# The Globalization Risk Premium[†]

Jean-Noël Barrot Erik Loualiche Julien Sauvagnat

December 2015

**Abstract**

We investigate how globalization is reflected in asset prices. We use shipping costs to measure U.S. firms' exposure to globalization. We find that firms in low shipping cost industries carry a 7.8 percent risk premium, suggesting that their cash-flows covary negatively with the representative investor's marginal utility. To understand the origins of this globalization risk premium, we develop a dynamic general equilibrium model of trade and asset prices. Guided by the model, we find that the premium emanates from the risk of displacement of least efficient firms triggered by import competition. These findings suggest that foreign productivity shocks are perceived as being associated with lower consumption growth by the representative U.S. investor.

[†]Preliminary, comments welcome. This paper was previously circulated under the title "Import Competition and the Cost of Capital". Jean-Noël Barrot is with MIT Sloan School of Management. Contact: jnbarrot@mit.edu. Erik Loualiche is with MIT Sloan School of Management. Contact: erikl@mit.edu. Julien Sauvagnat is with Bocconi University. Contact: julien.sauvagnat@unibocconi.it. We are grateful to Nick Bloom, Christian Julliard, Jonathan Parker, Michael Weber (discussant) and seminar participants at MIT Sloan, SED annual meetings 2015, 2015 China International Conference in Finance, and 2015 European Economic Association annual meetings for their valuable inputs. Julien Sauvagnat gratefully acknowledges financial support from the Agence Nationale de la Recherche - Investissements d'Avenir (ANR-11-IDEX-0003/Labex Ecodec/ANR-11-LABX-0047). We would like to thank Vincent Tjeng for outstanding research assistance.

# 1 Introduction

A defining feature of the past three decades is the dramatic increase in international trade flows. Commonly referred to as "globalization", this process has attracted a lot of scrutiny but its implications are still debated. Among the benefits are the availability of more product variety at lower prices (Broda and Weinstein, 2006), cheaper intermediate goods (Goldberg et al., 2010; De Loecker et al., 2012), and the access for U.S. firms to foreign markets (Lileeva and Trefler, 2010). On the other hand, foreign competition by low wage countries, including China especially after its entry in World Trade Organization, have been shown to threaten U.S. manufacturing employment and wages (Pierce and Schott, 2012; Autor et al., 2013; Acemoglu et al., 2014). In summary, globalization has hetereogeneous effects on households (Goldberg and Pavcnik, 2007) and firms (Melitz and Redding, 2014a) that complicate the analysis of its overall impact.

This paper studies how globalization is reflected in asset prices, and therefore how the representative U.S. investor perceives the domestic consequences of foreign productivity shocks. The intuition is as follows. If the performance of firms exposed to globalization covaries positively with the representative U.S. investor's consumption, these industries will command a risk premium. Consistent with this idea, we find that exposed firms command a risk premium. This premium can be driven by either a positive or negative joint reaction of U.S. firms' performance and households' consumption to foreign productivity shocks. We provide evidence in favor of the later: states of the world where firms suffer from increased import competition are also states where consumption is dear. Our results thus indicate that foreign productivity shocks are perceived as bad news for the representative U.S. investor.

We use shipping costs (SC) to measure firms' exposure to globalization. More precisely, we follow Bernard et al. (2006b) and exploit import data which allows us to compute the various costs associated to shipments, called Cost-Insurance-Freight as a percentage of the price paid by the importer. We document substantial cross-sectional variation and time-series persistence in SC, consistent with the idea that this proxy captures structural and slow-moving barriers to trade. We also show that shipping costs are tightly linked to the weight-to-value ratio of shipments, and find that both measures correlate negatively with firms' propensity to import and export, namely, with their exposure to globalization.

We then build portfolios based on quintiles of SC and analyze their returns from 1974 to 2013. We find that the hedge portfolio (high minus low SC) has average annual excess returns of -7.8 percent, and a Sharpe ratio of 35 percent. We then estimate excess returns based on a Fama-French three factor model. We find that the low SC portfolio has abnormal returns of 63 basis points, and that the hedge portfolio generates excess returns of negative 79 basis points per month. We conclude that the performance of firms exposed to foreign productivity shocks covaries positively with the consumption of the representative U.S. investor. There are two possible interpretation for this finding: a positive response of consumption and cash-flows to foreign productivity shocks through higher exports or more efficient sourcing of intermediate inputs; or a negative response of consumption and cash-flows to these shocks through displacement of domestic firms by import competition.

To disentangle these two interpretations and determine the sign of the price of risk, we build a standard two-country dynamic general equilibrium model of trade (Melitz, 2003). We first derive the elasticity of domestic and foreign profits to foreign productivity shocks. The elasticity of domestic profits is typically negative due to price effects, and amplified if demand elasticity is high. The elasticity of foreign profits is typically positive due to increased demand in the foreign country, although this effect is dampened by the intensity of competition on the foreign market. We then characterize the elasticity domestic households' utility to foreign productivity shocks. Within our limited risk-sharing framework,[1] the elasticity trades off two competing effects: a positive price effect where the price of the final consumption index decreases as import competition intensifies; a negative income effect due to the decrease in households' wealth since the value of the domestic portfolio drops after an increase in import competition. The sum of both effects on utility is ambiguous.

We derive additional predictions from the model that allow us to identify the sign of the price of foreign productivity risk in the cross-section of equity returns. First, we show that the price of risk is negative if the difference in excess returns between high and low SC industries is higher for small and less productive firms. The intuition is that these firms are hit the hardest by the entry of foreign competitors, and are also less likely to benefit from improved exporting opportunities. Moreover, we show that if the difference in excess returns between high and low SC industries is higher in high demand elasticity industries, then the price of risk is negative, namely, the globalization risk premium is driven by the displacement of domestic firms by import competition. The idea is that the propensity of consumers to substitute across products facilitates the entry of foreign firms, but does not improve the ability of domestic firms to compete in the foreign country. Finally, we find the price of risk to be negative if risk premia are concentrated in industries whose firm distribution has a high Pareto tail parameter, namely, where production is spread out among less productive firms, who are therefore less likely to benefit and more likely to suffer from international trade flows.

We go back to the data to test these predictions. We first split the sample further into

[1] For evidence of home bias in U.S. investors' portfolio, see Coval and Moskowitz (1999); Ivković and Weisbenner (2005); Rauh (2006); Brown et al. (2009); Baik et al. (2010); Bernile et al. (2015).

terciles of size and return on asset and estimate the globalization risk premium in double sorted portfolios. We find that the risk premium is concentrated among small firms with low return-on-assets, namely, firms that are likely to suffer from import penetration, but unlikely to greatly benefit from increased export opportunities. We also split the sample into high and low demand elasticity industries, and high and low Pareto tail parameter industries. Excess returns are concentrated in high demand elasticity and high Pareto tail industries, consistent with the idea that displacement risk is the key driver of the globalization risk premium. These findings indicate that the price of risk is negative, which suggests that the representative U.S. investor perceives foreign productivity shocks as bad news for consumption.

To further uncover the mechanism through which globalization affects asset prices, we calibrate the model using standard parameter values and analyze impulse responses of cash-flows, valuations and consumption to foreign productivity shocks. Again consistent with import competition displacing domestic firms, we find that exposed firms experience lower cash-flows and valuations, especially smaller ones. Importantly, we find that domestic consumption drops. These results thus corroborate our finding that the globalization risk premium is driven by the fact that domestic firms are displaced by import competition, and that the representative U.S. investor perceives foreign productivity shocks as being associated with lower consumption growth.

We contribute to the literature, which starting with Melitz (2003) and Bernard et al. (2003), has taken into account firm heterogeneity to analyze the gains from trade.[2] A common prediction of these models is that international trade elevates productivity through the contraction and exit of low-productivity firms and the expansion and entry into export markets of high-productivity firms. In this framework, globalization generates both winners and losers among firms within an industry, as better-performing firms expand into foreign markets, while worse-performing firms contract in the face of foreign competition. Consistent with this idea, Pavcnik (2002) finds that roughly two-thirds of the 19 percent increase in aggregate productivity following Chile's trade liberalization of the late 1970s and early 1980s is due to the relatively greater survival and growth of high-productivity plants. Bernard and Jensen (2004) find that almost half of all U.S. manufacturing productivity growth during 1983-1992 is explained by the reallocation of resources towards exporters. Trefler (2004) shows that 12 percent of the workers in low-productivity firms lost their jobs after the Canada-U.S. free trade agreement.

We also build on recent work that points out the displacement risk associated with imports. Bernard et al. (2006a) find that exposure to low-wage country imports is negatively associated with plant survival and employment growth, and Bernard et al. (2006b) find that

[2]For recent reviews, see Bernard et al. (2007), Melitz and Trefler (2012), Melitz and Redding (2014b).

the probability of plant death is higher in industries experiencing declining trade costs. Our results also relate to recent studies of the effect on the labor market of the acceleration of Chinese import penetration (Pierce and Schott, 2012; Autor et al., 2013; Acemoglu et al., 2014; Autor et al., 2014), or of trade shocks more generally (Artuç et al., 2010; Ebenstein et al., 2014). Our contribution is to show that displacement risk is reflected in the cost of capital, which suggests that the marginal utility of the representative U.S. investor covaries positively with this risk.

Finally, we add to a growing literature in finance that focuses on the implications of product market dynamics, including international trade for asset pricing. Recent contributions include Hou and Robinson (2006), Tian (2011), Loualiche (2013), Ready et al. (2013) and Bustamante and Donangelo (2015). A common result in these papers is that the threat of entry tends to be priced in the cross-section of expected returns.[3] In relation to these papers, we show that the mere threat of import competition has an effect on firms through their higher cost of capital.

The remainder of the paper is organized as follows. In Section 2, we present our measure of shipping costs and our baseline estimates of the globalization risk premium. In Section 3, we lay out the theoretical framework. We identify the sign of the price of risk in the cross-section of equity returns in Section 4. In Section 5 we calibrate the model. Section 6 concludes.

# 2 Measuring the globalization risk premium

## 2.1 Shipping costs

We start by sorting firms with respect to their exposure to globalization. We hypothesize that firms are less exposed to international trade flows if the shipping costs (SC) incurred to replace their products with imported ones are larger.[4] We measure these costs using the actual shipping cost paid by importers. We consider ad valorem freight rate from underlying product-level U.S. import data. We obtain these data at the four digit SIC level from Feenstra (1996) for 1974 to 1988, and from Peter Schott's website for 1989 to 2012. Freight costs – our proxy for shipping costs – is the markup of the Cost-Insurance-Freight value over the Free-on-Board value.

[3] In addition, a series of papers have used tariff cuts to instrument for import competition and have found that it affects firms capital budgeting decisions (Bloom et al., 2011; Fresard and Valta, 2014), and capital structure (Xu, 2012; Valta, 2012). Firms have also been found to suffer less from import competition if they have larger cash holdings (Fresard, 2010) and R&D expenses (Hombert and Matray, 2014).

[4] Hummels et al. (2014) also uses transportation costs as an instrument for the propensity of Danish firms to offshore tasks.

Building on prior work, we argue that SC is a structural characteristic rooted in the nature of the output produced by any given industry.[5] According to Hummels (2007), SC depends on the weight-to-value ratio: the mark-up is larger for goods that are heavy relative to their value. From 1989 onwards, we construct industry-year weight-to-value ratios, measured as the ratio of kilograms shipped to the value of the shipment, as alternative measure for shipping costs.

We check that shipping costs are widely dispersed across industries, that they are persistent and that they are indeed related to trade flows. We start by documenting substantial hetereogeneity in shipping costs across industries. Table 1 presents summary statistics for our industry-year sample that covers 439 unique manufacturing industries (with 4-digit SIC codes between 2000 and 3999). We find the average SC to be 5.9% of the price of shipments, with a first percentile of 0.2% and a 99 percentile of 22.7%.[6] Weight-to-value ratios also vary significantly around their mean of 0.67, with the first and 99th percentiles of 0.002 and 9.0, respectively.

To check whether SC is indeed persistent, we sort sectors by quintiles of SC each year, and look at the transition across quintiles over time. We present this analysis in Table 2. The first panel highlights the transition from year $t-1$ to year $t$, while the second panel shows the transition from year $t-5$ to year $t$. For sectors in the top or bottom quintiles of SC, the probability of being in the same quintile in the next year is above 85%.

Next we confirm SC is a relevant proxy for the exposure to the displacement risk associated to globalization. To analyze the differential trade flows in high and low SC industries, we consider imports, exports and net imports normalized by total domestic shipments plus imports at the industry-year level. We measure imports and exports as well as tariffs using U.S. data obtained from Peter Schott's website, and shipment data from the NBER-CES Manufacturing Industry Database, which also provides annual industry-level information on employment, value added and total factor productivity from 1958 to 2009.

