Human Capitalists, Firm Ownership and International Trade

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Abstract

This paper studies firm-related capital ownership as a source of trade-induced top inequality. Using a model of heterogeneous firms where managers are compensated through incomes and equity ownership, I illustrate the impact of input-trade liberalization on this form of inequality. Data on the capital ownership of US and UK corporate top earners empirically confirm that trade-induced capital gains vary more than labor incomes across firms. These capital gains arise from pass-through via equity prices and from compensation adjustments. The findings show that capital ownership is more pivotal than top incomes when assessing the impact of trade on top inequality.

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1 Introduction

Most industrialized economies have witnessed surges in labor and capital incomes at the top of the income distribution over the last decades. Corporate top earners comprise a substantial proportion of these top earners. What distinguishes their compensation structure from salaried employees is the incorporation of equity-based compensation, resulting in the accumulation of capital ownership. Consequently, a portion of their income is derived from business profits through their ownership stake in the employing firms.[1]

While previous research has shown that international trade increases income inequality – particularly for top earners (Ma and Ruzic 2021, Keller and Olney 2021, Cuñat and Guadalupe 2009) – this paper unveils that trade-induced capital ownership of corporate top earners is a major source of top inequality and exceeds the dispersion in trade-induced income changes. To fix ideas, I present a model of heterogeneous firms and managers, where managers are compensated with monetary transfers and equity claims. The model illustrates how firms adapt their compensation structure in response to the liberalization of input trade, incorporating both capital ownership and labor income. Compensation structures change due to a labor-market effect which changes reservation earnings and a contracting-effect which changes firms' desire to adjust equity ownership to provide incentives. Changes in capital ownership can materialize via changes in equity prices (profits in the model) or newly issued equity. I inspect the quantitative implications of the mechanism by calibrating the model for the US and the UK. The quantification exercise highlights that adjustments in capital ownership in response to trade liberalization exceed income changes.

I then exploit a comprehensive dataset on managers in US and UK firms and combine it with firm- and industry-level information on intermediate imports and export sales. The data is a matched employer-employee panel that tracks the careers of more than 40,000 distinct corporate top earners employed by over 4,000 corporations.[2] It includes information on managers' capital ownership, specifically in the form of inside equity that is tied to the stock prices of their employing firms, such as stocks, stock options or retirement-plan contributions. The sample firms are listed in the major US and UK stock indices and large in the aggregate as they control 49% of the economy-wide corporate assets in the US and 74% of corporate assets in the UK. More than 80% of the individuals in the sample are within the top 1% earners of their respective country and more than one third is within the top 0.1% earners. For more than 60% of the US managers in the sample, their value of

[1] 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. Eisfeldt et al. (2022) and Smith et al. (2019) provide evidence for the importance of capital ownership for human capital in the US. Piketty and Saez (2003) report a declining share of labor income and an increasing share of capital income as one moves up within the top decile and the top percentile of the income distribution.

[2] The manager data combine information from BoardEx, S&P Compustat ExecuComp and Coles et al. (2006).

capital ownership is sufficient to belong to the top 1% of the wealth distribution and for more than one fourth of the managers it is even enough to belong to the top 0.1%.[3]

To study empirically how trade-induced shocks affect corporate top earners, I focus on the rise in intermediate imports during the sample period spanning from 2000 to 2014, in a Bartik shift-share setting. The focus on intermediate inputs helps to mitigate endogeneity concerns caused by unobserved productivity or demand shocks, as I construct two instruments which leverage information from international input-output tables. These instruments are constructed based on the exposure of downstream producers to input-supplying countries and industries. The first instrument is a measure of input-level transport costs and the second instrument proxies the potential share of foreign inputs that are covered within trade agreements. During the sample period, the US and the UK experienced faster growth in intermediate imports than in exports and the majority of total imports in those economies are used as production inputs.

I provide evidence that an increase in input imports at the industry level is linked to a rise in equity prices within large, importing firms, while smaller, domestic firms experience declining equity prices. These findings align with the notion of trade-induced reallocation put forth by Melitz (2003).[4] I then proceed to analyze the implications of this reallocation channel on the capital ownership of corporate top earners. My findings reveal heterogeneous effects on capital gains across the firm-size distribution, with trade shocks having a greater impact on the capital gains of individuals employed in larger, importing firms. This finding aligns with the research of Song et al. (2019) who study US income inequality and observe that a significant portion of the rise in US income inequality occurred across firms due to a widening gap of firms' employee composition, likely also driven by outsourcing parts of the production process. Within larger, importing firms, there is a shift in compensation away from labor income and towards capital ownership. Conversely, in smaller, domestic firms, the opposite trend is observed. As a result, the heterogeneity in capital gains induced by input supply shocks outweighs the according heterogeneity in top labor incomes. Although both capital ownership and labor incomes increase at the top end of the firm-size distribution, the adjustment of capital ownership to input supply shocks is more responsive compared to the adjustment of labor incomes. This increasing significance of capital ownership is driven by both the appreciation of equity prices and firms issuing new equity to top earners.

The paper intersects with two strands of literature. First, the paper connects to research on top income inequality and executive compensation. Piketty and Saez (2003), Piketty and Saez (2013), Atkinson et al. (2011) and Alvaredo et al. (2013) document a general trend of increasing top 1% income shares for Anglo-Saxon countries. Bakija et al. (2008) report that executives roughly account

[3]Calculations are based on data from the World Inequality Database.

[4]This finding complements Breinlich (2014) who documents heterogeneous stock-price responses in an event study around the Canada–US FTA of 1989 in accordance with expected intra-industry reallocation of economic activity.

for one-third of the top 1% in the US income distribution such that their incomes contribute substantially to top income inequality. Talent assignment models by Gabaix and Landier (2008), Edmans et al. (2009), Falato and Kadyrzhanova (2012), Baranchuk et al. (2011) and Terviö (2008) explore the relationship between CEO pay and product market size. These models consider an exogenous mass of firms and thus do not account for adjustments of top earners' compensation structures in response to trade shocks.

Second, the paper relates to research exploring the role of international trade for inequality. Most closely, Ma and Ruzic (2021), Keller and Olney (2021) and Cuñat and Guadalupe (2009) examine how trade integration affects the incomes of US corporate executives. In contrast to this paper, these studies do not explore the value of capital ownership among corporate top earners. This paper shows that capital ownership is more pivotal than top incomes when assessing the impact of trade on top inequality. Monte (2011) and Sampson (2014) develop assignment models with firm heterogeneity to understand the role of trade on the dispersion of incomes across firms. Pupato (2017) develops a model of performance pay and trade to study the impact of trade liberalization on inequality between homogeneous workers. In contrast to focusing on capital ownership as an alternative margin of trade-induced inequality, Burstein and Vogel (2017) quantify changes in the skill premium within a Ricardian trade model. Grossman and Rossi-Hansberg (2008) investigate how offshoring affects skill premia in a model of global production. They show that one might expect a widening wage gap between managers and production workers if production jobs are also the most offshorable ones.[5] Feenstra and Hanson (1999) report that trade in inputs explains around 40% of the US skill premium 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 task characteristics. Offshoring has the largest positive wage effect on occupations that are intensive in communication and language, followed by social sciences and math. Notably, all these tasks are categorical for managerial occupations.

The remainder of the paper is organized as follows. In the next Section, I present the model and analyze its quantitative implications in Section 3. In Section 4, I present the data and empirical analyses. Finally, Section 5 concludes.

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

2 Model

The model combines a moral-hazard problem with assignment as in Edmans et al. (2009) and a trade model of heterogeneous firms. The aggregate of expected equity claims and labor incomes that individual managers receive is shaped by product and labor markets. Consistent with the empirical observation that labor supply decreases with income levels (see Boppart and Krusell 2020 and Bick et al. 2018), richer agents have a higher utility for leisure. The requirement to provide incentives then endogenizes the capital compensation that firms grant in equilibrium. Trade liberalization causes reallocation of economic activity towards larger firms which ultimately shifts the compensation structure of top earners. Focusing on a steady state allows for an analysis of the long-term effects of trade-induced shocks on capital ownership, capturing persistent changes in compensation structure over time.[6]

2.1 Model Setup

Preferences and Endowments: The economy accommodates a set of industries I and each industry $i \in I$ is endowed with a mass of agents N_i and blueprints Q_i. Agents' knowledge and blueprints are heterogeneous in their efficiencies and specific to a certain industry. The efficiency of blueprints is denoted by $q \in [1, \infty)$ and the measure of blueprints with an efficiency level above q is denoted as $Q_i(q) = Q_i/q$. Equivalently, knowledge is denoted by $k \in [1, \infty)$ such that $N_i(k) = N_i/k$ is the measure of agents with knowledge above k.[7] While the knowledge of agents is used in management occupations and tied to a specific industry, agents can take-up production employment in any sector and all agents share the same production efficiency independent of their level of knowledge. Production workers earn a numéraire wage. Preferences are characterized by a multiplicative utility function over consumption and leisure:

$$U = C \cdot G, \quad \text{with } C = \prod_{i=1}^{I} \left[\left(\int_{\omega} q_{\omega}^{\frac{\sigma-1}{\sigma}} d\omega \right)^{\frac{\sigma}{\sigma-1}} \right]^{\beta_i}, \tag{1}$$

where C denotes utility arising from consuming varieties ω across industries and G denotes utility from leisure. Sectoral expenditure shares β_i add up to one and σ is the elasticity of substitution across varieties. The expected compensation of an agent with knowledge level k employed in industry i is denoted by $r_i(k) = E[w_i(k)] = 1 + \Psi_i(k)$, where $w_i(k)$ denotes the realized compensation and

[6]For a more detailed description of the model, I refer to Appendix A.

[7]As the shape of the equilibrium earnings distribution will not only be determined by the shape of these distributions but also by the contribution of blueprints and knowledge to productivity, the assumption of Pareto distributions with unity shape parameters is without loss of generality for the earnings distribution (see Appendix A.9).

$\varPsi_i(k)$ is the compensation premium that the manager in industry i obtains on top of the numéraire wage.

Managerial Labor Supply: Managers face an unobservable binary choice of labor supply between effort levels $\overline{e}$ or $\underline{e}$ that requires firms to write incentive contracts. I normalize managerial effort levels to $-1 < \underline{e} < \overline{e} = 0$ and low effort reduces firm surplus by a fraction $(1 + \underline{e})$. I abstract from agency frictions in production work. Leisure utility G is given as:

$$G = \frac{1}{1 - \lambda(e, \varPsi_i)} \geq 1, \quad \lambda(e, \varPsi_i) \in [0, 1)\,. \tag{2}$$

Here, the parameter $\lambda(e, \varPsi_i)$ captures private benefits of leisure that managers obtain from low effort. I assume that leisure benefits increase with compensation levels $\frac{d\lambda(\underline{e},\varPsi_i)}{d\varPsi_i} \geq 0$ and that high effort $\overline{e}$ does not entail leisure benefits such that $\lambda(\overline{e}, \varPsi_i) = 0$.[8]

Production, Entry and International Activity: The mass of blueprints comprises the mass of potential entrants into each industry.[9] Firms originate from the matching of a manager to a blueprint and operate on a monopolistically competitive product market. Each firm faces a demand per variety equal to $A_i p^{-\sigma}$. The term $A_i \equiv X_i P_i^{\sigma-1}$ is an aggregate demand shifter that captures the market size from the perspective of individual firms in the industry. Here, X_i corresponds to industry size and P_i is the price index of the industry. Each firm produces a mass of varieties $\eta\,(1 + e)$ that depends on managerial effort e and an idiosyncratic unobservable stochastic noise term $\eta \geq 0$ with a mean of one. Each variety generates a monopolistic-competition profit stream π such that a firm's realized ex-post surplus is $\Pi = \eta\,(1 + e)\,\pi$.

Firms can choose to import parts of their inputs. Importing inputs from abroad lowers firms' unit-labor requirements by a factor $z_{is} \geq 1$ and requires firms to spend fixed costs F_{is}. Additionally, firms can spend fixed costs F_{ix} to export its goods to a symmetric foreign economy. All fixed costs are expressed in units of production labor. Exporting firms need to produce τ_{ix} units of output for one unit to reach the foreign destination. Without loss of generality, I postulate that the export choice is

[8]In this regard, the model deviates from Edmans et al. (2009) who assume that income and substitution effects exactly offset each other such that effort remains constant when agents become richer. They motivate this assumption with balanced-growth considerations where labor supply stays constant when income increases. In contrast, the assumption here implies that income effects on leisure exceed its substitution effects such that richer agents have a higher valuation for leisure. This is in line with Boppart and Krusell (2020) who document that most countries experienced declining labor supplies over time suggesting that income effects outweigh substitution effects. Furthermore, Bick et al. (2018) document empirically that labor supply decreases with income, both at the aggregate level across countries and also per worker with increasing individual wages.

[9]Similar to Chaney (2008), blueprints are owned by some mutual fund which maximizes firm profits that redistributes residual profits in some way that is exogenous to the model.

more restrictive than the import choice such that less productive firms find it worthwhile to import inputs relative to the firms that select into exporting.[10] Productivity of each firm is determined by the match quality and the firm's importing choice. Unit costs of production for a firm with a blueprint q and a manager with knowledge k are given as follows:

$$\varphi(k,q) = \begin{cases} \left(z_{is} k^{\mu_i} q^{\kappa_i}\right)^{-1} & \text{if importer} \\ \left(k^{\mu_i} q^{\kappa_i}\right)^{-1} & \text{if domestic,} \end{cases} \tag{3}$$

where parameters $\mu_i > 0$ and $\kappa_i > 0$ measure the influence of knowledge and blueprints for firm productivity. The surplus per variety π thus equals

$$\pi = \frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i \left[1 + \mathbb{I}_s\left(z_{is}^{\sigma-1} - 1\right) + \mathbb{I}_x\left(\left(1+\tau_{ix}^{1-\sigma}\right) z_{is}^{\sigma-1} - 1\right)\right] \left(k^{\mu_i} q^{\kappa_i}\right)^{\sigma-1}, \tag{4}$$

where $\mathbb{I}_s$ is an indicator for firms that import and $\mathbb{I}_x$ is an indicator for firms that export. Note, that high effort implies $E\left[\Pi|\bar{e}\right] = \pi$ and low effort implies $E\left[\Pi|\underline{e}\right] < \pi$. Stochastic noise prevents that effort can be directly inferred from realized ex-post surplus. As more knowledgeable agents have a comparative advantage in managing firms with better blueprints, there is positive assignment and individual firms balance the marginal benefit of higher knowledge with the marginal increase in expected compensation. The marginal manager in the industry with knowledge level $\underline{k}_i$ is indifferent between management or production work such that $r_i(\underline{k}_i) = 1$.

Incentive Contracts: Firms offer contracts that provide sufficient incentives for the manager to forego private leisure benefits from low effort. Contracts specify an income transfer f and capital ownership with value $V(\Pi)$. The elasticity of capital ownership with respect to firm surplus is denoted by ε_V.[11] Since agents are risk-neutral, there exists a continuum of incentive-compatible contracts that induce $\bar{e}$. Following Edmans et al. (2009), I restrict attention to contracts that satisfy individual rationality and minimize equity grants.[12]

Equilibrium: An equilibrium is characterized by the following properties: *(i)* firms offer contracts that are incentive-compatible, satisfy individual rationality and minimize capital ownership, the share of capital ownership relative to total compensation $\triangle$ is given by $\triangle = \frac{\lambda(e,\Psi_i)}{|\underline{e}|^{\varepsilon_V}}$; *(ii)* only firms with non-negative expected profits enter the market (zero-cutoff condition); *(iii)* firms select

[10] As the share of importing firms is larger than the share of exporting firms in my empirical sample, this is supported by the data.

[11] The capital market is outside of the model and capital ownership can comprise any portfolio of stocks and stock options on a firm's realized surplus Π.

[12] These contracts would also be the optimal ones under marginally positive risk aversion.

optimally into importing and exporting; *(iv)* labor markets clear such that demand for production workers equals production-labor supply (labor-market condition); *(v)* there is positive assignment of managers to blueprints and managers are compensated according to their expected marginal product.

2.2 Comparative Statics and Empirical Predictions: Trade Liberalization

In the following, I consider an input supply shock from trade liberalization that raises the productivity benefits from importing ($dz_{is} > 0$). This input-trade integration causes a reallocation of economic activity towards larger firms as in heterogeneous-firm models like Melitz (2003). The industry price index falls which leads to a higher cutoff $\underline{k}_i$ in equilibrium. Furthermore, the cutoff k_{is} for the marginal importing firm falls such that the fraction of importers in the industry increases. This has the following effects on managers and their capital ownership:

When input trade is liberalized in an industry i ($dz_i > 0$):

1. *The value of large and importing firms (with $k > k_{is}$) appreciates while the value of small and non-importing firms (with $k < k_{is}$) falls.*

2. *Top earners of large and importing firms (with $k > k_{is}$) experience capital gains while top earners of small and non-importing firms (with $k < k_{is}$) experience capital losses.*

3. *The compensation structure shifts towards capital ownership and away from labor income for top earners of large and importing firms (with $k > k_{is}$). The compensation structure shifts away from capital ownership and towards labor income for top earners of small and non-importing firms (with $k < k_{is}$).*

4. *Changes in capital ownership are caused by a labor-market effect and a contracting effect. These changes can occur via an appreciation in equity prices or newly issued equity:*

$$\hat{\triangle}\hat{r}_i\left(k\right) = \underbrace{\frac{r_i'\left(k\right)}{r_i\left(k\right)}}_{\text{labor market}} \times \underbrace{\frac{\triangle'}{\triangle}}_{\text{contract}} = \underbrace{\frac{V\left(\Pi'\right)}{V\left(\Pi\right)}}_{\text{appreciation}} \times \underbrace{\frac{V'\left(\Pi'\right)}{V\left(\Pi'\right)}}_{\text{new equity}}. \tag{5}$$

A formal proof of the empirical predictions is relegated to Subsection A.8 in the Appendix.

