects is larger throughout. In the regression with firm-specific individual fixed effects (Columns 6), total pay of the highest paid executive increases by 14 percent and the difference in comparison to the fifth executive is 7.6 percent larger after a single standard deviation (2 percentage points) increase in import penetration.

These results reflect a steepening of the wage ladder inside the firm as a result of higher foreign competition, and total compensation seems to increase for all executives, although more for those at the top. In the light of the results in the previous section we expect this to be a mixture of workers getting different levels of pay and different performance-pay-sensitivities that induce different levels of effort (and therefore performance). To provide a better interpretation of the mechanism behind the steepening of the wage ladder and within firm inequality, we investigated how slope and level of pay (independent of performance) changed with foreign competition at the different levels of the hierarchy.

Table 7 reports the results. First it shows that the baseline performance pay sensitivity is higher for executives closer to the top (elasticity of 0.28 for the more highly paid versus 0.22 for the fifth more highly paid executive), which suggests, as expected that the marginal contribution to the firm is higher the higher up in the hierarchy the worker is, or in other words effort and talent is more valuable at the top. Next it shows that these performance pay sensitivities increased with competition for all executives but more for the ones at the top. The level of fixed pay falls with additional competition for all executives. So the actual changes in total compensation with higher competition are mostly the result of the changes in incentive contracts, and possibly of the induced higher effort from these contracts. An executive looking to climb in the wage structure of the firm will have a higher total compensation arising from the higher sensitivity of pay to performance as they go up the hierarchy. This in turn should elicit more effort. Notice that the increase in total compensation is consistent with a faster increase in the demand, relative to the supply of executives, as domestic markets become more open, however a simple demand and supply explanation cannot account for the changes in the structure of incentives. In fact, Column 7

of Table 6 uses the logarithm of salary as a dependent variable and shows that salary levels did not change differentially along the hierarchy with competition, such that the changes come mostly from changing incentive contracts.

In sum, these results indicate that the ratio of the total pay of an executive to the total pay of the next lower paid executive grows with foreign competition. This is mostly the result of incentive contracts becoming steeper with competition as the executive climbs inside the firm, and possibly from the higher effort exerted with more high powered incentives. It therefore means that there are higher rewards for an internal promotion (for a given level of effort), which is also a way to provide incentives that complements the increase in performance-pay sensitivities documented in the last section. Incentives seem to be provided both with the structure of contracts and through promotion prospects inside the firm.

The results also complement those in the previous section in terms of the overall effect on total pay of changing compensation structures: total pay increases at the top of the firm as a result of more competition. This is related to the results in Revenga (1992), Abowd and Lemieux (1992), and Abowd and Allain (1996), who analyze workers and find a negative effect on total pay of increasing foreign competition. We find that compensation actually may increase for the very top executives; that this increase is partly a result of firms hiring more highly skilled executives, of paying them more as a function of firm performance; and that total compensation increases less, the lower in the hierarchy the executive is. Finally, even though this is not the focus of our analysis, our results are highly suggestive of the importance of talent at the top of the firm, since both pay and performance-pay sensitivities increase with position.

4.3 Talent

The previous section suggested that changes in wage differentials were partly attributable to firms hiring workers with different talent (measured as the unobserved fixed component of wages). Marin and Verdier (2003a and 2003b) argue that increased globalization and international trade lead firms to demand more talent (to a "war for talent") as the market becomes more competitive, and to the extent that talent is in limited supply. In this section we evaluate empirically whether firms tend to attract more or less talented CEOs and executives as import penetration increases. Of course, we cannot see how demand changes, but only what the realization of talent is in the firm.

The previous section also showed that total pay for the very top executives goes up. Murphy and Zabojnik (2004) and Frydman (2005) suggest that the increase in the level of CEO pay is the result of increased demand for general human capital or managerial talent.

This and the previous section complement their work to the extent that we provide evidence here for changes in the observed distribution of talent at the top of the firm and that we are able to systematically test whether competition is one reason for this increase in the demand for managerial ability.

Finding good measures of executive talent is not straightforward; however, a fairly good proxy for ability can be derived from the fixed-effects regressions. The individual fixed effect in a panel regression captures any fixed unobserved component that is not explicitly controlled for and that determines wages. The logarithm of total compensation is determined by a set of observables (like performance, firm size, industry, etc.) and an unobserved fixed component that the individual carries with him from one firm to another. In the labor literature, this term is interpreted as unobserved ability. We call this ability, or talent, interchangeably.