Table 3 presents industry-year OLS panel regressions of trade flows on our proxies for shipping costs as well as log employment, log value added, log shipments, and total factor productivity. All specifications include year fixed effects. In Panel A, the main explanatory

[5]The main limitation of SC is that it does not take into account unobserved shipping costs – for instance time to ship (Hummels et al., 2013) or information barriers and contract enforcement costs, holding costs for the goods in transit, inventory costs due to buffering the variability of delivery dates, or preparation costs associated with shipment size (Anderson and van Wincoop, 2004). Unless these costs are correlated in systematic ways with SC, they are likely to introduce noise in our measure of the sectoral exposure to displacement risk, which should generate an attenuation bias in our results. For recent contributions to the literature that adopts a structural approach to measure trade costs and estimate their effect on trade, see for instance Hummels and Skiba (2004), Das et al. (2007), or Irarrazabal et al. (2013).

[6]The distribution of shipping costs across 2-digit industries is presented in Appendix Table B.3.

variable is SC, namely, the markup of the Cost-Insurance-Freight value over the Free-on-Board value. SC is negatively associated with imports and exports. A one standard deviation increase in shipping costs is associated with 4% lower import (Column 2) and 4.7% lower exports (Column 5). Shipping costs are uncorrelated net imports (Column 8), which suggests that they capture the symmetric dimension of exposure to globalization: the benefits in terms of higher exports, and the costs in terms of higher import penetration. When we introduce industry fixed effects and effectively consider changes in shippings costs (Columns 3 and 6), the coefficient on shipping costs remains negative but drops sixfold and becomes insignificantly different from zero. This is consistent with the finding in Table 2 that shipping costs are persistent, and that within-industry variations in shipping costs do not predict cross-sectional variations in trade flows.[7] A very similar picture emerges when we consider the weight-to-value ratio instead of SC (Panel B). Overall, the evidence confirms that shipping costs are a good proxy for industry exposure to international trade flows.

## 2.2 Portfolio returns

We then explore whether and how globalization is reflected in asset prices, by comparing the average excess returns of firms with high and low exposure to globalization. To do so, we form equally-weighted stock portfolios based on quintiles of shipping costs (SC) in the previous year. Table (4) presents some characteristics of the five portfolios. We find that firms in industries with low SC have average returns that are 7.8 percent higher (annually) than average returns in the high SC industry. The Sharpe ratio of the long-short portfolio (column 6) is 35 percent. A similar picture emerges when we consider portfolios sorted on weight-to-value ratios: the average returns are 8 percent higher in low weight-to-value ratio industries, and the Sharpe ratio is 36 percent.

The difference in returns between high and low SC industries in our sample could be due to the differential composition of these industries, irrespective of their actual exposure to international trade flows. We next estimate excess returns using a Fama-French three factor model, thereby explicitly controlling for exposure of our SC portfolios to the market, size and value factors. As evidenced in Panel A Table 5 we find that the long-short portfolio alpha is 0.79 percent (9.9 percent annually). We note that our five portfolio load in a similar fashion on the market factor. However, low SC industries have a lower loading on the size and a higher loading on the value factor than high SC industries.

In Panel B, we perform the same exercise by value-weighting our portfolio based on the firms' market capitalization in the previous year. While the low SC portfolio has monthly

[7] Note that contrary to within-industry changes in SC, within-industry changes in tariffs are negatively associated with imports.

excess returns of 0.35 percent, the difference between the high and the low SC portfolios is not statistically different from zero. The discrepancy between the value and equally-weighted returns are due to the role of larger firms, a topic that we address in the next section. We also check and find in Appendix Table B.4, that we obtain similar results when we construct our portfolio based on quintiles of the sum of shipping costs and tariffs, another impediment to trade.

In Table 6 we find similar or stronger results when we sort firms in quintiles of weight-to-value ratio. Here, the excess returns on the long-short portfolios exceed 0.9 percent monthly and 10 percent annually. The low SC value-weighted portfolio also delivers positive excess returns, but the difference with the high SC portfolio is not statistically different from zero.

The results thus indicate that firms that are more exposed to globalization command a robust and substantial risk premium. This suggests that their performance covaries positively with the representative U.S. investor's consumption. While this is an unexpected finding in itself, it calls for further exploration. This premium can be driven by either a positive or negative joint reaction of U.S. firms' performance and households' consumption to foreign productivity shocks. In other terms, the price of risk can either be positive or negative depending on the underlying economic mechanism.

# 3 Model

To understand the origins of the risk premium estimated in the previous section, we write a dynamic model with trade flows and asset prices. We start with the observation of section 2 that there is a large heterogeneity in the exposure of industries to globalization. We then we explore its role, qualitatively and quantitatively, for firms in these industries. We derive predictions that allow us to identify the sign of the price of risk.

## 3.1 Setup

In this section, we spell out the structure of the model and define the equilibrium. Most derivations are left in Appendix (A). The model follows Ghironi and Melitz (2005). The world consists of two countries, and foreign variables are noted with an asterisk ($\star$). There is a representative household in each country and two industries producing specific consumption goods. The model is real but as price indices in each country change over time, we introduce money for convenience. We note nominal variables with a tilde, moreover we take the price of the aggregate consumption good as the numeraire in each country.

**Demand Side —** Households are homogeneous. The representative agent maximizes her intertemporal utility:

$$\mathcal{U}_0 = \mathbf{E}_0 \sum_{t=0}^{\infty} \beta^t \frac{C_t^{1-\psi}}{1-\psi},$$

where $C_t$ represents their intratemporal utility, $\beta$ the subjectve discount factor and $\psi$ the coefficient of relative risk aversion. Aggregate consumption stems from goods of both industry 1 and 2:

$$C = \mathcal{C}^{a_0} \cdot \mathcal{C}_0^{1-a_0} := \left( \eta_1^{\frac{1}{\theta}} \mathcal{C}_1^{\frac{\theta-1}{\theta}} + \eta_2^{\frac{1}{\theta}} \mathcal{C}_2^{\frac{\theta-1}{\theta}} \right)^{\frac{\theta}{\theta-1} a_0} \cdot \mathcal{C}_0^{1-a_0},$$

where $\mathcal{C}_1$ and $\mathcal{C}_2$ represent composite consumption of varieties from industry 1 and 2 respectively, and $\theta$ is the elasticity of substitution across industries. $\mathcal{C}_0$ is a composite good representing the non-tradable sector. We write with a calligraphic $\mathcal{C}$ the composite good in the tradable sector. Since our focus is on industries exposed to trade, we assume the non-tradable sector is perfectly competitive with a linear technology in labor and unit productivity; $a_0$ represents the weight of the tradable sector relative to the non-tradable one. The weights $(\eta_1, \eta_2)$ determine households taste for goods between industry.[8] The composite good in each industry is given by:

$$\mathcal{C}_J = \left[ M_J^{-\kappa_J} \int_{\Omega_J} c_J(\omega)^{\frac{\sigma_J - 1}{\sigma_J}} d\omega \right]^{\frac{\sigma_J}{\sigma_J - 1}}$$

where $c_J(\omega)$ is households' consumption of variety $\omega$ in industry $J$, $\sigma_J$ the elasticity of substitution across varieties within industry $J$. $M_J$ is the mass of firms producing in an industry and $\kappa_J$ captures households taste for variety.[9] $\Omega_J$ is the set of producing firms for the domestic country in industry $J$; note that production comes from the foreign country and the domestic country.

Finally households supply labor inelastically in quantity $L$ and own all firms in their own country. Their budget constraint reads (in nominal terms):

$$\sum_J \int_{\Omega_J} p_J(\omega) c_J(\omega) \mathrm{d}\omega \leq wL + \sum_J \int_{\Omega_J^{\mathcal{D}}} \pi_J(\omega) \mathrm{d}\omega,$$

where $p_J(\omega)$ is the price charged by firm $\omega$ for variety $\omega$ in industry $J$, $\Omega_J^{\mathcal{D}}$ is the set of domestic firms in industry $J$ and $\pi_J(\omega)$ their profit.

[8] We omit the time subscript when it causes no confusion.

[9] We recover the Dixit-Stiglitz case with $\kappa_J = 0$, and leave no taste for variety when $\kappa_J = 1/\sigma_J$.

**Supply Side —** Each firm produces a differentiated variety $\omega$ in quantity $y_J(\omega)$, using one single factor, labor, in quantity $l_J(\omega)$. Firms are heterogeneous and they produce each variety with different technologies indexed by $\varphi$, their idiosyncratic productivity. We index aggregate labor productivity by $A_t$. Hence a domestic firms with idiosyncratic productivity $\varphi$, produces $A_t\varphi$ units of variety $\omega$ per unit of labor. Firms are uniquely identified through either the variety they produce or their idiosyncratic productivity; from now on, we use $\varphi$ as identifier of a firm, standing for both a unique variety and an idiosyncratic productivity. We are most interested on productivity shock in the foreign country $A^\star$, as we explore the impact on domestic firms of shocks to the foreign productivity process. We assume productivities both follow an AR(1) in logarithm:

$$A_t = \rho_A A_{t-1} + \varepsilon_t^A$$
$$A_t^\star = \rho_{A^\star} A_{t-1}^\star + \varepsilon_t^{A^\star}$$

Later we derive most of the model partial equilibrium elasticities with respect to changes in $A^\star$.

There is no entry and exit in an industry, and the set $\Omega_J^{\mathcal{D}}$ is fixed. Idiosyncratic productivity is fixed over time but randomly assigned across firms. The distribution of idiosyncratic productivity is Pareto with tail parameter $\gamma_J$: the probability of a firm productivity falling below a given level $\varphi$ is:

$$\Pr\{\tilde{\varphi} < \varphi\} = G_J(\varphi) = 1 - \left(\frac{\varphi}{\underline{\varphi}_J}\right)^{-\gamma_J}$$

where a greater $\gamma_J$ corresponds to a more homogenous industry, in the sense that more output is concentrated among the smallest and least productive. Firms operate on both their domestic market and the export market. To export, a firm needs to pay a variable iceberg trade cost $\tau_J \geq 1$ and a fixed cost $f_J^{\mathcal{X}}$ (measured in labor efficiency units). The fixed cost is a flow cost paid every period.

Firms operate in a monopolistic competition market structure. They set their prices at a markup over marginal cost. Firms face isoelastic demand curves in each industry, with elasticity $\sigma_J$, hence they set their real prices $p_J(\varphi)$, at a markup $\sigma_J/(\sigma_J - 1)$ over their marginal costs. In that case we write both real prices on the domestic and export market as:

$$p_J(\varphi) = \frac{\tilde{p}(\varphi)}{P} = \frac{\sigma_J}{\sigma_J - 1} \cdot \frac{w}{A\varphi}$$
$$p_J^{\mathcal{X}}(\varphi) = \frac{\tilde{p}_J^{\mathcal{X}}(\varphi)}{P^\star} = \mathbf{F}^{-1}\ \tau_J \cdot p(\varphi),$$

where $P$ is the aggregate price index of the final composite consumption good $C$ and $\tilde{p}_J$ denote nominal prices. We reduce these nominal expressions to real expressions introducing the nominal exchange rate $\mathbf{F}$ as the ratio of both price indexes in the foreign and home country respectively: $\mathbf{F} := P^\star/P$.

Firm profits also depend on their status as an exporter. If productivity is too low, a firm might not find it optimal to export and pay the flow fixed costs $f_J^{\mathcal{X}}$. Firm profit is increasing in their idiosyncratic productivity, hence there exists a productivity cutoff in each industry under which a firm decides not to export: $\varphi^{\mathcal{X}} = \min_\varphi\{\varphi | \varphi \text{ is an exporter}\}$. In that case real profits at the firm level are:

$$\pi_J^{\mathcal{D}}(\varphi) = \frac{1}{\sigma_J} \left(p_J(\varphi)\right)^{1-\sigma_J}\ \Gamma_J^{\sigma_J-\theta}\mathcal{C},$$
$$\pi_J^{\mathcal{X}}(\varphi) = \frac{1}{\sigma_J} \left(p_J^{\mathcal{X}}(\varphi)\right)^{1-\sigma_J}\ (\Gamma_J^\star)^{\sigma_J-\theta}\ \mathcal{C}^\star\ F - \frac{w}{A} f^{\mathcal{X}},$$

where $\Gamma_J$ is the industry price index for the composite good in industry $J$ consumed in the domestic country. To find the industry price index we need to determine the mass of firms from the foreign country exporting in industry $J$: $M_J^{\mathcal{X}\star}$. Given the productivity cutoff for exporters from the foreign country, $\varphi_J^{\mathcal{X}\star}$, the fraction of exporters is simply:

$$\zeta_J^\star := \Pr\{\tilde{\varphi} > \varphi_J^{\mathcal{X}\star}\} = \left(\frac{\varphi_J^{\mathcal{X}\star}}{\underline{\varphi}_J^\star}\right)^{-\gamma_J}$$

Now the price index in industry $J$ reflects the effect of an increase in competition from the foreign country leading to lower industry level prices:[10]

$$\Gamma_J = \left( M_J^{1-\kappa_J\sigma_J} \int_{\Omega_J^{\mathcal{D}}} p_J(\varphi)^{1-\sigma_J} \mathrm{d}\varphi + \left(\zeta_J^{\mathcal{X}\star} M_J^\star\right)^{1-\kappa_J\sigma_J} \int_{\Omega_J^{\mathcal{X}\star}} p_J^{\mathcal{X}\star}(\varphi)^{1-\sigma_J} \mathrm{d}\varphi \right)^{\frac{1}{1-\sigma_J}}$$

Given the exporters' profits, we derive the productivity cutoffs for exporters defined by: $\varphi^{\mathcal{X}} = \min\{\varphi | \pi_J^{\mathcal{X}}(\varphi) > 0\}$.

