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# Financial Development and Export Concentration

## Abstract

This paper analyzes the impact of financial development on export concentration. I incorporate credit constraints into a trade model with heterogeneous exporters and endogenous quality choice. The model predicts that financial development increases innovation activity and export shares of larger firms. In contrast, a model variant in which exporters have to finance production costs instead of investments suggests a negative impact of financial development on export concentration as smaller firms benefit more from relaxing credit constraints. These opposing predictions are tested using export data for 70 countries over the period 1997-2014 and exploiting variation in external finance dependence across sectors. I find strong support for the predictions of the investment model that higher financial development increases export concentration among top firms, especially in sectors with high external finance dependence and large scope for quality differentiation. This effect is also present within firms: financial development induces exporters to skew their sales towards the top performing products. I finally show in a counterfactual analysis that financial frictions are quantitatively important to explain the variation in the skewness of exports across countries and sectors.

JEL-Codes: F120, F140, G320, L110.

Keywords: international trade, superstar firms, export concentration, external finance, credit constraints, financial development, innovation.

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# 1 Introduction

Trade flows are highly skewed towards large firms.[1] The observed concentration of exports varies substantially across countries and sectors. For example, the top 25% exporters account for 44% of Colombian export sales of meat products in 2012. In the same year, the share of top firms in Spanish rubber exports is 91%.[2] Identifying the determinants of export concentration is important for our understanding of the underlying frictions in international trade. It is further crucial for the design of trade policies that aim to promote exporting and the diversification of sales. Fernandes et al. (2016) show that larger and more developed countries have a stronger concentration of exports towards top firms, which points to the presence of frictions and misallocation preventing growth opportunities. However, the drivers of the variation in export concentration across countries and sectors are not fully understood.

Financial market imperfections have been identified as one important reason for frictions in international trade and misallocation across firms. A country's financial development increases trade flows, especially in sectors that are more dependent on external finance (Manova, 2013). Firm-level evidence further documents negative effects of financial frictions on the decision to export and on the sales volume of existing exporters (Berman and Héricourt, 2010; Minetti and Zhu, 2011; Muûls, 2015; Paravisini et al., 2015). While a positive relationship between financial development and the margins of trade is well established, the impact of credit frictions on export concentration has received less attention.

This paper aims to fill this gap by analyzing how credit frictions shape the variation in export concentration across countries and sectors. The relation between financial development and export concentration depends on the type of credit constraints and on the question which margin of trade is affected. First, consider the intensive margin of existing firms. If smaller exporters are more credit constrained, then better financial institutions allow them to increase sales relative to larger and less constrained firms resulting in lower export concentration.[3] Second, the opposite relation holds if financial frictions especially prevent investments and growth opportunities of larger exporters. Third, if financial development positively affects the extensive margin of trade, then export concentration will decrease through entry of smaller firms.

[1] Freund and Pierola (2015, 2020) and Ciliberto and Jäkel (2021) document the dynamics of so-called "superstar exporters" that account for a substantial part of export growth. Earlier studies show the high skewness of exports for a set of European countries (Mayer and Ottaviano, 2008), the U.S. (Bernard et al., 2009), and France (Eaton et al., 2011).

[2] These examples are from the World Bank Exporter Dynamics Database, see Section 3.2 for more details.

[3] On the one hand, Beck et al. (2005) show that credit constraints are negatively related with firm size. On the other hand, Feenstra et al. (2014) provide theory and evidence that the strength of credit constraints increases in a firm's export share due to a longer shipping time compared to domestic sales.

I incorporate these different mechanisms into a two-country and multi-sector trade model with heterogeneous exporters and credit constraints. Firms differ in their productivity and offer differentiated products with endogenous price-cost markups in a monopolistic setting following Melitz and Ottaviano (2008). Credit frictions arise from imperfect financial contractibility between external investors and firms in the spirit of Manova (2013), where sectors are assumed to differ in their need of external finance and in the possibility to offer collateral in case of default. To analyze the impact of financial development on export concentration, I consider two different types of credit frictions. First, I allow for endogenous quality choice of firms building on Antoniades (2015), and additionally assume that a fraction of these innovations requires external financing. In this case, higher financial development increases the concentration of exports among larger firms, especially in sectors that are more dependent on external finance and have lower asset tangibility. While better financial institutions reduce credit constraints, and hence increase investments for all active exporters, the return of additional innovations is relatively larger for the most productive firms and thus positively contributes to the skewness of sales. Second, I contrast this result with a model variant, in which firms have to finance a fraction of production costs instead of innovation costs. This implies that especially less productive and smaller exporters are credit constrained and hence benefit relatively more from financial development leading to lower export concentration.

The high concentration of export sales is closely related to the dominant presence of multi-product firms in international trade.[4] To account for this fact, I extend the theoretical analysis to multi-product exporters that face cost heterogeneity within their product portfolio (Eckel and Neary, 2010; Mayer et al., 2014, 2021). Building on the model with endogenous quality choice, I consider credit constraints that restrict access to external finance for product-specific innovations. In this case, financial development leads to an additional positive effect on within-firm concentration as exporters skew their sales towards the better performing varieties. While these results are based on the intensive margin of trade, concerning the sales distribution across and within firms, I further show that both model variants predict a positive impact of financial development on the number of exporting firms (the extensive margin), and on aggregate export flows consistent with the existing trade and finance literature.[5] However, the higher concentration of sales towards top firms in the investment model implies a positive impact of financial development on average exports, while the opposite holds in the case of external financing of production costs caused by the relative gain of smaller exporters.

[4]See Irlacher (2022) for a literature review on multi-product firms in international trade.

[5]See Manova (2008, 2013) and Leibovici (2021), among others. Manova et al. (2015) and Kohn et al. (2021) provide reviews of the literature on trade and finance.

To guide the empirical analysis, I show that the opposing effects of financial development are reflected in two measures of export concentration: the share of top exporters in total exports and a Herfindahl-Hirschman Index (HHI) of export sales by sector and destination. The advantage of the latter variable is that it can be decomposed into an extensive margin capturing changes in the number of exporters and an intensive margin measuring the skewness of sales. I use information on the share of top 25% exporters and the HHI from sectoral trade data for 70 countries over the period 1997-2014 of the World Bank Exporter Dynamics Database. This data source is combined with countries' financial development and information on financial vulnerability across 27 sectors. As common in the corporate finance literature, I use the ratio of private credit to GDP as a proxy of financial development at the country level. Following Rajan and Zingales (1998) and Manova (2013), a sector's financial vulnerability is measured by external finance dependence and asset tangibility. These measures are time-invariant, based on U.S. data, and reflect technological reasons why sectors differ in their need of external credit. The bilateral structure of the trade data further allows to control for different sets of sector- and country-fixed effects.

Consistent with both model variants, the results show that higher financial development in the exporting country increases the number of exporters, which reduces the HHI through the extensive margin. However, both the share of top exporters and the intensive margin of the HHI increase with better financial institutions, especially in sectors with high external finance dependence and low asset tangibility. This result is in line with the prediction of the investment model, and is also confirmed when analyzing the impact of financial development on within-firm export concentration. To do so, I exploit firm-level export data, which is available for a subset of 10 countries, and compute the share of top 3 products in total firm exports by sector and destination, as well as a firm-level analogue of the HHI measuring the concentration of exports across products of the same exporter. This allows to focus on within-firm changes in export concentration while controlling for differences across firms.

The crucial theoretical mechanism to explain these results is the interaction between endogenous markups and financing of innovations. With endogenous adjustment of markups, especially more productive firms benefit from financial development through higher innovation activity leading to stronger export concentration. I present additional supportive evidence for this channel. The positive effect of financial development on export concentration is (i) stronger in sectors with larger scope for quality differention (both within and across firms) using measures from the quality and trade literature (Kroszner et al., 2007; Kugler and Verhoogen, 2012; Manova and Zhang, 2012), (ii) associated with an increase of average exports, and (iii) within firms more pronounced for less productive exporters. The reason for the the latter result is that less productive firms face a higher price elasticity of demand

and thus react stronger to changes in credit costs by shifting resources within the product portfolio. In contrast, I show that alternative theoretical mechanisms cannot be reconciled with the evidence including models with constant elasticity of substitution (CES) preferences and external financing of fixed and/or variable export costs (Manova, 2013; Chaney, 2016). In these models, low productivity firms benefit relatively more from relaxing credit constraints, no matter whether the intensive or the extensive margin is considered.

I show that the estimated effects remain robust when addressing potential endogeneity concerns of financial development and accounting for alternative determinants of export concentration including variation in physical and human capital accumulation, differences in total factor productivity, and the quality of legal systems. Additionally, the focus on export concentration towards large firms raises the concern that results are driven by credit conditions in the destination rather than the origin country of exports, as multinational corporations benefit from the provision of credit through foreign affiliates (Manova et al., 2015; Bilir et al., 2019; Eppinger and Smolka, 2020). Consistent with these studies, I show that importer's financial development has a positive impact on export concentration, while the effect of exporter's credit conditions remains stable. The estimates are also robust when using alternative measures of export concentration, such as the share of top 5% exporters, and when accounting for the role of trade intermediation (Chan, 2019).

Based on my estimates, I finally show that credit frictions are quantitatively important drivers of the variation in export concentration. First, in a counterfactual analysis I compute the predicted changes of export concentration measures that are driven by changes in financial development over time. I show that these counterfactual changes have high predictive power to explain actual changes in export concentration, both across and within firms, while I do not find a significant impact of predicted changes due to factor accumulation including physical, human and natural capital. Second, moving from low to high financial development, measured as a shift from the 25th percentile to the 75th percentile of the private credit to GDP ratio in the estimating sample, leads to substantial differences of export concentration measures depending on the sectoral exposure to credit frictions. Third, I show that these counterfactual changes are associated with sizeable effects on average exports and aggregate exports in line with the investment model.

In addition to the studies cited above, this paper relates to four different strands in the literature. First, financial frictions have been identified as an important source that drives firm heterogeneity in international trade. In a model with financial frictions and endogenous investments at the entry stage, Bonfiglioli et al. (2019) show that financial development increases the sales dispersion across firms. The authors provide evidence for this channel using standard deviation measures of industries and countries exporting to the U.S. While focusing

on measures of export concentration across and within firms, I provide a complementary but distinct mechanism based on endogenous markups and endogenous quality choice after firm entry. Consistent with this channel, Altomonte et al. (2021) build a model with variable markups, where firms invest in intangible assets and differ in their exposure to financial frictions. By exploiting a liquidity shock on French firms, the authors show that heterogeneity in financial frictions is an important source of variation in investments and markups.

Second, this paper complements an influential literature showing negative effects of credit frictions on quality differentiation in international trade. Crinò and Ogliari (2017) find that differences in credit constraints across countries and across sectors explain the geographical variation of quality differentiation. Building on a model with endogenous quality choice (Kugler and Verhoogen, 2012) and credit frictions (Manova, 2013), the authors estimate how the quality channel shapes sectoral trade flows and export prices without considering firm-level effects and the implications for the skewness of sales. Related, Fan et al. (2015) and Ciani and Bartoli (2020) provide theory and firm-level evidence that credit constraints reduce quality differentiation among exporters. Eckel and Unger (2022) analyze differential implications of credit frictions on prices, productivity measures and welfare when both quality innovations and process innovations are taken into account. These studies build on trade models with CES preferences and hence do not capture endogenous adjustments of markups.

Third, understanding the rise of superstar firms and market concentration has received increasing attention to explain the development of markups and the observed decline in the labor share (Autor et al., 2020; De Loecker et al., 2020). This literature is complemented by studies analyzing import concentration and import competition as a driver behind national concentration (Amiti and Heise, 2022; Bonfiglioli et al., 2021). Consistent with my findings on export concentration, Bonfiglioli et al. (2021) show that reductions in the concentration of U.S. imports are driven by the extensive margin, while the intensive margin is the dominant force behind a higher skewness of sales towards top firms. However, the authors do not identify the causes behind these adjustments.

Finally, this study adds to the literature on economic distortions and resource misallocation (Hsieh and Klenow, 2009; Midrigan and Xu, 2014; Buera et al., 2011; Bento and Restuccia, 2017) by highlighting that credit frictions prevent especially larger firms from export growth. Berthou et al. (2020) provide theory and evidence that, in the presence of market distortions, export expansion reallocates activity towards more productive firms.

The paper is structured as follows. Section 2 presents the theoretical analysis of credit frictions and export concentration. The theoretical predictions are empirically tested in Section 3, and Section 4 discusses robustness checks. Section 5 shows the quantitative importance of the estimated effects, and finally, Section 6 concludes.

# 2 Trade model with credit frictions and innovation

This section introduces a two-country and multi-sector model of heterogeneous exporters with endogenous quality choice and financial frictions that vary across countries and sectors. After discussing the preference structure, I analyze the impact of credit constraints that are either related to the financing of innovation costs or production costs. Depending on the type of credit frictions, I derive opposing testable predictions on the relation between financial development and export concentration. Finally, I present additional implications of the framework and compare them to alternative theoretical channels.

## 2.1 Preferences

The economy is populated by $L$ consumers, each supplying one unit of labor, and consists of different sectors denoted by $s \in S$. Consumers derive utility from a Cobb-Douglas aggregate over sector-specific consumption indices $U_s$:

$$U = \sum_{s=0}^{S} \nu_s \ln U_s, \tag{1}$$

where $U_0 = q_0^c$ represents the consumption of a homogenous good, and $\nu_s \geq 0$ denotes the income share of sector $s$, with $\sum_{s=0}^{S} \nu_s = 1$. In each sector $s > 0$, preferences are defined over a continuum of differentiated varieties indexed by $i \in \Omega_s$:

$$U_s = \alpha \int_{i \in \Omega_s} q_{is}^c di + \beta \int_{i \in \Omega_s} z_{is} q_{is}^c di - \frac{1}{2}\gamma \int_{i \in \Omega_s} (q_{is}^c)^2 di - \frac{1}{2}\eta \left( \int_{i \in \Omega_s} q_{is}^c di \right)^2, \tag{2}$$

where $q_{is}^c$ is the consumption of a variety $i$ in sector $s$, and the quality level of each variety is given by $z_{is}$. The positive preference parameters $\alpha$ and $\eta$ determine the degree of substitution between differentiated products and the homogenous good, while the parameter $\gamma$ reflects the degree of differentiation between varieties.[6] The importance of quality differentiation is governed by the parameter $\beta$. If $\beta = 0$, there is no quality differentiation and consumers only care about consumption levels. The inverse demand function for a differentiated variety in sector $s$ is:

$$p_{is} = \alpha - \gamma q_{is}^c + \beta z_{is} - \eta Q_s^c, \tag{3}$$

where $Q_s^c = \int_{i \in \Omega_s} q_{is}^c di$ denotes total consumption of differentiated varieties in sector $s$. According to Equation (3), a higher quality level shifts demand upwards for any given price.

[6] This preference structure is based on Foster et al. (2008) and Antoniades (2015) who consider only one differentiated sector.

The homogenous good sector is characterized by perfect competition where one unit of labor is required to produce one unit of output. The price is normalized ($p_0 = 1$), implying a unit wage in the economy. As a share $\nu_s$ of labor income is spent on differentiated goods in a sector, $L_s = \nu_s L$, direct demand of one product can be written as follows:

$$q_{is} = L_s q_{is}^c = \frac{\alpha L_s}{\gamma + \eta M_s} - \frac{L_s}{\gamma}\left(p_{is} - \beta z_{is}\right) + \frac{L_s}{\gamma}\frac{\eta M_s}{\gamma + \eta M_s}\left(\overline{p}_s - \beta \overline{z}_s\right), \tag{4}$$

where $M_s$ denotes the number of differentiated products that are actually consumed as a subset $\Omega_s^* \in \Omega_s$. The averages of prices and quality levels in a sector are defined as $\overline{p}_s = \frac{1}{M_s}\int_{i\in\Omega_s} p_{is} di$, and $\overline{z}_s = \frac{1}{M_s}\int_{i\in\Omega_s} z_{is} di$. From Equation (4) it follows that the maximum price at which demand falls to zero ($q_{is} = 0$) is given by $p_s^{max} = \frac{\alpha\gamma + \eta M_s(\overline{p}_s - \beta\overline{z}_s)}{\gamma + \eta M_s}$. Combining this with Equation (4) leads to the direct demand function:

$$q_{is} = \frac{L_s}{\gamma}\left(p_s^{max} - p_{is} + \beta z_{is}\right). \tag{5}$$

The term $p_{is} - \beta z_{is}$ can be interpreted as the quality-adjusted price of a product. Firms take the demand function (5) into account while treating sectoral averages of prices, quantities and quality levels as given.

