Web Appendix
Labor Market Institutions, Firm-specific Skills, and Trade Patterns
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Abstract

This appendix provides proofs and data description omitted in the main text. Section A provides a detailed description of the PSID data and the procedures used to construct the proxies for the firm-specific and industry-specific skill intensities of the sector. It also provides the definitions of other variables used in the empirical analysis. Section B elaborates the theoretical model outlined in the main text. Section C discusses the derivation of the econometric specifications.

A Dataset Construction and Definition of Variables

A.1 Improving the quality of the PSID data to construct sector proxies for firm-specific skill intensity

The data for constructing the sector proxies for the firm-specific skill intensity are from the Panel Study of Income Dynamics (PSID). The sample I use includes observations from 20 waves (1974-1993) of PSID surveys that satisfy the following filters in order:

1) Following the related literature, the sample is restricted to white male heads of households, aged 18 to 64, who worked in manufacturing sectors for at least 500 hours in a year, and earned real hourly wages of at least \$2 (in 1990 dollars).

2) I follow the exact procedures reported in the "Variable Construction Procedures" section in Kambourov and Manovskii (2009) to enhance data quality. This procedure identifies an employer switch whenever the reported length of present employment is smaller than the time elapsed since the last interview date. Same rule applies to sector switches. An updated employee's time-series of firm tenure is constructed based on her corrected sequence of firm and sector switches. The procedure also checks consistency of the reported tenure and working experience, and make adjustments accordingly. For example, a worker may report to have worked for 8 years in the previous interview, but report 8 years again a year later. In this case, 1 year is added to the previously reported experience. Similar corrections are made for the subsequent reported experience of the same worker accordingly.

3) An individual might report to have been with the same employer, but have switched sector. In that case, within the same employer-specific job spell, the sector that appears more than half of the time is identified to be the sector for that spell. If no sector appears more than 50% of the time within a spell, all observations of that spell are dropped from the sample. This rule excludes 17% of the observations in the restricted sample after applying filter 1.

4) Although returns to firm tenure for different sector are estimated using all observations, in the end, only sectors that have at least 70 observations are retained in the sample.

A.2 Mapping industry codes from different classification systems

A.2.1 Mapping census codes to SIC72 codes

The concordance file is taken from Appendix 2 of 1981 PSID wave XIV documentation. Since there are 76 categories under the census classification (The original classification has 81 sectors, but 5 of them have no mapping to SIC72 codes), while there are 143 SIC72 categories, I restrict a SIC72 code from being mapped to more than one census codes. For the SIC72 categories that have more than one census maps (SIC72 = 282, 331, 333, 334, 335, 336, 339, 357, 379), I use the average of the specific skill intensity measures across the census categories within the same SIC category as the measure for that SIC category. Using the median has a negligible impact on the significance of the empirical results. In the end, each of the 143 SIC72 categories has a unique assignment to a census code.

A.2.2 Mapping SIC72 (3-digit) codes to SIC87 (3-digit) codes

The concordance file is taken from Bartelsman and Gray (1996) at the NBER-CES Manufacturing Industry Database.[1] Of the 140 SIC87 3-digit codes, 136 remain the same as the SIC72 codes. For those SIC87 (3-digit) categories that have multiple SIC72 (3-digit) categories identified, I choose the SIC72 code that accounts for the largest shipment value. As a result, each of the 143 SIC72 3-digit categories are assigned to a unique SIC87 3-digit category.

A.2.3 Mapping SITC (4-digit rev. 2) codes to SIC87 (4-digit) codes

Mapping SITC (4-digit rev.2) codes into SIC87 (4-digit) requires first converting each of the classification systems to the Harmonized system (HS 10-digit). The concordance file for mapping between SITC (4 digit revision 2) codes and HS (10-digit) codes is taken from Feenstra's website[2]. The concordance file for mapping between SIC87 (4-digit) codes and HS (10-digit) codes is taken from Peter Schott's website[3]. Following Nunn (2007), I use the number of 10-digit Harmonized-system categories shared between two codes from different classification systems to decide which SIC code to use for a given SITC code. When more than one SIC codes are identified for a SITC code, the SIC code that shares the most HS10 categories with that SITC code is used. For some rare cases, a SITC code has multiple SIC codes tied in the number of HS10 categories shared (It happens for 26 SITC codes out of 760 total). In those situations, I choose the SIC category that has the highest number of HS categories under it. As a result, 118 SIC87 3-digit codes suffice to cover all SITC codes.

A.3 Bilateral Variables

Bilateral Export Volumes at the Sector Level From Feenstra (2000), for the year 1995. Sector-level bilateral exports data are originally disaggregated at the 4-digit SITC (4-digit rev. 2) level.

Bilateral "Trade Costs" From the Centre d'Etudes Prospectives et d'Informations Internationales (CEPII).[4] Physical distance between two countries is calculated using the great circle formula. Other "trade costs" variables include 1) a "Common Language" dummy equal to 1 if at least 9% of the population in each country's speaks a common language; 2) a "Colony" dummy equal to 1 if a country had been a colony of the other in the same country pair; 3) a "Border" dummy equal to 1 if the countries share a common land border; 4) an "Island" dummy equal to 1 if one of the countries is an island; 5) a "Landlocked" dummy equal to 1 if one of the countries

[1] http://www.nber.org/nberces/
[2] http://cid.econ.ucdavis.edu/usixd/wp5515d.html
[3] http://www.som.yale.edu/faculty/pks4/sub_international.htm
[4] http://www.cepii.fr/anglaisgraph/bdd/distances.htm

is landlocked. 6) a "Legal" dummy equal to 1 if both trade partners share the same legal origin (British, French, German, Scandinavian). I refer to Rose (2004) and CIA World Factbook to augment the CEPII data, so all these “trade costs" variables are available for all country pairs in my sample.

Trade Partnership From the websites of the WTO and various regional trade blocs. The RTA dummy equals 1 if both countries are signatories of one of the following regional trade agreements by 1995: EU, US-Isreal, NAFTA, Canada-US, CARICOM, PATCRA, ANZ-CERTA, CACM, MERCOSUR, ASEAN, SPARTECA.

Currency Union From Glick and Rose (2002) and Helpman, Melitz, and Rubinstein (2008). A dummy equals 1 if the importing country and the exporting country used the same currency in 1995, or if money was interchangeable at a 1:1 exchange rate.

Common Legal Origin From Botero et al. (2004).

A.4 Country Characteristics

Labor Regulations From Botero et al. (2004).[5] A baseline labor protection index for a country is a weighted average over two indices: the “Employment Laws" and “Collective Relations" indices, using the principal component analysis method. The unweighted average of the two indices is also used to check the robustness of the main results. Taken directly from Botero et al. (2004), the “Employment Laws" index is an unweighted average of four subindices of the labor market: (1) Alternative employment contracts (2) Costs of increasing hours worked (3) Costs of firing workers, (4) Dismissal procedures. The "Collective Relations" index is an unweighted average of (1) Labor Union Power and (2) Collective Disputes. With Taiwan excluded from the sample due to missing “trade costs" data on bilateral variables, the sample for the baseline regression contains 84 countries. Indices are constructed by the authors using information from countries' legal documents in the late 1990s.

Factor Endowments Physical capital endowment and human capital endowment are taken from Caselli (2005). A country's stock of physical capital is the natural log of the average capital stock per worker. The stock of human capital is the natural log of the ratio of workers with a high school degree to those who did not. The measures used are from 1992, the closest year of which data are available. 60 of the countries in my sample have both of these measures.

Natural resources endowment is adopted from the World Bank's (1997) “Expanding the Measure of Wealth" dataset. A country's stock of raw materials is the natural log of the estimated dollar value of natural resources stock per worker. Natural resources included in this measure are 1)

[5] http://www.economics.harvard.edu/faculty/shleifer/Data/labor_dataset_qje_dataforweb_2005.xls

pastureland, 2) cropland, 3) timber resources, 4) nontimber forest resources, 5) protected areas and 6) subsoil assets. 57 countries in my sample have this measure.

Price Level of Consumption From the Penn World Tables. It is the PPP over the value of consumption divided by the exchange rate. By construction, the price level of the U.S. is set to 1, such that cross-country price levels can be compared within a year. All countries in my sample have this measure.

Quality of the Judicial System From Kaufmann, Kraay, and Mastruzzi (2006). Data to construct this measure were collected in 1996 by World Bank staff. The measure I use is a composite of 3 subindices, which include 1) perceptions of incidence of crime; 2) the effectiveness and predictability of judiciary; 3) the enforceability of contracts. The original measure ranges from -2.5 to 2.5, with a higher number indicating better judiciary. Following Nunn (2007), I rescale it to range between 0 and 1. All countries in my sample have this measure.

Financial Development From Beck (2002). It is equal to the amount of credit extended by banks and other financial intermediaries to the private sector divided by GDP. I use the value from 1995. 69 of the countries in my sample have this measure.

Entry Costs From Djankov et al. (2002) for 1999. "Procedures to start businesses" is the average number of legal procedures a person has to go through to start a business. "Days to start business" is the average number of days a person needs to acquire all necessary permits to start a new business.

A.5 Industry Characteristics

Factor Intensities From Bartelsman and Gray's (1996) NBER-CES Database. Following Chor (2010), capital intensity is the log of real capital stock to total employment; skill intensity is the log of the ratio of non-production workers to total employment; material intensity (s_m) is the ratio of the value of material costs to the sum of value added and material costs. Averages of the intensity measures over 1990-1999 are used. Since original data are disaggregated at the SIC 4-digit level, while the level of aggregation is SIC 3-digit in this paper, I use average value over all 4-digit SIC categories within the same SIC 3-digit as my sector measure.[6] All 3-digit SIC sectors have this measure.

Dependence on Contract Enforcement From Nunn (2007). A sector is considered more dependent on contract enforcement if a larger fraction (by value) of its inputs are not sold on an organized exchange, according to the classification constructed by Rauch (1999). Since his measures

[6] Instead of the averages, the medians of the intensity measures are also used as my 3-digit level measure. The empirical results remain robust upon using the medians.

are grouped into BEA IO categories, I use the mapping algorithm from Nunn (2007) to map IO categories into SIC87 categories. For cases in which multiple IO categories are identified for a given SIC category, the IO category with the greatest number of shared HS codes is used. After applying this procedure, three SIC 4-digit categories still have multiple IO categories identified. For these cases, I manually pick the unique crosswalk. As a result, 389 SIC87 4-digit categories have the contract dependence measure. The average value of all 4-digit categories within a 3-digit category is used as the sectoral measure. All 3-digit SIC sectors have this measure.

Sales Volatility From Cuñat and Melitz (2010a), through email communication. It is the employment-weighted standard deviation of sales growth for publicly listed firms from the Compustat data set over 1980-2004. All 3-digit SIC sectors have this measure.