[10]We leave all derivations to appendix (A)

**Aggregation of the Supply** — As in Melitz (2003), instead of keeping track the distribution of production and prices, it is sufficient to focus on two average producers, first for the whole domestic market $\bar{\varphi}_J$ and second restricted to exporting firms $\bar{\varphi}_J^{\mathcal{X}}$. These quantities are sufficient to define the equilibrium of Section 3.2:

$$\bar{\varphi}_J := \left[\int_{\underline{\varphi}_J}^{\infty} \varphi^{\sigma_J - 1} \mathrm{d}G_J(\varphi)\right]^{\frac{1}{\sigma_J - 1}} = \nu_J \cdot \underline{\varphi}_J$$
$$\bar{\varphi}_J^{\mathcal{X}} := \left[\int_{\varphi_J^{\mathcal{X}}}^{\infty} \varphi^{\sigma_J - 1} \mathrm{d}G_J(\varphi)\right]^{\frac{1}{\sigma_J - 1}} = \nu_J \cdot \varphi_J^{\mathcal{X}},$$

where $\nu_J$ is defined in appendix and depends solely on the elasticity of substitution and the tail parameter of the distribution.

Hence average profits for domestic firms in industry $J$ are: $\langle \pi_J^{\mathcal{D}} \rangle = \pi_J^{\mathcal{D}}(\bar{\varphi}_J)$, and for exporters $\langle \pi_J^{\mathcal{X}} \rangle = \pi_J^{\mathcal{X}}(\bar{\varphi}_J^{\mathcal{X}})$. Given the average profits, total profits for each industry are:

$$\Pi_J = M_j \cdot \langle \pi_J \rangle := M_J \left[\pi_J^{\mathcal{D}}(\bar{\varphi}_J) + \zeta_J \pi_J^{\mathcal{X}}(\bar{\varphi}_J^{\mathcal{X}})\right] \tag{3.1}$$

Given the aggregation properties of the model, we rewrite the aggregate budget constraint. The representative household holds all domestic firms in equilibrium and receives dividends from these holdings. Moreover consumption of the final composite good $C$ has a cost of $C$ given our choice of the numeraire. Hence the simplified real budget constraint:

$$C \leq wL + \sum_J \Pi_J$$

Finally we close the model assuming balanced trade in every period: the value of exports equals the value of imports, adjusted for the exchange rate:

$$\mathbf{F} \cdot \sum_J \left[M_J \zeta_J \, (p_J^{\mathcal{X}})^{1-\sigma_J} (\Gamma_J)^{\sigma_J - \theta}\right] \cdot C^\star = \cdot \sum_J \left[M_J^\star \zeta_J^\star \, (p_J^{\mathcal{X}\star})^{1-\sigma_J} (\Gamma_J^\star)^{\sigma_J - \theta}\right] \cdot C$$

## 3.2 Equilibrium

We solve for an endowment economy, where the mass of firms in an industry is constant over time. Hence the only production adjustments are in and out of exporting. We define an equilibrium as a collection of real prices $(p_J, p_J^{\mathcal{X}})$, wage $w$, output $y_J(\omega)$, consumption $c_J(\omega)$, labor demand $l_J(\omega)$ such that: (a) Each firm maximizes profit given consumer demand; (b) Consumers maximize their intertemporal utility given prices; (c) Markets for goods, and for labor clear; (d) Each country runs a balanced trade.

Practically there are 7 endogenous variables in the model: the aggregate consumption level in each country, $(C, C^{\star})$, the exchange rate $\mathbf{F}$ and four industry level export cutoffs: $(\varphi_J^{\mathcal{X}}, \varphi_J^{\mathcal{X}\star})$. Knowing these quantities is sufficient to solve for the equilibrium at each point in time.

## 3.3 Asset Prices

We are interested in asset prices of domestic firms across different industries. Since the representative households hold these firms, they are priced using her stochastic discount factor. The Euler equation for pricing is derived using a fictious asset with price $v_t$ in zero net supply with some arbitrary cash flows $\pi_t$:

$$\begin{aligned} &\max \mathbf{E}_0 \sum_{t=0}^{\infty} \beta^t \frac{C_t^{1-\psi}}{1-\psi} \\ \text{s.t} \quad & C_t + x_{t+1} v_t \leq w_t L + \sum_J \Pi_{J,t} + x_t (v_t + \pi_t) \end{aligned}$$

Hence we have the classic consumption-CAPM pricing equation:

$$v_t = \mathbf{E}_t \{ S_{t,t+1} (v_{t+1} + \pi_{t+1}) \},$$

where $S_{t,t+1} = \beta (C_{t+1}/C_t)^{-\psi}$ is the one period ahead stochastic discount factor. To understand how investors price firms in our model, we need to understand how aggregate shocks affect their marginal utility and how cash-flows react to these shocks. We explore both sides in the next section.

## 3.4 Mechanism

We derive elasticities of both firms' output and the elasticity of aggregate demand to foreign productivity $A^{\star}$. Tracing out the response of both the supply and the demand side of the economy sheds light on the model and its interpretation: the joint response of cash-flows (and realized returns) and demand ultimately determine the risk across industries and how this risk is priced in the economy, giving rise to a risk premium that differs across industries.

Due to the general equilibrium nature of the model, some of our elasticity formulas are approximate as they do not account for second order effects on aggregate demand. We confirm the qualitative and quantitatitve validity of our approximation in our calibration exercise.

**Cash-Flows —** First we consider the effect of an increase in productivity in the foreign country on domestic firms. To understand these effects we decompose firm profits:

$$\pi_J^{\mathcal{D}}(\varphi) = \underbrace{\frac{p_J(\varphi)}{\sigma_J}}_{\text{marked-up price}} \cdot \underbrace{\left(\frac{p_J(\varphi)}{\Gamma_J}\right)^{-\sigma_J}}_{\text{Local variety demand}} \cdot \underbrace{\Gamma_J^{-\theta}}_{\text{industry demand}} \cdot \underbrace{\mathcal{C}}_{\text{aggregate demand}}$$

A shock to foreign labor productivity affects three quantities: local demand, industry demand and aggregate demand. Foreign competition lowers the industry price index, increasing industry demand. However relative local demand decreases as local goods are now more expensive relative to the industry average. As long as the elasticity of substitution is higher within industries than across ($\sigma_J > \theta$), the second effect dominates and demand for domestic goods decreases. From now on we will assume we lie in this region of parameter values. Finally foreign labor productivity also affects aggregate demand, through price effects as described but also through wealth effects. We discuss this channel below when we adress the effects on marginal utility.

**Lemma 3.1.** *Keeping aggregate demand effects constant, the elasticity of domestic profits to foreign labor productivity is:*

$$\begin{aligned}
\frac{\partial \log \pi_J^{\mathcal{D}}(\varphi)}{\partial \log A^\star} &= -(\sigma_J - \theta) \cdot \left(-\frac{\partial \log \Gamma_J}{\partial \log A^\star}\right) \\
&= \underbrace{\frac{(M_J^\star \zeta_J^\star)^{1-\kappa_J\sigma_J} p^{\mathcal{X}\star}(\bar{\varphi}^{\mathcal{X}\star})}{\Gamma_J^{1-\sigma_J}}}_{\textit{import penetration: } \mathcal{I}_J} \cdot \\
&\qquad \underbrace{(\sigma_J - \theta)}_{\textit{demand elasticity}} \cdot \left( \underbrace{-1}_{\textit{price effect}} + \underbrace{\left(1 - \gamma_J \frac{1-\kappa_J\sigma_J}{\sigma_J - 1}\right) \cdot \left(-\frac{\partial \log \varphi^{\mathcal{X}\star}}{\partial \log A^\star}\right)}_{\textit{extensive margin}} + \underbrace{\frac{\partial \log \mathbf{F}}{\partial \log A^\star}}_{\textit{fx adjustment}} \right)
\end{aligned}$$

The elasticity summarizing the displacement of domestic profits comports 5 parts: (a) the level of import penetration determines the impact of foreign shocks on domestic firms in an industry; (b) industry (through demand elasticity) and (c) firm structure (through their distribution) affect how demand responds to competition; (d) productivity directly affects prices due to the linear technology; (e) the extensive margin of foreign exporters dampens the price effect, though the love for variety does affect their impact; (f) finally exchange rates dampen these effects as the exchange rate depreciates after a shock to foreign productivity.

If on the one hand foreign competition harms domestic firms on their local markets, it may also expands demand in foreign country. We characterize this effect and the increase in competition in the foreign market due to a foreign productivity shock, and how it impacts the profitability of exporters:

**Lemma 3.2.** *If a firm with productivity $\varphi$ does export, its elasticity of exporting profits to foreign productivity is:*

$$\frac{\partial \log \pi_J^{\mathcal{X}}(\varphi)}{\partial \log A^\star} = \left( \underbrace{\sigma \cdot \frac{\partial \log \mathbf{F}}{\partial \log A^\star}}_{\textit{fx adjustment}} + \underbrace{\frac{\partial \log \mathbf{C}^\star}{\partial \log A^\star}}_{\textit{demand increase}} - \underbrace{(\sigma_J - \theta) \cdot \left( - \frac{\partial \log \Gamma_J^\star}{\partial \log A^\star} \right)}_{\textit{competition}} \right) \cdot \underbrace{(1 + \ell(\varphi))}_{\textit{leverage}}.$$

The sign for the elasticity of export profits is ambiguous as it is the product of two forces. Exchange rate appreciates and demand increases in reaction to an increase in foreign productivity, these two forces increase firms export profits. However competition becomes more fierce in the foreign country, leading to a concomitant decline in profitability. $\ell(\varphi)$ captures operating leverage and is defined in appendix: as firms face fixed costs of exporting, changes in productivity will have a stronger effect the closest it is to the cutoff.[11] As firms become closer to the productivity export cutoff $\varphi_J^{\mathcal{X}}$, leverage amplifies their elasticity to foreign productivity shocks. In Appendix A.3 we also derive a sharper characterization of this elasticity and consider how it varies across industries.

We gather both claims and evaluate the total effect of a foreign productivity shock on an industry's average profit $\langle \pi_J \rangle$ that we separate in average domestic and average export profits with their respective shares:

**Lemma 3.3.** *Given the definition of the average profit level of an industry in equation (3.1), the elasticity of total profits to the foreign productivity shock is:*

$$\frac{\partial \log \langle \pi_J \rangle}{\partial \log A^\star} = \frac{\langle \pi_J^{\mathcal{D}} \rangle}{\langle \pi_J \rangle} \cdot \frac{\partial \log \langle \pi_J^{\mathcal{D}} \rangle}{\partial \log A^\star} + \frac{\zeta_J \langle \pi_J^{\mathcal{X}} \rangle}{\langle \pi_J \rangle} \cdot \left( \frac{\partial \log \langle \pi_J^{\mathcal{X}} \rangle}{\partial \log A^\star} + \frac{\partial \log \zeta_J^{\mathcal{X}}}{\partial \log A^\star} \right).$$

As emphasized above in lemmas (3.1) and (3.2), the first term, domestic profits, is negative while the second, export profits, is positive.[12] Thus the average effect on an industry's cash flows depends on the relative magnitudes of effects both on domestic and export profits and their relative contributions to average industry profits.

[11]Properties of $\ell$ are summarized as follow: $\lim_{+\infty} \ell = 0$, $\lim_{\varphi_J^{\mathcal{X}}} \ell = +\infty$ and $\ell$ is monotonous.

[12]For exposition we describe the model around our calibration. For example it is possible the elasticities of export profits becomes negative whenever competition effects are stronger than demand effects. However such case happens for a range of parameters outside of reasonable calibrations, for e.g. very high demand elasticities $\sigma_J$.