## 2.2 Innovation and exports under credit constraints

To analyze the export behavior of firms, I consider a two-country model, where countries are indexed by $j \in o, d$. Following Melitz and Ottaviano (2008), potential producers of differentiated varieties face two decisions. The first is whether to enter in a differentiated sector. At this entry stage, firms pay sunk costs $f_E$ and draw a cost parameter $c$ from a common distribution $G(c)$ with support on $[0, c_M]$. After entry, firms face monopolistic competition and decide on price setting as well as on quality levels.

I consider the export decision of a firm in sector $s$ selling from origin country $o$ to destination $d$. The production costs of exports are given by $C_{sod}(c) = \tau_{od} c q_{sod}(c)$, where $\tau_{od} > 1$ denotes iceberg trade costs and $c$ is the marginal production cost.[7] Besides that, I assume convex costs for quality innovations given by $Z_{sod}(c) = \delta z_{sod}(c)^2$, with technology parameter $\delta > 0$. This approach to allow for endogenous innovations in a trade model with firm heterogeneity is closely related to Antoniades (2015) and Eckel and Unger (2022).[8]

[7] For the sake of notational simplicity, I neglect the firm's index $i$ in the following analysis.

[8] Eckel and Unger (2022) analyze the impact of credit frictions in a model with convex costs for both process and quality innovations and CES preferences. Regarding linear demand and innovation costs, I follow Antoniades (2015) who further assumes that quality upgrades increase marginal production costs. For simplicity, I abstract from this assumption, which has no impact on the model's main implications.

As investments typically occur before revenues are realized, I assume that firms have to finance a fraction $d_s \in (0,1)$ of investment costs $Z_{sod}(c)$ by external credit. This share varies across sectors and hence captures differences in external finance dependence driven by factors exogenous to the firm, e.g. technological differences in the innovation process. In contrast, I initially assume that production costs can be financed from cash flows of current operations. Section 2.3 discusses the implications of a model variant in which a share of production costs has to be financed externally. I introduce financial contracting and credit frictions in the spirit of Manova (2013). To meet financing needs of investments, firms make a take-it-or-leave-it offer to an external investor at the beginning of the period. The financial contract includes the amount the firm has to borrow and the repayment $F(c)$ if the contract is enforced. At the end of the period, export sales are realized and the firm repays the credit amount.[9]

The probability that an investor will receive the repayment differs across countries with $\lambda_j \in (0,1)$, which captures the development of financial institutions. In case of default, the firm will not repay the borrowed amount, while the investor can only seize a part of innovation costs as collateral $T_{sod}(c) = t_s Z_{sod}(c)$, with $t_s < d_s$. This implies that a share of investments materializes as tangible assets, such as machinery and equipment. Importantly, this share is assumed to be lower than the fraction of innovation costs that is financed externally implying losses for investors in case of default.[10] A firm with cost $c$ from sector $s$ and country $o$ maximizes export profits by choosing the export price and the quality level:

$$\max_{p,z} \pi_{sod}(c) = [p_{sod}(c) - \tau_{od}c]\, q_{sod}(c) - (1-d_s)\, Z_{sod}(c) - \lambda_o F(c) - (1-\lambda_o)\, T_{sod}(c), \quad (6)$$

$$\text{s.t. } A_{sod}(c) \equiv [p_{sod}(c) - \tau_{od}c]\, q_{sod}(c) - (1-d_s)\, Z_{sod} \geq F(c), \quad (7)$$

$$B_{sod}(c) \equiv -d_s Z_{sod}(c) + \lambda_o F(c) + (1-\lambda_o)\, T_{sod}(c) \geq 0. \quad (8)$$

Firms take into account the demand function in Equation (5). The first term on the right-hand side of Equation (6) captures operating profits, while the fraction $(1-d_s)$ of innovation costs is financed internally. Equation (7) is a liquidity constraint stating that the repayment amount of the firm cannot exceed operating profits net of internally financed innovation costs. The participation constraint of the investor (8) ensures that the expected net return from lending $B_{sod}$ is weakly larger than the outside option, which is normalized to zero.

[9] I abstract from different sources of external credit. Cho et al. (2019) and Unger (2021) analyze the selection of heterogeneous exporters into bond and bank finance.

[10] Manova (2013) assumes that investors can seize a fraction of fixed entry costs $f_E$ as collateral in case of default. For the sake of analytical tractability, I express the collateral as a share of innovation costs. Both approaches follow the idea that a fraction of investments is reflected in tangible assets. I discuss the role of fixed entry costs for the main implications of the model in Section 2.3.6 and in the Web Appendix.

Following Manova (2013), I assume competitive credit markets such that investors receive a zero expected net return ($B_{sod} = 0$). If the liquidity constraint (7) does not bind, profit maximization implies that firms set the unconstrained export price:

$$p_{sod}^{u}(c) = \frac{1}{2}\left[p_{sd}^{max} + \tau_{od}c + \beta z_{sod}^{u}(c)\right], \tag{9}$$

where the quantity is $q_{sod}^{u}(c) = \frac{L_{sd}}{2\gamma}\left[p_{sd}^{max} - \tau_{od}c + \beta z_{sod}^{u}(c)\right]$, and the unconstrained quality level is given by:

$$z_{sod}^{u}(c) = \frac{\beta L_{sd}}{4\gamma\delta - \beta^2 L_{sd}}\left(p_{sd}^{max} - \tau_{od}c\right). \tag{10}$$

Similar to Antoniades (2015), I impose a parameter restriction that innovation costs are sufficiently convex to ensure positive quality levels.

**Condition 1** *$z_{sod}^{u}(c) > 0$ if $4\gamma\delta > \beta^2 L_{sd}$.*

Note that, ceteris paribus, the incentive to innovate is higher for more productive firms, and increases in the market size of the destination country $L_{sd}$, consistent with evidence on quality-based market segmentation (Manova and Zhang, 2012; Flach, 2016).

I now focus on the role of credit constraints. Combining Equations (7) and (8) leads to the following financing condition:

$$\left[p_{sod}(c) - \tau_{od}c\right] q_{sod}(c) \geq (1 + \theta_{so})\,\delta\left(z_{sod}(c)\right)^2. \tag{11}$$

To obtain external credit, operating profits have to be weakly larger than effective investments costs. The latter depend positively on the strength of credit frictions, captured by $\theta_{so} \equiv \frac{1-\lambda_o}{\lambda_o}(d_s - t_s)$. This parameter decreases in the repayment probability $\lambda_o$ reflecting better financial institutions, and increases in the share of required external finance compared to the share of collateral. Analogous to the unconstrained case above, the export price and the exported quantity depend on the financially constrained quality level:

$$p_{sod}^{f}(c) = \frac{1}{2}\left[p_{sd}^{max} + \tau_{od}c + \beta z_{sod}^{f}(c)\right], \tag{12}$$

$$q_{sod}^{f}(c) = \frac{L_{sd}}{2\gamma}\left[p_{sd}^{max} - \tau_{od}c + \beta z_{osd}^{f}(c)\right]. \tag{13}$$

By taking these relationships into account, the binding constraint (11) leads to the financially constrained investment level:

$$z_{sod}^{f}(c) = \frac{\Gamma_{sod}}{\beta}\left(p_{sd}^{max} - \tau_{od}c\right); \text{ with } \Gamma_{sod} \equiv \frac{\beta\left(\gamma L_{sd}\right)^{\frac{1}{2}}}{2\gamma\left(1+\theta_{so}\right)^{\frac{1}{2}}\delta^{\frac{1}{2}} - \beta\left(\gamma L_{sd}\right)^{\frac{1}{2}}}. \tag{14}$$

The comparison of Equations (10) and (14) leads to the following condition:

**Condition 2** $z^f_{sod}(c) < z^u_{sod}(c)$ *if* $1 + \theta_{so} > \frac{4\gamma\delta}{\beta^2 L_{sd}} > 1$.

If credit frictions are sufficiently large, then the financial constraint (11) is binding for all firms and quality levels are lower than the optimal ones in the unconstrained case. The right-hand side of Condition 2 captures the fact that financially constrained firms do not optimally account for costs and benefits of product quality at the margin. Hence, there is an underinvestment compared to the unconstrained case whenever credit frictions have a sufficiently strong impact on the effective innovation costs. Note that the last inequality in Condition 2 follows from Condition 1. In the following analysis, I focus on the financially constrained case in which Condition 2 is satisfied.

Given the origin country $o$ and sector $s$, all firms with cost draw $c \leq c^f_{sod}$ export to destination $d$. The marginal exporter, with $q^f_{sod}\left(c^f_{sod}\right) = 0$, follows immediately from Equation (13), where $p^{max}_{sd} = \tau_{od} c^f_{sod}$. Note that according to Equation (14), this marginal exporter operates at zero profits and hence has no incentive to invest in product quality. By taking into account the cost cut-off, the exported quantity and export sales can be written as follows:

$$q^f_{sod}(c) = \frac{\tau_{od} L_{sd}}{2\gamma}\left(1 + \Gamma_{sod}\right)\left(c^f_{sod} - c\right), \tag{15}$$

$$r^f_{sod}(c) = \frac{\tau^2_{od} L_{sd}}{4\gamma}\left(1 + \Gamma_{sod}\right)\left[\left(1 + \Gamma_{sod}\right) c^f_{sod} + \left(1 - \Gamma_{sod}\right) c\right]\left(c^f_{sod} - c\right). \tag{16}$$

Changes in financial development affect export performance in two ways. There is a direct effect on investments through $\Gamma_{sod}$. Additionally, in the free-entry equilibrium, selection of firms into exporting will be affected captured by changes in the cost cut-off level $c_{sod}$.

## 2.3 The impact of financial development on export concentration

I first analyze the effects of financial development on export concentration in a short-run equilibrium in which the cost cut-off is fixed. Then I take into account selection effects, where technical details of the free-entry equilibrium are shown in Appendix A.

### 2.3.1 External financing of innovation costs

In the theoretical framework outline above, better financial institutions in the exporting country are reflected by an increase in the parameter $\lambda_o$, which raises the repayment probability and hence the enforceability of credit contracts. From Equations (14) and (16) it follows that higher financial development increases quality upgrading and thus export sales

($\frac{\partial \Gamma_{sod}}{\partial \lambda_o} > 0$). This effect is stronger for more productive firms as relaxing the credit constraint leads to higher returns from innovations compared to less productive exporters. To see this, consider the ratio of export sales comparing two firms with cost draws $c_1 < c_2$:

$$r^{rel}_{sod}(c_1, c_2) \equiv \frac{r^f_{sod}(c_1)}{r^f_{sod}(c_2)} = \frac{p^f_{sod}(c_1)}{p^f_{sod}(c_2)} \frac{c^f_{sod} - c_1}{c^f_{sod} - c_2}. \tag{17}$$

Holding the export cost-cutoff $c^f_{sod}$ fixed, higher innovation levels of more productive exporters translate into a larger relative price in Equation (17). Note that this effect also increases the markup, $\mu^f_{sod} = p^f_{sod} - \tau_{od}c$, compared to less productive firms.

**Proposition 1** *When firms have to finance innovation costs by external credit, then higher financial development (i) increases the concentration of exports among larger firms,* $\frac{\partial r^{rel}_{sod}(c_1,c_2)}{\partial \lambda_o} > 0$. *This effect is (ii) stronger in sectors with high external finance dependence,* $\frac{\partial r^{rel}_{sod}(c_1,c_2)}{\partial \lambda_o \partial d_s} > 0$, *and (iii) weaker in sectors with high asset tangibility,* $\frac{\partial r^{rel}_{sod}(c_1,c_2)}{\partial \lambda_o \partial t_s} < 0$.

**Proof.** See Appendix B. ■

The innovation channel of financial development leads to market share gains of highly productive firms and thus increases the concentration of exports, especially in sectors that require a larger fraction of external finance ($d_s$), and that have a low share of tangible assets ($t_s$). Figure 1a illustrates this effect, where export sales are depicted as a function of firms' marginal cost. An increase in financial development ($\lambda_2 > \lambda_1$) shifts the sales profile upwards with a relatively stronger gain for more productive exporters.

### 2.3.2 External financing of production costs

As an alternative to the previous section, I highlight the main implications of a model with external financing of export-related production costs. The technical details are presented in Appendix A. To contrast the different approaches, I assume that consumers have no preference for quality differentiation ($\beta = 0$) in Equation (2), which implies that innovations are equal to zero ($z_{sod} = 0$), for all firms. Instead, exporters have to finance a fraction $d_s \in (0, 1)$ of production costs $C_{sod}$. Financial contracting follows the description in Section 2.2, where now a part $t_s < d_s$ of production costs can be seized as collateral by investors in case of default. Exporters are financially unconstrained if the following condition is satisfied:

$$[p_{sod}(c) - (1 + \theta_{so})\tau_{od}c]\, q_{sod}(c) \geq 0, \tag{18}$$

where $\theta_{so}$ captures the strength of credit frictions as defined in Section 2.2. Compared to the credit constraint under external financing of innovation costs in Equation (11), the binding

condition (18) directly implies a financially constrained price, $p^f_{sod}(c) = (1+\theta_{so})\tau_{od}c$, which increases in credit frictions and the firm's cost draw. The marginal product that is just exported is given by $q^f_{sod}\left(c^f_{sod}\right) = 0$, leading to the highest financially constrained export price $p^{max}_{sd} = (1+\theta_{so})\tau_{od}c^f_{sod}$.

The pricing rule of unconstrained exporters follows from Equation (12) without quality innovations, $p^u_{sod}(c) = \frac{1}{2}\left(p^{max}_{sd} + \tau_{od}c\right)$. Financially constrained firms have to set a price equal to the effective production costs including credit frictions, whereas the unconstrained price is based on profit maximization and hence also depends on characteristics of the destination market through $p^{max}_{sd}$. Whether exporters are credit constrained, depends on their initial cost draw. Comparing the two price functions leads to an additional cost-cutoff that determines the marginal unconstrained firm: $c^u_{sod} = \frac{1+\theta_{so}}{1+2\theta_{so}}c^f_{sod}$. Hence, the selection pattern in case of external financing of production costs can be described as follows: exporters with $c \leq c^u_{sod}$ charge the unconstrained price and operate at optimal scale, while intermediate exporters with $c^u_{sod} < c \leq c^f_{sod}$ have to set the financially constrained price that is larger than the optimal price in the relevant range $\left(p^f_{sod} > p^u_{sod}\right)$. In the absence of quality differentiation, a higher price implies that these exporters operate at an inefficient scale and realize lower sales compared to a situation without credit market imperfections. Firms with $c > c^f_{sod}$ cannot finance export costs and hence do not sell abroad.

The selection pattern is illustrated in Figure 1b. The kink in the sales profile depicts the cut-off level $c^u_{sod}$. As firms with costs above this threshold face credit constraints and operate inefficiently, the sales curve decreases stronger in the cost draw $c$. I compare the sales of an unconstrained exporter to a financially constrained exporter with $c_1 < c^u_{sod} < c_2 < c^f_{sod}$:

$$r^{rel}_{sod}(c_1, c_2) \equiv \frac{r^u_{sod}(c_1)}{r^f_{sod}(c_2)} = \frac{(1+\theta_{so})^2\left(c^f_{sod}\right)^2 - c_1^2}{4(1+\theta_{so})^2\left(c^f_{sod} - c_2\right)c_2}, \tag{19}$$

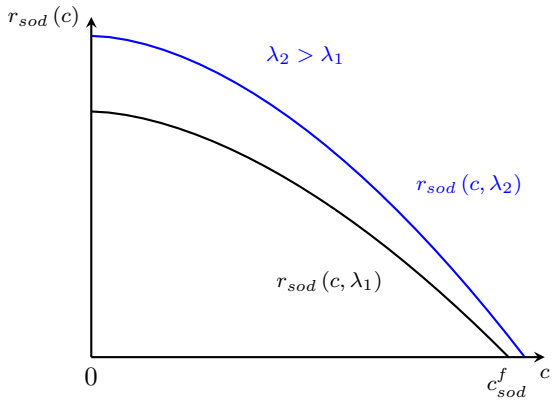
where financial development in the exporting country reduces the strength of credit frictions ($\partial\theta_{so}/\partial\lambda_o < 0$), and the export cost-cutoff is again assumed to be fixed in the short run.