3 Quantitative Analysis

In this Section, I conduct a quantitative exercise of the model and to illustrate the quantitative importance of capital-ownership variation in response to trade liberalization.

3.1 Calibration

I specialize the model to separately match moments of the US and the UK economy in the year 2006 before the financial crisis. This requires values for the following set of parameters: {σ, θ, $\triangle(\Psi_i)$, N_i, μ_i, κ_i, β_i, z_{is}, F_{is}, τ_{ix}, F_{ix}}, where I distinguish between three broad sectors i: manufacturing, services and all other economic activities. Mapping capital ownership and labor-income streams from the data to the model is not straightforward. Analogously to the following empirical Section, I compute capital-ownership shares $\triangle$ as the present value of capital ownership relative to the sum of capital ownership and the present value of previous labor income streams. Accordingly, compensation premia express this number in units of average domestic wages averaged over a managers' tenure years.

For the values of σ and θ, I use reference values from the literature and set the elasticity of substitution across varieties to 2.29 for the US and to 2.38 for the UK based on median elasticities reported by Broda and Weinstein (2006)[13] and the elasticity of substitution between domestic and foreign inputs to 4.006 based on estimates from Halpern et al. (2015). To obtain sectoral expenditure shares β_i, I rely on the WIOD socio-economic accounts. Since private leisure benefits G are not directly observable, I directly discipline the distribution of capital ownership $\triangle$ across the firm-size distribution to match its relation to the compensation premium Ψ_i in the data. Specifically, I fit the exponential function $\frac{B_2\Psi_i^{B_3}}{B_1+B_2\Psi_i^{B_3}}$ to match values for $\triangle$ in the data.

The remaining parameters N_i, μ_i, κ_i, z_{is}, F_{is}, τ_{ix} and F_{ix} are calibrated to target 15 macro and micro moments for the US and the UK economy. The macro moments are the sector-specific expenditure shares on imported inputs, export openness and the mass of firms in the economy.[14] Import shares are mainly responsible for the calibration of the fixed cost of importing F_{is} and the productivity gains from importing z_{is} and export openness for the fixed and variable exporting costs F_{ix} and τ_{ix}. The mass of firms loosely determines N_i for given cutoff values $\underline{k}_i$. For the remaining micro moments, I focus on the 500 largest firms within each economy and match the logarithm of the 50th percentile of the compensation premium and the logarithm of the 50th percentile of firm sales

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

[14] Statistics on the number of firms per sector in each economy are obtained from the OECD Structural Business Statistics. The expenditure share on imported inputs and exports relative to gross output are obtained from WIOD data.

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 compensation premia and firm sales as a function of each individual firm's market share which I can observe in the data. 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.[15]

The calibration searches over the parameter space to match the discussed moments using a weighted sum of squared relative differences between the model and the data as a loss function. To ensure that the calibrated expenditure shares on imported inputs and the export openness match the data well enough to consider a realistic degree of openness in the counterfactual, I give these moments a tenfold weight compared to the other targeted moments.[16]

I list the calibrated parameter values in Table 1. Compared to the influence of technologies κ_i on firm productivity, the contribution of managerial knowledge μ_i is fairly small which is identified by the share of rents $\frac{\mu_i}{\kappa_i+\mu_i}$ that accrue to managers. Moreover, the calibration suggests higher fixed costs of importing for the US relative to the UK since the expenditure share on imported inputs is lower in the US. Table 2 lists the calibrated moments and their data counterparts. Since the calibration puts a large weight on the trade moments, expenditure shares on imported inputs and export openness match the data very closely. Most calibrated moments are within less than 10% deviation from the data. The correlation coefficient for the calibrated and observed capital-ownership shares $\triangle$ across firms is 0.61 for the UK and 0.64 for the US economy. The R^2 is 0.37 for the UK and 0.41 for the US.

3.1.1 Untargeted Moments

With the help of Figure 1, I evaluate how well the calibration exercise fits the power law of the earnings distribution suggested by the data. The shape of the earnings distribution is not targeted in the calibration itself. The Figure plots the log knowledge distribution and the log number of firms whose top earners own equity above this threshold.[17] The shape of the observed and calibrated distributions fit very well for both economies.

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

[16] To search for the parameter values, I first use a simulated annealing algorithm. Then, starting from the parameter set suggested by the algorithm outcome, I run a minimization limited BFGS algorithm that incorporates parameter bound constraints. The calibration uses the "basin-hopping" routine in Scipy Python.

[17] This approach is similar to what other researchers have done to illustrate the shape of the firm-size distribution (see e.g. Luttmer 2007).

Table 1: Calibrated Parameter Values

	Industry-Wide Parameters								*Economy-Wide Parameters*				
	μ_i	κ_i	z_{is}	F_{is}	τ_{ix}	F_{ix}	$N_i{\times}10^8$	β_i	σ	θ	B_1	B_2	B_3
							Parameters USA						
Manuf.	0.0027	0.73	1.23	0.79	2.01	1.41	0.37	0.20					
Serv.	0.0057	0.66	1.13	0.73	3.07	1.95	0.24	0.59	2.29	4.006	10.15	1.85	0.62
Oth.	0.0022	0.59	1.19	0.72	3.21	1.11	0.18	0.21					
							Parameters GBR						
Manuf.	0.0095	0.65	1.15	0.27	1.33	1.21	0.02	0.17					
Serv.	0.0121	0.61	1.24	0.98	2.16	1.40	0.03	0.58	2.38	4.006	12.66	4.13	0.52
Oth.	0.0024	0.52	1.48	2.12	2.38	2.05	0.23	0.25					

3.2 The Impact of Trade Liberalization

Consider a switch from an economy with $\delta_i \to 0$ to the calibrated levels of δ_i. This counterfactual switch from autarky to an open economy corresponds to an average economy-wide increase in the expenditure share on imported inputs of 12 p.p. in the US and 16 p.p. in the UK. Correspondingly, the switch from autarky to an open economy corresponds to an 21 percent reduction in the US price index, while the UK price index falls by 28 percent.

I compute relative changes in capital ownership and labor income for corporate top earners across the three sectors. Table 3 presents the results for selected percentiles. As predicted by the model, trade liberalization has a larger impact for top earners employed by larger firms. More importantly, increases in capital ownership exceed increases in labor incomes at the top of the earnings distribution such that the increase in inequality of capital ownership exceeds the increase in top income inequality.[18] Quantitatively, the counterfactual increases in capital ownership due to trade are notably larger than the calibrated trade-induced skill premia from Burstein and Vogel (2017). Specifically, their model estimates the trade-induced skill premium to be approximately 2% for the US and 4% for the UK for levels of openness in 2006 in comparison to autarky.

[18] In Appendix B.2, I additionally use the model to discuss how large taxes on top earners would need to be to restore their earnings to autarky levels and how distortive such a tax would be.

Table 2: Calibrated Moments

Moment		USA			GBR		
		Manuf.	*Serv.*	*Oth.*	*Manuf.*	*Serv.*	*Oth.*
Expenditure share	Model	0.17	0.05	0.10	0.28	0.14	0.16
on imported inputs	Data	0.18	0.05	0.10	0.28	0.14	0.15
	Deviation	*-0.6%*	*-0.9%*	*-0.1%*	*-0.4%*	*-0.1%*	*0.2%*
Export share	Model	0.14	0.02	0.04	0.44	0.09	0.04
in gross output	Data	0.14	0.02	0.04	0.44	0.09	0.04
	Rel. Deviation	*0.9%*	*1.8%*	*-1.0%*	*0.7%*	*-0.5%*	*0.6%*
Compensation premium,	Model	4.27	5.03	4.26	2.88	3.05	2.80
50th pct.	Data	4.37	5.00	4.39	2.92	3.10	2.96
	Deviation	*-2.4%*	*0.6%*	*-3.0%*	*-1.4%*	*-1.8%*	*-5.5%*
Sales,	Model	10.71	10.62	10.69	7.99	7.85	9.06
50th pct.	Data	12.11	12.03	12.09	8.84	8.70	9.91
	Deviation	*-11.6%*	*-11.7%*	*-11.6%*	*-9.6%*	*-9.7%*	*-8.6%*
Number	Model	371,273	3,422,697	1,940,085	133,765	913,419	706,467
of firms	Data	371,275	3,162,206	1,879,471	131,817	921,780	671,111
	Deviation	*0.0%*	*8.2%*	*3.2%*	*1.5%*	*-0.9%*	*5.3%*

4 Empirical Analysis

4.1 Data

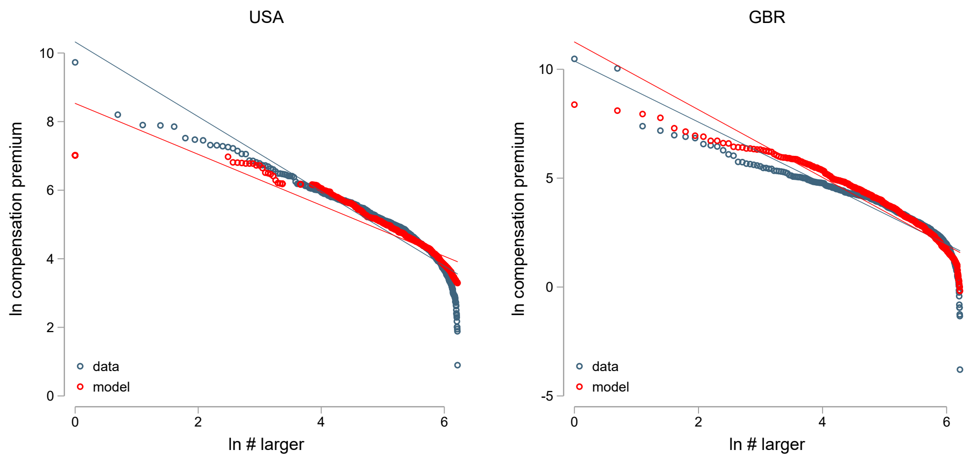
4.1.1 Data on Corporate Top Earners

The empirical analysis utilizes individual-level data for top earners of publicly quoted firms in the US and the UK from 2000 to 2014. Information on US managers is obtained from S&P Compustat ExecuComp, while data on British managers is sourced from BoardEx, a commercial business intelligence provider. These sources gather information on remuneration and biographical details of business leaders from various regulatory entities, such as the RNS, the London Stock Exchange, Companies House (UK), SEC filings, and NASDAQ or NYSE (US).

Stock companies in the US and UK report directors' stock ownership and option holdings in annual proxy statements, enabling the computation of individual capital ownership within their respective employing firms.[19] In the US, stock ownership is disclosed in proxy statements submitted to the Securities Exchange Commission, while the UK required a register of directors' interests in the employing firm's shares as per the Companies Act 1985. Capital ownership comprises the value of stocks owned by managers, acquired through exercised stock options or direct grants, along with

[19]Sometimes, this measure of capital ownership is referred to as "inside equity". See Appendix C for more details on the data construction.

Figure 1: Shape of the Earnings Distribution in the Model and the Data



Notes: The Figure depicts the shape of the earnings distribution for the US (left graph) and the UK (right graph).

the market value of their outstanding equity options. For managers employed by US companies, the approach suggested by Coles et al. (2006) is followed. The value of the stock portfolio is the product of the number of shares that an individual holds and the year-end stock price. Prior to the revision of Federal Accounting Standard 123 in 2006, the value of the option portfolio includes newly-granted options, as well as previously-granted unvested and vested options. From 2006 onwards, options are reported at the option-tranche level, and the value of the option portfolio is obtained by aggregating values across tranches. For managers employed by UK firms, capital ownership data is directly sourced from BoardEx, following the same principle of summing stock value and estimated options value.

Besides capital ownership, the data contain information on direct monetary compensation and in some cases also its individual components such as salary, bonuses or other incentive payments. I will treat the total sum of monetary compensation as labor income throughout the empirical analysis.

Overall, the panel includes more than 40,000 top earners employed by over 4,000 corporations. About one quarter of these are employed by British companies while the remaining top earners are employed by companies in the US. Compared to World Bank data, the sample firms comprise 82% of the US and 57% of the UK market capitalization of listed companies. Compared to total country-wide assets from KLEMS data, the sample firms control 49% of corporate assets in the US and 74% of corporate assets in the UK. The median level of labor income in the sample is above 900 thousand \$ and the median value of capital ownership equals about 3 million \$. Based on data from the World Inequality Database for the year 2006, more than 80% of the managers in the sample are above the

Table 3: Impact of Trade Liberalization on Corporate Top Earners

	p90			p99			p99.9		
	Total	Capital Ownership	Labor Income	Total	Capital Ownership	Labor Income	Total	Capital Ownership	Labor Income
USA									
Manuf.	102	139	101	118	165	114	160	209	144
Serv.	100	105	100	112	134	110	133	155	125
Oth.	100	115	100	105	133	104	122	152	118
GBR									
Manuf.	109	150	105	150	196	135	192	228	157
Serv.	106	130	103	138	172	127	170	198	145
Oth.	101	126	100	112	159	107	148	203	134

Notes: The Table shows in changes of top earners' earnings at selected percentiles from autarky to the level of trade openness in 2006. Changes are measured as $\frac{value_{2006}}{value_{aut}} \times 100\%$.

top 1% pre-tax national income threshold of their respective country and more than one third are above the top 0.1% threshold. For more than 60% of the US managers, their value of capital ownership is sufficient to belong to the top 1% of the wealth distribution and for more than one fourth of the US managers it is sufficient to be within the top 0.1% of the wealth distribution.

4.1.2 Data on Firms and Industries

I match individuals in the sample to their employers using firm-level information from Compustat US or Compustat Global. Additionally, I utilize Dun&Bradstreet WorldBase data (D&B WorldBase) to classify firms as importers or exporters.

To assess the exposure of individuals to foreign input markets, I link the sample firms to industry data from the World Input Output Database (WIOD, 2016 release) based on firms' primary industries. The WIOD data track the flow of intermediate and final goods and services across countries and industries over time. The data cover imports across 56 sectors, including agriculture, mining, construction, utilities, manufacturing, and services, based on ISIC Rev. 4. The exposure of individual managers to foreign inputs is measured by calculating the value of imported inputs relative to the total input consumption within each country-industry-year cell. Alternatively, I use a more disaggregated I-O table for manufacturing industries based on the 1992 US Benchmark I-O table from the US Bureau of Economic Analysis and import data from the UN Comtrade database. I also construct an offshorability measure based on the task composition within occupations and the occupational composition within industries.[20]

Table 4 presents selected summary statistics on individuals, firms and industries.

[20]This proxy has been used by Acemoglu and Autor (2011), Blinder (2009) and Bretscher (2019) (see Appendix C).

Table 4: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	25th Pct.	Median	75th Pct.
Manager-Year Level						
Labor Income (in Thd. USD)	201,009	2,410	11,040	433	940	2,207
Equity Wealth (in Thd. USD)	165,071	24,150	392,265	870	2,926	9,208
Firm-Year Level						
Nb. of Individuals	43,712	4.7	1.7	3	5	6
Assets (in Mio. USD)	42,704	7,976	25,498	196	937	4,060
Employment (in Thd.)	40,292	12.4	27.9	0.5	2.6	9.8
Sales (in Mio. USD)	40,536	3,698	8,942	179	743	2,670
Country-Industry-Year Level						
Imported Inputs (Expenditure Share)	1,431	0.16	0.10	0.08	0.13	0.20
Output (in Mio. USD)	1,431	257,977	360,530	41,585	125,572	315,866
Imports (in Mio. USD)	1,431	25,368	42,949	3,289	9,003	27,360
Exports (in Mio. USD)	1,431	19,069	26,002	3,174	10,056	23,949

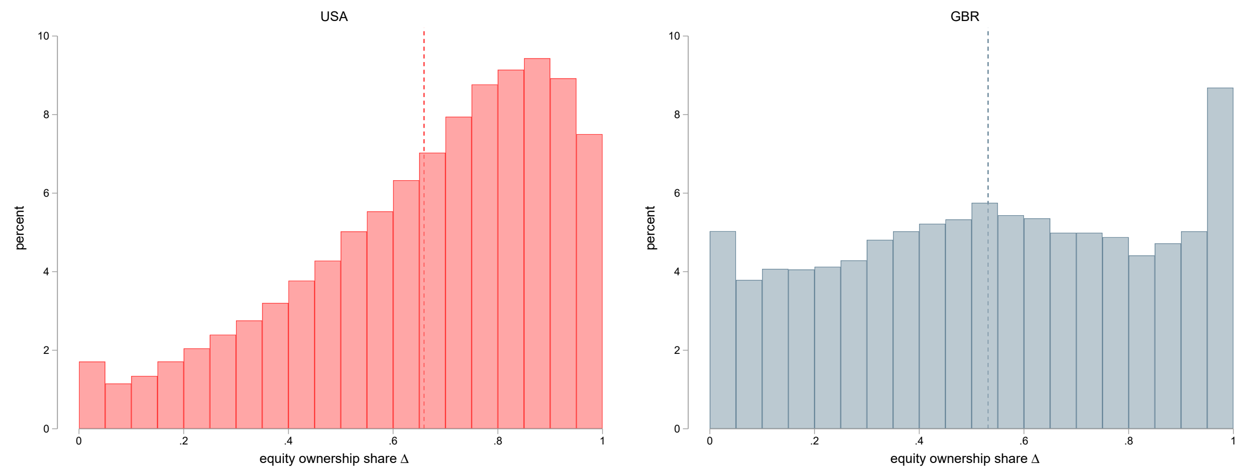
4.2 Facts on Capital Ownership of Corporate Top Earners

Before turning to the empirical analysis, I present four stylized facts on capital ownership of corporate top earners based on descriptive statistics.