In industries with low impediments to trade, for e.g. when shipping costs are low, import penetration is high. While this means domestic profits are exposed to trade risk, an increase in foreign demand compensates exporting firms by increasing their profits. To disentangle both channels, exposure to trade risk through imports, and hedging through exports, we zoom-in at the firm level and separate our analysis between small non-exporters firms and large exporter firms. Isolating the import risk channel for the smaller firms sharpens our characterization of trade risk exposure across industries. We explore these implications in comparative statics analysis at the industry and firm level in the following proposition:

**Proposition 3.4.** *Consider two industries $(J_1, J_2)$ in the same country, both affected by the same shock to foreign productivity $A^\star$.*

*(a) If industries have different variable trade costs such that $\tau_1 > \tau_2$, then:*
   - *(i) Import penetration is greater in industry $J_2$ than $J_1$: $\mathcal{I}_2 > \mathcal{I}_1$.*
   - *(ii) The elasticity of profit to a shock to foreign productivity for small (non-exporter) firms is greater (more negative) in industry $J_2$.*
   - *(iii) The difference in the elasticity of profits between large and small firms to a shock to foreign productivity is greater in industry $J_2$.*

*(b) If industries have different price elasticity of demand such that $\sigma_1 > \sigma_2$, then: the elasticity of profit to a shock to foreign productivity is lower algebraically in industry $J_1$.*

*(c) If industries have different firm distribution, i.e. their Pareto tail is such that $\gamma_1 > \gamma_2$ and $\gamma$ is sufficiently large, then: the elasticity of average profit to a shock to foreign productivity is greater in $J_1$ than in $J_2$.*

The first result follows from the definition of import penetration, as the marginal impact of foreign firms on domestic industry prices. The second statement is specific to small firms. Lower shipping costs go with higher import penetration but also with greater exports. The effects restricted to domestic profits, or here to small firms follows from Lemma 3.1. The results hold more generally at the level of average profits $\langle \pi_J \rangle$, if the overall impact of foreign productivity lowers average profits, *i.e.* export profits do not make up for the loss in domestic profits. Import penetration scales up the loss leading to the result. We find that case to be the relevant one in our calibration exposed in Section 5. Our second comparative static exercise focuses on the elasticity of substitution at the industry level, $\sigma_J$. The effect is larger when consumer demand is more elastic as an increase in competition has a larger effect on prices.[13] Finally, in industries where the distribution of firm has a high tail parameter $\gamma$, productivity is concentrated among smaller, less productive firms. For a given export productivity cutoff, the mass of firms exporting is smaller, decreasing the compensating effect of an increase in exports. Thus the import channel has more bite in these industries and the elasticity of average profits is more negative.

**Marginal Utility of Consumption —** To assess how shocks to foreign productivity affect domestic firms, we explore the risk channel, *i.e.* how marginal investors apprehend these shocks. Changes in their marginal utility captures the price of risk they demand. It is easiest to first look at the elasticity of consumption.

**Lemma 3.5.** *The elasticity of consumption to foreign productivity is:*

$$\begin{aligned}\frac{\partial \log C}{\partial \log A^\star} &= \frac{\partial \log Y}{\partial \log A^\star} - \frac{\partial \log P}{\partial \log A^\star} \\ &= \underbrace{\sum_J \left( \frac{\Pi_J^{\mathcal{D}}}{\Pi_J} \cdot \frac{\partial \log \Pi_J^{\mathcal{D}}}{\partial \log A^\star} + \frac{\Pi_J^{\mathcal{X}}}{\Pi_J} \cdot \left( \frac{\partial \log \zeta_J}{\partial \log A^\star} + \frac{\partial \log \Pi_J^{\mathcal{X}}}{\partial \log A^\star} \right) \right)}_{\textit{wealth effect}} \\ &\quad + \underbrace{\left( \sum_K \eta_K \Gamma_K^{1-\theta} \right)^{-1} \sum_J \eta_J \Gamma_J^{1-\theta} \frac{\partial \log \Gamma_J}{\partial \log A^\star}}_{\textit{price effect}} .\end{aligned} \tag{3.2}$$

Both effects of trade compete in their role on aggregate consumption: (a) a classic price effect where import competition lowers monopoly power in each industry, increase variety and lower prices; (b) a wealth effect, since total household expenditures depend on the dividends received from domestic firms. We showed in Lemma 3.3, the sign of the wealth effect is ambiguous. [14] In our calibration we find it is negative, *i.e* increase demand in the foreign country does not lift exports enough to compensate for lower domestic profits.

The price of foreign competition risk solely depends on the relative magnitude of these two effects. Rather than decomposing the two forces to analyze their relative magnitudes, we stay agnostic about the sign of the price of risk for now. We will show how to infer directly from asset prices data how investors apprehend this risk (see Proposition 3.6 and Section‘4. If the price of risk is positive, then firms in industry with greater profit elasticity command

[13] Note that we have assumed $\sigma_J - \theta > 0$. This assumption states industries group firms producing close (with respect to demand) products.

[14] Our framework does not allow for international risk sharing. If households were globally diversified, this would undo most of the wealth effect, and low SC industries would not command a risk premium. For evidence of home bias in U.S. investors' portfolio, see Coval and Moskowitz (1999); Ivković and Weisbenner (2005); Rauh (2006); Brown et al. (2009); Baik et al. (2010); Bernile et al. (2015).

higher risk premium and lower valuation as a consequence.

### 3.5 Identifiying the price of risk in the model

**Equilibrium Returns —** We focus on shocks to $A^\star$, foreign productivity, as the only shock of the economy in our model. Hence dynamics of consumption and cash-flows across industries follow these shocks to productivity. The representative household first order condition, her Euler equation, determines the industry asset prices:

$$\mathbf{E}_t\{S_{t,t+1}\mathbf{R}_{J,t+1}\} = 1 \tag{3.3}$$

The Euler equation delivers a consumption-CAPM model for prices, where expected returns are the price of consumption risk multiplied by the risk exposure of an industry. To hold stocks in industries with negative exposure to trade shocks ($\partial\pi_J/\partial A^\star < 0$), investors command a positive (negative) risk premium if the price of risk is negative (positive). Thus, industries with stronger negative exposure to foreign productivity shocks will have higher (lower) expected returns that industries with small exposure. The results of Section 2 show the risk premium is significant, however they are not informative about the price of foreign productivity risk. For example, in a case where the price of risk is positive, and a higher trade exposure favors the firms (because export effects dominate for e.g.), then we would also find that firms in low shipping costs industries tend to have higher expected returns: their returns are strongly procyclical.

We formulate three testable predictions to identify the price of risk given the cross-section of asset prices.

**Proposition 3.6.** *In the cross-section of equity returns, it is possible to identify the price of foreign productivity risk:*

*(a) If for the fraction of exporters within industries, foreign demand effects dominate such that $\partial\pi_J^{\mathcal{X}}/\partial A^\star > 0$, then:*
*the difference in expected returns between high and low shipping costs industries among the smallest (and least productive) firms is higher than the difference in expected returns between high and low shipping costs industries among the largest (and most productive) firms then the price of consumption risk is negative.*

*(b) If two sets of industries have different price elasticity of demand such that $\sigma_1 > \sigma_2$, then:*
*If the difference in expected returns between high and low shipping costs industries in the high elasticity of substitution set ($\sigma_2$) is higher than the difference in expected returns*

*between high and low shipping costs industries in the low elasticity of substitution set ($\sigma_1$) then the price of consumption risk is negative.*

*(c) If two sets of industries have different firm distribution such that $\gamma_1 > \gamma_2$, and foreign demand effects dominate such that $\partial \pi_J^{\mathcal{X}} / \partial A^\star > 0$, then:*
*If the difference in expected returns between high and low shipping costs industries in the high $\gamma_1$ industries is higher than the difference in expected returns between high and low shipping costs industries with low $\gamma_2$ then the price of consumption risk is negative.*

As we have emphasized above, only large firms, not small firms, do export. Hence when exports are beneficial to firms because demand effects outweigh competition effects in the foreign country, small firms are affected more negatively than large firms. This distinction between firms within industries on the direction of the effects allows to distinguish if the price of risk is positive or negative. The elasticity of substitution amplifies the competitive effects of a shock to foreign productivity. Hence greater elasticity of substitution leads to lower (algebraically) elasticity of cash-flows, domestic and exports. Beyond our results from Section 2, observing the expected returns high-minus-low shipping costs portfolios within two sets of industries, high and low elasticity, reveals if the risk premium is due to covariance with a factor that increases or decreases consumption growth. Finally regarding the distribution of firms, a high $\gamma_1$ means production is spread out among less productive firms, and the industry includes less exporters. Hence more firms are negatively affected by the trade shock and these industries are more negatively exposed. Differences with high $\gamma_2$ allows us to recover the price of risk.

# 4 The sign of the price of risk in the cross-section of equity returns

We take the three hypotheses in Proposition 3.6 to the data in order to determine the sign of the price of risk. Within industries already sorted by their level of shipping costs, we first separate firms based on a measure of size and productivity. If the price of risk is negative, the risk premium should be concentrated on small and less productive firms.

We proxy for size using market capitalization and for productivity using return-on-assets (ROA). We present results for our double-sorted portfolios in Table 7. We report Fama-French three factor alphas for each of the five SC portfolios, as well as for the long-short portfolio. In the lowest size tercile, a portfolio that goes long high shipping costs and short low shipping costs has an alpha of -121 basis points monthly. This difference decreases to -51 basis point for the highest size tercile. We find the long-short portfolio alpha to be -107 basis points in the bottom ROA tercile while it falls to -59 basis point in the top ROA tercile. Similar results are obtained for portfolios constructed based on weight-to-value ratios: excess returns are strongly decreasing with size and profitability.

We test the robustness of these results in various ways. We run the same analyses on value-weighted portfolios, based on firms market capitalization in the previous year. We find in Appendix Table B.5 that high SC firms have significantly lower abnormal returns in the bottom tertile of firm size and return-on-assets. We also perform the same test using quintiles of the sum of shipping costs and tariffs. The results in Appendix Table B.6 confirm that the globalization risk premium is sharply decreasing with size and ROA, and is therefore concentrated in firms that are more likely to be negatively affected by foreign productivity shocks, both because they are more likely to be displaced by foreign competitors, and because they are less likely to be productive enough to export.

The second model prediction regarding the sign of the price of risk is that risk premia should depend on the elasticity of demand. Intuitively, displacement risk will be lower in an industry where consumers are less sensitive to prices. To check whether this is indeed the case, we split firms in each SC quintile into those belonging to high versus low demand elasticity industries. Demand elasticities are obtained from Broda and Weinstein (2006) at the commodity level and aggregated at the four-digit SIC level based on cumulative trade flows. We present the results in Table 8. Whether portfolios are based on shipping costs or weight-to-value ratios, we find that the excess returns of exposed firms are concentrated in high demand elasticity industries, consistent with a negative price of risk.

The third model prediction is that the sign of risk is negative if the difference in expected returns between high and low SC industries is larger in industries whose firm distribution is characterized by a high Pareto tail parameter, namely whose output is spread out among less productive firms. The intuition is that these industries are more likely to be strongly affected by the entry of foreign competitors, and also less likely to be productive enough to export and therefore benefit from foreign productivity shocks. We therefore split firms in each SC quintile into those belonging to high versus low Pareto tail industries. For each year and 4-digit industries, we rank firms in descending order according to their market capitalization (Compustat item CSHO $\times$ PRCC_F). We estimate the Pareto parameter separately for each industry-year as the estimated coefficient $\gamma$ of the following OLS regression: $ln(MKTCAP) = \gamma ln(Rank) + constant$. Table 9 presents estimates of excess returns from a Fama-French three factor model for each SC or weight-to-value portfolios, separately for high and low Pareto tail parameter ($\gamma$) industries. The long-short portfolio has more negative excess returns in high $\gamma$ industries.

Absent from the model is the fact that high and low SC industries might be differentially affected by foreign productivity shocks not only through import competition and expansion on foreign markets, but also through more efficient sourcing (Goldberg et al., 2010; De Loecker et al., 2012). If there is a lot of within-industry trade, then low SC industries might benefit from cheaper intermediate inputs than high SC industries. This mechanism is likely to boost the risk premium if it is driven by the export channel (i.e., if the price of risk is positive), and to dampen the risk premium if it is driven by the import competition channel (i.e, if the price of risk is negative). Empirically, our finding that the price of risk is negative suggests that the import competition mechanism dominates any positive sourcing effects. This could be related to the fact that low SC industries do not primarily source intermediate inputs within SC industries. Alternatively, small and less productive firms, that are most likely to be displaced by import competition and not to benefit from exporting opportunities, are also less likely to benefit from better sourcing opportunities (Bernard et al., 2007).

We further examine how the returns of the aforementioned portfolios covary with two factors that capture shocks to $A^{\star}$ in the model: (i) the returns to the factor mimicking portfolio, namely, the portfolio that is long high-shipping costs industries and short low-shipping costs industries, and (ii) the growth rate of Chinese import to the U.S. We present the average returns on industries sorted across shipping costs and one of the four characteristics considered above: size, ROA, demand elasticity and Pareto tail parameter in Panels (1a), (1b), (1c), (1d) of Figure (1), respectively. In each panel, we first plot the link between SC quintiles and average returns for each portfolio. This simple graph allows us to visualize the results estimated above: the slope between high and low shipping costs portfolios is highest in, for example, small firms or firms with low ROA. The second graph in each panel represents average returns as a function of the regression coefficient of portfolios returns on the factor mimicking portfolio. We confirm the slope is negative: portfolios that are more exposed to the factor mimicking portfolio, which proxies for foreign productivity shocks, earn higher returns. Moreover the difference of expose differs across characteristics: the difference in exposure is larger in industries with high elasticity of substitution (1d) or Pareto tail parameter (1d). We finally obtain similar insights when when we use a real proxy for foreign productivity shocks in the model, namely, monthly import growth from China to the US. Not only do we find a negative relation between exposure and returns, as expected, but we also find the variance in exposure to be greater among small or low ROA firms and in industries with high $\sigma$ or $\gamma$.

Taken together, these results clearly indicate that the price of risk is negative, and that the risk premium carried by firms exposed to globalization is driven by the risk of displacement by foreign competition. They also suggest that the representative U.S. investor perceives foreign productivity shocks as being associated with lower consumption growth.