**Proposition 2** *When firms have to finance production costs by external credit, higher financial development (i) reduces the concentration of exports among larger firms,* $\frac{\partial r^{rel}_{sod}(c_1,c_2)}{\partial\lambda_o} < 0$. *This effect is (ii) stronger in sectors with high external finance dependence,* $\frac{\partial r^{rel}_{sod}(c_1,c_2)}{\partial\lambda_o\partial d_s} < 0$, *and (iii) weaker in sectors with high asset tangibility,* $\frac{\partial r^{rel}_{sod}(c_1,c_2)}{\partial\lambda_o\partial t_s} > 0$.

**Proof.** See Appendix B. ■

In contrast to financing of innovation costs (Proposition 1), higher financial development lowers credit constraints of less productive exporters which allows them to reduce prices and

(a) Financing of innovation




(b) Financing of production costs

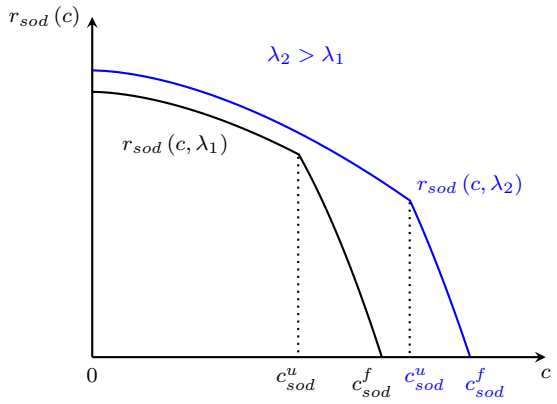



Figure 1: Effect of financial development on export sales across firms

increase export sales compared to unconstrained firms. The resulting decrease in export concentration is depicted in Figure 1b. It further highlights that financial development is associated with a larger share of unconstrained firms, captured by an increase in the relative cutoff $c^u_{sod}/c^f_{sod}$, which is consistent with firm-level evidence (Irlacher and Unger, 2018).

### 2.3.3 Free-entry equilibrium

To take into account that financial development affects the extensive margin of exporting, I introduce a free-entry equilibrium in the two-country setting. At the entry stage, firms pay sunk costs $f_E$ and draw the cost parameter $c$ from a Pareto distribution with $G(c) = \left(\frac{c}{c_M}\right)^k$, and positive support on the interval $[0, c_M]$, where $k > 1$ is the Pareto shape parameter. Free entry ensures that expected profits are equal to entry costs ($E[\pi] = f_E$). In both model variants, I assume that non-exporters and exporters face credit constraints.[11]

**Proposition 3** *(i) If innovation costs are financed externally, financial development increases the export cost cut-off,* $\frac{\partial c^f_{sod}}{\partial \lambda_o} > 0$*, which reduces relative sales,* $\frac{\partial r^{rel}_{sod}(c_1,c_2)}{\partial c^f_{sod}} \frac{\partial c^f_{sod}}{\partial \lambda_o} < 0$*. The direct positive impact of financial development on relative sales (see Proposition 1), outweighs the selection effect whenever trade costs* $\tau_{od}$ *and/or the Pareto shape parameter* $k$ *are sufficiently large. (ii) In case of external financing of production costs, financial development leads to a positive extensive margin effect,* $\frac{\partial c^f_{sod}}{\partial \lambda_o} > 0$*, if* $k\theta_{so} > 1$*. This selection effect reinforces the direct negative effect of financial development on relative sales (Proposition 2).*

**Proof.** See Appendix B. ■

[11] Appendices A.1 and A.2 provide technical details of the free-entry equilibrium in both model variants. Assuming that only exporters face credit constraints does not change the main implications of the model but only the size of adjustments at the extensive margin. I show these results in the Web Appendix.

Both model variants are consistent with previous work showing that financial development has a positive impact on the extensive margin of trade (Minetti and Zhu, 2011; Manova, 2013; Muûls, 2015). This effect is illustrated in Figure 1 by a shift of the export cost cut-off levels to the right. The mechanisms behind these results differ in the two model variants. In case of external financing of innovation costs, exporter's higher financial development increases expected profits of firms located in this country, while decreasing expected profits of firms in the destination. This leads to less entry of potential producers in the latter market, which increases the cost-cutoff level $c^f_{sdd}$, and thus the export cutoff $c^f_{sod} = c^f_{sdd}/\tau_{od}$. Hence, selection of less productive firms into exporting counteracts the positive impact of financial development on relative sales in Equation (17). With sufficiently high trade costs and/or skewness of the productivity distribution, the innovation channel dominates the selection effect leading to export concentration (see part (i) of Proposition 3).

In case of external financing of production costs, the export cost cut-off is $c^f_{sod} = \frac{1+2\theta_{sd}}{1+\theta_{so}} \frac{c^u_{sdd}}{\tau_{od}}$. Better financial institutions lead to a direct positive impact on the extensive margin of exporting through a reduction in credit frictions $\theta_{so}$. Similar to the reasoning above, there is a positive effect on $c^u_{sdd}$, as origin's financial development reduces export profits from $d$ to $o$, and thus lowers entry in the destination country. In contrast to the case of financing of innovation costs, a reduction in credit frictions improves access to finance for less productive firms in the origin country leading to lower expected profits. Consequently, the cost-cutoff level $c^u_{soo}$ increases, mirrored by a decrease in $c^u_{sdd}$. The second part of Proposition 3 shows that the positive effect on $c^u_{sdd}$ dominates whenever the combination of $k$ and $\theta_{so}$ is sufficiently large. In this case, the skewness of the productivity distribution and the level of credit frictions dampens the selection effect of lower productivity firms. Hence, the increase in the export cost cut-off represents an additional margin how financial development reduces relative sales in Equation (19) besides the direct (negative) effect in Proposition 2. The higher cut-off further reduces competition for unconstrained firms and thus increases their sales, but to a smaller extent compared to financially constrained exporters (see Figure 1b).

### 2.3.4 Within-firm concentration of exports

The previous analysis has focused on single-product exporters. I extend the model to multi-product firms by introducing a flexible manufacturing technology as in Eckel and Neary (2010) and Mayer et al. (2014). The cost draw $c$ now determines the productivity of a firm's core product, while adding products to the portfolio occurs at increasing marginal costs with $v(m, c) = \omega^{-m} c$, where $\omega \in (0, 1)$, and $m = 0$ denotes the core competence. This technology follows the idea that adopting production processes for further varieties is costly, where a lower $\omega$ leads to a stronger increase in marginal costs when adding products to the portfolio.

Following the financial contracting problem in Section 2.2, I assume that multi-product firms have to raise external finance for product-specific quality innovations. Firms in sector $s$ and country $o$ export products to destination $d$ up to the point where the marginal variety satisfies $p_{sd}^{max} = \tau_{od} v_{sod}^{f}$. Hence, analogous to Equation (17), I consider the relative sales of two different varieties within the same multi-product exporter, with $v_1(c, m_1) < v_2(c, m_2)$.

**Proposition 4** *Higher financial development (i) increases the within-firm concentration of exports,* $\frac{\partial r_{sod}^{rel}(c,m_1,m_2)}{\partial \lambda_o} > 0$. *This effect is (ii) stronger with high external finance dependence,* $\frac{\partial r_{sod}^{rel}(c,m_1,m_2)}{\partial \lambda_o \partial d_s} > 0$, *and (iii) weaker with high asset tangibility,* $\frac{\partial r_{sod}^{rel}(c,m_1,m_2)}{\partial \lambda_o \partial t_s} < 0$.

**Proof.** See Appendix B. ■

Proposition 4 highlights that financial development should not only increase export concentration across firms as shown in Proposition 1, but additionally induces multi-product exporters to shift resources towards the better performing products. Intuitively, these varieties with lower marginal costs benefit relatively more from relaxing credit constraints through increased innovations.

### 2.3.5 The role of quality differentiation and firm size

Whether financial development decreases or increases export concentration, depends on the role of the innovation channel compared to financing of production costs. To differentiate between these counteracting mechanisms, I present two additional results that are specific to the model with financing of innovation costs. I first consider variation in the sectoral scope for quality differentiation, which increases in consumers' valuation of product quality $\beta$.

**Proposition 5** *(i) Consider the relative export sales of two firms with* $c_1 < c_2$. *The positive effect of financial development on export concentration is stronger in sectors with larger scope for quality differentiation,* $\frac{\partial r_{sod}^{rel}(c_1,c_2)}{\partial \lambda_o \partial \beta} > 0$. *(ii) Consider the export sales of two different products within the same firm with* $m_1 < m_2$. *The positive impact of financial development on within-firm export concentration is more pronounced for smaller firms,* $\frac{\partial r_{sod}^{rel}(c,m_1,m_2)}{\partial \lambda_o \partial c} > 0$.

**Proof.** See Appendix B. ■

The first part of Proposition 5 holds both across firms and within firms. Whenever consumers have stronger preferences for quality differentiation, financial development leads to a higher incentive for quality upgrading. This holds especially for the most productive firms that reap larger market shares resulting in stronger export concentration. The second part of Proposition 5 shows that the effect on within-firm concentration varies across firms. Smaller exporters with larger marginal production costs face a higher price elasticity of demand for their varieties. Hence, these firms will react stronger to financial development by concentrating on the best performing products.

### 2.3.6 Discussion of alternative theoretical channels

Before turning to the empirical analysis, I discuss the implications of the theoretical framework compared to alternative channels. First, the interaction between endogenous markups and financing of innovation costs (Section 2.3.1) is crucial for the positive relation between financial development and export concentration as highlighted in Propositions 1 and 4. With endogenous adjustments of markups, especially more productive firms benefit from relaxing credit constraints such that relatively larger investments translate into market share gains (see Figure 1a). This result is consistent with studies showing negative effects of frictions on export performance and growth of large firms (Fernandes et al., 2016; Berthou et al., 2020).

In contrast, I show in the Web Appendix that a model with CES demand and financing of innovation costs leads to the same prediction compared to Proposition 2 that financial development reduces export concentration. As in the model with external financing of production costs and linear demand (Section 2.3.2), the liquidity constraint divides firms into financially constrained and unconstrained ones.[12] While all firms set prices as a constant markup over marginal costs, credit frictions reduce investments and lead to an inefficient scale. Higher financial development allows inefficiently small firms to increase investments and sales which reduces export concentration. Second, the same result occurs in the presence of CES preferences and external financing of variable export costs as shown by Manova (2013). Hence, these model variants generate a pattern as illustrated in Figure 1b.

Third and alternatively, a positive impact of financial development on export concentration can also occur when firms have to finance a fraction of fixed entry costs before they know their cost draw (see the Web Appendix for technical details). In this case, however, financial development allows more potential producers to finance the fixed entry costs. Consequently, increased entry reduces expected profits associated with a decrease in the cost cut-off level in contrast to Proposition 3. This especially hurts high cost firms as they face a larger price elasticity of demand resulting in a higher skewness of sales.

Fourth, Bonfiglioli et al. (2019) build a model with financial frictions related to entry costs where firms can invest at the entry stage to draw productivity from a more dispersed distribution. As financial development reduces entry barriers, firms increase investments resulting in a higher sales dispersion, which is measured by the standard deviation of exports to the U.S. by industry and country. While this approach can be seen as complementary to explain a positive relationship between financial development and firm heterogeneity, I focus on measures of export concentration reflecting the skewness of sales towards large firms.

[12] As in Manova (2013), I assume that exporters have also to finance a fraction of fixed export costs. In a framework with CES preferences, the presence of fixed costs ensures a well-defined selection pattern of firms. See the Web Appendix for technical details.

# 3 Empirical analysis

I first discuss how the theoretical results correspond to empirical measures of export concentration. Section 3.2 describes the data sources, and the empirical identification of export concentration across and within firms is presented in Sections 3.3 and 3.4. I test further implications of the investment model in Section 3.5.

## 3.1 From theory to measurement

To measure export concentration, I first consider the share of top firms in total export sales, $Share_{sod} \equiv \frac{R^{\rho}_{sod}}{R_{sod}}$, where $R^{\rho}_{sod}$ denotes the export sales of a fraction $\rho \in [0,1]$ of top firms, and $R_{sod}$ are total sales in a sector $s$ from origin country $o$ to destination $d$. If firms rely on external finance for innovation costs, this share clearly increases in financial development $\lambda_o$ of the exporting country, following the result in Proposition 1. In case of external financing of production costs, I assume that the fraction of top firms is unconstrained. Under this condition, the share of top firms is decreasing in financial development in line with Proposition 2. As depicted in Figure 1, the changes of export shares reflect that financial development disproportionally benefits larger exporters compared to smaller firms when financing of innovation is important, while the opposite holds in the presence of credit frictions related to production costs. I show formal proofs of the effects of financial development on the export shares in both model variants in Appendix C.1.

The relation between financial development and export concentration has important implications for average sales denoted by $\bar{r}_{sod}$. In the investment model, better financial institutions increase the export shares of more productive firms through higher innovation resulting in larger average exports. In contrast, the model variant with financing of production costs predicts a negative relation between financial development and average exports as less productive firms with initially lower sales benefit relatively more from relaxing credit constraints. A more formal discussion of these effects is provided in Appendix C.2.

As a second measure of export concentration, I use the Herfindahl-Hirschman Index (HHI) of export sales.

$$HHI_{sod} = \frac{1}{G\left(c^{f}_{sod}\right)} \frac{\sigma^2_{sod} + \bar{r}^2_{sod}}{\bar{r}^2_{sod}}, \tag{20}$$

where $G\left(c^{f}_{sod}\right) = \left(c^{f}_{sod}/c_M\right)^{k}$ under the assumption of Pareto distributed productivity, and $\sigma^2_{sod}$ denotes the variance of export sales by sector and destination. The HHI has two important advantages compared to the share of top exporters. First, it is not subject to the choice of the top share $\rho$ but rather considers the whole variation of sales across exporters.

Second, the HHI can be decomposed into an extensive margin and an intensive margin component. The results in Proposition 3 have shown that financial development increases the export cost-cutoff $c^f_{sod}$, leading to selection of smaller firms into exporting and thus to a decrease of the HHI. The second component in Equation (20) captures the intensive margin by relating the variance of export sales, $\sigma^2_{sod}$, to the squared average exports, $\bar{r}^2_{sod}$. While the extensive margin effect of financial development on the HHI is negative in both model variants, I show in Appendix C.2 that the intensive margin increases in financial development if there is external financing of innovation costs. Note that the decomposition in Equation (20) takes into account that average sales increase as well, implying that the higher variation in sales is the dominating force.

The relation between credit frictions and the HHI is more subtle in the model with external financing of production costs, as the variation of sales both for unconstrained and financially constrained exporters has to be taken into account. With higher financial development, the intensive margin component decreases for constrained firms ($\frac{\partial HHI^f_{sod}}{\partial \lambda_o} < 0$), while it increases for unconstrained firms ($\frac{\partial HHI^u_{sod}}{\partial \lambda_o} > 0$). Intuitively, relaxing credit frictions reduces the heterogeneity of sales among constrained exporters as shown in Figure 1b. Unconstrained exporters increase their sales driven by a higher export cost-cutoff (see Section 2.3.3), which raises the second moment of exports. Following part (ii) of Proposition 3, I impose the condition $k\theta_{so} > 1$, and show in Appendix C.2 that financial development clearly reduces the intensive margin of the HHI in the relevant range of sufficiently large credit frictions ($\frac{\partial HHI^u_{sod}}{\partial \lambda_o} + \frac{\partial HHI^f_{sod}}{\partial \lambda_o} < 0$). Only if financial development is substantially high, the intensive margin component of unconstrained firms dominates leading to an increase of the HHI. In the extreme case of perfect financial institutions ($\lambda_o = 1$), the share of constrained firms goes to zero implying that the variation of sales is completely driven by unconstrained firms (see Figure 2 in Appendix C.2 for an illustration of the discussed effects).