Gross Job Flows From an updated dataset of Davis, Haltiwanger, and Schuh (1996) at Haltiwanger's website.[7] It is the average of job creation and job destruction rates. The job creation rate of a sector is defined as the employment-weighted average of employment growth across plants within a sector. The job destruction rate of a sector is defined as employment-weighted average of the absolute value of negative employment growth across plants within a sector. I use the annual series of gross job flows over 1990-1999. First, I compute the employee-weighted average over all SIC 4-digit categories within a SIC 3-digit category. Then averages are taken over 1990-1999 for each SIC 3-digit category. All 3-digit SIC sectors have this measure.

Dependence on External Finance From Rajan, and Zingales (1998). It is the fraction of total capital expenditure over 1980-1989 not financed by internal cash flow. It is computed based on the publicly listed firms in the Compustat dataset. Original data are constructed at the ISIC (rev.2) 3-digit industry level. I manually map them into SIC87 2-digit, and then into SIC87 3-digit categories available in my sample. Averages are used when a mapping goes from a lower to a higher level of aggregation.

Value-added Share From Bartelsman and Gray's (1996) NBER-CES Database. It is an industry's value added divided by total manufacturing value added of shipment. Averages are taken over 1990-1999. All 3-digit SIC sectors have this measure.

TFP Growth From Bartelsman and Gray's (1996) NBER-CES Database. It is an industry's annual growth rate in total factor productivity. Averages are taken over 1990-1999. All 3-digit SIC sectors have this measure.

[7] http://econweb.umd.edu/~haltiwan/download.htm

B Theoretical Appendix

B.1 The Closed-Economy Model

In this section, I solve for the firm-level equilibrium in a closed economy, taking demand for goods as given. The ultimate goal is to show how labor market institutions affect workers' skill acquisition, which in turn affect firm revenue and profit. The open-economy model will be introduced in the following section.

B.1.1 Preferences

Consider a closed economy of $S+1$ sectors, with one sector producing homogeneous goods, serving as the numéraire. S sectors producing horizontally-differentiated varieties.

Labor is the only factor of production. The economy is inhabited by a measure L of ex-ante identical and risk-neutral consumers/workers, who supply labor inelastically. For simplicity, each worker is endowed with $\overline{h}$ units of general skills to begin with. The level of general skills can be endogenized if needed.

Workers' preferences have two parts: Utility from consumption and disutility from skill acquisition. Utility from consumption takes the Cobb-Douglas form as follows:

$$C = C_0^{1-\alpha} \left(\prod_{s=1}^{S} C_s^{b_s} \right), \qquad \text{where } \sum_{s=1}^{S} b_s = \alpha,$$

where C_0 represents consumption of the homogeneous-good and C_s is a constant-elasticity of substitution (CES) aggregate over horizontally-differentiated varieties $\omega' s$ in sector s as follows:

$$C_s = \left[\int_{\omega \in \Omega_s} c_s(\omega)^{\frac{\sigma-1}{\sigma}} d\omega \right]^{\frac{\sigma}{\sigma-1}}$$

where $c_s(\omega)$ represents consumption of variety ω in sector s. Ω_s is the set of all available varieties, which will be determined in equilibrium. The elasticity of substitution between varieties, σ, is assumed to be bigger than 1 and identical across sectors.[8] Demand for variety ω in sector s is $c_s(\omega) = D_s p_s(\omega)^{-\sigma}$, with $p_s(\omega)$ being the variety's price. $D_s = P_s^{\sigma-1} b_s Y$ captures the demand level for goods in sector s, with Y being the aggregate spending of the economy; the ideal price index of sector s is $P_s = \left[\int_{\omega \in \Omega_s} p_s(\omega)^{1-\sigma} d\omega \right]^{\frac{1}{1-\sigma}}$.

If worker i exerts an effort level e_i to acquire skills, she incurs effort costs κe_i, measured in units of the homogeneous good. Therefore, given the ideal price index P of consumption and income w_i, her indirect utility is expressed as[9]

$$U_i = \frac{w_i - \kappa e_i}{P}.$$

[8] This assumption implies a higher degree of substitutability between varieties within sectors than between sectors.

[9] The assumption that disutility of effort is measured in the same units of nominal wages is implicitly made in the Shapiro-Stiglitz (1984) efficiency wage model, and more recently in Davis and Harrigan (2007).

B.1.2 Production Technologies and Market Structure

Production of the homogeneous goods requires only general skills. Technology is linear, with unit labor requirement of general skills set to 1. The product market of homogeneous goods is perfectly competitive, implying zero profits for the numéraire sector. The wage rate of a worker in this sector is equal to her level of general skills.

The markets for differentiated products are monopolistically competitive. A potential employer chooses a sector to enter and sets up a firm costlessly.[10] The production function of a firm in sector s is

$$y_s = \epsilon f_s(a)\, l, \tag{A-1}$$

where l is firm employment, ϵ is an exogenous firm-specific productivity. The firm's endogenous labor productivity is

$$f_s(a) = a^{\lambda_s} \overline{h}^{(1-\lambda_s)},$$

where $\overline{h}$ stands for the fixed level of general skills acquired by workers before matching up with a firm; a represents the *average* level of workers' firm-specific skills acquired on the job. λ_s is constant for all firms in the same sector. $\lambda_s \in (0,1)$ is increasing in the sector index s, such that $\lambda_s > \lambda_{s'}$ if $s > s'$ $\forall s, s' \in \{1, .., S\}$.

After setting up the firm, the employer hires workers by posting a contractible wage, w_1. Suppose there exists a large number of ex-ante identical workers competing for jobs, w_1 adjusts across firms and sectors to ensure identical expected wages for all workers at the time of hiring.

At the hiring stage, workers have two options: join one of the differentiated-good firms, or stay out in the external labor market. If they choose to stay out, they expect to be employed by the homogeneous-good sector later. A worker joining a differentiated-good firm receives w_1 and expects to exert effort to acquire specific skills. In practice, investments in firm-specific skills are difficult, if not impossible, to specify in contracts, and therefore cannot be verified by a third party ex post. For this reason, I assume that investments in firm-specific skills are non-contractible, though observable.[11] To focus on the core of the paper, the degree of contract incompleteness is assumed to be the same across sectors.

Because no enforceable contract can be written ex ante, the employer and the workers bargain over the division of surplus after the workers invest in specific skills. I adopt a Generalized Nash Bargaining framework between the representative worker (e.g. a union leader) and the employer, with the intrinsic bargaining power of the workers equal to $\phi \in (0,1)$. Bargaining is assumed to take place within the "right-to-manage" framework, implying that the two parties of the firm bargain over wages, with the level of employment being chosen unilaterally by the employer before bargaining.[12]

[10] The main conclusions of the paper are independent of the assumption of zero fixed costs.

[11] For instance, contract incompleteness of human capital investment has been used as an explanation for firm-provided training in studies by Balmaceda (2005) and Casas-Arce (2006). I take the assumption of contract incompleteness as a fact of life, and do not complicate the model by discussing its underpinnings.

[12] As discussed in Stole and Zwiebel (1996a and 1996b), firms have a strategic incentive to overemploy workers if

To abstract from issues related to coordination and incentive problems among workers, I assume that investment efforts of all workers are chosen by a representative worker in the firm. This assumption can be rationalized by real-world bargaining situations between the employer and the union representative, who represents the common interest of the union members.[13] Developing a model that features multilateral bargaining between individual workers and the employer, such as those in Stole and Zwiebel (1996a and 1996b) and Acemoglu et al. (2007), can shed important light on the coordination issues among workers. I opt for a simpler set-up with bilateral bargaining to focus on the determinants of firm-specific skill acquisition.

After incurring the investment costs, both the employer and the employees bargain over the division of expected surplus of the firm. At the bargaining stage, the employer's outside option is normalized to 0. Without loss of generality, production after investment and bargaining is assumed to require no effort by the workers. Concurrently, the homogeneous-good sector hires workers who remain in the external labor market.[14] A worker with $\overline{h}$ units of general skills in the differentiated-good firm can quit and supply labor in the competitive homogeneous-good sector. Each worker's outside option at the time of bargaining is $\overline{h}$.

B.1.3 Labor Regulations and Implied Workers' Bargaining Power

Following Blanchard and Giavazzi (2003) and Spector (2004), I use the parameter for workers' bargaining power ϕ, admittedly in an abstract fashion, to represent the degree of a country's labor protection in the model.[15] To the extent that more protective labor laws grant workers more bargaining power over the surplus from the joint relationship, ϕ is increasing in the degree of labor market protection (regulation). To mention a few real-world examples, ϕ can capture the degree of extension agreements, closed-shop arrangements, or rules on the right to strike (Blanchard and Giavazzi, 2003). The bargaining power of the workers are assumed to be the same across sectors and firms.

B.1.4 Timing of Events

The timing of events is summarized as follows (see also Figure 1). There is no discounting between t_1 and t_4.

the technology has decreasing returns to scale. However, as noted in these papers, unions internalize this effect with a single representative bargaining on other workers' positions. Thus, no incentive for overemployment arises. This statement is valid even if I relax the "right-to-manage" assumption.

[13] Allowing decentralized bargaining between a single worker and her employer would substantially complicate the model. Along these lines, Acemoglu et al. (2007) and Helpman and Itskhoki (2010) employ the Shapley value concept to solve for workers' bargaining power in an incomplete-contract setting. They show that workers' bargaining power is higher in sectors with lower elasticities of substitution between varieties.

[14] The assumption that the homogeneous-good sector hires workers later than the differentiated-goods firms is not crucial for the main conclusions of the paper. Having this assumption allows me to highlight the ex-post relative returns to both types of skills. If I assume instead that this sector employs workers at exactly the same time as the differentiated-goods firms, the solutions of w_1 will be different. Nevertheless, since ex-ante transfers do not affect workers' incentives to invest, the main insights of the model are unchanged.

[15] See also Griffith et al. (2007) for a discussion.

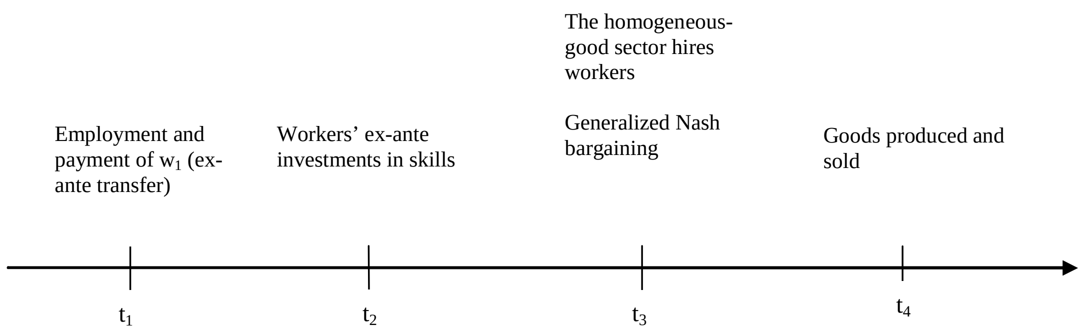

Figure 1: Timing of Events

At t_1, the firm posts a contractible wage w_1 to hire workers. Job seekers either join a differentiated-good firm or stay out in the external labor market.