We first model compensation as:

$$\ln(W_{ifjt}) = \alpha + \beta_1 imp_{ft} + \sum_{k=1}^{5} \beta_2^k h_k + \beta_3 \ln assets_{fjt} + d_t + d_f + \eta_i + \epsilon_{ifjt} \qquad (5)$$

where variables are defined as above. In particular, h_k are dummies indicating the level (k) in the hierarchy occupied by the worker. From this we estimate an individual fixed effect $\widehat{\eta_i}$. This estimate does not include the fact that wages may be higher because of higher import penetration, nor that workers receive different wages at different levels in the hierarchy (h_k). Nor does it include firm size effects, firm fixed effects, or any aggregate trend in wages, or cross-industry differences in wages. The estimate $\widehat{\eta_i}$ is net of all those effects. However, it will include things such as innate talent, ability, and education (not explicitly controlled for and arguably constant over time for executives).[26] Studying $\widehat{\eta_i}$ shows what type of workers firms hire over time. For instance, the $\widehat{\eta_i}$ associated with the k^{th} executive in a given firm (the talent of that executive) will change over time, when he is replaced. So, we can define $\widehat{\eta}_{ikft}$ as the fixed effect estimated for the k^{th} worker (k goes from 1 to 5) of firm f at time t and estimate:

$$\widehat{\eta}_{ikft} = \lambda + \sum_{r=1}^{5} \gamma^r h_r imp_{ft} + d_t + u_{kft} \qquad (6)$$

Where h_r are the hierarchy dummies in this second regression, d_t year dummies and u_{kft} a white noise. Here, the identification comes from firms who replace their k^{th} executive: that is, from the change in talent from one executive to his successor.

[26] This regression does not include performance, given that if an individual with higher ability leads the firm to perform better, we do not want to net this out of our ability estimate.

Table 8 presents the results of the talent regressions. Column 1 shows a positive but not highly significant average effect of import penetration on talent, however we found a more significant effect of lagged import penetration on talent, which given that the identification comes from executive changes, indicates that it is the previous year's import penetration what matters more for hiring/firing decisions -that are slower to adjust (column 2). Column 3 shows the estimation of equation 6 where imp_{ft} is lagged import penetration. The results suggest that as firms face more foreign competition, they replace their executives with more talented individuals, in particular at the very top of the company. Column 4 shows the results for instrumented import penetration, and even thought the pattern is qualitatively similar the standard errors are considerably larger. This may be because unexpected shocks are too distressing for the company, and therefore executives are not replaced, but it is also possibly due to the fact that since we identify only from movers, and only 1.5 percent of executive observations move within the sample, imposing exogeneity of the changes leaves us with very little power.

In sum, we find some direct evidence that the distribution of talent within the firm changes, with firms hiring more talented workers at the top as they face more competition. This is consistent with the results found in the previous section. Therefore, firms not only try to elicit more effort from workers through incentives (as shown in Sections 4.1 and 4.2) but also seem to attract more talented workers. These results are consistent with the predictions of the model in Marin and Verdier (2003) and suggest that there may be a war for talent playing out when markets are more globalized. Furthermore, from an organizational perspective, the results suggest that talent matters "at the top". When faced with competitive pressure, firms seem to want to ensure that the CEO and the top executives are high performers, probably because their marginal contribution to the success of the firm is much larger. This would in turn provide a rationale for the polarization of earnings observed in the overall US wage distribution.

4.4 Job Mobility: Turnover

Next we explore whether the probability of an executive exiting the firm is affected by foreign competition. We know from Huson et al. (2001), that since the 1970s, the hiring of outside CEOs and forced CEO succession have increased. An increase in the probability of either voluntary departures (through external promotion) or involuntary ones (through forced retirement or firing) in principle should increase the incentives of the executive to exert effort and thus increase the performance of the firm. Since we have a panel of executives, we can use survival analysis methods to analyze the effect of foreign competition on the probability of turnover. Using this type of estimation method is important, because the

probability that an individual exits the firm in a given period is not independent of how long he has been in the firm. Therefore, we want to model the underlying time-dependence (captured by the baseline hazard) and assess how foreign competition alters the probability of exit.

Executives may exit the firm because they are fired, hired by a rival firm, or they retire. The motivations behind each of these are clearly different. Unfortunately, Execucomp data are not well suited to a detailed analysis of this question because, even though they contain a variable that reports why an executive leaves the firm, this information is not very reliable. First, the set of reasons listed is not exhaustive (in particular, no executive reports a firing); second, for most executives no reason is reported; finally, the incentives to misreport the true motives are strong, given that Execucomp is effectively a non-anonymous dataset. Therefore, we are left with an indicator for exit from the firm, that groups all of these reasons together and estimate whether job turnover in general changes with foreign competition.

A second, more important limitation concerns the available information on entry. Execucomp only reports the date when the executive effectively entered the firm for a subset of observations. This poses two problems. First, for a large number of observations, we do not know when the individual entered the firm; therefore, we do not know exactly when these observations started being at risk of exiting. We simply observe when the individual became one of the top 5 executives while the firm was in the sample. This left-censoring leads us to drop those observations. Second, even for those who report an entry date, we only observe individuals who survived until the moment they were included in the sample. All those executives who entered and exited the firm before the firm entered the sample are not observed (along with those who never made it to the top 5). Therefore, longer durations are more likely to appear in the sample, and this may be a source of selection bias. We deal with this type of left-truncation in the estimation.

