Human Capitalists and the Global Division of Labor

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May 2019

Abstract

The widespread practice of equity-based compensation has transformed skilled labor from a labor input into a class of human capitalists. This paper examines the effects of globalization via improved access to foreign input markets on top earners' incentive contracts. I develop a heterogeneous firm span-of-control model in which firms choose to compensate managers with equity to alleviate agency frictions. The model illustrates that trade liberalization provokes a reallocation of compensation towards equity ownership for top earners when agency frictions depend on firm size or when top earners are compensated with stock options. Calibrating the model to micro and macro moments in U.S. and U.K. data, I illustrate that foreign input supply can account for substantial heterogeneity in compensation contracts. Ignoring the ownership of equity would result in considerable mismeasurement of the returns of globalization for highly skilled labor. Using data on equity ownership and income streams for managers of public firms in the U.S. and U.K. I then study the empirical relation between access to foreign input markets and compensation contracts for highly skilled labor. Based on international input-output tables and a shift-share instrumentation strategy that exploits variation in foreign input supply and trade costs, I find broad support for the model predictions. Improved access to foreign input markets induces a change in managerial compensation contracts. Managers of the largest firms in the economy attain higher levels of compensation and receive a larger fraction of their compensation as equity. This can explain why capital incomes are more prevalent than labor incomes for top earners in an open economy.

Keywords: Top Inequality, Incentive Contracts, Offshoring
JEL classification: L22, F14, F16, J33

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I would like to thank various seminar and conference participants at the University of Mannheim, Goethe University Frankfurt, Higher School of Economics St. Petersburg, LMU Munich (IO&Trade), TU Munich (Finance), IfW Kiel, GEABA Frankfurt, Midwest International Trade Conference SMU Dallas for helpful comments and suggestions. Financial support from the DFG - CRC TR224 is gratefully acknowledged.
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1 Introduction

Many industrialized economies have witnessed sharp increases in labor and capital incomes at the top of the income distribution over previous decades. Among others, Atkinson et al. (2011) and Alvaredo et al. (2013) document rising top income shares in Anglo-Saxon economies over the last thirty years. Compared to other employees, these top earners earn a larger fraction of their earnings from capital incomes instead of labor incomes.[1] This distinguishes many top earners from a pure labor input and rather makes them partial capital owners in their employing firms.

This paper examines how access to global factor markets affects top earners' compensation contracts. The industrialized world has experienced an increasing fragmentation of production across national borders that has been driven by economic or political reforms, improvements in infrastructure or IT. While some tasks at the core of a firm's business such as management activities are typically undertaken within local headquarters, the production of various inputs is nowadays frequently moved offshore to exploit differences in factor prices leading to productivity gains within firms.[2] The paper asks how these trade-induced productivity gains can account for a change in top earners' compensation.

I present a quantifiable theoretical framework that relates aggregate economic variables to variation in top incomes and equity ownership. The model combines firm heterogeneity with a span-of-control managerial assignment framework similar to Monte (2011) and Sampson (2014) and includes a tractable microfoundation for incentive contracts. Agents are heterogeneous in their knowledge and have multiplicative preferences for consumption and leisure. Complementarities between technology and knowledge induce positive assignment between managers and technological efficiencies, determine firm productivity and produce a superstar effect in the spirit of Rosen (1981) and similar to the literature on the cross-section of CEO pay.[3] In equilibrium, the occupational choice between management and production work is endogenous which gives rise to increasing returns to scale at the firm level as in Krugman (1979). The opportunity to import production inputs from abroad acts as a productivity shifter for importing firms further increasing the returns on managerial knowledge at the top of the firm size distribution. I endogenize the composition of compensation into labor incomes and capital ownership by introducing a tractable moral hazard problem that borrows from Edmans et al. (2009). In equilibrium, the total level of expected compensation that each individual manager obtains is determined by market equilibrium forces coming from product and labor markets. Incentive contracts then endogenize how the expected compensation is split into equity ownership and labor income. Managers are partly compensated with equity that underlies fluctuating market value in order to forego private shirking benefits. In assuming that private benefits increase in firm size I impose that agency frictions increase with the size of the firm. Additionally, when equity is paid in the form of stock options, growing firms might want to increase managerial equity ownership since a larger underlying

[1] For example, Piketty and Saez (2003) report a declining share of labor incomes and an increasing share of capital incomes as one moves up within the top decile and the top percentile of the income distribution.

[2] See Baldwin (2016), Baldwin and Lopez-Gonzalez (2015), Hummels et al. (2001), Johnson and Noguera (2012) or Timmer et al. (2014) among others for evidence on the increasing international fragmentation of production.

[3] See Gabaix and Landier (2008), Terviö (2008) or Baranchuk et al. (2011).

firm value would ceteris paribus reduce the elasticity of the option value and thus reduce the strength of incentives. In the cross section, the model thereby predicts that managers employed by larger firms receive on average higher compensation levels and that their compensation comes to a larger extend in terms of equity ownership as documented by Piketty and Saez (2003).

I then study how input trade liberalization, for example induced by a drop in import prices or improvements in foreign input quality, affects compensation contracts. Following Melitz (2003), trade liberalization leads to an intra-industry reallocation of economic activity towards larger importing firms. This strengthens the superstar effect such that the expected compensation premium that managers in large firms obtain rises. Furthermore, this increase in expected compensation is accompanied by a shift of compensation within firms towards a larger share of equity and a smaller share of labor income.

In order to assess the quantitative implications of the theory I calibrate the model to match micro and macro moments in U.S. and U.K. data. I discipline the model parameters to match industry-specific import expenditure shares, the aggregate mass of active firms in the economy and CEO compensation and sales levels among top firms. As predicted by the model, I show that managers that received larger compensation levels obtain a larger fraction of that compensation from equity ownership. This positive relationship between compensation and equity ownership is prevalent in both countries and I target this functional relationship in the calibration exercise. I then compare the calibrated incentive contracts for the top 1,000 firms in the U.S. and the U.K. to incentive contracts in a counterfactual autarky situation where firms would lose all access to foreign input markets. This quantitative exercise suggests that importing foreign inputs has substantial effects on top earners' compensation. In particular, I find strong compensation effects for U.K. manufacturing managers with an income change of about one fifth. In contrast, managers in U.K. service industries are almost not affected by the counterfactual. Also in the U.S., manufacturing managers are affected the most strongly, however the quantitative effects are more homogeneous across sectors. Importantly, the counterfactual illustrates that the majority of adjustments is in changing values of equity ownership and not in labor incomes. For example, the value of equity ownership for British manufacturing managers would change by almost 30 percent while labor incomes adjust by less than 15 percent. This suggests that ignoring equity ownership would result in serious mismeasurement of the returns of globalization for high skilled labor and likely understate its effects on top inequality.

I then comprise a panel dataset on executives in U.S. and U.K. firms over the period between 2000 and 2014 to empirically analyze the implications of the model. The data is a matched employer-employee panel that follows the top management careers of more than 30,000 distinct managers employed by over 4,000 corporations. It contains information on the level of various components of labor incomes (such as salaries and bonus payments). In addition, the data contain an annual measure of a manager's wealth that is linked to the employer's equity. This equity-linked wealth measure tracks and prices the equity-linked compensation components (e.g. stock options) that a manager has earned over his previous tenure within the employing firm. The sample firms are listed in the major stock indices in the U.S. and U.K. Overall, sample firms cover 82 percent of the U.S. and 57 percent of the U.K. total market capitalization and own 49 percent of the economy-wide corporate assets in the U.S. and 74 percent of corporate assets in the U.K. The median managerial income level is more than 900 thousand $ and the median value of equity ownership equals about 3 million $. More than 80 percent of the managers in the sample are within the top 1 percent of their respective country income distribution and more than one third is within the top 0.1 percent of the income distribution. For more than 60 percent of the managers in the sample their value of equity ownership is sufficient to belong to the top 1 percent of the wealth distribution and for more than one fourth of the managers it is even enough to belong to the top 0.1 percent.[4] I document that equity-linked capital ownership quantitatively dominates annual incomes for the majority of managers in the sample and that the importance of equity ownership is increasing for managers of larger firms. Across industries, managers that are employed in more offshorable industries[5] obtain an income and an even larger equity wealth premium.

To empirically study how the access to global factor markets affects top earners' compensation contracts, I combine the manager sample with international input-output tables from the World Input-Output Database (WIOD). Variation in import shares within sectors over time allow me to analyze the effects on compensation contracts. To address potential endogeneity concerns, for example due to unobserved demand or productivity shocks, I follow a shift-share instrumentation strategy where I construct two instrumental variables. First, I construct a measure of input level trade costs. WIOD provides a time-varying measure of trade and transport margins based on the price wedge between c.i.f. and f.o.b. prices that I weight according to initial input-output coefficients. Second, I follow Hummels et al. (2014) and instrument the imports of foreign inputs with the total trade in inputs in the rest of the world, again weighted by initial input-output coefficients, to proxy for variation in global input supply. Using this shift-share instrumentation strategy, I establish three main empirical findings that broadly support the predictions of the theoretical model.

First, I find that sector level increases in the import share lead to higher top incomes on average. Variation in the expenditure share on foreign sourced inputs affects managerial incomes within an industry with an estimated semi-elasticity of about two. Finding positive income effects of global sourcing complements other studies that find positive managerial income effects of trade integration, studying different channels of globalization. Cuñat and Guadalupe (2009), Ma and Ruzic (2019) and Keller and Olney (2017) document that increasing market size and import competition have contributed to higher executive incomes and income elasticities.

Second, the paper moves beyond analyzing income effects and studies the effects on equity wealth ownership. Using the measure of managerial equity ownership, I study how equity wealth responds to variation in import shares. I find that the value of equity ownership responds more than twice as elastic to variation in importing compared to effects on incomes. In line with the model, equity wealth inequality is a relatively more important margin of top inequality caused by trade liberalization.

[4] These calculations are based on data from the World Income Database and the year 2006. Since there are no aggregate wealth data in the WID for the U.K., the wealth calculations are for U.S. managers, only.

[5] The offshorability of an industry is defined following Acemoglu and Autor (2011) and calculated for U.S. labor market data.

Interestingly, also the response of equity ownership to a trade liberalization in the calibrated model is about twice as large as the according income response. Since the value of equity ownership is directly tied to capital markets, the equity ownership channel can cause a direct surge in top inequality: while changes in firm value due to trade liberalization directly pass-through via varying stock prices into top earners' equity wealth, employees that are compensated purely with wage incomes face more rigid income adjustments. I show that the trade-induced increases in managers' equity wealth are partially reflected in stock price appreciations of their employing firms.

Third, I explore the heterogeneity of effects across firms. When imported inputs give rise to economies of scale at the firm level, trade liberalization can increase top inequality across firms as suggested by my model and also by other models of offshoring and firm heterogeneity such as Antràs et al. (2006) or Carluccio et al. (2019). Indeed, I find that positive income and wealth effects are driven by the top quintile of the sample firm size distribution.[6] While income and equity wealth is relatively inelastic to input sourcing shocks for managers at the lower end of the firm size distribution, I estimate a wealth semi-elasticity of around 9.9 and an income semi-elasticity of around 4.3 at the top quintile of firms. This finding is consistent with recent evidence from Song et al. (2019) who document that substantial parts of the rise in U.S. income inequality occurred across firms due to a widening gap of firms' employee composition. They suggest that outsourcing parts of the production process might be a relevant driver of that development. My results also coincide with the literature that links the fall of aggregate labor shares to rising between-firm reallocation (Autor et al. (2017)) and reallocation in labor income shares across skill groups (Dao et al. (2017)). When I relate the average manager's income and equity wealth response within each firm to the firms' labor expenses, I find that input sourcing shocks shift the distribution of within-firm rents. While in smaller firms labor expenses increase relative to managers' compensation, the opposite is true in larger firms.

The paper covers a question at the intersection between international, organizational and labor economics and thus relates to different strands of these literatures. First, the paper relates to empirical studies on top income inequality and executive compensation. Piketty and Saez (2003), Atkinson et al. (2011) and Alvaredo et al. (2013) document a general trend of increasing top 1% income shares for Anglo-Saxon countries and other economies since the 1980s or even earlier with the exception of the Great Recession period (see Piketty and Saez (2013)). Bakija et al. (2008) report that top managers roughly account for one third of the top 1% in the U.S. income distribution based on income tax return data such that their incomes comprise a relevant fraction of top income inequality in general. Talent assignment models by Gabaix and Landier (2008), Edmans et al. (2009), Falato and Kadyrzhanova (2012), Baranchuk et al. (2011) and Terviö (2008) study the relation between CEO pay and product markets. Since these models either consider an exogenous firm mass or an exogenous demand side, they deliver only limited information about responses of the executive pay structure to aggregate shocks in the economy. By introducing the assignment and a principal-agent problem into an industry equilibrium framework, my model can explain how the cross-section of managerial compensation

[6] Approximately, these firms had annual sales of more than 500 million \$ (U.K.) or 3,000 million \$ (U.S.) in the first three sample years 2000-2002 or more than 7 thousand (U.K.) , respectively 14 thousand (U.S.) employees.

contracts responds to deeper international integration.

Cuñat and Guadalupe (2009), Keller and Olney (2017) and Ma and Ruzic (2019) use ExecuComp data to study how executive compensation in the United States is shaped by trade integration. This paper intends to expand these empirical findings by bringing the composition of top earnings into focus. Monte (2011) and Sampson (2014) develop general equilibrium assignment models with firm heterogeneity to explain the role of trade on the dispersion of incomes across firms. My theoretical framework extends their approaches by including incentives contracts to endogenize managerial equity ownership.

This paper also relates to studies that explore the role of intermediate input trade for various labor market outcomes. Grossman and Rossi-Hansberg (2008) propose a theory of global production and investigate how falling offshoring costs affect factor prices. They show that one might expect a widening wage gap between managers and production workers if production jobs are also the most offshorable ones.[7] Feenstra and Hanson (1999) report that trade in inputs explains around 40 percent of the wage gap between high and low skilled U.S. workers between 1979 and 1990. Becker et al. (2013) find that offshoring shifted the wage bill towards more non-routine and more interactive tasks in German firms. Furthermore, Hummels et al. (2014) and Baumgarten et al. (2013) report varying wage effects of offshoring across occupational task characteristics for Denmark, respectively Germany. Offshoring has the largest positive wage effect on occupations that are intensive in communication and language, followed by social sciences and maths. Notably, all these skills are categorical for managerial occupations.

A separate literature has examined how trade affects the organization of firm management. Since the choice of incentive contracts is a margin of organizational adjustment, I also relate to that literature. Previous papers have studied different margins of organizational adjustment that adjust to changing trade expose such as hierarchical layers (Caliendo and Rossi-Hansberg (2012), Antràs et al. (2006, 2008)), management practices (Bloom et al. (2018), Chen (2019)), corporate governance (Schymik (2018)) and decision autonomy (Marin et al. (2018)).

The paper is organized as follows. In the next section, I present the theoretical framework and characterize the equilibrium assignment and the managerial compensation profile across firms and discuss the impact of a deeper international integration on compensation contracts. Then I discuss how the model can be calibrated to fit moments in the U.S. and the U.K. economy and present results of an counterfactual move to autarky. In Section 4, I present the data and empirical analyses. Section 5 concludes.

[7] To the extent that offshoring is associated with reductions in consumer prices, production workers may still benefit from increases in real wages.

2 The Model

This section develops a quantifiable model that relates firm heterogeneity to the cross-section of managerial incomes and equity ownership. The model rationalizes heterogeneous income and equity wealth effects of input sourcing across and within firms. I begin by discussing preferences and endowments, production and input sourcing. I then provide a microfoundation of managerial incentive contracts based on a stylized agency problem within firms. Then I close the model by clearing the labor market and endogenizing firm entry and discuss comparative statics of input trade liberalization.

2.1 Preferences and Endowments

I consider an industrialized economy that accommodates a set of industries I and is endowed with a mass of agents $\sum_I N_i$ and blueprints $\sum_I Q_i$. Agents are heterogeneous in their managerial knowledge and blueprints are heterogeneous in their efficiencies. Knowledge and blueprints are industry-specific such that the mass of potential blueprints for industry $i \in I$ is Q_i and the mass of potential managers for that industry is N_i. The efficiency of blueprints is denoted by $q \in (0, \infty)$ such that $Q_i(q) = Q_i/q$ is the measure of blueprints that are at least as good as the blueprint with efficiency q. Furthermore, agents differ in their knowledge $k \in [1, \infty)$ such that $N_i(k) = N_i/k$ is the measure of agents with knowledge level k or higher. Agents that do not choose management occupations can take up production employment in any sector and production employment is independent from managerial knowledge levels. The occupational choice between production and management will be endogenized later. Agents' preferences are characterized by a multiplicative utility function over consumption and leisure:

$$U = C \cdot G, \tag{1}$$

where C denotes utility arising from consuming varieties across industries and G denotes utility gains from leisure. Consumption utility C is a Cobb-Douglas utility function that aggregates c.e.s. sub-utility functions over individual varieties across industries:

$$C = \prod_{i=1}^{I} \left[\left(\int_{\omega} q_{\omega}^{\frac{\sigma-1}{\sigma}} d\omega \right)^{\frac{\sigma}{\sigma-1}} \right]^{\beta_i}, \tag{2}$$

where q_ω is the consumption amount of an individual variety, β_i is the expenditure share on varieties from industry i such that $\sum_i \beta_i = 1$ and σ is the constant elasticity of substitution across varieties. The indirect utility associated with (1) is

$$W(k) = r_i(k) P^{-1} \cdot G, \tag{3}$$

where $r_i(k) P^{-1} = E[w_i(k)] P^{-1}$ is the expected real compensation of an agent with knowledge k employed in industry i. Note that the realized compensation $w_i(k)$ might differ from the expected compensation $r_i(k)$ since agents in management occupations will be partially compensated with equity that underlies fluctuating market value. I introduce the specific form of the leisure function G and the distinction between expected and realized compensation when I discuss the agency problem within firms.

2.2 Production and Firm Entry

Consider production and firm entry in industry i with a monopolistically competitive product market. Firms originate from the matching of a manager to a blueprint and the employment of production workers to produce the firm's output. Similar to Chaney (2008), the mass of blueprints comprises the mass of potential entrants into the industry. I assume that all blueprints are owned by a mutual fund (the principal) which maximizes the individual profits of each firm and redistributes them equally across the population. The productivity of each firm is determined by the blueprint-manager match quality and the firm's importing status. I assume that there are complementarities between managerial knowledge k and blueprint efficiency q such that more knowledgeable managers have a comparative advantage in running firms with higher efficiency. Furthermore, importing intermediate tasks increases firm productivity by $Z_{iS} \geq 1$ which will be specified in the following subsection. To sum up, the unit costs of production for a firm with a blueprint q and a manager with knowledge k are given as follows:

$$\varphi(k,q) = \begin{cases} \frac{w}{Z_{iS} k^{\mu_i} q^{\kappa_i}} & \text{if importer} \\ \frac{w}{k^{\mu_i} q^{\kappa_i}} & \text{if domestic,} \end{cases} \tag{4}$$

where I use the labor wage rate w as the numéraire such that $w = 1$. The parameters $\mu_i > 0$ and $\kappa_i > 0$ measure the influence of knowledge and technologies for firm productivity.