# 5 Calibration

We calibrate the model to provide further evidence of how globalization is reflected in asset prices, and to check that we also find a negative sign for the price of risk within a reasonable parameter range. Our parameter calibration and a summary of the moments we match are in table A.1 and A.2 respectively. We also explore the additional predictions discussed in our theoretical analysis. First the model is able to replicate the results of Section 2 quantitatively: we not only find a strong reaction of the elasticity of profits, we also find marginal investors do care about the foreign productivity shocks and are willing to pay for protection. The price of risk, their willingness to pay for hedging the risk, is albeit small for reasons we detail and attempt to overcome in an extension.

Moreover we find small firms are more exposed to foreign productivity shocks. In the model small firms have lower productivity and earn most of the risk premium on $A^\star$ as they do not export. Larger firms do export and take advantage of growing demand abroad, an opportunity to hedge their domestic risk, lowering their risk premium.

Finally we investigate if extending the model to account for a more realistic price of risk helps in pricing the risk quantitatively.

**Cash-flow Mechanism —** Much of our model focuses on capturing the granularity of the supply-side, differentiating industries and firms. The impulse-responses of cash-flows in Figure 2 perfectly illustrates the model mechanisms described above. In panel (2a), we show the response of two industries: the grey one with low import penetration, hence lower exposure, and the other, in black, with high import penetration. In our baseline calibration we find the elasticity of import penetration to foreign shocks is close to 0.2 for low shipping-costs industries while it is only 0.01 for high-shipping costs industries. The difference is not surprising, however it is smaller than our empirical measures.[15] To gain a better understanding of what drives the average profit response in an industry, we split industries further between the smaller and larger firms. In panel (2b) and (2c) we separate the effect across industries on the smallest, least productive firms (2b) from the effect on the more productive firms (2c). We exposed in Proposition 3.4 that small firms do not export, a mechanical consequence of fixed export costs. Hence the effects of a foreign productivity

[15]In the Online Appendix, we estimate the elasticity of import penetration and cash-flows to changes in tariffs across industries with different shipping costs. We find the elasticities of import penetration to tariffs range from -0.1 to -0.7 for high and low shipping-costs industries respectively, see Table B.9.

shock on these small firms is negative overall. The import competition channel coupled with different level of import penetration across industries, leads to a large differential response across small firms. This result contrasts with Panel 2c where the difference in response of large firms across industries is smaller relative to small firms. The reason is these firms do export, and the increase in demand in the foreign country compensates for the loss incurred in imports. The more exposed is an industry to import competition, the easier it is for the larger firms to export and take advantage of an increase in foreign demand.

**Consumption Response —** As shown in lemma (3.5) and equation (3.2), consumption moves in response to two forces: (a) a price effect whereby consumption becomes cheaper due to more productive varieties being imported from the foreign country; (b) a wealth effects, consequence of our hypothesis on financial autarky, where on average domestic firms do lose profit shares to the foreign firms.

In our calibration we do find the wealth effects dominate, and consumption falls after a shock to foreign productivity. The fall in consumption translates into valuations summarized by the Euler equation (3.3). Firms that do poorly in times of low consumption have lower valuations, leading to higher expected returns in equilibrium. We represent the impulse response on Figure 3.

Quantitatively our model generates a variance of consumption that is low, 0.09% in our baseline calibration. We now discuss the implications of low consumption variance for asset prices.

**Valuations —** After evaluating the response of cash-flows and consumption, we are able to answer our main questions: how do investors care about the risk of foreign productivity shocks and how much?

We are able to provide a clear answer to the first question from the model. As consumption declines when foreign productivity increases, consumption is dear exactly at times when firms cash-flows also tend to be negative. Investors seek protection to hedge from that source of systematic risk. Firms doing poorly when consumption is low trade at a discount to firms with high cash-flows in these states of the world. We conclude the price of risk is negative, as it is bad news for consumption.

To the second question, we might be tempted to answer "not very much". Consumption in our baseline model is not very volatile, as is mechanically the volatility of the stochastic discount factor. Indeed the risk premium earned by low SC industries compared to high SC industries is 0.02% annualized. This number falls short of our empirical result in Section 2.

As we have emphasized before, the mechanism centers around displacement risk. Enriching the demand side to account for a greater variability in consumption and in the stochastic discount factor falls outside of the scope of our paper. To precisely test the mechanism of displacement into prices we keep our calibrated model as is, and specify a stochastic discount factor from the data. To obtain an estimate of the price of risk from foreign productivity shocks empirically, we use the Sharpe ratio of the long-short portfolio from Table 4. Second we specify an exogenous discount factor to price assets in the model that takes the classic form of: $\log S_t = -r_f - \mathrm{rp}\varepsilon^{A^\star}/\sigma_{A^\star}$. We find our exogenous SDF generates a risk premium of 2.5% annually and that risk is concentrated among small firms. Given this SDF we represent the firms' value response to a shock in foreign productivity in Figure 4. Again we find the valuations' response are different between low-shipping-costs (black line) and high-shipping-costs (grey line) industries. Most of the difference is concentrated among small firms, in Panel 4b.

# 6 Conclusion

This paper studies how globalization is reflected in asset prices, and therefore how the representative U.S. investor perceives the domestic consequences of foreign productivity shocks. We use shipping costs to measure U.S. firms' exposure to globalization. We find that firms in low shipping cost industries carry a 7.8 precent risk premium, suggesting that their cash-flows covary negatively with the representative investor's marginal utility. This premium can be driven by either a positive or negative joint reaction of U.S. firms' performance and households' consumption to foreign productivity shocks. To understand the origins of this globalization risk premium, we develop a dynamic general equilibrium model of trade and asset prices. Guided by the model, we find that the premium emanates from the risk of displacement of least efficient firms triggered by import competition. These findings suggest that foreign productivity shocks are perceived as being associated with lower consumption growth by the representative U.S. investor.

# References


**Acemoglu, Daron, David Autor, David Dorn, Gordon H. Hanson, and Brendan Price**, "Import Competition and the Great U.S. Employment Sag of the 2000s," *NBER Working Paper*, 2014.

**Anderson, James E. and Eric van Wincoop**, "Trade Costs," *Journal of Economic Literature*, 2004, *42* (3), 691–751.

**Artuç, Erhan, Shubham Chaudhuri, and John McLaren**, "Trade Shocks and Labor Adjustment: A Structural Empirical Approach," *American Economic Review*, 2010, *100* (3), 1008–1045.

**Autor, David H., David Dorn, and Gordon H. Hanson**, "The China Syndrome: Local Labor Market Effects of Import Competition in the United States," *American Economic Review*, 2013, *103* (6), 2121–68.

**_ , _ , _ , and Jae Song**, "Trade Adjustment: Worker Level Evidence," *Quarterly Journal of Economics*, 2014, *129* (4), 1799–1860.

**Baik, Bok, Jun-Koo Kang, and Jin-Mo Kim**, "Local Institutional Investors, Information Asymmetries, and Equity Returns," *Journal of Financial Economics*, 2010, *97* (1), 81–106.

**Bernard, Andrew B and J Bradford Jensen**, "Exporting and Productivity in the USA," *Oxford Review of Economic Policy*, 2004, *20* (3), 343–357.

**_ , _ , and Peter K Schott**, "Survival of the Best Fit: Exposure to Low-wage Countries and the (uneven) Growth of US Manufacturing Plants," *Journal of International Economics*, 2006, *68* (1), 219–237.

**_ , _ , and _** , "Trade Costs, Firms and Productivity," *Journal of Monetary Economics*, 2006, *53* (5), 917–937.

**_ , _ , Jonathan Eaton, and Samuel Kortum**, "Plants and Productivity in International Trade," *American Economic Review*, 2003, *93* (4), 1268–1290.

**_ , _ , Stephen J Redding, and Peter K Schott**, "Firms in International Trade," *Journal of Economic Perspectives*, 2007, *21* (3), 105–130.

**Bernile, Gennaro, Alok Kumar, and Johan Sulaeman**, "Home away from Home: Geography of Information and Local Investors," *Review of Financial Studies*, 2015.

**Bloom, Nicholas, Mirko Draca, and John Van Reenen**, "Trade Induced Technical Change? The Impact of Chinese Imports on Innovation, IT and Productivity," *NBER Working Paper*, 2011.

**Broda, Christian and David E Weinstein**, "Globalization and the Gains From Variety," *Quarterly Journal of Economics*, 2006, *121* (2), 541–585.

**Brown, Jeffrey, Joshua Pollet, and Scott Weisbenner**, "The Investment Behavior of State Pension Plans," *NBER Working Paper*, 2009.

**Bustamante, Maria Cecilia and Andres Donangelo**, "Industry Concentration and Markup: Implications for Asset Pricing," *Available at SSRN 2662691*, 2015.

**Coval, Joshua D and Tobias J Moskowitz**, "Home Bias at Home: Local Equity Preference in Domestic Portfolios," *Journal of Finance*, 1999, *54* (6), 2045–2073.

**Das, Sanghamitra, Mark J Roberts, and James R Tybout**, "Market Entry Costs, Producer Heterogeneity, and Export Dynamics," *Econometrica*, 2007, *75* (3), 837–873.

**Ebenstein, Avraham, Ann Harrison, Margaret McMillan, and Shannon Phillips**, "Estimating the Impact of Trade and Offshoring on American Workers using the Current Population Surveys," *Review of Economics and Statistics*, 2014, *96* (4), 581–595.

**Feenstra, Robert C**, "US imports, 1972-1994: Data and Concordances," *NBER Working Paper*, 1996.

**Fresard, Laurent**, "Financial Strength and Product Market Behavior: The Real Effects of Corporate Cash Holdings," *Journal of Finance*, 2010, *65* (3), 1097–1122.

_ **and Philip Valta**, "How Does Corporate Investment Respond to Increased Entry Threat?," *Working Paper*, 2014.

**Ghironi, Fabio and Marc Melitz**, "International Trade and Macroeconomics Dynamics with Heterogeneous Firms," *The Quarterly Journal of Economics*, 2005, pp. 865–915.

**Goldberg, Pinelopi Koujianou, Amit Kumar Khandelwal, Nina Pavcnik, and Petia Topalova**, "Imported Intermediate Inputs and Domestic Product Growth: Evidence from India," *The Quarterly Journal of Economics*, 2010, *125* (4), 1727–1767.

_ **and Nina Pavcnik**, "Distributional Effects of Globalization in Developing Countries," *Journal of Economic Literature*, 2007, pp. 39–82.

**Hombert, Johan and Adrien Matray**, "Can Innovation Help US Manufacturing Firms Escape Import Competition from China?," *Working Paper*, 2014.

**Hou, Kewei and David T Robinson**, "Industry Concentration and Average Stock Returns," *Journal of Finance*, 2006, *61* (4), 1927–1956.

**Hummels, David**, "Transportation Costs and International Trade in the Second Era of Globalization," *Journal of Economic Perspectives*, 2007, *21* (3), 131–154.

**_ and Alexandre Skiba**, "Shipping the Good Apples Out? An Empirical Confirmation of the Alchian-Allen Conjecture," *Journal of Political Economy*, 2004, *112* (6), 1384–1402.

**_ , Rasmus Jørgensen, Jakob R Munch, and Chong Xiang**, "The Wage Effects of Offshoring: Evidence from Danish Matched Worker-Firm Data," *American Economic Review*, 2013.

**_ , Rasmus Jrgensen, Jakob Munch, and Chong Xiang**, "The Wage Effects of Offshoring: Evidence from Danish Matched Worker-Firm Data," *American Economic Review*, 2014, *104* (6), 1597–1629.

**Irarrazabal, Alfonso, Andreas Moxnes, and Luca David Opromolla**, "The Tip of the Iceberg: A Quantitative Framework for Estimating Trade Costs," *NBER Working Paper*, 2013.

**Ivković, Zoran and Scott Weisbenner**, "Local does as Local is: Information Content of the Geography of Individual Investors' Common Stock Investments," *Journal of Finance*, 2005, *60* (1), 267–306.

**Lileeva, Alla and Daniel Trefler**, "Improved Access to Foreign Markets Raises Plant-level Productivity For Some Plants," *The Quarterly Journal of Economics*, 2010, *125* (3), 1051–1099.

**Loecker, Jan De, Pinelopi K Goldberg, Amit K Khandelwal, and Nina Pavcnik**, "Prices, markups and trade reform," 2012.

**Loualiche, Erik**, "Asset Pricing with Entry and Imperfect Competition," *Working Paper*, 2013.

**Melitz, Marc J**, "The Impact of Trade on Intra-industry Reallocations and Aggregate Industry Productivity," *Econometrica*, 2003, *71* (6), 1695–1725.

— **and Daniel Trefler**, "Gains from Trade when Firms Matter," *Journal of Economic Perspectives*, 2012, *26* (2), 91–118.

— **and Stephen J Redding**, "Heterogeneous Firms and Trade," *Handbook of International Economics,*, 2014, *4*, 1–54.

— **and** — , "Heterogeneous Firms and Trade," *Handbook of International Economics, 4th ed*, 2014.

**Pavcnik, Nina**, "Trade Liberalization, Exit, and Productivity Improvements: Evidence from Chilean Plants," *Review of Economic Studies*, 2002, *69* (1), 245–276.