## 3.2 Data sources

To estimate the effects of financial development on export concentration, I combine three different sources of data. First, export information at the HS 2-digit sector level comes from the World Bank Exporter Dynamics Database, covering 70 exporting countries over the period 1997-2014, as described in Fernandes et al. (2016). For each sector-country-pair combination, the database reports the share of exports of top 25% exporters as well as the Herfindahl-Hirschman Index (HHI) of export sales, which I use as main measures of export concentration. To take into account the extensive margin of trade, the number of exporters is considered. Note that the HHI is only reported if there are at least two firms in

a sector that export to a particular destination. The share of top 25% exporters requires at least four observations by sector and country pair.[13] Panel A of Table 1 summarizes export characteristics at the sector-country-pair level. I further use more detailed firm-level export

Table 1: Export characteristics from World Bank Exporter Dynamics Database

| Variable | Obs. | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|
| *A. Sector-level export data* | | | | | |
| Number of exporters | 1,446,752 | 16.63 | 77.77 | 1 | 7624 |
| Log bilateral exports | 858,588 | 12.34 | 3.01 | -8.16 | 24.79 |
| Share of top 25% exporters | 583,689 | 77.55 | 18.29 | 15.00 | 99.99 |
| Share of top 5% exporters | 189,530 | 52.52 | 20.74 | 6.83 | 99.96 |
| Herfindahl-Hirschman Index | 858,588 | 48.77 | 27.75 | 0.26 | 100.00 |
| *B. Firm-level export data* | | | | | |
| Number of exporters | 228,235 | 12.15 | 95.11 | 1 | 12,886 |
| Number of exported products | 2,781,357 | 1.98 | 3.31 | 1 | 441 |
| Log firm-level exports | 2,781,357 | 8.59 | 3.30 | -6.37 | 24.29 |
| Firm-level HHI | 2,781,357 | 87.29 | 22.21 | 1.57 | 100 |
| Share of top 1 product | 2,781,357 | 90.33 | 18.05 | 4.25 | 100 |
| Share of top 2 products | 911,854 | 91.78 | 13.78 | 8.25 | 100 |
| Share of top 3 products | 464,676 | 93.07 | 11.70 | 11.31 | 100 |

*Notes*: Panel A shows summary statistics by HS 2-digit sector and exporter-importer pair, 1997-2014; Panel B reports firm-level export characteristics by destination and HS 2-digit sector, 1997-2012. *Source*: Exporter Dynamics Database, World Bank.

data for 10 origin countries over the period 1997-2012.[14] The advantage of this data set is that it contains exports to all destinations by firm and HS 6-digit product classification. I use the export sales to compute the Herfindahl-Hirschman Index at the firm level by destination and HS 2-digit sector. Additionally, I consider the share of top products in total export sales for each exporter and destination within the same 2-digit sector. The firm-level variables are summarized in Panel B of Table 1.

Second, I combine these export characteristics with information on financial development at the country level and on external finance dependence at the sectoral level. The ratio of private credit to GDP from the World Development Indicators by the World Bank is used as a proxy for a country's financial development. Following the method of Rajan and Zingales (1998), I use information on external finance dependence and asset tangibility to measure the extent to which sectors are reliant on external finance. These data are reported by Braun (2005) and Manova (2013) and computed by using information for publicly listed

[13]There is a significant and positive relation between the share of top 25% exporters and the intensive margin of the HHI (correlation coefficient 0.44). Note that the latter measure entails additional information as it captures the variation of sales across all exporters, see the discussion in Section 3.1.

[14]The countries in the firm-level data set are Bulgaria, Burkina Faso, Guatemala, Jordan, Malawi, Mexico, Peru, Senegal, Uruguay, and Yemen.

U.S. companies from Compustat's annual industrial files. As these sectoral characteristics are available at the 3-digit-ISIC sector level, the data are combined by using the concordance table available at World Integrated Trade Solution (WITS).[15] External finance dependence captures sectoral averages of the share of capital expenditures that is not financed with own cashflows from operations. Asset tangibility is the share of net property, plant and equipment in total book-value assets. These measures are obtained by using industry averages and do not vary over time. Following Braun (2005) and Manova (2013), using industry measures from U.S. data as proxies for credit constraints has two main advantages. First, the U.S serves as a reference country with one of the most highly developed financial systems. Second, the measures capture differences in the reliance on external finance across sectors that can be seen as exogenous to a country's financial development and to the export performance of a single firm. Importantly, the ranking of sectors according to external finance dependence is quite stable over time and reflects technological differences that shape the reliance on external credit (Rajan and Zingales, 1998; Braun, 2005). To control for other sources of comparative advantage, I include per capita values of produced capital, human capital and natural capital by country and year from the World Bank's Wealth Accounts (The World Bank, 2021), and the corresponding capital intensity for each sector from Braun (2005). Data on GDP is from the World Development Indicators of the World Bank.

In a third step, the dataset is expanded by bilateral distance, as well as dummy variables for contiguity, common language, and colonial relationships taken from CEPII's GeoDist databse by Mayer and Zignago (2011). Information on regional trade agreements between countries comes from Mario Larch's Regional Trade Agreements Database described in Egger and Larch (2008).[16]

### 3.3 Empirical analysis of export concentration across firms

To empirically test Propositions 1 and 2, I start with the following estimation equation:

$$\begin{aligned} Y_{sodt} = {} & \xi_0 + \xi_1 \ln FinDev_{ot} + \xi_2 \ln FinDev_{ot} \times ExtFin_s + \xi_3 \ln FinDev_{ot} \times Tang_s \\ & + \xi_4 \ln GDP_{ot} + \xi_5 RTA_{odt} + \boldsymbol{D_{od}} + \upsilon_t + \upsilon_d + \upsilon_s + \epsilon_{sodt}, \end{aligned} \tag{21}$$

where $Y_{sodt}$ denotes the concentration measure of export sales in sector $s$ from origin country $o$ to destination country $d$ in year $t$. $FinDev_{ot}$ is private credit as a share of GDP in country $o$ and year $t$. Financial development is interacted with external finance dependence

[15] The product concordance tables are available at: https://wits.worldbank.org/product_concordance.html.

[16] The updated version is available at: https://www.ewf.uni-bayreuth.de/en/research/RTA-data/index.html.

($ExtFin_s$) and asset tangibility ($Tang_s$) at the sectoral level. Equation (21) further controls for exporter's GDP and a set of bilateral determinants, including distance, common language and contiguity, summarized by the vector $D_{od}$. While this captures time-invariant bilateral determinants, I also include a dummy variable that measures whether a country pair belongs to a regional trade agreement ($RTA_{odt}$). I control for year fixed effects $v_t$, destination fixed effects $v_d$, and sector fixed effects $v_s$. The error term is denoted by $\epsilon_{sodt}$.

In an alternative regression equation, I include exporter-time $v_{ot}$ and importer-time fixed effects $v_{dt}$, which absorbs any time-varying country variables, especially the direct impact of financial development on export concentration:

$$\begin{aligned} Y_{sodt} = \xi_0 + \xi_2 \ln FinDev_{ot} \times ExtFin_s + \xi_3 \ln FinDev_{ot} \times Tang_s \\ + \xi_5 RTA_{odt} + \boldsymbol{D_{od}} + v_{ot} + v_{dt} + v_{sd} + \epsilon_{sodt}. \end{aligned} \tag{22}$$

Equation (22) additionally controls for sector-destination fixed effects $v_{sd}$. Note that this approach still allows to identify the interaction effects of financial development with sectoral measures of external finance dependence and asset tangibility. Following the implications of the investment model in Proposition 1, it is expected that financial development increases export concentration, and more so in sectors that rely stronger on external finance, i.e. $\xi_1, \xi_2 > 0$, and $\xi_3 < 0$. In contrast, the case of external financing of production costs predicts the opposite sign of coefficients. (Proposition 2).

Table 2 shows estimates with the share of top 25% exporters as dependent variable. The regression in column (1) is based on Equation (21), while column (2) includes importer-sector interacted fixed effects instead of separate fixed effects by sector and importer. Consistent with Proposition 1, financial development has a positive impact on the share of top exporters, especially in sectors with larger external finance dependence and lower asset tangibility. In line with the results of Fernandes et al. (2016), exporter's GDP, common border and common language are positively related with the share of top exporters, while bilateral distance has a significantly negative impact. Additionally, I find that being in a regional trade agreement leads to a higher share of top exporters.

These results imply that overall development and lower trade barriers induce especially larger exporters to increase sales. One concern is that other exporter-specific determinants are correlated with financial development and affect export concentration. Additionally, importer-specific effects influence the sales distribution. Mayer et al. (2014, 2021) show that larger markets imply higher competition and induce firms to skew their sales towards the better performing products. Flach et al. (2021) find that corporate tax reforms in the destination also lead to a stronger concentration on top products.

Table 2: Effect of financial development on share of top 25% exporters

| Dependent variable: Share of top 25% exporters by sector and destination | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $\ln FinDev_{ot}$ | 2.678*** | 2.965*** | | | |
| | (0.228) | (0.225) | | | |
| $\ln FinDev_{ot} \times ExtFin_s$ | 0.830*** | 0.685*** | 1.005*** | 0.832*** | 0.901*** |
| | (0.202) | (0.196) | (0.205) | (0.198) | (0.213) |
| $\ln FinDev_{ot} \times Tang_s$ | −1.055** | −1.836*** | −1.344*** | −2.245*** | −1.860*** |
| | (0.517) | (0.509) | (0.508) | (0.499) | (0.551) |
| $\ln GDP_{ot}$ | 2.904*** | 2.978*** | | | |
| | (0.106) | (0.106) | | | |
| $\ln Dist_{od}$ | −4.345*** | −4.325*** | −5.192*** | −5.235*** | −5.214*** |
| | (0.204) | (0.206) | (0.166) | (0.169) | (0.179) |
| Common border | 2.725*** | 2.845*** | 2.308*** | 2.399*** | 2.386*** |
| | (0.629) | (0.638) | (0.534) | (0.547) | (0.582) |
| Common language | 5.021*** | 5.088*** | 5.146*** | 5.197*** | 5.187*** |
| | (0.386) | (0.389) | (0.336) | (0.339) | (0.360) |
| Colonial link | 2.005*** | 1.919*** | 2.571*** | 2.561*** | 2.507*** |
| | (0.678) | (0.684) | (0.517) | (0.526) | (0.557) |
| RTA | 1.047*** | 1.148*** | 1.282*** | 1.395*** | 1.390*** |
| | (0.309) | (0.309) | (0.240) | (0.240) | (0.255) |
| Year FE | yes | yes | no | no | no |
| Sector FE | yes | no | yes | no | no |
| Importer FE | yes | no | no | no | no |
| Importer-sector FE | no | yes | no | yes | no |
| Exporter-year FE | no | no | yes | yes | yes |
| Importer-year FE | no | no | yes | yes | no |
| Importer-sector-year FE | no | no | no | no | yes |
| $N$ | 373,350 | 373,241 | 373,233 | 373,118 | 360,577 |
| $R^2$ | 0.204 | 0.237 | 0.254 | 0.286 | 0.347 |

*Notes*: This table estimates the effect of exporter's log financial development $FinDev_{ot}$ on the share of top 25% exporters in exports using sector-country-pair data, as summarized in Panel A of Table 1. Financial development, measured as ratio of private credit to GDP, is interacted with sectoral external finance dependence, $ExtFin_s$, as well as with asset tangibility $Tang_s$. All columns include log bilateral distance, and dummy variables for common border, common language, colonial links between countries, as well as a dummy that takes a value of one if a country pair belongs to a regional trade agreement (RTA). Columns (1) and (2) additionally control for exporter's log GDP, while Columns (3) and (4) include exporter-year and importer-year fixed effects. The last column accounts for importer-sector-year fixed effects and exporter-year fixed effects. Standard errors in parentheses are clustered by exporter-importer pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

To control for country-specific shocks, I include exporter-year and importer-year fixed effects in column (3), which absorbs the direct impact of exporter's financial development and GDP. Column (4) shows results of estimation equation (22) by accounting for sector-destination fixed effects as in column (2). Additionally, the effects of financial development might be driven by sector- and destination-specific shocks that vary over time. To address this concern, I include importer-sector-year interacted fixed effects in column (5). The coefficients on the interaction between exporter's financial development and sectoral exposure to external finance remain highly significant and are consistent with the prediction of the investment model (see Proposition 1) in all specifications.

Table 3 presents the effects of financial development on the (log) intensive margin of the HHI by sector and destination as defined in Equation (20). In line with Proposition 1 and the estimates in Table 2, financial development increases the concentration of export sales,

especially in sectors that depend more on external finance, which holds across different specifications controlling for country-year and importer-sector fixed effects. Following Proposition 3, higher financial development is expected to increase the number of exporting firms leading to a negative effect on the HHI in Equation (20). This result can be confirmed in the data (see Table D1 in Appendix D), and is consistent with previous findings in the trade and finance literature (Berman and Héricourt, 2010; Minetti and Zhu, 2011; Manova, 2013; Muûls, 2015). Comparing the estimated coefficients in Tables D1 and 3 reveals that the extensive margin is quantitatively more important. Consequently, the total effect of financial development on the HHI is negative as reported in Table D2, consistent with evidence of Minetti et al. (2021). Hence, the results are in line with the predictions of the investment model that financial development decreases export concentration through the extensive margin, while increasing concentration through the intensive margin (see Propositions 1 and 3).

Table 3: Effect of financial development on log intensive margin HHI

| Dependent variable: Intensive margin of Herfindahl-Hirschman Index by sector and destination | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $\ln FinDev_{ot}$ | 0.202*** | 0.219*** | | | |
| | (0.0121) | (0.0118) | | | |
| $\ln FinDev_{ot} \times ExtFin_s$ | 0.149*** | 0.181*** | 0.166*** | 0.195*** | 0.202*** |
| | (0.0117) | (0.0116) | (0.0119) | (0.0117) | (0.0124) |
| $\ln FinDev_{ot} \times Tang_s$ | −0.272*** | −0.347*** | −0.320*** | −0.398*** | −0.405*** |
| | (0.0272) | (0.0257) | (0.0278) | (0.0260) | (0.0284) |
| $\ln GDP_{ot}$ | 0.207*** | 0.215*** | | | |
| | (0.0062) | (0.0063) | | | |
| $\ln Dist_{od}$ | −0.286*** | −0.290*** | −0.323*** | −0.329*** | −0.331*** |
| | (0.0113) | (0.0116) | (0.0113) | (0.0114) | (0.0121) |
| Common border | 0.223*** | 0.227*** | 0.199*** | 0.204*** | 0.204*** |
| | (0.0435) | (0.0444) | (0.0398) | (0.0404) | (0.0428) |
| Common language | 0.249*** | 0.255*** | 0.276*** | 0.284*** | 0.286*** |
| | (0.0215) | (0.0222) | (0.0194) | (0.0200) | (0.0211) |
| Colonial link | 0.298*** | 0.295*** | 0.215*** | 0.215*** | 0.211*** |
| | (0.0394) | (0.0399) | (0.0323) | (0.0329) | (0.0344) |
| RTA | 0.0528*** | 0.0567*** | 0.0850*** | 0.0895*** | 0.0887*** |
| | (0.0165) | (0.0168) | (0.0136) | (0.0140) | (0.0148) |
| Year FE | yes | yes | no | no | no |
| Sector FE | yes | no | yes | no | no |
| Importer FE | yes | no | no | no | no |
| Importer-sector FE | no | yes | no | yes | no |
| Exporter-year FE | no | no | yes | yes | yes |
| Importer-year FE | no | no | yes | yes | no |
| Importer-sector-year FE | no | no | no | no | yes |
| $N$ | 540,505 | 540,435 | 540,405 | 540,328 | 528,809 |
| $R^2$ | 0.371 | 0.401 | 0.431 | 0.461 | 0.487 |

*Notes*: This table estimates the effect of exporter's log financial development $FinDev_{ot}$ on the log intensive margin component of the Herfindahl-Hirschman Index using sector-country-pair data, as summarized in Panel A of Table 1. Financial development, measured as ratio of private credit to GDP, is interacted with sectoral external finance dependence, $ExtFin_s$, as well as with asset tangibility $Tang_s$. All columns include log bilateral distance, and dummy variables for common border, common language, colonial links between countries, as well as a dummy that takes a value of one if a country pair belongs to a regional trade agreement (RTA). Columns (1) and (2) additionally control for exporter's log GDP, while columns (3) and (4) include exporter-year and importer-year fixed effects. The last column accounts for importer-sector-year fixed effects and exporter-year fixed effects. Standard errors in parentheses are clustered by exporter-importer pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

One concern with the sector analysis is that the share of top 25% exporters reflects a substantial part of trade flows and consequently, results might be driven by observations of extreme concentration in some export markets. Table 1 shows that the mean of the share of top 25% exporters is 77.55 pointing to a high degree of concentration. I first address this concern by restricting the regression sample to observations for which the corresponding share of the top 25% exporters by sector and destination is smaller than 90%. As reported in Table D3, for this subsample the effect of financial development on export concentration becomes quantitatively stronger compared to the baseline results in Table 2. In a further step, I restrict the sample to the time period 2007-2014, as data availability is lower for earlier years. The effects are again stronger in magnitude compared to the baseline estimations (see Table D4). Additionally, I estimate the effects for the share of top 5% exporters as dependent variable. For this measure, the mean value of 52.5 is considerably lower compared to the share of top 25% exporters (see Table 1). However, this variable is only reported for destination markets with at least 20 exporting firms, which considerably reduces the sample size. Nevertheless, in Table D5, I show that there is a positive and highly significant impact of financial development on the share of top 5% exporters.