Firms face a demand per variety equal to $q = A_i p^{-\sigma}$, where the term $A_i = X_i P_i^{\sigma-1}$ is an aggregate shifter that captures the market size from the perspective of individual firms in the industry. Market size increases if the aggregate expenditure level on varieties of industry i ($X_i \uparrow$) or the industry price level ($P_i \uparrow$) increase. Firms charge a constant markup over their unit costs of production and obtain a profit per variety that is equal to

$$\pi(k,q) = \frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i \varphi(k,q)^{\sigma-1}. \tag{5}$$

Only firms with non-negative expected earnings will enter into the industry. The marginal firm employs the marginal manager with knowledge level $\underline{k}_i$. This firm will just break even and the marginal manager will receive an expected compensation equal to the numéraire wage. Assuming that not all firms are importers and using $q = \left(\frac{Q_i}{N_i}k\right)$ for each manager-blueprint pair (k,q) the indifference condition for the marginal firm can be stated as

$$\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i \left(\left(\frac{Q_i}{N_i}\right)^{\kappa} \underline{k}_i^{\kappa_i+\mu_i}\right)^{\sigma-1} = 1. \tag{6}$$

2.3 Input Sourcing

To model the input sourcing of production tasks I adopt the frameworks from Grossman and Rossi-Hansberg (2008) and Halpern et al. (2015). Production of one unit of output within each industry involves to perform a bundle of tasks S_i in terms of labor. A fraction of these tasks S_{iS} can come from a foreign source and the remainder of tasks S_{iH} is conducted domestically such that $S_{iS} + S_{iH} = 1$. The task bundle is assembled according to a c.e.s. technology such that

$$S_i = \left[S_{iH}^{\frac{\theta-1}{\theta}} + (B_{iS} S_{iS})^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}, \tag{7}$$

where θ is the elasticity of substitution across tasks and B_{iS} is the quality of imported tasks. Importing production tasks requires to pay fixed costs F_{iS} in terms of domestic production labor. The prices of the foreign tasks are denoted P_{iS} and the firms are price takers in foreign input markets. The price-adjusted quality advantage of foreign tasks is thus $\Omega_i = B_{iS}/P_{iS}$ and measures the advantage of a dollar spent on a foreign relative to a domestic task. The effective price of the composite bundle S stated in terms of Ω_i is then $\left(1 + \Omega_i^{\theta-1}\right)^{\frac{1}{1-\theta}}$ which means that the productivity gains from global sourcing represented by Z_{iS} are

$$Z_{iS} = \left(1 + \Omega_i^{\theta-1}\right)^{\frac{1}{\theta-1}} \geq 1. \tag{8}$$

As can be seen, Z_{iS} is increasing in Ω_i and if there is no sourcing from abroad ($\Omega_i = 0$), then Z_{iS} is equal to one. Because of imperfect substitutability of tasks, importing firms use both domestic and foreign tasks and an importer's expenditure share on foreign tasks in total expenditure on tasks equals $\frac{\Omega_i^{\theta-1}}{1+\Omega_i^{\theta-1}}$.

2.4 Compensation Levels and Assignment

Next, I endogenize the expected compensation that a manager with knowledge level k will obtain in industry equilibrium. Similar to other assignment models of managerial pay, I take the market size A_i and the mass of active firms in the industry as given here (as in Gabaix and Landier (2008), Terviö (2008), Edmans et al. (2009) or Baranchuk et al. (2011)). These will become endogenous once the model is closed. Consider the expected surplus of a firm given by equation (5). This surplus covers the compensation that accrues to the manager and the profits that accrue to the owner of the blueprint with efficiency q. The complementarity between knowledge and blueprint efficiencies which drives the positive assortative assignment is given by a positive cross derivative of that surplus ($\partial^2 \pi (k, q) / \partial k \partial q > 0$) and creates an incentive for firms with higher q to hire more knowledgeable managers.[8] Individual firms are considered to be too small to affect aggregate labor market conditions

[8] Consider the following argument to see why a positive assortative assignment arises in equilibrium. Suppose there were two technology-blueprint matches (q_1, k_2) and (q_2, k_1) that form firms in equilibrium with $q_1 < q_2$ and $k_1 < k_2$. By assigning the manager with knowledge k_1 to the firm with blueprint q_1 and the other manager with knowledge k_2 to the firm with blueprint q_2 the joint surplus could be increased. Since any competitive equilibrium is efficient, this is a contradiction.

such that each firm takes the market clearing expected compensation $r_i(k)$ as given and makes its employment decision based on $r_i(k)$. The standard assignment equation balances the marginal benefit of a higher knowledge level with the marginal increase in expected compensation:

$$\frac{\partial E\left[\pi\left(k,q\right)\right]}{\partial k}_{|q=q(k)} = r_i'\left(k\right), \tag{9}$$

and the marginal manager in the industry with knowledge level $\underline{k}_i$ must be indifferent between management or production work such that $r_i(\underline{k}_i) = 1$. Integrating (9) over the knowledge distribution and setting $r_i(\underline{k}_i) = 1$ allows to state the expected compensation of a manager with knowledge k in industry i as

$$r_i\left(k\right) = 1 + \Psi_i\left(k\right). \tag{10}$$

The term $\Psi_i(k)$ corresponds to the expected knowledge premium that managers with knowledge k obtain in industry i and is specified as follows (proven in Appendix A.1.2).

Proposition 1: *The knowledge premium $\Psi_i(k)$ that a manager with knowledge level k receives in expectation over the production wage rate can be stated as follows:*

$$\Psi_i\left(k\right) = \begin{cases} \frac{\mu_i}{\kappa_i+\mu_i}\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i\left(\frac{Q_i}{N_i}\right)^{\kappa_i(\sigma-1)}\left[\left(k_{iS}^{1-\xi_i} - \underline{k}_i^{1-\xi_i}\right) + Z_{iS}^{\sigma-1}\left(k^{1-\xi_i} - k_{iS}^{1-\xi_i}\right)\right] & \text{if } k_{iS} \leq k \\ \frac{\mu_i}{\kappa_i+\mu_i}\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i\left(\frac{Q_i}{N_i}\right)^{\kappa_i(\sigma-1)}\left(k^{1-\xi_i} - \underline{k}_i^{1-\xi_i}\right) & \text{if } \underline{k}_i < k < k_{iS}, \end{cases} \tag{11}$$

where $\xi_i \equiv 1-(\kappa_i+\mu_i)(\sigma-1) \in (0,1)$ and k_{iS} is the cutoff skill for the marginal importing firm.[9]

For all managers within the industry the knowledge premium scales with aggregate variables such as the industry-specific market size A_i, the technological intensity of the industry $\frac{Q_i}{N_i}$ and the importance of knowledge in the production process $\frac{\mu_i}{\kappa_i+\mu_i}$. Besides, there is a match-specific component to $\Psi_i(k)$ given by $k^{1-\xi_i} - \underline{k}_i^{1-\xi_i}$ for domestic firms and by $k_{iS}^{1-\xi_i} - \underline{k}_i^{1-\xi_i} + Z_{iS}^{\sigma-1}(k^{1-\xi_i} - k_{iS}^{1-\xi_i})$ for importing firms. This match-specific factor relates the knowledge level k relative to the knowledge of the marginal manager in the industry $\underline{k}_i$ and increases with the elasticity of substitution, κ_i, μ_i and Z_{iS}. Since the marginal knowledge level $\underline{k}_i$, the importer cutoff k_{iS} and the industry-specific market size A_i are equilibrium objects, the expected compensation stated in equation (11) can be regarded as the partial equilibrium expression of expected compensation.

2.5 Microfoundation of Managerial Incentive Contracts

In this subsection I introduce a moral hazard problem with tractable incentive contracts that specify the split of the expected compensation $r_i(k)$ into labor income and equity ownership. A manager's effort is modeled as a binary choice between high effort $\overline{e}$ or low effort $\underline{e}$. Without loss of generality I

[9] If $(\sigma-1)(\kappa+\mu) > 1$ the firm productivity distribution would be too skewed towards highly efficient firms such that the industry price index would converge to zero.

normalize these effort levels to be $-1 < \underline{e} < \overline{e} = 0$. The firm's realized ex post surplus Π is

$$\Pi = \eta\,(1+e)\,\pi, \tag{12}$$

where $\eta \geq 0$ is an idiosyncratic stochastic noise term with a mean of one and $e \in \{\underline{e}, \overline{e}\}$ such that high effort implies $E\left[\Pi|\overline{e}\right] = \pi$. This model entails a broad definition of effort as any action that increases firm surplus but imposes personal costs for the manager. For example, e could be interpreted as the choice of a strategy where $\overline{e}$ is the first best strategy and $\underline{e}$ yields private benefits to the manager. The term $\eta\,(1+e)$ corresponds to the mass of varieties that the firm produces based on the chosen strategy where each variety generates a profit stream of π. Since the effort choice has a proportional effect on firm value, the agency model is particularly well suited in capturing decisions that are proportionally to firm value. Firms offer contracts that induce high effort $\overline{e}$ and need to incentive managers in order to be willing to forego leisure gains from low effort. I specify the impact of leisure on utility G as follows:

$$G = \frac{1}{1+\lambda(e,\pi)} \geq 1, \quad \lambda(e,\pi) \in [0,1)\,, \tag{13}$$

where the parameter $\lambda(e,\pi)$ are private managerial benefits. I make the following assumption regarding agency frictions arising from private managerial benefits.

Assumption 1: *Private managerial benefits weakly increase with firm size* $\frac{d\lambda(\underline{e},\pi)}{d\pi} \geq 0$ *such that agency frictions are more severe in larger firms. High effort* $\overline{e}$ *does not entail private benefits such that* $\lambda(\overline{e},\pi) = 0$, $\forall \pi$.

The multiplicative form of the utility function (1) implies that leisure and compensation are complements. Due to this complementarity, relatively large firms need to provide sufficient incentives for their manager to induce high effort $\overline{e}$ since low effort $\underline{e}$ would increase the manager's utility by a fraction of $\lambda(e,\pi)$. I abstract from any agency frictions in production work by assuming that production worker effort is perfectly contractable such that $\lambda = 0$ and $G = 1$ for all agents that become production workers. Contracts cannot be specified on the effort choice itself and firms offer contracts that induce high effort $\overline{e}$.

A manager's compensation package is comprised of a labor income f and equity ownership that is modeled as a call option portfolio on the firm's realized surplus. The realized value of this equity ownership is $V\,(\Pi)$ and a manager's realized compensation $w_i\,(k)$ can be stated as

$$w_i\,(k) = f + V\,(\Pi)\,. \tag{14}$$

Since all agents are risk-neutral, in principle there exists a continuum of incentive-compatible contracts that induce $\overline{e}$. I restrict attention to that particular contract which is incentive-compatible, satisfies individual rationality and minimizes the equity ownership component within the compensation package following Edmans et al. (2009).[10] The optimal contract is characterized as follows (proven in Appendix A.1.4):

[10] These contracts would be optimal under any nonzero risk aversion.

Proposition 2: *The incentive-compatible contract with the smallest possible equity ownership that satisfies individual rationality depends on the manager's expected compensation level $r_i(k)$ and the expected surplus of the firm π. It compensates the manager with a fraction $\triangle$ of the expected compensation $r_i(k)$ in equity and pays the remainder $(1-\triangle)r_i(k)$ in labor income:*

$$\begin{aligned} \textit{Equity Ownership} &= E[V(\Pi)] = \triangle r_i(k), \\ \textit{Labor Income} &= f = (1-\triangle)\, r_i(k). \end{aligned}$$

The fraction of equity ownership in total compensation $\triangle$ is given by

$$\triangle = \frac{\lambda(e,\pi)}{|\underline{e}|^{\varepsilon_V}} \in (0,1],$$

where ε_V denotes the elasticity of the equity portfolio with respect to firm surplus π.

The equity ownership share in compensation $\triangle$ is large when private managerial benefits are high ($\lambda(\underline{e},\pi)\uparrow$), when low effort has small effects on managerial compensation ($|\underline{e}|\downarrow$) or when the equity portfolio is inelastic to changes in firm surplus ($\varepsilon_V \downarrow$). The following Proposition relates differences in expected compensation to variation in the equity ownership share in compensation and firm profits (proven in Appendix A.1.5).

Proposition 3: *There is a positive relationship between firms' surplus π and the fraction of managerial equity ownership in total compensation $\triangle$. When managers in larger firms obtain larger knowledge premia their fraction of managerial equity ownership in total compensation $\triangle$ is also larger.*

Intuitively, there are two channels of adjustment for the equity ownership share in compensation $\triangle$ when firms become larger. First, increases in firm surplus also raise private managerial benefits. In order to keep the compensation contract incentive compatible, a larger fraction of the compensation package needs to be tied to the firm value. Second, when the firm surplus increases and managers are compensated with stock options, the value of these options becomes less elastic. To keep the compensation contract incentive compatible, more additional equity compensation is required.

2.6 Closing the Model

I close the model by clearing labor markets and ensuring that no firm with negative expected profits enters the industry. Relating the profit per variety for the zero cutoff firm and the profit gains per variety for the marginal importing firm allows to write the importing cutoff k_{iS} as a linear function of the zero earnings cutoff $\underline{k}_i$:

$$k_{iS} = \left(Z_{iS}^{\sigma-1} - 1\right)^{-\frac{1}{1-\xi_i}} F_{iS}^{\frac{1}{1-\xi_i}} \underline{k}_i. \tag{15}$$

For those firms that employ managers above knowledge level k_{iS} in industry i the decision to source tasks from abroad will be profitable. Using (15) the industry price index P_i can be stated as

$$P_i = \frac{\sigma}{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{-\kappa_i}\left(\frac{\xi_i}{N_i}\right)^{1/(\sigma-1)}(1+\delta_i)^{\frac{1}{1-\sigma}}\,\underline{k}_i^{\frac{\xi_i}{\sigma-1}}. \tag{16}$$

The term δ_i is an index of trade integration with $\delta_i \equiv \left(Z_{iS}^{\sigma-1}-1\right)^{\frac{1}{1-\xi_i}} F_{iS}^{-\frac{\xi_i}{1-\xi_i}}$ which increases with Z_{iS} and falls with F_{iS}. Plugging the industry price index into (6) and rearranging terms yields the zero earnings cutoff condition for industry i which can be stated as

$$X_i(\underline{k}_i) = \frac{\sigma N_i\,(1+\delta_i)}{\xi_i}\underline{k}_i^{-1}. \tag{17}$$

This zero earnings cutoff pins down the number of firms and the knowledge level $\underline{k}_i$ of the marginal manager in industry i for a given nominal industry GDP X_i. The zero earnings cutoff condition $X_i(\underline{k}_i)$ is negatively sloped since a larger nominal industry GDP X_i translates into higher firm revenues and to restore zero earnings for the marginal firm, the cutoff knowledge level $\underline{k}_i$ must fall to reduce the productivity of the marginal firm in the industry. Furthermore, stronger productivity gains from input sourcing ($\delta_i \uparrow$) raise competition, lowering the price index such that for any industry GDP X_i the marginal manager must be more knowledgeable.

In order to endogenize the industry expenditure levels X_i for each individual industry and to close the model, one needs to solve for the labor market equilibrium. In equilibrium, the aggregate demand for production labor needs to match the aggregate supply of production workers. Equivalently, the aggregate income of all agents in the economy is spent on goods produced by the firms in the economy. In contrast to Melitz (2003), production worker supply is endogenous here because the supply of production workers depends on the occupational choice between managerial and production work around the cutoff knowledge level $\underline{k}_i$.[11] A firm with knowledge k employs in expectation $1/\varphi\,(k)$ units of labor per unit of output and produces q_ω output units on average. The individual firm's expected demand for production labor can be written in terms of prices:

$$\frac{q_\omega}{\varphi\,(k)} = \frac{\sigma-1}{\sigma}X_i P_i^{\sigma-1}p_\omega^{1-\sigma}. \tag{18}$$

Integrating the production labor demand for an individual firm over all active firms of the economy and adding labor demand for fixed costs of foreign input sourcing yields aggregate labor demand. Setting it equal to the aggregate supply of production labor ensures labor market clearing. This labor market clearing condition can be stated as

$$\sum_{i=1}^{I}\left(\left(\int_{\omega\in i}\frac{\sigma-1}{\sigma}X_i P_i^{\sigma-1}p_\omega^{1-\sigma}d\omega\right)+F_{iS}N_i k_{iS}^{-1}\right) = \sum_{i=1}^{I}\left(N_i\left(1-\underline{k}_i^{-1}\right)\right). \tag{19}$$

[11] Other assignment models that comprise such an occupational choice are Chen (2019), Wu (2011) or Monte (2011).

While the left hand side of (19) corresponds to aggregate demand for production labor in the economy, the right hand side corresponds to the aggregate supply of production workers. Simplifying (19) and plugging in the zero earnings cutoff conditions for each industry i yields

$$X = \sum_{i=1}^{I} \frac{\sigma}{\sigma - 1 + \xi_i} N_i, \tag{20}$$

which closes the model since (20) pins down the individual industry GDP $X_i = \beta_i X$ and given these values for X_i the cutoff knowledge levels $\underline{k}_i$ and k_{iS} are determined from (15) and (17). Thus, the equilibrium is pinned down by $I+1$ equations: the labor market clearing condition (20) and the zero cutoff earnings conditions (17) for each individual industry i.

Plugging the equilibrium effective market size A_i, the equilibrium cutoff knowledge $\underline{k}_i$ and the cutoff knowledge for the marginal importer k_{iS} into the knowledge premium (11) yields the premium that managers with knowledge k can expect to obtain in industry i on top of the numéraire wage:

$$\Psi_i(k) = \begin{cases} \frac{\mu_i}{\kappa_i + \mu_i} \left(Z_{iS}^{\sigma-1} \left(\frac{k}{\underline{k}_i} \right)^{1-\xi_i} - (F_{iS} + 1) \right) & \text{if } k_{iS} \leq k \\ \frac{\mu_i}{\kappa_i + \mu_i} \left(\left(\frac{k}{\underline{k}_i} \right)^{1-\xi_i} - 1 \right) & \text{if } \underline{k}_i < k < k_{iS}. \end{cases} \tag{21}$$

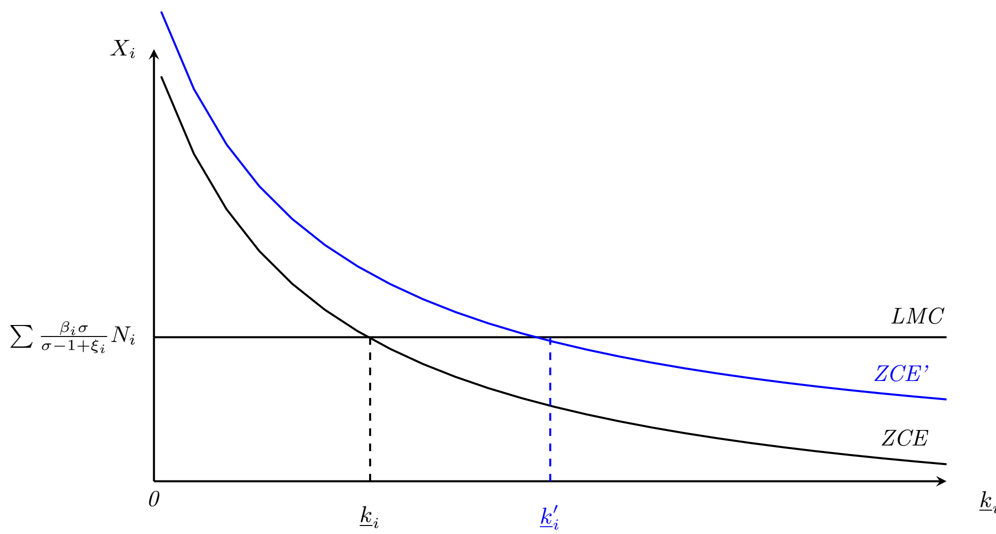
Together with Proposition 2, equation (21) relates compensation differences across managers to differences across firms driven by positive assignment. Equation (21) implies that managerial compensation inequality across firms is larger among importers since the slope of $\Psi_i(k)$ is steeper for $k \geq k_{iS}$. Furthermore, (21) also suggests that compensation levels are higher in sectors that are more integrated (higher Z_{iS}, lower F_{iS}) since managers of importing firms are expected to earn more than managers of importing firms in other sectors and since there is a larger fraction of importers in those sectors. Furthermore, Proposition 3 suggests that managerial compensation in more integrated sectors consists to a larger fraction of equity.

2.7 Adjustments to an Input Trade Liberalization

To study how compensation contracts adjust to globalization I consider a policy or technological change that raises the productivity gains from importing ($d\Omega_i > 0 \rightarrow dZ_{iS} > 0$) which is associated with an increase in the index of integration ($d\delta_i > 0$). Figure 1 illustrates the comparative statics towards the new equilibrium solution. The increase in integration shifts the zero cutoff earnings curve upwards since the larger efficiency gains from importing reduce the industry price index and thus require a larger industry GDP for the marginal firm to break even. This increase in competitive pressure leads to a higher cutoff knowledge $\underline{k}_i$ in equilibrium. Furthermore, the cutoff k_{iS} for the marginal importer decreases such that the fraction of importing firms in the economy rises. The following proposition states how compensation contracts adjust in response to globalization (proven in Appendix A.1.10).