At t_2, workers in differentiated-good firms acquire specific skills, in anticipation of a share ϕ of the ex-post surplus from sales, together with the outside options that depend only on general skills.

At t_3, after workers' investments, agents in a differentiated-good firm bargain over the division of expected surplus. The homogeneous-good sector hires workers, paying each of them $\overline{h}$. The labor market clears.

At t_4, if both parties in the firm agreed to continue the relationship at t_3, workers produce goods using their acquired skills effortlessly. Ex-post surplus S from sales (revenue minus the outside options of both parties) is divided between the employer and the employees, according to the workers' primitive bargaining power ϕ. The homogeneous-good sector produces and sells an amount $\overline{h}l_0$ of goods. All goods markets clear.

B.1.5 Firm-level Equilibrium

Preliminaries I solve the model backward in time from t_4. In this section, I focus on a single firm and suppress both firm (ω) and sector (s) subscripts. The price and firm revenue of a variety (as a function of y) can be expressed as $p = D^{1-\eta}y^{\eta-1}$, and $R = D^{1-\eta}y^{\eta}$, with $\eta = 1 - 1/\sigma < 1$ and D being the demand level for goods in a given sector. Since each firm is infinitesimal, D is taken as given by agents in each firm.

With a worker's outside option equal to $\overline{h}$ and that of the employer normalized to 0, the ex-post surplus of a firm with l workers is

$$S(a) = R(a) - \overline{h}l.$$

Workers' Investment in Firm-specific Skills (at t_2) Since investment in specific skills are non-contractible, workers invest optimally at t_2, anticipating payoffs from ex-post bargaining at t_3. Throughout the paper, I assume that firms do not invest in workers' human capital.[16]

[16] They do, however, indirectly pay for them in equilibrium through ex-ante transfers.

To simplify algebra, I assume that the marginal cost of skill acquisition κ equals 1. Since each worker expects to obtain $\phi S(a)/l + \overline{h}$ ex post, the representative employee of the firm maximizes her expected payoffs for all workers by choosing an optimal level of specific skills (a) as

$$\max_a \left\{\phi D^{1-\eta}\left[\epsilon f(a)\, l\right]^{\eta} + (1-\phi)\,\overline{h}l - al\right\}.$$

With l chosen by the employer ex ante, the first order condition delivers the optimal investment level in specific skills and endogenous labor productivity as follows:

$$\begin{aligned} a^*(\phi,\lambda) &= \left[\phi\lambda\eta B\left(\epsilon\overline{h}^{1-\lambda}\right)^{\eta}\right]^{\frac{1}{1-\lambda\eta}}; \\ f^*(\phi,\lambda) &= \left[(\phi\lambda\eta B\epsilon^{\eta})^{\lambda}\,\overline{h}^{1-\lambda}\right]^{\frac{1}{1-\lambda\eta}}, \end{aligned} \tag{A-2}$$

where $B = (D/l)^{1-\eta}$. Each worker expects to receive a smaller share of firm revenue when the firm gets bigger. Because the marginal revenue is decreasing in labor, all else being equal, workers have less incentive to acquire skills in larger firms. When workers anticipate a higher share of firm revenue ϕ, they exert more effort to acquire specific skills. With incomplete contracting, there will always be under-investments in specific skills from the perspective of the employers.[17] Notice that the degree of underinvestment is increasing in the intensity of specific-skills in production (increasing in λ).[18] Notice that the focus of this paper is on comparative advantage due to labor regulations. The current discussion about ϕ has no normative implications for optimal labor laws. For welfare analysis for countries under different labor laws, see a review by Nickell (1997).

These effects of labor regulations on endogenous firm productivity is summarized as follows:

Lemma 1 Let $\varsigma_\phi(\phi,\lambda) \equiv \partial \ln f^*(\phi,\lambda)/\partial \ln \phi$ be the elasticity of $f^*(\phi,\lambda)$ with respect to ϕ, and $\varsigma_\lambda \equiv \partial \ln f^*(\phi,\lambda)/\partial \ln \lambda$ be the elasticity of $f^*(\phi,\lambda)$ with respect to λ. I have that:
i) $\varsigma_\phi(\phi,\lambda) > 0$;
ii) $\partial\varsigma_\phi(\phi,\lambda)/\partial\lambda > 0$ and $\partial\varsigma_\lambda(\phi,\lambda)/\partial\phi > 0$.

Proof: Recall from the text that

1. $\varsigma_\phi \equiv \partial \ln f^*(\phi,\lambda)/\partial \ln\phi = \lambda/(1-\lambda\eta)$;
2. $\varsigma_\lambda \equiv \partial \ln f^*(\phi,\lambda)/\partial \ln\lambda = (1-\lambda\eta)^{-2}\ln\left(\phi\lambda\eta B\overline{h}\right) + \eta(1-\lambda\eta)^{-2}\ln\left(\epsilon\overline{h}\right)$;
3. $\ln f = \frac{1}{1-\lambda\eta}\left[\lambda\ln\left(\phi\lambda\eta B\overline{h}\right) + (1-\lambda\eta)\ln\epsilon\overline{h}\right]$.

[17] Consider for a moment that human capital investments are contractible, such that the employer can impose her preferred levels of investments on the workers. The first-best investment level (a^c) under complete contracting would imply $a^*/a^c = \phi^{\frac{\lambda}{1-\lambda\eta}} < 1$. The first-best maximization problem for the workers is $\max_a R(a)/l - a$.

[18] This is a standard one-sided hold-up result, when workers are not the full residual claimants of the gains from their investments. In reality, ϕ is never close to 1. Also, this simple model does not include capital as a factor of production. With capital as a factor of production, an employer would require some surplus to cover her sunk investment costs.

$\partial\varsigma_\phi/\partial\phi = (1-\lambda\eta)^{-2} > 0$. Although the sign of the elasticity of f with respect to λ depends on parameter values,[19] $\partial\varsigma_\lambda/\partial\phi = (1-\lambda\eta)^{-2}\phi^{-1}$ is unambiguously positive.■

Part (i) of this lemma highlights that all else equal, a higher bargaining power of workers enhances labor productivity. When workers are the only party investing in human capital, workers' anticipation of higher ex-post payoffs encourages specific skill acquisition, which in turn enhances firm productivity.

Part (ii) of the lemma captures the main determinant of institutional comparative advantage in the paper. Similar to Costinot (2009b), part (ii) of Lemma 1 specifies that labor productivity $f^*(\phi,\lambda)$ is log-supermodular in both arguments. In other words, the positive effect of granting workers bargaining power is larger for firm-specific skill-intensive sectors, which potentially mitigates the costs of employment protection. This insight is consistent with Roberts and Van den Steen (2000), who postulate that it is optimal for an employer to grant her employees a larger share of equity or role in governance when non-contractible human-capital are more important for production.

The log-supermodularity of $f^*(\phi,\lambda)$ provides general implications. Consider a world with two countries: i and k, which are identical in all aspects beside that labor laws are more protective in i than k, i.e. $\phi_i > \phi_k$. To show different degrees of impact of labor protection across sectors, consider the ratio of firm labor productivity between two countries for a given sector:

$$\frac{f^*(\phi_i,\lambda)}{f^*(\phi_k,\lambda)} = \left(\frac{\phi_i}{\phi_k}\right)^{\frac{\lambda}{1-\lambda\eta}}.$$

This ratio is increasing in λ as long as $\phi_i > \phi_k$. Intuitively, through endogenous workers' skill acquisition, the model delivers an upward-sloping technology schedule (in λ) that captures comparative advantage of the two countries. This schedule is close in spirit to the exogenous technology schedule in Dornbusch, Fischer, and Samuelson's (1977) two-country Ricardian trade model with a continuum of industries.

At t_3, since the Nash-bargaining outcomes are always efficient, both parties agree to produce jointly. At t_4, workers produce goods effortlessly with the acquired skills.

Firm Employment Decision (t_1) Now let us go back to period t_1. The employer chooses the level of employment l to maximize the expected net surplus $(1-\phi)\left[R(a^*,\epsilon) - \overline{h}l\right] - w_1 l$.

At t_1, the outside options for workers are determined by the (expected) future employment opportunities in the homogeneous-good sector. With the wage for each unit of general skills equal to 1, a worker with $\overline{h}$ units of general skills expects an ex post outside option of $\overline{h}$. On the other hand, joining a firm with productivity ϵ gives her an up-front payment $w_1(\epsilon)$ plus expected future payoffs equal to $\phi R(a^*) + (1-\phi)\overline{h}$ minus costs of investment. Hence, the ex-ante participation constraint for a worker joining the firm at t_1 is $w_1(\epsilon) + \phi R(a^*,\epsilon)/l + (1-\phi)\overline{h} - a^* \geq \overline{h}$. An

[19] $\varsigma_\lambda > 0$ if $\phi\lambda\eta B\overline{h}^{1-\eta} > \epsilon^\eta$ and $\varsigma_\lambda \leq 0$ if $\phi\lambda\eta B\overline{h}^{1-\eta} \leq \epsilon^\eta$.

inelastic supply of ex-ante identical workers implies that $w_1(\epsilon)$ will adjust until this participation constraint binds, which gives $w_1(\epsilon)$ as $w_1(\epsilon) = -\phi\left[R(a^*, \epsilon)/l - a^* - \overline{h}\right] + (1-\phi)a^*$.

