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 through wage structures, promotion profiles 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. (i) It increases the sensitivity of pay to performance, (ii) it raises the return to a promotion and increases pay inequality among the top executives of the firm, with CEOs typically experiencing wage increases while lower rank executives see their wages fall, and (iii) Higher competition is associated with a higher probability of leaving the firm. Finally we show (iv) that higher foreign competition is also associated with a higher demand for talent at the top of the firm. These results indicate that increased foreign competition can explain some of the recent trends in compensation structures.

JEL codes: M52, L1, J31

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1 Introduction

The US structure of wages and compensation changed substantially over the 1980s and 1990s. Firms increased their use of performance-related-pay such as piece rates, bonus and stock options, to provide incentives; earnings inequality, returns to skill and compensation at the top of the distribution increased substantially; and job mobility was higher. These changes affected executives at the top of the earnings distribution as well as workers in general.[1] In spite of the large literature on changes in inequality and job mobility, and the discussions on the reasons behind the increase in CEO pay, little is known about the reasons for the dramatic changes in compensation structures and incentive provision. What are the driving forces behind these trends?[2]

In this paper we argue that a major force behind many of these changes is the increase in foreign competition resulting from reductions in trade barriers and the globalization of economic activity. Foreign competition, and globalization more generally, can have an impact on incentive structures to the extent that they make product markets more competitive (Tybout, 2003). Higher imports, changes in entry barriers, lower costs of transport and information diffusion; all tend to increase the degree of competition that firms face and, therefore, they should indirectly affect the provision of incentives by firms (Hermalin, 1992; Raith, 1994; Schmidt, 1997). What follows is an empirical assessment of the extent to which changes in foreign competition, measured as industry-level import penetration faced by US firms in the period 1992-2000 affected the way and extent to which they provided incentives.

The variation in import competition over time and across industries allows us to clearly identify one of the channels through which globalization affects the working of firms. We assess how firms in different industries, with different evolutions in their trade exposure changed their incentives structures over the 1990s in the US. In addition to showing the overall effect, and in order isolate fluctuations in foreign competition that are exogenous to the incentive policies of firms and uncorrelated with potential omitted variables, industry specific import tariffs and exchange rate fluctuations[3] are used as instruments. Lagged tariffs and exchange rates provide a compelling source of

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[1] Murphy (1999) surveys the evidence on the increase of total pay and performance-pay sensitivities for executives. Lemieux et al. (2005) show that the use of bonus and incentive contracts increased in the US not only for executives, but also for workers. Frydman (2005) provides further evidence of the evolution of pay and finds that inequality among executives increased, CEO pay went up and job mobility was higher in the 1980s and 1990s relative to earlier decades. Katz and Autor (1999) survey the evidence on changes in inequality and returns to skill.

[2] Murphy and Zabojnik (2004 a and b) and Frydman (2005) claim that the increase in CEO pay is due to a higher demand for general skills. Competition can be thought of as an additional explanation that in addition could also explain why the demand for general skills may have increased. Bebchuck and Fried (2005) argue that it is due to an increase in rent extraction on the part of managers, that is camouflaged as incentive provision, although the reason why the incentives to extract rents from the firm has changed is unclear.

[3] Exchange rates are weighted by the relative importance of each currency in total industry imports, such that

variation since their evolution differs across sectors throughout the studied period and are arguably exogenous to current executive employment. The use of instrumental variables allows us to provide a precise causal effect, that is possibly a lower bound of the overall effect of the changes in competition.

While we restrict the impact of globalization to its effect through import penetration, the definition of incentives tries to be as comprehensive as possible. The incentives to exert effort and to improve the manager´s total contribution to the productivity of the firm can be provided through several instruments. Some of them 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, such as discretionary bonuses or the commitment of the firm to a given promotion scheme. Finally, some incentives may not be provided directly by firms but are implicit in labour 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).[4]

To provide a comprehensive view of the provision of incentives inside firms, we relate changes in foreign competition to a number of measures, regardless of whether these incentives are provided through explicit contracts or implicit agreements, through direct rewards on contemporaneous performance or through indirect ones based on promotions, turnover or career concerns in general. Even though executives are only a subsample of the general employed population, this group of workers has some characteristics that make them an ideal study group to elicit some of the questions we are interested in.

First, the availability of data on executive compensation allows for a detailed analysis of wages and promotions. We use a matched employer-employee panel dataset (Execucomp) with 5 executives per firm. It contains very detailed information on both firm and employment characteristics which provides 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 changed over time and across industries. The richness of the data allows us to look at a variety of measures that capture incentives, these are: 1) fixed and variable pay, 2) within firm wage inequality and promotion ladders 3) turnover. We are also able to assess whether firms seek to hire more 'able' or 'talented' CEOs and executives as foreign competition increases (Marin and Verdier, 2003). These measures jointly give a comprehensive view of the provision of incentives.

Second, this particular group of workers allows us to better identify the effect of changes in foreign competition on firm contracting behavior independently of its effects on labor markets. This

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there is differential variation across sectors in a given period.

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

is because the boundaries of labor and product markets are relatively independent when it comes to executives, as it is more frequent for executives to change firms between industries than within industries.[5] 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, and, by concentrating on executives we are able to isolate the effects that come mostly from product market competition.[6]

Finally, even though executives constitute a very particular subset of high skilled workers, the comparison of the results on executives with existing results on the general labor force may shed some light on how foreign competition is affecting differentially high and low skilled workers.

The results show, first, that higher foreign competition reduces the level of fixed pay and increase the sensitivity of pay to performance; second, it increases the steepness of the promotion ladder and inequality within a firm and third, higher competition is associated with higher job turnover, although the direction of the causality of this last result is less clear. All of these results suggest that 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' (the permanent unobserved component of wages) from the estimated individual fixed effects and find that as foreign competition increases, firms hire more 'talented' CEOs.

This paper also contributes to the growing (and still inconclusive) literature on the positive relationship between wage inequality and trade openness.[7] We propose an additional driver and show that foreign competition may affect the provision of incentives within firms in two relevant ways that raise inequality: by increasing wage dispersion within firms and through the use of performance related pay.[8]

The structure of 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 in the empirical sections, Section 4.1 shows the specification and results relative to fixed and variable pay, Section 4.2 presents the results on promotion ladders and turnover, in section 4.4 we explore how firms reward talent differently according to the degree of foreign competition; finally Section 5 provides an overall picture and concludes.

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[5] 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).

[6] As a reference, the median compensation of an executive in Execucomp represents 0.1% of the median firm revenue.

[7] The mechanisms proposed are the effects of openness on total labor supply, total labor demand, skill biased labor demand and institutions. There seems to be a consensus that the evolution in inequality cannot be explained with only one of these reasons. See Slaughter (1999).

[8] Lemieux et al (2005) empirically establish the link between the growing use of performance-related-pay and the increase in wage inequality in the US between the 70s and 90s.

2   Background and Related Literature

Foreign competition, and globalization more generally, imply that firms are increasingly exposed to competitive pressure. An increase in import penetration to an industry means that the number of goods sold in the market/competitors increases. Furthermore, changes in foreign competition can permanently reshape the general competitive configuration of an industry to the extent that if there are some fixed entry costs, once foreign firms decide to enter the market they are unlikely to exit. [9] Therefore one can think of the increase in foreign competition as an increase in competitive pressure to the industry.

The effect of competition on incentive provision has been studied by a number of papers within the principal-agent framework (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.[10] 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 substitution. 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, shifting the profit function downwards and making market stealing less attractive. This leads the firm to reduce the steepness of its incentive contracts.[11] Overall, the total effect of competition on incentive pay is theoretically ambiguous, which makes this an interesting empirical question. Our analysis evaluates which of the two effects dominates empirically.[12] In terms of the way in which firms provide incentives, we study explicitly 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.