Proposition 4: *A marginal increase in the productivity gains from importing in industry i ($d\Omega_i >$*

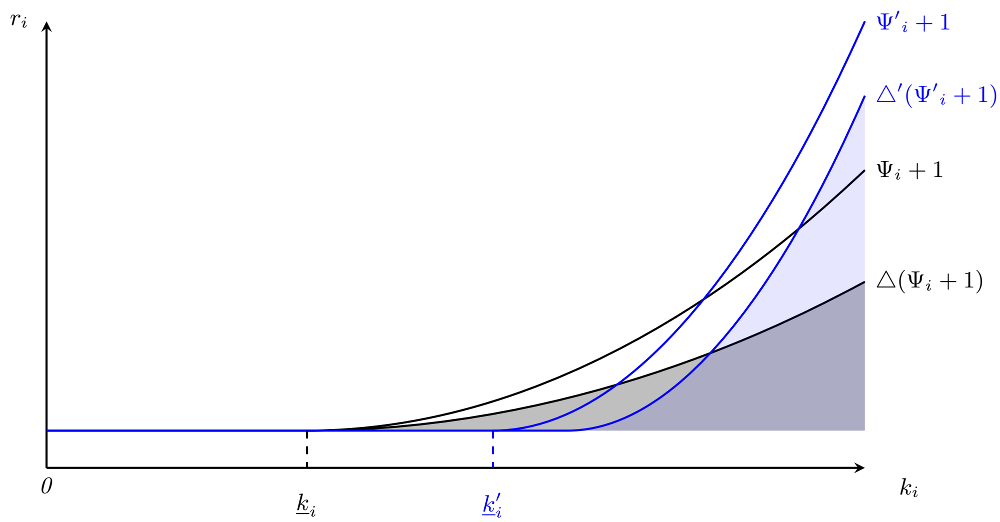
Figure 1: Industry Equilibrium Effects of Input Trade Liberalization ($d\delta_i > 0$)



$0 \to dZ_{iS} > 0$) *increases the knowledge premium* $\Psi_i(k)$ *for managers with knowledge level* $k \geq k_{iS}$ *and decreases the knowledge premium* $\Psi_i(k)$ *for managers with knowledge level* $k < k_{iS}$. *Since globalization increases the size of importing firms and decreases the size of domestic firms, the fraction of managerial equity ownership in total compensation* $\triangle$ *increases in importing firms and falls in domestic firms.*

Intuitively, international integration affects compensation contracts via three adjustments. First, there is a productivity effect that is caused by the reduction of marginal costs that importing firms face which raises the value of managerial knowledge. Second, there is a selection effect that is caused by tougher competition and lower price levels. This effect reduces firm surplus and income levels and forces some managers of relatively small firms out of the industry. Lastly, there is the within firm channel discussed in subsection 2.5 which affects the composition of compensation into income streams and equity ownership. According to Propositions 2 and 3, those managers that are employed by firms that benefit from globalization obtain a larger fraction of equity ownership $\triangle$. Vice versa, those managers whose employers shrink in response to globalization obtain a smaller fraction of equity ownership in compensation. Figure 2 depicts the adjustments of incentive contracts in response to input trade liberalization across firms. While agents below $\underline{k}_i$ select into production occupations earning the numéraire wage, the expected compensation level $\Psi_i(k) + 1$ increases with k above $\underline{k}_i$. Additionally, the fraction of equity ownership in total compensation $\triangle$ increases with k. Globalization increases compensation inequality due to the productivity and the selection effect. Equity ownership inequality gets more pronounced than labor income inequality since both, $\triangle$ and $\Psi_i(k)$ increase with firm size.

Figure 2: Input Trade Liberalization, Knowledge Premia and Equity Ownership



3 Quantitative Analysis of the Model

In this section, I calibrate the model and provide a counterfactual analysis. The aim of this quantitative exercise is to study how a counterfactual move to autarky would affect top earners' compensation contracts. I use the quantitative exercise to explore changes in labor incomes and equity ownership. This exercise illustrates how an exclusive focus on top incomes would understate trade-induced top inequality by neglecting the effects on equity ownership.

3.1 Calibration

I specialize the model for the U.S. and the U.K. economy in the year 2006 and distinguish between three broad sectors i: manufacturing, services and all other economic activities. The quantitative exercise requires values of the following set of parameters: σ, θ, $\triangle$, N_i, μ_i, κ_i, β_i, Z_{iS}, F_{iS}. For the values of σ and θ I use reference values from the literature. I set the elasticity of substitution across varieties to 2.29 for the U.S. and to 2.38 for the U.K. based on median elasticities reported by Broda and Weinstein (2006).[12] The elasticity of substitution between domestic and foreign inputs is set to 4.006 based on estimates in Halpern et al. (2015). To obtain β_i, I rely on the WIOD socio-economic accounts and calculate expenditure shares for each sector i from the data.

In order to model the relation between the fraction of equity ownership in total compensation $\triangle$ and the knowledge premium Ψ_i, I fit the values B_1-B_3 of the following exponential function:

$$\triangle \hat{=} \frac{B_2 \Psi_i^{B_3}}{B_1 + B_2 \Psi_i^{B_3}}.$$

[12] See http://www.columbia.edu/~dew35/TradeElasticities/TradeElasticities.html for the data.

The remaining parameters μ_i, κ_i, N_i, Z_{iS}, F_{iS} are calibrated to match 16 micro and macro moments for the U.S. and the U.K. economy. The macroeconomic moments that the calibration targets are the expenditure share on imported inputs in each sector and the total mass of firms in the economy.[13] For the remaining microeconomic moments I focus on the 500 largest firms within each economy[14] and match the logarithm of the 10th, 50th and 90th percentile of the knowledge premium and the logarithm of the 50th percentile of firm sales within each sector for this group of firms. Since individual knowledge levels k and firm blueprints q are unobservable, I restate the terms for the knowledge premia and firm sales as a function of each individual firm's market share which I can observe in the data.[15] All these moments are expressed in units of the country-specific average (numéraire) wage rate that I compute from the WIOD socio-economic accounts by dividing the economy-wide compensation of employees by total employment.[16]

The calibration searches over the parameter space for parameter values that match the discussed moments using a weighted sum of squared relative differences between the model and the data as a loss function. Since the counterfactual exercise will consider the switch to an autarky situation I want to ensure that the calibrated expenditure shares on imported inputs match the data well in order to consider a realistic degree of openness in the counterfactual. I do so, in giving these moments a hundredfold weight compared to the other targeted moments. To search for the parameter values, I first use a simulated annealing algorithm[17] and then, starting from the parameter set suggested by the algorithm outcome, I run a minimization limited BFGS algorithm that incorporates parameter bound constraints.

I list the calibrated parameter values in Table 1. Table 2 presents the model and data moments as well as their percentage deviations from each other. Since the calibration puts a large weight on the expenditure shares on imported inputs, the calibrated import shares match the data closely within less than half a percent deviation for either sector and country. Also the mass of active firms is matched closely within 0.2% for the U.K. and -5.0% for the U.S. economy. The deviations of the calibrated knowledge premia from the data vary across percentiles, sectors and countries but are all within 15% deviation or less. The sales of the median firms in the top 500 is calibrated fairly closely for the U.K. with less than 1.5% deviation from the data and somewhat less precise for the U.S. with a bit less than 10% deviation from the data moments. Figure 3 plots the fit between observed and calibrated equity ownership shares $\triangle$ for both countries. A correlation coefficient for the calibrated and observed equity ownership shares is 0.73 for the U.K. and 0.63 for the U.S. economy. The R-squared is 0.54 for the U.K. and 0.40 for the U.S.

[13]Statistics on the total number of firms in each economy are obtained from the Census Statistics of U.S. Businesses (SUSB) for the U.S. and the UK Office for National Statistics publication "UK Business: Activity, Size and Location - 2006" (Section B1.1) for the U.K. The expenditure share on imported inputs is obtained from WIOD data.

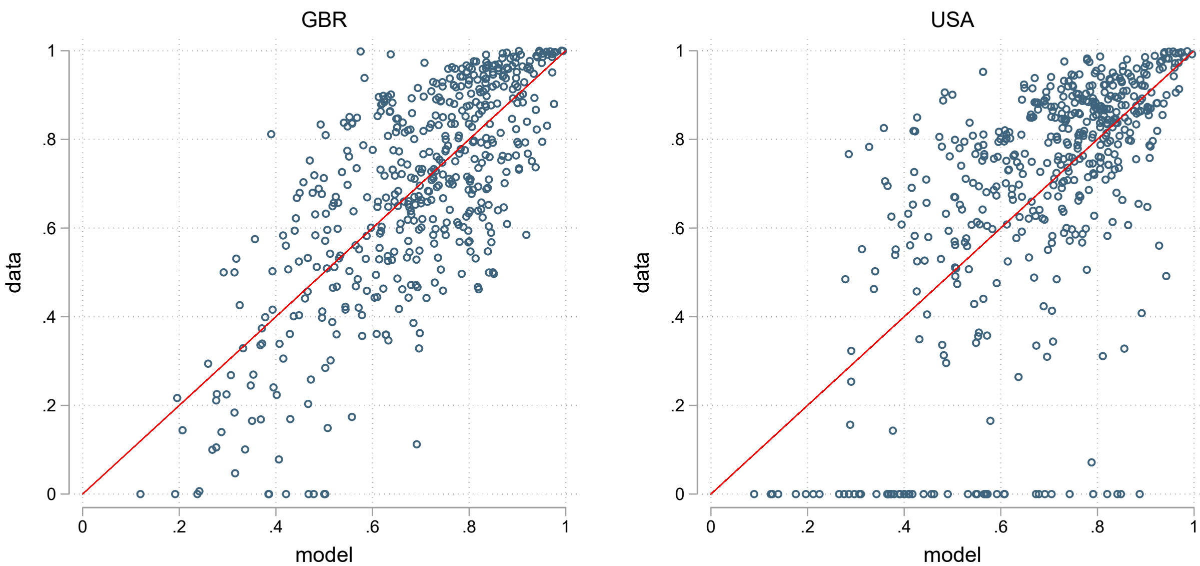
[14]Firm size is based on sales in 2006 and conditional on observable CEO compensation and employment. Firm data come from Compustat North America for U.S. firms and Compustat Global for U.K. firms. CEO compensation is obtained from ExecuComp for the U.S. and BoardEx for the U.K. In Subsection 4.1 of the Empirical Section, I discuss the data in more detail.

[15]See Appendix B.1 for details.

[16]$w = \frac{\sum_i \texttt{COMP}_i}{\sum_i \texttt{EMP}_i}$

[17]For this algorithm, I use the "basin-hopping" routine in Scipy Python.

Figure 3: Equity Ownership in the Model and the Data



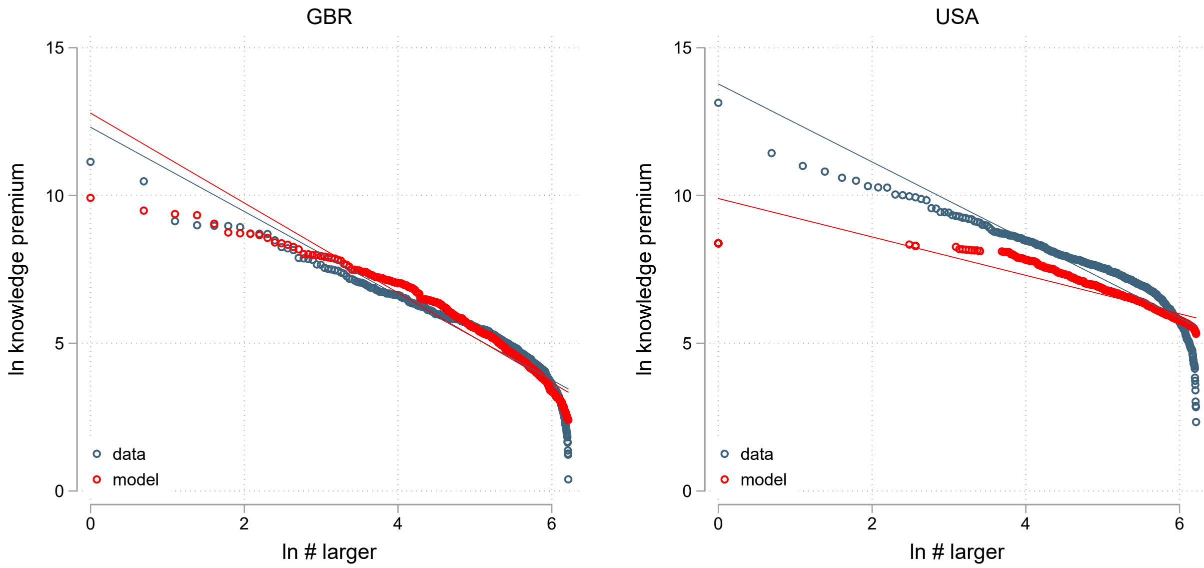
Notes: The Figure shows scatter plots of calibrated versus observed equity ownership shares $\triangle$ for the U.K. (left graph) and the U.S. (right graph).

With the help of Figure 4 I evaluate how well the calibration exercise fits the power law of knowledge premia suggested by the data. Note that the shape parameter of the CEO pay distribution was not targeted in the calibration exercise itself. Similar to what other researchers have done to illustrate the shape of the firm size distribution (see e.g. Luttmer (2007)), the Figure plots the log knowledge premium and the log number of firms where CEOs obtain a larger premium. I do this for the observed data (in blue) and the calibrated outcomes (in red). For the U.K. economy, the shape of the observed and calibrated distributions fit extremely well. In the calibration I obtain a slope of -1.52 which is backed by a slope of -1.43 in the data. For the U.S. economy, the fit is a bit less neat, which is driven by a kink in the observed shape at the right tail of the distribution (i.e. for lower paid CEOs) and some outliers at the left tail. The shape of the calibrated and observed distributions fit much better for the mid of sample CEOs. When dropping the top and bottom 50 observations the shape parameter for the knowledge premium becomes more comparable with -1.03 in the calibrated version and -1.30 in the data.

3.2 A Counterfactual Move to Autarky

To illustrate the quantitative implications suggested by the model mechanism I consider how a counterfactual move to autarky, i.e. letting $Z_{iS} \to 1$ and/or $F_{iS} \to \infty$ would affect the compensation contracts of top earners in a set of large firms. For this counterfactual exercise, I consider the sample of firms the top 1,000 firms within each economy. Using the calibrated values and the observed market

Figure 4: Shape of the Knowledge Premium Distribution in the Model and the Data



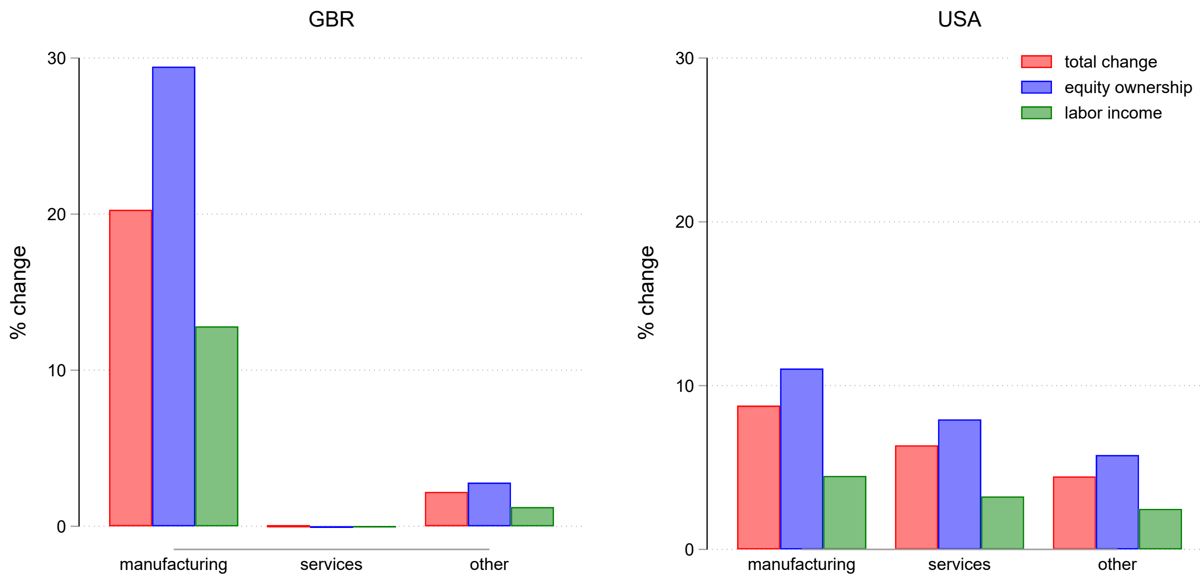
Notes: The Figure depicts the shape of the knowledge premium distribution $\Psi_i(k)$ for the U.K. (left graph) and the U.S. (right graph).

shares of each firm in the year 2006, I back out the knowledge levels k for each firm and then study how a move to autarky would affect total managerial compensation and its individual components equity ownership and labor income. These backed out knowledge levels k are all above the importer cutoff k_{iS}. The counterfactual move to autarky corresponds to a change of the expenditure share on imported inputs of 28.1 (manuf.) / 13.7 (serv.) / 15.4 (oth.) percentage points for the U.K. and of 17.6 (manuf.) / 5.3 (serv.) / 10.1 (oth.) percentage points for the U.S.

Figure 5 shows the average changes of total compensation (red bars) and then the changes of equity (blue bars) and labor incomes (green bars), individually. It plots these as predicted compensation changes as one moves from autarky towards the situation in 2006. In Figure 6, I plot the counterfactual effects for individual firms across sectors. As predicted by the model, a larger fraction of compensation changes comes from variation in equity ownership. The counterfactual exercise suggests strong compensation effects for managers of U.K. manufacturing firms with an income change of about 20 percent. In contrast, managers in U.K. service industries are almost not affected by the counterfactual. The effects on managers in the other industries in the U.K. are somewhat smaller than in manufacturing. The rise of equity ownership by 2.8 percent and an increase of labor incomes by 1.2 percent translate to a combined increase in compensation of 2.2 percent. In the U.S. calibration, the quantitative effects are more homogeneous across sectors. However, with an average 8.8 percent increase in total compensation manufacturing managers are also here affected more strongly than managers from other sectors. Importantly, the counterfactual illustrates that the majority of adjustments comes from changing values of equity ownership rather than from labor income adjustments.

Throughout both countries and all sectors, the value of equity ownership adjusts approximately twice as elastic compared to managerial labor incomes. This suggests that ignoring equity ownership would result in serious mismeasurement of the returns of globalization for highly skilled labor and likely understate its effects on top inequality.

Figure 5: Counterfactual Effects on Total Compensation, Equity Ownership and Labor Incomes



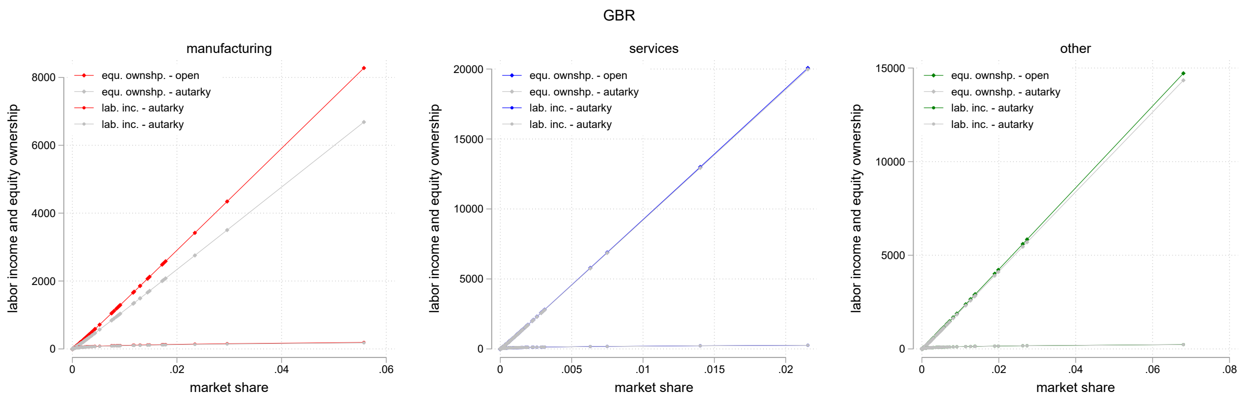
Notes: The Figure considers the effects of a counterfactual autarky compared to levels of openness in 2006. It depicts percentage increases of average total compensation (red bar), equity ownership (blue bar) and labor incomes (green bar) arising from shifting to the level of importing in 2006 coming from autarky for the U.K. (left graph) and the U.S. (right graph).