Substituting w_1 into the firm's objective function yields[20][21]

$$\widetilde{\pi}(a^*, \epsilon) \equiv \max_l \left\{R(a^*, \epsilon) - \left(a^* + \overline{h}\right)l\right\}.$$

With $f^*(\phi, \lambda)$ solved in (3), the firm's revenue and the employer's net surplus can be expressed as follows:

Using

1. $l^* = D\epsilon^{\frac{\eta}{1-\eta}}\overline{h}^{-1}\left[\left(\frac{(1-\phi\lambda\eta)(1-\lambda)}{1-\lambda\eta}\right)^{1-\lambda\eta}(\phi\lambda)^{\lambda\eta}\eta\right]^{\frac{1}{1-\eta}}$
2. $f^* = \left[(\phi\lambda\eta B\epsilon^\eta)^\lambda \overline{h}^{1-\lambda}\right]^{\frac{1}{1-\lambda\eta}}$, where $B = (D/l)^{1-\eta}$

and the solution to the employer's maximization problem, the net surplus of the employer $\widetilde{\pi}(\phi, \lambda, \epsilon) = D\left(\frac{\Theta(\phi,\lambda)}{\epsilon\eta}\right)^{1-\sigma}\frac{(1-\phi\lambda\eta)(1-\eta)}{1-\lambda\eta}$.

$$\begin{aligned} R(\phi, \lambda, \epsilon) &= D\left(\frac{\Theta(\phi, \lambda)}{\epsilon\eta}\right)^{1-\sigma}; \\ \widetilde{\pi}(\phi, \lambda, \epsilon) &= D\left(\frac{\Theta(\phi, \lambda)}{\epsilon\eta}\right)^{1-\sigma}\frac{(1-\phi\lambda\eta)(1-\eta)}{1-\lambda\eta} \end{aligned} \quad \text{(A-3)}$$

where $\widetilde{\lambda} = (1-\lambda)^{-(1-\lambda)}\lambda^{-\lambda}$ and

$$\Theta(\phi, \lambda) = \widetilde{\lambda}\left(\frac{1-\lambda\eta}{1-\phi\lambda\eta}\right)^{1-\lambda}\left(\frac{1}{\phi}\right)^\lambda.$$

These firm values take the familiar functional forms. R and $\widetilde{\pi}$ are increasing in sector-level demand D and firm-level productivity ϵ. A higher ϕ induces workers to exert more effort to acquire skills. These effects are stronger in sectors for which firm-specific skills are more important. Notice that all firm-level variables are independent of the level of general skills $\overline{h}$.[22]

[20] One may wonder that since the employer's ex-post surplus is decreasing with ϕ, all else being equal, the employer should be worse off when the workers gain more bargaining power. However, with a constant ex-ante outside option $\overline{h}$ for the workers, ex-ante transfers to the workers $w_1(\epsilon)$ adjust in such a way so that all workers across firms and sectors receive the same "life-time" income. Hence, when a higher ϕ increases investments in specific skills and therefore joint surplus, the employer's net surplus increases one for one.

[21] By replacing $R(\phi, \lambda, \epsilon)$ by $D^{1-\eta}(a(\phi, \lambda, \epsilon)l)^\eta$ and $a(\lambda, \phi, \epsilon) = \left[\phi\lambda\eta B\left(\epsilon\overline{h}^{1-\lambda}\right)^\eta\right]^{\frac{1}{1-\lambda\eta}}$ (from (3)) in $\widetilde{\pi}(\phi, \lambda, \epsilon) = R(\phi, \lambda, \epsilon) - a(\phi, \lambda, \epsilon)l - \overline{h}l$, I can express $\widetilde{\pi}(\phi, \lambda, \epsilon)$ in terms of parameter values and ϵ as

$\widetilde{\pi}(\phi, \lambda, \epsilon) = \left(D^{1-\eta}\epsilon^\eta\right)^{\frac{1}{1-\lambda\eta}}\psi(\phi, \lambda)\left(\overline{h}l\right)^{\delta(\lambda)} - \overline{h}l$

where $\psi(\phi, \lambda) = (\phi\lambda\eta)^{\frac{\lambda\eta}{1-\lambda\eta}}(1-\phi\lambda\eta)$. Since $\delta(\lambda) = (1-\lambda)\eta/(1-\lambda\eta) \in (0,1)$, the maximization problem with respect to l is convex. The first order condition of the problem has a unique solution. ■

[22] It happens that $\overline{h}$ is multiplied to l in both the employers' surplus and labor costs, which offset each other in these equations.

Depsite the static nature, the model delivers a positive relation between the slope of the wage profile ($\frac{w_3}{w_1} - 1$) and the specific-skill intensity of the sector, λ. Formally, the ratio of the wage at t_3 (the bargaining stage) to that at t_1(ex ante transfer) can be expressed as:

$$\begin{aligned}
\frac{w_1}{w_3} &= \frac{-\phi\left[R(\phi,\lambda,\epsilon)/l - a^* - \overline{h}\right] + (1-\phi)\,a^*}{\phi R(\phi,\lambda,\epsilon)/l} \\
&= -1 - \frac{(1-\phi)\,\overline{h}l}{\phi R(\phi,\lambda,\epsilon)} + \frac{a^* + \overline{h}}{\phi R(\phi,\lambda,\epsilon)/l} \\
&= -1 - \frac{(1-\phi)(1-\lambda)\,\eta}{\phi}\left(\frac{1-\phi\lambda\eta}{1-\lambda\eta}\right) + \frac{(R(\phi,\lambda,\epsilon) - \widetilde{\pi}(\phi,\lambda,\epsilon))}{\phi R(\phi,\lambda,\epsilon)} \\
&= \left(\frac{1}{\phi} - 1\right) - \frac{(1-\phi\lambda\eta)}{\phi(1-\lambda\eta)}\left[(1-\phi)(1-\lambda)\,\eta + (1-\eta)\right]
\end{aligned}$$

It can be shown that $\frac{w_3 - w_1}{w_1}$ is increasing in λ $\forall\lambda > \frac{1-\sqrt{1-\eta}}{\eta}$.[23] There are two forces that affect the slope of the wage profile when λ increases. The first force is that the elasticity of firm revenue to firm-specific skills increases. Offsetting this positive impact on wage growth, the second force is a higher compensation for the workers to cover the extra costs of specific-skill acquisition, so that the workers are indifferent between joining any sectors. When λ is sufficiently high, the first force dominates, more so for the more specific-skill-intensive sectors. This predicted positive relation serves as a theoretical foundation for the approach of using the returns to firm tenure as proxies for firm-specific skill intensity.

In this model, workers invest only in firm-specific skills but not general skills. However, the model is general enough to incorporate non-contractible investment activities for both types of skills. The solutions to this extended model posit that higher workers' bargaining power alleviates underinvestment for all human capital investments, especially for production that depends more on specific skills. The rationale is that since specific skills are not transferable across firms, the associated underinvestment problem is relatively more severe. If protective labor laws can alleviate the underinvestment problems for both types of skills, the effect would be greater for specific human-capital investments and for production that depends more on them. Since the extension does not change the main insights about comparative advantage, a simpler model is presented here.

Notice that using workers' bargaining power to capture the degree of labor market protection is a reduced form to formalize how labor laws affect workers' skill acquisition and thus firm productivity. Alternatively, one can think of a higher ϕ as an endogenous outcome representing a higher expected return to investment, due to a longer and more stable worker-employer relationship in a more protective (rigid) labor market. A more stable worker-employer relationship would naturally imply higher incentives for the workers to acquire relationship-specific skills (something that we will test in the empirical section) and for the firm to provide training that are specific to the relationship.

[23] $\frac{\partial\left(\frac{w_1}{w_3}\right)}{\partial\lambda} = -\frac{\eta(1-\phi)\phi\eta}{\phi(1-\lambda\eta)^2}\left[\lambda(1-\lambda\eta) - (1-\lambda)\right]$, which is negative if $\lambda > \frac{1-\sqrt{1-\eta}}{\eta}$. In other words, $\frac{w_3-w_1}{w_3}$ is increasing in λ if $\lambda > \frac{1-\sqrt{1-\eta}}{\eta}$.

B.2 The Multi-Country Open-Economy Model

In this section, I describe in detail how to embed the above model in a multi-country open-economy framework, à la Helpman, Melitz and Yeaple (2004), to derive the empirical specifications. Here I highlight the key features of the extension and outline the empirical specifications derived from the model.

B.2.1 The Environment

Consider an open economy with N countries. All goods are potentially traded across countries. While the homogeneous (numéraire) goods are assumed to be freely traded, differentiated-good firms face fixed and variable export costs. The variable cost takes the form of an "iceberg" transportation cost – for a unit of a variety shipped from country i to country j, only a fraction $1/\tau_{ij} < 1$ arrives in the destination. In addition, to export to country j, a firm in country i has to pay an up-front fixed cost f_{ij} in units of the numéraire.[24] For simplicity, I assume symmetric variable and fixed trade costs between any two trade partners, i.e. $\tau_{ij} = \tau_{ji}$ and $f_{ij} = f_{ji}$.

I consider only equilibria in which the numéraire good is produced in all countries.[25] Given that each worker is endowed with $\overline{h}_i$ of general skills, all workers' life-time incomes in country i equal $\overline{h}_i$. To simplify notation, I denote country $i's$ nominal labor income by $w_i = \overline{h}_i$.

As in Helpman, Melitz, and Yeaple (2004), firms in different sectors draw their $\epsilon's$ from a common Pareto distribution over bounded support $[1, \epsilon_H]$, with the cumulative distribution function of ϵ equal to $\Pr(\epsilon < \epsilon') = G(\epsilon) = \left(1 - \epsilon^{-\xi}\right) / \left(1 - \epsilon_H^{-\xi}\right)$, where ξ is a measure of the dispersion of $\epsilon's$ across firms. ξ is assumed to be bigger than $\sigma - 1$.

B.2.2 Sectoral Export Thresholds for a Foreign Market

Denote $\Theta_{is} \equiv \Theta(\phi_i, \lambda_s)$, and the employer's net surplus from exporting to j in sector s as $\widetilde{\pi}_{ijs}(\epsilon) \equiv \widetilde{\pi}_j(\epsilon, \phi_i, \lambda(s))$. From (6), the employer's net surplus is

$$\widetilde{\pi}_{ijs}\left(\epsilon | \epsilon \geq \epsilon^*_{ijs}\right) = \frac{b_s Y_j}{P_{js}^{1-\sigma}} \left(\frac{\Theta_{is}\tau_{ijs}}{\epsilon\eta}\right)^{1-\sigma} \frac{(1-\phi\lambda\eta)(1-\eta)}{1-\lambda\eta} - f_{ijs},$$

where b_s is a sector-specific constant; Y_j is the aggregate spending of country j; P_{js} is the price index of sector s in j; and ϵ^*_{ijs} is the productivity threshold above which firms in i export to j (to be determined below). Evidently, all else being equal, a firm in i exports more to a larger market j (i.e., a higher $P_{js}Y_j$).

Importantly, the employer's net surplus depends on the term of endogenous comparative advantage due to i's labor laws Θ_{is}. The break-even condition, $\widetilde{\pi}_{ijs}(\epsilon) = 0$, pins down the productivity

[24] Examples of the fixed export costs include costs for setting up a distribution network, research on the foreign markets, and so on.

[25] This condition will hold as long as the expenditure share of the numéraire $(1-\alpha)$ is large enough, or trade costs for differentiated goods are high enough.

threshold for exporting ϵ^*_{ijs} as

$$\epsilon^*_{ijs} = \frac{\Psi_{is}\tau_{ijs}}{P_{js}}\left(\frac{b_s Y_j}{f_{ijs}}\right)^{\frac{1}{1-\sigma}}, \tag{A-4}$$

where $\Psi_{is} = \Theta_{js}\left(\frac{(1-\phi\lambda\eta)(1-\eta)}{1-\lambda\eta}\right)^{\frac{1}{1-\sigma}}$ .The impact of labor laws on ϵ^*_{ijs} is summarized by the following lemma.