A related effect is the implicit incentive that executives face when competition increases the risk of the firm going bankrupt. 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 a higher pressure on profits, employees tend to work harder. If an increase in foreign competition indeed pushes profits down, this would implicitly discipline workers, thus reducing the need for explicit incentives provided by the firm.

An increase in competition may increase the available information about market conditions and

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

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

[11] Raith (2003) allows for free entry and exit of firms so firm profits are constant and his second effect is not present.

[12] Cuñat and Guadalupe (2004) and (2005) find evidence that competition, measured as deregulation in the US financial services and a sharp appreciation in the UK respectively, raised performance-pay sensitivities

help firms elicit the contribution of an executive to profits (Hart, 1983; Scharfstein, 1988; and Hermalin, 1992). If this is the case more competition should lead to steeper incentives schemes, although there should also be a higher focus on relative-performance evaluation and a lower (or even negative) weight on own performance. However, the overall predicted effect of this literature on the relationship between competition and incentives is largely ambiguous.

Many of the arguments made with respect to the reward to managerial effort are also valid for the rewards to skill (Guadalupe, 2004) and managerial talent. Marin and Verdier (2003) explore the theoretical relationship between globalization, the hierarchical structure of the firm and the reward for talent. Competition affects the hierarchical structure of firms and thus, the explicit and implicit incentives that executives face.[13] We explicitly analyze and the empirical effect of competition on the reward for talent in section 4.4.

This paper is related to several contributions that link foreign competition to labour market conditions. Revenga (1992) and Bertrand (2004) explore the effects of competition on other aspects of employment, using as measures of competition the fluctuations in import penetration over long periods of time and instrumenting them with exchange rates. Revenga (1992) relates micro-data on unemployment and wages to import penetration at a sector level and finds that increased foreign competition lead to higher unemployment and lower wages over the 1977-1987 period. Bertrand (2004) studies whether implicit contracts are replaced by spot contracting as competition increases, by analyzing how the relationship between wages and unemployment at a sector level is affected by foreign competition. The results show that salaries are more responsive to current unemployment rates the more competitive the industry is. In two related papers, Abowd and Lemieux (1992) and Abowd and Allain (1996), find that the elasticity of salaries to firms quasi-rents increases when the latter are instrumented using shocks to foreign competition.

The underlying idea behind these articles is that foreign competition modifies the labor market conditions of an industry to the extent that it alters the rents available to be split, the outside options of employees and the bargaining power of the parties. Therefore foreign competition affects bargaining conditions and labor market institutions. Our article departs from this perspective since by concentrating on executives, labor market considerations and changes to labor market institutions are less likely to be playing a role, while issues related to product market competition and governance may be more relevant. Furthermore, we study changes in the structure of compensation (and not just pay levels) as well as other incentives provided. We also extend the identification strategy in Revenga (1992) and Bertrand (2004) by using average tariffs as an additional instrument of import

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[13] The effects of competition and globalization on hierarchies are the subject of a growing literature (Antras et al., 2006; Rajan and Wulf, 2006).

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penetration.[14] [15]

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.[16] 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. A unique feature of this data for our purposes 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. 1992 is when the data start, 1999 is the last year for which we are able to compute import penetration, and manufacturing in the sector for which we have trade data. This leaves us with 555 firms and 4,750 executives (17,178 unique onbservations).

From this data we obtain, for each executive in the sample, a comprehensive measure of total yearly compensation that includes both the components of pay that are related to performance and those that are not. In particular, given the increased importance of stock options and long-term incentive plans (Murphy, 1999) it is important to include them in addition to bonuses. 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.[17] We also define and the logarithm of salary plus bonus.

3.2 Discussion of Foreign Competition and its Instruments: Identification

The data analysis in the next section evaluates the effect of foreign competition for firm f in industry j at time t, imp_{fjt} on a number of aspects of compensation and incentives Y_{ifjt}, for each individual i. We run regressions of the form:

$$Y_{ifjt} = \alpha + \gamma_1 imp_{fjt} + imp_{fjt} * X'_{ifjt}\gamma_2 + X'_{ifjt}\gamma_3 + W'_{ifjt}\beta + u_{ifjt} \tag{1}$$

[14] An argument, symmetric to ours, relative to globalization and pay can be found in Feenstra and Hanson (1997). They identify that an increase in foreign direct investment increases the retribution of skill in Mexican firms.

[15] We also extend the analysis by calculating firm-specific import penetration, exchange rates and tariffs, while Revenga (1992) and Bertrand (2004) use sector specific ones.

[16] 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.

[17] Execucomp variable TDC1.

Each Y_{ifjt} -total compensation etc.- has its own specification, but the variation exploited in all is the same: changes in import penetration to the industry, and eventually its interaction with some variables X_{ifjt}.[18] W'_{ifjt} are control variables such as firm size and we will have specifications for the error term u_{ifjt} with and without fixed effects.

We define two measures of import penetration at the firm level. The first is is defined by the firm's main industry (at 4 digit SIC) as imports divided by the total value of internal production plus imports (such that $imp_{fjt} = imp_{jt}$). We take the average of current and one forward lag import penetration. This measures the extent to which foreign competitors penetrate the local market. We take the deviation with respect to the industry mean and include industry dummies in all the regressions to ensure that we do not capture in $\widehat{\gamma_1}$ or $\widehat{\gamma_2}$ unobserved differences by industry that are correlated with import penetration. The identification arises from import penetration changing within an industry over time, and doing so differently across industries. On average, import penetration increases from 0.16 to 0.21 over the sample period, but this varies considerably across industries, which is the variation we exploit in the data. Over the sample period, import penetration increases for some sectors and decreases for others and, on a given year, we may find a rich combination of changes for different sector. As an example, Figure 1 shows this for three selected industries.

However, since many firms sell goods in more than one industry, the previous measure may be misleading of the actual import penetration the firm faces. To account for this we define a firm specific import penetration measure imp_{fjt} as the weighted average of import penetration -computed as above- that the firm faces in all the industries (business segments) it operates. The weights are constructed as the fraction of total sales associated to each SIC4 industry the firm operates in (from Compustat Segments data). Since the industries the firm operates in may change endogenously over time, the weights used correspond to the firm's operations in 1991. The identification here 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 the firm faces in a particular year. Most other definitions of import penetration can be thought of as a combination of the two measures we use, so this allows us to check the robustness of the results to different specifications.

However rich the variation of import penetration in the panel, its use can still be subject to a number of criticisms. One could argue that changes in compensation structures may drive the

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[18]That depend on the outcome of interest, it can be firm performance (section 4.1) or hierarchical level (sections 4.2 and 4.4).

behavior of executives and therefore the degree of competition in the market and the extent to which foreign firms enter (reverse causation). Such is the mechanism proposed by Aggarwal and Samwick (1999).

One could also argue that there are important omitted variables that are correlated with import penetration and not captured by the controls, like other dimensions of trade, such as exports.[19] Or alternative explanations put forward in the literature, and that are hard to measure, such as rent extraction (Bebchuck and Fried, 2005) or the increased importance of general skills (Murphy and Zabojnik, 2004).

It is also possible that to some extent, import fluctuations are foreseen by firms and anticipated, such that changes observed in a given year are an under-estimate of the actual reaction. Finally, iport penetration may very well be measured with error.

All the reasons above would tend to understimate the effect of import penetration on our measures of compensation and incentives, and bias the results towards zero. To deal with these endogeneity concerns, and in order to evaluate the effect of purely exogenous fluctuations in import penetration we provide instrumental variables results.