**Pierce, Justin R. and Peter K. Schott**, "The Surprisingly Swift Decline of U.S. Manufacturing Employment," *NBER Working Paper*, 2012.

**Rauh, Joshua D**, "Investment and Financing Constraints: Evidence from the Funding of Corporate Pension Plans," *Journal of Finance*, 2006, *61* (1), 33–71.

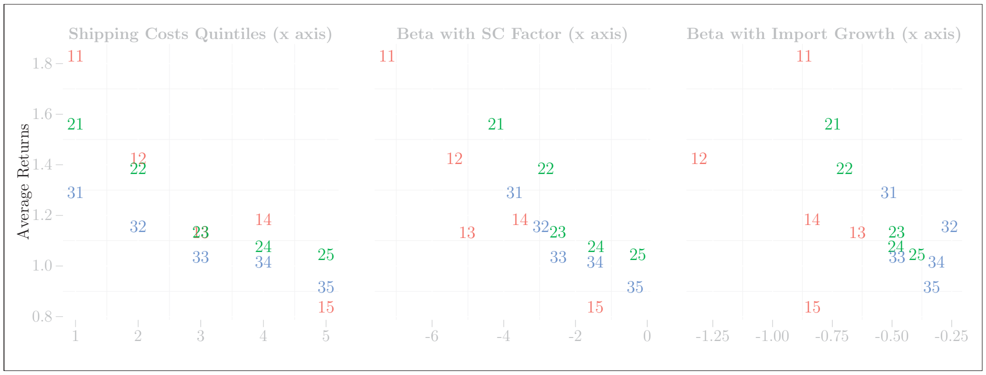
**Ready, Robert, Nikolai Roussanov, and Colin Ward**, "Commodity Trade and the Carry Trade: A tale of Two Countries," *NBER Working Paper*, 2013.

**Tian, Mary**, "Tradability of Output, Business Cycles, and Asset Prices," *Working Paper*, 2011.

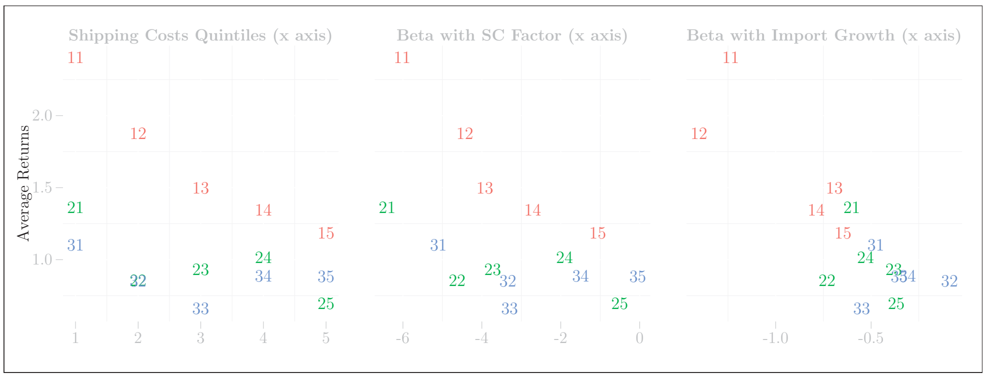
**Trefler, Daniel**, "The Long and Short of the Canada-US Free Trade Agreement," *American Economic Review*, 2004, *94* (4), 870–895.

**Valta, Philip**, "Competition and the Cost of Debt," *Journal of Financial Economics*, 2012, *105* (3), 661–682.

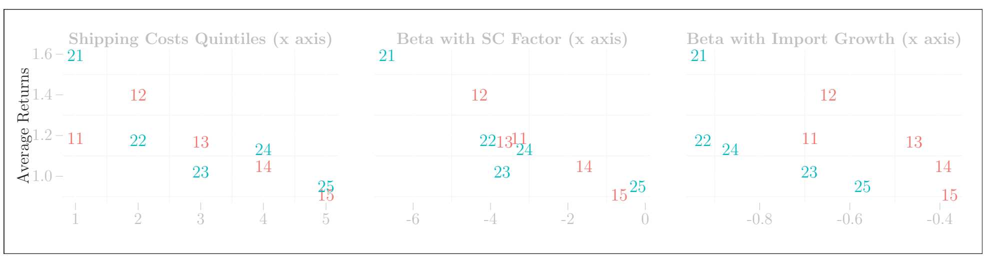
**Xu, Jin**, "Profitability and Capital Structure: Evidence from Import Penetration," *Journal of Financial Economics*, 2012, *106* (2), 427–446.



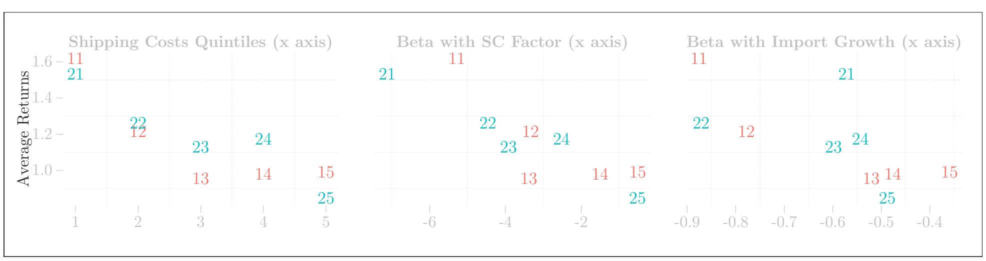

**(a)** Portfolios Sorted by ROA




**(b)** Portfolios Sorted by Size




**(c)** Portfolios Sorted by Demand Elasticity ($\sigma$)

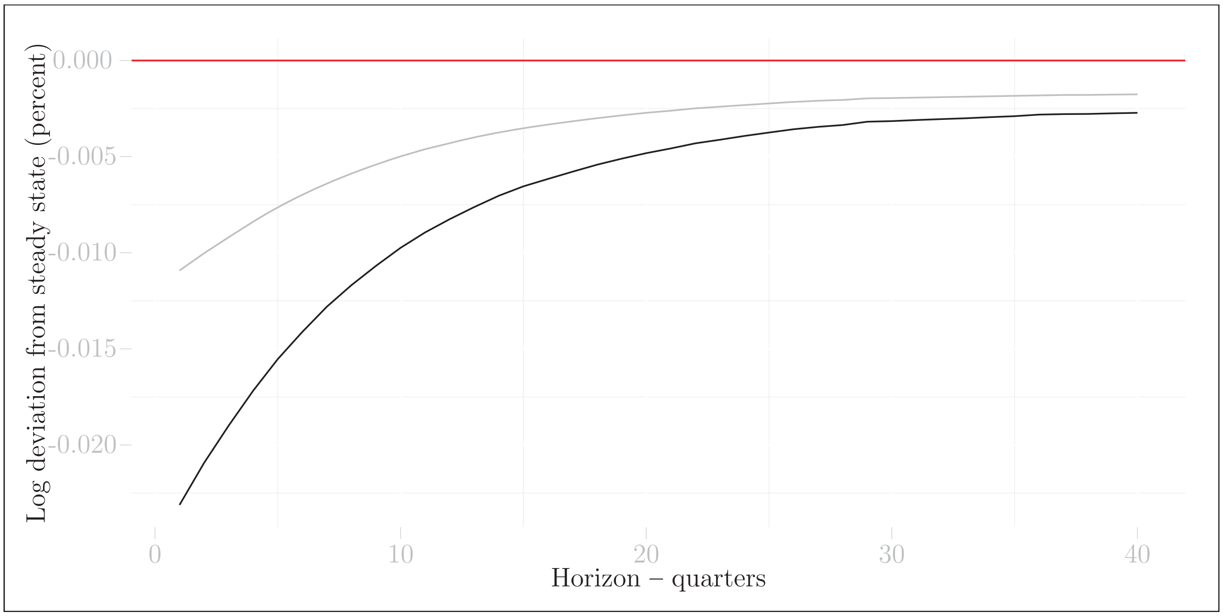



**(d)** Portfolios Sorted by Pareto Tail ($\gamma$)

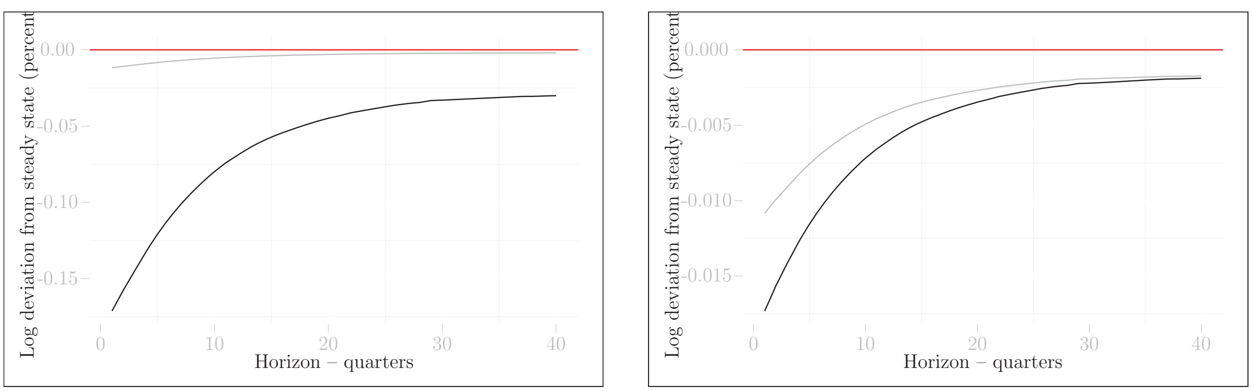
**Figure 1**

Portfolio Characteristics across Shipping Costs Quintiles

Each panel represents average returns of portfolios on the y axis against respectively from left to right: shipping costs quintiles, the beta of a univariate regression of returns against the high–low shipping costs portfolio and the beta of a univariate regression of returns against the import growth of China in the US (monthly frequency, Census). From top to bottom on the four figures portfolios are sorted on shipping costs (last digit, from 1 low shipping costs to 5 high shipping costs) and another characteristic: The top Figure 1a double sorts portfolios using ROA (first digit from 1, low, to 3, high), the second figure by size (last digit from 1 to 3), the third using $\sigma$ (last digit from 1 to 2) and the last by $\gamma$ (last digit from 1 to 2).




**(a)** Average Response




**(b)** Small Firms Response

**(c)** Large Firms Response

**Figure 2**

Impulse Response of Local Firms' Profit

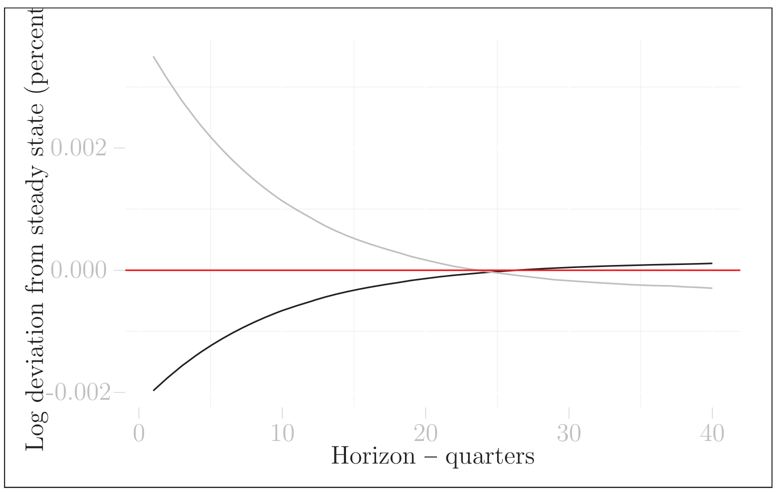
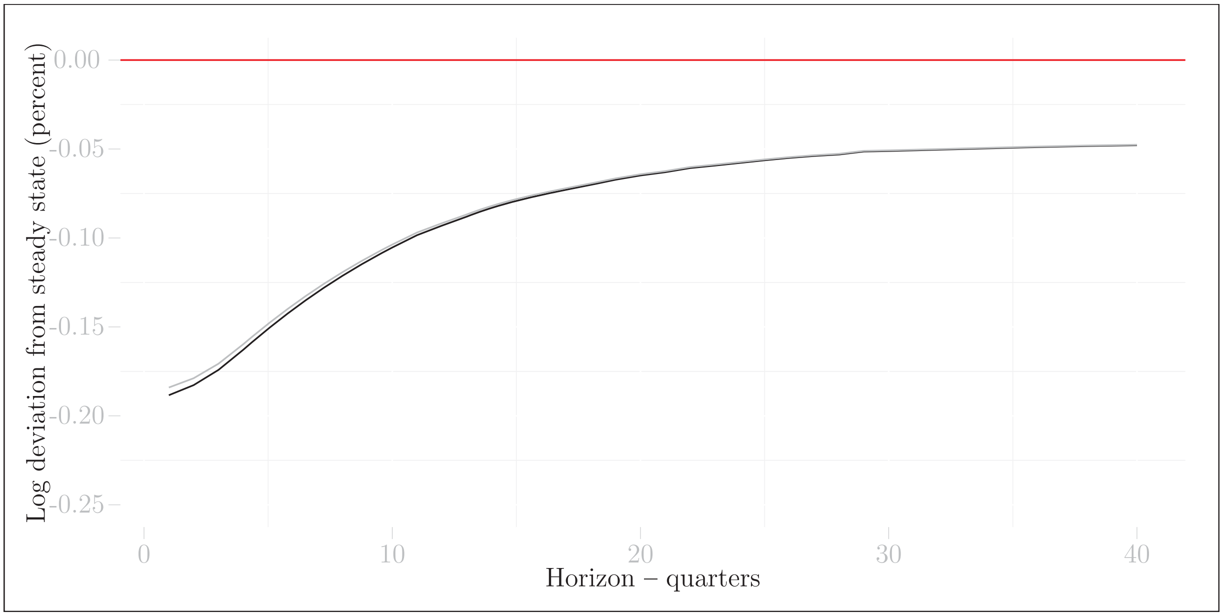
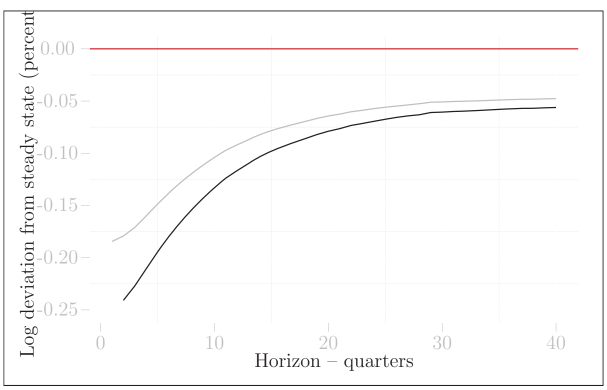