In the Web Appendix, I conduct further sensitivity checks showing that the main results presented in this section still hold when allowing for alternative specifications. First, I show that the estimates are robust to including pair-fixed effects that absorb all time-invariant heterogeneity across country pairs. Second, while the estimations in this section are based on clustering by exporter-importer pair, the results remain significant when standard errors are clustered at the sector-country-pair level. Third, I use the first lag of the credit to GDP ratio as the main regressor, which results in slightly smaller coefficients on the interaction terms with external finance dependence, while the effects remain highly significant.

## 3.4 Empirical analysis of within-firm export concentration

I now investigate the impact of financial development on within-firm export concentration. The advantage of this step compared to the previous section is that one can take into account firm heterogeneity by controlling for firm fixed effects. This is especially relevant if changes in financial development lead to entry and exit dynamics across firms.[17] Analogous to the sectoral analysis above, I consider two measures of export concentration within firms, which are used as dependent variables $Y_{isodt}$ in the regressions. First, for each year and exporter,

[17] An influential literature highlights the dynamic aspects of credit frictions to explain financing patterns (Crouzet, 2018), innovation and productivity development (Midrigan and Xu, 2014), dynamics of new exporters compared to international trade models with sunk export entry costs (Kohn et al., 2016), as well as to evaluate gains from trade (Brooks and Dovis, 2020).

I compute the share of top 3 products (classified at the HS 6-digit level) by destination and within the same 2-digit industry. As a second measure, I compute the firm-level HHI analogous to Equation (20), where the extensive margin component reflects the number of exported products by 2-digit sector and destination. The intensive margin component relates a firm $i$'s variance of export sales of different products in sector $s$ and country $o$, exported to destination $d$, to the firm average sales in that destination. To test Proposition 4, I use the following estimation equation:

$$\begin{aligned} Y_{isodt} = \xi_0 + \xi_2 \ln FinDev_{ot} * ExtFin_s + \xi_3 \ln FinDev_{ot} * Tang_s \\ + \xi_5 RTA_{odt} + \boldsymbol{D_{od}} + \upsilon_{ot} + \upsilon_{dt} + \upsilon_s + \upsilon_i + \epsilon_{isodt}. \end{aligned} \tag{23}$$

Additional to country-year ($\upsilon_{ot}, \upsilon_{dt}$) and sector controls ($\upsilon_s$), Equation (23) includes firm-level fixed effects ($\upsilon_i$) to focus on within-firm changes of export concentration over time. According to Proposition 4, one expects that $\xi_2 > 0$, and $\xi_3 < 0$. Column (1) of Table 4 shows results for the effect of financial development on the share of top 3 products within firms by sector and destination. In column (2), sector fixed effects are replaced by importer-sector interacted fixed effects, while column (3) accounts for firm-destination fixed effects, which is especially relevant if firms select into particular markets.

In line with Proposition 4, all specifications show that financial development has a significantly positive impact on within-firm concentration in sectors with large external finance dependence, while the effect is attenuated whenever asset tangibility is high. These results are confirmed in columns (4)-(6) of Table 4 when considering the intensive margin component of the firm-level HHI as dependent variable. In all specifications, firm-level observations with at least four products by sector and destination are included, and standard errors are clustered by firm-destination pair.

Similar to the previous section, I perform a sensitivity analysis to check the robustness of the main results. As alternative measures of within-firm export concentration, I use the share of top 2 products and the share of the core product by sector and destination. Table D6 shows that the positive impact of financial development on export concentration is confirmed for both cases. Further sensitivity checks are reported in the Web Appendix. I show that the results are robust to alternative clustering at the sector-country-pair level, when accounting for pair-fixed effects, and considering the lagged effect of financial development. The estimates remain also stable and highly significant when restricting the sample period to the years with most observations, and when excluding extreme values of export concentration. Additionally, I show that controlling for the extensive margin, namely the number of exporters by sector and destination, does not change the main implications.

Table 4: Effect of financial development on within-firm export concentration by destination

| Dependent variable: | Firm-level share of top 3 products | | | Firm-level intensive margin HHI | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\ln FinDev_{ot} \times ExtFin_s$ | 5.847*** | 5.015*** | 6.999*** | 0.227*** | 0.197*** | 0.252*** |
| | (0.822) | (0.756) | (0.877) | (0.034) | (0.033) | (0.034) |
| $\ln FinDev_{ot} \times Tang_s$ | −9.197*** | −6.853*** | −11.76*** | −0.372*** | −0.306**** | −0.482*** |
| | (2.247) | (2.184) | (2.375) | (0.108) | (0.110) | (0.111) |
| Gravity controls | yes | yes | yes | yes | yes | yes |
| Sector FE | yes | no | yes | yes | no | yes |
| Firm FE | yes | yes | no | yes | yes | no |
| Exp.-year FE, Imp.-year FE | yes | yes | yes | yes | yes | yes |
| Imp.-sec. FE | no | yes | no | no | yes | no |
| Imp.-firm FE | no | no | yes | no | no | yes |
| $N$ | 235,004 | 234,132 | 219,447 | 235,604 | 234,736 | 220,013 |
| $R^2$ | 0.432 | 0.472 | 0.498 | 0.377 | 0.405 | 0.456 |

*Notes*: This table estimates the effect of exporter's log financial development, $FinDev_{ot}$, interacted with sectoral external finance dependence, $ExtFin_s$, as well as with asset tangibility $Tang_s$, on firm-level export concentration. Columns (1)-(3) show results for the share of top 3 exported products within firms by sector and destination. Columns (4)-(6) show estimates with the intensive margin of the firm-level HHI by sector and destination as dependent variable. The estimating sample uses firm-level export information as reported in Panel B of Table 1, and excludes observations whose corresponding number of products per destination and 2-digit-sector is smaller than 4. All columns include log bilateral distance, and dummy variables for common border, common language, colonial links between countries, as well as a dummy that takes a value of one if a country pair belongs to a regional trade agreement (RTA). Standard errors in parentheses are clustered by firm-destination pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

## 3.5 The innovation channel

So far, the results show supportive evidence for the model variant with external financing of innovation costs (Section 2.3.1). To further validate the mechanism related to innovations, I investigate the first part of Proposition 5 that the effect of financial development should be stronger in sectors with higher scope for quality differentiation. As a first proxy, I take the advertising and R&D intensity at the sectoral level from Kugler and Verhoogen (2012) and interact it with exporter's financial development. Alternatively, I use the R&D intensity from Kroszner et al. (2007). Both measures are defined as the average ratio of expenditures for research and development to total sales in a sector and do not vary over time. Based on the R&D intensity of Kroszner et al. (2007), I additionally generate a dummy variable that takes the value of one if the R&D intensity is above the median value across sectors.

Table 5 confirms the prediction of the investment model that sectors with higher R&D intensity show stronger effects of financial development on the share of top 25% exporters.[18] For all three proxies, the interaction with exporter's financial development is highly significant and positive. Table D7 in the Empirical Appendix confirms the positive relation between financial development and R&D intensity for the within-firm share of top 3 products.[19]

[18]The number of observations is lower when using the advertising and R&D intensity from Kugler and Verhoogen (2012) in columns (1) and (2) of Table 5, as a smaller number of sectors can be matched with the trade data. These measures are also used by Manova and Zhang (2012) and Flach and Unger (2022).

[19]The results are confirmed for the intensive margin HHI across and within firms (see the Web Appendix).

Table 5: Effect of financial development and R&D intensity on share of top 25% exporters

| Dependent variable: Share of top 25% exporters by sector and destination | | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\ln FinDev_{ot} \times (adv. + R\&D)_s$ | 15.39*** | 14.49*** | | | | |
| | (1.733) | (1.721) | | | | |
| $\ln FinDev_{ot} \times R\&D_s$ | | | 25.53*** | 25.02*** | | |
| | | | (3.284) | (3.199) | | |
| $\ln FinDev_{ot} \times high\ R\&D_s$ | | | | | 0.620*** | 0.815*** |
| | | | | | (0.149) | (0.144) |
| Gravity controls | yes | yes | yes | yes | yes | yes |
| Sector FE | yes | no | yes | no | yes | no |
| Importer-Sector FE | no | yes | no | yes | no | yes |
| Exporter-year, importer-year FE | yes | yes | yes | yes | yes | yes |
| $N$ | 238,632 | 238,513 | 366,554 | 366,451 | 366,554 | 366,451 |
| $R^2$ | 0.263 | 0.302 | 0.255 | 0.286 | 0.255 | 0.286 |

*Notes*: This table estimates the effect of exporter's log financial development, $FinDev_{ot}$, interacted with sectoral measures of R&D intensity, on the share of top 25% exporters by sector and destination. In columns (1) and (2), I use the advertising and R&D intensity from Kugler and Verhoogen (2012). For regressions in columns (3) and (4), information on R&D intensity is taken from Kroszner et al. (2007). Based on this measure, columns (5)-(6) show an interaction of financial development with a dummy variable=1 if R&D intensity is above the median value across sectors. All columns include exporter-year and importer-year fixed effects, as well as log bilateral distance, dummy variables for common border, common language, colonial links between countries, and a dummy that takes a value of one if a country pair belongs to a regional trade agreement (RTA). Columns (1), (3) and (5) further control for sector fixed effects, which are replaced by importer-sector fixed effects in columns (2), (4) and (6). Standard errors in parentheses are clustered by exporter-importer pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The investment model further suggests that the effect of financial development on within-firm concentration should be stronger for smaller exporters (see the second part of Proposition 5). Hence, I use again the firm-level export data to test this prediction and include firms' total exports across all destinations, $Exports_{it}$, as well as triple interaction terms with exporter's financial development and sectoral external finance dependence. Table 6 reports the results, where firm fixed effects ensure that only within-firm variation in export sales is used to identify the relationship. Consistent with Proposition 5, the triple interaction term with external finance dependence is significantly negative, while the triple effect with asset tangibility is positive. This confirms that the impact of financial development on export concentration becomes weaker for larger firms. This result is also obtained when using the total number of exported products by firm and year as a proxy for exporter size (see Table D8 in the Empirical Appendix).

The results confirm the predictions of a model with external financing of quality innovations and endogenous markups. In sectors with high R&D intensity, financial development has a stronger positive impact on export concentration both across and within firms. Additionally, smaller exporters face a higher price elasticity of demand, which implies that they react stronger to financial development by concentrating on the best performing products.

Table 6: Effect of financial development on share of top 3 products & firm size

| Dependent variable: Firm-level share of top 3 products by sector and destination | | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| $\ln FinDev_{ot} \times ExtFin_s$ | 7.040*** | 6.501*** | 8.253*** |
| | (0.903) | (0.855) | (0.941) |
| $\ln FinDev_{ot} \times Tang_s$ | −10.87*** | −9.238*** | −13.75*** |
| | (2.571) | (2.569) | (2.636) |
| $\ln Exports_{it}$ | −0.024 | −0.076 | −0.192*** |
| | (0.067) | (0.069) | (0.072) |
| $\ln FinDev_{ot} \times ExtFin_s \times \ln Exports_{it}$ | −0.181*** | −0.166*** | −0.210*** |
| | (0.024) | (0.022) | (0.024) |
| $\ln FinDev_{ot} \times Tang_s \times \ln Exports_{it}$ | 0.243*** | 0.245*** | 0.316*** |
| | (0.074) | (0.071) | (0.075) |
| Gravity controls | yes | yes | yes |
| Sector FE | yes | no | yes |
| Firm FE | yes | yes | no |
| Exporter-year FE | yes | yes | yes |
| Importer-year FE | yes | yes | yes |
| Importer-sector FE | no | yes | no |
| Importer-firm FE | no | no | yes |
| $N$ | 235,004 | 234,132 | 219,447 |
| $R^2$ | 0.433 | 0.473 | 0.499 |

*Notes*: This table estimates the effect of exporter's log financial development, $FinDev_{ot}$, on firms' share of top 3 products per destination and sector. Additional to the interaction terms of financial development with sectoral external finance dependence and asset tangibility, triple interaction effects with total firm export sales are included. All columns control for log bilateral distance, dummy variables for common border, common language, colonial links between countries, and a dummy that takes a value of one if a country pair belongs to a regional trade agreement (RTA). The estimating sample excludes observations whose corresponding number of products per destination and 2-digit-sector is smaller than 4. Standard errors in parentheses are clustered by firm-destination pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

# 4 Alternative determinants of export concentration

This part addresses that financial development could be endogenously correlated with other determinants of export concentration. The following section 4.1 shows that the estimates are robust to alternative sources of comparative advantage, such as physical and human capital. Additionally, I use indices of contractual enforcement to measure financial development (Section 4.2), and account for country differences in the quality of the legal system and in productivity (Section 4.3). In the following, I analyze the impact of importer's financial development on export concentration (4.4). Finally, I investigate the additional role of trade intermediation (4.5). The main robustness checks for the share of top 25% exporters and the firm-level share of top 3 products by sector and destination are reported in Tables 7 and 8, respectively. These results are based on a more detailed analysis in the Web Appendix.

## 4.1 Capital intensity and sources of comparative advantage

The positive relationship between financial development and export concentration might be driven by other sources of comparative advantage that have received a lot of attention in the trade literature. First, access to finance can be closely related to the availability of

physical capital. In this case, more capital abundant countries have a comparative advantage in sectors that are more capital intensive, which could help especially large firms to grow. Second, export concentration can be driven by differences in human capital across countries. Third, the availability of natural resources is an alternative channel in this setting with a large number of developing countries, which is particularly important in sectors that rely on this input source, e.g. wood products or metals. Indeed, countries with larger shares of natural resources show higher export concentration in non-resource goods (Bahar and Santos, 2018).[20] To control for these alternative channels of comparative advantage, I include per capita values of produced capital, human capital and natural capital by country and year from the World Bank's Wealth Accounts (The World Bank, 2021).[21] I interact these time-varying country measures with the corresponding sectoral intensity in physical, human and natural capital from Braun (2005), and add these controls to the regression analysis.

In columns (1)-(3) of Table 7, the interaction terms of the different sources of comparative advantage are added separately to the estimation. Column (4) accounts for physical, human and natural capital accumulation in one regression. Both human and natural capital have a positive impact on the share of top 25% exporters, especially in sectors that rely more on these resources. In contrast, physical capital abundance tends to reduce export concentration, where the effect is only significant in the combined regression of column (4).[22] Accounting for these alternative channels of comparative advantage does not change the main implication that financial development has a positive impact on sectoral export concentration.

The impact of capital accumulation on firm-level measures of export concentration is less clear-cut compared to the sectoral analysis (see Columns (1)-(4) of Table 8). Both physical and natural capital reduce the within-firm share of top products, especially in sectors with high prevalence of these input factors. When accounting for these determinants, there is no significant effect of human capital in column (4). However, I show in the Web Appendix that firm-level concentration measured by the intensive margin of the HHI is influenced

[20] The authors rationalize this finding in a two-sector heterogeneous firm model where an increase in resources drives wages up and reduces the competitiveness of firms, especially in the labor intensive sector.

[21] According to The World Bank (2021) produced capital includes machinery, buildings, equipment and nonresidential urban land, while human capital is measured as the present value of future earnings for the working population over their lifetimes. The value of natural capital takes into account renewable (agricultural land, forests, protected areas, mangroves and fisheries) and nonrenewable resources (fossil fuel energy and minerals). All values are measured at market exchange rates in constant 2018 US dollars by using country-specific GDP deflators (The World Bank, 2021).