The first instrument used follows Bertrand (2004) that constructs a measure of industry specific import weighted exchange rates. The weights on the bilateral exchange rates between the US and its trading partners are the average proportion in total imports from each country in the years 1990 and 1991. This instrument is arguably exogenous since exchange rates are determined in international financial markets and are therefore 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 both use current and one lag exchange rate.

Using industry specific exchange rates has two important advantages. First, different currency mixes imply that, on any given year, a sector may be subject to an appreciation while a different one may be subject to a depreciation. This allows for a richer variation in instrumented import penetration than if we were using a single exchange rate for all sectors. Second, using static import weights increases the explanatory power of exchange rates on imports and reduces their explanatory power on potential confounding factors, thus reinforcing the exclusion restriction. For example, import weighted exchange rates are poorly related to exports such that our instrumented regressions are not capturing an indirect effect of exchange rates through changes in exports.

Second, we use import tariffs faced by firms wanting to enter the US market as an additional instrument. Tariffs are obtained from the UNCTAD TRAINS dataset. We define the average tariff

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[19] The correlation between export openness and import penetration is 0.4.

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of a particular industry as the weighted average of tariffs set by the US on imports from each country, where the weights are the proportion of imports from each country measures in a base year (1993) to avoid endogeneity. We use one year lag of the tariff measure. Again, this is arguably exogenous since tariffs are determined either at trade negotiation rounds (WTO) or by Federal policy and therefore independently of firm's compensation policies and incentives. Indeed, most of our tariff variation is around 1995, when the Uruguay round was implemented. It is also hard to think of a channel through which changes in tariffs facing foreign firms will affect domestic firms through something else than imports. Our implicit maintained assumption is that it does not, and as expected, it has zero explanatory power for other related variables such as exports.

Therefore, we provide two stage least squares of equation 1 where imp_{jt} and $imp_{jt} * X_{ifjt}$ are instrumented with the source weighted exchange rate, its interaction with a dummy that equals one if there is an appreciation, and tariffs for industry j in year t and the interaction of these with the relevant X_{ifjt} variables.

Column 1 of Tables 2A and 2B show the basic first stage underlying the paper, which regresses import penetration on current exchange rate, lagged exchange rate and lagged tariffs. In Table 2A (and in all Tables A in the remainder of the paper) import penetration is defined by industry, and so are the instruments. In Table 2B. import penetration is defined by firm using the business segments weights, and so are the instruments. The effect of exchange rates and tariffs are higly significant in both cases.

Column 1 of Tables 2A and 2B shows the first stage of the first specification in the paper. The joint significance of all the instruments and control variables is quite high, with an R^2 around 33%. Moreover, the additional R^2 explained by the instrumental variables excluded in the second stage (Exchange rate, lagged exchange rate and lagged tariffs) is around 5%. The test of the excluded instruments shows that their joint explanatory power is statistically significant. Since we have 3 instruments, we tested for overidentification in all the regressions and could not reject the null that they are valid instruments (uncorrelated with the error and therefore correctly excluded from the regression). The second stage results were statistically identical if we only used tariffs or exchange rates, which lends further credibility to the instrumental variables.

It is important to emphasize that even though globalization is a pervasive trend, the effect identified here is deliberately much narrower than the overall trend, such that 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 dummies in all the regressions and interactions of time dummies with the relevant independent

variables.[20] Furthermore, the instrumental variables results capture changes in the structure of compensation as a response to unexpected shocks to import penetration, which by their nature are not spurious. Focusing on this narrow channel has the advantage that we know where the variation is coming from and it estimates a clear channel for the effect. The cost of this strategy is that globalization may operate through various other channels such that our results are possibly a lower bound of the overall effect of globalization on compensation structures.

All the tariff and trade information is obtained from the NBER database "US Imports, Exports and Tariff Data, 1989-2001 (NBER 9387)" and the UNCTAD TRAINS dataset.[21] Total production at the industry level is obtained from the Bureau of Economic Analysis Industry Shipments data. Further details of all the variables and their construction can be found in the appendix.

4 Results

In what follows, we present results using the industry (in A Tables) and the firm specific (in B Tables) import penetration measures.

4.1 Pay Structure

Executive pay consists of a fixed component and a component that is related to performance. As mentioned, in the 80s and 90s, the proportion of the variable component in total pay and the sensitivity of pay to performance increased. Here we assess the effect of foreign competition on this trend.

Total compensation for each executive i in firm f, in industry j, in year t, can be written as $W_{ifjt} = A_{ifjt} + B_{ifjt}(Perf_{fjt}) + d_t + d_j + \eta_i + \epsilon_{ifjt}$. where d_t and d_j are time and industry dummies, η_i are individual fixed effects and ϵ_{ifjt} is a white noise. That is, compensation, W_{ifjt}, contains a fixed component A_{ifjt} and a variable component $B_{ifjt}(Perf_{fjt})$, that is a function of firm performance. Both elements can vary across individuals, firms and industries. We specify:

$$A_{ifjt} = a_0 + a_1 imp_{fjt} + \sum a_s X^s_{ifjt} \quad ; \quad B_{fjt} = b_0 + b_1 imp_{jt} + \sum b_k Z^k_{ifjt}$$

Where the term imp_{fjt} is a measure of import penetration (we two different measures -industry and firm varying) and the terms X^s_{ifjt} and Z^k_{ifjt} are other determinants of the structure of pay. The

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[20] As explained later on in detail, we also de-mean import penetration at a SIC4 level.

[21] See Feenstra et al (2002) for a detailed description of the construction of each of these variables.

reduced form specification that we estimate is therefore:

$$W_{ifjt} = a_0 + a_1 imp_{fjt} + b_0 Perf_{fjt} + b_1 imp_{jt} Perf_{fjt} + \sum a_s X_{ifjt}^s + \sum b_k Z_{ifjt}^k Perf_{fjt} + d_t + d_j + \eta_i + \epsilon_{ifjt}$$
(2)

The main coefficients of interest are a_1, that measures the effect of foreign competition on the fixed component of pay, and b_1, that captures the differential slope of the performance-related-pay agreement with respect to different levels of import penetration. Standard errors are clustered at the firm-year level.

The compensation measure used is the log of total pay and the performance measure is the log of shareholders value[22], such that the sensitivity estimates can conveniently be interpreted as elasticities.

Foreign competition is measured by the degree of import penetration at the industry (four digit SIC) level and is always demeaned. This transformation guarantees that b_1 does not capture any unobserved cross-sectional differences at a sector level that could be correlated with compensation. This is weighted by firm sales in different segments to obtain the firm specific import penetration. Controls for firm size (logarithm of assets), year dummies, industry dummies and a CEO dummy in the cases we pool all executives[23], are included in all regressions.

Columns 1 to 7 of table 3 show the OLS estimates of this specification. Increases in import penetration are associated with a lower fixed component of pay and a variable component of pay that is more sensitive to firm performance. Columns 1 to 5 pool all executives while columns 6 and 7 restrict the analysis to company CEOs. Columns 4, 5 and 7 include time variation explicitly in the slope of compensation by interacting time dummies with the performance measure. We define 3 time periods in the sample (1992-1994, 1995-1997 and 1998-2000) and control for the slope changing over these. We also allow for differential slopes across industries (interacting industry dummies with performance).

The effect of import penetration is sizeable. For all executives (column 2) a 1 percent increase in import penetration generates an average drop in fixed pay of 5.3 percent and a 0.71 percent increase in the sensitivity of pay to performance (-6.9 and 1 respectively with firm specific imports in table 3B). For CEOs (column 6), the changes are larger and correspond to a 6.2 percent fall in pay and a 0.9 percent increase in the sensitivity of pay to performance. The magnitudes are very similar (not

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[22] This specification is similar to the ones in Bertrand and Mullainathan (2001) and Murphy (1986) among others. Given that we estimate a fixed effects specification, it is equivalent to regressing the change in log total pay against the change in shareholders value, as is frequently done in the corporate finace literature.