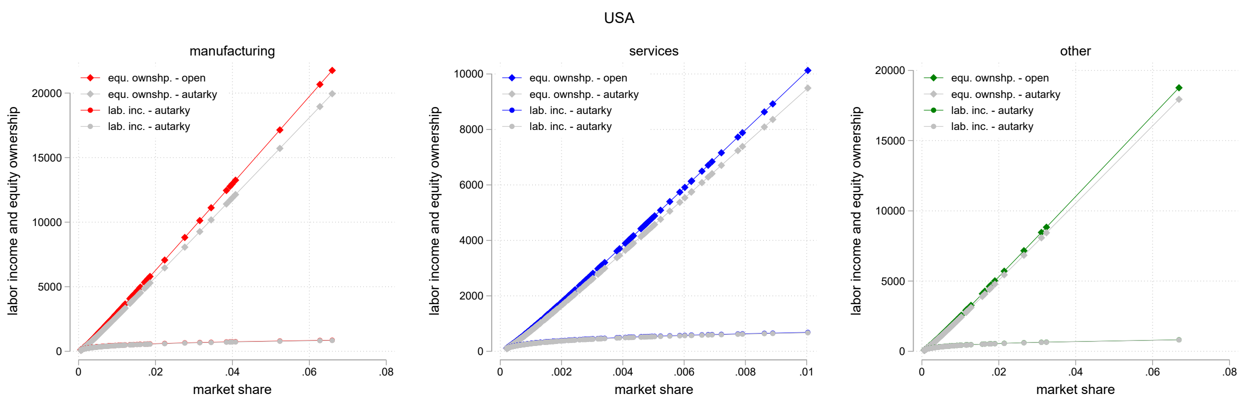
4 Empirical Analysis

In this section I study empirically how easier access to foreign factor markets affects top earners' compensation contracts. I employ a matched manager-firm panel dataset that contains information on the compensation structure and equity-linked wealth of individual managers and link these to variation in sectoral input imports. To address the endogeneity of sectoral input imports I use a shift-share instrumentation strategy to identify exogenous shifts in input importing.

Figure 6: Counterfactual Effects on Equity Ownership and Labor Incomes Across Firms

(a)





(b)

Notes: The Figure considers the effects of a counterfactual autarky compared to levels of openness in 2006. It depicts levels of equity ownership and labor incomes across firms for the level of importing in 2006 and an autarky situation.

4.1 Data and Descriptive Statistics

4.1.1 Data on Managers

The empirical analyses rely on individual level data on incomes and equity ownership for managers of publicly quoted firms in the U.S. and the U.K. spanning from 2000 until 2014. While data on managers employed by U.S. firms is obtained from S&P Compustat ExecuComp, I obtain information on managers employed by British firms from BoardEx. BoardEx is a British business intelligence company that collects details on remuneration and biographical information on business leaders across the world. Both data sources consolidate public domain information concerning the executives and senior managers of publicly quoted and large private companies. The majority of information from both data providers is collected from regulatory entities. These are the RNS (Regulatory News Service), the London Stock Exchange and Companies House for the U.K. and SEC (Security Exchange Commission) filings, the NASDAQ or NYSE for the U.S. firms. Additionally, data is collected from annual reports but also from corporate press releases or third party sources providing bibliographical information.

Both data sources contain information on direct monetary compensation and in some cases also its individual components such as salary, bonuses or other incentive payments. Since it is often difficult to distinguish these side payments from regular incomes I will treat the total sum of these monetary incomes as labor income throughout the empirical analyses. In addition, both databases contain information on equity-linked parts of compensation over a manager's employment duration within the firm. These equity-linked compensation parts are mostly option grants but also include direct stock transfers and long-term incentive or retirement plans that are tied to the employer's stock price. Using information on stock prices, expiry dates and option strike prices it is possible to individually price these equity-linked components using Black-Scholes formula. Aggregating the total value of previously obtained equity-linked compensation delivers a measure of equity-linked wealth for each individual manager for each year in the sample. While BoardEx provides information on managerial equity-linked wealth data directly, I obtain managerial equity-linked wealth data based on ExecuComp using the calculation methods from Coles et al. (2006). These calculated values of equity wealth are my obtained measure of equity ownership.

Altogether, the panel includes more than 30,000 distinct managers employed by over 4,000 corporations. About 10,000 of these managers are employed by British companies while the remaining 30,000 are employed by companies in the U.S. Compared to World Bank data, the sample firms cover 82 percent of the U.S. and 57 percent of the U.K. market capitalization of listed companies. Compared to total country-wide assets from KLEMS data, the sample firms own 49 percent of corporate assets in the U.S. and 74 percent of corporate assets in the U.K. The median labor income level of a sample manager is over 900 thousand $ and the median value of equity ownership equals about 3 million $. Based on data from the World Income Database for the year 2006, more than 80 percent of the managers in the sample are above the top 1 percent pre-tax national income threshold of their respective country and more than one third are above the top 0.1 percent threshold. For more than 60 percent of the U.S. managers their value of equity ownership is sufficient to belong to the top 1 percent of the wealth distribution and for more than one fourth of the U.S. managers it is even sufficient to be within the top 0.1 percent of the wealth distribution (there are no wealth information in the WID for the U.K. in 2006).

4.1.2 Firm Level and Industry Data

I match individuals in my sample to firm level information from Compustat U.S. or Compustat Global for British firms. To measure the exposure of an individual to foreign input sourcing, I then match firms to industry data from WIOD (World Input Output Database, 2016 release). The WIOD data track the flow of intermediate and final goods and services across countries and industries over time.

The data cover imports from 43 countries across 56 sectors based on ISIC Rev. 4 over the period 2000 to 2014. Industries cover all types of economic activity including agriculture, mining, construction, utilities, manufacturing and services. My measure of input imports thus aggregates imports of physical and service inputs. To obtain the indicator of intermediate importing for an individual manager during each year, I calculate the value of imported inputs relative to the value of total input consumption for each country-industry-year cell. Industries are based on the firms' primary 4-digit SIC level industry and matched to the ISIC industries in WIOD. Additionally, I construct an offshorability measure based on the task composition within occupations and the occupational composition within industries. This proxy has been suggested by Acemoglu and Autor (2011), Blinder (2009) and Bretscher (2018), is measured at the 3-digit SIC industry level and not varying over time (see Appendix C.2).

I provide selected summary statistics on managers, firms and industries in Table 3.

4.1.3 Preliminary Analyses of Compensation Contracts: Firm and Industry Characteristics

In this subsection I describe compensation outcome variables and their correlation with various firm and industry characteristics in Table 4. The first column reports the result of simple regressions using the log of total labor income as dependent variable. In column (2), I use the equity-linked part of labor income as the dependent variable (in logs). Column (3) studies correlations with the log of equity ownership and in column (4) I study the share of equity ownership in total compensation $\triangle$, i.e. the sum of equity ownership and labor incomes. I correlate these compensation outcomes with firm level characteristics such as sales, employment, capital intensity or multinational status. Additionally, I correlate the compensation outcomes with industry level characteristics such as industry offshorability, TFP and output. To calculate offshorability, I use data from the U.S. Department of Labor O*NET program on occupational task contents and the U.S. BLS Occupational Employment Statistics to calculate an industry-specific offshorability score following Acemoglu and Autor (2011).[18] In almost every respect managerial compensation is positively correlated with these firm and industry characteristics - managers have higher labor incomes and more equity ownership in larger (more sales or employment), more capital-intensive and in multinational firms. The same applies to more offshorable industries, larger and to some extent also to more productive industries. Furthermore, the share of equity ownership in total compensation $\triangle$ is positively correlated with firm size, capital intensity, offshorability, industry size and industry productivity.

[18] I use version O*NET 20.3 available from https://www.onetonline.org and the BLS OES from the year 2000. I first calculate an offshorability score at the occupation level and then aggregate at the industry level according to industry-specific employment shares of individual occupations. Higher values for offshorability indicate that there are many employees within the industry whose occupations do not involve face-to-face interaction and can be done off site. See Appendix C.2 for details.

4.2 Input Imports and Managerial Compensation Contracts

4.2.1 Empirical Strategy

While a statistical association between offshorability and top earners' income or wealth premia is informative, the following empirical analyses aim to establish a causal relationship between managerial compensation contracts and input imports. In order to measure the effects of global sourcing, I use the value of imported inputs relative to the value of total input consumption from WIOD as my measure of foreign input sourcing as in the calibration. In particular, I estimate specifications of the following type:

$$I_{mfict} = \alpha_1 \times imp_{cit} \times q_f + \Delta_{mfict} + \mu_{mf} + \mu_{ct} + \varepsilon_{mfict}, \tag{22}$$

where I_{mfit} is the measure of interest (e.g. labor income or equity ownership in logs) and the subscripts correspond to a manager m, employed by firm f, active in industry i, in country $c \in \{U.S., U.K.\}$, during year t. The regressor imp_{cit} is the expenditure share on foreign intermediates and measures the extend of global sourcing in a country-industry cell over time. In order to allow for different effects across the firm size distribution, I interact imp_{cit} with a vector of firm size quintile dummies q_f which allows me to estimate separate effects of input sourcing for each firm size quintile. I construct these time-invariant firm size quintiles by sorting firms by their sales or employment levels within each country. In order to prevent endogeneity issues driven by firms changing their position within the firm size distribution over time, I base the measure on average firm size during the first 3 sample years 2000 - 2002 to calculate q_f.[19] Alternatively, I also estimate models with the average effect of imp_{cit} across quintiles. The vector Δ_{mfict} includes control variables such as the firms' capital intensity, industry output and an industry TFP index. Furthermore, I include country-year fixed effects μ_{ct} and match-specific fixed effects μ_{mf} for manager-firm pairs.

The empirical specifications relate time-varying levels of labor income or equity ownership to time-varying industry level measures of input sourcing. The identification challenges that I am facing are twofold. First, time variation in incomes and equity within industrialized economies might affect sourcing decisions leading to reversed causality biases. Second, unobservable productivity or demand shocks will affect both, sourcing and managerial compensation leading to potential biases that can lead to over- or underestimation of the effect. To address these concerns, I construct two shift-share instrumental variables that are correlated with input sourcing but arguably exogenous to changes in managerial compensation: international trade and transport margins (ttm_{ict}) and the world export supply (wes_{ict}). I estimate five first stage regressions (one per firm size quintile) and with the two instruments I can test for an overidentified model.

Changes in transport margins capture shocks to the delivered price of imported inputs purchased by the U.S. or the U.K. To construct the ttm_{ict} instrument, I use time-varying trade and transport margins provided by WIOD. These margins are defined as the wedge between f.o.b. and c.i.f. prices

[19] I plot transition probabilities of firms across size quintiles in Table A3 of the Appendix.

and WIOD provides them at the input supplying country-industry level ($\hat{i}\hat{c}$). In order to obtain ad-valorem transport margins I divide those by export values of the input supplier $\hat{i}\hat{c}$. To calculate trade transport margins that are specific to the output country-industry pair (ic), I weight these ad-valorem transport margins according to input shares $\theta(\hat{i},\hat{c})_{2000}$ from the WIOD input-output table in the base year 2000. Finally, since input-sided transport margins are highly correlated with the output country-industry level transport margins I subtract the transport margins from the output side and obtain the ttm_{ict} instrument as the wedge between input- and output-sided trade and transport margins:

$$\begin{aligned} ttm_{ict} &= \sum_{\hat{i},\hat{c}} \theta\left(\hat{i},\hat{c}\right)_{2000} \times \frac{\text{total ttm}_{\hat{i}\hat{c}t}}{\text{total exports}_{\hat{i}\hat{c}t}} - \frac{\text{total ttm}_{ict}}{\text{total exports}_{ict}}, \\ \sum_{\hat{i},\hat{c}} \theta\left(\hat{i},\hat{c}\right)_{2000} &= 1. \end{aligned} \tag{23}$$

My second instrumental variable is the world export supply wes_{ict}, following Hummels et al. (2014). This instrumental variable aims to capture technological developments within input supplying countries. I aggregate the log value of inputs exported in the rest of the world excluding exports to and from the U.S. or the U.K., respectively. These input export values are again weighted according to the input shares $\theta(\hat{i},\hat{c})_{2000}$ in base year 2000

$$wes_{ict} = \sum_{\hat{i},\hat{c}} \theta\left(\hat{i},\hat{c}\right)_{2000} \times \ln\left(\text{total exports excluding those to/from } c_{\hat{i}\hat{c}t}\right). \tag{24}$$

4.2.2 Results

I begin by studying the average effect of input sourcing on managerial incomes. The estimated coefficient of interest corresponds to a semi-elasticity that indicates a percentage income change associated with a percentage point change in the expenditure share on imported inputs. In specification (1) of Table 5, the coefficient estimate of 1.16 suggests a positive correlation between foreign inputs and managerial incomes which is significant at the 1 percent level. In specification (2), I instrument the import share with the shift-share instrumental variables ttm_{ict} and wes_{ict}. The coefficient estimate increases to 2.00 but also the standard error increases such that significance falls to the 10 percent level. The first-stage F-statistic equals 36.08 and the null hypothesis of an overidentified model does not need to be rejected with a p-value of 0.61. Restricting the sample exclusively to CEOs in specification (3) suggests that global sourcing has smaller income effects for top earners within firms with an estimated semi-elasticity of 0.94 that is insignificantly different from zero. In specifications (4) and (5), I split the sample across both countries and find somewhat larger effects for the U.K. with coefficient estimates of 2.26 versus 1.86. The first-stage F-statistics are above 30 across all specifications and the null hypothesis of an overidentified model is never rejected, here as well.

To study the average effect of foreign inputs on the value of equity ownership I use the value of equity ownership as the dependent variable and repeat the previous specifications in all other respects in

Table 6. Compared to the estimated income semi-elasticities, I estimate larger semi-elasticities for the value of equity ownership throughout all specifications. In particular, I find a larger semi-elasticity for the U.S. subsample with an estimated semi-elasticity of 5.87 that is significant at the 1 percent level.

In a next step, I study if the income and equity effects of input sourcing vary across the firm size distribution. When there is intra-industry reallocation from improved access to foreign input markets such as in the theoretical model, an increase in global sourcing should lead to higher income premia for managers that are employed by larger firms. In Table 7 I estimate one semi-elasticity of input imports for each individual firm size quintile. While specifications (1) to (3) rely on sales-based size quintiles, specifications (4) to (6) rely on employment-based size quintiles. Specifications (1) and (4) report OLS coefficients, specifications (2) and (5) report coefficients from IV estimations and specifications (3) and (6) repeat the IV estimations but restrict the sample to the firms' CEOs. I find evidence for heterogeneous income effects across firms throughout all specifications. Although the firms in my sample are relatively large,[20] income effects of input imports are small for managers in firms within the bottom three quintiles of the firm size distribution. The estimated income semi-elasticity for managers in the second quintile of the IV estimations are even significantly negative. The upper panel of Figure 7 plots the sales-based estimates across firm size for specifications (1) to (3) and displays the effect heterogeneity across firm size. Only managers in the upper two quintiles obtain substantial income raises from a rise in input imports. Based on specifications (2) and (3), the estimated semi-elasticity for managers in top quintile firms is 4.26. This implies that a one percentage point increase in the expenditure share on imported inputs raises managerial incomes by about 4.3 percent when focusing on the top 20 percent of sample firms. The qualitative sorting of effects across firm sizes is similar when considering employment size quintiles however the estimates for the upper quintiles are somewhat larger compared to the sales-based estimates.

To study the heterogeneity of effects on equity ownership across firms, I repeat the specifications from Table 7 in Table 8 but use the value of equity ownership as the dependent variable instead. The bottom panel in Figure 7 plots the coefficient estimates for the sales-based firm size quintiles to make them comparable to the effects on labor incomes. Also for managerial equity ownership I find evidence for heterogeneous effect sizes across firms. Comparing the effects of input sourcing on equity ownership with those on incomes, I find that effect heterogeneity for equity ownership quantitatively dominates the heterogeneity of income effects. As it is suggested by the model, this implies that there is reallocation within the composition of compensation towards equity ownership. This trade-induced reallocation towards equity ownership particularly happens for managerial compensation packages in the largest firms. For example, the estimated semi-elasticity of input imports on equity ownership for managers in the top quintile equals 9.91 in the IV specification (2) compared to an income semi-elasticity of 4.26. In particular the semi-elasticity for CEOs' equity ownership is more pronounced. While CEO incomes responded less heterogeneously to input sourcing compared to the manager sample overall, the value of their equity ownership seems to react more heterogeneously compared to the full sample of managers. Consider for example the estimated semi-elasticities for the top quintile of firms.

[20] The median level of sales equals 740 Mio. $ and 2,600 employees, see Table 3.

The estimated equity semi-elasticity of 11.93 in specification (3) is larger than the respective income elasticity of 2.20 and also above the top quintile semi-elasticity for the full sample.

When comparing the estimated equity effects with income effects in their magnitude, equity effects are on average roughly twice as large compared to income effects. Interpreting the estimates from Figure 7 jointly suggests that input imports lead to more inequality for managers across firms. Furthermore, input imports seem to induce a change in the composition of top earners' compensation packages. For top earners' within the largest firms, equity ownership becomes the dominant source of compensation while for smaller firms, labor income gain prevalence. This seems consistent with the finding from Piketty and Saez (2003) that the share of labor income declines and the share of capital income increases as one moves to higher quantiles of the income distribution.

Besides the interpretation of effects for individual firm size quintiles, one can also formally test for effect heterogeneity across size quintiles. In Table 9 I report p-values for the hypotheses that labor income and equity ownership effects are identical *i.* for the top and the bottom quintile, *ii.* for the second lowest and the second largest quintile and *iii.* across all quintiles. These hypotheses are tested based on specifications (1) to (6) in Tables 7 and 8. The null hypothesis of equal income effects across all size quintiles is rejected at the 1 percent level for all specifications with the exception of the CEO subsample. When considering heterogeneous effects on the value of equity ownership, the null hypothesis of equal equity effects across all size quintiles is rejected at the 1 percent level throughout all specifications. Furthermore, the null hypothesis of equal equity effects in the bottom versus the top firm quintile is rejected at the 5 percent level or lower. The result that managers of larger firms earn a premium from import liberalization is also consistent with Bloom et al. (2018) who report a positive association between management practices and importing[21] and Ma and Ruzic (2019) who find that trade and firm heterogeneity account substantially to rising top income shares. Taken together, these results suggest that heterogeneity in firm size and/or managerial ability can partially account for the selection into importing activity which affects skill premia of managers. However, these results do not deliver an explanation why trade liberalization triggers a shift of the compensation structure within firms where equity ownership gets more prevalent for top earners.[22]

Since the value of equity ownership is directly linked to stock prices, one explanation for the larger equity elasticity in top firms is that there is direct pass-through from capital markets to top earners' equity wealth. When firms become more productive and the market prices this into the value of the firms' stock this should be reflected in an appreciation of stock prices which ultimately pass through to top earners' equity wealth. In contrast, incomes might be more rigid since salaries need to be renegotiated or new equity-linked options need to be issued such that parts of the income package might be relatively inelastic to changes in firm productivity. In order to explore if there is a capital market response of stock prices on variation in input sourcing, I regress the average annual price of

[21]Specifically, they find that better management practices within firms is correlated with higher expenditure on imported inputs, imports of higher quality inputs and more complex inputs from more origin countries.

[22]In Table A4 I replicate the specifications from Tables 7 and 8 using the fraction of equity wealth relative to the sum of labor incomes and equity wealth as an alternative illustration of the rising prevalence of equity for managers in the largest firms to confirm the robustness of this result.

each firm's main security on the interaction between input imports and the firm-size quintiles including firm fixed effects and the control variables. The results are presented in Table 10. Also the stock price reaction to increasing import shares seems to differ across firms. The estimates support the hypothesis that more input imports raise stock prices for the largest firms. However, the estimated stock price semi-elasticities are smaller compared to those estimated for managerial equity wealth. For example, the estimated stock price semi-elasticity for firms in the top quintile is smaller than 5 throughout all specifications while the equity ownership semi-elasticity for these firms was about twice as large.