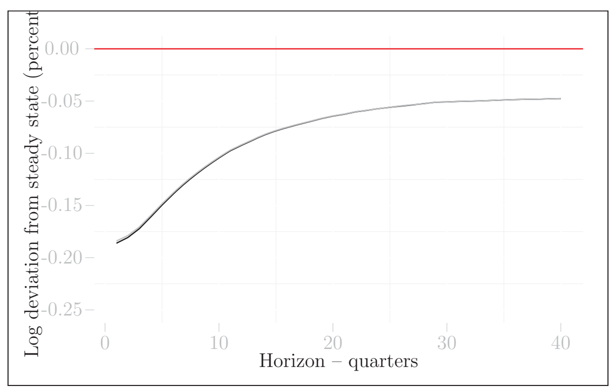

**Figure 3**
Impulse Response of Domestic Households' Consumption




**(a)** Average Response




**(b)** Small Firms Response




**(c)** Large Firms Response

**Figure 4**
Impulse Response of Local Firms' Value

## Table 1
## Summary statistics

This table presents the summary statistics for our industry-year sample that covers 439 unique manufacturing industries (with 4-digit SIC codes between 2000 and 3999). Shipping costs are measured at the industry-year level as the % difference of the Cost-Insurance-Freight value with the Free-on-Board value of imports. Weight-to-value is measured at the industry-year level as the ratio of the weight in kilograms over the Free-On-Board value of imports. Tariffs are measured at the industry-year level as the ratio of customs duties to the Free-on-Board value of imports. Import penetration is measured at the industry-year level as the ratio of the Free-on-Board value of imports and the sum of total shipments and imports minus exports. Shipping costs, weight-to-value ratio, tariffs, imports, exports are available from the Census and obtained from Peter Schott's website. Employment, shipments, value added, and TFP are obtained from the NBER CES files.

| | Obs. | Mean | SD | p1 | p50 | p99 |
|---|---|---|---|---|---|---|
| Trade Data | | | | | | |
| Shipping costs | 13590 | 0.059 | 0.072 | 0.002 | 0.048 | 0.227 |
| Weight-to-value | 7929 | 0.672 | 2.637 | 0.002 | 0.177 | 8.987 |
| Tariff | 13590 | 0.044 | 0.055 | 0.000 | 0.029 | 0.271 |
| Imports | 13590 | 0.163 | 0.187 | 0.000 | 0.095 | 0.873 |
| Exports | 13590 | 0.105 | 0.128 | 0.000 | 0.065 | 0.595 |
| Net Imports | 13590 | 0.058 | 0.202 | -0.413 | 0.012 | 0.788 |
| Industry Controls | | | | | | |
| Log employment | 13590 | 3.008 | 1.119 | 0.182 | 2.996 | 5.639 |
| Log value added | 13590 | 7.242 | 1.301 | 4.218 | 7.251 | 10.36 |
| Log shipments | 13590 | 7.979 | 1.308 | 4.990 | 8.005 | 11.17 |
| TFP | 13590 | 1.050 | 1.350 | 0.628 | 0.989 | 1.663 |

## Table 2
## Shipping cost persistence

This table presents the frequency of transition across shipping cost quintiles from year $t-1$ to $t$ (Panel A) and $t-5$ to $t$ (Panel B) in the sample. SC are measured at the industry-year level as the % difference of the Cost-Insurance-Freight value with the Free-on-Board value of imports.

| Panel A: | Transitions from year $t-1$ to year $t$ | | | | |
|---|---|---|---|---|---|
| | Q1 (t) | Q2 (t) | Q3 (t) | Q4 (t) | Q5 (t) |
| Q1 (t-1) | 0.863 | 0.115 | 0.013 | 0.003 | 0.006 |
| Q2 (t-1) | 0.115 | 0.732 | 0.137 | 0.014 | 0.002 |
| Q3 (t-1) | 0.010 | 0.138 | 0.680 | 0.162 | 0.010 |
| Q4 (t-1) | 0.004 | 0.012 | 0.157 | 0.704 | 0.122 |
| Q5 (t-1) | 0.003 | 0.005 | 0.015 | 0.122 | 0.855 |
| Panel B: | Transitions from year $t-5$ to year $t$ | | | | |
| | Q1 (t) | Q2 (t) | Q3 (t) | Q4 (t) | Q5 (t) |
| Q1 (t-5) | 0.757 | 0.164 | 0.046 | 0.019 | 0.015 |
| Q2 (t-5) | 0.155 | 0.571 | 0.214 | 0.047 | 0.014 |
| Q3 (t-5) | 0.039 | 0.203 | 0.493 | 0.227 | 0.038 |
| Q4 (t-5) | 0.015 | 0.050 | 0.204 | 0.546 | 0.185 |
| Q5 (t-5) | 0.016 | 0.019 | 0.056 | 0.185 | 0.723 |

# Table 3
# Shipping costs and trade flows

This table presents the result of industry-year regressions of the value of trade flows on shipping costs (Panel A) and the weight-to-value ratio (Panel B). We consider successively imports (Columns 1 to 3), exports (Columns 4 to 6) and imports net of exports (Columns 7 to 9) normalized by the total value of shipments plus imports. Shipping costs are measured at the industry-year level as the % difference of the Cost-Insurance-Freight value with the Free-on-Board value of imports. Weight-to-value is measured as the ratio of the weight in kilograms over the Free-On-Board value of imports. Tariffs are measured at the industry-year level as the ratio of customs duties to the Free-on-Board value of imports. Some regressions include control for the industry level of tariffs, penetration, log employment, log value added, log shipments and total factor productivity, all obtained from the NBER CES datasets. Standard errors are clustered at the industry level and reported in parentheses. *, ** and *** means statistically different from zero at 10%, 5% and 1% level of significance. The sample period is 1974-2009 in Panel A, and 1989-2009 in Panel B.

| | Panel A: Shipping costs | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Imports | | | Exports | | | Net imports | | |
| Shipping costs | -0.311* | -0.565*** | -0.094 | -0.665*** | -0.672*** | -0.041 | 0.358* | 0.111 | -0.044 |
| | (0.164) | (0.157) | (0.088) | (0.118) | (0.103) | (0.092) | (0.194) | (0.168) | (0.116) |
| Tariff | | 0.504*** | -0.465*** | | -0.213*** | -0.089 | | 0.710*** | -0.375*** |
| | | (0.124) | (0.126) | | (0.046) | (0.056) | | (0.125) | (0.129) |
| Log employment | | 0.033*** | -0.075*** | | -0.031*** | -0.020 | | 0.063*** | -0.056** |
| | | (0.012) | (0.016) | | (0.009) | (0.014) | | (0.013) | (0.022) |
| Log value added | | -0.050** | -0.055*** | | 0.025* | -0.020 | | -0.075*** | -0.035 |
| | | (0.023) | (0.018) | | (0.014) | (0.016) | | (0.023) | (0.024) |
| Log shipments | | -0.029 | 0.006 | | -0.005 | 0.009 | | -0.024 | -0.000 |
| | | (0.022) | (0.021) | | (0.013) | (0.017) | | (0.023) | (0.025) |
| TFP | | 0.007*** | 0.000 | | 0.006*** | 0.001 | | 0.001 | -0.001 |
| | | (0.002) | (0.001) | | (0.002) | (0.003) | | (0.004) | (0.005) |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry FE | No | No | Yes | No | No | Yes | No | No | Yes |
| Observations | 13590 | 13590 | 13590 | 13590 | 13590 | 13590 | 13590 | 13590 | 13590 |
| $R^2$ | 0.138 | 0.313 | 0.863 | 0.107 | 0.143 | 0.695 | 0.046 | 0.229 | 0.769 |

| | Panel B: Weight-to-value ratio | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Imports | | | Exports | | | Net imports | | |
| Weight-to-value | -0.008*** | -0.005*** | 0.000 | -0.004*** | -0.005*** | 0.001 | -0.004* | 0.000 | -0.000 |
| | (0.002) | (0.002) | (0.000) | (0.001) | (0.001) | (0.000) | (0.002) | (0.002) | (0.001) |
| Tariff | | 1.128*** | -0.135 | | -0.550*** | -0.126* | | 1.655*** | 0.001 |
| | | (0.289) | (0.088) | | (0.101) | (0.065) | | (0.313) | (0.099) |
| Log employment | | 0.031** | -0.061*** | | -0.028*** | 0.005 | | 0.058*** | -0.064** |
| | | (0.016) | (0.017) | | (0.010) | (0.015) | | (0.016) | (0.025) |
| Log value added | | -0.012 | -0.029* | | 0.045*** | -0.021 | | -0.057** | -0.006 |
| | | (0.030) | (0.015) | | (0.017) | (0.015) | | (0.028) | (0.022) |
| Log shipments | | -0.072** | -0.030 | | -0.031** | -0.014 | | -0.041 | -0.017 |
| | | (0.032) | (0.020) | | (0.015) | (0.019) | | (0.031) | (0.028) |
| TFP | | 0.008*** | -0.001 | | 0.006*** | -0.001 | | 0.002 | 0.000 |
| | | (0.002) | (0.002) | | (0.002) | (0.003) | | (0.004) | (0.005) |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry FE | No | No | Yes | No | No | Yes | No | No | Yes |
| Observations | 7929 | 7929 | 7929 | 7929 | 7929 | 7929 | 7930 | 7929 | 7929 |
| $R^2$ | 0.057 | 0.305 | 0.941 | 0.016 | 0.071 | 0.815 | 0.023 | 0.275 | 0.873 |

# Table 4
## Shipping cost and weight-to-value portfolios

The table reports report (annualized) mean excess returns over the risk-free rate ($\mu$), volatilities ($\sigma$) and Sharpe ratios ($\mu/\sqrt{12}\sigma$) for five shipping costs portfolios (Panel A), and five weight-to-value portfolios (Panel B). Shipping costs are measured at the industry-year level as the % difference of the Cost-Insurance-Freight value with the Free-on-Board value of imports. Weight-to-value is measured at the industry-year level as the ratio of the weight in kilograms over the Free-On-Board value of imports. The sample period is 1974-2013 in Panel A, and 1989-2013 in Panel B.

| | Panel A: Shipping cost portfolios | | | | | |
|---|---|---|---|---|---|---|
| Portfolio Moments | Low | 2 | 3 | 4 | High | Hi-Lo |
| Mean excess return ($\mu$) | 0.195 | 0.153 | 0.133 | 0.133 | 0.117 | -0.078 |
| | (0.046) | (0.043) | (0.039) | (0.036) | (0.033) | (0.030) |
| Volatility ($\sigma$) | 0.083 | 0.078 | 0.071 | 0.065 | 0.059 | 0.054 |
| Sharpe ratio | 0.677 | 0.567 | 0.539 | 0.591 | 0.573 | -0.349 |

| | Panel B: Weight-to-value portfolios | | | | | |
|---|---|---|---|---|---|---|
| Portfolio Moments | Low | 2 | 3 | 4 | High | Hi-Lo |
| Mean excess return ($\mu$) | 0.193 | 0.169 | 0.136 | 0.112 | 0.095 | -0.098 |
| | (0.064) | (0.059) | (0.055) | (0.043) | (0.041) | (0.047) |
| Volatility ($\sigma$) | 0.091 | 0.083 | 0.078 | 0.061 | 0.059 | 0.066 |
| Sharpe ratio | 0.614 | 0.586 | 0.504 | 0.530 | 0.467 | -0.358 |