[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 like tenure.

statistically different) when we look at stayers (by including firm specific individual fixed effects, in column 3) or if we saturate with time trends (column 4). Wehn comparing 3A and B, we tend to find that the effect on the slope is larger when using the firms specific import measure, alsthough in general the results are very similar, which indicates the results are robust to the choice of import penetration measure.

As for the magnitude of the effects, a one standard deviation (0.02) change in import penetration would imply a decrease in fixed pay of 0.10 to 0.14 percent and a 0.015 to 0.02 percent increase in the sensitivity of pay to performance. This is not negligible, given that the sensitivity of pay to performance is around 0.22.

With these estimates, one can assess what happens to overall compensation for an executive in a firm with average performance (6.9). A given increase in import penetration lowers the fixed component of pay by a factor of 6.1and increases the variable component by a factor of 6.07 (this is 0.88 times 6.9), such that total compensation does not change much,or falls slightly for the average executive, although its composition does. For the CEO sample, average performance is 7.1 such that fixed pay falls by a factor of 9.6 while variable pay increases by a factor of 9.9 for a given increase in import penetration, suggesting that overall pay increases for this group. This is only preliminary evidence of differential patterns, section 4.2 analyzes in more detail what happens to total compensation of the different layers of executives.

Next, since 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 provide instrumental variable results in tables 4A and B. The instruments are the weighted real exchange rate of the dollar (current and lagged) and the lagged tariff. These are industry (4A) or firm specific(4B).

The effect of a 1 standard deviation change in import penetration coming from changes in the exchange rate and tariffs is to reduce the intercept by 0.4 to 0.5 and increase the slope of contracts by 0.04 to 0.06 percentage points. The results are virtually identical for all executives (columns 1 and 3), for CEOs (columns 2 and 4) and in the saturated model (columns 3 and 4). These 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. The mean log compensation is 6.7 and the slope sensitivity is 0.22, so these correspond to around a 6% fall in fixed pay and a 20% increase in the slope of pay to performance, which are non negligible magnitudes. The IV results are also very similar across import penetration measures.

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 firms to shift the components of pay in a way that should induce executives to increase firm performance, and the use of instrumental variables allows us to identify that the causality of this effect goes from foreign competition to pay and not the other way around.

To have a sense of the contribution of import penetration to the overall changes in executive compensation and to the increase in performance pay sensitivities, one can compare columns 4 and 5 of table 3. Column 5 is the same as column 4, leaving out the import penetration variables. The coefficients on the time dummies (three time periods), and their interaction with performance show the average changes to the structure of compensation over the sample period. They suggest that the fixed part of compensation increased by 0.17 and the slope increased by 0.05. Once we control for the import penetration measure (column 4), we find that fixed pay increased by 0.25 and pay sensitivity by 0.04. That is, imports seem to explain a substantial part of the increase in sensitivities over the 1990s (20 percent of the increase) and therefore may be thought of as an important contributor to the overall trend. On the other hand, imports, and their negative effect on the fixed component of pay, tended to dampen the trend towards increasing fixed pay that characterizes the period. Even though the standard errors around these estimates are large (especially for fixed pay), they gives us an idea sense of the total contribution of import penetration to changes in the structure of compensation. Overall, it seems to explain part of the increase in performance-pay sensitivities and in the proportion of incentive pay in executive contracts.[24]

4.2 Promotion and Wage ladders

Just as the incentives of executives to exert effort and act in the interest of owners can be provided by tying pay to performance, the expectation of a promotion after good performance and its associated wage increase can be used as an incentive device. Similarly, the expectation of a potential demotion or firing after poor performance may play the same role. In this section we analyze how the wage ladder -the wage differentials between executives within a firm- evolves with foreign competition. This can be seen as a measure of the expected premium associated with a promotion.[25]

This section evaluates changes in pay differentials between the different executives of the firm.

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[24] We also contrasted the robustness of the results to the inclusion of a number of mechanisms, none of which altered our results. Allowing for relative perfomace evaluation, looking at firms with different leverage or different levels of anti-takeover protection yielded no significant differences. Those results are available upon request.

[25] We investigated whether higher foreign competition lead to changes in the probability of a promotion/demotion by studiing internal rank mobility. Our regressions related the effect on foreign competition on probability for an executive of changing the rank within the firm. We found no significant effects, suggesting that the probability did not change and therefore all the cnage in incentives comes form changes in the level of compensation associated to each leavel in the hierarchy, not to changes in promotion probabilities.

The idea is to measure whether, as foreign competition increases, executives can expect a higher wage increase from moving up in the firm compensation hierarchy (be it through a promotion or through a wage increase). To measure these changes in the promotion ladder, we rank each executive according to total pay within the firm in a given year.[26] 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.

$$W_{ifjt} = a_0 + \sum_{k=2}^{5} \beta_k h_k + \sum_{k=2}^{5} \theta_k h_k imp_{fjt} + \sum b_s X_{ifjt}^s + d_t + d_j + \eta_i + \epsilon_{ifjt} \tag{3}$$

Where imp_{jt} is import penetration, X_{ifjt}^s are control variables and the rest of variables are as in Section 4.1. The coefficients β_k represent the average wage differential throughout the whole period between the different levels of executives. Given that the pay measure is in logs, these differentials should be interpreted as ratios between the total pay of different executives, and therefore are not capturing the fact that pay increased during the period for all executives. The coefficients of interest are θ_k, that measure the change in these differentials with competition. If the difference in pay between executives increases with imp_{fjt}, we would expect to find that β_k increases in k (in absolute value), indicating that the wage differentials are more acute with 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 due to different abilities of executives in the hierarchy. That is, if the highest paid worker ($k = 1$) receives a higher wage than the rest (reflected by $\beta_k < 0$) it is not because they are the most talented individuals, since unobserved ability, that we can think of as 'talent', is accounted for in the fixed effect. We present and discuss results with and without fixed effects. Section 4.4 exploits what the individual fixed effects can tell us about the 'talent' of the executives that firms hire, and how this changes with competition.

Table 5 shows the results of this specification. We use as dependent variable both the log of total compensation and the log of salary plus bonus since the latter may be a better measure of the promotion structure. The omitted category is always the highest paid executive. A comparison of column 1 (that omits individual fixed effects) and column 3 (that includes them) shows that CEO pay increases in import penetration if we do not include individual fixed effects, suggesting that the increase in pay for that group is correlated with the unobserved component of pay, which we can interpret as talent or general human capital. What this says indirectly is that the increase in CEO

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[26] Our data do not allow us to accurately identify whether differences across executives in pay are also linked to differences in job title. That is why our measure of 'hierarchy' reflects pay hierarchy exclusively.

pay can be a result of firms in more competitive industries hiring more skilled/talented CEOs in those industries. This is consistent with and illustrates Frydman (2005) and Murphy et al. (2004), where the increase in demand for talent would come from increased product market competition.

A comparison of columns 1 and 2 also shows that the wage ladder is less steep when one controls for individual unobserved heterogeneity (comparing columns 1 to 3 and 2 to 4 shows that the the total pay difference between the highest and the fifth highest paid executive is reduced when controlling for unobserved heterogeneity). This indicates that one of the reasons for existing wage differentials among executives is given by different levels in the hierarchy being occupied by workers with different ability levels. However, ability or talent, is only part of the explanation since columns 3 and 4 still gives significant and sizable differences between the different levels. Therefore 'advancing in the pay hierarchy' is associated with a wage increase and therefore provides incentives (so long as promotion is tied to performance). The IV results yield similar results.