[22] These results are confirmed when using the intensive margin of the Herfindahl-Hirschman Index as measure of concentration. I report these results in the Web Appendix. Note that Leibovici (2021) exploits differences in capital intensity as measures of external finance dependence to show that financial development reallocates trade shares from labor- to capital-intensive industries. Following Manova (2013), I add sectoral variation in capital intensities to account for other sources of comparative advantage besides the financial channel.

positively by human capital accumulation. As for the sectoral analysis, the effects of financial development on within-firm export concentration remain highly significant and stable.

Table 7: Effect of financial development on export concentration - Robustness checks

| Dependent variable: Share of top 25% exporters | | | | | | | |
|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| $\ln FinDev_{ot} \times ExtFin_s$ | 0.828*** | 0.419** | 0.771*** | 0.650*** | 0.876*** | 0.597*** | 0.604*** |
| | (0.198) | (0.190) | (0.197) | (0.196) | (0.213) | (0.192) | (0.206) |
| $\ln FinDev_{ot} \times Tang_s$ | −2.040*** | −3.070*** | −2.665*** | −2.789*** | −2.028*** | −2.576*** | −2.621*** |
| | (0.587) | (0.505) | (0.527) | (0.624) | (0.534) | (0.510) | (0.671) |
| $\ln (K/L)_{ot} \times K\_Intensity_s$ | −0.501 | | | −5.440*** | | | −5.498*** |
| | (1.244) | | | (1.904) | | | (2.075) |
| $\ln (H/L)_{ot} \times H\_Intensity_s$ | | 2.815*** | | 2.575*** | | | 2.478*** |
| | | (0.266) | | (0.274) | | | (0.296) |
| $\ln (N/L)_{ot} \times N\_Intensity_s$ | | | 1.804*** | 1.616*** | | | 1.733*** |
| | | | (0.175) | (0.173) | | | (0.186) |
| $\ln FinDev_{dt} \times ExtFin_s$ | | | | | −0.928** | | −0.756 |
| | | | | | (0.471) | | (0.490) |
| $\ln FinDev_{dt} \times Tang_s$ | | | | | −1.399 | | −2.142 |
| | | | | | (1.370) | | (1.453) |
| $\ln FinDev_{ot} \times Intermed_s$ | | | | | | −0.629*** | −0.220 |
| | | | | | | (0.127) | (0.148) |
| Gravity controls | yes | yes | yes | yes | yes | yes | yes |
| Importer-sector FE | yes | yes | yes | yes | yes | yes | yes |
| Exporter-year FE | yes | yes | yes | yes | yes | yes | yes |
| Importer-year FE | yes | yes | yes | yes | yes | yes | yes |
| $N$ | 372,700 | 372,700 | 338,860 | 338,860 | 324,246 | 373,118 | 295,318 |
| $R^2$ | 0.285 | 0.287 | 0.282 | 0.283 | 0.286 | 0.286 | 0.283 |

*Notes*: This table shows several robustness checks for the effect of exporter's log financial development $FinDev_{ot}$ on the share of top 25% exporters by sector and destination. Financial development, measured as ratio of private credit to GDP, is interacted with sectoral external finance dependence, $ExtFin_s$, as well as with asset tangibility $Tang_s$. All columns include importer-sector fixed effects, exporter-year and importer year fixed effects, as well as log bilateral distance, and dummy variables for common border, common language, colonial links between countries and membership in regional trade agreements. Standard errors in parentheses are clustered by exporter-importer pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

## 4.2 Indices of contractual enforcement

To address the concern that financial development could be endogenous with respect to other determinants of export concentration, I follow Manova (2013) and use indices of contractual enforcement from La Porta et al. (1998) capturing a country's quality of accounting standards, the likelihood of contract repudiation by the government, and the risk of expropriation. These measures are time-invariant and capture heterogeneity in the quality of financial institutions across countries. I interact the country indices with the sectoral measures of external finance dependence and asset tangibility. Tables E1 and E2 report the estimates for the share of top 25% exporters, and the intensive margin of the HHI, as dependent variables, respectively. For all three measures of contract enforcement, the interaction with external finance dependence has a positive and significant impact on export concentration, while the interaction with asset tangibility is significantly negative. These results confirm that the

positive impact of financial development on export concentration is related to the quality of financial institutions.[23]

Table 8: Within-firm concentration - Robustness checks

| Dependent variable: Firm-level share of top 3 products | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| $\ln FinDev_{ot} \times ExtFin_s$ | 6.964*** | 6.957*** | 7.877*** | 7.618*** | 6.576*** | 6.648*** | 5.822*** |
| | (0.877) | (0.869) | (0.856) | (0.844) | (0.943) | (0.804) | (0.838) |
| $\ln FinDev_{ot} \times Tang_s$ | −14.26*** | −11.86*** | −13.61*** | −16.78*** | −10.12*** | −12.37*** | −18.06*** |
| | (2.361) | (2.389) | (2.254) | (2.323) | (2.456) | (2.586) | (2.619) |
| $\ln (K/L)_{ot} \times K\_Intensity_s$ | −14.23*** | | | −25.38*** | | | −25.47*** |
| | (2.608) | | | (4.390) | | | (5.455) |
| $\ln (H/L)_{ot} \times H\_Intensity_s$ | | −1.771* | | −0.922 | | | −0.338 |
| | | (1.048) | | (1.295) | | | (1.436) |
| $\ln (N/L)_{ot} \times N\_Intensity_s$ | | | −3.210*** | −1.636*** | | | −0.729 |
| | | | (0.617) | (0.609) | | | (0.618) |
| $\ln FinDev_{dt} \times ExtFin_s$ | | | | | 0.234 | | 0.439 |
| | | | | | (0.283) | | (0.275) |
| $\ln FinDev_{dt} \times Tang_s$ | | | | | −3.993*** | | −0.477 |
| | | | | | (0.742) | | (0.770) |
| $\ln FinDev_{ot} \times Intermed_s$ | | | | | | −0.517 | −3.401*** |
| | | | | | | (0.412) | (0.566) |
| Gravity controls | yes | yes | yes | yes | yes | yes | yes |
| Sector FE | yes | yes | yes | yes | yes | yes | yes |
| Exp.-year FE, imp.-year FE | yes | yes | yes | yes | yes | yes | yes |
| Imp.-firm FE | yes | yes | yes | yes | yes | yes | yes |
| $N$ | 219,447 | 219,447 | 152,196 | 152,196 | 196,295 | 219,447 | 135,224 |
| $R^2$ | 0.498 | 0.498 | 0.530 | 0.530 | 0.492 | 0.498 | 0.527 |

*Notes*: This table shows several robustness checks for the effect of exporter's and importer's log financial development, $FinDev_{ot}$ and $FinDev_{dt}$, interacted with sectoral external finance dependence, $ExtFin_s$, as well as with asset tangibility $Tang_s$, on the share of top 3 exported products within firms by sector and destination. The estimating sample uses firm-level export information as reported in Panel B of Table 1, and excludes observations whose corresponding number of products per destination and 2-digit-sector is smaller than 4. All columns include sector fixed effects, exporter-year and importer year fixed effects, and importer-firm fixed effects, as well as log bilateral distance, dummy variables for common border, common language, colonial links between countries, and a dummy that takes a value of one if a country pair belongs to a regional trade agreement (RTA). Standard errors in parentheses are clustered by firm-destination pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

## 4.3 Quality of legal system, capital intensity, and productivity

A further concern is that financial development would be related to the quality of the legal system rather than capturing specific conditions of the credit market. Hence, I control for a rule of law index from La Porta et al. (1998), which does not vary over time and ranges from zero to 10, where lower scores reflect less tradition for law and order. Including this measure in the regression analysis allows to test whether the impact of financial development remains robust when accounting for more general country differences in the quality of institutions without a distinct connection to financial policy. Related to this, I further control for total factor productivity at the country level from the Penn World Table version 10.0 (Feenstra

[23]Note that I do not analyze the impact of contract enforcement on within-firm concentration, as the small number of countries does not provide sufficient variation to use the time-invariant indicator variables.

et al., 2015), which addresses the concern that the effects of financial development are driven by productivity differences across countries. Both the rule of law index and time-varying productivity measures are interacted with sectoral external finance dependence and asset tangibility. Table E3 reports the results for the share of top 25% exporters, where also the sources of comparative advantage from the previous subsection are included, and shows that the coefficients on the interaction of financial development measures with sectoral exposure to external finance remain stable.[24] The interaction terms with the rule of law index do not show a clear picture and are only partly significant, which implies that the effect of financial development seems not to be driven by differences in the quality of the legal system. Additionally, the interactions with total factor productivity show positive and significant coefficients, while the effect of financial development remains highly robust. Similar results are obtained for estimations with the intensive margin of the HHI as dependent variable (see Table E4).

## 4.4 Impact of importer's financial development

Empirical studies show that export performance does not only depend on financial development in the origin country. Multinational firms benefit from the provision of credit in the destination country through affiliates (Manova et al., 2015; Eppinger and Smolka, 2020), and increase their aggregate sales as well as sales to third countries through export-platform FDI (Bilir et al., 2019). This channel is especially relevant for larger firms with more complicated production networks and whenever credit conditions tighten in the origin country. Note that importer-year or importer-sector-year fixed effects in the previous analysis absorb financial shocks in the destination country. Nevertheless, I show an additional specification that includes interaction terms of the importer's financial development, measured by the private credit to GDP ratio, with sectoral external finance dependence and asset tangibility. The results for the share of top 25% exporters, reported in column (5) of Table 7, show that the impact of exporter's financial development remains stable and highly significant compared to Table 2. Financial development in the importing country reduces export concentration in sectors with higher external finance dependence, while the interaction term with asset tangibility is insignificant. Column (5) of Table 8 further shows that there are only weak effects of importer's financial development on within-firm concentration, while the impact of exporter's credit conditions remains robust.[25]

[24] Only in one case with contract repudiation, the interaction of financial development with asset tangibility is not significant, see column (3) of Table E3.

[25] Note that the sample size is lower compared to Table 4, due to missing observations of importer's credit to GDP ratio.

### 4.5 The role of trade intermediation

Chan (2019) shows that financial frictions induce firms to choose indirect modes of exporting compared to direct exporting, especially in countries with less developed financial systems. This result is rationalized in a trade model with external finance of trade costs and credit frictions, where direct exporting is associated with higher fixed export costs but lower variable costs compared to trade intermediation. Based on the classification of sectors of Chan (2019), I introduce a dummy variable that takes a value of one if a sector relies strongly on trade intermediaries for exporting.[26] To test the hypothesis that trade intermediation helps to reduce the impact of financial frictions, I interact the dummy variable with exporter's financial development and include this interaction term in the regression analysis. Consistent with Chan (2019), the results in column (6) of Table 7 show that the impact of financial development on export concentration is reduced in sectors with higher prevalence of trade intermediation. However, there is no such significant effect of intermediaries on within-firm export concentration (see Column (6) of Table 8). These results provide suggestive evidence that trade intermediation is especially important for export participation of smaller firms consistent with the idea of lower fixed costs for indirect exporting in Chan (2019). Note that the interaction terms of financial development with external finance dependence and asset tangibility remain robust and highly significant in both sector-level and firm-level regressions.

The last columns of Tables 7 and 8 show estimates when including all controls. While the number of observations drops due to data availability, the positive impact of financial development on export concentration can be confirmed.

## 5 Quantitative importance of results

Based on my empirical estimates, I now study how quantitatively important the effects of financial development are, and compare them to the implications of alternative channels as discussed in the previous section. For this purpose, I conduct two different counterfactual scenarios. In the first counterfactual experiment, I compute predicted changes of export concentration that are based on changes in financial development over time by country and sector. I compare these predicted changes to the actual ones in the sample to evaluate the explanatory power of financial development. In a second step, I calculate the effects of moving from a less-developed to a highly financially developed country across sectors with high and low external finance dependence. The results will be compared to the ones obtained from changes of alternative sources of export concentration.

[26] The sectors that rely more on trade intermediation are product classifications of food products, apparel, textiles, metals, machinery, and wood.

## 5.1 Changes of financial development over time

I first consider the actual change of financial development over the period 2003 to 2008 for each exporting country. Based on my estimates I then compute the predicted changes of export concentration measures associated with this change in financial development by sector and country.[27] To compare these counterfactual values associated with financial development to alternative sources of export concentration, I further compute the predicted changes due to factor accumulation including physical, human and natural capital. Comparing these estimates to the actual changes of export concentration shows how important financial development is in explaining variation of export concentration across countries and sectors. Table 9 reports beta coefficients from regressing the actual changes in export concentration on predicted ones, conditioned on importer-sector effects. Columns (1)-(3) show that financial development is highly important to explain variation in the share of top 25% exporters across countries and sectors, while predicted changes of factor accumulation are positively but not significantly related to actual changes. A similar pattern appears for the intensive margin component of the HHI in columns (4)-(6), where the beta coefficients associated with factor accumulation turn negative but remain insignificant.

Table 9: Actual vs. predicted changes in export concentration

| Actual change / | Share of top 25% exporters | | | ln Intensive margin HHI | | |
|---|---|---|---|---|---|---|
| Predicted change due to | (1) | (2) | (3) | (4) | (5) | (6) |
| Financial development | 0.919*** | | 0.906*** | 1.020*** | | 1.031*** |
| | (0.344) | | (0.342) | (0.340) | | (0.342) |
| Factor accumulation | | 0.607 | 0.572 | | −0.039 | −0.100 |
| | | (0.425) | (0.422) | | (0.235) | (0.237) |
| Importer-sector FE | yes | yes | yes | yes | yes | yes |
| $N$ | 11,342 | 11,342 | 11,342 | 16,971 | 16,971 | 16,971 |
| $R^2$ | 0.189 | 0.188 | 0.189 | 0.175 | 0.174 | 0.175 |

*Notes*: This table shows beta coefficients from regressions of changes in sectoral export concentration on the corresponding counterfactual changes associated with 5-year changes in financial development and factor accumulation between 2003 and 2008, including physical, human and natural capital. The counterfactual changes are computed by using the estimates from the Web Appendix Table C1, columns (1) and (4). All specifications include importer-sector fixed effects. Standard errors in parentheses are clustered by exporter-importer pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

## 5.2 Moving from low to high financial development

In a second counterfactual scenario, I consider an increase of the private credit to GDP ratio from the 25th percentile (value of 15.5) to the 75th percentile (68.2) in the estimating sample. This can be interpreted as a move from a less developed to a highly developed financial market

[27] The period is chosen as it covers the years with most observations before the global financial crisis. The counterfactual changes are computed by using estimates from the Web Appendix Table C1, columns (1) and (4) for the share of top 25% exporters and the intensive margin component of the HHI, respectively.

related to the analysis of Leibovici (2021). Based on my estimates, I evaluate the impact of this change in financial development at the mean value of external finance dependence across sectors with external finance dependence above the 75th percentile (0.72), and at the average value of asset tangibility of sectors with asset tangibility below the 25th percentile (0.17). In contrast to this scenario with high credit exposure, I compute the predicted change of export concentration at the mean of external finance dependence for sectors below the 25th percentile (-0.05) and with asset tangibility 0.41, which is the average across sectors above the 75th percentile. I further compare results to the ones evaluated at the mean values of external finance dependence (0.22) and of asset tangibility (0.33) across all sectors.

The previous section has shown that human capital accumulation is an alternative source driving export concentration. Hence, I investigate a change of human capital per capita from the 25th to the 75th percentile, which corresponds to a log change of 4.08. Similar to the financial development scenario, I evaluate the impact of human capital at the average human capital intensity across sectors, as well as at the mean across sectors for which human capital is above the 75th percentile, and below the 25th percentile, respectively.

Panel A of Table 10 shows that moving from a less developed to a highly financially developed economy increases the share of top exporters, up to 12.6pp in sectors with high credit exposure. The change is lower in sectors that are less dependent on external finance, but with 8.8pp still substantial. The relative difference is also remarkable for the change in the intensive margin HHI, where the increase in export concentration is by 0.61 log points larger in sectors with high credit exposure compared to sectors with low exposure. The quantitative differences across sectors are even more important at the firm level. Financial development increases the share of top products by around 8pp in sectors with high external finance dependence, whereas the firm responses turn negative in sectors with average and low exposure to credit frictions. This pattern is also confirmed for changes in the firm-level intensive margin HHI.