With the limitations of the data in mind, we first plot Kaplan-Meier survival functions to see the effect of high foreign competition on turnover patterns. Because we need entry dates to do this, we restrict the sample to individuals who report their date of entry to the firm. We classify individuals according to whether they are in industries with above or below average levels of foreign competition.[27] This is shown in Figure 2. The vertical axis represents the probability of staying in the same firm after a given number of years (represented in the horizontal axis). Figure 2 indicates that individuals in industries with

[27] We define them relative to the industry average. Graphs using the deviation with respect to the overall (economy wide) import penetration average were qualitatively similar. However, to avoid identifying the results out of the cross-sectional variation in imports, we favored the industry-specific average.

high foreign competition (above average import penetration) are more likely to exit the firm (less likely to survive, their Kaplan-Meier survival function drops faster). Therefore, turnover (exit from the firm) seems to be higher in high-foreign-competition industries. However, when the sample is divided according to the predicted import penetration using instrumental variables (Figure 3), the results are quite different, and show a much more similar survival pattern for both high and low predicted import penetration groups.

This graphical analysis does not allow us to control adequately for the structure of the data (the left-truncation and the potential survivor bias), nor for other covariates that may be correlated with imports and determine the exit probability. Table 9 shows the results of the hazard estimation taking into account the right-censoring, left-truncation and discrete nature of the data, and controlling for CEO status, firm performance and firm size (as the logarithm of assets). We estimate a logistic hazard model with a baseline hazard defined as the logarithm of duration time $(ln(t))$[28] and restricting the analysis to the observations for which we observe entry.

The analysis reveals that the probability of exit from the firm increases with import penetration, but this is largely a result of exit probabilities and imports trending in the same direction over time. Once we control for year dummies (Column 3), the significance of the coefficient in Column 1 disappears, although it is still positive. When using the predicted value of imports (using our instruments) as a regressor (Columns 2 and 4) instead of the actual value, we find no significant effect of imports on the probability of exit. If anything, this is negative (not significant) in Column 4 with controls for year dummies. We do find in all of the specifications that higher performance reduces the probability of exiting the firm and that executives in large corporations are more mobile. Further, CEOs also have a lower probability of exit. However, since our measure does not distinguish between voluntary and involuntary exits, it is hard to draw conclusions beyond these general descriptive results.

Overall, the results do not suggest a strong relationship between turnover and competition: turnover is positively related to increases in import penetration, but this seems to be the result of a secular trend rather than a response to the exogenous changes induced by exchange rates and tariffs. One possible explanation for this effect is that firms decide to change their CEOs when they expect increases in competition, but are reluctant to do so once competition has already increased and the firm is under stress. However, with these data and results, there is little more we can say other than to point to weak a correlation between turnover and foreign competition.

[28] We model the baseline hazard as ln(t). The results were basically identical when using a non-parametric baseline, but we lost many observations because of the inclusion of dummies.

5 Conclusion

In this paper we identify the effects of foreign competition through imports on different aspects of executive pay and the provision of incentives within the firm. Eliciting the empirical interaction between competition and the provision of incentives is particularly important, as the existing theoretical predictions are largely ambiguous, and there is little evidence that explains the increased use of incentive contracts, both for executives and workers.

Our results show that increases in foreign competition are associated with lower levels of fixed pay and a higher sensitivity of pay to performance. We also show that this is unlikely to be the result of rent extraction, but rather the consequence of optimal contracting. Furthermore, and in contrast to the literature relative to foreign competition and general wages, we do not find a consistent decrease in total pay across all executives associated with more competition. Instead, we observe that total compensation increases for all executives, and that the wage ladder of the firm becomes steeper with more competition; that is, the highest paid executives in the firm tend to earn proportionally more when competition is high, and inequality within firms increases. We also show that higher foreign competition leads to a higher demand for talent, especially at the very top layers of the firm hierarchy. Finally, we find some evidence that the probability of exiting the firm (either through an external promotion, because the executive gets fired or for any other reason) increases with foreign competition. This is likely to induce executives to work harder, however, this last effect seems to be related only to changes in expected competition.

Thus, we find a causal effect of foreign competition on incentive provision across a number of different incentive mechanisms, and show that part of the relative increase in compensation of CEOs with respect to other executives is attributable to an increased demand for managerial talent.

There are certainly other reasons why compensation structures may have changed over time. We established that one important contributor is the extent of import penetration and the implied increase in product-market competition: as they face more competitive pressure firms demand more talent and are also willing to pay more for "effort". This explains the use of incentive contracts and also provides a rationale and potential causal explanation for the increased skewness and polarization of the wage distribution, thus contributing to explain the main feature of increased wage inequality since the 1980s.

There are also many sources for increased competition other than foreign competition, and these are possibly contributing further to the overall change in the wage distribution. Developing our understanding of these mechanisms further is left to future research.

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6 Data Appendix

Execucomp dataset:

A panel that records information on at least the top 5 executives of the firms included in the S&P1500 index from 1992 onwards. We concentrate on the firms in industries for which we have import penetration (the manufacturing sector in 1992-1999). We also restrict the sample to the top five executives of each firm (ranked by salary-plus-bonus) and drop the observations where there is no information on total pay received by the executive.