Fact #1: There is heterogeneity in the prevalence of top earners' capital ownership: Figure 2 presents the distribution of capital ownership among individuals in the sample, measured as the ratio of capital ownership to the sum of capital ownership and the present value of labor incomes. This measure captures the proportion of total compensation attributed to capital ownership. The Figure highlights the heterogeneity observed across firms. On average, top earners in the US have a higher proportion of their compensation derived from capital ownership compared to their UK counterparts (0.66 versus 0.53).

Fact #2: Capital ownership of top earners is higher in larger and international firms: Correlating capital ownership with firm covariates in the upper part of Table 5 reveals that top earners in larger firms (measured by sales or employment) tend to have higher capital ownership. This observation also holds true for importing firms, exporting firms, multinationals and more capital-intensive firms.

Figure 2: Prevalence of Capital Ownership



Notes: The Figure plots the distribution of *Capital-Ownership Shares* △ in the data. The *Capital-Ownership Share* △ is calculated as *Capital Ownership* relative to the sum of *Capital Ownership* and the present value of previous labor-income payments.

Fact #3: Capital ownership of top earners is higher in larger, more productive and more offshorable industries: Examining covariates at the industry-level in the bottom part of Table 5 suggests a positive correlation between capital ownership and industry productivity (measured by TFP index), industry output, exports, and the offshorability of tasks within the industry.

Fact #4: The value of capital ownership correlates with the development of equity prices: Figure 3 illustrates that the development of the value of top earners' capital ownership over time closely tracks the evolution of market-wide equity indices proxied by the S&P 500 index for the US or the FTSE 350 index for the UK.

4.3 Empirical Strategy

4.3.1 Specification

To evaluate the empirical predictions between trade-induced reallocation and the structure of corporate top earners' compensation formulated in Subsection 2.2, I estimate specifications of the following type:

$$I_{mfict} = \alpha_1 \times q_f \times imp_{ict} + \alpha_2 \times q_f \times exp_{ict} + \Gamma_{mfict} + \mu_{mf} + \mu_{ct} + \varepsilon_{mfict}. \tag{6}$$

Table 5: Capital Ownership, Firm and Industry Characteristics

(a) Firm Covariates

	Sales (log)	Employment (log)	Capital Intensity (log)	Multinational	Importer	Exporter
Capital Ownership (log)	0.393***	0.353***	0.265***	0.823***	0.640***	0.667***
Capital-Ownership Share △	0.0174***	0.0133***	0.0240***	0.0428***	0.0168**	0.0242***

(b) Industry Covariates

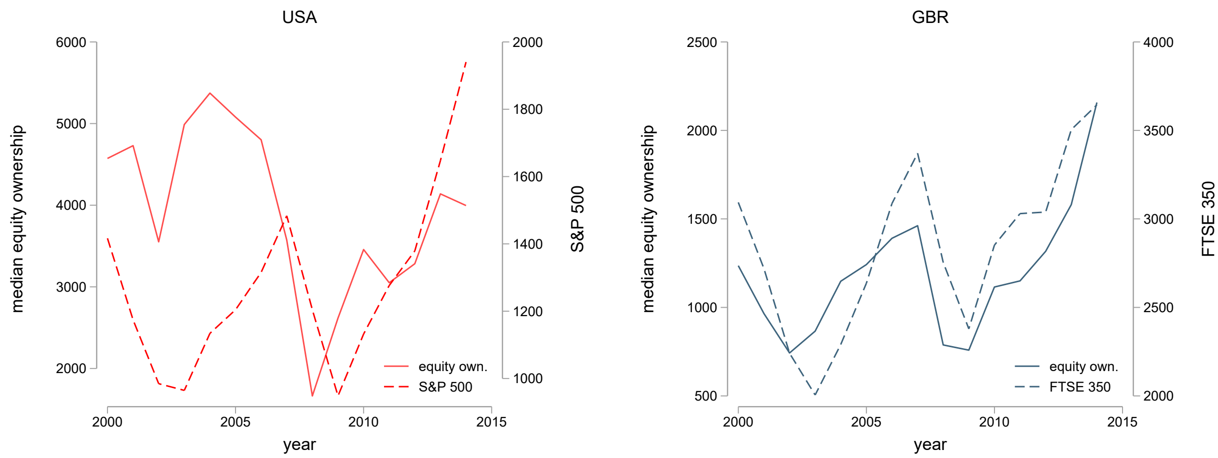
	Offshorability (S.D.)	TFP (log)	Output (log)	Exports (log)
Capital Ownership (log)	0.148***	0.601***	0.189***	0.0352***
Capital-Ownership Share △	0.0111***	0.109***	0.0128***	0.0103***

Notes: The cells are coefficient estimates of univariate regressions, whose dependent variables are down the rows and regressors are along the columns. Specifications additionally control for tenure and include country-year fixed effects and in Table (a) also industry fixed effects. The dependent variables are *Capital Ownership* (in logs) and the *Capital-Ownership Share* △ (*Capital Ownership* relative to the sum of *Capital Ownership* and the present value of previous labor-income payments). Standard errors are cluster-robust at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The outcome of interest is denoted by I_{mfict} (e.g. capital ownership in logs) and the subscripts correspond to a manager m, employed by firm f, active in industry i based in country $c \in \{US, UK\}$, during year t. The regressor imp_{ict} is the expenditure share on imported intermediates and measures the extent of input imports in a country-industry cell over time. To allow the effect of input imports to vary across firms, I interact imp_{ict} with a vector of firm characteristics q_f. These are either firm-size quintile dummies which place each firm into its size bin within the firm-size distribution or a dummy for firm f's import or export status. I construct the 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.[21] In some specifications, I additionally control for the firm-level export exposure $q_f \times exp_{ict}$ which is the interaction between the firm-size dummies or exporter status and industry-level exports in logs. The vector Γ_{mfict} includes control variables such as the firms' capital intensity, domestic absorption at the industry-level (output plus imports net of exports) and an industry TFP index. Estimations further include country-year fixed effects μ_{ct} and match fixed effects μ_{mf} for manager-firm pairs. The inclusion of match fixed effects absorb differences in managers' tenure within their employing firm, which is a strong predictor of capital ownership. Following Abadie et al. (2023), I correct for

[21] I plot transition probabilities of firms across size quintiles in Table C4 of the Appendix.

Figure 3: Capital Ownership and Equity Prices



Notes: The Figure plots the median value of *Capital Ownership* and the S&P 500 or the FTSE 350 stock price index over time.

clustering of standard errors at the firm level.

4.3.2 Instrumental Variables

The empirical specifications relate time-varying labor-market outcomes to time-variation in importing. The identification challenges that I am facing are threefold. First, labor-market outcomes in industrialized economies might affect sourcing decisions leading to reversed-causality bias. Second, unobservable productivity or demand shocks will affect both, sourcing and managerial capital ownership leading to potential biases that can lead to over- or underestimation of the effects. Third, measurement error in the exposure of individuals to imports can cause attenuation bias. To address these concerns, I construct two Bartik shift-share instrumental variables: international trade and transport margins (ttm_{ict}) and RTA coverage (rta_{ict}).

Transport Margins: Identification from transport margins comes from shocks to the delivered price of imported inputs over time. A concern for identifying input imports from variation in transport margins arises when declines in transportation costs are caused by demand-side factors at the output-industry level. To alleviate this concern, I estimate transport margins based on variation in oil prices, bilateral distances and their interaction over time in the spirit of Hummels et al. (2014). WIOD provides transport margins as part of their international use tables across (input) industries i' and country pairs $c'c$. These margins are defined as wedges between f.o.b. and c.i.f. prices. In a first step, I obtain predicted transport margins $\widehat{ttm}_{i'c'ct}$ by regressing the ad-valorem transport margins[22] on log distance, log oil prices and their interactions:

$$\widehat{ttm}_{i'c'ct} = 0.014675 + 0.067386 \times goods_{i'} - 0.011203 \times \ln oil\ price_t + 0.000946 \times \ln dist_{c'c} \times \ln oil\ price_t, \quad (7)$$

where the R^2 of this prediction is 0.58 and the correlation coefficient between predicted and observed margins equals 0.78. In a second step, I obtain transport margins that are specific to the output country-industry pair (ic) by weighting the predicted ad-valorem transport margins according to input shares $\theta^{ic}(i',c')_{2000}$ from the WIOD input-output table in the base year 2000:

$$\begin{aligned} ttm_{ict} &= \sum_{i',c'} \theta^{ic}(i',c')_{2000} \times \widehat{ttm}_{i'c'ct}, \quad (8) \\ \sum_{i',c'} \theta^{ic}(i',c')_{2000} &= 1 \ \forall i,c. \end{aligned}$$

RTA Coverage: My second instrumental variable is the share of RTA coverage across input suppliers (rta_{ict}). This instrumental variable aims to capture the degree of trade integration between the output-producing economy c and input-supplying countries c' over time. To calculate this instrument, I use data from the CEPII gravity database. The data provide a dummy that indicates whether two countries have a regional trade agreement in place in year t. Furthermore, CEPII provides information on whether these RTAs cover goods, services or both. Using this information, I first construct the dummy $rta_{i'c'ct}$, that indicates whether trade between countries c and c' for goods in input industry i' are covered by an RTA. Using the same input shares $\theta^{ic}(i',c')_{2000}$ as Bartik shares, I obtain the RTA-coverage instrument:

$$rta_{ict} = \sum_{i',c'} \theta^{ic}(i',c')_{2000} \times rta_{i'c'ct}. \quad (9)$$

Validity of the Instruments: The validity of both Bartik shift-share instruments hinges on two sufficient conditions. First, exogeneity of the instruments is satisfied when the initial country-industry input shares $\theta^{ic}(i',c')_{2000}$ are exogenous conditional on controls (i.e. including fix effects) as shown by Goldsmith-Pinkham et al. (2020). If the composition of the input shares $\theta^{ic}(i',c')_{2000}$ predicts changes in capital ownership via other channels than input sourcing this assumption would be violated. Alternatively, exogeneity is also satisfied whenever the Bartik shifts in the transport margins or RTA are random across input supplying country-industry pairs i',c' and the number of shock pairs i',c' is sufficiently large (Borusyak et al. 2022).

[22] To obtain ad-valorem transport margins, I divide the total margins relative to total use.

I explore the exogeneity assumption of my instruments in three ways. First, I can test for overidentification in the empirical models with the two instrumental variables. As I interact the instruments with q_f, I estimate five first-stage regressions (or two when I differentiate by importer status) and report overidentification test statistics for the null hypothesis that the effect of input sourcing is overidentified. Second, I compute Rotemberg weights for both instruments as suggested by Goldsmith-Pinkham et al. (2020). These weights are a scaled sensitivity-to-misspecification parameter and show on which country-industry combinations identification hinges the most. I then construct instruments with an alternative weight structure omitting the country-industry pairs with the largest Rotemberg weights and show that the estimates based on these perturbed instruments are similar to instrumental variable estimations using all input supplying country-industry pairs. Lastly, industry-specific technology shocks that are correlated across countries could lead to omitted variable bias because the input shares used to construct the instruments place a lot of weight on the diagonal. I address this by constructing alternative instruments without using the diagonal elements of the input-output matrix and show that also here the estimates resemble estimations using all input supplying country-industry pairs.[23]

4.4 Results

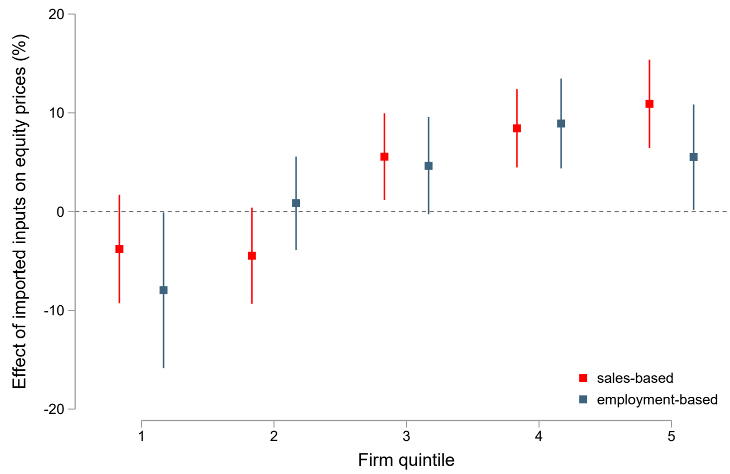
4.4.1 Equity Prices

To see if trade-induced reallocation is reflected in heterogeneous responses of equity prices as predicted in Subsection 2.2, I begin by studying the capital-market response of stock prices across firms. Since top earners' capital gains are directly linked to stock prices, one potential channel of adjustment is the direct pass-through from capital markets. 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 passes through to top earners' capital ownership. In order to explore whether there is a capital-market response of stock prices on variation in input sourcing, I regress the average annual price of each firm's main security in logs - after making adjustments for dividends and stock splits - on the interaction between input imports and firm-size quintile dummies including firm fixed effects and control variables. The estimated coefficients of interest correspond to a semi-elasticity that indicates a percentage change in equity prices associated with a percentage-point increase in the industry-level share of imported inputs.

Figure 4 depicts the instrumental-variable estimates, which additionally control for differences in industry-level exports (also interacted with firm-size quintile dummies), domestic absorption, industry TFP and firms' capital intensity. The full regression results are presented in Table 6. The

[23]For the discussion of these sensitivity-to-misspecification results, I refer to Appendix C.

Figure 4: Trade and Equity Prices



Notes: The Figure depicts the IV coefficients of importing on equity prices for individual firm-size quintiles (either sales-based or employment-based). The estimates are based on columns (4) and (5) from Table 6. Individual coefficients capture the effect of a percentage-point increase in the industry-level share of imported inputs on equity prices in percent. The lines correspond to 95% confidence intervals.

estimated semi-elasticities support the hypothesis that equity-price reactions differ across firms and that input imports increase equity prices mostly for the largest firms. At the top, equity prices appreciate by approximately 11% in response to a percentage-point increase in industry-level intermediate imports based on the instrumental-variable estimates. This complies with Smith et al. (2019) who document that growth in pass-through business profits are a primary source of US top incomes. The null hypothesis that effects are similar across firm-size bins can be distinctly rejected at the one-percent level.

When estimating the equity-price effect for importing firms relative to non-importers in Table 7, a similar pattern emerges. I classify importers or exporters as those firms that have at least one establishment that is classified as an importer or exporter in WorldBase. The estimated semi-elasticities in Table 7 suggest that equity-price appreciations in response to increases in imports cause a 6%-16% price appreciation relative to non-importers per each percentage-point increase in the import share. Similarly, industry-wide increases in export openness are associated with higher stock prices for exporters.[24]

[24] These results comply with Breinlich (2014) who provides evidence that equity prices respond heterogeneously to trade liberalization due to intra-industry reallocation.

4.4.2 Capital Ownership and Compensation Structure of Corporate Top Earners

Capital Ownership: Next, I study how input trade shocks affect capital ownership of top earners, based on estimating empirical models described by equation (6). According to the prediction made in Subsection 2.2, the value of capital ownership is supposed to increase for top earners that are employed by larger firms when there is intra-industry reallocation due to improved access to foreign markets.