Regarding the effect of import penetration, the results on θ_2 to θ_5 show the effect of imports on the differential between the executive layers. They are negative and increasing in absolute value with respect to the import penetration measure. As import penetration increases (competition increases) the wage schedule becomes broader, with the highest paid executive earning proportionally more than the second highest paid executive and so on for all 5 categories.

The effect is again sizeable: one standard deviation increase in foreign competition generates an additional wage differential between the highest and the fifth highest paid executives of 5 percent (in salary plus bonus) or 3.6 percent (in total compensation), even after controlling for ability (columns 3 and 4).

Again, since the estimated θ_2 to θ_5 are net of all characteristics that are controlled for in X_{ifjt}, as well as individual unobserved heterogeneity, they should not be driven by the fact that individuals with different ability occupy different positions but with how much the firm pays for that position.

To assess the effect of unexpected changes in foreign competition we use instrumental variables as before. The estimated effects on promotion ladders displays the same pattern as in the OLS regressions, but the effect is larger throughout, although not significantly different in statistical terms.

Overall, the results in Table 5 show that when foreign competition increases, the returns of a promotion are higher. This is consistent with the results of the previous section in the sense that firms seem to be reacting to increases in foreign competition by increasing the provision of incentives within the firm.

Table **5** also sheds light on the effect on total pay for these executives. In columns 1 to 4, the

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coefficient on the executive dummies and their interaction with competition is negative, while the coefficient associated to import penetration is positive and has an absolute value that is generally higher than the value of most coefficients of the different layers. Thus, in columns 1 to 4 it seems that total pay goes up, especially for executives at the top, with the fifth executive remaining generally unchanged or seeing pay decline.

In sum, these results indicate that the ratio between the total pay of an executive and the total pay of the next lower paid executive grows with foreign competition. However this increase in the span of executive salaries does not translate into a generalized increase in pay levels. Note that this complements 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, but this partly is a result of a firms hiring more skilled workers, and total compensation falls more, the lower in the hierarchy the executive is.

4.3 Talent

The previous section suggested that changes in wage differentials were partly due to firms hiring workers with differnt abilities, with different talent. 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. Here we evaluate empirically whether as import penetration increases, firms tend to attract more or less talented CEOs and executives. Of course, we cannot see how the 'demand' changes, but only what the realization of talent in the firm is.

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

We first model compensation as:

$$W_{ifjt} = \alpha + \beta_1 imp_{fjt} + \sum_{k=1}^{5} \beta_2^k h_k + \beta_3 \ln assets_{fjt} + d_t + d_j + \eta_i + \epsilon_{ifjt} \qquad (4)$$

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 $\widehat{\eta}_i$. The fixed effects are estimated on the full Execucomp sample, not just on the restricted sample for which we have trade information.

Notice that this estimate does not include the fact that wages may be higher because of higher import penetration, nor the fact that workers receive different wages at different levels in the hierarchy (h_k) because of incentive effects, nor firm size effects, nor 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). Studying $\widehat{\eta}_i$ shows what type of workers firms higher over time. For instance, over time, the $\widehat{\eta}_i$ associated to the the highest paid worker of a given firm (the talent of that executive) will change when he is replaced. So we can define $\widehat{\eta}_{ift}^1$ as the fixed effect estimated for the highest paid worker of firm f at time t. Similarly, one can define $\widehat{\eta}_{ift}^k$ as the talent of each of the k executives in the firm's hierarchy. Thus, for each k we estimate:

$$\widehat{\eta}_{ift}^{k} = \lambda + \gamma imp_{fjt} + d_t + \phi_f + u_{ifjt} \tag{5}$$

where ϕ_f are firm fixed effects. Here, the identification comes from firms who replace their k^{th} executive: from the change in talent from one executive to his successor. We also include time dummies d_t to account for the fact that the ability in the sample may have been changing over time across all firms and to avoid a confounding effect of this on the 'talent' effect from imp_{jt}.

Table 6 presents the results of the Talent regressions. Columns 1 and 2 (IV) restrict the analysis to the company CEO and yield no significant results.

We next look at the distribution of talent within the firm. In columns 3 and 4 we estimate jointly the evolution of talent at each level of the hierarchy. For this purpose we estimate the following specification:

$$\widehat{\eta}_{ikft} = \lambda + \gamma imp_{fjt} + \sum_{k=1}^{5} \beta^k h_k + d_t + \phi_f + u_{ifjt}$$

The results indicate that the increase in talent from foreign competition is highest at the top of the hierarchy, and when one gets to the fifth executive it is actually zero or negative. This is 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.

4.4 Job Mobility: Turnover

Next we explore whether the probability of an executive exiting the firm is affected by foreign competition. Since we have a panel of executives and observe them while they are in the firm, 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 that probability.

Executives may exit the firm either 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 for a detailed analysis of this question because, even though it contains a variable that reports the reasons 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; and 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. However, we know from Huson et al. (2001) that since the 1970s the hiring of outside CEOs and forced CEO succession increased. An increase in the probability of either voluntary departures (through external promotion) or involuntary ones (through forced retirement or firing) should in principle increase the incentives of the executive to exert effort and increase the performance of the firm.

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, and therefore we do not know exactly when these observations started being 'at risk' of exiting. We just observe when the individual became one of the top 5 executives while the firm is 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 that 'survived' until the moment they are in the sample. All those executives that entered and exited the firm before the firm entered the sample are not observed (as well as those who never made it to the top 5). Therefore, longer durations are more likely in the sample, and this may be a source of selection bias. We deal with this type of 'left truncation' in the estimation.

Finally, note that the data used are discrete (firms only report yearly information) and that we do not know the exact day of entry or exit of the executive. This leads us to use a discrete duration model in the estimation.

Given the limitations of the data, we use a very descriptive approach and plot Kaplan-Meier

survival functions to see whether firms in sectors with high foreign competition display different turnover patterns. Since we need entry dates to do this, we restrict the sample to individuals that report their date of entry to the firm. Figure 2 shows the Kaplan-Meier function for the whole sample: the probability of survival falls (the probability of exit from the firm increases) over the duration of employment.

Then, we classify individuals according to whether they are in industries with above or below average levels of foreign competition.[27] This is shown in figures 3 and 4. The vertical axis represents the probability of staying in the same firm after a given number of years (represented in the horizontal axis). Both figures indicate that individuals in sectors with 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 we divide the sample according to the predicted import penetration using instrumental variables (Figure 4), the results are quite different, showing a virtually identical survival pattern for both high and low predicted import penetration groups. Overall, the results show a strong relationship between high competition, however the unexpected part of the changes in competition does not seem to be causing the result. A 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. This question may require further analysis.

Huson et al. (2001) find that hiring of outside CEOs and forced CEO succession increased between 1971 and 1994, but that the relationship between these and firm performance did not change much in the period. This is consistent with our story and results, i.e. with a situation where firms want to provide more incentives to their workers, because the extent of competition they face is larger, but this is independent of firm performance. Our results support a causal explanation for why this may have been the case: a higher intensity of foreign competition leads to higher turnover rates. This points once more in the direction of higher incentives for executives to increase firm performance whenever foreign competition is high.

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[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.

5 Conclusions

In this paper we identify the effects of foreign competition 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.

Our results show that increases in foreign competition are associated with lower levels of fixed pay and a higher sensitivity of performance-related pay. Furthermore, and unlike in the literature relative to foreign competition and general wages, we do not find a decrease in total pay associated to more competition. Instead we observe that the wage ladder of the firm becomes broader with more competition, that is, the highest paid executives in the firm tend to earn proportionally more when competition is high, while the lower layers of executives earn less as competition increases. All of these results indicate that the incentives that the firm provides to executives to improve the performance of the firm increase with foreign competition.