Since the trade-induced stock price appreciations do not seem to fully explain the change in compensation structure within firms, in a next step I study if incomes shift towards more equity-linked parts in response to an input trade liberalization. If managers receive new stocks or option grants, this can partially cause the accumulation of more equity ownership. I replicate the previous specifications in Table 11 but use the fraction of equity-linked incomes relative to the sum of salaries, bonuses and equity-linked incomes as the dependent variable. The results suggest that top earners in the largest firms also receive a larger fraction of their incomes in the form of equity-linked instruments. This suggests that two margins of adjustment of an input trade liberalization lead to the accumulation of equity ownership for top earners. On the one hand, the value of equity ownership increases due to a stock price appreciation on the capital market. On the other hand, employers choose to compensate top earners with additional equity that is linked to stock prices. The former channel has often been referred to as pay-for-luck in the literature (see Bertrand and Mullainathan (2001)). A microfoundation of the latter channel is firm owners' desire to keep managers sufficiently incentivized in response to a globalization shock. Both channels are present in the theoretical model presented before: globalization affects firm and equity values directly but it also affects managerial incentives for a given equity package since the private benefits of shirking change due to larger firm size and the elasticity of the equity value to firm performance falls. This effect on incentives can explain why firm owners' opt to compensate top earners with additional equity.

4.2.3 Additional Results and Robustness

In this subsection, I discuss additional results and various robustness checks.

Rent distribution within firms: Empirical studies by Autor et al. (2017) and De Loecker and Eeckhout (2017) explore the role of increasing market concentration and the rise of superstar firms for falling aggregate labor shares in many industrialized countries. They argue that lower labor shares are in part driven by increasing concentration of economic activity among top firms and one candidate explanation for this development is globalization. I study how an increase of foreign input sourcing affects the within-firm rent distribution between top management and the other employees in Table 12. To do so, I calculate two dependent variables: the average top manager labor income relative to aggregate labor expenses within the firm and the average top manager equity ownership relative to aggregate labor expenses within the firm and estimate at the firm level. Overall, the estimates suggest that more foreign input sourcing tilts the rent distribution within firms towards aggregate labor expenses for the bottom three quintiles of firm sizes. However, managers gain relative to labor in the upper two quintiles of the firm size distribution which supplements the findings by Autor et al. (2017) who argue that superstar firms produce less labor-intensive.

Import competition: A typical feature of an economy's input-output structure is that a substantial fraction of inputs stem from within the same industry. When the differentiation between input imports and imports of competing products is imprecise this might blur the measure of imported inputs. In Table A5 of the Appendix I study if the results survive when I control for interactions between firm size quintiles and import competition. I define import competition as industry imports relative domestic industry absorption (industry output net of exports plus imports). Even when controlling for variation in import competition the heterogeneity of managerial equity and income effects across firms prevails. Furthermore, the effects on equity ownership dominate the income effects.

Multinational firms: The theoretical model does not distinguish between input sourcing from within or across firm boundaries. Table A6 in the Appendix, shows results for a split sample into multinationals and non-multinational firms.[23] The results suggests that the effects of input sourcing on compensation contracts are present in both types of firms. Managers of the largest multinationals and non-multinational firms attain higher levels of compensation, in particular equity compensation. Labor income increases seem particularly strong in large non-multinationals (specifications (1) and (5)).

Trade collapse during the recession: During the global recession of 2008-2009 the value of international trade collapsed. From the first quarter in 2008 to the first quarter in 2009, real world trade fell by about 15 percent which exceeded the downfall of real global GDP by roughly a factor of 4 (Bems et al. (2013)). Similarly, stock prices substantially depreciated during the recession. In Table A7 I reestimate specifications from Tables 7 and 8 but omit the global recession years 2008-2009 to illustrate that the results survive without the variation from those recession years.

5 Conclusion

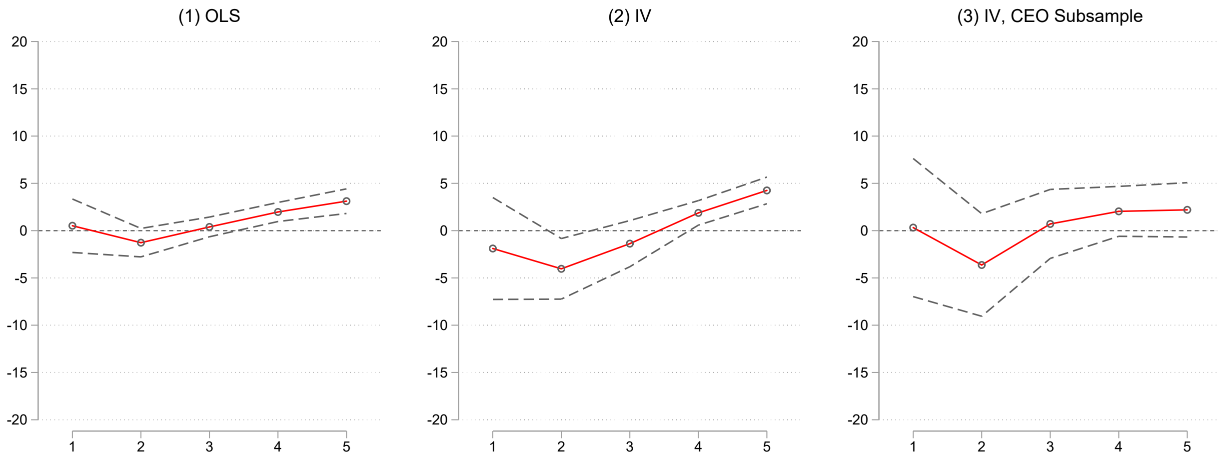
This paper examines how globalization affects the compensation contracts of top earners. I incorporate a stylized principal-agent model into an industry equilibrium assignment model to study how access to foreign factor markets affects top earnings. Trade-induced intra-industry reallocation leads to a higher compensation premium for top earners in the largest firms. Furthermore, the agency problem within firms induces a reallocation of compensation away from labor incomes towards higher equity ownership. Using panel data on executives across U.S. and U.K. firms, I find broad support for these predictions. This suggests that the ownership of equity considerably contributes to the returns of globalization for highly skilled labor and ignoring equity wealth would result in considerable understatements of the effects of globalization on top inequality. My findings have broader implications for the microeconomic

[23] A firm is defined as a multinational firm if reports foreign asset ownership. Since Compustat does disclose international assets separately, I obtain this information from Thompson WorldScope data.

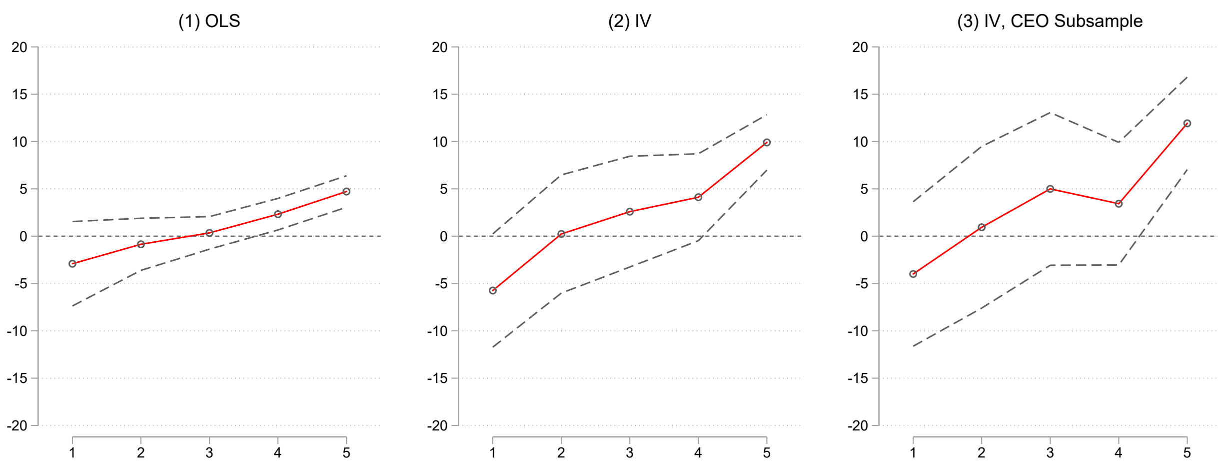
implications of agency frictions on firm operations and their impact on firm heterogeneity and overall inequality. The findings also speak to policy concerns about designing effective policies to lower inequality.

Figure 7: Importing, Top Incomes and Equity Ownership Across Firms

(a) Top Incomes



(b) Equity Ownership



Notes: The Figure depicts the coefficients of offshoring for individual size quintiles (sales based) based on Table 7. The individual graphs show coefficients based on columns 1: sales-based, OLS, 2: sales-based, IV and 3: sales-based, IV, CEOs only. The dashed lines correspond to 95% confidence intervals.

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Table 1: Parameter Values

	μ_i	κ_i	Z_{iS}	F_{iS}	N_i	β_i	σ	θ	B_1	B_2	B_3
							Economy-Wide Parameters				
Calibrated Parameters USA											
Manufacturing	0.0161	0.671	1.36	1.47	29,139,675	0.20					
Services	0.0178	0.678	1.20	1.74	56,606,988	0.59	2.29	4.006	18.82	0.34	0.72
Other	0.0140	0.696	1.21	1.05	13,936,876	0.21					
Calibrated Parameters GBR											
Manufacturing	0.0107	0.538	1.52	1.58	11,820,802	0.17					
Services	0.0251	0.695	1.27	1.46	43,145,792	0.58	2.38	4.006	2.12	0.22	0.67
Other	0.0130	0.682	1.26	1.18	11,649,863	0.25					

Table 2: Calibrated Moments

Moment		Moments GBR			Moments USA		
		Manuf.	*Serv.*	*Oth.*	*Manuf.*	*Serv.*	*Oth.*
Expenditure Share	Model	0.281	0.137	0.154	0.176	0.053	0.101
on Imported Inputs	Data	0.281	0.138	0.155	0.176	0.053	0.101
	Deviation	*-0.1%*	*-0.2%*	*-0.3%*	*0.1%*	*-0.4%*	*-0.2%*
Knowledge Premium	Model	2.777	3.305	2.890	5.677	5.698	5.540
10th Percentile	Data	2.736	3.259	3.036	5.442	5.141	4.868
	Deviation	*1.5%*	*1.4%*	*-4.8%*	*4.3%*	*10.8%*	*13.8%*
Knowledge Premium	Model	4.225	4.627	5.117	6.392	6.472	6.237
50th Percentile	Data	4.635	4.912	4.848	6.938	7.218	6.666
	Deviation	*-8.8%*	*-5.8%*	*5.5%*	*-7.9%*	*-10.3%*	*-6.4%*
Knowledge Premium	Model	7.158	6.965	7.364	7.812	8.142	7.730
90th Percentile	Data	6.643	6.558	7.125	8.254	8.920	8.428
	Deviation	*7.8%*	*6.2%*	*3.4%*	*-5.4%*	*-8.7%*	*-8.3%*
Firm Sales	Model	9.033	8.851	9.963	10.973	10.966	10.993
50th Percentile	Data	8.912	8.730	9.842	12.115	12.108	12.135
	Deviation	*1.4%*	*1.4%*	*1.2%*	*-9.4%*	*-9.4%*	*-9.4%*
Mass of	Model		1,649,324			5,722,223	
Active Firms	Data		1,646,285			6,022,127	
	Deviation		*0.2%*			*-5.0%*	

Table 3: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	25th Pct.	Median	75th Pct.
Manager-Year Level						
Total Income (in Thd. $)	201,008	2,410	11,040	433	940	2,207
thereof: Equity-Linked Income (in Thd.)$	182,473	1,934	11,356	97	495	1,619
Value of Equity Ownership (in Thd. $)	165,068	24,150	392,268	870	2,926	9,208
Firm-Year Level						
Employment (in Thd.)	39,584	12.4	28.0	0.5	2.6	9.8
Sales (in Mio. $)	39,797	3,694	8,930	176	740	2,670
Assets (in Mio. $)	41,960	7,976	25,548	191	928	4,037
Country-Industry-Year Level						
Expenditure Share on Imported Inputs	1,403	0.16	0.10	0.08	0.14	0.21
Output (in Mio. $)	1,403	251,006	348,127	40,842	123,969	312,615
Imports (in Mio. $)	1,403	25,087	42,301	3,291	9,006	26,990
Exports (in Mio. $)	1,403	18,964	25,865	3,202	10,003	23,949

Table 4: Firm and Industry Effects on Compensation Contracts

	Total Income	Equity-Linked Income	Equity Ownership	Shr. of Equity Ownersh. in Comp.
	(1)	(2)	(3)	(4)
Firm Level Characteristics				
Sales (log)	0.338***	0.524***	0.359***	0.00595***
	(0.00533)	(0.0106)	(0.00858)	(0.000988)
Employment (log)	0.280***	0.406***	0.315***	0.00453***
	(0.00592)	(0.0115)	(0.00918)	(0.00102)
Capital Intensity	0.0968***	0.154***	0.150***	0.00777***
	(0.00864)	(0.0154)	(0.0140)	(0.00141)
Multinational Firm	0.349***	0.450***	0.346***	0.00300
	(0.0275)	(0.0477)	(0.0402)	(0.00396)
Industry Level Characteristics				
Offshorability (S.D.)	0.0611***	0.0384*	0.132***	0.00990***
	(0.0134)	(0.0231)	(0.0200)	(0.00196)
Industry TFP	0.105	0.0365	0.461***	0.0578***
	(0.110)	(0.183)	(0.163)	(0.0166)
Industry Output	0.146***	0.198***	0.200***	0.00725***
	(0.0172)	(0.0305)	(0.0256)	(0.00257)

Notes: The cells are coefficient estimates of various regressions, whose dependent variables are are along the columns and regressors are down the rows. The dependent variables are *Total Income* (an individual executive's annual total income in logs), *Equity-Linked Income* (in logs), *Value of Equity Ownership* (total equity-linked wealth in logs) and the fraction of *Equity Ownership* in the sum of *Total Income* and *Equity Ownership*. All specifications include country-year fixed effects. Standard errors are cluster-robust at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 5: Importing and Top Incomes

	Total Income				
	(1)	(2)	(3)	(4)	(5)
Import Share	1.162***	2.008*	0.944	1.863*	2.260***
	(0.336)	(1.049)	(1.576)	(1.097)	(0.804)
Capital Intensity	0.179***	0.178***	0.189***	0.194***	0.133***
	(0.0269)	(0.0271)	(0.0328)	(0.0358)	(0.0274)
Industry Output	0.448***	0.448***	0.522***	0.497***	0.206*
	(0.0937)	(0.0921)	(0.107)	(0.107)	(0.116)
Industry TFP	0.216***	0.212***	0.0482	0.273***	-0.00337
	(0.0816)	(0.0779)	(0.157)	(0.0913)	(0.126)
Match F.E.	yes	yes	yes	yes	yes
Country-Year F.E.	yes	yes	yes	yes	yes
First-Stage					
KP F-test		36.08	28.29	59.57	36.56
Overident. (p-value)		0.606	0.518	0.884	0.295
Sample	All	All	CEOs	USA	GBR
Observations	181,325	181,325	34,768	149,037	32,288
Cluster Groups	96	96	96	47	49
Firms	4,170	4,170	4,042	2,731	1,439
Individuals	32,777	32,777	7,236	26,380	6,397

Notes: The dependent variable *Total Income* is an individual executive's annual total income (in logs). *Import Share* is the expenditure share on foreign inputs measured at the country-industry-year level based on WIOD data. All specifications include firm level *Capital Intensity* and country-industry-year level *Output* and a *TFP* index. All estimations include fixed effects for individual manager-firm matches and country-years. Instrumental variables are international trade and transport margins and world export supply described in subsection 4.1. Standard errors are cluster-robust at the country-industry pair level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6: Importing and Equity Ownership of Top Earners

	Value of Equity Ownership				
	(1)	(2)	(3)	(4)	(5)
Import Share	1.457*	5.441*	5.207	5.871***	2.889
	(0.746)	(3.069)	(3.926)	(1.633)	(1.795)
Capital Intensity	0.345***	0.341***	0.309***	0.358***	0.325***
	(0.0377)	(0.0381)	(0.0398)	(0.0556)	(0.0445)
Industry Output	0.416***	0.427***	0.393***	0.408**	0.374*
	(0.130)	(0.129)	(0.149)	(0.157)	(0.211)
Industry TFP	0.309**	0.296**	0.350**	0.285	0.356
	(0.145)	(0.146)	(0.169)	(0.177)	(0.358)
Match F.E.	yes	yes	yes	yes	yes
Country-Year F.E.	yes	yes	yes	yes	yes
First-Stage					
KP F-test		27.87	26.61	50.48	37.30
Overident. (p-value)		0.281	0.380	0.373	0.085
Sample	All	All	CEOs	USA	GBR
Observations	146,425	146,425	29,999	114,134	32,291
Cluster Groups	96	96	96	47	49
Firms	3,896	3,896	3,641	2,419	1,477
Individuals	27,721	27,721	6,284	21,373	6,348

Notes: The dependent variable *Value of Equity Ownership* is an individual manager's total equity-linked wealth (in logs). Equity-linked wealth comprises the total value of all equity-linked compensation that an individual has earned over the career that is linked to the equity of the employing firm. Outstanding rewarded options are priced according to Black-Scholes formula. *Import Share* is the expenditure share on foreign inputs measured at the country-industry-year level based on WIOD data. All specifications include firm level *Capital Intensity* and country-industry-year level *Output* and a *TFP* index. All estimations include fixed effects for individual manager-firm matches and country-years. Instrumental variables are international trade and transport margins and world export supply described in subsection 4.1. Standard errors are cluster-robust at the country-industry pair level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 7: Importing and Top Incomes Across Firms

	Total Income					
	(1)	(2)	(3)	(4)	(5)	(6)
	By Sales			*By Employment*		
Import Share by Firm Size Quintile						
Import Share × Q1	0.522	-1.884	0.327	0.629	-1.857	-0.654
	(1.423)	(2.713)	(3.678)	(1.285)	(2.513)	(3.633)
Import Share × Q2	-1.269*	-4.035**	-3.628	-0.103	0.209	-0.0706
	(0.758)	(1.614)	(2.731)	(0.674)	(1.469)	(1.913)
Import Share × Q3	0.396	-1.374	0.714	0.874*	1.493	2.727*
	(0.525)	(1.229)	(1.838)	(0.500)	(1.286)	(1.639)
Import Share × Q4	1.975***	1.880***	2.043	2.256***	2.057**	0.487
	(0.508)	(0.653)	(1.329)	(0.718)	(0.988)	(1.916)
Import Share × Q5	3.123***	4.256***	2.203	3.684***	5.962***	3.503*
	(0.655)	(0.709)	(1.447)	(0.632)	(1.076)	(2.012)
Match F.E.	yes	yes	yes	yes	yes	yes
Country-Year F.E.	yes	yes	yes	yes	yes	yes
First-Stage						
KP F-test		13.79	10.60		18.81	11.70
Overident. (p-value)		0.178	0.194		0.419	0.663
Sample	All	All	CEOs	All	All	CEOs
Observations	161,618	161,618	29,734	158,029	158,029	28,666
Cluster Groups	95	95	95	95	95	95
Firms	3,241	3,241	3,168	2,963	2,963	2,915
Individuals	28,677	28,677	6,026	27,734	27,734	5,703

Notes: The dependent variable *Total Income* is an individual executive's annual total income (in logs). *Import Share* is the expenditure share on foreign inputs measured at the country-industry-year level based on WIOD data. All specifications include firm level *Capital Intensity* and country-industry-year level *Output* and a *TFP* index (output suppressed). All estimations include fixed effects for individual manager-firm matches and country-years. Instrumental variables are international trade and transport margins and world export supply described in subsection 4.1. Firm size quintiles are based on the average firm sales or employment during the first 3 sample years and order the sample firms within the same country. Standard errors are cluster-robust at the country-industry pair level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 8: Importing and Equity Ownership Across Firms