In Table 8, I estimate semi-elasticities of input imports by firm-size quintiles. Note that the inclusion of match fixed effects and country-year fixed effects absorbs variation in capital ownership that accrues from variation in managers' employment duration. While specifications (1) to (5) rely on size quintiles based on sales, specification (6) relies on employment-based size quintiles. Figure 5 depicts the baseline instrumental-variable coefficient estimates of specifications (4) and (6). The estimated effects on capital ownership are heterogeneous across firms. Although the firms in my sample are relatively large overall,[25] the effects of input imports are small or negative for top earners in firms within the bottom quintiles of the firm-size distribution. In contrast, the value of capital ownership appreciates by 7-10% for top earners employed by firms in the top quintile in response to a percentage-point increase in industry-level intermediate imports. The appreciation is slightly larger for the top earners within the CEO subsample. In specifications (2) and (4) to (6), I additionally include interaction terms with the set of firm-size dummies and exports. Exports also seem to appreciate capital ownership only for those top earners that are employed by the largest firms. Increases in the size of the (domestic) market are positively associated with capital ownership throughout all specifications and significant at the one-percent level (output suppressed). Overall, the absolute magnitudes of IV estimates are somewhat larger than their OLS counterparts. This can be explained by the import measure capturing firms' exposure imprecisely causing measurement error. Furthermore, endogeneity from unobserved shocks in foreign countries can play a role as well: rising industries in foreign countries can cause downward pressure on domestic labor markets and increase imports from them.

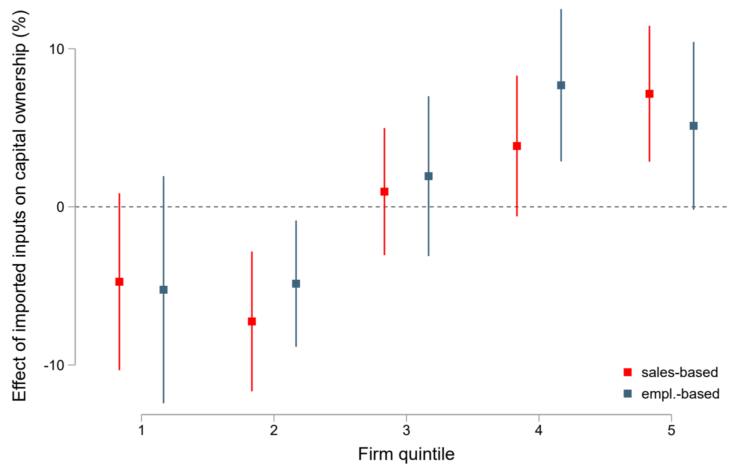
Besides the interpretation of effects for individual firm-size quintiles, one can also formally test if the effects are heterogeneous across size bins. The null hypothesis of equal effects across all size quintiles is rejected at the one-percent level throughout all specifications. Furthermore, the null hypothesis of equal equity effects in the bottom versus the top firm quintile is also rejected at the one-percent level.[26]

To further explore the link between capital ownership and importing activity, I differentiate the effects for top earners employed by importing firms in Table 9. Here, I interact the import share

[25]The median level of sales equals 740 Mio. $ and 2,600 employees, see Table 4.

[26]Table C5 in Appendix C reports p-values for hypothesis tests that capital ownership effects are identical.

Figure 5: Trade and Capital Ownership Across Firms



Notes: The Figure depicts the IV coefficients of importing on capital ownership of corporate top earners for individual firm-size quintiles (either sales-based or employment-based). The estimates are based on columns (4) and (6) from Table 8. Individual coefficients capture the effect of a percentage-point increase in the industry-level share of imported inputs on capital ownership in percent. The lines correspond to 95% confidence intervals.

with the importer dummy and include country-industry-year fixed effects. Top earners of importing firms experience significantly larger capital gains by 4%-10% per percentage-point increase of the import share.

Compensation Structure and Pass-Through Income: Increases in capital ownership can arise from the appreciation of equity prices or from the accumulation of newly granted equity. To further explore the adjustment channels of capital ownership, I consider new equity grants to top earners in specification (1) of Table 10. The dependent variable here is the amount of new equity-linked compensation relative to the sum of direct income in the form of salary and bonuses and new equity. The estimates indicate that the largest firms shift compensation towards equity in response to a trade shock by granting relatively more equity. In contrast, the opposite adjustment occurs within smaller firms, where firms increase the fraction of direct compensation relative to new equity grants. This suggests that both margins of adjustment play a role for the accumulation of capital ownership for top earners: firms adapt by adjusting compensation structures and reallocation causes equity-price appreciations at the top leading to pass-through income.[27] A microfoundation of the former channel is shareholders' desire to keep managers sufficiently incentivized in response to a reallocation shock. Hence, trade integration directly affects the value of firms and furthermore, affects incentives for given contracts since private benefits and the elasticity of equity portfolios change as well.

[27]The latter channel has often been referred to as pay-for-luck in the literature (see Bertrand and Mullainathan 2001).

Table C6 in the Appendix replicates Table 8 and additionally controls for equity prices as an alternative to show that both channels are present. Estimated semi-elasticities of input imports on capital ownership remain heterogeneous across firms but the heterogeneity is smaller compared to Table 8. This suggests that changes in the structure of compensation via new equity grants and pass-through income via equity-price adjustments occur both.

Specifications (2) to (5) of Table 10 then study how top earners' capital-ownership shares adjust. As before, capital-ownership shares are calculated as an individual's value of capital ownership relative to the sum of capital ownership and the present value of previous labor-income payments. The estimates imply that capital ownership responds more elastically than labor incomes to trade shocks. Thus, capital ownership gets more prevalent for top earners employed by large firms. These observed changes in compensation structures suggest that international trade can be a driver of the higher prevalence of capital income vis-à-vis labor income for top earners as documented by Piketty and Saez (2003).

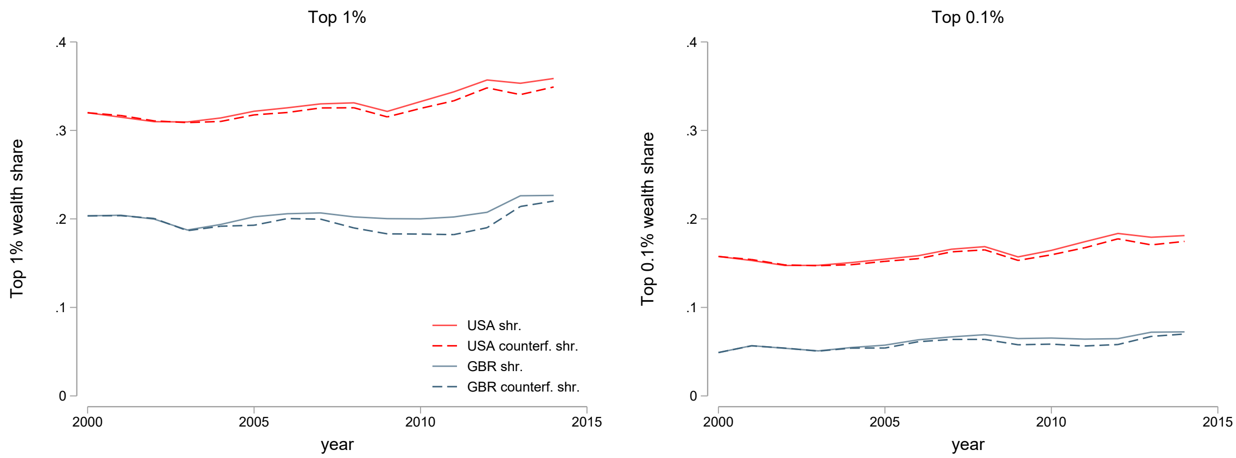
4.4.3 Impact on Overall Inequality

Taking these results together, there is a clear empirical picture of the role of international trade on increasing top inequality across firms. A natural question is how important these effects are for wealth inequality on an economy-wide level. To obtain rough magnitudes for the importance of importing inputs in shaping top inequality, I use the regression coefficients to perform some back-of-the-envelope quantification of counterfactual top 1% or top 0.1% wealth shares.

To quantify the magnitude of trade-induced inequality, I calculate counterfactual top 1% or top 0.1% shares of wealth inequality assuming constant levels of intermediate inputs based on the year-2000 levels and leaving the bottom of the wealth distribution and top earners outside of management occupations unaffected. To achieve this, I place individuals in the sample into the top 1% or top 0.1% according to the wealth thresholds reported in the World Inequality Database. Further, I assume that 55% of the population individuals in the top 1% and 0.1% are in management positions based on BLS Occupational Employment Statistics for the year 2000. Based on the regression coefficients in Table 8, specification (4) and the size bins of top earners' employing firms, I calculate counterfactual levels of capital ownership. Comparing these counterfactual levels of capital ownership with the observed levels, I obtain by how much capital ownership would be lower if no increase in input imports had occurred.

Using this difference between factual and counterfactual capital ownership, I can then calculate how the top 1% or top 0.1% share would have evolved without the rise in intermediate-inputs trade. This evolution of the true and counterfactual top 1% and top 0.1% shares is depicted in Figure 6. In the

Figure 6: Importing and Top Wealth Shares



Notes: The Figure depicts top 1% and top 0.1% wealth shares for the US and the UK from the World Inequality Database as well as their counterfactual values. The counterfactual wealth shares are computed based on coefficients in column (4) from Table 8, assuming that 55% of the individuals in the top 1% and 0.1% are in management occupations and that input imports remain at 2000 levels.

US, the top 0.1% share increased by 14.9% (2.4 percentage points) from 15.76 to 18.12 between 2000 and 2014 in the factual data. Assuming that individuals with management occupations in the top 0.1% are affected in the same way as the top earners in the sample, this increase would have been only 10.8% (1.7 percentage points) instead, assuming no increase in intermediate-inputs trade.

4.4.4 Rent Distribution Within Firms

Empirical studies by Autor et al. (2019) and De Loecker et al. (2020) explore the role of increasing market concentration on falling aggregate labor shares. They argue that lower labor shares are in part driven by increasing concentration of economic activity among top firms. In Table 11, I use firm-level averages of top earners' capital ownership relative to aggregate firm-level labor expenses as an outcome to study how reallocation affects the within-firm rent distribution. The estimates suggest that more foreign input sourcing tilts the rent distribution within firms towards aggregate labor expenses for the bottom quintiles of firm sizes. In contrast, top earners gain relative to labor in large firms.

4.4.5 Robustness and Additional Results

Controlling for final-goods imports: 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 input imports. In Table C7 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). When controlling for variation in import competition, the heterogeneity of capital ownership and capital-ownership shares across firms prevails.

Using more granular I-O tables for US manufacturing: An advantage of the WIOD I-O tables is that these are available for all types of industries since WIOD combines information from trade in goods as well as trade in services which are obtained from balance-of-payment measures. Furthermore, WIOD provides information on total intermediate consumption, output, imports and exports at the same level. This combined approach comes at a cost: in order to maintain comparability of I-O tables across countries and over time, the level of industry aggregation in WIOD is fairly broad with less than 60 industries covering all sorts of economic activity. In order to assess the robustness of my results to a more disaggregated I-O table that is specialized to firms in manufacturing industries, I turn to the 1992 US Benchmark I-O table from the US Bureau of Economic Analysis (BEA). This table has been used extensively in previous studies of intermediate-goods trade (Alfaro et al. 2019, Alfaro et al. 2016, Conconi et al. 2018) and I use the version from Alfaro et al. (2019) who transform this table to the SIC industry level. Based on this I-O table, I calculate my alternative measure of exposure to imported inputs: $\tilde{imp}_{cit} = \sum_{i'} \theta^i(i')_{BEA} \times \ln\left(\text{total imports}_{i'ct}\right)$, where $\theta^i(i')_{BEA}$ are I-O coefficients from the BEA table (at the 3-digit SIC level) and $\ln\left(\text{total imports}_{i'ct}\right)$ is the logarithm of total imports in country c during year t. Table C8 presents the robustness results using this alternative proxy for imported inputs based on the sample of managers in manufacturing firms. The value of capital ownership is positively associated with input imports as suggested by specification (1). Furthermore, the heterogeneity of equity elasticities across firm-size quintiles prevails.

Omitting the trade collapse during the Great 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% which exceeded the downfall of real global GDP by roughly a factor of four (Bems et al. 2013). Similarly, stock prices substantially depreciated during the recession. In Table C9, I omit the global recession years 2008-2009 to illustrate that the results survive without the variation from those recession years.

5 Conclusion

This paper assesses how trade-induced economic reallocation affects adjustments in capital ownership among corporate top earners. Using matched employer-employee data on corporate top earners in the US and the UK, I show that trade-induced reallocation of economic activity changes the compensation structure for top earners towards higher capital incomes. An assignment model of heterogeneous firms where managers are compensated through income streams and equity claims can rationalize the empirical findings and a calibrated version of the model confirms that changes in capital ownership outweigh changes in income streams for top earners.

Table 6: Trade and Equity Prices across Firms

	Equity Price				
	(1)	(2)	(3)	(4)	(5)
	By Sales				*By Empl.*
Import Share by Firm-Size Quintile					
Import Share × Q1	-4.024***	-2.614*	-6.518***	-3.789	-7.969**
	(1.303)	(1.442)	(2.426)	(2.808)	(4.021)
Import Share × Q2	-1.210	-1.632	-1.170	-4.460*	0.845
	(1.044)	(1.081)	(2.262)	(2.482)	(2.413)
Import Share × Q3	1.570*	1.873**	3.905*	5.569**	4.646*
	(0.870)	(0.859)	(2.091)	(2.233)	(2.512)
Import Share × Q4	2.905***	2.285***	8.537***	8.429***	8.923***
	(0.791)	(0.822)	(1.897)	(2.020)	(2.321)
Import Share × Q5	3.367***	2.502***	11.03***	10.91***	5.520**
	(0.727)	(0.729)	(2.081)	(2.282)	(2.718)
Log Exports by Firm-Size Quintile					
Exports × Q1		-0.384***		-0.182	-0.00287
		(0.108)		(0.125)	(0.108)
Exports × Q2		-0.116		0.116	-0.125
		(0.0885)		(0.0986)	(0.0876)
Exports × Q3		-0.219***		-0.134	-0.0761
		(0.0829)		(0.0895)	(0.0890)
Exports × Q4		-0.0756		-0.0356	-0.119*
		(0.0615)		(0.0713)	(0.0671)
Exports × Q5		-0.0337		-0.0323	-0.0529
		(0.0533)		(0.0575)	(0.0720)
Firm F.E.	×	×	×	×	×
Country-Year F.E.	×	×	×	×	×
Controls	×	×	×	×	×
First Stage					
KP F-test			98.33	104.2	35.47
Overident. (p-value)			0.177	0.158	0.0114
Observations	32,713	32,713	32,713	32,713	31,404
Firms	3,222	3,222	3,222	3,222	2,935

Notes: The dependent variable *Equity Price* is the end-of-year closing price of the firms' main security adjusted for splits and dividends (in logs). *Import Share* is the expenditure share on foreign inputs. *Import Share* and *Exports* (in logs) are measured at the country-industry-year level based on WIOD data. All specifications include the following additional controls (output suppressed): firm-level *Capital Intensity,* country-industry-year level *Domestic Absorption* and a *TFP* index. All estimations include fixed effects for firms and country-years. Instrumental variables are international trade and transport margins and RTA coverage described in Subsection 4.3. 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 firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 7: Trade and Equity Prices by Firm Status

	Equity Price			
	(1)	(2)	(3)	(4)
Import Share × Importer	6.574***	5.727***	16.39***	14.25***
	(1.413)	(1.378)	(3.425)	(3.499)
Exports × Exporter		0.200**		0.127
		(0.0834)		(0.0849)
Firm F.E.	×	×	×	×
Country-Industry-Year F.E.	×	×	×	×
First Stage				
KP F-test			256.3	225.1
Overident. (p-value)			0.182	0.148
Observations	31,431	31,431	31,431	31,431
Firms	3,079	3,079	3,079	3,079

Notes: The dependent variable *Equity Price* is the end-of-year closing price of the firms' main security adjusted for splits and dividends (in logs). *Import Share* is the expenditure share on foreign inputs. *Import Share* and *Exports* (in logs) are measured at the country-industry-year level based on WIOD data. *Importer* and *Exporter* are time-invariant firm dummy variables obtained from WorldBase data (see description in main text). All specifications include firm-level *Capital Intensity* and fixed effects for individual firms and country-industry-years. Instrumental variables are international trade and transport margins and RTA coverage described in Subsection 4.3. Standard errors are cluster-robust at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 8: Trade and Capital Ownership across Firms