Total Compensation: Sum of salary, bonus, total value of stock options granted (valued using the standard Black-Scholes formula), total value of restricted stock granted, long-term incentive payouts and other annual compensation. In real 1996 dollars (Execucomp variable TDC1).

Firm Performance: Firm performance is measured as the total market value of the firm, when this value includes the reinvestment of dividends and excludes mergers, share buyouts, spin-offs, and seasoned equity offerings. Since we take logs, this is the return to shareholders that includes the market value of the firm and the monthly reinvestment of dividends (Computed from execucomp variables mktval and trs1yr).

Trade Data:

Import Penetration: Import penetration is defined at the industry level at 4 digit SIC as the ratio of imports over imports plus domestic production in that year, demeaned at the industry level. For each firm, we construct weights that correspond to the fraction of sales associated to each industry (business segment in Compustat) in which it operated in 1991. The final import penetration measure is the weighted average of all manufacturing industries in which the firm operates in 1991. Since the industries the firm operates in may change endogenously over time, the weights used correspond to the firm's operations in 1991. (Source: NBER database "US Imports, Exports and Tariff Data, 1989-2001 (NBER 9387)" and Compustat Segments data)

Tariffs: The average tariff measure is defined as the weighted average of the tariffs imposed by the US on imports to each country, where the weights are the fraction of imports coming from each country in 1993. (Source: UNCTAD TRAINS dataset)

Exchange rates: The exchange rate index is defined as in Bertrand (2004) at the industry level (3 digit SIC code) as the weighted average of the log real exchange rates of importing countries (expressed in foreign currency per dollar), where the weights are the share of each foreign country's import on total imports in a base period (1990- 1991). Real exchange rates are nominal exchange rates multiplied by US Consumer Price Index and divided by the trading partner CPI. Nominal exchange rates and foreign CPIs are obtained from the International Financial Statistics of the IMF.

Tariffs and exchange rates are also weighted to obtain the firm specific measure.

All the trade information is obtained from the NBER database "US Imports, Exports and Tariff Data, 1989-2001 (NBER 9387)". The tariff information is from UNCTAD TRAINS dataset and the information on domestic production is from Census Bureau's Annual Survey of Manufactures (Statistics for Industry Groups and Industries) provided by the Bureau of Economic Analysis.

Duration Analysis:

To construct employment durations and transitions, we exploit the panel. Each executive has a unique identifier (variable EXECID) that allows us to follow him over time, provided job changes occur within the Execucomp sample. We identify as firm transitions:

-observations where the firm reports that the executive left the sample in that particular year (variable leftco).

-transitions in which we observe the individual in a firm one year and in another firm the year after (coded as exit from the firm);

-transitions in which we observe the individual in a firm one year and not the following year, although the firm remains in the sample (the individual may have moved to a firm outside the sample).

All other spells are considered as censored. In particular, if the firm exits the sample we consider all executive observations in that firm as censored on the year the firm exits

the sample.

We also need to restrict the sample to those individuals for whom an entry date into the firm is reported because of the left-truncation problem.

7 Tables and Figures

Table 1: Summary Statistics

	Mean	Std. Dev.	25th perc	Median	75th perc.	N
Ln Total Compens.	6.73	0.95	6.05	6.65	7.33	22899
Ln Salary	12.58	0.61	12.19	12.55	12.94	22888
ln Performance	7.09	1.67	5.88	6.95	8.15	22899
Raw Import Pen.	0.17	0.14	0.07	0.15	0.22	16678
Import Pen. (demeaned)	0.01	0.02	0	0.002	0.01	22899
Imp. Pen*ln Perf.	0.05	0.14	-0.03	0.01	0.09	22899
w.exch. rate	0.02	0.01	0.01	0.02	0.03	22899
w tariff	0.03	0.07	0.01	0.02	0.04	20914
ln assets	6.88	1.61	5.77	6.78	7.93	22899
CEO	0.18	0.38				22899
Raw Export Open.	0.20	0.17	0.06	0.17	0.27	16678
Export Open. (demeaned)	0	0.05	-0.01	0	0.01	16678

Notes: Total pay is total yearly compensation that includes salary, bonus, total value of stock options granted (Black-Scholes valued), total value of restricted stock granted, long-term incentive payouts and other annual compensation; ln Performance is the natural logarithm shareholders value -includes the market value of the shares and reinvestment of dividends (in $1000) ; Import Penetration is Imports divided by Imports plus domestic production at 4 digit SIC, demeaned with respect to the industry average; Ln assets measures firm size; CEO is an indicator for who is the company CEO; Exchange rate is the weighted average of the log real exchange rates of importing countries (expressed in foreign currency per dollar), where the weights are the share of each foreign country's import on total imports in a base period (1990- 1991); Tariff is the weighted average of tariffs paid by importers where the weights are the importance of each country's imports in the base year. Imp.pen, w tariff and w.exch rate are firm specific weighted averages of the industry measures where the weights are the fraction of sales in each of the firm's business segments in 1991. Export Openness is industry exports divided by industry output at 4 digit SIC, demeaned. See data appendix for further details and sources.