	Value of Equity Ownership					
	(1)	(2)	(3)	(4)	(5)	(6)
	By Sales			*By Employment*		
Import Share by Size Quintile						
Import Share × Q1	-2.909	-5.738*	-3.991	-1.258	0.874	4.940
	(2.246)	(3.013)	(3.843)	(2.086)	(3.923)	(5.155)
Import Share × Q2	-0.855	0.236	0.946	-0.952	1.579	2.803
	(1.386)	(3.144)	(4.300)	(1.145)	(3.196)	(3.756)
Import Share × Q3	0.351	2.598	4.997	0.925	4.657	6.357
	(0.867)	(2.947)	(4.063)	(0.873)	(3.350)	(3.958)
Import Share × Q4	2.327***	4.116*	3.434	3.573***	8.426***	8.431***
	(0.839)	(2.311)	(3.263)	(0.972)	(1.975)	(3.082)
Import Share × Q5	4.723***	9.908***	11.93***	5.264***	12.43***	14.04***
	(0.838)	(1.475)	(2.460)	(0.940)	(2.058)	(3.258)
Match F.E.	yes	yes	yes	yes	yes	yes
Country-Year F.E.	yes	yes	yes	yes	yes	yes
First-Stage						
KP F-test		12.34	10.64		14.69	13.55
Overident. (p-value)		0.330	0.271		0.339	0.170
Sample	All	All	CEOs	All	All	CEOs
Observations	130,175	130,175	25,896	127,253	127,253	25,079
Cluster Groups	95	95	95	95	95	95
Firms	3,071	3,071	2,921	2,792	2,792	2,698
Individuals	24,295	24,295	5,294	23,454	23,454	5,030

Notes: The dependent variable *Value of Equity Ownership* is an individual manager's total equity-linked wealth (in logs). Equity-linked wealth comprises the total value of all equity-linked compensation that an individual has earned over the career that is linked to the equity of the employing firm. Outstanding rewarded options are priced according to Black-Scholes formula. *Import Share* is the expenditure share on foreign inputs measured at the country-industry-year level based on WIOD data. All specifications include firm level *Capital Intensity* and country-industry-year level *Output* and a *TFP* index (output suppressed). All estimations include fixed effects for individual manager-firm matches and country-years. Instrumental variables are international trade and transport margins and world export supply described in subsection 4.1. Firm size quintiles are based on the average firm sales or employment during the first 3 sample years and order the sample firms within the same country. Standard errors are cluster-robust at the country-industry pair level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 9: Testing for Inequality Across Firm Size Quintiles

	(1)	(2)	(3)	(4)	(5)	(6)
	Importing and Top Income Inequality Across Firms					
i. $H0 : Q1 = Q5$	0.126	0.027	0.601	0.067	0.007	0.284
ii. $H0 : Q2 = Q4$	< 0.001	< 0.001	0.033	0.026	0.287	0.811
iii. $H0 : Qi$ const.	< 0.001	< 0.001	0.180	< 0.001	< 0.001	0.382
	Importing and Equity Ownership Inequality Across Firms					
i. $H0 : Q1 = Q5$	< 0.001	< 0.001	< 0.001	0.002	< 0.001	0.023
ii. $H0 : Q2 = Q4$	0.016	0.173	0.388	< 0.001	0.003	0.027
iii. $H0 : Qi$ const.	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001

Notes: The Table reports p-values for hypotheses tests based on Tables 7 and 8 and tests for unequal effects of global sourcing across firm size quintiles. Columns correspond to the columns in the respective table.

Table 10: Offshoring and Stock Price Movements by Firm Size Quintile - Interactions

	Stock Price			
	(1)	(2)	(3)	(4)
	By Sales		*By Employment*	
Import Share by Size Quintile				
Import Share × Q1	0.336	-0.943	2.313	0.0675
	(1.740)	(2.837)	(1.526)	(3.049)
Import Share × Q2	0.725	-0.431	1.502	2.195
	(1.382)	(2.570)	(1.097)	(2.279)
Import Share × Q3	2.563***	2.320	2.127**	3.464**
	(0.794)	(1.963)	(0.810)	(1.510)
Import Share × Q4	2.218***	3.251**	3.232***	4.654***
	(0.791)	(1.492)	(0.976)	(1.464)
Import Share × Q5	2.534***	3.750***	2.180***	4.187**
	(0.781)	(1.391)	(0.772)	(2.048)
Firm F.E.	yes	yes	yes	yes
Country-Year F.E.	yes	yes	yes	yes
First-Stage				
KP F-test		8.335		8.904
Overident. (p-value)		0.0579		0.432
Observations	32,100	32,100	30,793	30,793
Cluster Groups	95	95	95	95

Notes: The dependent variable *Stock Price* is the average annual price of a firm's main security (in logs). *Import Share* is the expenditure share on foreign inputs measured at the country-industry-year level based on WIOD data. All specifications include firm level *Capital Intensity* and country-industry-year level *Output* and a *TFP* index (output suppressed). All estimations include fixed effects for individual manager-firm matches and country-years. Instrumental variables are international trade and transport margins and world export supply described in subsection 4.1. Firm size quintiles are based on the average firm sales or employment during the first 3 sample years and order the sample firms within the same country. Standard errors are cluster-robust at the country-industry pair level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 11: Importing and Changes in the Income Composition Across Firms

	Equity-Linked Income / (Salary + Bonus + Equity-Linked Income)					
	(1)	(2)	(3)	(4)	(5)	(6)
	By Sales			*By Employment*		
Import Share by Size Quintile						
Import Share × Q1	-0.288	-2.443**	-1.479	-0.224	-1.547*	-0.541
	(0.564)	(0.996)	(1.364)	(0.489)	(0.899)	(1.263)
Import Share × Q2	-0.400	-2.120**	-2.304*	-0.0166	-0.273	-0.818
	(0.355)	(0.853)	(1.276)	(0.285)	(0.684)	(0.945)
Import Share × Q3	0.213	-0.561	0.150	0.510**	0.624	0.705
	(0.207)	(0.515)	(0.799)	(0.212)	(0.549)	(0.871)
Import Share × Q4	0.880***	0.573	0.542	0.724***	0.705*	0.646
	(0.174)	(0.394)	(0.676)	(0.187)	(0.420)	(0.817)
Import Share × Q5	0.959***	0.973***	0.852	0.950***	1.660***	1.493*
	(0.169)	(0.328)	(0.713)	(0.193)	(0.442)	(0.759)
Match F.E.	yes	yes	yes	yes	yes	yes
Country-Year F.E.	yes	yes	yes	yes	yes	yes
First-Stage						
KP F-test		13.10	15.82		25.61	13.32
Overident. (p-value)		0.240	0.284		0.290	0.417
Sample	All	All	CEOs	All	All	CEOs
Observations	151,824	151,824	26,917	149,836	149,836	26,483
Cluster Groups	94	94	94	94	94	94
Firms	3,056	3,056	2,949	2,874	2,874	2,806
Individuals	27,120	27,120	5,506	26,594	26,594	5,343

Notes: The dependent variable is the fraction of *Equity-Linked Income* relative to the sum of the *Salary*, *Bonuses* and *Equity-Linked Income*. *Import Share* is the expenditure share on foreign inputs measured at the country-industry-year level based on WIOD data. All specifications include firm level *Capital Intensity* and country-industry-year level *Output* and a *TFP* index (output suppressed). All estimations include fixed effects for individual manager-firm matches and country-years. Instrumental variables are international trade and transport margins and world export supply described in subsection 4.1. Firm size quintiles are based on the average firm sales or employment during the first 3 sample years and order the sample firms within the same country. Standard errors are cluster-robust at the country-industry pair level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 12: Importing and Within-Firm Rent Distributions

	Avg. Top Incomes / Labor Expenses		Avg. Top Equ. Ownersh. / Labor Expenses		Avg. Top Income / Labor Expenses		Avg. Top Equ. Ownersh. / Labor Expenses	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	By Sales				*By Employment*			
Import Share by Size Quintile								
Import Share × Q1	-1.527	-12.09	-5.470	-17.29***	-3.730	-13.90**	-6.177*	-16.28***
	(1.913)	(7.455)	(3.661)	(3.945)	(2.347)	(5.772)	(3.402)	(4.753)
Import Share × Q2	-1.113	-10.13**	0.524	-18.04**	-0.673	-3.799*	0.780	-9.251***
	(1.715)	(4.750)	(2.813)	(7.651)	(0.753)	(2.044)	(1.229)	(3.283)
Import Share × Q3	-0.711	-4.908**	-1.644	-11.51***	0.198	-2.623	-0.238	-12.29***
	(0.747)	(2.013)	(2.254)	(3.400)	(1.103)	(2.528)	(2.125)	(4.355)
Import Share × Q4	1.460	2.383	4.982***	-0.670	1.483	1.365	5.651***	3.157
	(1.387)	(2.069)	(1.703)	(3.227)	(1.691)	(2.323)	(1.809)	(3.061)
Import Share × Q5	1.853**	4.381*	6.354***	9.464***	3.154***	8.304***	7.399***	12.63***
	(0.873)	(2.591)	(1.479)	(3.541)	(1.111)	(2.976)	(1.863)	(3.846)
Firm F.E.	yes	yes	yes	yes	yes	yes	yes	yes
Country-Year F.E.	yes	yes	yes	yes	yes	yes	yes	yes
First Stage								
KP F-test		21.91		18.09		9.429		9.766
Overident. (p-value)		0.556		0.360		0.279		0.381
Observations	11,030	11,030	10,801	10,801	9,489	9,489	9,186	9,186
Cluster Groups	87	87	87	87	85	85 each	85	85
Firms	1,240	1,240	1,240	1,240	961	961	945	945

Notes: The dependent variable *Average Top Incomes / Labor Expenses* is the average firm-level managerial income relative to the firm-level labor expenses (in logs). The dependent variable *Average Top Equity Ownership / Labor Expenses* is the average firm-level managerial value of equity ownership relative to the firm-level labor expenses (in logs). *Import Share* is the expenditure share on foreign inputs measured at the country-industry-year level based on WIOD data. All specifications include firm level *Capital Intensity* and country-industry-year level *Output* and a *TFP* index. All estimations include fixed effects for individual manager-firm matches and country-years. Instrumental variables are international trade and transport margins and world export supply described in subsection 4.1. Firm size quintiles are based on the average firm sales or employment during the first 3 sample years and order the sample firms within the same country. Standard errors are cluster-robust at the country-industry pair level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Supplementary Materials

A Model Details

A.1 Model Proofs

A.1.1 Indirect Utility and Multiplicative Preferences

Consider an agent with multiplicative preferences $U = C \cdot G$ and an expected compensation level $r_i(k)$. Plugging in $C = \prod_{i=1}^{I}\left[\left(\int_\omega q_\omega^{\frac{\sigma-1}{\sigma}} d\omega\right)^{\frac{\sigma}{\sigma-1}}\right]^{\beta_i}$ and replacing the consumption amount for each individual variety with the agent's demand $q_\omega = r(k)p_\omega^{-\sigma}P_i^{\sigma-1}$ yields

$$
\begin{aligned}
U &= \prod_{i=1}^{I}\left[\left(\int_\omega \left(r_i(k)p_\omega^{-\sigma}P_i^{\sigma-1}\right)^{\frac{\sigma-1}{\sigma}} d\omega\right)^{\frac{\sigma}{\sigma-1}}\right]^{\beta_i} \cdot G = \prod_{i=1}^{I}\left[P_i^{\sigma-1}\left(\int_\omega p_\omega^{1-\sigma} d\omega\right)^{\frac{\sigma}{\sigma-1}}\right]^{\beta_i} \cdot r_i(k) \cdot G \\
&= \prod_{i=1}^{I}\left[P_i^{\beta_i}\right]^{-1} \cdot r_i(k) \cdot G = r_i(k)P^{-1} \cdot G = W(k),
\end{aligned}
$$

where $P \equiv \prod_{i=1}^{I}\left[P_i^{\beta_i}\right]$ is a price index for the aggregate economy. ■

A.1.2 Proof of Proposition 1: Assignment

Consider the assignment equation (9). Differentiating expected profits with respect to knowledge k and then substituting $q = \frac{Q_i}{N_i}k$ yields:

$$
\begin{aligned}
\frac{dE\left[\pi(k,q)\right]}{dk}_{|q=q(k)} &= \frac{\partial}{\partial k}\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i\left(Z_{iS}k^{\mu_i}q^{\kappa_i}\right)^{\sigma-1}_{|q=q(k)} \\
&= \begin{cases} \mu_i(\sigma-1)\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i Z_{iS}^{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{\kappa_i(\sigma-1)} k^{(\kappa_i+\mu_i)(\sigma-1)-1} & \text{if } k_{iS} \le k \\ \mu_i(\sigma-1)\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i\left(\frac{Q_i}{N_i}\right)^{\kappa_i(\sigma-1)} k^{(\kappa_i+\mu_i)(\sigma-1)-1} & \text{if } \underline{k}_i < k < k_{iS}. \end{cases}
\end{aligned}
$$

Integrating this expression over k using the occupational indifference of the marginal manager yields

$$
\begin{aligned}
r_i(k) &= \begin{cases} \mu_i(\sigma-1)\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i\left(\frac{Q_i}{N_i}\right)^{\kappa_i(\sigma-1)} & \\ \times\left(\int_{\underline{k}_i}^{k} \iota^{(\kappa+\mu)(\sigma-1)-1}d\iota + \left(Z_{iS}^{\sigma-1}-1\right)\int_{k_{iS}}^{k}\iota^{(\kappa_i+\mu_i)(\sigma-1)-1}d\iota\right)+1 & \text{if } k_{iS} \le k \\ \mu(\sigma-1)\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i\left(\frac{Q_i}{N_i}\right)^{\kappa_i(\sigma-1)}\left(\int_{\underline{k}_i}^{k}\iota^{(\kappa_i+\mu_i)(\sigma-1)-1}d\iota\right)+1 & \text{if } \underline{k}_i < k < k_{iS} \end{cases} \\
&= \Psi_i(k) + 1,
\end{aligned}
$$

where the knowledge premium $\Psi_i(k)$ can be stated as

$$\Psi_i(k) = \begin{cases} \frac{\mu_i}{\kappa_i+\mu_i}\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i \left(\frac{Q_i}{N_i}\right)^{\kappa_i(\sigma-1)} & \\ \times\left(\left(k^{(\kappa_i+\mu_i)(\sigma-1)} - \underline{k}_i^{(\kappa_i+\mu_i)(\sigma-1)}\right) + \left(Z_{iS}^{\sigma-1}-1\right)\left(k^{(\kappa_i+\mu_i)(\sigma-1)} - k_{iS}^{(\kappa_i+\mu_i)(\sigma-1)}\right)\right) & \text{if } k_{iS} \le k \\ \frac{\mu_i}{\kappa_i+\mu_i}\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i \left(\frac{Q_i}{N_i}\right)^{\kappa_i(\sigma-1)}\left(k^{(\kappa_i+\mu_i)(\sigma-1)} - \underline{k}_i^{(\kappa_i+\mu_i)(\sigma-1)}\right) & \text{if } \underline{k}_i < k < k_{iS}. \end{cases}$$

A.1.3 Industry Price Index

Since firms face identical demand elasticities, the operating profit ratio of a marginal importer and the zero cutoff earnings firm can be stated as

$$\frac{\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i k_{iS}^{(\sigma-1)(\kappa_i+\mu_i)}}{\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i \underline{k}_i^{(\sigma-1)(\kappa_i+\mu_i)}}\left(Z_{iS}^{\sigma-1}-1\right) = F_{iS},$$

which yields $k_{iS} = \left(Z_{iS}^{\sigma-1}-1\right)^{-\frac{1}{(\sigma-1)(\kappa_i+\mu_i)}} F_{iS}^{\frac{1}{(\sigma-1)(\kappa_i+\mu_i)}} \underline{k}_i$. The industry price index is $P_i = \left[\int_{\underline{k}_i}^{\infty} p_\omega^{1-\sigma} d\omega\right]^{1/(1-\sigma)}$. Plugging the firms' pricing decision $p = \frac{\sigma}{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{-\kappa_i} Z_{iS}^{-1} k^{-(\kappa_i+\mu_i)}$ into P_i and integrating over the distribution of knowledge, the price index can be written as

$$P_i = \frac{\sigma}{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{-\kappa_i}\left[\int_{\underline{k}_i}^{k_{iS}}\left(k^{-(\kappa_i+\mu_i)}\right)^{1-\sigma} dN_i\left(1-k^{-1}\right) + \int_{k_{iS}}^{\infty}\left(Z_{iS}^{-1}k^{-(\kappa_i+\mu_i)}\right)^{1-\sigma} dN_i\left(1-k^{-1}\right)\right]^{1/(1-\sigma)}.$$

Substituting $dN_i(1-k^{-1}) = N_i k^{-2} dk$ the industry price index P_i can be simplified as follows:

$$\begin{aligned} P_i &= \frac{\sigma}{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{-\kappa_i}\left[\int_{\underline{k}_i}^{k_{iS}} k^{(\sigma-1)(\kappa_i+\mu_i)-2} N_i dk + \int_{k_{iS}}^{\infty} k^{(\sigma-1)(\kappa_i+\mu_i)-2} Z_{iS}^{(\sigma-1)} N_i dk\right]^{1/(1-\sigma)} \\ &= \frac{\sigma}{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{-\kappa_i}\left(\frac{1-(\sigma-1)(\kappa_i+\mu_i)}{N_i}\right)^{1/(\sigma-1)}\left[\underline{k}_i^{(\sigma-1)(\kappa_i+\mu_i)-1} + \left(Z_{iS}^{\sigma-1}-1\right) k_{iS}^{(\sigma-1)(\kappa_i+\mu_i)-1}\right]^{1/(1-\sigma)} \\ &= \frac{\sigma}{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{-\kappa_i}\left(\frac{1-(\sigma-1)(\kappa_i+\mu_i)}{N_i}\right)^{1/(\sigma-1)} \\ &\quad \times\left(1 + \left(Z_{iS}^{\sigma-1}-1\right)\left(Z_{iS}^{\sigma-1}-1\right)^{-\frac{(\sigma-1)(\kappa_i+\mu_i)-1}{(\sigma-1)(\kappa_i+\mu_i)}} F_{iS}^{\frac{(\sigma-1)(\kappa_i+\mu_i)-1}{(\sigma-1)(\kappa_i+\mu_i)}}\right)^{\frac{1}{1-\sigma}} \underline{k}_i^{\frac{1-(\sigma-1)(\kappa_i+\mu_i)}{\sigma-1}}. \end{aligned}$$

Simplifying notation by introducing $\xi_i \equiv 1-(\sigma-1)(\kappa_i+\mu_i) \in (0,1)$ and an index of trade integration $\delta_i \equiv \left(Z_{iS}^{\sigma-1}-1\right)^{\frac{1}{1-\xi_i}} F_{iS}^{-\frac{\xi_i}{1-\xi_i}}$, then leads to

$$P_i = \frac{\sigma}{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{-\kappa_i}\left(\frac{\xi_i}{N_i}\right)^{1/(\sigma-1)}\left(1+\delta_i\right)^{\frac{1}{1-\sigma}} \underline{k}_i^{\frac{\xi_i}{\sigma-1}}. \blacksquare$$

A.1.4 Proof of Proposition 2: Optimal Incentive Contract

In equilibrium, the manager requires to receive a compensation of $r_i(k)$ in expectation and to obtain an expected indirect utility $r_i\,(k)\,P^{-1}G\,(\bar{e}) = r_i\,(k)\,P^{-1}$. Low effort $\underline{e}$ yields utility

$$
\begin{aligned}
E\left[w_i\,(k)\,P^{-1}G\,(\underline{e})\,|\underline{e}\right] &= E\left[f + V\left((1-|\underline{e}|)\Pi\right)\right]P^{-1}G\,(\underline{e}) \\
&= E\left[f + V\,(\Pi) - |\underline{e}|^{\varepsilon_V} E\left[V\,(\Pi)\right]\right]P^{-1}\frac{1}{1-\lambda(e,\pi)}.
\end{aligned}
$$

Hence, the manager exerts effort if $E\left[w_i\,(k)\,G\,(\bar{e})\,|\bar{e}\right] \geq E\left[w_i\,(k)\,G\,(\underline{e})\,|\underline{e}\right]$, i.e. when

$$
r_i\,(k) \geq \frac{r_i\,(k) - |\underline{e}|^{\varepsilon_V} E\left[V\,(\Pi)\right]}{1-\lambda(e,\pi)} \Leftrightarrow E\left[V\,(\Pi)\right] \geq r_i\,(k)\,\frac{\lambda(e,\pi)}{|\underline{e}|^{\varepsilon_V}},
$$

such that the share of equity ownership in total expected compensation $\triangle$ is given by

$$
\triangle = \frac{\lambda(e,\pi)}{|\underline{e}|^{\varepsilon_V}}. \blacksquare
$$

A.1.5 Proof of Proposition 3: Firm Surplus and the Fraction of Equity Ownership in Compensation $\triangle$

Consider the fraction of equity ownership in compensation $\triangle$. There are two distinct margins of adjustment for $\triangle$ when the expected firm surplus changes. First, Assumption 1 assumes that private managerial benefits $\lambda(e,\pi)$ increase with the firm surplus which makes stronger financial incentives necessary to induce the manager to forego these private benefits. Second, for a given strike price the elasticity of the equity portfolio with respect to changes in the firm surplus ε_V falls when the expected surplus increases. Both margins, $\lambda(e,\pi)\uparrow$ and $\varepsilon_V\downarrow$ let $\triangle$ increase.