	Capital Ownership					
	(1)	(2)	(3)	(4)	(5)	(6)
			By Sales			*By Empl.*
Import Share by Firm-Size Quintile						
Import Share × Q1	-3.447***	-2.091	-7.909***	-4.737*	-5.775	-5.240
	(1.253)	(1.380)	(2.272)	(2.854)	(3.585)	(3.663)
Import Share × Q2	-1.231	-1.406	-4.710**	-7.247***	-4.918*	-4.858**
	(0.996)	(1.012)	(2.123)	(2.255)	(2.931)	(2.038)
Import Share × Q3	-0.113	0.250	-0.694	0.962	3.939	1.941
	(0.873)	(0.918)	(1.866)	(2.051)	(2.399)	(2.579)
Import Share × Q4	1.946***	1.983***	2.934	3.848*	3.329	7.689***
	(0.675)	(0.736)	(2.001)	(2.271)	(2.764)	(2.459)
Import Share × Q5	4.414***	3.226***	10.09***	7.149***	9.851***	5.125*
	(0.753)	(0.747)	(2.081)	(2.191)	(2.822)	(2.706)
Log Exports by Firm-Size Quintile						
Exports × Q1		-0.392***		-0.302**	-0.158	-0.149
		(0.0999)		(0.121)	(0.153)	(0.0948)
Exports × Q2		-0.124*		0.00280	-0.0233	-0.0922
		(0.0753)		(0.0871)	(0.105)	(0.0794)
Exports × Q3		-0.229***		-0.224***	-0.232**	-0.212**
		(0.0683)		(0.0750)	(0.104)	(0.105)
Exports × Q4		-0.158*		-0.172*	-0.168	-0.171*
		(0.0900)		(0.0996)	(0.130)	(0.0883)
Exports × Q5		0.0711		0.0156	0.0251	0.0626
		(0.0519)		(0.0577)	(0.0716)	(0.0710)
Match F.E.	×	×	×	×	×	×
Country-Year F.E.	×	×	×	×	×	×
Controls	×	×	×	×	×	×
First Stage						
KP F-test			128.6	118.7	61.21	40.20
Overident. (p-value)			0.717	0.744	0.423	0.032
Observations	130,175	130,175	130,175	130,175	25,896	127,253
Firms	3,071	3,071	3,071	3,071	2,921	2,792
Individuals	24,295	24,295	24,295	24,295	5,294	23,454

Notes: The dependent variable *Capital Ownership* is an individual manager's total ownership of equity (in logs) linked to the employer's stock price. *Import Share* is the expenditure share on foreign inputs. *Import Share* and *Exports* (in logs) are measured at the country-industry-year level based on WIOD data. All specifications include the following additional controls (output suppressed): firm-level *Capital Intensity,* country-industry-year level *Domestic Absorption* 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 RTA coverage described in Subsection 4.3. 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 firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 9: Trade and Capital Ownership by Firm Status

	Capital Ownership				
	(1)	(2)	(3)	(4)	(5)
Import Share × Importer	4.085***	3.593***	6.976**	4.476	10.15**
	(1.380)	(1.354)	(3.334)	(3.265)	(4.275)
Exports × Exporter		0.144**		0.138*	0.103
		(0.0727)		(0.0734)	(0.0906)
Match F.E.	×	×	×	×	×
Country-Industry-Year F.E.	×	×	×	×	×
First Stage					
KP F-test			228.8	230.0	191.3
Overident. (p-value)			0.0541	0.0455	0.285
Observations	125,644	125,644	125,644	125,644	125,644
Firms	2,877	2,877	2,877	2,877	2,877
Individuals	23,210	23,210	23,210	23,210	23,210

Notes: The dependent variable *Capital Ownership* is an individual manager's total ownership of equity (in logs) linked to the employer's stock price. *Import Share* is the expenditure share on foreign inputs. *Import Share* and *Exports* (in logs) are measured at the country-industry-year level based on WIOD data. *Importer* and *Exporter* are time-invariant firm dummy variables obtained from WorldBase data (see description in main text). All specifications include firm-level *Capital Intensity* and fixed effects for individual firm-manager matches and country-industry-years. Instrumental variables are international trade and transport margins and RTA coverage interacted with importer, respectively exporter status described in Subsection 4.3. Standard errors are cluster-robust at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 10: Trade and Changing Compensation Structures

	New Equity	Capital-Ownership Share			
	(1)	(2)	(3)	(4)	(5)
Import Share by Firm-Size Quintile					
Import Share × Q1	-1.055	-1.094***	-0.524**	-2.538***	-1.111**
	(0.709)	(0.209)	(0.225)	(0.427)	(0.482)
Import Share × Q2	-1.345**	-0.294*	-0.264	-1.099***	-1.512***
	(0.569)	(0.177)	(0.188)	(0.381)	(0.418)
Import Share × Q3	-0.0534	-0.0391	-0.00722	0.0382	0.0968
	(0.488)	(0.137)	(0.145)	(0.320)	(0.352)
Import Share × Q4	1.922***	0.378***	0.338**	0.983***	0.946**
	(0.499)	(0.126)	(0.136)	(0.343)	(0.376)
Import Share × Q5	2.203***	0.725***	0.483***	2.180***	1.566***
	(0.459)	(0.118)	(0.119)	(0.339)	(0.358)
Log Exports by Firm-Size Quintile					
Exports × Q1	-0.0410*		-0.125***		-0.102***
	(0.0230)		(0.0184)		(0.0212)
Exports × Q2	-0.0160		-0.0315**		-0.000946
	(0.0215)		(0.0157)		(0.0161)
Exports × Q3	0.00108		-0.0318**		-0.0261*
	(0.0202)		(0.0131)		(0.0144)
Exports × Q4	-0.0301		-0.0162		-0.0200
	(0.0202)		(0.0148)		(0.0172)
Exports × Q5	-0.00336		0.0207**		0.00732
	(0.0118)		(0.00913)		(0.00977)
Match F.E.	×	×	×	×	×
Country-Year F.E.	×	×	×	×	×
Controls	×	×	×	×	×
First Stage					
KP F-test	127.4			128.4	118.9
Overident. (p-value)	0.003			0.508	0.460
Observations	151,822	130,784	130,784	130,784	130,784
Firms	3,056	3,071	3,071	3,071	3,071
Individuals	27,120	24,419	24,419	24,419	24,419

Notes: The dependent variable *Capital-Ownership Share* is calculated as *Capital Ownership* relative to the sum of *Capital Ownership* and the present value of previous labor-income payments. The dependent variable *New Equity* 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. *Import Share* and *Exports* (in logs) are measured at the country-industry-year level based on WIOD data. All specifications include the following additional controls (output suppressed): firm-level *Capital Intensity*, country-industry-year level *Domestic Absorption* 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 RTA coverage described in Subsection 4.3. Firm-size quintiles are based on the average firm sales during the first 3 sample years and order the sample firms within the same country. Standard errors are cluster-robust at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 11: Trade and the Within-Firm Rent Distribution

	∅ Capital Ownership / Labor Expenses		
	(1)	(2)	(3)
Import Share by Firm-Size Quintile			
Import Share × Q1	-5.483	-5.228	-3.806
	(3.561)	(3.647)	(8.981)
Import Share × Q2	0.525	1.006	7.115
	(2.299)	(2.271)	(7.146)
Import Share × Q3	-1.641	-0.670	5.653
	(1.744)	(1.734)	(5.541)
Import Share × Q4	4.997***	4.824***	14.55**
	(1.472)	(1.496)	(5.671)
Import Share × Q5	6.348***	5.427***	21.00***
	(1.387)	(1.364)	(5.937)
Log Exports by Firm-Size Quintile			
Exports × Q1		-0.123	0.143
		(0.227)	(0.276)
Exports × Q2		-0.325*	-0.109
		(0.192)	(0.210)
Exports × Q3		-0.374**	-0.158
		(0.156)	(0.172)
Exports × Q4		-0.0147	0.172
		(0.121)	(0.147)
Exports × Q5		0.136*	0.232**
		(0.0814)	(0.114)
Firm F.E.	×	×	×
Country-Year F.E.	×	×	×
Controls	×	×	×
First Stage			
KP F-test			12.24
Overident. (p-value)			0.678
Observations	10,801	10,801	10,801
Firms	1,240	1,240	1,240

Notes: The dependent variable ∅ *Capital Ownership / Labor Expenses* is the average firm-level managerial value of capital ownership relative to the firm-level labor expenses (in logs). *Import Share* is the expenditure share on foreign inputs. *Import Share* and *Exports* (in logs) are measured at the country-industry-year level based on WIOD data. All specifications include the following additional controls (output suppressed): firm-level *Capital Intensity,* country-industry-year level *Domestic Absorption* and a *TFP* index. All estimations include fixed effects for firms and country-years. Instrumental variables are international trade and transport margins and RTA coverage described in Subsection 4.3. Firm-size quintiles are based on the average firm sales during the first 3 sample years and order the sample firms within the same country. Standard errors are cluster-robust at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

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Internet Appendix

Contents

A Model Appendix

A.1 Indirect Utility and Multiplicative Preferences

Consider an agent with multiplicative upper-tier preferences $U = C \cdot G$ and an expected compensation level $r(k)$. Plugging in the consumption sub-utility C and replacing the consumption amount for each individual variety with the agent's individual demand $q_\omega = r(k) p_\omega^{-\sigma} P_i^{\sigma-1}$ yields

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

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

A.2 Productivity Benefits of Input Imports

To endogenize the productivity benefits of importing z_{is}, I borrow from Halpern et al. (2015) and assume that production of output requires a task bundle S_i that is produced in terms of production labor. The production function of a firm is thus given by $q_\omega = S_i / \left(k^{\mu_i} q^{\kappa_i} \right)$. The task bundle itself is assembled according to a c.e.s. technology such that

$$S_i = \left[S_{ih}^{\frac{\theta-1}{\theta}} + \left(B_{is} S_{is} \right)^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}},$$

where S_{is} is the fraction of imported tasks and S_{ih} is the fraction of tasks produced with domestic labor such that $S_{is} + S_{ih} = 1$. The parameter θ is the elasticity of substitution across tasks and B_{is} is the quality of imported tasks. The prices of the foreign tasks are denoted P_{is} and firms are price takers in foreign input markets. The quality-adjusted price 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 stated in terms of Ω_i is then the analogue to a c.e.s. price index and captures the productivity benefits of importing:

$$z_{is} = \left(1 + \Omega_i^{\theta-1} \right)^{\frac{1}{\theta-1}} \geq 1.$$

It can be seen that z_{is} is increasing in Ω_i and if there is no sourcing from abroad ($\Omega_i = 0$), then z_{is} equals the unit wage rate of one. From this, I get the following unit costs $\varphi(k, q)$ which are equivalent to domestic labor demand per unit of output since the wage rate is used as the numéraire:

$$\varphi(k, q) = \begin{cases} \left(z_{is} k^{\mu_i} q^{\kappa_i} \right)^{-1} & \text{if importer} \\ \left(k^{\mu_i} q^{\kappa_i} \right)^{-1} & \text{if domestic.} \end{cases}$$

Because of imperfect substitutability across foreign and domestic inputs, importing firms use domestic and foreign inputs and an importer's expenditure share on foreign inputs in total expenditure on inputs equals $\frac{\Omega_i^{\theta-1}}{1+\Omega_i^{\theta-1}}$.

A.3 Optimal Contracts

The incentive-compatible contract that minimizes capital grants and satisfies individual rationality compensates the manager with a fraction $\triangle$ of the expected compensation $r_i(k)$ in capital and pays the remainder $(1-\triangle)r_i(k)$ as labor income:

$$\begin{aligned} \textit{Equity Ownership} &= E[V(\Pi)] = \triangle r_i(k), \\ \textit{Labor Income} &= f = (1-\triangle) r_i(k), \end{aligned} \tag{10}$$

where the fraction of capital in total compensation $\triangle$ is given by

$$\triangle = \frac{\lambda(e, \Psi_i)}{|\underline{e}|^{\varepsilon_V}} \in (0,1]. \tag{11}$$

Consider the following proof for (11). In equilibrium, the manager requires to receive an expected compensation level of $r(k)$ to satisfy individual rationality which yields expected indirect utility $r(k)P^{-1}G(\bar{e}) = r(k)P^{-1}$. Low effort $\underline{e}$ yields utility

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

Hence, the contract is incentive compatible and the manager exerts effort if $E\left[w(k)P^{-1}G(\bar{e})\,|\bar{e}\right] \geq E\left[w(k)P^{-1}G(\underline{e})\,|\underline{e}\right]$, i.e. when

$$r(k) \geq \frac{r(k) - |\underline{e}|^{\varepsilon_V} E[V(\Pi)]}{1-\lambda(e,\Psi)} \Leftrightarrow \frac{E[V(\Pi)]}{r(k)} \geq \frac{\lambda(e,\Psi)}{|\underline{e}|^{\varepsilon_V}} = \triangle. \blacksquare$$

A.3.1 Relation Between Firm Size and Capital Ownership

There are two distinct margins of adjustment for the capital-ownership share $\triangle$ when the expected firm surplus changes. First, private benefits $\lambda(\underline{e}, \Psi_i)$ increase with the compensation premium Ψ_i. This makes stronger financial incentives necessary in larger firms to induce the manager to provide high effort. Additionally, the elasticity of the equity portfolio with respect to changes in the firm surplus ε_V falls when the expected surplus increases in the case of stock options. Both margins, $\lambda(\underline{e}, \Psi_i)\uparrow$ and $\varepsilon_V \downarrow$ let $\triangle$ increase.

Consider the relation between ε_V and the firm surplus Π. Suppose a manager's equity portfolio consists of a 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

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

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 capital 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.4 Industry Price Index and Effective Industry Size A_i

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

$$\frac{\left(z_{is}^{\sigma-1}-1\right) k_{is}^{1-\xi_i}}{\underline{k}_i^{1-\xi_i}} = \frac{F_{is}}{1} \Leftrightarrow k_{is} = \left(z_{is}^{\sigma-1}-1\right)^{-\frac{1}{1-\xi_i}} F_{is}^{\frac{1}{1-\xi_i}} \underline{k}_i.$$

Furthermore, the operating profit ratio of a marginal exporter and the cutoff firm can be stated as follows:

$$\frac{\tau^{1-\sigma} z_{is}^{\sigma-1} k_{ix}^{1-\xi_i}}{\underline{k}_i^{1-\xi_i}} = \frac{F_{ix}}{1} \Leftrightarrow k_{ix} = z_{is}^{\frac{1-\sigma}{1-\xi_i}} \tau_{ix}^{\frac{\sigma-1}{1-\xi_i}} F_{ix}^{\frac{1}{1-\xi_i}} \underline{k}_i.$$

Plugging the firms' pricing decision

$$p_\omega = \begin{cases} \frac{\sigma}{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{-\kappa_i} \tau z_{is}^{-1} k^{-(\kappa_i+\mu_i)} & \text{if exporter} \\ \frac{\sigma}{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{-\kappa_i} z_{is}^{-1} k^{-(\kappa_i+\mu_i)} & \text{if importer} \\ \frac{\sigma}{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{-\kappa_i} k^{-(\kappa_i+\mu_i)} & \text{if domestic,} \end{cases}$$

into the c.e.s. industry price index $P_i = \left[\int_{\underline{k}_i}^{\infty} p_\omega^{1-\sigma} d\omega\right]^{1/(1-\sigma)}$ and integrating over the knowledge distribution, this price index can be written as

$$\begin{aligned} P_i \quad = \quad & \frac{\sigma}{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{-\kappa_i}\left[\int_{\underline{k}_i}^{k_{is}} \left(k^{-(\kappa_i+\mu_i)}\right)^{1-\sigma} dN_i\left(1-k^{-1}\right).\right. \\ & + z_{is}^{\sigma-1}\int_{k_{is}}^{k_{ix}} \left(k^{-(\kappa_i+\mu_i)}\right)^{1-\sigma} dN_i\left(1-k^{-1}\right) \\ & \left. + \left(1+\tau_{ix}^{1-\sigma}\right) z_{is}^{\sigma-1}\int_{k_{ix}}^{\infty} \left(k^{-(\kappa_i+\mu_i)}\right)^{1-\sigma} dN_i\left(1-k^{-1}\right)\right]^{1/(1-\sigma)}. \end{aligned}$$

Substituting $dN_i(1-k^{-1}) = N_i k^{-2} dk$ and solving for the integrals in the price index leads to

$$\begin{aligned} P_i &= \frac{\sigma}{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{-\kappa_i} N_i^{1/(1-\sigma)}\left[\int_{\underline{k}_i}^{k_{is}} k^{-\xi_i-1}dk + z_{is}^{\sigma-1}\int_{k_{is}}^{k_{ix}} k^{-\xi_i-1}dk + \left(1+\tau_{ix}^{1-\sigma}\right) z_{is}^{\sigma-1}\int_{k_{ix}}^{\infty} k^{-\xi_i-1}dk\right]^{1/(1-\sigma)} \\ &= \frac{\sigma}{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{-\kappa_i}\left(\frac{\xi_i}{N_i}\right)^{1/(\sigma-1)}\left[\underline{k}_i^{-\xi_i} + \left(z_{is}^{\sigma-1}-1\right) k_{is}^{-\xi_i} + \tau_{ix}^{1-\sigma} z_{is}^{\sigma-1} k_{ix}^{-\xi_i}\right]^{1/(1-\sigma)}. \end{aligned}$$

Using the relations between the cutoffs k_{is}, k_{ix} and $\underline{k}_i$ and the index of trade integration $\delta_i \equiv$

$\left(z_{is}^{\sigma-1}-1\right)^{\frac{1}{1-\xi_i}} F_{is}^{-\frac{\xi_i}{1-\xi_i}} + z_{is}^{\frac{\sigma-1}{1-\xi_i}} \tau_{ix}^{-\frac{\sigma-1}{1-\xi_i}} F_{ix}^{-\frac{\xi_i}{1-\xi_i}}$ gives