Table 2: First stage

	Import Pen.	Export Open.	Import Pen.	Import Pen.*Perf
	1	2	3	4
w.exch.rate	-0.436	0.402	-0.561	11.056***
	[0.307]	[1.475]	[0.573]	[3.624]
Lag w.exch.rate	-2.495**	0.737	-1.184	-25.957***
	[1.087]	[2.673]	[1.193]	[8.146]
Lag w.tariff	-0.016*	-0.142	-0.225**	-1.08
	[0.009]	[0.111]	[0.114]	[0.672]
ln Perf.			0.006**	0.054**
			[0.003]	[0.022]
w.exch.rate* ln Perf.			0.032	-1.969***
			[0.065]	[0.496]
Lag w.exch.rate*ln Perf.			-0.221*	0.958
			[0.129]	[1.049]
Lag w.tariff*ln Perf.			0.024*	0.109
			[0.013]	[0.075]
Year dummies	yes	yes	yes	yes
Indiv*Firm FE	yes	yes	yes	yes
Observations	17964	13094	17964	17964
R-squared	0.271	0.024	0.277	0.291
Shea partial R squared	0.02		0.097	0.115
Joint significance of IV (F-stat)	9.74***		45.43***	53.72***
Hansen Overid test P-value	0.81		0.60	0.60

Notes: Std. errors clustered by firm in brackets. * significant at 10%; ** at 5%; *** at 1%. Columns 1, 3 and 4 are the first stage regressions for the main endogenous variables instrumented in sections 4.1 (Column 3 and 4) and 4.2 (Column 1). Column 2 is a test of the exclusion restriction. The dependent variable is Import penetration in columns 1 and 3, export openness in column 2 and Import penetration times ln performance in column 4. All regressions include the explanatory variables of the second stage in addition to the instruments and variables reported on the table (see corresp. tables). Performance is total shareholders return including shareholders value at fiscal year end plus reinvestment of dividends; Import penetration is imports divided by Imports plus domestic production at 4 digit SIC, demeaned with respect to the industry average; Exchange rate is the import weighted average of the log real exchange rates of importing countries. tariff is the import weighted average of duties imposed on imports. w tariff and w.exch rate are firm specific weighted averages of the industry measures where the weights are the fraction of sales in each of the firm's business segments in 1991. All trade variables are weighted at the firm level, where weights take into account the sectors of operation of the firm in a base year. See data appendix for further details and sources.

Table 3: Performance-related-pay or rent extraction?

	ln TotComp	ln TotComp	ln TotComp	ln TotComp
		Rent extraction or "Pay-for-luck" coefficient		
		IV	IV	IV
	1	2	3	4
ln Perf.	0.255***	-0.239	0.012	0.102
	[0.020]	[0.354]	[0.234]	[0.789]
Import Pen.				119.22
				[265.273]
Import Pen.*lnPerf.				-15.976
				[37.116]
Instrumented variables	none	ln Perf.	ln Perf.	lnPerf, Im.Pen , Im.Pen*lnPerf
Instruments		w.exch.rate, Lag w.exch.rate and Lag w tariff + Import Pen.		
Year dummies	yes	yes	yes	yes
Fixed Effects	Indiv*Firm	Indiv*Firm	Indiv*Firm	Indiv*Firm
Observations	22899	17964	17964	17964
R-squared	0.228	0.03	0.15	-0.99
Shea R2 on lnPerf regression		0.003	0.005	0.001

Notes: Std. errors clustered by firm in brackets. * significant at 10%; ** at 5%; *** at 1%. The dependent variable, is the log of total yearly compensation that includes salary, bonus, total value of stock options granted (at Black-Scholes), total value of restricted stock granted, long-term incentive payouts and other annual compensation;; Performance is total shareholders return including shareholders value at fiscal year end plus reinvestment of dividends; Import Penetration is Imports divided by Imports plus domestic production at 4 digit SIC, demeaned and weighted at the firm level, where weights take into account the sectors of operation of the firm in a base year. All regressions control for ln assets an a CEO dummy; Column 1 is an OLS regression, Col. 2 to 4 are two stage least squares IV regressions where ln. Perf is instrumented with exchange rates and lagged tariffs, in column 2 import penetration is used as an additional instrument, and in column 4 import penetration and its interaction with performance are also instrumented. See data appendix for further details and sources.

Table 4: Pay Structure: Performance-related-pay

	ln TotComp	ln TotComp	Stayers	TC trends	CEOs	CEOs+trends
	1	2	3	4	5	6
ln Perf.	0.22***	0.24***	0.24***		0.33***	
	[0.02]	[0.02]	[0.02]		[0.04]	
Import Pen.	-3.56**	-4.24**	-4.21**	-4.15**	-3.61	-3.77
	[1.70]	[1.74]	[1.73]	[1.99]	[2.70]	[2.98]
Import Pen.*lnPerf.	0.56**	0.64***	0.64***	0.68**	0.69*	0.84**
	[0.24]	[0.25]	[0.25]	[0.28]	[0.38]	[0.42]
ln assets	0.15***	0.11***	0.11***	0.12***	0.15***	0.14***
	[0.02]	[0.03]	[0.03]	[0.03]	[0.04]	[0.04]
CEO	0.86***	0.23***	0.23***	0.23***		
	[0.01]	[0.02]	[0.02]	[0.02]		
Year dummies	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes			yes	
Individual FE		yes			yes	
Indiv*Firm FE			yes	yes		yes
Indus.dummies*lnPerf.				yes		yes
Time dummies*lnPerf.				yes		yes
Observations	22899	22899	22899	22899	4100	4100
R-squared	0.36	0.26	0.23	0.26	0.24	0.29