Moreover we also find some evidence that the probability of exiting the firm (either through an external promotion, because the executive gets fired or due to any other motive) increases with foreign competition, this is likely to induce executives to work harder, particularly when seen in connection with the increased span of wage schedules. However this last effect seems to be related only to expected competition changes.

Finally we show that higher foreign competition leads to a higher demand for talent, at least for the very top layers of the firm hierarchy.

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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 and drop the observations where there is no information on total pay received by the executive. This leaves 22,083 executive-year observations.

Trade Data:

Industry 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. We take the average of contemporary and one year forward lag import penetration by industry. This is demeaned at the industry level.

Firm specific Import Penetration: A second measure is computed by firm and year as the weighted average of import penetration -computed as above- that the firm faces in all the industries (business segments) it operates. The weights are constructed as the fraction of total sales associated to each SIC4 industry the firm operates in (from Compustat Segments data). Since the industries the firm operates in may change endogenously over time, the weights used correspond to the firm's operations in 1991.

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.

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 Internationals Financial Statistics of the IMF.

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:

-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, also coded as exit from the firm)).

If the firm exits the sample we consider all executive observations in that firm as censored on the year the firm exits the sample (coded as censored observation).

We also need to restrict the sample to those individuals for whom an entry date into the firm is reported.

7 Tables and Figures

Table 1: Summary Statistics

variable	mean	sd	p50	p10	p90	N
Log total pay	13.677	0.999	13.575	12.482	15.003	20308
Log Performance	6.934	1.643	6.699	5.073	9.165	20308
Import penetration	0.007	0.026	0.001	-0.019	0.044	20308
Import penetr. * Performance	0.051	0.190	0.007	-0.135	0.299	20308
Log assets	6.735	1.641	6.576	4.687	8.975	20308
CEO	0.176	0.381	0.000	0.000	1.000	20308
Exchange rate	2.086	0.777	2.171	0.784	3.080	20308
Exchange rate when appreciation	1.270	1.162	1.396	0.000	2.760	20308
Exchange rate * Performance	14.353	6.480	13.994	5.956	22.532	20308
Exchange rate when apprec. * Perf	8.734	8.426	8.356	0.000	20.151	20308
Average tariff	-0.002	0.011	-0.001	-0.018	0.010	20308
Average tariff * Perf	-0.017	0.078	-0.004	-0.116	0.061	20308

Notes: Total pay is 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; Peformance is the natural logarithm shareholders value at fiscal year end (in $1000) ; Import Penetration is Imports divided by Imports plus domestic production at 4 digit SIC, the variable is demeaned with respect to the industry average; Log 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); Exchange rate when appreciation is the product of the Exchage rate variable and a dummy that equals one if that year the industry weighted exchange the experienced an appreciation Average tariff is total duties paid divided by total customs value of imports at 4 digit SIC. See data appendix for further details and sources.

Table 2: First stage

	Main Sector		Weighted 91 segments	
	Import.Pen.	Import.Pen.* Perf	Import.Pen.	Import.Pen.* Perf
Exchange Rate	-0.004	-0.005	-0.012***	-0.007
	[0.003]	[0.007]	[0.003]	[0.007]
Exchange Rate * Performance		0.001		0.001
		[0.001]		[0.001]
Lagged Exchange Rate	-0.065***	0.008	0.015***	-0.006
	[0.013]	[0.010]	[0.003]	[0.009]
Lagged Exch. Rate * Performance		-0.006***		-0.004***
		[0.001]		[0.001]
Lagged Tariffs	-0.003***	-0.002**	-0.002***	-0.003***
	[0.000]	[0.001]	[0.000]	[0.001]
Performance		0.016***		0.009***
		[0.002]		[0.002]
Lagged Tariffs*Performance		0		0
		[0.000]		[0.000]
Year Dummies	yes	yes	yes	yes
Industry Dummies	yes	yes	yes	yes
Indiv. Fixed Effects	yes	yes	yes	yes
Observations	2728	13158	2800	13509
R-squared	0.519	0.323	0.456	0.309

Robust standard errors in brackets clustered by industry-year

* significant at 10%; ** significant at 5

Notes: This is the first stage regression for the two endogenous variables instrumented in section 4.1 (table 4). The dependent variable, Import penetration, is imports divided by Imports plus domestic production at 4 digit SIC, the variable associated to period t is the average of the ratio in period t and period t+1, the variable is demeaned with respect to the industry average; Peformance is the natural logarithm of shareholders value at fiscal year end; 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); the weights correspond to the main sector of the firm in columns 1 and 2 and to the weighted average of all the segments of the firm according to their relative importance in 1991. Average tariff is total duties paid divided by total customs value of imports at 4 digit SIC. See data appendix for further details and sources.

Table 3: Pay Structure: Performance-related-pay

Variables Weighted Using Main Sector

	Total comp.	Total comp.	Stayers	Total comp.	Total comp	CEOs	CEOs+Trend
	1	2	3	4	5	6	7
Performance	0.19***	0.22***	0.22***			0.30***	
	[0.01]	[0.02]	[0.02]			[0.03]	
Import Penetration	-3.33**	-5.35***	-4.77**	-2.82		-6.19**	-5.39*
	[1.64]	[1.90]	[1.90]	[2.07]		[2.45]	[3.11]
Import Penetration*performance	0.58**	0.71***	0.64**	0.39		0.89***	0.94**
	[0.23]	[0.27]	[0.27]	[0.30]		[0.32]	[0.43]
Log assets	0.20***	0.05	0.06*	0.04	0.05	0.09**	0.07
	[0.01]	[0.03]	[0.03]	[0.03]	[0.03]	[0.04]	[0.05]
CEO	0.81***	0.20***	0.18***	0.20***	0.20***		
	[0.01]	[0.02]	[0.02]	[0.02]	[0.02]		
Performance*trend1991-1995				0.04***	0.04***		
				[0.01]	[0.01]		
Performance*trend1996-2000				0.04***	0.05***		
				[0.01]	[0.01]		
Observations	17178	17178	17178	17178	17178	3042	3042
R-squared	0.6	0.84	0.84	0.84	0.84	0.82	0.83

Variables Weighted Using All the Segments of the Firm as in 1991

	Total comp.	Total comp.	Stayers	Total comp.	Total comp.	CEOs	CEOs+Trend
	1	2	3	4	5	6	7
Performance	0.18***	0.21***	0.22***			0.29***	
	[0.01]	[0.02]	[0.02]			[0.03]	
Import Penetration	-5.00***	-6.92***	-6.33***	-5.42**		-5.99**	-5.18
	[1.80]	[2.12]	[2.12]	[2.32]		[2.61]	[3.32]
Import Penetration*performance	0.88***	1.01***	0.94***	0.83**		0.96***	0.96**
	[0.26]	[0.30]	[0.30]	[0.35]		[0.35]	[0.46]
Log assets	0.20***	0.05*	0.06*	0.05	0.05	0.10**	0.08*
	[0.01]	[0.03]	[0.03]	[0.03]	[0.03]	[0.04]	[0.05]
CEO	0.81***	0.20***	0.18***	0.20***	0.20***		
	[0.01]	[0.02]	[0.02]	[0.02]	[0.02]		
Performance*trend1991-1995				0.04***	0.04***		
				[0.01]	[0.01]		
Performance*trend1995-200				0.03**	0.05***		
				[0.02]	[0.01]		
Observations	17178	17178	17178	17178	17178	3042	3042
R-squared	0.60	0.84	0.84	0.84	0.84	0.82	0.83

Year Dummies	yes	yes	yes	yes	yes	yes	yes
Industry Dummies	yes	yes	yes	yes	yes	yes	yes
Indiv. Fixed Effects	no	yes	yes	yes	yes	yes	yes
Indust.dummies * Perf	no	no	no	yes	yes	no	yes
Year dummies * Perf.	no	no	no	yes	yes	no	yes