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

Using the zero-cutoff condition and the industry price index from above, the effective industry size $A_i = X_i P_i^{\sigma-1}$ can be stated as

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

A.5 Zero Cutoff Earnings

The marginal firm in an industry 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 the marginal firm does not import, this indifference condition can be stated as follows:

$$\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}A_i\left(\left(\frac{Q_i}{N_i}\right)^{\kappa}\underline{k}_i^{\kappa_i+\mu_i}\right)^{\sigma-1} = 1. \tag{12}$$

Using (12), the price index of the industry P_i can be denoted as

$$P_i = \frac{\sigma}{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{-\kappa_i}\left(\frac{\xi_i}{N_i}\right)^{1/(\sigma-1)}\left(1+\delta_i\right)^{\frac{1}{1-\sigma}}\underline{k}_i^{\frac{\xi_i}{\sigma-1}}, \tag{13}$$

where I define $\xi_i \equiv 1-\left(\kappa_i+\mu_i\right)(\sigma-1) \in (0,1)$ to shorten the notation. Further, δ_i is an index of trade integration which is defined as follows:

$$\delta_i \equiv \left(z_{is}^{\sigma-1}-1\right)^{\frac{1}{1-\xi_i}} F_{is}^{-\frac{\xi_i}{1-\xi_i}} + z_{is}^{\frac{\sigma-1}{1-\xi_i}} \tau_{ix}^{-\frac{\sigma-1}{1-\xi_i}} F_{ix}^{-\frac{\xi_i}{1-\xi_i}}. \tag{14}$$

This index captures how strongly the industry is integrated with international input and output markets. It increases with productivity gains from importing z_{is} and falls with fixed costs of importing or exporting F_{is} and F_{ix} as well as variable exporting costs τ_{ix}. Using the price index, the zero-cutoff condition for an individual industry i can be stated as

$$X_i(\underline{k}_i) = \frac{\sigma N_i\left(1+\delta_i\right)}{\xi_i}\underline{k}_i^{-1}. \blacksquare \tag{15}$$

Furthermore, the effective industry size shrinks with the cutoff:

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

A.6 Labor-Market Clearing

As the supply of production workers depends on the occupational choice between managerial and production work, production-labor supply is endogenous.[28] Supply is given by $\sum_{i=1}^{I} N_i \left(1 - \underline{k}_i^{-1}\right)$. Labor demand is comprised of labor demand to produce for the domestic and the export market and labor demand to cover the fixed costs of importing and exporting. Integrating the production-labor demand over all firms and including demand to cover the fixed costs of importing and exporting yields aggregate labor demand. Setting labor demand and supply equal yields

$$\sum_{i=1}^{I} \left[\frac{\sigma-1}{\sigma} X_i + F_{is} N_i k_{is}^{-1} + F_{ix} N_i k_{ix}^{-1}\right] = \sum_{i=1}^{I} N_i \left(1 - \underline{k}_i^{-1}\right). \tag{17}$$

Simplifying this expression yields the labor-market clearing condition as a function of the cutoff $\underline{k}_i$:

$$\frac{\sigma-1}{\sigma} X = \sum_{i=1}^{I} N_i \left(1 - (1+\delta_i) \underline{k}_i^{-1}\right). \tag{18}$$

Intuitively, the labor-market clearing is upward sloping in the $X\left(\underline{k}_i\right)$ space. Increases in $\underline{k}_i$ imply a larger supply of production labor. To keep the labor market balanced, labor demand needs to increase which is ensured by a larger GDP X. Plugging in the $\underline{k}_i^{-1}$ from the zero-cutoff condition (15) then yields aggregate GDP X in equilibrium:

$$X = \frac{\sigma}{\sigma - 1 + \sum_{i=1}^{I} \beta_i \xi_i} \sum_{i=1}^{I} N_i. \tag{19}$$

An equilibrium on the product market is thus pinned down by a set of $I+1$ equations: the labor-market condition (19) and the zero-cutoff conditions (15) for each individual industry i.

To obtain (17), consider the following steps. When a firm produces q_ω units of output, its variable labor demand is $q_\omega \varphi(k,q)$. This can be restated using the c.e.s. pricing rule $p_\omega = \frac{\sigma}{\sigma-1}\varphi(k,q)$ (or $p_\omega = \frac{\sigma}{\sigma-1}\tau_i \varphi(k,q)$ abroad) and the c.e.s. demand function $q_\omega = A_i p_\omega^{-\sigma} = X_i P_i^{\sigma-1} p_\omega^{-\sigma}$:

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

Variable labor demand for domestic and exported output is thus

$$\frac{\sigma-1}{\sigma} \sum_{i=1}^{I} X_i P_i^{\sigma-1} \left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} \left(\frac{Q_i}{N_i}\right)^{\kappa(\sigma-1)} \times$$
$$\left[\int_{\underline{k}_i}^{k_{is}} k^{1-\xi_i} dN_i \left(1-k^{-1}\right) + \int_{k_{is}}^{k_{ix}} z_{is}^{\sigma-1} k^{1-\xi_i} dN_i \left(1-k^{-1}\right) + \left(1+\tau^{1-\sigma}\right) \int_{k_{ix}}^{\infty} z_{is}^{\sigma-1} k^{1-\xi_i} dN_i \left(1-k^{-1}\right)\right],$$

which can be simplified to

$$\frac{\sigma-1}{\sigma} \sum_{i=1}^{I} X_i P_i^{\sigma-1} \left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} \left(\frac{Q_i}{N_i}\right)^{\kappa(\sigma-1)} \frac{N_i}{\xi_i} \left[\underline{k}_i^{-\xi_i} + \left(z_{is}^{\sigma-1} - 1\right) k_{is}^{-\xi_i} + \tau^{1-\sigma} z_{is}^{\sigma-1} k_{ix}^{-\xi_i}\right] = \frac{\sigma-1}{\sigma} \sum_{i=1}^{I} X_i.$$

As there are $\sum_{i=1}^{I} N_i k_{is}^{-1}$ importers and $\sum_{i=1}^{I} N_i k_{ix}^{-1}$ exporters, fixed labor demand equals $\sum_{i=1}^{I} F_{is} N_i k_{is}^{-1} + \sum_{i=1}^{I} F_{ix} N_i k_{ix}^{-1}$. Together, this yields the (17).

[28] This is in contrast to Melitz (2003). Other assignment models share the same feature are Chen (2019), Wu (2011) or Monte (2011).

Using the relation between the cutoffs yields

$$\begin{aligned}
\frac{\sigma-1}{\sigma}\sum_{i=1}^{I}X_i+\sum_{i=1}^{I}N_i\underline{k}_i^{-1}z_{is}^{\frac{\sigma-1}{1-\xi_i}}\tau_{ix}^{\frac{1-\sigma}{1-\xi_i}}F_{ix}^{\frac{-\xi_i}{1-\xi_i}}+\sum_{i=1}^{I}N_i\underline{k}_i^{-1}\left(z_{is}^{\sigma-1}-1\right)^{\frac{1}{1-\xi_i}}F_{is}^{-\frac{\xi_i}{1-\xi_i}} &= \sum_{i=1}^{I}N_i\left(1-\underline{k}_i^{-1}\right)\\
&\Leftrightarrow\\
\frac{\sigma-1}{\sigma}\sum_{i=1}^{I}X_i+\sum_{i=1}^{I}N_i\delta_i\underline{k}_i^{-1} &= \sum_{i=1}^{I}N_i\left(1-\underline{k}_i^{-1}\right)\\
&\Leftrightarrow\\
\frac{\sigma-1}{\sigma}\sum_{i=1}^{I}X_i &= \sum_{i=1}^{I}N_i\left(1-\left(1+\delta_i\right)\underline{k}_i^{-1}\right).
\end{aligned}$$

Plugging the zero-cutoff conditions $\underline{k}_i^{-1}=X_i\frac{\xi_i}{\sigma N_i(1+\delta_i)}$ into this expression and using the fact that $\sum_{i=1}^{I}X_i=\sum_{i=1}^{I}\beta_iX=X$ gives

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

A.7 Assignment

Equilibrium compensation premia $\Psi_i(k)$ that managers can expect to obtain in industry i are given by

$$\Psi_i(k)=\begin{cases}\frac{\mu_i}{\kappa_i+\mu_i}\left[z_{is}^{\sigma-1}\left(1+\tau_{ix}^{1-\sigma}\right)\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i}-F_{is}-F_{ix}-1\right] & \text{if } k_{ix}\leq k\\ \frac{\mu_i}{\kappa_i+\mu_i}\left[z_{is}^{\sigma-1}\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i}-F_{is}-1\right] & \text{if } k_{iS}\leq k<k_{ix}\\ \frac{\mu_i}{\kappa_i+\mu_i}\left[\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i}-1\right] & \text{if } \underline{k}_i\leq k<k_{iS}.\end{cases} \tag{20}$$

Equation (20) relates compensation differences across managers to differences across firms driven by positive assignment. Compensation inequality across firms is larger among international and larger firms since the slope of $\Psi_i(k)$ is steeper for $k\geq k_{is}$ and even more so for $k\geq k_{ix}$. Furthermore, (20) suggests that compensation levels are higher in sectors that are more integrated.

To derive (20), differentiate expected profits $E\left[\Pi(k,q)\right]$ with respect to knowledge k and then substitute $q = \frac{Q_i}{N_i} k$:

$$\frac{dE\left[\Pi\left(k,q\right)\right]}{dk}_{|q=q(k)} = \begin{cases} \mu_i \frac{\sigma-1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i \left(1+\tau_{ix}^{1-\sigma}\right) z_{is}^{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{\kappa_i(\sigma-1)} k^{-\xi_i} & \text{if } k_{ix} \leq k \\ \mu_i \frac{\sigma-1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i z_{is}^{\sigma-1}\left(\frac{Q_i}{N_i}\right)^{\kappa_i(\sigma-1)} k^{-\xi_i} & \text{if } k_{is} \leq k < k_{ix} \\ \mu_i \frac{\sigma-1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i \left(\frac{Q_i}{N_i}\right)^{\kappa_i(\sigma-1)} k^{-\xi_i} & \text{if } \underline{k}_i \leq k < k_{is}. \end{cases}$$

Integrating this expression over k and using the occupational indifference of the marginal manager yields the (partial-equilibrium version of the) compensation premium $\Psi_i\left(k\right)$:

$$\begin{aligned} \Psi_i\left(k\right) &= \frac{\mu_i}{\kappa_i+\mu_i}\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A_i\left(\frac{Q_i}{N_i}\right)^{\kappa_i(\sigma-1)} \times \\ &\begin{cases} \left[\left(k_{is}^{1-\xi_i} - \underline{k}_i^{1-\xi_i}\right) + z_{is}^{\sigma-1}\left(k_{ix}^{1-\xi_i} - k_{is}^{1-\xi_i}\right) + z_{is}^{\sigma-1}\left(1+\tau_{ix}^{1-\sigma}\right)\left(k^{1-\xi_i} - k_{ix}^{1-\xi_i}\right)\right] & \text{if } k_{ix} \leq k \\ \left[\left(k_{is}^{1-\xi_i} - \underline{k}_i^{1-\xi_i}\right) + z_{is}^{\sigma-1}\left(k^{1-\xi_i} - k_{is}^{1-\xi_i}\right)\right] & \text{if } k_{iS} \leq k < k_{ix} \\ \left(k^{1-\xi_i} - \underline{k}_i^{1-\xi_i}\right) & \text{if } \underline{k}_i \leq k < k_{iS}. \end{cases} \end{aligned}$$

For all managers within the industry, the compensation 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 relative importance of knowledge in the production process $\frac{\mu_i}{\kappa_i+\mu_i}$. Besides, there is a match-specific component to $\Psi_i\left(k\right)$ given by $k^{1-\xi_i} - \underline{k}_i^{1-\xi_i}$ for domestic firms, 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 importers and $\left(k_{is}^{1-\xi_i} - \underline{k}_i^{1-\xi_i}\right) + z_{is}^{\sigma-1}\left(k_{ix}^{1-\xi_i} - k_{is}^{1-\xi_i}\right) + z_{is}^{\sigma-1}\left(1+\tau_{ix}^{1-\sigma}\right)\left(k^{1-\xi_i} - k_{ix}^{1-\xi_i}\right)$ for importer-exporters. This match-specific factor relates the knowledge level k relative to the knowledge of the marginal manager in the industry $\underline{k}_i$.

Since the cutoffs and the industry-specific market size A_i are equilibrium objects, the expected compensation stated above can be regarded as the partial-equilibrium expression of expected compensation. It closely matches the distribution of executive pay in assignment models with an exogenous firm mass and market size such as Gabaix and Landier (2008). Equilibrium pay levels are increasing with the size of a "reference firm" in the economy (here $\underline{k}_i$) and the aggregate market size (here A_i). In this model, both objects are equilibrium outcomes to study comparative exercises of a globalization shock.

Plugging in A_i and simplifying yields

$$\Psi_i\left(k\right) = \begin{cases} \frac{\mu_i}{\kappa_i+\mu_i}\left[z_{is}^{\sigma-1}\left(1+\tau_{ix}^{1-\sigma}\right)\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i} - F_{is} - F_{ix} - 1\right] & \text{if } k_{ix} \leq k \\ \frac{\mu_i}{\kappa_i+\mu_i}\left[z_{is}^{\sigma-1}\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i} - F_{is} - 1\right] & \text{if } k_{iS} \leq k < k_{ix} \\ \frac{\mu_i}{\kappa_i+\mu_i}\left(\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i} - 1\right) & \text{if } \underline{k}_i \leq k < k_{iS}. \blacksquare \end{cases}$$

A.8 Comparative Static with $dz_{is} > 0$

Consider how an increase in z_{is} affects the compensation premium of a manager. The derivative of $\Psi_i(k)$ with respect to z_{is} can be written as

$$\frac{d\Psi_i(k)}{dz_{is}} = \begin{cases} \frac{\mu_i}{\kappa_i+\mu_i}\left(1+\tau_{ix}^{1-\sigma}\right) z_{is}^{\sigma-1}\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i}\left[(\sigma-1) z_{is}^{-1}-(1-\xi_i)\underline{k}_i^{-1}\frac{d\underline{k}_i}{z_{is}}\right] & \text{if } k_{ix} \le k \\ \frac{\mu_i}{\kappa_i+\mu_i} z_{is}^{\sigma-1}\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i}\left[(\sigma-1) z_{is}^{-1}-(1-\xi_i)\underline{k}_i^{-1}\frac{d\underline{k}_i}{z_{is}}\right] & \text{if } k_{iS} \le k < k_{ix} \\ \frac{\mu_i}{\kappa_i+\mu_i}\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i}(1-\xi_i)\underline{k}_i^{-1}\frac{d\underline{k}_i}{z_{is}} & \text{if } \underline{k}_i \le k < k_{iS}. \end{cases}$$

Next, consider the derivative $\frac{d\underline{k}_i}{dz_{is}}$, which is $\frac{d\underline{k}_i}{dz_{is}} = \frac{d\underline{k}_i}{d\delta_i}\frac{d\delta_i}{dz_{is}}$. First,

$$\frac{d\underline{k}_i}{d\delta_i} = \frac{\sigma N_i}{\xi_i} X_i^{-1} = \frac{\underline{k}_i}{1+\delta_i}.$$

Second, consider

$$\frac{d\delta_i}{dz_{is}} = d\left(\left(z_{is}^{\sigma-1}-1\right)^{\frac{1}{1-\xi_i}} F_{is}^{-\frac{\xi_i}{1-\xi_i}} + z_{is}^{\frac{\sigma-1}{1-\xi_i}} \tau_{ix}^{\frac{-(\sigma-1)}{1-\xi_i}} F_{ix}^{-\frac{\xi_i}{1-\xi_i}}\right)\frac{1}{dz_{is}} = \frac{\sigma-1}{1-\xi_i} z_{is}^{-1}\left(\left(z_{is}^{\sigma-1}-1\right)^{\frac{\xi_i}{1-\xi_i}} F_{is}^{-\frac{\xi_i}{1-\xi_i}} + \delta_i\right).$$

Lastly, since $\left(z_{is}^{\sigma-1}-1\right) < F_{is}$ (because $\underline{k}_i < k_{is}$), we have

$$(\sigma-1) z_{is}^{-1} - (1-\xi_i)\underline{k}_i^{-1}\frac{d\underline{k}_i}{z_{is}} = (\sigma-1) z_{is}^{-1}\left(1 - \frac{\left(z_{is}^{\sigma-1}-1\right)^{\frac{\xi_i}{1-\xi_i}} F_{is}^{-\frac{\xi_i}{1-\xi_i}} + \delta_i}{1+\delta_i}\right) > 0,$$

such that the compensation premium increases for managers of importing firms. Since $\frac{d\underline{k}_i}{z_{is}} < 0$, it falls for managers of domestic firms. Furthermore, this implies that capital-ownership shares $\triangle$ increase (fall) for managers of importers (domestic firms) given Assumption 1 and the optimal contracting (11). ■