Lemma 2 (Firm Selection into Exporting): All else being equal, the productivity thresholds for exporting are lower when labor laws become more protective; more so in sectors for which firm-specific skills are more important (higher λ).

Proof: Recall from the main text that $\Theta_{is} = \Theta(\phi_i, \lambda(s))$ and $\Psi_{is} = \Theta_{is}\left(\frac{(1-\phi\lambda\eta)(1-\eta)}{1-\lambda\eta}\right)^{\frac{1}{1-\sigma}}$.

Consider the elasticity of $\Psi(\phi,\lambda)$ with respect to ϕ: $\frac{\partial \ln \Psi_{is}}{\partial \ln \phi} = -\frac{\lambda\eta(1-\phi)}{1-\phi\lambda\eta} < 0$. The partial impacts of higher λ or ϕ on the elasticity are

1. $\frac{\partial}{\partial\lambda}\frac{\partial \ln \Psi_{is}}{\partial \ln \phi} = -\frac{\eta(1-\phi)}{(1-\phi\lambda\eta)^2} < 0$;
2. $\frac{\partial}{\partial\phi}\frac{\partial \ln \Psi_{is}}{\partial \ln \lambda} = \frac{\partial}{\partial\phi}\left[\frac{\partial \ln \Theta_{is}}{\partial \ln \lambda} + \frac{\lambda\eta}{1-\sigma}\left[\frac{1-\phi}{(1-\phi\lambda\eta)(1-\lambda\eta)}\right]\right] = \lambda\left[\frac{1-\left(2\lambda\eta-\phi(\lambda\eta)^2\right)}{1-\phi\left(2\lambda\eta-\phi(\lambda\eta)^2\right)} - \phi^{-1}\right] < 0.$

Given that $\epsilon^*_{ijs} = \frac{\Psi_{is}\tau_{ij}}{P_{js}}\left(\frac{b_s Y_j}{f_{ij}}\right)^{\frac{1}{1-\sigma}}$ (from (5)), we have

$$\frac{\partial \ln \epsilon^*_{ijs}}{\partial \ln \phi} < 0 \qquad \frac{\partial}{\partial\lambda}\frac{\partial \ln \epsilon^*_{ijs}}{\partial \ln \phi} < 0 \qquad \frac{\partial}{\partial\phi}\frac{\partial \ln \epsilon^*_{ijs}}{\partial \ln \lambda} < 0$$

Consider two exporters, i and k, which are identical, except that labor laws are more protective in country i than k, i.e. $\phi_i > \phi_k$. The ratio of the cutoffs for exporting to j between the two exporting countries is $\epsilon^*_{ijs}/\epsilon^*_{kjs} = \Psi_{is}/\Psi_{ks} < 1$. The fact that $\frac{\partial}{\partial\lambda}\frac{\partial \ln \epsilon^*_{ijs}}{\partial \ln \phi} < 0$ and $\frac{\partial}{\partial\phi}\frac{\partial \ln \epsilon^*_{ijs}}{\partial \ln \lambda} < 0$ together implies that $\epsilon^*_{ijs}/\epsilon^*_{kjs}$ is decreasing in λ.■

Ceteris paribus, this result comes from the fact that an employer's net surplus $\widetilde{\pi}_{ijs}$ is increasing in workers' bargaining power ϕ_i, proportionally more so for the more firm-specific skill-intensive sectors.

Without firm-level data for a large sample of countries, we cannot test Lemma 2 empirically. With country-level data, we test a counterpart of Lemma 2 as follows:

Prediction 1 (Extensive Margin of Trade): Among a country's trade partners, those with more protective labor laws are more likely to export in firm-specific skill-intensive sectors.

B.2.3 Sectoral Export Volume to a Foreign Market

By rewriting the demand level D in (A-3) in terms of the sectoral price (P_{js}) and aggregate spending (Y_j) of j, aggregating all firms' export gives the volume of exports from i to j in sector s as

$$X_{ijs} = b_s N_{is} Y_j \left(\frac{\Theta_{is} \tau_{ijs}}{\eta P_{js}} \right)^{1-\sigma} W_{ijs}, \tag{A-5}$$

where N_{is} is the number of all firms (including non-exporters) in sector s and country i. As in Helpman, Melitz, and Rubinstein (2008), the extensive margin of trade is derived as

$$W_{ijs} = \max \left\{ \left(\frac{\epsilon_H}{\epsilon^*_{jis}} \right)^{\xi-(\sigma-1)} - 1, 0 \right\}. \tag{A-6}$$

Labor protection affects the sectoral volume of exports on both the intensive margin and the extensive margin. First, higher firm productivity due to higher level of specific skills directly increases firm and sectoral export volumes (the intensive margin). For the same reason, a higher ϕ_i implies a larger fraction of firms exporting. Since both margins imply larger exports, the combined effects of labor laws on trade flows are summarized as follows.

Prediction 2 (Intensive Margin of Trade): Among a country's trade partners, those with more protective labor laws export relatively more in firm-specific skill-intensive sectors.

Proof: Recall from the main text that $X_{ijs} = \frac{b_s N_{is} Y_j}{(\eta P_{js})^{1-\sigma}} \left(\Theta_{is} \tau_{ijs} \right)^{-(\sigma-1)} W_{ijs}$ where $W_{ijs} = \left\{ \left(\frac{\epsilon_H}{\epsilon^*_{jis}} \right)^{\xi-(\sigma-1)} - 1, 0 \right\}$. Lemma 2 postulates that $\epsilon^*_{ijs}/\epsilon^*_{kjs}$ is decreasing in λ as long as $\phi_i > \phi_k$. Therefore, $\forall W_{ijs} > 0$, W_{ijs}/W_{kjs} is increasing λ. Similarly, given that $\phi_i > \phi_k$, $X_{ijs}/X_{kjs} > 1$. Also, since $\frac{\partial}{\partial \phi} \frac{\partial \ln \Theta(\phi,\lambda)}{\partial \ln \lambda} < 0$ and $\frac{\partial}{\partial \lambda} \frac{\partial \ln \Theta(\phi,\lambda)}{\partial \ln \phi} < 0$, X_{ijs}/X_{kjs} is increasing in λ.■

B.2.4 Solving for firm-level variables in general equilibrium

The model can be closed in general equilibrium, under the assumptions made by Chaney (2008). This section discusses how to close the multi-sector open-economy model in general equilibrium. To this end, I make three assumptions following Chaney (2008). First, instead of imposing the firm free-entry condition, the number of firms in each sector is assumed to be proportional to the size of the economy $w_i L_i$.[26] Second, firm profits are distributed back to workers through a global mutual fund. In particular, each worker in country i owns w_i shares of a global mutual fund, which collects and distributes firm profits. Each shareholder gets π per share without transaction costs. Thus, aggregate income of country i equals $w_i (1 + \pi) L_i$, where $\pi = \left(\sum_j^N w_j L_j \right)^{-1} \sum_{i,j}^N \sum_s^S w_j L_j \left[\int_{\epsilon^*_{ijs}} \pi(\epsilon) \, dG(\epsilon) \right]$.

[26] Eaton and Kortum (2002) make a similar assumption by taking the set of goods as exogenously given.

Finally, I assume that $\epsilon_H \to \infty$. Notice that for Prediction 2 to hold, ϵ_H needs to be bounded. Otherwise, the likelihood of a country's exporting is not defined.

Under these assumptions and the Pareto distribution assumption for ϵ, the ideal price index for goods in sector s and country i is expressed as

$$P_{is} = \left[\int_{\omega \in \Omega_{is}} p_{is}(\omega)^{1-\sigma} d\omega\right]^{\frac{1}{1-\sigma}} = \left[\sum_{j}^{N} w_j L_j \left(\frac{\eta}{\Theta_{js}}\right)^{\sigma-1} \frac{\xi}{\xi-(\sigma-1)} \left(\epsilon^*_{jis}\right)^{\sigma-1-\xi}\right]^{\frac{1}{1-\sigma}}.$$

Substituting ϵ^*_{jis} from (7) gives

$$P_{js} = \mu_1 Y_i^{\frac{1}{\xi}+\frac{1}{1-\sigma}} \Delta_i,$$

where $\mu_1 = \frac{1}{\eta}\left(\frac{\xi-(\sigma-1)}{\xi}\right)^{\frac{1}{\xi}} \left(\frac{(1-\phi\lambda\eta)(1-\eta)b_s}{1-\lambda\eta}\right)^{\frac{1}{\xi}+\frac{1}{1-\sigma}}$ and

$$\Delta_j^{-\xi} = \sum_{i}^{N} \frac{Y_i \Theta_{is}^{-\xi}}{1+\pi} \tau_{ijs}^{-(\xi-(\sigma-1))} f_{ij}^{-\frac{\xi-(\sigma-1)}{\sigma-1}},$$

which captures country j's remoteness from the rest of the world. It accounts for the impact of both fixed and variable trade costs j imposes on other countries. Δ_j is positively correlated with the average trade costs for its exporters, and thus P_{js}. Notice that Δ_j is similar to "multilateral resistance" in Anderson and van Wincoop (2003). In their paper, a country's multilateral resistance depends on its trading partners' respective multilateral resistances, while here Δ_j summarizes the effects on the sectoral price of j's trading partners' nominal income, Y_i, and their degrees of labor protection, Θ_{is}, weighted by respective distances from its trading partners.

For sector s in country j, the aggregate demand term $D_{js} = P_{js}^{\sigma-1} b_s Y_j$ is now solved solely as a function of Y_j. I can express the volume of firm-level exports x_{ijs} and the productivity threshold for exporting ϵ^*_{ijs} in terms of j's income and parameters as:

$$\begin{aligned} x_{ijs}\left(\epsilon | \epsilon \geq \epsilon^*_{ijs}\right) &= \mu_2 \Delta_j^{\sigma-1} Y_j^{\frac{\sigma-1}{\xi}} \left(\frac{\Theta_{is}\tau_{ijs}}{\epsilon\eta}\right)^{1-\sigma}, \\ \epsilon^*_{ijs} &= \mu_3 \Delta_j^{-1} Y_j^{-\frac{1}{\xi}} \tau_{ij} f_{ijs}^{\frac{1}{\sigma-1}} \Psi_{is}, \end{aligned} \tag{A-7}$$

where μ_2 and μ_3 are sector-specific constants.[27] Perhaps surprisingly, x_{ijs} is increasing in Δ_j. When country j is far from any country in the world, the relative distance between i and j is shorter. However, the effect of "remoteness" is likely to be dominated by both fixed and variable trade costs (f_{ij} and τ_{ij}), which deter exports and increase the exporting threshold.