Consider the relation between ε_V and firm surpluses. Suppose a manager's equity portfolio consists of a European call option on the firm surplus Π (with $E\,[\Pi] = \pi$) with a strike price of S. Denote the standard deviation of realized firm surpluses by σ_Π. According to the Black-Scholes formula, the value V of that option is $V = \Pi\phi\,(d_1) - S_n\phi\,(d_2)$, where $\phi\,(.)$ is the cumulative distribution function of a standard normal variable and the terms d_1 and d_2 are defined as

$$
\begin{aligned}
d_1 &\equiv \frac{\ln\left(\Pi/S\right) + \sigma_\Pi^2/2}{\sigma_\Pi} \\
d_2 &\equiv \frac{\ln\left(\Pi/S\right) - \sigma_\Pi^2/2}{\sigma_\Pi}.
\end{aligned}
$$

The "delta" of the option (i.e. the derivative of V with respect to firm surplus Π) is given by $\frac{dV}{d\Pi} = \phi\,(d_1) > 0$ and an individual option's elasticity with respect to the firm's surplus equals

$$
\varepsilon_V = \frac{dV}{d\Pi}\frac{\Pi}{V} = \frac{\Pi\phi\,(d_1)}{\Pi\phi\,(d_1) - S\phi\,(d_2)} > 1.
$$

This elasticity is falling in the firm surplus Π and converges to one when the firm surplus approaches infinity:

$$\frac{d\varepsilon_V}{d\Pi} < 0, \quad \lim_{\Pi \to \infty} \varepsilon_V = 1.$$

Equivalently, the same argument can be made when the manager's equity ownership consists of $1, ..., n$ European call options on parts of the firm surplus such that ε_V becomes a weighted sum of individual elasticities each falling in firm surpluses. ■

A.1.6 Zero Cutoff Earnings

To derive the zero cutoff earnings conditions (17), consider the marginal firm that just breaks even and does not engage in importing such that:

$$\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i \left(\left(\frac{Q_i}{N_i}\right)^{\kappa_i} \underline{k}_i^{\kappa_i+\mu_i}\right)^{\sigma-1} = 1,$$

which can be restated as follows using the price index from above leading to

$$X_i(\underline{k}_i) = \frac{\sigma N_i\left(1+\delta_i\right)}{\xi_i}\underline{k}_i^{-1}. ■$$

A.1.7 Effective Industry Size A_i

Using the zero cutoff earnings condition and the industry price index from above, the effective industry size can be stated as

$$\begin{aligned}
A_i &= X_i P_i^{\sigma-1} \\
&= \left(\frac{\sigma N_i\left(1+\delta_i\right)}{\xi_i}\underline{k}_i^{-1}\right)\left(\frac{\sigma}{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{-\kappa_i}\left(\frac{\xi_i}{N_i}\right)^{1/(\sigma-1)}\left(1+\delta_i\right)^{\frac{1}{1-\sigma}}\underline{k}_i^{\frac{\xi_i}{\sigma-1}}\right)^{\sigma-1} \\
&= \sigma\left(\frac{\sigma}{\sigma-1}\right)^{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{-\kappa_i(\sigma-1)}\underline{k}_i^{\xi_i-1}. ■
\end{aligned}$$

A.1.8 Labor Market Clearing

Simplifying (19) yields

$$\begin{aligned}
\sum_{i=1}^{I}\left(\left(\int_{\omega}\frac{\sigma-1}{\sigma}X_i P_i^{\sigma-1}p_{\omega}^{1-\sigma}d\omega\right)+F_{iS}N_i k_{iS}^{-1}\right) &= \sum_{i=1}^{I}\left(N_i\left(1-\underline{k}_i^{-1}\right)\right) \\
\frac{\sigma-1}{\sigma}\sum_{i=1}^{I}X_i+\sum_{i=1}^{I}N_i\left(Z_{iS}^{\sigma-1}-1\right)^{\frac{1}{1-\xi_i}}F_{iS}^{\frac{-\xi_i}{1-\xi_i}}\underline{k}_i^{-1} &= \sum_{i=1}^{I}N_i\left(1-\underline{k}_i^{-1}\right) \\
\frac{\sigma-1}{\sigma}\sum_{i=1}^{I}X_i &= \sum_{i=1}^{I}N_i\left(1-\left(1+\delta_i\right)\underline{k}_i^{-1}\right)
\end{aligned}$$

Plugging in the $\underline{k}_i^{-1}$ from the zero cutoff earnings conditions (17) yields

$$\begin{aligned}
\frac{\sigma-1}{\sigma}\sum_{i=1}^{I}X_i &= \sum_{i=1}^{I}N_i\left(1-(1+\delta_i)\frac{\xi_i}{\sigma N_i(1+\delta_i)}X_i\right)\\
\sum_{i=1}^{I}X_i &= \frac{\sigma}{\sigma-1+\xi_i}\sum_{i=1}^{I}N_i. \blacksquare
\end{aligned}$$

A.1.9 The Knowledge Premium $\Psi_i(k)$ in Equilibrium

Plugging A_i into the formula for the knowledge premium and simplifying terms yields

$$\begin{aligned}
\Psi_i(k) &= \begin{cases} \frac{\mu_i}{\kappa_i+\mu_i}\left(\left(\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i}-1\right)+\left(Z_{iS}^{\sigma-1}-1\right)\left(\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i}-\left(\frac{k_{iS}}{\underline{k}_i}\right)^{1-\xi_i}\right)\right) & \text{if } k_{iS}\le k\\ \frac{\mu_i}{\kappa_i+\mu_i}\left(\underline{k}_i^{\xi_i-1}\right)\left(k^{1-\xi_i}-\underline{k}_i^{1-\xi_i}\right) & \text{if } \underline{k}_i<k<k_{iS}. \end{cases}\\
&= \begin{cases} \frac{\mu_i}{\kappa_i+\mu_i}\left(-1+Z_{iS}^{\sigma-1}\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i}-\left(Z_{iS}^{\sigma-1}-1\right)\left(\frac{k_{iS}}{\underline{k}_i}\right)^{1-\xi_i}\right) & \text{if } k_{iS}\le k\\ \frac{\mu_i}{\kappa_i+\mu_i}\left(\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i}-1\right) & \text{if } \underline{k}_i<k<k_{iS}. \end{cases}\\
&= \begin{cases} \frac{\mu_i}{\kappa_i+\mu_i}\left(Z_{iS}^{\sigma-1}\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i}-F_{iS}-1\right) & \text{if } k_{iS}\le k\\ \frac{\mu_i}{\kappa_i+\mu_i}\left(\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i}-1\right) & \text{if } \underline{k}_i<k<k_{iS}. \blacksquare \end{cases}
\end{aligned}$$

A.1.10 Proof of Proposition 4: Comparative Statics with $dZ_{iS}>0$

Importer Cutoff k_{iS}: Consider how an increase in Z_{iS} affects k_{iS}. First notice that $dZ_{iS}>0$ raises the index of trade integration $\delta_i=\left(Z_{iS}^{\sigma-1}-1\right)^{\frac{1}{1-\xi_i}}F_{iS}^{-\frac{\xi_i}{1-\xi_i}}$. Furthermore, from (17) and (20) it can be seen that $\underline{k}_i$ rises as well. Plugging $\underline{k}_i$ and δ_i into (15) allows to see how the importer cutoff k_{iS} adjusts to this trade liberalization:

$$k_{iS}=\left(Z_{iS}^{\sigma-1}-1\right)^{-\frac{1}{1-\xi_i}}F_{iS}^{\frac{1}{1-\xi_i}}(1+\delta_i)\left(\frac{\sigma N_i}{\xi_i X_i}\right)=\left(\left(Z_{iS}^{\sigma-1}-1\right)^{-\frac{1}{1-\xi_i}}F_{iS}^{\frac{1}{1-\xi_i}}+F_{iS}\right)\left(\frac{\sigma N_i}{\xi_i X_i}\right),$$

such that $\frac{dk_{iS}}{dZ_{iS}}<0$.

Knowledge Premium $\Psi_i(k)$: Next, consider how an increase in Z_{iS} affects the knowledge premium. The derivative of $\Psi_i(k)$ with respect to Z_{iS} can be written as

$$\frac{d\Psi_i(k)}{dZ_{iS}}=\begin{cases} \frac{\mu_i(\sigma-1)}{\kappa_i+\mu_i}\left(\frac{k}{\underline{k}_i}\right)^{(\kappa_i+\mu_i)(\sigma-1)}Z_{iS}^{\sigma-1}\left(Z_{iS}^{-1}-(\kappa_i+\mu_i)\underline{k}_i^{-1}\frac{d\underline{k}_i}{dZ_{iS}}\right)>0 & \text{if } k_{iS}\le k\\ -\mu_i(\sigma-1)\left(\frac{k}{\underline{k}_i}\right)^{(\kappa_i+\mu_i)(\sigma-1)}\underline{k}_i^{-1}\frac{d\underline{k}_i}{dZ_{iS}}<0 & \text{if } \underline{k}_i<k<k_{iS}, \end{cases}$$

such that the knowledge premium increases for managers of importing firms and falls for managers of domestic firms.

To see why $\Psi_i(k)$ increases if $k_{iS} \leq k$ consider the term $\left(Z_{iS}^{-1} - (\kappa_i + \mu_i)\underline{k}_i^{-1} \frac{d\underline{k}_i}{dZ_{iS}} \right)$ which needs to be positive. This term can be restated as follows:

$$Z_{iS}^{-1} - (\kappa_i + \mu_i)\underline{k}_i^{-1} \frac{d\underline{k}_i}{dZ_{iS}} \Leftrightarrow Z_{iS}^{-1} - (\kappa_i + \mu_i)\underline{k}_i^{-1} \frac{d\underline{k}_i}{d\delta_i}\frac{d\delta_i}{dZ_{iS}} \Leftrightarrow Z_{iS}^{-1} - \frac{\kappa_i + \mu_i}{1+\delta_i}\frac{d\delta_i}{dZ_{iS}},$$

which is positive if $\frac{1+\delta_i}{\kappa_i+\mu_i} Z_{iS}^{-1} > \frac{d\delta_i}{dZ_{iS}}$. Plugging the derivative $\frac{d\delta_i}{dZ_{iS}} = \frac{\sigma-1}{1-\xi_i}\left(Z_{iS}^{\sigma-1} - 1\right)^{\frac{\xi_i}{1-\xi_i}} Z_{iS}^{\sigma-2} F_{iS}^{-\frac{\xi_i}{1-\xi_i}}$ into the inequality it becomes $(1+\delta_i) > Z_{iS}^{\sigma-1}\left(Z_{iS}^{\sigma-1} - 1\right)^{\frac{\xi_i}{1-\xi_i}} F_{iS}^{-\frac{\xi_i}{1-\xi_i}}$ which can be simplified to $Z_{iS}^{\sigma-1} - 1 < F_{iS}$ which is true since $\underline{k}_i < k_{iS}$. ■

B Details on the Calibration

B.1 Mathematical Derivations

Stating Firm Sales and Knowledge Premia in Terms of Market Shares $\mathcal{M}$: Assuming that firms within the list of top 500 firms are importer[24] firm sales are $\sigma Z_{iS}^{\sigma-1}\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i}$, where the term $\frac{k}{\underline{k}_i}$ is unobservable. This term can be backed out from the market share of an individual firm using $\mathcal{M} \equiv \sigma Z_{iS}^{\sigma-1}\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i} X_i^{-1}$ such that

$$\mathcal{M} = \left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i}\left(\frac{\xi_i \underline{k}_i Z_{iS}^{\sigma-1}}{N_i(1+\delta_i)}\right) \Leftrightarrow \left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i} = \mathcal{M}\frac{N_i(1+\delta_i)}{\xi_i Z_{iS}^{\sigma-1}\underline{k}_i} \Leftrightarrow k = \left(\mathcal{M}\frac{N_i(1+\delta_i)}{\xi_i Z_{iS}^{\sigma-1}\underline{k}_i^{\xi_i}}\right)^{1/(1-\xi_i)}.$$

Stating the knowledge premium and sales as functions of $\mathcal{M}$ yields:

$$\begin{aligned} sales &= \sigma\mathcal{M}\frac{N_i(1+\delta_i)}{\xi_i\underline{k}_i} \\ knowledge\,premium &= \frac{\mu}{\kappa+\mu}\left(\mathcal{M}\frac{N_i(1+\delta_i)}{\xi_i\underline{k}_i} - (F_{iS}+1)\right) \end{aligned}$$

C Empirical Appendix

C.1 Variable Descriptions

- *Total Income:* variable `TotalAnnualCompensation` from BoardEx U.K. or variable `tdc2` from ExecuComp for the U.S. in nominal Thd. $ (in logs); Source: BoardEx, ExecuComp

[24] This can be verified ex post by comparing the computed values for k with the calibrated value for k_{iS}.

- *Value of Equity Ownership:* variable `TotalWealth` from BoardEx U.K. or variable `firm_related_wealth` from Coles et al. (2006) using ExecuComp for the U.S. in nominal Thd. $ (in logs); Source: BoardEx, ExecuComp, Coles et al. (2006)

- *Equity-Linked Income:* variable `TotalEquityLinkedCompensation` from BoardEx U.K. or variable `tdc2` from ExecuComp net of `salary` and `bonus` for the U.S. in nominal Thd. $ (in logs); Source: BoardEx, ExecuComp

- *Sales:* variable `sale` from Compustat in nominal Mio. $, winsorized at the 99th percentile (in logs); Source: Compustat North America, Compustat Global

- *Employment:* variable `emp` from Compustat in Thd., winsorized at the 99th percentile (in logs); Source: Compustat North America, Compustat Global

- *Capital Intensity:* ratio of variables `at` and `emp`, both winsorized at the 99th percentile (in logs); Source: Compustat North America, Compustat Global

- *Firm Size Quintiles:* order firms into quintiles by their average sales or employment during the years 2000 to 2002 within their country of location; Source: Compustat North America, Compustat Global

- *Stock Price:* annual arithmetic mean of daily closing stock prices `prccd` in nominal $ (in logs); Source: Compustat North America, Compustat Global (Security Daily Files)

- *Labor Expenses:* variable `xlr` from Compustat in nominal Thd. $, winsorized at the 99th percentile (in logs); Source: Compustat North America, Compustat Global

- *Import Share:* expenditure on imported intermediates relative to total expenditures on intermediate inputs for a country-industry-year, industries matched to firms' main SIC industry; Source: WIOD

- *Industry Output:* gross output in nominal Mio. $ for a country-industry-year (in logs), industries matched to firms' main SIC industry; Source: WIOD Socio-Economic Accounts

- *Industry TFP:* TFP index for a country-industry-year, year 2000 is normalized to 100 (in logs), industries matched to firms' main SIC industry; Source: WIOD Socio-Economic Accounts

- *Offshorability:* measures prevalence of occupations that do not involve face-to-face interaction and can be done off site for an industry (see C.2 for details), standardized (s.d. = 1) at the industry level, industries matched to firms' primary 3-digit SIC level industry; Source: O*NET version 20.3, BLS OES from the year 2000, Acemoglu and Autor (2011), Blinder (2009), Bretscher (2018)

- *Trade Transport Margins:* wedge between input import and output export trade margins defined as in Equation (23) using the variable `IntTTM` in WIOD and input level country-industry specific input coefficients based on WIOD in the year 2000; Source: WIOD

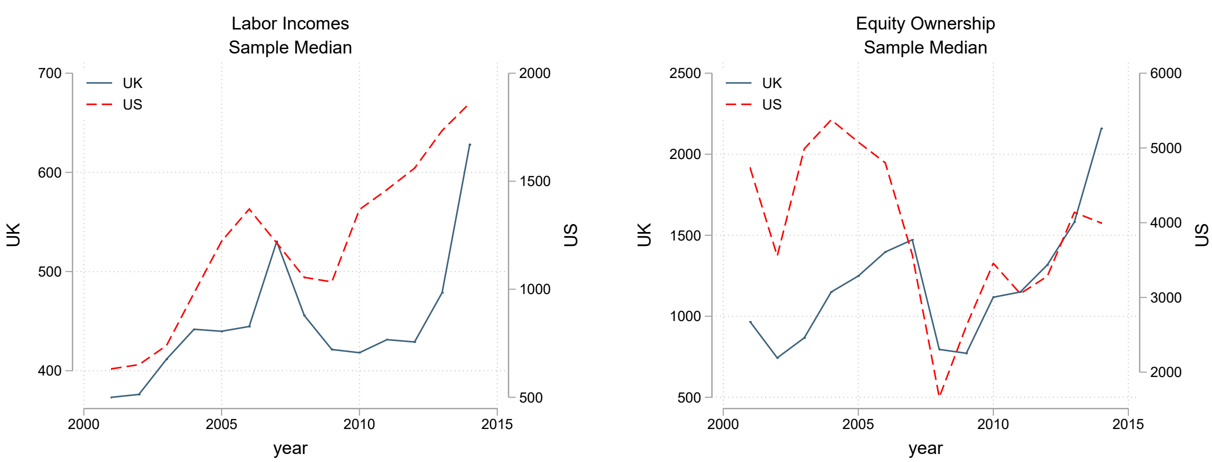
- *World Export Supply:* aggregate sum of log input trade in the rest of the world defined as in Equation (24) using input level country-industry specific input coefficients based on WIOD in the year 2000; Source: WIOD

C.2 Details on the Data

C.2.1 Summary Statistics on Managerial Labor Incomes and Equity Ownership

Figure A1 plots the median income and equity wealth levels in the sample for the U.S. and the U.K. over time. The level of incomes and equity wealth is substantially higher in the U.S. compared the U.K.: both, median level income streams and equity wealth are roughly twice as large in the U.S. on average. Even though the level of pay and wealth is different, there are similar time trends across both countries. Between 2000 and 2014 there has been a general surge in incomes. Due to its connection to stock prices, equity-linked wealth seems to be more volatile over time and plumped during the Great Recession, particularly in the U.S. To get an intuition for the prevalence of equity-linked wealth, Figure A2 plots the fraction of equity wealth in the sum of equity wealth and annual incomes for the year 2006 showing that equity wealth dominates incomes for most managers in the sample. The country means are 65% for the U.K. and 71% for the U.S.

Figure A1: Labor Incomes and Equity Ownership Over Time



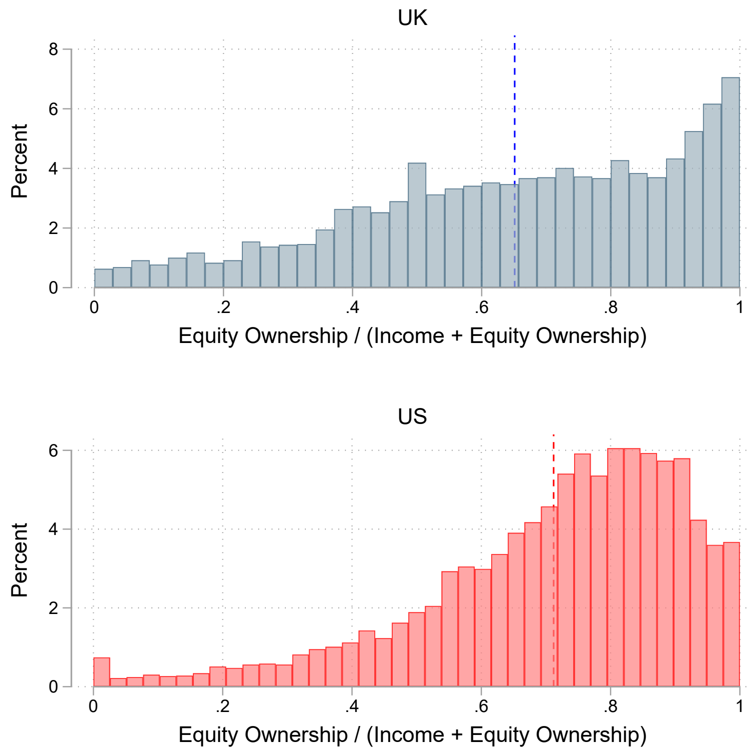
Notes: The Figure depicts annual sample medians of labor incomes and equity ownership in thousand nominal $.