Notes: Std. errors clustered by firm in brackets. * significant at 10%; ** at 5%; *** at 1%. The dependent variable, is the log of total yearly compensation that includes salary, bonus, total value of stock options granted (at Black-Scholes), total value of restricted stock granted, long-term incentive payouts and other annual compensation; Performance is total shareholders return including shareholders value at fiscal year end plus reinvestment of dividends; Import Penetration is Imports divided by Imports plus domestic production at 4 digit SIC, demeaned and weighted at the firm level, where weights take into account the sectors of operation of the firm in a base year; ln assets measures firm size; CEO is an indicator for who is the company CEO. See data appendix for further details and sources.

Table 5: Pay Structure: IV Results

	ln TotComp	CEOs	TC trends	CEOs+trends
	IV	IV	IV	IV
	1	2	3	4
ln Perf.	0.17***	0.24***		
	[0.03]	[0.05]		
Import Pen.	-10.83**	-10.97	-25.20***	-26.66**
	[5.10]	[6.86]	[8.80]	[12.66]
Import Pen.*lnPerf.	2.48***	2.48**	4.52***	4.45**
	[0.76]	[0.98]	[1.31]	[1.82]
ln assets	0.17***	0.18***	0.19***	0.18***
	[0.04]	[0.05]	[0.04]	[0.05]
dceo	0.28***		0.28***	
	[0.02]		[0.02]	
Year dummies	yes	yes	yes	yes
Indiv*Firm FE	yes	yes	yes	yes
Indus.dummies*lnPerf.			yes	yes
Time dummies*lnPerf.			yes	yes
Observations	17964	3476	17964	3476
R squared	0.14	0.17	0.15	0.21

Notes: Std. errors clustered by firm in brackets. * significant at 10%; ** at 5%; *** at 1%. These are two stage least squares regressions of table 3 where Import Penetration and its interaction with Performance are instrumented with exchange rates and tariffs (see table 2 for the firs stage result). The dependent variable, is the log of total yearly compensation that includes salary, bonus, total value of stock options granted (valued using the standard Black-Scholes formula), total value of restricted stock granted, long-term incentive payouts and other annual compensation; Performance is the natural logarithm shareholders value at fiscal year end ; Import Penetration is Imports divided by Imports plus domestic production at 4 digit SIC, the variable is the mean of the contemporaneous ratio and one forward lag, and it is demeaned with respect to the industry average; Log assets measures firm size; CEO is an indicator for who is the company CEO. See data appendix for further details and sources.

Table 6: Promotion and Wage Ladders

	ln TotComp	ln TotComp	ln TotComp	ln TotComp	ln TotComp IV	ln TotComp IV	ln Salary
	1	2	3	4	5	6	7
Import Pen.	1.36**	1.26*	1.25*	0.96	4.23	7.35	-0.01
	[0.66]	[0.65]	[0.65]	[0.67]	[4.76]	[4.62]	[0.29]
Second*Imp.Pen.	-1.42***	-1.33**	-1.33**	-0.93	-1.27	-2.55	-0.09
	[0.54]	[0.59]	[0.59]	[0.66]	[1.81]	[1.80]	[0.33]
Third*Imp.Pen	-1.71***	-1.07*	-1.04*	-0.4	-5.24***	-3.75*	0.03
	[0.51]	[0.58]	[0.58]	[0.63]	[1.57]	[2.04]	[0.31]
Fourth*Imp.Pen.	-1.06*	-1.20*	-1.20*	-0.77	-2.7	-2.64	0.29
	[0.58]	[0.62]	[0.62]	[0.70]	[1.74]	[2.34]	[0.37]
Fifth*Imp.Pen	-0.79	-1.05*	-1.03	-1.06	-3.50**	-3.81*	0.27
	[0.61]	[0.63]	[0.63]	[0.73]	[1.74]	[2.19]	[0.41]
Second	-0.53***	-0.22***	-0.21***	-0.20***	-0.54***	-0.19***	-0.44***
	[0.01]	[0.02]	[0.02]	[0.02]	[0.02]	[0.03]	[0.01]
Third	-0.81***	-0.33***	-0.33***	-0.31***	-0.79***	-0.28***	-0.64***
	[0.01]	[0.03]	[0.03]	[0.03]	[0.02]	[0.03]	[0.01]
Fourth	-0.98***	-0.41***	-0.41***	-0.40***	-0.97***	-0.37***	-0.77***
	[0.01]	[0.03]	[0.03]	[0.03]	[0.02]	[0.04]	[0.01]
Fifth	-1.11***	-0.47***	-0.47***	-0.47***	-1.09***	-0.41***	-0.89***
	[0.01]	[0.03]	[0.03]	[0.03]	[0.02]	[0.04]	[0.01]
Year dummies	yes	yes	yes	yes	yes	yes	yes
Firm FE	yes	yes			yes		yes
Individual FE		yes					
Indiv*Firm FE			yes	yes	yes	yes	
Observations	22899	22899	22899	22899	17964	17964	22888
R-squared (within)	0.45	0.24	0.2	0.2	0.75	0.14	0.5