Finally, the labor market clears in each country, as long as the homogeneous-good sector is active in all economies.

The sector-level gravity equation derived in general equilibrium will then be used as the spec-

[27] $\mu_2 = b_s \mu_1^{\sigma-1}$ and $\mu_3 = b_s^{\frac{1}{1-\sigma}} \mu_1^{-1}$.

ification for traditional gravity estimation using OLS. Using the assumption that $N_{is} = w_i L_i$, the value of sectoral exports equals $X_{ijs} = w_i L_i \int_{\epsilon^*_{ijs}}^{\epsilon_H} x_{ijs}(\epsilon) G(\epsilon)$. By substituting $x_{ijs}(\epsilon)$ and ϵ^*_{jis} with the corresponding equations in (A-7), and evoking the assumption that $\epsilon_H \to \infty$, X_{ijs} can be expressed as follows:

$$X_{ijs} = \varsigma_s Y_i Y_j \left(\frac{\Delta_j}{\Psi_{is}} \right)^{\xi} \frac{1}{1 - \phi_i \lambda(s) \eta} \tau_{ij}^{-\xi} f_{ijs}^{-\frac{\xi - (\sigma - 1)}{\sigma - 1}}, \tag{A-8}$$

where ς_s is a sector-specific constant.[28] As in a standard gravity equation, X_{ijs} is decreasing in both variable and fixed trade costs, and is increasing in the product of incomes of the trading partners. Importantly, the comparative statics of ϕ and λ for sector-level exports derived in partial equilibrium, summarized in Prediction 2 in the previous section, continue to hold.[29] ■

C Empirical Appendix

This section discusses the derivations of the empirical specifications (5) and (6) in the main text. Following Helpman, Melitz and Rubinstein (2008), I make several parametric assumptions. For variable trade costs, let $\tau_{ijs}^{\sigma-1} \equiv D_{ij}^{\vartheta} e^{-u_{ijs}}$, where D_{ij} represents the distance between country i and country j. $u_{ijs} \sim N(0, \sigma_u^2)$ $\forall s$ captures any (symmetric) unmeasured trade frictions for the country pair at the sector level. For fixed trade costs, let $f_{ijs} \equiv \exp\left(\psi_{ex,i} + \psi_{im,j} + \varphi \psi_{ij} - \upsilon_{ijs}\right)$, where $\upsilon_{ijs} \sim N(0, \sigma_\upsilon^2)$ represents unobserved fixed trade costs for the country pair. $\psi_{ex,i}$ is a measure of observed fixed export costs in i (to any destination); $\psi_{im,j}$ captures the observed trade barrier imposed by j on all importers; ψ_{ij} represents other observed fixed trade costs that are specific to the country pair. Plugging these functions into equation (3) and taking log, I obtain the specification for the second-stage gravity equation as

$$\ln X_{ijs} = \alpha + \beta Labor_i \times FSpec_s + \vartheta \ln D_{ij} + \delta_n \ln N_{is} + \delta_p \ln P_{js} + (F_s + F_i + F_j) + \omega_{ijs} + u_{ijs}, \tag{A-9}$$

where $\alpha = (\sigma - 1) \ln \eta$ is a constant. The explanatory variable of interest $Labor_i \times Spec_s$ is an interaction term between i's degree of labor protection and sector s's firm-specific skill intensity. Together with the exporting country fixed effect F_i, the interaction term is to proxy for $\ln\left(\phi^{-\lambda} \left((1 - \lambda\eta) / (1 - \phi\lambda\eta)\right)^{1-\lambda}\right)$. $F_s = \ln b_s + \ln \widetilde{\lambda}$ is a sector fixed effect; $F_j = \ln Y_j$ is an importing country fixed effect; and $\omega_{ijs} = \ln W_{ijs}$.

The econometric specification for the extensive margin of trade is derived from equation (5). In the model, when there are positive trade flows between i and j in sector s, $W_{ijs} > 0$. I define

[28] $\varsigma_s = \frac{\xi(1-\gamma\eta)\eta^{\xi}(1+\pi)^{-1}}{\xi-(\sigma-1)} b_s^{\frac{\xi}{\sigma-1}} \left[\frac{1}{\eta} \left(\frac{\xi-(\sigma-1)}{\xi} \right)^{\frac{1}{\xi}} \left(\frac{(1-\phi\lambda\eta)(1-\eta)b_s}{1-\lambda\eta} \right)^{\frac{1}{\xi}+\frac{1}{1-\sigma}} \right]^{\xi}$.

[29] However, with the assumption of $\epsilon_H \to \infty$, the prediction of the extensive margin of trade no longer holds. It is important to note that this assumption is needed to close the model in general equilibrium. Empirical evidence for the extensive margin of trade reported later in this paper requires ϵ distributed over a bounded support, regardless of whether $G(\epsilon)$ is Pareto or not.

a latent variable $Z_{ijs} = \left(\epsilon_H/\epsilon^*_{jis}\right)^{\sigma-1}$ such that $W_{ijs} = Z^{\delta}_{ijs} - 1$, where $\delta = \frac{\xi}{\sigma-1} - 1$ (see (9)), and $W_{ijs} > 0$ if and only if $Z_{ijs} > 1$. With ϵ^*_{ijs} solved explicitly in (5), I can express the latent variable as

$$Z_{ijs} = \left(\frac{\epsilon_H P_{js}}{\Psi_{is}\tau_{ij}}\right)^{\sigma-1} \frac{b_s Y_j}{f_{ij}}.$$

This equation serves as the foundation of the first-stage estimation. Using the stochastic fixed and variable trade costs specified above, I obtain the log-linear specification for the first-stage estimation as

$$z_{ijs} \equiv \ln Z_{ijs} = \alpha^z + \beta^z Labor_i \times Spec_s + \chi^z \ln P_{js} + \vartheta^z \ln D_{ij} + \varphi^z \psi_{ij} + \left(F^z_s + F^z_i + F^z_j\right) + e_{ijs},$$

where $e_{ijs} = u_{ijs} + \upsilon_{ijs} \sim N\left(0, \sigma^2_u + \sigma^2_\upsilon\right)$ is an i.i.d. error term;[30] γ^z_s, δ^z_j and δ^z_i are sector, importer and exporter fixed effects, respectively. α^z is a constant term and ψ_{ij} is a measure of observed fixed trade costs between a country pair. F^z_s, F^z_i, and F^z_j stand for sector-, importer-, and exporter-specific constants, repsectively.[31]

With positive trade flows, $W_{ijs} > 0$ and $Z_{ijs} > 1$, implying $\ln Z_{ijs} > 0$. Since Z_{ijs} is unobservable in the data, I use an indicator variable $I_{ijs} \in \{0, 1\}$ to represent $\ln Z_{ijs}$. Specifically, I_{ijs} equals 1 if trade flows are observed from i to j in sector s, and 0 otherwise. I therefore estimate the selection equation by a Probit model as:

$$\begin{aligned} \rho_{ijs} &= \Pr\left(I_{ijs} = 1 | \text{ observed vars.}\right) \\ &= \Phi\left(\alpha^* + \beta^* Labor_i \times Spec_s + \vartheta^* \ln D_{ij} + \delta^*_p \ln P_{js} + \varphi^* \psi_{ij} + \left(F^*_s + F^*_i + F^*_j\right)\right), \end{aligned} \quad \text{(A-10)}$$

where $\Phi(.)$ is the c.d.f. of a unit-normal distribution. All starred coefficients represent the original ones (with superscripts 'z') divided by σ_e, the standard deviation of e. This coefficient transformation is essential if a unit-normal distribution of the error term is assumed.

This Probit estimation serves two purposes. First, it tests Prediction 2. Second, it permits an imputation of $\widehat{\omega}_{ijs}$, a regressor to be included in the second-stage estimation to control for the extensive margin of trade. I use predicted probabilities of exporting $\widehat{\rho}'_{ijs}s$, from estimating (A-10) to impute the estimated latent variable as $\widehat{z}^*_{ijs} = \Phi^{-1}\left(\widehat{\rho}_{ijs}\right)$. In turn, I estimate W_{ijs} according to (A-6) as $\widehat{W}_{ijs} = \left\{\widehat{Z}^{*\delta_z}_{ijs} - 1, 0\right\}$, where $\delta_z = \frac{\sigma_e(\xi-(\sigma-1))}{\sigma-1}$ and $\widehat{Z}^*_{ijs} = \exp \widehat{z}^*_{ijs}$.[32] As a result, the required regressor $\widehat{\omega}_{ijs} = \ln \widehat{W}_{ijs}$ takes form as $\ln\left\{\exp\left(\delta_z \widehat{z}_{ijs}\right) - 1\right\}$.

Since u_{ijs} is correlated with observable trade frictions (d_{ij}) due to the Heckman sample selection, and ω_{ijs} is also correlated with u_{ijs} because $e_{ijs} = u_{ijs} + \upsilon_{ijs}$. According to Helpman Melitz

[30] u_{ijs} and υ_{ijs} are assumed to be uncorrelated. Therefore, u_{ijs} and υ_{ijs} are jointly normal.

[31] $Labor_i \times Spec_s$ reprensents $(1-\sigma)\ln \Psi_{is}$;
$F^z_j = \ln Y_j - \psi_{im,j}$; $F^z_i = -\psi_{ex,i}$;
$F^z_s = \ln b_s$;

[32] σ_e is multiplied in front of the exponent of equation (11) because in the Probit model, all variables, including the predicted value, are divided by σ_e. See Helpman, Melitz and Rubinstein (2008) for details.

and Rubinstein (2008), a consistent estimation of ω_{ijs} requires controlling for firm selection into exporting conditional on positive exports, i.e. $\overline{\omega}_{ijs} = E\left[\omega_{ijs}|I_{ijs}=1\right]$, and the standard Heckman correction for sample selection bias, $E\left[u_{ijs}|I_{ijs}=1\right] = corr\left(u_{ijs}, e_{ijs}\right)\left(\sigma_u/\sigma_e\right)\widehat{\overline{e}}^*_{ijs}$. Both terms depend on $\widehat{\overline{e}}^*_{ijs} = \phi\left(\widehat{z}^*_{ijs}\right) / \Phi\left(\widehat{z}^*_{ijs}\right)$, the inverse Mills' ratio. Thus, the consistent estimate of the latent variable, $\overline{z}^*_{ijs}$ and $\overline{\omega}_{ijs}$ are $\widehat{\overline{z}}^*_{ijs} = \widehat{z}^*_{ijs} + \widehat{\overline{e}}^*_{ijs}$ and $\widehat{\overline{\omega}}^*_{ijs} \equiv \ln\left\{\exp\left(\beta\widehat{\overline{z}}^*_{ijs}\right) - 1\right\}$, respectively. Therefore, I always include both $\widehat{\overline{e}}^*_{ijs}$ and $\widehat{\overline{\omega}}^*_{ijs}$ as regressors when I estimate the second-stage trade flow equation.