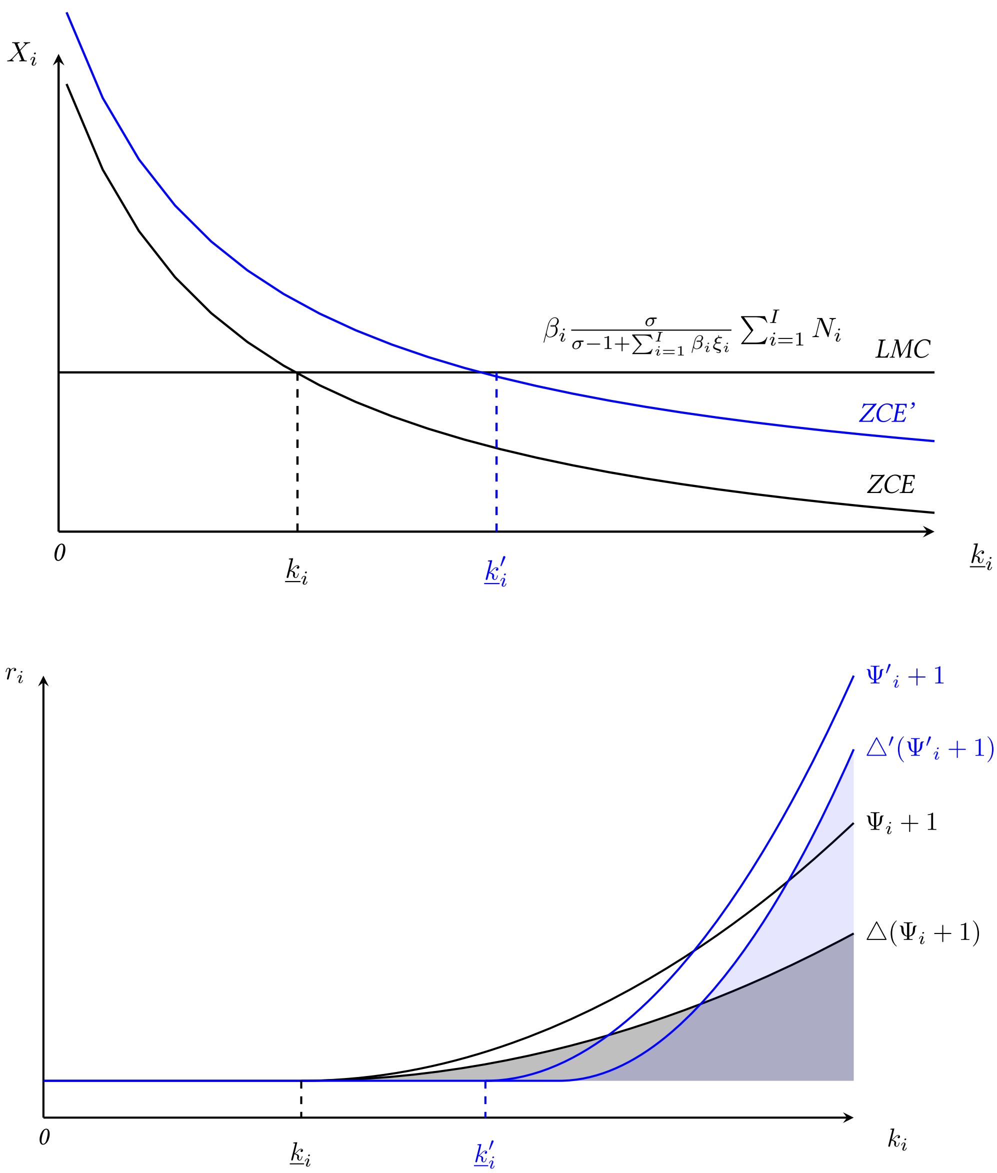
A.9 Invariance of the Earnings Distribution

To show that the assumption of a unity shape parameter on the Pareto distribution of blueprints and managers is without loss of generality, suppose that knowledge and blueprints are Pareto-distributed with general shape parameters s_k and s_q and redefine $Q_i' = Q_i^{s_k}$ and $N_i' = N_i^{s_k}$ such that $Q_i(q) = Q_i' q^{-s_q}$ is the mass of blueprints that are at least as good as the blueprint with efficiency q and $N_i(k) = N_i' k^{-s_k}$ is the mass of agents with knowledge of at least k. Due to positive assignment, both masses need to be equal for each matched pair (k, q):

$$\frac{N_i'}{k^{s_k}} = \frac{Q_i'}{q^{s_q}} \Longleftrightarrow q = \left(\frac{Q_i'}{N_i'}\right)^{1/s_q} k^{s_k/s_q}.$$

Figure A1: Effects of Trade Liberalization ($d\delta_i > 0$)

(a) Industry Equilibrium



(b) Compensation Premia and Capital Ownership

Differentiating expected operating profits $E\left[\Pi\left(k,q\right)\right]=\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}A_i\left(k^{\mu_i}q^{\kappa_i}\right)^{\sigma-1}$ with respect to knowledge k and then substituting $q=\left(\frac{Q_i'}{N_i'}\right)^{1/s_q}k^{s_k/s_q}$ yields (consider for brevity a domestic firm):

$$\frac{dE\left[\Pi\left(k,q\right)\right]}{dk}_{|q=q(k)}=\mu_i\left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}A_i\left(\frac{Q_i'}{N_i'}\right)^{\kappa_i(\sigma-1)/s_q}k^{(\mu_i+\kappa_i s_k/s_q)(\sigma-1)-1}.$$

Integrating this expression over k and using the occupational indifference of the marginal manager yields the compensation premium $\Psi_i\left(k\right)$:

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

such that the compensation premium is identical after redefining parameter κ_i from the model to $\kappa_i\frac{s_k}{s_q}$, here. ■

B Quantification Appendix

B.1 Derivations

Stating Firm Sales and Compensation Premia in Terms of Market Shares $\mathcal{M}$: Assuming that firms within the list of top 500 firms are importers and exporters,[29] firm sales are

$$p_\omega q_\omega = X_i P^{\sigma-1} p_\omega^{1-\sigma}\left(1+\tau_{ix}^{1-\sigma}\right) = \sigma z_{is}^{\sigma-1}\left(1+\tau_{ix}^{1-\sigma}\right)\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i},$$

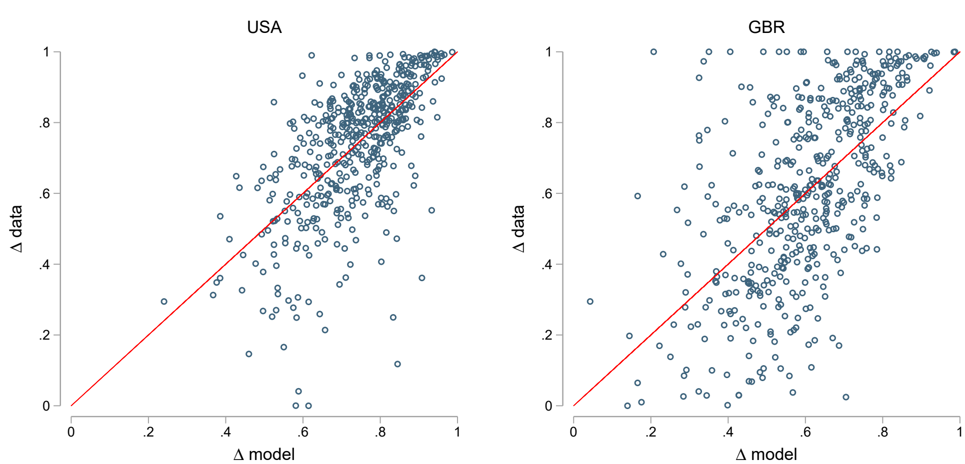
where the term $\frac{k}{\underline{k}_i}$ is unobservable. This term can be backed out from the market share of an individual firm using the industry market share $\mathcal{M} \equiv \sigma z_{is}^{\sigma-1}\left(1+\tau_{ix}^{1-\sigma}\right)\left(\frac{k}{\underline{k}_i}\right)^{1-\xi_i} X_i^{-1}$ which is observable in the data:

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

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

$$\begin{aligned} sales &= \sigma\mathcal{M}\frac{N_i\left(1+\delta_i\right)}{\underline{k}_i\xi_i} \\ knowledge\ premium &= \frac{\mu_i}{\kappa_i+\mu_i}\left[\mathcal{M}\frac{N_i\left(1+\delta_i\right)}{\underline{k}_i\xi_i} - F_{is} - F_{ix} - 1\right]. \end{aligned}$$

Figure B1: Capital Ownership in the Model and the Data



Notes: The Figure shows scatter plots of calibrated versus observed capital-ownership shares $\triangle$ for the US (left graph) and the UK (right graph).

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

Trade Shares The share of import expenditures can be expressed as

$$import\ share = \frac{k_i}{k_{is}} \times \frac{\Omega_i^{\theta-1}}{1+\Omega_i^{\theta-1}} = \left(\left(z_{is}^{\sigma-1} - 1 \right)^{\frac{1}{1-\xi_i}} F_{is}^{-\frac{1}{1-\xi_i}} \right) \times \frac{z_{is}^{\theta-1} - 1}{z_{is}^{\theta-1}}$$

The share of exports in sales is given by

$$export\ share = \frac{k_i}{k_{ix}} \times \tau^{1-\sigma} = \left(z_{is}^{\frac{\sigma-1}{1-\xi_i}} \tau_{ix}^{\frac{1-\sigma}{1-\xi_i}} F_{ix}^{\frac{-1}{1-\xi_i}} \right) \times \tau^{1-\sigma} = z_{is}^{\frac{\sigma-1}{1-\xi_i}} \tau_{ix}^{\frac{(1-\sigma)(2-\xi_i)}{1-\xi_i}} F_{ix}^{\frac{-1}{1-\xi_i}}$$

B.2 Taxing Top Earners

How distortive is the introduction of a tax on top earners to restore top earnings to autarky levels? The mechanism described in the model suggests that the increase in top earners' compensation in response to globalization contributes to inequality but at the same time this increase is efficient as compensation of productive managers allows more productive firms to expand more. Suppose that a fiscal authority wants to introduce a tax on corporate top earners that aims to restore earnings at certain percentiles of the earnings distribution back to counterfactual autarky levels. This tax is distortive for both, zero-cutoff earnings and labor-market clearing. First, the tax makes entry more costly and the marginal firm needs to be more productive such that less firms enter. Second, a larger fraction of firms are active internationally as the importer and exporter cutoffs move closer to the domestic entry cutoff such that a larger fraction of labor is used for fixed entry costs. Table B1 reports the average tax rates that are required to restore earning gains back to autarky levels and the effect on consumer prices. Naturally, the higher the percentile that the tax targets, the larger is the required tax rate and the more distortive it is. A 24 (29) percent tax rate is necessary to remove the trade-induced benefits at the 99.9 percentile of the earnings distribution in the US (UK). The distortion that such a tax rate would create according to the model is reflected in a 2 percent higher price index in the US, respectively a 3 percent higher price index in the UK.

Table B1: Taxation of Corporate Top Earners

	p90	p99	p99.9
		USA	
Price index change	100	101	102
Required average tax rate	1	9	24
		GBR	
Price index change	100	102	103
Required average tax rate	1	10	29

Notes: The Table shows required tax rates to bring earnings at selected percentiles back to autarky levels and the associated increase in consumer prices. Changes in the price index are measured as $\frac{value_{2006}}{value_{aut}} \times 100\%$.

C Empirical Appendix

C.1 Variable Descriptions

- *Capital Ownership:* see C.2.1 for details on Capital Ownership; variable `TotalWealth` from BoardEx UK or variable `firm_related_wealth` from Coles et al. (2006) using ExecuComp for the US in nominal Thd. $ (in logs); Source: BoardEx, ExecuComp, Coles et al. (2006)

- *Capital-Ownership Share:* calculated as *Capital Ownership* relative to the sum of *Capital Ownership* and the present value of previous labor-income payments, the present value of previous labor-income payments is calculated as $PV_{Labor}\left(T\right)=\sum_{t=1,..,T}\left(1+r\right)^{T-t}income\left(t\right)$, where T is the current and t the t^{th} year of employment within the firm, income comprises salaries and bonuses and r is the real interest rates from the World Bank World Development Indicators; Source: BoardEx, ExecuComp, Coles et al. (2006), World Bank WDI

- *Equity Price:* end-of-year closing price of the firms' main security adjusted for splits and dividends calculated as `(prccd / ajexdi)`×`trfd` in nominal $ (in logs); Source: Compustat North America, Compustat Global (Security Daily Files)

- *New Equity:* variable `TotalEquityLinkedCompensation` from BoardEx UK or variable `tdc2` from ExecuComp net of `salary` and `bonus` for the US in nominal Thd. $ (in logs); Source: BoardEx, ExecuComp

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

- *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

- *Multinational:* dummy that indicates if the headquarter owns subsidiaries in a foreign country (time invariant); Source: Dun&Bradstreet WorldBase, 2018 vintage

- *Importer:* dummy that indicates if at least one establishment within the firm imports from a foreign country (time invariant); Source: Dun&Bradstreet WorldBase, 2018 vintage

- *Exporter:* dummy that indicates if at least one establishment within the firm exports to a foreign country (time invariant); Source: Dun&Bradstreet WorldBase, 2018 vintage

- *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

- *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

- *Trade Transport Margins:* input import trade margins defined as in Equation (8) using the variable `IntTTM` in WIOD and input level country-industry specific input coefficients based on WIOD in the year 2000; Source: WIOD

- *RTA Coverage:* fraction of inputs covered by an RTA defined as in Equation (9) using input level country-industry specific input coefficients based on WIOD in the year 2000; Source: WIOD, CEPII

- *Industry Exports:* Exports for a country-industry-year (in logs), industries matched to firms' main SIC industry; Source: WIOD

- *Industry Domestic Absorption:* gross output net of exports plus imports 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

- *Industry Import Penetration:* imports relative to domestic absorption in nominal Mio. $ for a country-industry-year (in logs), industries matched to firms' main SIC industry; Source: WIOD

- *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 (2019)

C.2 Details on the Data

C.2.1 Calculating Capital Ownership

Capital ownership measures how much firm-related equity an individual manager in the sample owns. It includes the value of stocks that a manager owns in the employing firm's stocks - either obtained from exercised stock options or directly - and the market value of outstanding equity options. Firms in the sample are required to report information on share ownership and options as part of their proxy statements or annual reports.

In the US, stock ownership of directors is disclosed in firms' proxy statements filed to the Securities Exchange Commission. In the UK, a register of directors' interests in shares of the employing firm was required under the Companies Act 1985. Even though companies no longer need to maintain such a register since 2006 as there is no equivalent requirement in the Companies Act 2006, public companies are in practice likely to maintain disclosure of stock ownership.

For managers employed by US companies, I follow the data method suggested by Coles et al. (2006). The value of the stock portfolio is the product of the number of shares that an individual holds and the year-end stock price (`prccf`). The calculation of the value of a managers' firm-related option portfolio depends on the respective year as there has been a change in reporting rules (the revision of accounting rule FAS 123R). Before 2006, the value of the option portfolio held by an individual manager is the sum of three subportfolios in ExecuComp: (i) the value of newly-granted options during the current year, (ii) the value of previously-granted options that have not yet vested and (iii) the value of vested options. From 2006 onwards, all options are reported at the option-tranch level such that the value of the option portfolio is calculated by aggregating values of outstanding options across tranches. Capital ownership for managers employed by UK firms comes directly from BoardEx and follows the same principle. It also equals the sum of the estimated value of options held plus the value of shares held. In both subsamples, a valuation of options is based on the year-end stock price and a generalized Black-Scholes pricing formula.

C.2.2 Calculating Offshorability

I use data from the US Department of Labor O*NET program on occupational task contents and the US BLS Occupational Employment Statistics to calculate offshorability.[30] O*NET provides information 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 C1 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 (2019), 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:

$$off_j = \frac{1}{\sum_{a=1}^{6} I_{aj}^{2/3} L_{aj}^{1/3} + I_{cj} L_{cj}}. \tag{21}$$

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

$$OFF_i = \sum_j off_j \times \frac{emp_{j,i}}{\sum_{j,i} emp_{j,i}}, \tag{22}$$

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.

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

Table C1: 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

C.2.3 Instrumental Variables

I compute Rotemberg weights as a measure of sensitivity-to-misspecification suggested by Goldsmith-Pinkham et al. (2020). Since input sourcing imp_{ict} varies at the country-industry-year level, I collapse my data to that level and obtain the Rotemberg weights for both instruments, ttm_{ict} and rta_{ict}. I use the number of managers within a country-industry-year cell as analytical weight. By definition, the sum of these weights aggregates to 1 and weights can be negative. The upper part of Table C2 summarizes the fraction of positive and negative weights. In the bottom part of the Table, I list the shock-level country-industry pairs $\hat{i}\hat{c}$ that have the largest sensitivity-to-misspecification and the fraction of their Rotemberg weights in the total sum of positive weights. The mining industry has a strong sensitivity to misspecification for the transport-margin instrument. For the RTA instrument, financial services and manufacturing of computers matter most.