Notes: Std. errors clustered by firm in brackets. * significant at 10%; ** at 5%; *** at 1%. lnTotal Comp. is the log of total yearly compensation that includes salary, bonus, total Black-Scholes value of stock options granted, total value of restricted stock granted, long-term incentive payouts and other annual compensation; Second is a dummy that records the second most highly paid executive, third is the third most highly paid etc (corresponding to dummies h_1 to h_5). The base category is the most highly paid executive in the firm. Import Penetration is Imports divided by Imports plus domestic production at 4 digit SIC, demeaned and defined at the firm level. All regressions include ln assets as control. Columns 5 and 6 are two stage least squares regressions where Import Penetration and its interaction with the hierarchy dummies are instrumented with (current and lagged) exchange rates and lagged tariffs (see table 2 column 1 for the first stage results). See data appendix for further details and sources.

Table 7: Promotion and Wage Ladders

	ln TotComp	ln TotComp
	1	2
ln Perf.	0.25***	0.28***
	[0.02]	[0.02]
Second*lnPerf.	-0.02**	-0.04***
	[0.01]	[0.01]
Third*lnPerf.	-0.04***	-0.07***
	[0.01]	[0.01]
Fourth*lnPerf.	-0.03***	-0.07***
	[0.01]	[0.01]
Fifth*lnPerf.	-0.03***	-0.06***
	[0.01]	[0.01]
Import Pen.*lnPerf.	0.61*	0.80**
	[0.34]	[0.37]
Second*Imp.Pen.*lnPerf.	-0.31	-0.53
	[0.33]	[0.38]
Third*Imp.Pen*lnPerf.	-0.51	-0.59
	[0.32]	[0.39]
Fourth*Imp.Pen.*lnPerf.	-0.36	-0.52
	[0.33]	[0.37]
Fifth*Imp.Pen*lnPerf.	-0.45	-0.51
	[0.35]	[0.39]
Import Pen.	-2.94	-4.65*
	[2.40]	[2.56]
Second*Imp.Pen.	0.73	2.57
	[2.28]	[2.68]
Third*Imp.Pen	1.87	3.33
	[2.19]	[2.68]
Fourth*Imp.Pen.	1.49	2.7
	[2.41]	[2.60]
Fifth*Imp.Pen	2.34	2.87
	[2.51]	[2.74]
Year dummies	yes	yes
Firm FE	yes	
Indiv*Firm FE		yes
Observations	22899	22899
R-squared	0.47	0.25

Notes: Std. errors clustered by firm in brackets. * significant at 10%; ** at 5%; *** at 1%. All variables are defined as inTable 6. All regressions include ln assets as control. See data appendix for further details and sources.

Table 8: Talent regressions

	Talent	Talent	Talent	Talent IV
	1	2	3	4
Import Pen.	0.29			
	[0.73]			
Lag Imp.Pen		1.09	1.66**	14.07
		[0.74]	[0.77]	[14.94]
Second*Lag Imp.Pen.			-0.79*	-2.55
			[0.47]	[2.28]
Third*Lag Imp.Pen			-1.43***	-0.88
			[0.44]	[2.27]
Fourth*Lag Imp.Pen.			-0.63	0.11
			[0.51]	[2.37]
Fifth*Lag Imp.Pen			-0.27	-1.58
			[0.65]	[2.71]
Second			-0.31***	-0.31***
			[0.01]	[0.02]
Third			-0.48***	-0.49***
			[0.01]	[0.02]
Fourth			-0.56***	-0.57***
			[0.01]	[0.02]
Fifth			-0.63***	-0.62***
			[0.02]	[0.02]
Year dummies	yes	yes	yes	yes
Observations	22899	22899	22899	14894
R-squared	0.001	0.002	0.1	0.022

Notes: Std. errors clustered by firm in brackets. * significant at 10%; ** at 5%; *** at 1%. The dependent variable is the estimated individual fixed effect from a first stage regression of log of total pay on firm size, hierarchy, year and firm dummies. Import Penetration is defined as in Table 1 and lagged in columns 2 to 4. Second is a dummy that records the second most highly paid executive, third is the third most highly paid etc (corresponding to dummies h_1 to h_5).