Changes of export concentration induced by human capital accumulation are substantially lower in magnitude (see the last columns of Panel A). Moving from low to high human capital per capita increases the share of top exporters by around 2pp in sectors with high human capital intensity, whereas the reaction is negative in sectors with low human capital intensity. The relative differences are also smaller in magnitude across sectors compared to the scenario of financial development. This is also confirmed for log changes in the intensive margin HHI, which lie between 0.13 and 0.42 across sectors. The quantitative effects are less clear-cut for the firm-level analysis. While human capital increases the share of top 3 products by 1.56pp in sectors with high human capital intensity, the response of the intensive margin HHI is negative across sectors. Remarkably, the relative differences between the

three scenarios are less pronounced compared to the case of financial development. Hence, these counterfactual scenarios show that the quality of financial institutions is quantitatively important to explain the observed variation in export concentration across countries and sectors.

Table 10: Quantitative importance of empirical estimates

| Panel A. Effect of financial development and human capital on export concentration | | | | | | |
|---|---|---|---|---|---|---|
| Change in | Financial development | | | Human capital accumulation | | |
| Sector exposure | High | Average | Low | High | Average | Low |
| Δ Share of top 25% exporters | 12.56 | 10.04 | 8.76 | 2.03 | 0.22 | −1.06 |
| Δ ln Intensive margin HHI | 0.90 | 0.49 | 0.29 | 0.42 | 0.25 | 0.13 |
| Δ Firm-level share of top 3 products | 8.34 | −7.44 | −15.47 | 1.56 | 1.17 | 0.90 |
| Δ Firm-level intensive margin HHI | 0.58 | −0.02 | −0.33 | −0.63 | −0.96 | −1.19 |
| **Panel B. Implications for average exports by sector and destination** | | | | | | |
| Change in | Financial development | | | Human capital accumulation | | |
| Sector exposure | High | Average | Low | High | Average | Low |
| Average exports | 0.73 | 0.24 | −0.01 | 1.86 | 1.13 | 0.61 |
| Number of exporters | 1.86 | 1.01 | 0.58 | 0.56 | −0.01 | −0.41 |
| Aggregate exports | 2.59 | 1.25 | 0.57 | 2.42 | 1.12 | 0.20 |

*Notes*: This table shows the estimated effects of changes in financial development and human capital on measures of export concentration, depending on a sector's exposure to external credit, and human capital intensity, respectively. The sector-level estimates in Panel A are based on the beta coefficients reported in columns (1) and (4) of Table C1 in the Web Appendix. The firm-level estimates are obtained by using modified regression equations based on columns (1) and (4) of Table C2, where exporter-year fixed effects are replaced by direct controls of country variables. The counterfactual analysis in Panel B is based on estimated coefficients from Table E5.

## 5.3 Implications for average and aggregate exports

The variation in export concentration across sectors and countries is closely linked to the relation between financial development and average exports. While financial development increases average sales in the investment model, there is a negative impact whenever production costs are financed externally (see the discussion in Section 3.1). Column (1) of Table E5 provides additional evidence in support of the investment model that financial development leads to higher average exports. In contrast to average sales, note that both model variants predict a positive impact of financial development on total exports and the number of exporters (see Proposition 3). These effects have been extensively studied in the existing literature on trade and finance (Manova, 2013; Crinò and Ogliari, 2017), and is confirmed by the estimates in columns (2) and (3) of Table E5.

I use the estimates of Table E5 to link the quantitative effects of financial development on export concentration to the implications for the margins of trade. I consider the same move from a less developed to a highly financially developed country as in the previous section and compute the implied changes of average exports, the number of exporters and aggregate

exports by sector and destination. The results in Panel B of Table 10 indicate that financial development leads to an increase of average exports by 0.73 log points in sectors with high external finance dependence, while a decrease of 0.01 log points occurs with low external finance dependence. Financial development further increases the number of exporters by 1.86 log points in sectors with high exposure to credit frictions, while the change is 0.58 log points in sectors with low exposure to credit frictions. These two margins together lead to the positive impact of financial development on aggregate exports, which varies substantially across sectors as reported in the last line of Panel B.

Table E5 further reports how human capital affects the margins of trade. I use these estimates to compute counterfactual changes of the margins of trade as reported in the second part of Panel B. Human capital accumulation leads to substantial increases in aggregate exports, especially in sectors that rely on this factor. Note that the aggregate effects are slightly smaller in magnitude compared to the scenario of financial development. Notably, the impact works stronger through an increase in average exports, while the number of exporters decreases in sectors with low exposure to human capital. Most importantly, while both scenarios lead to sizeable positive effects on aggregate exports, financial development is associated with a substantially stronger impact on export concentration.

Hence, the results of the counterfactual analysis suggests that credit constraints are an important source of frictions that prevent export growth and affect the distribution of sales across and within firms. Accounting for this impact of financial development besides aggregate effects on exports is thus crucial to understand the variation in export concentration and in average exporter size across countries and sectors.

# 6 Conclusion

This paper provides theory and evidence that financial development increases export concentration among large firms. I analyze the relation between credit constraints and the concentration of export sales in a two-country and multi-sector model of trade with endogenous markups, where firms need external finance to invest in product-specific quality innovations. The model predicts that better financial institutions lead to a higher skewness of sales towards top firms and better performing products within exporters. The reason for this result is that the marginal benefit of additional innovations is especially large for high productivity firms. I contrast this result with a model variant where exporters have to finance part of production costs instead of innovations. In this case, financial development especially benefits smaller exporters and reduces export concentration.

These opposing predictions are tested by combining export data for 70 countries over the

period 1997-2014 with information on financial development across countries and sectoral variation in external finance dependence. The estimates show that better financial institutions increase export concentration among top firms, especially in sectors that rely more on external finance. This relationship also holds within multi-product exporters. By using firm-level export data for 10 countries, I show that financial development induces firms to skew sales towards the top performing products. As these results are in line with a trade model that accounts for endogenous markups and external financing of innovation costs, I provide further evidence for this channel. First, the positive impact of financial development on export concentration both across firms and within firms is especially pronounced in sectors with large scope for quality differentiation. Second, the effect of financial development on within-firm concentration is stronger for smaller and less productive exporters as they face a higher price elasticity of demand.

The results highlight the important interaction between endogenous markups and external financing of innovations to explain the positive relation between financial development and export concentration. In contrast, models with constant markups and credit frictions related to innovations or production costs predict a negative relation between financial development and export concentration as especially less efficient exporters benefit from relaxing credit constraints. I further show that the empirical results remain robust when accounting for the potential endogeneity of financial development, other determinants of export performance, and alternative measures of export concentration.

While existing studies show a positive impact of financial development on aggregate exports, this paper identifies an additional channel that credit frictions prevent export growth opportunities of larger firms, especially in sectors that are more reliant on external finance and where the degree of quality differentiation is high. Financial development reallocates resources towards better performing firms and products, which gives rise to stronger export concentration.

# References


Altomonte, C., Favoino, D., Morlacco, M., and Sonno, T. (2021). Markups, intangible capital and heterogeneous financial frictions. CEP Discussion Papers dp1740, Centre for Economic Performance, LSE.

Amiti, M. and Heise, S. (2022). U.s. market concentration and import competition. Working papers, U.S. Census Bureau, Center for Economic Studies.

Antoniades, A. (2015). Heterogeneous firms, quality, and trade. *Journal of International Economics*, 95(2):263–273.

Autor, D., Dorn, D., Katz, L. F., Patterson, C., and Van Reenen, J. (2020). The fall of the labor share and the rise of superstar firms. *The Quarterly Journal of Economics*, 135(2):645–709.

Bahar, D. and Santos, M. A. (2018). One more resource curse: Dutch disease and export concentration. *Journal of Development Economics*, 132:102–114.

Beck, T., Demirgüç-Kunt, A., and Maksimovic, V. (2005). Financial and legal constraints to growth: does firm size matter? *The Journal of Finance*, 60(1):137–177.

Bento, P. and Restuccia, D. (2017). Misallocation, establishment size, and productivity. *American Economic Journal: Macroeconomics*, 9(3):267–303.

Berman, N. and Héricourt, J. (2010). Financial factors and the margins of trade: Evidence from cross-country firm-level data. *Journal of Development Economics*, 93(2):206–217.

Bernard, A. B., Jensen, J. B., and Schott, P. K. (2009). Importers, exporters and multinationals: A portrait of firms in the U.S. that trade goods. In *Producer Dynamics: New Evidence from Micro Data*, NBER Chapters, pages 513–552. National Bureau of Economic Research, Inc.

Berthou, A., Jong-Hyun Chung, J., Manova, K., and Sandoz Dit Bragard, C. (2020). Trade, productivity and (mis)allocation. CEP Discussion Papers dp1668, Centre for Economic Performance, LSE.

Bilir, L. K., Chor, D., and Manova, K. (2019). Host-country financial development and multinational activity. *European Economic Review*, 115:192–220.

Bonfiglioli, A., Crinò, R., and Gancia, G. (2019). Trade, finance, and endogenous firm heterogeneity. *Journal of the European Economic Association*, 17(1):79–130.

Bonfiglioli, A., Crinò, R., and Gancia, G. (2021). Concentration in international markets: Evidence from US imports. *Journal of Monetary Economics*, 121:19–39.

Braun, M. (2005). Financial contractability and asset hardness. *Available at SSRN 2522890*.

Brooks, W. and Dovis, A. (2020). Credit market frictions and trade liberalizations. *Journal of Monetary Economics*, 111:32–47.

Buera, F. J., Kaboski, J. P., and Shin, Y. (2011). Finance and development: A tale of two sectors. *American Economic Review*, 101(5):1964–2002.

Chan, J. M. (2019). Financial frictions and trade intermediation: Theory and evidence. *European Economic Review*, 119:567–593.

Chaney, T. (2016). Liquidity constrained exporters. *Journal of Economic Dynamics and Control*, 72:141–154.

Cho, I., Contessi, S., Russ, K. N., and Valderrama, D. (2019). Financial choice and international trade. *Journal of Economic Behavior & Organization*, 157:297–319.

Ciani, A. and Bartoli, F. (2020). Export quality differentiation under credit constraints. *The World Economy*, 43(5):1398–1433.

Ciliberto, F. and Jäkel, I. C. (2021). Superstar exporters: An empirical investigation of strategic interactions in danish export markets. *Journal of International Economics*, 129:103405.

Crinò, R. and Ogliari, L. (2017). Financial imperfections, product quality, and international trade. *Journal of International Economics*, 104:63–84.

Crouzet, N. (2018). Aggregate implications of corporate debt choices. *The Review of Economic Studies*, 85(3):1635–82.

De Loecker, J., Eeckhout, J., and Unger, G. (2020). The rise of market power and the macroeconomic implications. *The Quarterly Journal of Economics*, 135(2):561–644.

Eaton, J., Kortum, S., and Kramarz, F. (2011). An anatomy of international trade: Evidence from french firms. *Econometrica*, 79(5):1453–1498.

Eckel, C. and Neary, J. P. (2010). Multi-product firms and flexible manufacturing in the global economy. *The Review of Economic Studies*, 77(1):188–217.

Eckel, C. and Unger, F. (2022). Credit constraints, endogenous innovations, and price setting in international trade. *Mimeo, conditionally accepted at International Economic Review*.

Egger, P. and Larch, M. (2008). Interdependent preferential trade agreement memberships: An empirical analysis. *Journal of International Economics*, 76(2):384–399.

Eppinger, P. and Smolka, M. (2020). Firm exports, foreign ownership, and the global financial crisis. CESifo Working Paper Series 8808, CESifo.

Fan, H., Lai, E. L.-C., and Li, Y. A. (2015). Credit constraints, quality, and export prices: theory and evidence from China. *Journal of Comparative Economics*, 43(2):390–416.

Feenstra, R. C., Inklaar, R., and Timmer, M. P. (2015). The next generation of the Penn World Table. *American Economic Review*, 105(10):3150–82.

Feenstra, R. C., Li, Z., and Yu, M. (2014). Exports and credit constraints under incomplete information: Theory and evidence from China. *Review of Economics and Statistics*, 96(4):729–744.

Fernandes, A. M., Freund, C., and Pierola, M. D. (2016). Exporter behavior, country size and stage of development: Evidence from the exporter dynamics database. *Journal of Development Economics*, 119(C):121–137.

Flach, L. (2016). Quality upgrading and price heterogeneity: Evidence from Brazilian exporters. *Journal of International Economics*, 102:282–290.

Flach, L., Irlacher, M., and Unger, F. (2021). Corporate taxes and multi-product exporters: Theory and evidence from trade dynamics. *Journal of International Economics*, 132:103515.

Flach, L. and Unger, F. (2022). Quality and gravity in international trade. *Journal of International Economics*, 137:103578.

Foster, L., Haltiwanger, J., and Syverson, C. (2008). Reallocation, firm turnover, and efficiency: Selection on productivity or profitability? *American Economic Review*, 98(1):394–425.

Freund, C. and Pierola, M. D. (2015). Export superstars. *Review of Economics and Statistics*, 97(5):1023–1032.

Freund, C. and Pierola, M. D. (2020). The origins and dynamics of export superstars. *The World Bank Economic Review*, 34(1):28–47.

Hsieh, C.-T. and Klenow, P. J. (2009). Misallocation and manufacturing TFP in China and India. *The Quarterly Journal of Economics*, 124(4):1403–1448.

Irlacher, M. (2022). Multi-product firms in International Economics. CESifo Working Paper Series 9589, CESifo.

Irlacher, M. and Unger, F. (2018). Capital market imperfections and trade liberalization in general equilibrium. *Journal of Economic Behavior & Organization*, 145:402–423.

Kohn, D., Leibovici, F., and Szkup, M. (2016). Financial frictions and new exporter dynamics. *International Economic Review*, 57(2):453–486.

Kohn, D., Leibovici, F., and Szkup, M. (2021). Financial frictions and international trade. Working Papers 2021-009, Federal Reserve Bank of St. Louis.

Kroszner, R. S., Laeven, L., and Klingebiel, D. (2007). Banking crises, financial dependence, and growth. *Journal of Financial Economics*, 84(1):187–228.

Kugler, M. and Verhoogen, E. (2012). Prices, plant size, and product quality. *Review of Economic Studies*, 79(1):307–339.

La Porta, R., Lopez-de Silanes, F., Shleifer, A., and Vishny, R. W. (1998). Law and finance. *Journal of political economy*, 106(6):1113–1155.

Leibovici, F. (2021). Financial development and international trade. *Journal of Political Economy*, 129(12):3405–3446.

Manova, K. (2008). Credit constraints, equity market liberalizations and international trade. *Journal of International Economics*, 76(1):33–47.

Manova, K. (2013). Credit constraints, heterogeneous firms, and international trade. *Review of Economic Studies*, 80(2):711–744.

Manova, K., Wei, S.-J., and Zhang, Z. (2015). Firm exports and multinational activity under credit constraints. *Review of Economics and Statistics*, 97(3):574–588.

Manova, K. and Zhang, Z. (2012). Export prices across firms and destinations. *The Quarterly Journal of Economics*, 127(1):379–436.

Mayer, T., Melitz, M. J., and Ottaviano, G. I. (2014). Market size, competition, and the product mix of exporters. *American Economic Review*, 104(2):495–536.

Mayer, T., Melitz, M. J., and Ottaviano, G. I. (2021). Product mix and firm productivity responses to trade competition. *Review of Economics and Statistics*, 103(5):874–891.

Mayer, T. and Ottaviano, G. I. (2008). The happy few: The internationalisation of European firms. *Intereconomics*, 43(3):135–148.

Mayer, T. and Zignago, S. (2011). Notes on CEPII's distances measures: The GeoDist database.

Melitz, M. J. and Ottaviano, G. I. P. (2008). Market size, trade, and productivity. *Review of Economic Studies*, 75(1):295–316.

Midrigan, V. and Xu, D. Y. (2014). Finance and misallocation: Evidence from plant-level data. *American Economic Review*, 104(2):422–58.

Minetti, R., Mulabdic, A., Ruta, M., and Zhu, S. C. (2021). Financial structures, banking regulations, and export dynamics. *Journal of Banking & Finance*, 124:106056.

Minetti, R. and Zhu, S. C. (2011). Credit constraints and firm export: Microeconomic evidence from italy. *Journal of International Economics*, 83(2):109–125.