Robust standard errors in brackets clustered by industry-year

* significant at 10%; ** significant at 5

Notes: 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

Table 4: Pay Structure: IV Results

Variables Weighted Using Main Sector

	IV	IV CEOs	IVtr	IVtr
	1	2	3	4
Market return	0.15***	0.22***	0.49***	0.53**
	[0.02]	[0.04]	[0.16]	[0.21]
Import Pen.	-20.94***	-19.66***	-19.08***	-17.71***
	[4.77]	[6.58]	[3.84]	[6.27]
Import Pen.* Performance.	3.15***	2.89***	1.97***	2.03***
	[0.63]	[0.84]	[0.47]	[0.78]
ln assets	0.11***	0.10*	0.06*	0.06
	[0.03]	[0.05]	[0.03]	[0.05]
CEO	0.21***		0.22***	0.30***
	[0.03]		[0.02]	[0.05]
Observations	13158	2535	13158	2535

Variables Weighted Using All the Segments of the Firm as in 1991

	IV	IV CEOs	IVtr	IVtr
	1	2	3	4
Market return	0.12***	0.20***	0.47***	0.57**
	[0.03]	[0.04]	[0.16]	[0.24]
Import Pen.	-31.28***	-18.72***	-25.99***	-8.67
	[7.24]	[6.62]	[5.48]	[7.98]
Import Pen.* Performance.	4.34***	2.93***	2.91***	2.04*
	[0.99]	[0.89]	[0.75]	[1.12]
ln assets	0.10***	0.12**	0.07*	0.12**
	[0.04]	[0.05]	[0.04]	[0.05]
CEO	0.21***		0.22***	0.29***
	[0.03]		[0.02]	[0.05]

Year Dummies	yes	yes	yes	yes
Industry Dummies	yes	yes	yes	yes
Indiv. Fixed Effects	yes	yes	yes	yes
Indust.dummies * Perf	no	no	yes	yes
Year dummies * Perf.	no	no	yes	yes
Observations	13509	2603	13509	2603

Robust standard errors in brackets clustered by industry-year

* significant at 10%; ** significant at 5

Notes: 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). 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; . Peformance 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 5: Promotion and Wage Ladders

Variables Weighted Using Main Sector

	Sal+Bonus	Total comp.nofe	Sal+Bonus	Total comp.	Total comp.	Total comp.+Trend
	1	2	3	4	5	6
	No IVs	No IVs	No IVs	No IVs	IV	IV
Import Pen.	1.79***	1.71***	1.31***	0.6	3.75	0.41
	[0.48]	[0.65]	[0.43]	[0.66]	[2.89]	[2.41]
Second * Imp.Pen.	-0.22	-0.66*	0.04	0.19	-1.47	-0.26
	[0.44]	[0.37]	[0.40]	[0.51]	[1.30]	[1.34]
Third * Imp.Pen	-0.36	-0.95**	-0.44	-0.81	-2.60*	-2.50*
	[0.43]	[0.42]	[0.38]	[0.54]	[1.44]	[1.36]
Fourth * Imp.Pen.	-0.22	-0.92**	-0.79**	-0.88	-2.23	-0.45
	[0.44]	[0.46]	[0.40]	[0.60]	[1.48]	[1.55]
Fifth * Imp.Pen	0.02	-1.11**	-1.25***	-1.18*	-3.66**	-3.02
	[0.43]	[0.52]	[0.45]	[0.66]	[1.60]	[1.86]
Second	-0.38***	-0.56***	-0.10***	-0.42***	-0.56***	-0.41***
	[0.01]	[0.01]	[0.01]	[0.02]	[0.02]	[0.02]
Third	-0.61***	-0.87***	-0.16***	-0.65***	-0.87***	-0.61***
	[0.01]	[0.01]	[0.02]	[0.02]	[0.02]	[0.02]
Fourth	-0.73***	-1.07***	-0.20***	-0.81***	-1.08***	-0.80***
	[0.01]	[0.01]	[0.02]	[0.02]	[0.02]	[0.03]
Fifth	-0.85***	-1.27***	-0.25***	-0.95***	-1.25***	-0.92***
	[0.01]	[0.01]	[0.02]	[0.03]	[0.02]	[0.03]
Observations	17173	17178	17173	17178	13158	13158
R-squared	0.68	0.69	0.89	0.86		

Variables Weighted Using All the Segments of the Firm as in 1991

	Sal+Bonus	Total comp.nofe	Sal+Bonus	Total comp.	Total comp.	Total comp.+Trend
	1	2	3	4	5	6
	No IVs	No IVs	No IVs	No IVs	IV	IV
Import Pen.	1.88***	1.90***	1.64***	0.66	5.32*	3.52*
	[0.55]	[0.69]	[0.51]	[0.72]	[3.23]	[2.11]
Second * Imp.Pen.	-0.32	-0.90**	0.08	0.51	-2.46**	-1.95
	[0.52]	[0.40]	[0.48]	[0.56]	[1.23]	[1.39]
Third * Imp.Pen	0.01	-0.93**	-0.48	-0.53	-3.73***	-3.96***
	[0.48]	[0.45]	[0.43]	[0.60]	[1.38]	[1.37]
Fourth * Imp.Pen.	0.01	-0.81	-0.65	-0.48	-3.24**	-2.6
	[0.50]	[0.50]	[0.47]	[0.65]	[1.42]	[1.60]
Fifth * Imp.Pen	0.32	-0.96*	-1.09**	-0.74	-4.81***	-5.53***
	[0.51]	[0.55]	[0.51]	[0.70]	[1.57]	[1.83]
Second	-0.38***	-0.55***	-0.10***	-0.43***	-0.55***	-0.40***
	[0.01]	[0.01]	[0.01]	[0.02]	[0.01]	[0.02]
Third	-0.61***	-0.87***	-0.16***	-0.65***	-0.86***	-0.61***
	[0.01]	[0.01]	[0.02]	[0.02]	[0.02]	[0.02]
Fourth	-0.73***	-1.07***	-0.20***	-0.81***	-1.07***	-0.79***
	[0.01]	[0.01]	[0.02]	[0.02]	[0.02]	[0.03]
Fifth	-0.85***	-1.27***	-0.25***	-0.95***	-1.24***	-0.90***
	[0.01]	[0.01]	[0.02]	[0.03]	[0.02]	[0.03]
Observations	17173	17178	17173	17178	13509	13509
R-squared	0.68	0.69	0.89	0.86		

Table 6: Talent regressions

Variables Weighted Using:	Main Sector				All the Segments of the Firm as in 1991			
	1	2	3	4	1	2	3	4
	CEO	CEO IV	Talent	IVTalent	CEO	CEO IV	Talent	IVTalent
Import Pen.	0.23	-0.5	0.823***	2.420*	0.16	-0.57	0.851***	0.858
	[0.20]	[0.98]	[0.257]	[1.403]	[0.22]	[0.94]	[0.279]	[0.890]
Second * Imp.Pen.			-0.739**	-1.268			-1.139***	-1.589*
			[0.298]	[1.240]			[0.334]	[0.948]
Third * Imp.Pen			-0.484	-2.284*			-0.593*	-1.332
			[0.305]	[1.255]			[0.339]	[0.956]
Fourth * Imp.Pen.			-0.47	-1.267			-0.569	-1.971**
			[0.327]	[1.280]			[0.360]	[0.968]
Fifth * Imp.Pen			-0.565	-1.534			-0.58	-2.553***
			[0.353]	[1.381]			[0.389]	[0.989]
Second			-0.135***				-0.132***	
			[0.006]				[0.006]	
Third			-0.225***				-0.224***	
			[0.007]				[0.007]	
Fourth			-0.274***				-0.273***	
			[0.007]				[0.007]	
Fifth			-0.325***				-0.325***	
			[0.008]				[0.008]	
Observations	3042	2535	17178	13158	3042	2603	17178	13509
R-squared	0.94		0.845		0.94		0.845	
Number of Clusters		527		541		538		551

Robust standard errors in brackets clustered by industry-year

* significant at 10%; ** significant at 5

Notes: The dependent variable is the estimated fixed effect from a first stage regression of log of total pay on Performance, Hierarchy, year and industry dummies. Second is a dummy that records the second most highly paid executive, third is the third most highly paid etc. 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, the variable is the mean of the contemporaneous ratio and a forward lag. It is demeaned with respect to the industry average; Log assets measures firm size; Columns 2, 4 and 6 are two stage least squares regressions of table 3 where Import Penetration (and its interaction with the hierarchy dummies) are instrumented with exchange rates and tariffs. See data appendix for further details and sources.