## Table 5
## Shipping cost portfolios - Returns

This table presents the monthly excess returns ($\alpha$) over a three-factor Fama-French model of portfolios constructed based on the shipping costs in their industry. Shipping costs are measured at the industry-year level as the % difference of the Cost-Insurance-Freight value with the Free-on-Board value of imports. In any given month, stocks are sorted into five portfolios based on their industry SC in the previous year. We regress a given portfolio's return in excess of the risk free rate on the market portfolio minus the risk-free rate, the size factor (small minus big), and the value factor (high minus low), all obtained from Kenneth French's website. Standard Errors are estimated using Newey-West with 12 lags. ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. The sample period is from 1974 to 2013.

| | Shipping cost portfolios - Equally weighted | | | | | |
|---|---|---|---|---|---|---|
| | Low | 2 | 3 | 4 | High | Hi-Lo |
| $\alpha$ | 0.630*** | 0.223 | 0.089 | 0.027 | -0.162 | -0.792*** |
| | (0.226) | (0.195) | (0.146) | (0.114) | (0.121) | (0.284) |
| $\beta^{MKT}$ | 1.083*** | 1.032*** | 1.024*** | 1.081*** | 1.058*** | -0.025 |
| | (0.056) | (0.044) | (0.041) | (0.045) | (0.040) | (0.077) |
| $\beta^{SMB}$ | -0.347*** | -0.126* | -0.040 | 0.247*** | 0.580*** | 0.927*** |
| | (0.075) | (0.069) | (0.084) | (0.083) | (0.086) | (0.122) |
| $\beta^{HML}$ | 1.283*** | 1.321*** | 1.123*** | 0.871*** | 0.729*** | -0.555*** |
| | (0.095) | (0.079) | (0.066) | (0.098) | (0.111) | (0.182) |

| | Shipping cost portfolios - Value weighted | | | | | |
|---|---|---|---|---|---|---|
| | Low | 2 | 3 | 4 | High | Hi-Lo |
| $\alpha$ | 0.348*** | 0.012 | -0.179 | -0.032 | 0.129 | -0.218 |
| | (0.129) | (0.124) | (0.163) | (0.113) | (0.118) | (0.172) |
| $\beta^{MKT}$ | 0.960*** | 1.068*** | 1.089*** | 1.067*** | 0.920*** | -0.040 |
| | (0.051) | (0.044) | (0.039) | (0.030) | (0.042) | (0.050) |
| $\beta^{SMB}$ | -0.366*** | -0.340*** | -0.150 | -0.075 | 0.334*** | 0.700*** |
| | (0.051) | (0.061) | (0.118) | (0.063) | (0.094) | (0.086) |
| $\beta^{HML}$ | -0.098* | 0.255*** | 0.193*** | 0.105* | -0.027 | 0.071 |
| | (0.052) | (0.056) | (0.052) | (0.061) | (0.066) | (0.095) |

# Table 6
# Weight-to-value portfolios - Returns

This table presents the monthly excess returns ($\alpha$) over a three-factor Fama-French model of portfolios constructed based on the weight-to-value in their industry. Weight-to-value is measured at the industry-year level as the ratio of the weight in kilograms over the Free-On-Board value of imports. In any given month, stocks are sorted into five portfolios based on their industry weight-to-value ratio in the previous year. We regress a given portfolio's return in excess of the risk free rate on the market portfolio minus the risk-free rate, the size factor (small minus big), and the value factor (high minus low), all obtained from Kenneth French's website. Standard Errors are estimated using Newey-West with 12 lags. ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. The sample period is from 1989 to 2013.

| | Weight-to-value portfolios - Equally weighted | | | | | |
|---|---|---|---|---|---|---|
| | Low | 2 | 3 | 4 | High | Hi-Lo |
| $\alpha$ | 0.751** | 0.553** | 0.271 | 0.066 | -0.172 | -0.923** |
| | (0.343) | (0.275) | (0.206) | (0.157) | (0.176) | (0.415) |
| $\beta^{MKT}$ | 1.136*** | 1.077*** | 1.103*** | 1.030*** | 1.084*** | -0.052 |
| | (0.084) | (0.063) | (0.078) | (0.043) | (0.061) | (0.099) |
| $\beta^{SMB}$ | -0.434*** | -0.277*** | -0.176* | 0.295*** | 0.679*** | 1.113*** |
| | (0.099) | (0.084) | (0.104) | (0.101) | (0.087) | (0.127) |
| $\beta^{HML}$ | 1.303*** | 1.282*** | 1.108*** | 0.782*** | 0.632*** | -0.671*** |
| | (0.139) | (0.096) | (0.094) | (0.123) | (0.086) | (0.183) |

| | Weight-to-value - Value weighted | | | | | |
|---|---|---|---|---|---|---|
| | Low | 2 | 3 | 4 | High | Hi-Lo |
| $\alpha$ | 0.427** | 0.360* | -0.128 | -0.080 | 0.096 | -0.331 |
| | (0.173) | (0.209) | (0.158) | (0.137) | (0.116) | (0.237) |
| $\beta^{MKT}$ | 0.871*** | 1.141*** | 1.197*** | 0.990*** | 0.834*** | -0.037 |
| | (0.058) | (0.070) | (0.055) | (0.030) | (0.037) | (0.075) |
| $\beta^{SMB}$ | -0.349*** | -0.674*** | -0.484*** | 0.331*** | 0.331*** | 0.680*** |
| | (0.061) | (0.092) | (0.067) | (0.082) | (0.090) | (0.115) |
| $\beta^{HML}$ | -0.106 | 0.219** | 0.321*** | 0.092* | -0.074 | 0.031 |
| | (0.079) | (0.086) | (0.062) | (0.049) | (0.068) | (0.128) |

## Table 7
## Shipping cost and weight-to-value portfolios - Returns, conditional on size and profitability

This table presents the equally-weighted monthly excess returns (Alpha) over a three-factor Fama-French model of portfolios constructed based on the shipping costs in their industry. Shipping costs are measured at the industry-year level as the % difference of the Cost-Insurance-Freight value with the Free-on-Board value of imports. In any given month, stocks are sorted into five portfolios based on their industry shipping costs in the previous year. Firms are then sorted in terciles based on their market capitalization (Size), return on assets (ROA), as well as two measures of fixed costs (Fixed costs), namely the correlation of sales growth and cost growth in the past five to ten years, and the ratio of sales, general, and administrative expenses (SGA) to sales. We regress a given portfolio's return in excess of the risk free rate on the market portfolio minus the risk-free rate, the size factor (small minus big), and the value factor (high minus low), all obtained from Kenneth French's website. Standard errors are estimated using Newey-West with 12 lags. ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. The sample period is from 1974 to 2013.

| | Shipping cost portfolios (EW) | | | | | | Weight-to-value portfolios (EW) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Low | 2 | 3 | 4 | High | Hi-Lo | Low | 2 | 3 | 4 | High | Hi-Lo |
| | Size terciles | | | | | | Size terciles | | | | | |
| T1 | 1.347*** | 0.797*** | 0.476* | 0.356* | 0.139 | -1.208*** | 1.634*** | 1.168*** | 0.812** | 0.587** | 0.235 | -1.399*** |
| | (0.346) | (0.293) | (0.249) | (0.206) | (0.219) | (0.349) | (0.517) | (0.406) | (0.347) | (0.296) | (0.318) | (0.500) |
| T2 | 0.353 | -0.169 | -0.095 | -0.175 | -0.504*** | -0.857*** | 0.361 | 0.283 | -0.068 | -0.245* | -0.493** | -0.854* |
| | (0.251) | (0.216) | (0.150) | (0.133) | (0.126) | (0.326) | (0.399) | (0.313) | (0.206) | (0.144) | (0.197) | (0.511) |
| T3 | 0.389* | -0.009 | -0.152 | -0.073 | -0.108 | -0.497* | 0.509* | 0.121 | 0.002 | -0.105 | -0.187 | -0.696* |
| | (0.199) | (0.140) | (0.132) | (0.104) | (0.115) | (0.265) | (0.293) | (0.205) | (0.177) | (0.144) | (0.157) | (0.371) |
| | ROA terciles | | | | | | ROA terciles | | | | | |
| T1 | 0.794** | 0.315 | 0.088 | 0.093 | -0.271 | -1.065*** | 0.897** | 0.713* | 0.457 | 0.169 | -0.146 | -1.043** |
| | (0.309) | (0.285) | (0.259) | (0.202) | (0.235) | (0.366) | (0.455) | (0.427) | (0.339) | (0.273) | (0.311) | (0.516) |
| T2 | 0.719*** | 0.363** | 0.209 | 0.019 | -0.084 | -0.802*** | 0.922*** | 0.836*** | 0.326* | 0.079 | -0.116 | -1.039*** |
| | (0.190) | (0.166) | (0.137) | (0.114) | (0.130) | (0.268) | (0.238) | (0.209) | (0.188) | (0.162) | (0.204) | (0.360) |
| T3 | 0.522*** | 0.319** | 0.204 | 0.055 | -0.040 | -0.562*** | 0.590** | 0.402* | 0.377* | 0.096 | -0.085 | -0.674** |
| | (0.151) | (0.162) | (0.137) | (0.122) | (0.122) | (0.209) | (0.249) | (0.205) | (0.204) | (0.174) | (0.146) | (0.304) |

## Table 8
## Shipping cost and and weight-to-value portfolios - Returns, conditional on US trade elasticities

This table presents the equally-weighted monthly excess returns (Alpha) over a three-factor Fama-French model of portfolios constructed based on the shipping costs (SC) in their industry. SC are measured at the industry-year level as the % difference of the Cost-Insurance-Freight value with the Free-on-Board value of imports. We regress a given portfolio's return in excess of the risk free rate on the market portfolio minus the risk-free rate, the size factor (small minus big), and the value factor (high minus low), all obtained from Kenneth French's website. $\sigma$ are US trade elasticities estimated by Broda and Weinstein (2006) from 1990 to 2001 at the commodity level, aggregated at the four-digit SIC based on total imports over 1990-2001. Standard errors are estimated using Newey-West with 12 lags. ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. The sample period is from 1974 to 2013.

| | Shipping cost portfolios (EW) | | | | | | Weight-to-value portfolios (EW) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Low | 2 | 3 | 4 | High | Hi-Lo | Low | 2 | 3 | 4 | High | Hi-Lo |
| Low $\sigma$ industries | 0.255 | 0.483* | 0.200 | -0.020 | -0.123 | -0.377* | 0.304 | 0.733** | 0.077 | 0.076 | -0.182 | -0.487 |
| | (0.189) | (0.268) | (0.141) | (0.123) | (0.124) | (0.199) | (0.306) | (0.298) | (0.218) | (0.147) | (0.191) | (0.318) |
| High $\sigma$ industries | 0.607** | 0.178 | 0.138 | 0.135 | -0.200 | -0.807** | 0.716* | 0.632* | 0.366 | 0.044 | -0.060 | -0.776 |
| | (0.275) | (0.198) | (0.193) | (0.152) | (0.177) | (0.367) | (0.392) | (0.354) | (0.257) | (0.231) | (0.247) | (0.528) |

## Table 9

## Shipping cost and and weight-to-value portfolios - Returns, conditional on Pareto parameter

This table presents the equally-weighted monthly excess returns (Alpha) over a three-factor Fama-French model of portfolios constructed based on the shipping costs (SC) in their industry. SC are measured at the industry-year level as the % difference of the Cost-Insurance-Freight value with the Free-on-Board value of imports. We regress a given portfolio's return in excess of the risk free rate on the market portfolio minus the risk-free rate, the size factor (small minus big), and the value factor (high minus low), all obtained from Kenneth French's website. $\gamma$ is the Pareto tail parameter. For each year and 4-digit industries, we rank firms in descending order according to their market capitalization (Compustat item CSHO $\times$ PRCC_F). We estimate the Pareto parameter separately for each industry-year as the estimated coefficient $\gamma$ of the following OLS regression: $ln(MKTCAP) = \gamma ln(Rank) + constant$. Standard errors are estimated using Newey-West with 12 lags. ***, **, and * indicate significance at the 1, 5, and 10% level, respectively. The sample period is from 1974 to 2013.

| | Shipping cost portfolios (EW) | | | | | | Weight-to-value portfolios (EW) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Low | 2 | 3 | 4 | High | Hi-Lo | Low | 2 | 3 | 4 | High | Hi-Lo |
| Low $\gamma$ industries | 0.685*** | 0.286 | -0.010 | -0.003 | 0.046 | -0.639** | 0.840*** | 0.422 | 0.096 | 0.140 | -0.065 | -0.904** |
| | (0.196) | (0.196) | (0.153) | (0.125) | (0.124) | (0.252) | (0.292) | (0.333) | (0.253) | (0.179) | (0.164) | (0.358) |
| High $\gamma$ industries | 0.607** | 0.222 | 0.188 | 0.081 | -0.340** | -0.946** | 0.700 | 0.579** | 0.301 | -0.043 | -0.321 | -1.021* |
| | (0.304) | (0.214) | (0.165) | (0.141) | (0.137) | (0.373) | (0.474) | (0.292) | (0.208) | (0.175) | (0.208) | (0.543) |