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Other references cited in the appendix can be found in the reference list of the main text.

E. Appendix Tables

Table A1: Sector Measures of Firm-specific and Industry-specific Skill Intensity

Rank	PSID Code	Industry Description (SIC 72 3-digit Code)	Firm-specific Tenure Effects		Industry-specific Tenure Effects		Num. Obs.
			Estimate	t stats	Estimate	t stats	
1	377	Petroleum refining (291)	0.329	14.77	0.345	10.47	98
2	127	Cement, concrete, gypsum, and plaster products (324, 327)	0.299	10.23	0.214	9.93	91
3	329	Miscellaneous paper and pulp products (264)	0.219	9.06	0.010	0.36	74
4	188	Office and accounting machines (357 except 3573)	0.214	12.11	-0.004	-0.19	72
5	357	Drugs and medicines (283)	0.205	10.37	0.123	6.27	81
6	289	Beverage industries (208)	0.198	9.61	0.176	8.78	94
7	108	Sawmills, planing mills, and mill work (242, 243)	0.169	9.97	0.203	13.67	278
8	328	Pulp, paper, and paperboard mills (261-263, 266)	0.168	6.82	0.160	6.07	95
9	139	Blast furnaces, steel works, rolling and finishing mills (3312, 3313)	0.155	6.32	0.158	6.51	121
10	319	Apparel and accessories (231-238)	0.147	7.53	0.127	6.37	135
11	168	Miscellaneous fabricated metal products (341, 343, 347, 348, 349)	0.143	8.76	0.167	9.14	192
12	227	Aircraft and parts (372)	0.136	8.16	0.162	9.81	369
13	339	Printing, publishing, and allied industries, except newspapers (272-279)	0.130	11.41	0.137	12.4	438
14	268	Meat products (201)	0.130	11.04	0.156	12.51	223
15	287	Bakery products (205)	0.129	7.9	0.169	11.76	106
16	187	Metalworking machinery (354)	0.124	6.78	0.160	8.66	139
17	369	Not specified chemicals and allied products	0.120	3.77	0.125	4.21	70
18	259	Miscellaneous manufacturing industries (39)	0.120	7.38	0.115	7.27	174
19	239	Scientific and controlling instruments (381, 382)	0.118	5.6	0.149	8.11	71
20	337	Paperboard containers and boxes (265)	0.117	4.48	0.112	4.27	95
21	379	Rubber products (301-303, 306)	0.112	7.51	0.122	8.47	135
22	247	Optical and health services supplies (383, 384, 385)	0.104	5.53	0.065	3.6	95
23	258	Ordnance	0.103	4.11	0.106	4.44	101
24	219	Motor vehicles and motor vehicle equipment (371)	0.103	10.78	0.125	13.18	805
25	208	Electrical machinery, equipment, and supplies, not elsewhere classified (361, 362, 364, 367, 369)	0.100	6.88	0.133	9.3	362
26	317	Yarn, thread, and fabric mills (221-224, 228)	0.091	5.92	-0.002	-0.1	150
27	179	Construction and material handling machines (353)	0.067	2.92	0.090	4.14	166
28	118	Furniture and fixtures (25)	0.066	3.62	0.070	3.56	227
29	189	Electronic computing equipment (3573)	0.060	4.21	0.172	11.13	324
30	197	Machinery, except electrical, not elsewhere classified (355, 356, 358, 359)	0.055	3.96	0.069	4.87	350
31	158	Fabricated structural metal products (344)	0.034	2.44	0.064	5.61	212
32	338	Newspaper publishing and printing (271)	0.012	0.75	0.163	11.31	189
33	228	Ship and boat building and repairing (373)	-0.005	-0.31	0.114	6.96	198
34	387	Miscellaneous plastic products (307)	-0.006	-0.41	0.086	5.97	186
35	119	Glass and glass products (321-323)	-0.026	-0.66	0.011	0.26	83
36	207	Radio, T.V., and communication equipment (365, 366)	-0.169	-6.9	-0.092	-4.27	157

Table A2: Countries' Labor Protection Indices

Rank	Country	Labor Protection	Rank	Country	Labor Protection	Rank	Country	Labor Protection
1	Kazakhstan	1.000	31	Vietnam	0.596	61	Dominican Republic [khn]	0.403
2	Portugal [khn]	0.985	32	Korea, Rep. [khn]	0.595	62	Morocco [kn]	0.392
3	France [khn]	0.957	33	Mali [khn]	0.592	63	Egypt, Arab Rep. [khn]	0.386
4	Russia	0.919	34	Philippines [khn]	0.584	64	Thailand [khn]	0.357
5	Mozambique [khn]	0.898	35	Greece [khn]	0.583	65	China [khn]	0.344
6	Norway [khn]	0.892	36	Burkina Faso [kn]	0.570	66	Uganda [kh]	0.341
7	Georgia	0.867	37	Sri Lanka [khn]	0.568	67	Zimbabwe [khn]	0.334
8	Spain [khn]	0.867	38	Finland [khn]	0.560	68	Australia [khn]	0.330
9	Germany	0.858	39	Argentina [khn]	0.555	69	Hong Kong, China [kh]	0.286
10	Italy [khn]	0.846	40	Denmark [khn]	0.550	70	Singapore [khn]	0.266
11	Sweden [khn]	0.810	41	Bulgaria	0.536	71	Pakistan [khn]	0.254
12	Peru [khn]	0.795	42	Tanzania [k]	0.528	72	Uruguay [khn]	0.253
13	Ukraine	0.794	43	Madagascar [kn]	0.527	73	Israel [khn]	0.213
14	Latvia	0.789	44	Croatia	0.523	74	Kenya [khn]	0.179
15	Poland	0.764	45	Romania [khn]	0.519	75	Mongolia	0.150
16	Slovenia	0.747	46	Belgium [khn]	0.509	76	United States [khn]	0.102
17	Mexico [khn]	0.743	47	South Africa [khn]	0.500	77	Zambia [khn]	0.086
18	Venezuela, RB [khn]	0.739	48	Brazil [khn]	0.500	78	United Kingdom [khn]	0.071
19	Kyrgyzstan	0.728	49	Lebanon	0.491	79	Canada [khn]	0.065
20	Netherlands [khn]	0.716	50	Turkey [khn]	0.482	80	Malawi [khn]	0.063
21	Tunisia [khn]	0.690	51	Japan [khn]	0.475	81	New Zealand [khn]	0.049
22	Armenia	0.682	52	Switzerland [khn]	0.456	82	Jamaica [khn]	0.024
23	Senegal [khn]	0.676	53	Colombia [khn]	0.451	83	Nigeria [kn]	0.023
24	Lithuania	0.675	54	Bolivia [khn]	0.446	84	Malaysia [khn]	0.000
25	Ecuador [khn]	0.661	55	Chile [khn]	0.432			
26	Slovakia	0.651	56	Austria [khn]	0.429			
27	Panama [khn]	0.629	57	Ireland [khn]	0.427			
28	Hungary [hn]	0.613	58	Czech Rep [k]	0.421			
29	Indonesia [khn]	0.602	59	India [khn]	0.413			
30	Jordan [khn]	0.601	60	Ghana [khn]	0.406			

Labor protection index is a linear combination of the "Employment Law" index and "Collective Relations" index from Botero et al. (2004), with weights estimated using principle component analysis. Superscripts 'k' and 'h' indicate that the country has both physical capital and human capital endowments measures from Caselli (2005). Superscript 'n' indicates that the country has the measure for natural resources endowment from the World Bank (1997). See Appendix B for detailed description of these measures.

Table A3: Summary Statistics of Sector-level Variables (SIC87 3-digit)

	Min	10th	25th	50th	75th	90th	Max	Std. Dev	No. Obs
Firm-Spec	0.000	0.261	0.317	0.410	0.470	0.656	1.000	0.180	62
Capital Intensity	2.306	3.012	3.666	4.022	4.575	5.369	6.773	0.860	118
Skill Intensity	-2.250	-1.832	-1.672	-1.377	-1.190	-0.888	-0.400	0.371	118
Material Intensity	2.903	3.617	3.912	4.251	4.839	5.311	7.424	0.717	118
Sales Volatility	0.084	0.124	0.141	0.157	0.187	0.225	0.336	0.044	118
Gross Job Flows	7.534	12.410	16.247	18.466	22.264	23.694	38.731	5.110	118
Contract Dep.	0.331	0.640	0.794	0.951	0.973	0.987	0.998	0.155	118
Ext. Fin. Dep.	-0.450	-0.025	0.110	0.240	0.450	0.770	0.960	0.296	118

Note: 118 of 140 sectors suffice to cover all SITC (rev. 2 4-digit) sectors in Feenstra's (2000) dataset of trade flows. Regressions in this paper include 62 of the 118 sectors, covering more than 60 percent of global exports in 1995.

Table A4: Correlation between Sector-level Variables (SIC87 3-digit)

	Firm-Spec	Capital Intensity	Skill Intensity	Material Intensity	Sales Volatility	Gross Job Flows	Contract Dep.
Capital Intensity	0.316						
Skill Intensity	0.073	0.143					
Material Intensity	0.438	0.758	-0.014				
Sales Volatility	-0.062	-0.111	0.002	-0.088			
Gross Job Flows	-0.203	-0.630	0.028	-0.388	0.277		
Contract Dep.	-0.238	-0.198	0.464	-0.388	0.011	0.283	
Ext. Fin. Dep.	-0.313	-0.137	0.263	-0.194	0.457	0.172	0.244

Table A5: Summary Statistics of Country Variables

	Min	10th	25th	50th	75th	90th	Max	Std. Dev	No. Obs.
Labor Protection	0	0.102	0.372	0.527	0.686	0.858	1	0.250	84
ln(real GDP/L)	6.448	7.097	8.105	8.880	9.872	10.187	10.817	1.097	82
ln(H/L)	0.092	0.469	0.594	0.827	1.005	1.088	1.224	0.270	61
ln(K/L)	6.054	7.554	8.984	10.290	11.604	11.813	11.996	1.611	65
ln(Resource/L)	6.666	7.197	7.564	8.298	8.981	9.482	10.912	0.983	62
ln(Credit/GDP)	-3.326	-2.433	-1.607	-0.974	-0.305	0.014	0.509	0.913	69
Judicial Quality	0.240	0.357	0.444	0.543	0.770	0.904	0.972	0.207	73

Table A6: Correlation between Country Variables

	Labor Protection	ln(real GDP/L)	ln(H/L)	ln(K/L)	ln(Resource/L)	ln(Credit/GDP)
ln(real GDP/L)	0.101	1				
ln(H/L)	-0.072	0.834	1			
ln(K/L)	0.124	0.971	0.860	1		
ln(Resource/L)	-0.007	0.666	0.632	0.660	1	
ln(Credit/GDP)	0.011	0.684	0.580	0.678	0.326	1
Judicial Quality	-0.015	0.838	0.773	0.812	0.549	0.682

Table A7: Sensitivity Analysis

This table repeats the analysis for column (4) in Table 4 over different subsamples. Only the second-stage regression results, estimated using maximum likelihood, are reported.