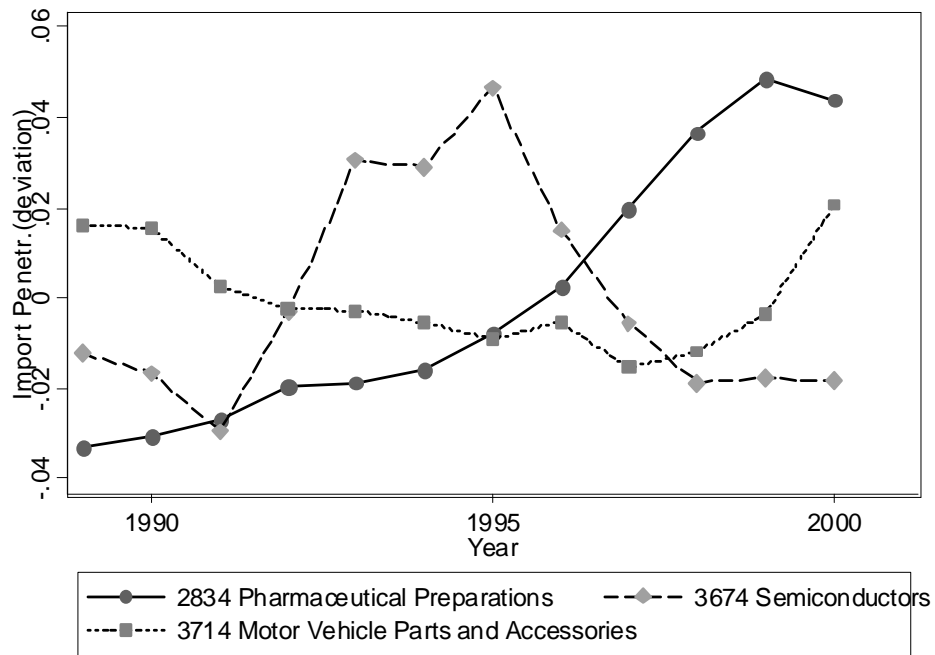Figure 1: Import Penetration (deviation from mean) in 3 selected industries

- 2834 Pharmaceutical Preparations
- 3674 Semiconductors
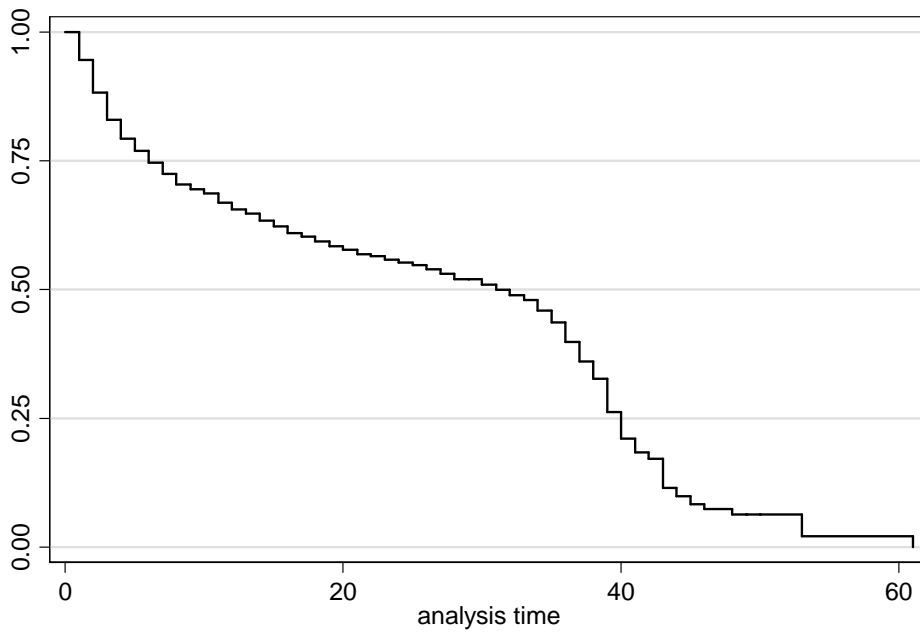- 3714 Motor Vehicle Parts and Accessories

Figure 2: Kaplan-Meier Survival Estimates

Figure 3: Kaplan-Meier Survival Estimates, by import penetration

Kaplan-Meier Survival Estimates by Import Penetration

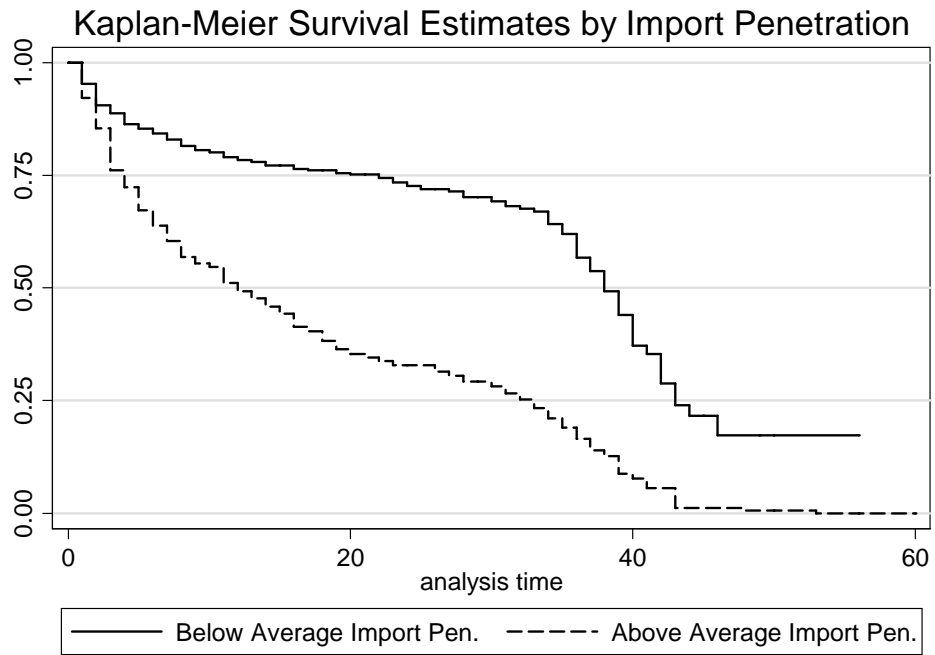Below Average Import Pen. ----- Above Average Import Pen.

Figure 4: Kaplan-Meier Survival Estimates, by predicted (IV) import penetration

Kaplan-Meier Survival Estimates by Import Penetration

Below Average iv Import Pen. ----- Above Average iv Import Pen.