To assess the robustness regarding the choice of instruments I present results based on two alternative instrument sets. First, I calculate alternative instruments ttm_{ict} and rta_{ict} where I exclude the country-industry pairs with the largest Rotemberg weight to evaluate how how sensible the estimates are with respect to those. Second, I calculate a second set of alternative instruments where I omit elements from the diagonal of the input-output matrix, excluding inputs from the same industry, to prevent omitted variable bias coming from industry-specific technology shocks that are correlated across countries.

The results in Table C3 suggest that results are robust to altering the instruments since estimates are quantitatively similar to those with the default instruments and equality of effects across firm-size quintiles.

Table C2: Rotemberg Weights of the Instruments

(a) Negative and Positive Rotemberg Weights

	TTM Instrument		*RTA Instrument*	
	Share	Mean	Share	Mean
Positive	0.449	0.019	0.968	0.0005
Negative	0.551	-0.015	0.032	-0.002

(b) Top 5 Rotemberg Weight Country-Industries

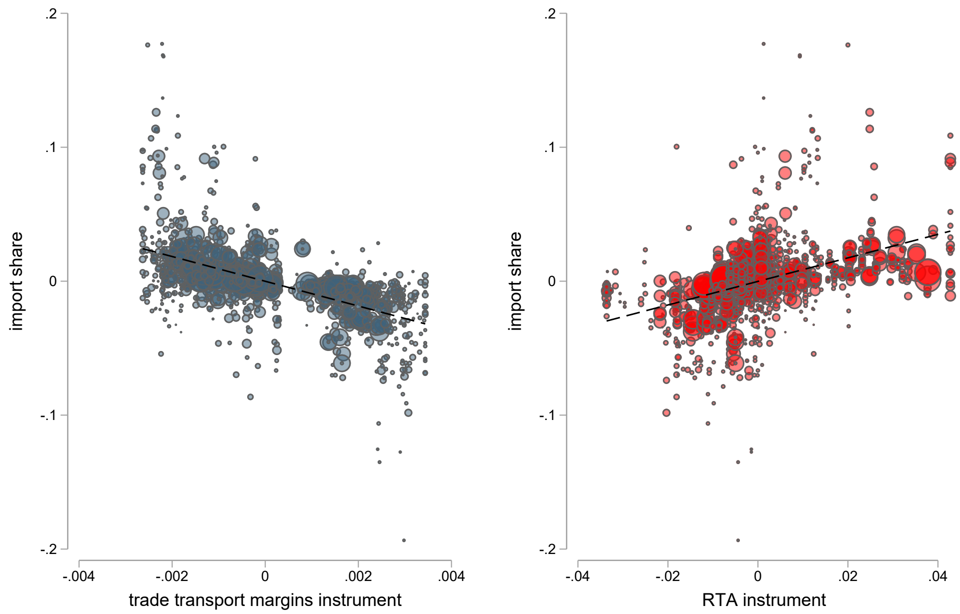
RTA Instrument	
Country-Industry:	Share Pos. Weight
Switzerland - Financial service activities	0.48
Korea - Manufacture of computer products	0.19
Switzerland - Administrative and support service activities	0.08
Switzerland - Accommodation and food services	0.06
Switzerland - Legal and accounting activities	0.04
TTM Instrument	
Country-Industry:	Share Pos. Weight
Norway - Mining and quarrying	0.27
Canada - Mining and quarrying	0.12
Germany - Manufacture of chemicals	0.03
France - Manufacture of chemicals	0.03
Mexico - Mining and quarrying	0.03

Table C3: Robustness: Alternative Instruments - Excluding Shocks with High Rotemberg Weights or Diagonal Elements on the I-O Table

	Capital Ownership	Capital-Ownership Share	Capital Ownership	Capital-Ownership Share
	(1)	(2)	(3)	(4)
	Rotemberg Weights		*Diagonal Elements*	
Import Share by Firm-Size Quintile				
Import Share × Q1	-4.707	-1.132**	-7.350**	-1.389**
	(2.937)	(0.495)	(3.416)	(0.568)
Import Share × Q2	-7.283***	-1.508***	-9.322***	-1.840***
	(2.257)	(0.419)	(2.532)	(0.467)
Import Share × Q3	0.953	0.102	-0.312	-0.0700
	(2.055)	(0.355)	(2.207)	(0.376)
Import Share × Q4	3.757*	0.942**	2.212	0.743*
	(2.247)	(0.376)	(2.595)	(0.419)
Import Share × Q5	6.980***	1.593***	5.201**	1.236***
	(2.210)	(0.366)	(2.495)	(0.402)
Log Exports by Firm-Size Quintile				
Exports × Q1	-0.305**	-0.101***	-0.292**	-0.103***
	(0.121)	(0.0214)	(0.128)	(0.0223)
Exports × Q2	0.00115	-0.000860	-0.0146	-0.00276
	(0.0871)	(0.0161)	(0.0891)	(0.0163)
Exports × Q3	-0.227***	-0.0260*	-0.253***	-0.0305**
	(0.0752)	(0.0144)	(0.0768)	(0.0147)
Exports × Q4	-0.173*	-0.0197	-0.195**	-0.0237
	(0.0997)	(0.0172)	(0.0989)	(0.0173)
Exports × Q5	0.0166	0.00695	-0.000938	0.00608
	(0.0579)	(0.00980)	(0.0589)	(0.00989)
Match F.E.	×	×	×	×
Country-Year F.E.	×	×	×	×
Controls	×	×	×	×
First Stage				
KP F-test	89.95	89.99	114.0	114.5
Overident. (p-value)	0.811	0.564	0.630	0.0739
Observations	130,175	130,784	130,175	130,784
Firms	3,071	3,071	3,071	3,071
Individuals	24,295	24,419	24,295	24,419

Notes: The Table replicates specifications (4) from Table 8 and (5) from Table 10 with alternative instruments. The alternative instruments in columns (1) - (2) exclude shocks from the input-supplying country-industry pairs with the largest Rotemberg weight. The alternative instruments in columns (3) - (4) exclude shocks from diagonal elements of the I-O table.

Figure C1: Relevance of Instruments: Trade and Transport Margins and RTA Coverage



Notes: The Figure depicts a scatter plot of the two instrumental variables with import shares. Observations show variation within country-industry pairs and the size of the markers indicates the frequency of each country-industry pair in the regressions. For optical reasons, the graph omits outliers of both instruments and just plots the 1st to the 99th percentile of both instruments.

C.3 Additional Results and Robustness

Table C4: 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	**90.20**	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 C5: Testing for Inequality Across Firm-Size Quintiles

	(1)	(2)	(3)	(4)	(5)	(6)
i. $H0 : Q1 = Q5$	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.007
ii. $H0 : Q2 = Q4$	0.006	0.006	0.002	< 0.001	0.021	< 0.001
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 Table 8 and tests for unequal effects of importing across firm-size quintiles.

Table C6: Robustness: Trade and Capital Ownership Across Firms - Controlling for Equity Prices

	Capital Ownership					
	(1)	(2)	(3)	(4)	(5)	(6)
			By Sales			*By Empl.*
Import Share by Firm-Size Quintile						
Import Share × Q1	-1.319	-1.072	-3.370*	-2.994	-1.663	-1.489
	(0.885)	(0.898)	(1.735)	(1.864)	(2.530)	(2.419)
Import Share × Q2	-0.223	-0.0520	-3.452**	-3.954**	-3.376	-4.413***
	(0.659)	(0.665)	(1.608)	(1.786)	(2.302)	(1.626)
Import Share × Q3	-0.742	-0.336	-2.101	-0.365	0.117	-1.017
	(0.612)	(0.638)	(1.436)	(1.621)	(1.862)	(2.033)
Import Share × Q4	0.577	0.826	-2.184	-2.031	-3.629	2.384
	(0.556)	(0.589)	(1.529)	(1.776)	(2.284)	(1.856)
Import Share × Q5	2.671***	1.983***	4.096***	1.824	3.293	2.757
	(0.560)	(0.554)	(1.528)	(1.585)	(2.140)	(1.915)
Log Exports by Firm-Size Quintile						
Exports × Q1		-0.0631		-0.0647	-0.129	-0.0569
		(0.0818)		(0.0916)	(0.119)	(0.0731)
Exports × Q2		-0.0486		-0.0189	-0.150*	-0.00268
		(0.0625)		(0.0740)	(0.0828)	(0.0669)
Exports × Q3		-0.0918*		-0.144**	-0.176**	-0.0992
		(0.0553)		(0.0611)	(0.0803)	(0.0686)
Exports × Q4		-0.0616		-0.0515	-0.142	-0.0347
		(0.0632)		(0.0684)	(0.0950)	(0.0706)
Exports × Q5		0.106**		0.0620	-0.00681	0.116*
		(0.0457)		(0.0494)	(0.0567)	(0.0595)
Equity Price	0.883***	0.882***	0.882***	0.881***	0.882***	0.882***
	(0.0195)	(0.0195)	(0.0195)	(0.0195)	(0.0189)	(0.0199)
Match F.E.	×	×	×	×	×	×
Country-Year F.E.	×	×	×	×	×	×
Controls	×	×	×	×	×	×
First Stage						
KP F-test			125.4	116.4	59.78	41.23
Overident. (p-value)			0.189	0.203	0.184	0.251
Observations	126,873	126,873	126,873	126,873	25,155	124,306
Firms	3,008	3,008	3,008	3,008	2,868	2,756
Individuals	23,775	23,775	23,775	23,775	5,164	23,025

Notes: The dependent variable *Capital Ownership* is an individual manager's total ownership of equity (in logs) linked to the employer's stock price. *Import Share* is the expenditure share on foreign inputs. *Import Share* and *Exports* (in logs) are measured at the country-industry-year level based on WIOD data. *Equity Price* is the end-of-year closing price of the firms' main security adjusted for splits and dividends (in logs). All specifications include the following additional controls (output suppressed): firm-level *Capital Intensity,* country-industry-year level *Domestic Absorption* 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 RTA coverage described in Subsection 4.3. 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 firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table C7: Robustness: Controlling for Import Competition

	Capital Ownership		Capital-Ownership Share	
	(1)	(2)	(3)	(4)
Import Share by Firm-Size Quintile				
Import Share × Q1	-0.848	-8.581**	-0.747***	-3.719***
	(1.677)	(3.653)	(0.272)	(0.731)
Import Share × Q2	-0.120	-6.620**	-0.125	-1.804***
	(1.190)	(3.231)	(0.194)	(0.588)
Import Share × Q3	-0.322	-2.237	-0.120	-0.165
	(0.897)	(2.848)	(0.159)	(0.518)
Import Share × Q4	1.656**	2.986	0.341**	1.248***
	(0.746)	(2.532)	(0.143)	(0.439)
Import Share × Q5	4.465***	13.86***	0.629***	2.970***
	(0.826)	(2.763)	(0.135)	(0.469)
Import Penetration by Firm-Size Quintile				
IP × Q1	-2.513**	0.763	-0.334*	0.923***
	(1.075)	(1.647)	(0.174)	(0.319)
IP × Q2	-1.367	1.535	-0.202	0.571**
	(0.855)	(1.342)	(0.150)	(0.251)
IP × Q3	0.165	1.237	0.0882	0.197
	(0.596)	(1.171)	(0.103)	(0.210)
IP × Q4	0.313	0.0770	0.0454	-0.200
	(0.699)	(0.976)	(0.116)	(0.161)
IP × Q5	-0.198	-4.190***	0.143	-0.824***
	(0.811)	(1.259)	(0.118)	(0.200)
Match F.E.	×	×	×	×
Country-Year F.E.	×	×	×	×
Controls	×	×	×	×
First Stage				
KP F-test		76.31		76.72
Overident. (p-value)		0.811		0.932
Observations	130,175	130,175	130,784	130,784
Firms	3,071	3,071	3,071	3,071
Individuals	24,295	24,295	24,419	24,419

Notes: The dependent variable *Capital Ownership* is an individual manager's total ownership of equity (in logs) linked to the employer's stock price. The dependent variable *Capital-Ownership Share* is calculated as *Capital Ownership* relative to the sum of *Capital Ownership* and the present value of previous labor-income payments. *Import Share* is the expenditure share on foreign inputs. *Import Penetration (IP)* is imports over domestic absorption. *Import Share* and *Import Penetration* are measured at the country-industry-year level based on WIOD data. All specifications include the following additional controls (output suppressed): firm-level *Capital Intensity*, country-industry-year level *Domestic Absorption* 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 RTA coverage described in Subsection 4.3. Firm-size quintiles are based on the average firm sales during the first 3 sample years and order the sample firms within the same country. Standard errors are cluster-robust at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table C8: Robustness: More Granular I-O Table for Manufacturing Industries

	Capital Ownership			Capital-Ownership Share
	(1)	(2)	(3)	(4)
		By Sales	*By Empl.*	*By Sales*
Imports	0.730***			
	(0.102)			
Imports by Firm-Size Quintile				
Imports × Q1		0.220	0.231	-0.0521
		(0.181)	(0.183)	(0.0352)
Imports × Q2		0.545***	0.537***	0.0172
		(0.152)	(0.155)	(0.0280)
Imports × Q3		0.825***	0.728***	0.0713***
		(0.131)	(0.139)	(0.0227)
Imports × Q4		0.742***	0.943***	0.0739***
		(0.128)	(0.115)	(0.0207)
Imports × Q5		0.914***	0.955***	0.108***
		(0.125)	(0.135)	(0.0217)
Match F.E.	×	×	×	×
Country-Year F.E.	×	×	×	×
Sample	Manuf.	Manuf.	Manuf.	Manuf.
Observations	55,052	52,015	50,410	52,202
Firms	1,332	1,161	1,068	1,161
Individuals	10,434	9,728	9,362	9,772

Notes: The dependent variable *Capital Ownership* is an individual manager's total ownership of equity (in logs) linked to the employer's stock price. The dependent variable *Capital-Ownership Share* is calculated as *Capital Ownership* relative to the sum of *Capital Ownership* and the present value of previous labor-income payments. *Imports* is the log industry expenditure on foreign inputs measured at the country-industry-year level based on Comtrade import data and the 1992 US Benchmark I-O table from the US Bureau of Economic Analysis transposed at the 3-digit SIC level. Estimations include firms with primary industries in manufacturing only. All specifications include firm level *Capital Intensity*. All estimations include fixed effects for individual manager-firm matches and country-years. 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 firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table C9: Robustness: Recession Years

	Capital Ownership		Capital-Ownership Share	
	(1)	(2)	(3)	(4)
Import Share by Firm-Size Quintile				
Import Share × Q1	-2.415	-6.360**	-0.649***	-1.373***
	(1.491)	(3.035)	(0.245)	(0.514)
Import Share × Q2	-2.362**	-8.274***	-0.474**	-1.661***
	(1.040)	(2.288)	(0.190)	(0.431)
Import Share × Q3	-0.185	1.147	-0.0743	0.202
	(0.961)	(2.111)	(0.148)	(0.366)
Import Share × Q4	1.661**	4.506*	0.324**	1.077***
	(0.772)	(2.366)	(0.139)	(0.390)
Import Share × Q5	2.973***	8.748***	0.434***	1.969***
	(0.794)	(2.324)	(0.127)	(0.382)
Log Exports by Firm-Size Quintile				
Exports × Q1	-0.398***	-0.243*	-0.131***	-0.0958***
	(0.107)	(0.132)	(0.0200)	(0.0229)
Exports × Q2	-0.127	0.0239	-0.0321**	0.00334
	(0.0791)	(0.0892)	(0.0157)	(0.0162)
Exports × Q3	-0.239***	-0.221***	-0.0329**	-0.0239
	(0.0701)	(0.0766)	(0.0134)	(0.0150)
Exports × Q4	-0.166*	-0.172	-0.0152	-0.0149
	(0.101)	(0.112)	(0.0159)	(0.0185)
Exports × Q5	0.0828	0.0192	0.0243**	0.00931
	(0.0543)	(0.0599)	(0.00964)	(0.0102)
Match F.E.	×	×	×	×
Country-Year F.E.	×	×	×	×
First Stage				
KP F-test		108.6		108.8
Overident. (p-value)		0.658		0.971
Observations	109,749	109,749	110,267	110,267
Firms	3,044	3,044	3,045	3,045
Individuals	23,011	23,011	23,134	23,134

Notes: The dependent variable *Capital Ownership* is an individual manager's total ownership of equity (in logs) linked to the employer's stock price. The dependent variable *Capital-Ownership Share* is calculated as *Capital Ownership* relative to the sum of *Capital Ownership* and the present value of previous labor-income payments. Observations from 2008 and 2009 are omitted from the estimation sample. *Import Share* is the expenditure share on foreign inputs. *Import Share* and *Exports* (in logs) are measured at the country-industry-year level based on WIOD data. *Equity Price* is the end-of-year closing price of the firms' main security adjusted for splits and dividends (in logs). All specifications include the following additional controls (output suppressed): firm-level *Capital Intensity,* country-industry-year level *Domestic Absorption* 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 RTA coverage described in Subsection 4.3. Firm-size quintiles are based on the average firm sales during the first 3 sample years and order the sample firms within the same country. Standard errors are cluster-robust at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$