Dependent Variable: (ln) bilateral exports from i to j by sector: $\ln(X_{ijs})$								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample	OECD	Non-OECD	Non Oil Exporters	Exclude Oil (SIC = 291)	Exclude Top 2 & Bottom 2 Sectors	Exclude Insignificant Estimates of Firm-Spec	Use Production Workers Only to Estimate Firm-Spec	Use Trade Data from 2000
Labor x Firm-Spec.	0.671**	3.443**	0.679**	0.625**	0.660**	0.821**	0.394**	0.841**
	(3.54)	(5.23)	(3.48)	(3.21)	(3.04)	(3.45)	(3.56)	(4.35)
Labor x Industry-Spec.	-0.228	-0.590	0.150	-0.056	0.212	0.072	-0.219	-0.293
	(-1.11)	(-0.55)	(0.65)	(-0.25)	(0.88)	(0.31)	(-1.23)	(-1.27)
# exporters	23	34	56	57	57	57	57	57
# clusters	1926	1547	2844	2849	2952	2831	2940	2849
# observations	54253	21716	75897	74807	74307	71173	73286	78382

Controls include exporter, importer, and sector fixed effects; Interactions between 1) capital endowment and capital intensity; 2) human capital endowment and human capital intensity; 3) resource endowment and material intensity; 4) importers' CPI and sector dummies; and 5) 9 trade frictions variables listed in Table 5.
z-statistics, based on standard errors are clustered by importer-exporter pair, are reported in parentheses.
**, * and † denote 1%, 5% and 10% significance levels respectively.
See Appendix B for detailed description of the variables

Table A8: Labor Protection and Bilateral Export Volumes (Controlling for Exporting Country Characteristics)

This table repeats the analysis for column (4) in Table 4, including interaction terms between different country characteristics and specific skill intensity of the sector. Only the second-stage regression results, estimated using maximum likelihood, are reported.

Dependent Variable: (ln) bilateral exports from i to j by sector: $\ln(X_{ijs})$						
	(1)	(2)	(3)	(4)	(5)	(6)
Exporters' Characteristics:	Income	Human Capital	Capital	Judicial Quality	All (w/ sales vol.)	All (w/ job flows)
Labor x Firm-Spec.	0.677**	0.345†	0.799**	0.556**	0.689**	0.445*
	(3.46)	(1.78)	(4.00)	(2.86)	(3.22)	(2.10)
Labor x Industry-Spec.	0.161	0.152	0.157	0.171	0.231	0.342
	(0.70)	(0.66)	(0.68)	(0.75)	(1.00)	(1.40)
Labor x Volatility					-0.249	-0.025**
					(-0.60)	(-3.49)
ln(rgdp per cap.) x Spec.	-0.293**				1.186**	1.195**
	(-4.00)				(4.34)	(4.40)
ln(H/L) x Spec		-1.674**			-1.688**	-1.704**
		(-5.16)			(-4.68)	(-4.72)
ln(K/L) x Spec			-0.323**		-1.118**	-1.120**
			(-4.71)		(-4.86)	(-4.90)
Judicial x Spec				-1.292**	0.640	0.639
				(-3.69)	(1.37)	(1.38)
# exporters	57	57	57	56	56	56
# clusters	2852	2852	2852	2840	2777	2777
# observations	75969	75969	75969	75851	72205	72205

Controls include exporter, importer, and sector fixed effects; Interactions between 1) capital endowment and capital intensity; 2) human capital endowment and human capital intensity; 3) resource endowment and material intensity; 4) importers' CPI and sector dummies; and 5) 9 trade frictions variables listed in Table 5.
z-statistics, based on standard errors are clustered by importer-exporter pair, are reported in parentheses.
**, * and † denote 1%, 5% and 10% significance levels respectively.
See Appendix C for detailed description of the variables

Table A9: Labor Protection and Bilateral Export Volumes (Controlling for Sector Characteristics)

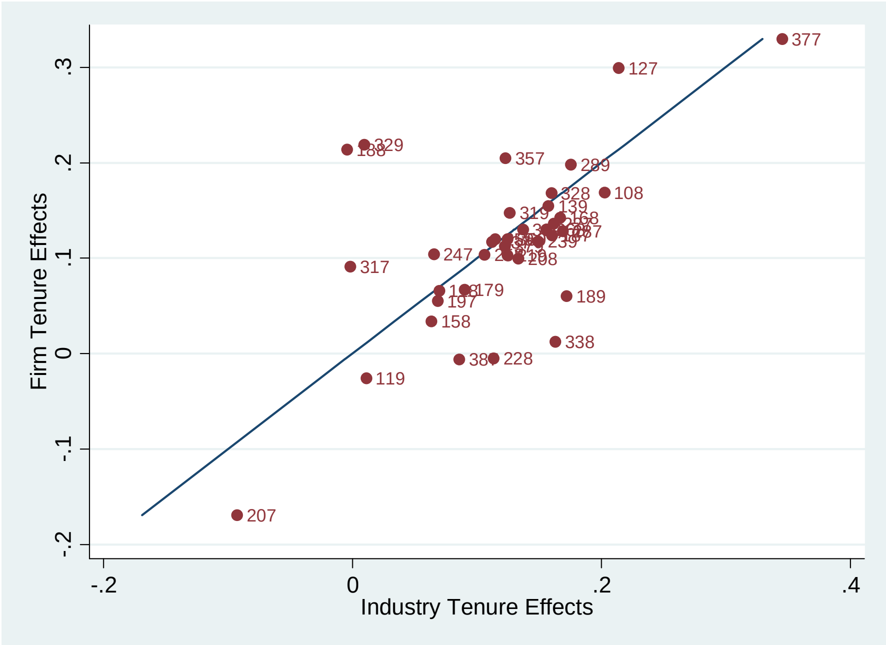
This table repeats the analysis for column (4) in Table 4, including interaction terms between the country's index of labor protection and various sector characteristics. Only the second-stage regression results, estimated using maximum likelihood, are reported.

Dependent Variable: (ln) bilateral exports from i to j by sector: $\ln(X_{ijs})$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sectoral Characteristics:	VA	Skill Intensity	Capital Intensity	Contract Depend.	Ext. Fin. Dep.	TFP Growth	All
Labor x Firm-Spec.	0.682**	0.802**	0.539**	0.997**	0.394*	0.741**	0.871**
	(3.46)	(4.03)	(2.73)	(4.96)	(2.14)	(3.72)	(4.68)
Labor x Industry-Spec.	0.182	0.047	0.15193	0.076	0.290	0.047	-0.168
	(0.79)	(0.23)	(0.67)	(0.34)	(1.25)	(0.20)	(-0.85)
Labor x Value added	0.267						-1.144**
	(1.24)						(-4.51)
Labor x Skill Intensity		0.196**					-0.008
		(2.46)					(-0.11)
Labor x Capital Intensity			0.144**				0.174**
			(2.91)				(2.97)
Labor x Contract Dep.				1.647**			2.484**
				(5.68)			(7.22)
Labor x Ext. Fin. Dep.					-0.246**		-0.250*
					(-2.34)		(-2.25)
Labor x TFP Growth						-5.914**	-11.556**
						(-4.94)	(-7.28)
# exporters	57	57	57	56	56	56	56
# clusters	2852	2852	2852	2777	2777	2852	2777
# observations	75969	75969	75969	72208	72208	75969	72208

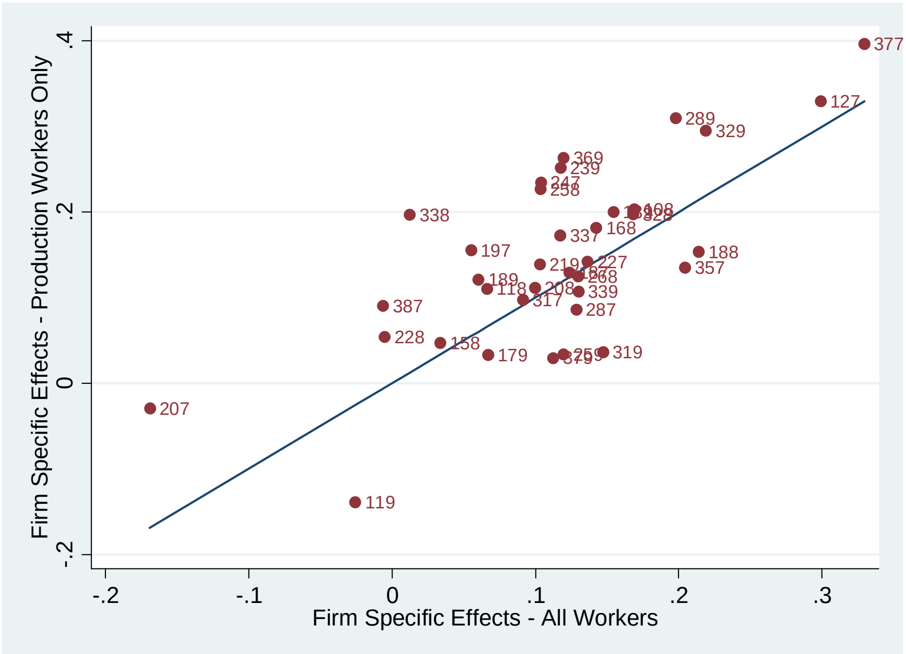
Controls include exporter, importer, and sector fixed effects; Interactions between 1) capital endowment and capital intensity; 2) human capital endowment and human capital intensity; 3) resource endowment and material intensity; 4) importers' CPI and sector dummies; and 5) 9 trade frictions variables listed in Table 5.
z-statistics, based on standard errors are clustered by importer-exporter pair, are reported in parentheses.
**, * and † denote 1%, 5% and 10% significance levels respectively.
See Appendix B for detailed description of the variables

Figure A1: Correlation between Firm-specific and Industry-specific Tenure Effects



An industry's firm-specific tenure effects are obtained by estimating specification (13). An industry's firm-specific tenure effects are obtained by estimating specification (13), but with firm-specific tenure being replaced by industry-specific tenure. Corr. = 0.615

Figure A2: Correlation between Firm-specific Tenure Effects (Using all workers and production workers only)



Corr. = 0.713