C.2.2 Calculating Offshorability

I use data from the U.S. Department of Labor O*NET program on occupational task contents and the U.S. BLS Occupational Employment Statistics to calculate offshorability.[25] O*NET provides infor-

[25]I use version O*NET 20.3 available from https://www.onetonline.org and the BLS OES from the year 2000.

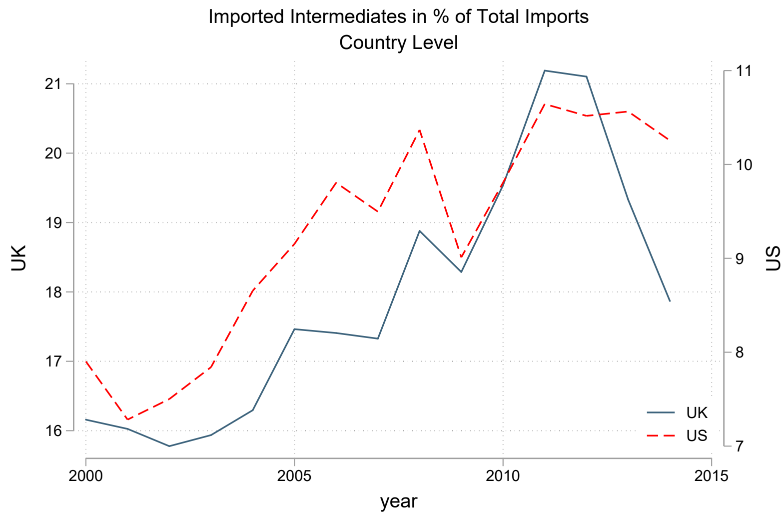
Figure A2: Histogram of the Fraction of Equity Ownership in Total Compensation



mation about the tools, technology, knowledge, skills, work values, education, experience and training needed for various occupations. Following Acemoglu and Autor (2011), I calculate an offshorability score at the occupation level in the first step which aims to capture how well each individual occupation is offshorable. Acemoglu and Autor (2011) argue that occupations requiring a lot of face-to-face interactions and that need to be carried out on site are less likely to be offshorable. They conclude to focus on the seven occupational characteristics listed in Table A1 to determine offshorability at the occupation level. The first six of these work are listed as "activities" and provide values for their respective "importance" "level" while there is no "importance" score for the work context characteristic "Face-to-Face Discussions". Following Blinder (2009) and Bretscher (2018), I assign a Cobb-Douglas weight of 2/3 to "importance" and 1/3 to "level" and multiply the relative frequency for "Face-to-Face Discussions" by the level to obtain the offshorability score at the occupation level j:

$$off_j = \frac{1}{\sum_{a=1}^{6} I_{aj}^{2/3} L_{aj}^{1/3} + I_{cj} L_{cj}}. \tag{25}$$

Figure A3: Imports of Inputs Over Time



Notes: The Figure plots the empirical measure of foreign input sourcing for the U.S. and the U.K. over time. The trend in global sourcing over time looks similar in both countries with the smaller U.K. being the more open economy on average.

In a second step, I aggregate the scores off_j at the industry level according to industry-specific employment shares:

$$OFF_i = \sum_j \mathit{off}_j \times \frac{emp_{j,i}}{\sum_{j,i} emp_{j,i}}, \tag{26}$$

which I standardize at the industry level such that it is centered around a zero mean and has a standard deviation equal to one. Generally, high values for OFF_i indicate that there are many employees within industry i whose occupations do not involve face-to-face interaction and can be done off site.

Table A1: Occupational Characteristics in O*Net Defining Offshorability

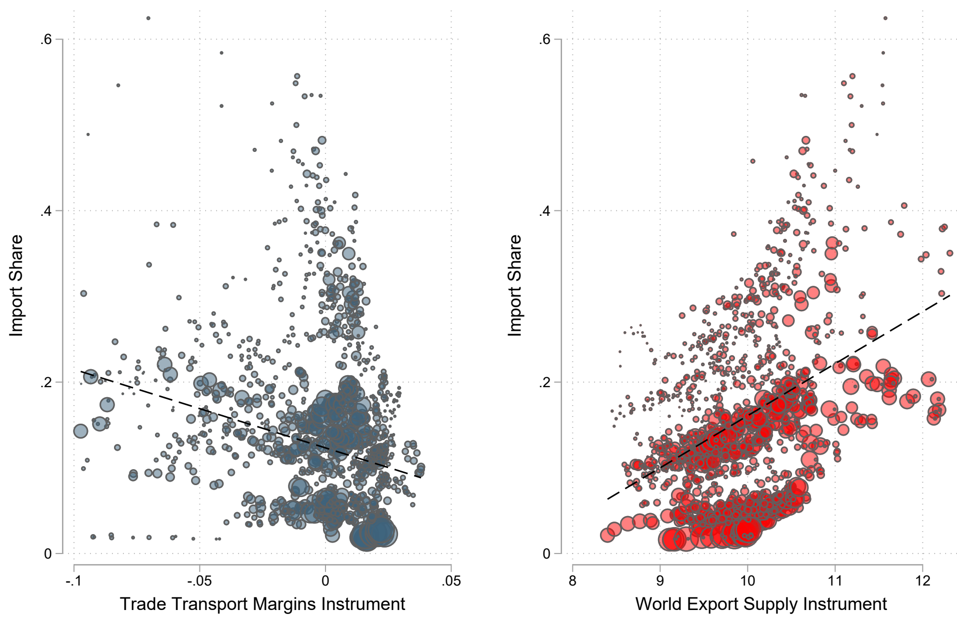
Task	*Description*
4.A.4.a.5	Assisting and Caring for Others
4.A.4.a.8	Performing for or Working Directly with the Public
4.A.1.b.2	Inspecting Equipment, Structures, or Material
4.A.3.a.2	Handling and Moving Objects
4.A.3.b.4	Repairing and Maintaining Mechanical Equipment (*0.5)
4.A.3.b.5	Repairing and Maintaining Electronic Equipment (*0.5)
4.C.1.a.2.l	Face-to-Face Discussions

Table A2: Relevance of the Instruments

	Import Share			
	(1)	(2)	(3)	(4)
			Weighted Regressions	
Trade Transport Margins	-0.0462***	-0.0450***	-0.0617***	-0.0583***
	(0.00870)	(0.00794)	(0.0153)	(0.0150)
World Export Supply	0.0808***	0.111***	0.0371**	0.0487*
	(0.0292)	(0.0324)	(0.0172)	(0.0256)
Country-Industry F.E.	yes	yes	yes	yes
Country-Year F.E.	yes	yes	yes	yes
Industry Controls	no	yes	no	yes
Observations	1,431	1,431	204,339	204,339
Cluster Groups	96	96	96	96

Notes: The dependent variable *Import Share* is the expenditure share on foreign inputs measured at the country-industry-year level based on WIOD data. Industry controls include country-industry-year level *Output* and a *TFP* index (output suppressed). All estimations include fixed effects for country-industry pairs and country-years. *International Trade Margins* and *World Export Supply* are described in subsection 4.1. Standard errors are cluster-robust at the country-industry pair level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Figure A4: Relevance of the Trade and Transport Margins and the World Export Supply Instruments



Notes: The Figure depicts a scatter plot of the two instrumental variables with import shares. The size of the markers indicates the frequency of each country-industry-year pair in the regressions. For optical reasons, I have omitted outliers of trade and transport margins from the graph. These are however included in Table A2.

Table A3: Annual Transition Matrix across Firm Size Quintiles

Size Quintile in t	*Size Quintile in t+1*				
	1	2	3	4	5
			By Sales		
1	**88.08**	11.54	0.25	0.10	0.03
2	5.86	**80.50**	13.43	0.20	0.01
3	0.19	7.17	**81.69**	10.90	0.04
4	0.04	0.18	6.29	**87.22**	6.27
5	0.03	0.00	0.12	4.27	**95.58**
			By Employment		
1	**90.2**	9.47	0.25	0.06	0.03
2	5.28	**83.99**	10.43	0.29	0.01
3	0.17	5.91	**85.02**	8.85	0.04
4	0.03	0.21	5.36	**89.23**	5.16
5	0	0.04	0.1	3.34	**96.53**

Table A4: Robustness: Importing and Changes in the Prevalence of Equity Ownership Across Firms

	Equity Ownership / (Income + Equity Ownership)					
	(1)	(2)	(3)	(4)	(5)	(6)
	By Sales			*By Employment*		
Import Share by Size Quintile						
Import Share × Q1	-0.552**	-0.395	-0.448	-0.329*	0.361	0.698*
	(0.251)	(0.345)	(0.422)	(0.193)	(0.340)	(0.386)
Import Share × Q2	-0.0143	0.384	0.525	-0.260**	0.187	0.303
	(0.150)	(0.333)	(0.427)	(0.123)	(0.328)	(0.429)
Import Share × Q3	-0.115	0.345	0.680	-0.0447	0.263	0.447
	(0.128)	(0.453)	(0.531)	(0.127)	(0.375)	(0.442)
Import Share × Q4	0.000113	0.204	0.0173	0.177	0.867***	1.062***
	(0.121)	(0.287)	(0.415)	(0.143)	(0.198)	(0.296)
Import Share × Q5	0.261*	0.786***	1.257***	0.326**	1.054***	1.436***
	(0.137)	(0.200)	(0.300)	(0.148)	(0.245)	(0.394)
Match F.E.	yes	yes	yes	yes	yes	yes
Country-Year F.E.	yes	yes	yes	yes	yes	yes
First-Stage						
KP F-test		12.68	10.67		14.77	13.64
Overident. (p-value)		0.587	0.498		0.661	0.431
Sample	All	All	CEOs	All	All	CEOs
Observations	129,349	129,349	25,954	127,009	127,009	25,129
Cluster Groups	95	95	95	95	95	95
Firms	3,031	3,031	2,922	2,780	2,780	2,699
Individuals	24,205	24,205	5,307	23,480	23,480	5,041

Notes: The dependent variable is the fraction of the *Value of Equity Ownership* relative to the sum of the *Value of Equity Ownership* and *Total Income*. *Import Share* is the expenditure share on foreign inputs measured at the country-industry-year level based on WIOD data. All specifications include firm level *Capital Intensity* and country-industry-year level *Output* and a *TFP* index (output suppressed). All estimations include fixed effects for individual manager-firm matches and country-years. Instrumental variables are international trade and transport margins and world export supply described in subsection 4.1. Firm size quintiles are based on the average firm sales or employment during the first 3 sample years and order the sample firms within the same country. Standard errors are cluster-robust at the country-industry pair level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A5: Robustness: Controlling for Import Competition

	Total Income		Equity Wealth		Total Income		Equity Wealth	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	By Sales				*By Employment*			
Import Share by Size Quintile								
Import Share × Q1	2.829**	1.174	-0.639	-6.918	2.008*	-1.599	1.421	3.282
	(1.133)	(3.949)	(1.871)	(4.311)	(1.090)	(3.026)	(1.336)	(3.969)
Import Share × Q2	-1.122	-4.771**	-0.000370	0.621	0.980*	2.457	0.869	3.549
	(0.712)	(2.218)	(0.978)	(3.581)	(0.527)	(1.627)	(0.853)	(2.660)
Import Share × Q3	-0.0696	-2.175	0.0278	2.575	0.337	1.113	0.550	2.910
	(0.484)	(2.019)	(1.128)	(4.106)	(0.582)	(1.549)	(1.083)	(3.425)
Import Share × Q4	1.373***	1.876**	1.936**	2.685	1.331**	0.864	2.887**	6.250***
	(0.407)	(0.800)	(0.921)	(2.536)	(0.535)	(1.097)	(1.152)	(1.643)
Import Share × Q5	2.489***	4.256***	4.708***	9.034***	3.001***	5.847***	4.902***	11.29***
	(0.519)	(0.736)	(0.934)	(1.351)	(0.579)	(1.187)	(1.189)	(1.655)
Import Penetration by Size Quintile								
Import Comp. × Q1	-2.248***	-1.609	-2.179	0.515	-1.410*	0.199	-2.751	-3.147
	(0.722)	(1.570)	(1.541)	(2.385)	(0.746)	(1.398)	(2.091)	(2.681)
Import Comp. × Q2	-0.148	1.356	-1.037	-1.059	-1.297**	-1.862**	-2.333***	-3.073***
	(0.517)	(1.044)	(1.144)	(1.692)	(0.513)	(0.847)	(0.744)	(1.163)
Import Comp. × Q3	0.545	1.431	0.330	-0.529	0.802	0.591	0.441	-0.0468
	(0.584)	(1.012)	(1.039)	(1.979)	(0.491)	(0.691)	(1.014)	(1.569)
Import Comp. × Q4	0.916**	0.737*	0.504	0.426	1.338***	1.605***	0.879	-0.0842
	(0.416)	(0.438)	(1.066)	(1.358)	(0.478)	(0.602)	(0.992)	(1.082)
Import Comp. × Q5	1.062**	0.237	-0.0421	-1.765*	0.912*	-0.243	0.376	-1.989*
	(0.418)	(0.502)	(0.943)	(0.944)	(0.495)	(0.606)	(0.938)	(1.044)
Match F.E.	yes	yes	yes	yes	yes	yes	yes	yes
Country-Year F.E.	yes	yes	yes	yes	yes	yes	yes	yes
First-Stage								
KP F-test		7.896		10.58		12.61		11.37
Overident. (p-value)		0.0816		0.301		0.266		0.226
Sample	All	All	All	All	All	All	All	All
Observations	161,618	161,618	130,175	130,175	158,029	158,029	127,253	127,253
Cluster Groups	95	95	95	95	95	95	95	95
Firms	3,241	3,241	3,071	3,071	2,963	2,963	2,792	2,792
Managers	28,677	28,677	24,295	24,295	27,734	27,734	23,454	23,454

Notes: The dependent variable *Total Income* is an individual executive's annual total income (in logs). The dependent variable *Value of Equity Ownership* is an individual manager's total equity-linked wealth (in logs). *Import Share* is the expenditure share on foreign inputs measured at the country-industry-year level based on WIOD data. *Import Competition* is imports over domestic absorption at the country-industry-year level based on WIOD data. All specifications include firm level *Capital Intensity* and country-industry-year level *Output* and a *TFP* index (output suppressed). All estimations include fixed effects for individual manager-firm matches and country-years. Instrumental variables are international trade and transport margins and world export supply described in subsection 4.1. Firm size quintiles are based on the average firm sales or employment during the first 3 sample years and order the sample firms within the same country. Standard errors are cluster-robust at the country-industry pair level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A6: Robustness: Multinational Firms

	Total Income		Equity Wealth		Total Income		Equity Wealth	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	By Sales				*By Employment*			
	Non-MNE	*MNE*	*Non-MNE*	*MNE*	*Non-MNE*	*MNE*	*Non-MNE*	*MNE*
Import Share by Size Quintile								
Import Share × Q1	2.463	-6.065**	-3.797	-9.655**	1.691	-4.845	6.036	-4.341
	(3.802)	(2.619)	(4.589)	(3.993)	(3.002)	(2.952)	(4.607)	(5.101)
Import Share × Q2	-2.985	-2.770	0.342	0.538	2.072	-2.125	1.102	-2.817
	(2.436)	(1.840)	(4.596)	(3.983)	(1.679)	(1.920)	(3.289)	(2.903)
Import Share × Q3	-1.181	-0.884	0.398	2.485	3.675**	-0.0670	6.770**	0.671
	(1.639)	(1.396)	(2.998)	(3.179)	(1.417)	(1.768)	(2.600)	(2.804)
Import Share × Q4	3.749***	0.388	4.992**	1.822	3.041***	0.671	5.203**	6.958***
	(1.408)	(1.168)	(2.155)	(2.517)	(1.040)	(1.204)	(2.198)	(2.282)
Import Share × Q5	5.073***	2.511**	6.155***	9.194***	7.142***	3.551***	9.898***	9.465***
	(1.024)	(0.979)	(2.172)	(2.450)	(1.806)	(1.089)	(2.753)	(2.637)
Match F.E.	yes	yes	yes	yes	yes	yes	yes	yes
Country-Year F.E.	yes	yes	yes	yes	yes	yes	yes	yes
First-Stage								
KP F-test	11.60	22.17	10.09	18.64	9.596	12.48	16.05	11.97
Overident. (p-value)	0.138	0.565	0.369	0.304	0.267	0.480	0.607	0.630
Observations	64,415	62,837	50,990	53,126	62,505	62,070	49,615	52,447
Cluster Groups	94	93	94	93	92	93	92	93
Firms	1,682	1,387	1,563	1,356	1,514	1,298	1,401	1,265
Managers	12,311	12,002	10,214	10,603	11,758	11,762	9,762	10,381

Notes: The dependent variable *Total Income* is an individual executive's annual total income (in logs). The dependent variable *Value of Equity Ownership* is an individual manager's total equity-linked wealth (in logs). *Import Share* is the expenditure share on foreign inputs measured at the country-industry-year level based on WIOD data. Firms are defined to be *MNE* if they report any foreign-owned assets based on Thompson WorldScope data. All specifications include firm level *Capital Intensity* and country-industry-year level *Output* and a *TFP* index (output suppressed). All estimations include fixed effects for individual manager-firm matches and country-years. Instrumental variables are international trade and transport margins and world export supply described in subsection 4.1. Firm size quintiles are based on the average firm sales or employment during the first 3 sample years and order the sample firms within the same country. Standard errors are cluster-robust at the country-industry pair level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A7: Robustness: Recession Years

	Total Income	Value of Equity Ownership	Total Income	Value of Equity Ownership
	(1)	(2)	(3)	(4)
	By Sales		*By Employment*	
Import Share by Size Quintile				
Import Share × Q1	-2.181	-8.968***	-2.478	-2.787
	(2.973)	(3.315)	(2.563)	(3.686)
Import Share × Q2	-5.437***	-3.840	-0.262	-1.364
	(1.749)	(3.239)	(1.457)	(2.841)
Import Share × Q3	-2.362*	-0.324	0.675	1.196
	(1.265)	(2.238)	(1.152)	(3.023)
Import Share × Q4	1.398*	1.154	1.711*	6.642***
	(0.704)	(1.936)	(0.966)	(1.723)
Import Share × Q5	3.969***	8.019***	6.292***	10.84***
	(0.962)	(1.469)	(1.163)	(2.119)
Match F.E.	yes	yes	yes	yes
Country-Year F.E.	yes	yes	yes	yes
First-Stage				
KP F-test	13.67	12.11	16.66	13.23
Overident. (p-value)	0.203	0.364	0.425	0.308
Observations	137,564	109,749	135,341	108,141
Cluster Groups	95	95	95	95
Firms	3,216	3,044	2,950	2,782
Managers	27,122	23,011	26,345	22,333

Notes: The dependent variable *Total Income* is an individual executive's annual total income (in logs). The dependent variable *Value of Equity Ownership* is an individual manager's total equity-linked wealth (in logs). *Import Share* is the expenditure share on foreign inputs measured at the country-industry-year level based on WIOD data. Estimations omit recession years 2008 and 2009. All specifications include firm level *Capital Intensity* and country-industry-year level *Output* and a *TFP* index (output suppressed). All estimations include fixed effects for individual manager-firm matches and country-years. Instrumental variables are international trade and transport margins and world export supply described in subsection 4.1. Firm size quintiles are based on the average firm sales or employment during the first 3 sample years and order the sample firms within the same country. Standard errors are cluster-robust at the country-industry pair level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$