Table 9: Survival Analysis: Probability of exit from the firm

	Pr. exit	Pr. exit IV	Pr. exit	Pr. exit IV
	1	2	3	4
Import Pen.	5.40***	2.72	2.33	-28.22
	[1.79]	[4.50]	[2.14]	[31.67]
ceo	-1.07***	-1.09***	-1.07***	-1.10***
	[0.10]	[0.11]	[0.10]	[0.11]
ln Perf.	-0.17***	-0.17***	-0.17***	-0.17***
	[0.04]	[0.04]	[0.04]	[0.04]
ln assets	0.21***	0.20***	0.21***	0.20***
	[0.04]	[0.05]	[0.05]	[0.05]
Baseline Hazard: ln(t)	0.05	0.02	0.04	0.02
	[0.04]	[0.04]	[0.04]	[0.04]
Year dummies			yes	yes
Instrumented imp.pen.		yes		yes
Observations	6080	5344	6080	5344

Notes: Std. errors in brackets. * significant at 10%; ** at 5%; *** at 1%. Estimates a logistic hazard model of the probability of exiting the firm. The baseline hazard is defined as the logarithm of spell duration and all other variables are defined as in table 1. Columns 2 and 4 use predicted import penetration using our instruments instead of the raw value in Columns 1 and 3. See data appendix for further details and sources.

Figure 1: Import Penetration (deviation from mean) in 3 selected industries

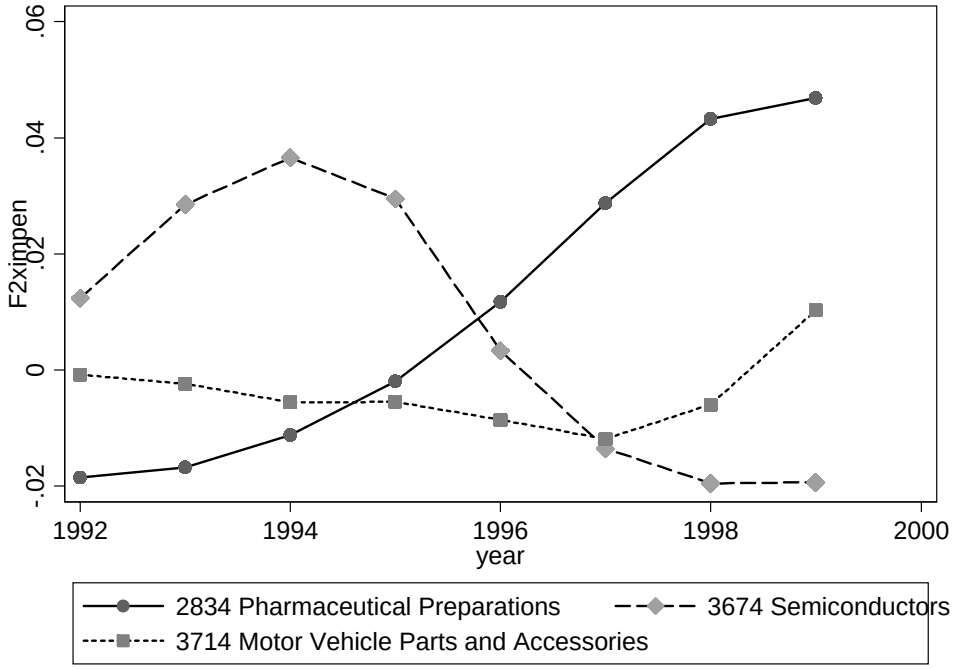

Figure 2: Kaplan-Meier Survival Estimates, by import penetration

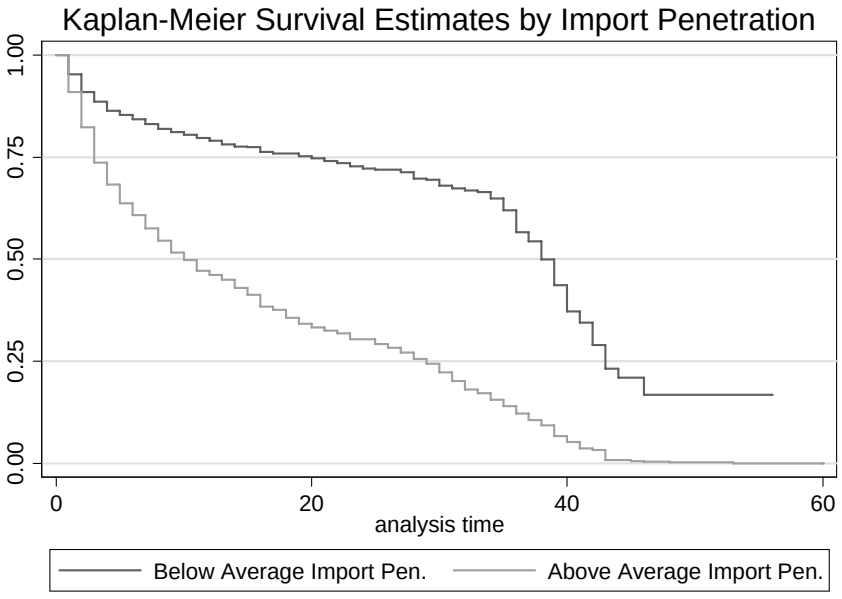

Figure 3: Kaplan-Meier Survival Estimates, by predicted (IV) import penetration