Muûls, M. (2015). Exporters, importers and credit constraints. *Journal of International Economics*, 95(2):333–343.

Paravisini, D., Rappoport, V., Schnabl, P., and Wolfenzon, D. (2015). Dissecting the effect of credit supply on trade: Evidence from matched credit-export data. *The Review of Economic Studies*, 82(1):333–359.

Rajan, R. and Zingales, L. (1998). Financial development and growth. *American Economic Review*, 88(3):559–586.

The World Bank. Exporter Dynamics Database. available at https://www.worldbank.org/en/research/brief/exporter-dynamics-database.

The World Bank. World Development Indicators. available at https://databank.worldbank.org/source/world-development-indicators.

The World Bank (2021). The Changing Wealth of Nations: Managing Assets for the Future. Washington, DC: World Bank. doi:10.1596/978-1-4648-1590-4.

Unger, F. (2021). Credit frictions, selection into external finance and gains from trade. *Canadian Journal of Economics/Revue canadienne d'économique*, 54(3):1206–1251.

# A Theoretical analysis of model with credit frictions

This section presents the technical details of the free-entry equilibrium for the two model variants with external financing of innovation costs (see Section A.1), and with external financing of production costs (Section A.2).

## A.1 Free entry equilibrium with external finance of innovations

Based on the model description in Section 2.2, I first focus on the case in which firms have to finance a fraction of endogenous innovation costs. The free-entry condition from the perspective of the origin country, as described in Section 2.3.3, can be written as follows:

$$E\left[\pi\right] = \int_0^{c_{soo}^f} \pi_{soo}^f\left(c\right) dG\left(c\right) + \int_0^{c_{sod}^f} \pi_{sod}^f\left(c\right) dG\left(c\right) = f_E, \tag{A.1}$$

where $dG\left(c\right)$ is the probability of drawing a cost parameter $c$. Assuming that firms draw costs from a Pareto distribution, implies that $dG\left(c\right) = k\frac{c^{k-1}}{c_M^k}$, where $k > 1$ is the Pareto shape parameter and $c_M$ is the maximum value of cost draws.
The profit functions for domestic sales and exports are given by:

$$\pi_{soo}^f\left(c\right) = \delta\theta_{so}\frac{\Gamma_{soo}^2}{\beta^2}\left(c_{soo}^f - c\right)^2;\ \pi_{sod}^f\left(c\right) = \tau_{od}^2\delta\theta_{so}\frac{\Gamma_{sod}^2}{\beta^2}\left(c_{sod}^f - c\right)^2, \tag{A.2}$$

where $\Gamma_{soo} \equiv \frac{\beta\left(\gamma L_{so}\right)^{\frac{1}{2}}}{2\gamma\left(1+\theta_{so}\right)^{\frac{1}{2}}\delta^{\frac{1}{2}}-\beta\left(\gamma L_{so}\right)^{\frac{1}{2}}}$, $\Gamma_{sod} \equiv \frac{\beta\left(\gamma L_{sd}\right)^{\frac{1}{2}}}{2\gamma\left(1+\theta_{so}\right)^{\frac{1}{2}}\delta^{\frac{1}{2}}-\beta\left(\gamma L_{sd}\right)^{\frac{1}{2}}}$, and $\theta_{so} \equiv \frac{1-\lambda_o}{\lambda_o}\left(d_s - t_s\right)$ (see Section 2.2). Inserting the profit functions (A.2) into Equation (A.1) and exploiting that productivity is Pareto distributed, leads to the following equilibrium condition for the origin country:

$$\frac{\phi}{2\delta} = \Phi_{soo}\left(c_{soo}^f\right)^{k+2} + \Phi_{sod}\left(c_{sdd}^f\right)^{k+2}, \tag{A.3}$$

where $\phi \equiv \left(k+1\right)\left(k+2\right)c_M^k f_E$, $\Phi_{soo} \equiv \theta_{so}\left(\frac{\Gamma_{soo}}{\beta}\right)^2$, and $\Phi_{sod} \equiv \tau_{od}^{-k}\theta_{so}\left(\frac{\Gamma_{sod}}{\beta}\right)^2$. Analogous to the origin country, I define the terms $\Gamma_{sdd} \equiv \frac{\beta\left(\gamma L_{sd}\right)^{\frac{1}{2}}}{2\gamma\left(1+\theta_{sd}\right)^{\frac{1}{2}}\delta^{\frac{1}{2}}-\beta\left(\gamma L_{sd}\right)^{\frac{1}{2}}}$, and $\Gamma_{sdo} \equiv \frac{\beta\left(\gamma L_{so}\right)^{\frac{1}{2}}}{2\gamma\left(1+\theta_{sd}\right)^{\frac{1}{2}}\delta^{\frac{1}{2}}-\beta\left(\gamma L_{so}\right)^{\frac{1}{2}}}$. Hence, the equivalent free-entry condition for the destination country is given by:

$$\frac{\phi}{2\delta} = \Phi_{sdd}\left(c_{sdd}^f\right)^{k+2} + \Phi_{sdo}\left(c_{soo}^f\right)^{k+2}, \tag{A.4}$$

with $\Phi_{sdd} \equiv \theta_{sd}\left(\frac{\Gamma_{sdd}}{\beta}\right)^2$, and $\Phi_{sdo} \equiv \tau_{do}^{-k}\theta_{sd}\left(\frac{\Gamma_{sdo}}{\beta}\right)^2$. The combination of Equations (A.3) and (A.4) yields solutions for the domestic cut-off levels $c_{soo}^f$ and $c_{sdd}^f$.

## A.2 Free entry with external financing of production costs

Turning to the model variant with external financing of production costs as described in Section 2.3.2, the free-entry condition in the origin country is:

$$\begin{aligned} E[\pi] = &\int_0^{c_{soo}^u} \pi_{soo}^u(c)\, dG(c) + \int_{c_{soo}^u}^{c_{soo}^f} \pi_{soo}^f(c)\, dG(c) \\ &+ \int_0^{c_{sod}^u} \pi_{sod}^u(c)\, dG(c) + \int_{c_{sod}^u}^{c_{sod}^f} \pi_{sod}^f(c)\, dG(c) = f_E. \end{aligned} \tag{A.5}$$

In contrast to the free-entry condition in Equation (A.1), financing of production costs in the presence of credit frictions divides firms into unconstrained and financially constrained ones. The profits of unconstrained (non-)exporters are given by:

$$\pi_{soo}^u(c) = \frac{L_{sd}}{4\gamma}\left[(1+2\theta_{so})\, c_{soo}^u - c\right]^2, \tag{A.6}$$

$$\pi_{sod}^u(c) = \frac{\tau_{od}^2 L_{sd}}{4\gamma}\left[(1+2\theta_{so})\, c_{sod}^u - c\right]^2, \tag{A.7}$$

where credit frictions are defined as in Section 2.2, $\theta_{so} \equiv \frac{1-\lambda_o}{\lambda_o}(d_s - t_s)$. The profit functions of financially constrained (non-)exporters can be written as follows:

$$\pi_{soo}^f(c) = \frac{L_{so}}{\gamma}\theta_{so}(1+\theta_{so})\left(c_{soo}^f - c\right)c, \tag{A.8}$$

$$\pi_{sod}^f(c) = \frac{\tau_{od}^2 L_{sd}}{\gamma}\theta_{so}(1+\theta_{so})\left(c_{sod}^f - c\right)c. \tag{A.9}$$

Inserting Equations (A.6)-(A.9) into the free-entry condition (A.5), and exploiting that cost draws follow a Pareto distribution, yields the following condition from the perspective of the origin country:

$$\frac{2\gamma\phi}{\Lambda_{so}} = L_{so}\left(c_{soo}^u\right)^{k+2} + \tau_{od}^{-k} L_{sd}\left(\frac{1+2\theta_{sd}}{1+2\theta_{so}}\right)^{k+2}\left(c_{sdd}^u\right)^{k+2}, \tag{A.10}$$

where $\Lambda_{so} \equiv 1 + 2\theta_{so}(1+\theta_{so})\left(2 + k\left(\frac{1+2\theta_{so}}{1+\theta_{so}}\right)^{k+2}\right)$, and $\phi$ is defined as in Appendix A.1. Free entry in the destination country implies the following condition:

$$\frac{2\gamma\phi}{\Lambda_{sd}} = L_{sd}\left(c_{sdd}^u\right)^{k+2} + \tau_{do}^{-k} L_{so}\left(\frac{1+2\theta_{so}}{1+2\theta_{sd}}\right)^{k+2}\left(c_{soo}^u\right)^{k+2}, \tag{A.11}$$

with $\Lambda_{sd} \equiv 1 + 2\theta_{sd}(1+\theta_{sd})\left(2 + k\left(\frac{1+2\theta_{sd}}{1+\theta_{sd}}\right)^{k+2}\right)$. Equations (A.10) and (A.11) represent two equilibrium conditions in two unknowns, namely the two unconstrained cost cut-off levels, $c^u_{soo}$ and $c^u_{sdd}$. The financially constrained cost cut-off of exporting from origin country $o$ to destination $d$ can be written as:

$$c^f_{sod} = \frac{1+2\theta_{so}}{1+\theta_{so}} c^u_{sod} = \frac{1+2\theta_{sd}}{1+\theta_{so}} \frac{1}{\tau_{od}} c^u_{sdd}. \tag{A.12}$$

# B Proofs of theoretical propositions

This section presents the proofs of Propositions 1 - 5 as discussed in Section 2.3.

**Proof of Proposition 1.** Inserting the price function in Equation (12) and the financially constrained investment level (14) into relative sales in Equation (17) leads to:

$$r^{rel}_{sod}(c_1, c_2) = \frac{(1+\Gamma_{sod})\, c^f_{sod} + (1-\Gamma_{sod})\, c_1}{(1+\Gamma_{sod})\, c^f_{sod} + (1-\Gamma_{sod})\, c_2} \frac{c^f_{sod} - c_1}{c^f_{sod} - c_2} \tag{B.1}$$

Taking the derivative of Equation (17) with respect to the financial development parameter $\lambda_o$ and holding the export cost cut-off level $c_{sod}$ constant, yields a positive impact of financial development on relative sales:

$$\left.\frac{\partial \ln r^{rel}_{sod}(c_1,c_2)}{\partial \ln \lambda_o}\right|_{c^f_{sod}} = \frac{\tau^2_{od}(c_2 - c_1)\, c^f_{sod} \Gamma_{sod}}{2 p^f_{sod}(c_1)\, p^f_{sod}(c_2)} \frac{\partial \ln \Gamma_{sod}}{\partial \ln \lambda_o} > 0, \tag{B.2}$$

where $c_1 < c_2$ by assumption, and $\frac{\partial \ln \Gamma_{sod}}{\partial \ln \lambda_o} = \frac{(\gamma\delta)^{\frac{1}{2}} \Gamma_{sod}}{(1+\theta_{so})^{\frac{1}{2}} \beta L^{\frac{1}{2}}_{sd}} \frac{d_s - t_s}{\lambda_o} > 0$. Note that $\frac{\partial \ln \Gamma_{sod}}{\partial \ln \lambda_o \partial d_s} = \frac{(\gamma\delta)^{\frac{1}{2}} \Gamma_{sod}}{(1+\theta_{so})^{\frac{1}{2}} \beta L^{\frac{1}{2}}_{sd}} \frac{1}{\lambda_o} > 0$, and $\frac{\partial \ln \Gamma_{sod}}{\partial \ln \lambda_o \partial t_s} = -\frac{\partial \ln \Gamma_{sod}}{\partial \ln \lambda_o \partial d_s} < 0$, which implies that $\frac{\partial \ln r^{rel}_{sod}(c_1,c_2)}{\partial \ln \lambda_o \partial d_s} > 0$, and $\frac{\partial \ln r^{rel}_{sod}(c_1,c_2)}{\partial \ln \lambda_o \partial t_s} < 0$.

**Proof of Proposition 2.** Consider two firms with $c_1 < c^u_{sod} < c_2 < c^f_{sod}$, such that firm 1 is unconstrained, while firm 2 is financially constrained. Taking the derivative of Equation (19) with respect to financial development $\lambda_o$, and holding the cost cut-off level $c^u_{sdd}$ constant, leads to:

$$\left.\frac{\partial \ln r^{rel}_{sod}(c_1,c_2)}{\partial \ln \lambda_o}\right|_{c^u_{sdd}} = \frac{\theta_{so}}{1+\theta_{so}} \frac{2c_2 - c^f_{sod}}{c^f_{sod} - c_2} \frac{\partial \ln \theta_{so}}{\partial \ln \lambda_o} < 0. \tag{B.3}$$

Note that $2c_2 > c^f_{sod}$, which can be seen when inserting the lower limit of $c_2 = c^u_{sod} = \frac{1+\theta_{so}}{1+2\theta_{so}} c^f_{sod}$ into the inequality, leading to $\frac{2+2\theta_{so}}{1+2\theta_{so}} > 1$. The last derivative in Equation (B.3) is negative,

$\frac{\partial \ln \theta_{so}}{\partial \ln \lambda_o} = -\frac{d_s - t_s}{\lambda_o \theta_{so}} < 0$, which implies that financial development reduces relative sales in Equation (19). The effects of external finance dependence $d_s$ and of asset tangibility $t_s$ on the elasticity in Equation (B.3) follow immediately from the last derivative.

**Proof of Proposition 3.** *Part (i)* Consider first the model variant with external financing of innovation costs. By totally differentiating Equations (A.3) and (A.4), the effect of financial development $\lambda_o$ on the destination country's cost cut-off can be written as follows:

$$\frac{\partial \ln c^f_{sdd}}{\partial \ln \lambda_o} = \frac{1}{k+2} \frac{\Phi_{soo}\Phi_{sdo}}{\Phi_{soo}\Phi_{sdd} - \Phi_{sod}\Phi_{sdo}} \left[ \frac{\partial \ln \Phi_{soo}}{\partial \ln \lambda_o} \left( \frac{c^f_{soo}}{c^f_{sdd}} \right)^{k+2} + \frac{\Phi_{sod}}{\Phi_{soo}} \frac{\partial \ln \Phi_{sod}}{\partial \ln \lambda_o} \right] > 0. \quad \text{(B.4)}$$

To ensure positive domestic cut-off levels, it has to hold that $\Phi_{soo} > \Phi_{sdo}$, and $\Phi_{sdd} > \Phi_{sod}$. Using the definitions from Appendix A.1, these conditions can be written as $\tau^k_{od} > \frac{\theta_{so}}{\theta_{sd}} \left( \frac{\Gamma_{sod}}{\Gamma_{sdd}} \right)^2$, and $\tau^k_{do} > \frac{\theta_{sd}}{\theta_{so}} \left( \frac{\Gamma_{sdo}}{\Gamma_{soo}} \right)^2$, stating that iceberg-trade costs are sufficiently large compared to the relative differences in financial conditions and market size between countries. If countries are symmetric with respect to market size ($L_{so} = L_{sd}$) and financial characteristics ($\theta_{so} = \theta_{sd}$), the conditions just impose that trade costs have to be larger than one, $\tau_{od}, \tau_{do} > 1$. The derivatives in Equation (B.4) are given by:

$$\frac{\partial \ln \Phi_{soo}}{\partial \ln \lambda_o} = \frac{\beta (\gamma L_{so})^{\frac{1}{2}} - 2\gamma \left( \frac{\delta}{1+\theta_{so}} \right)^{\frac{1}{2}}}{2\gamma (1+\theta_{so})^{\frac{1}{2}} \delta^{\frac{1}{2}} - \beta (\gamma L_{so})^{\frac{1}{2}}} \frac{d_s - t_s}{\lambda_o \theta_{so}} > 0, \quad \text{(B.5)}$$

$$\frac{\partial \ln \Phi_{sod}}{\partial \ln \lambda_o} = \frac{\beta (\gamma L_{sd})^{\frac{1}{2}} - 2\gamma \left( \frac{\delta}{1+\theta_{so}} \right)^{\frac{1}{2}}}{2\gamma (1+\theta_{so})^{\frac{1}{2}} \delta^{\frac{1}{2}} - \beta (\gamma L_{sd})^{\frac{1}{2}}} \frac{d_s - t_s}{\lambda_o \theta_{so}} > 0, \quad \text{(B.6)}$$

where the positive signs follow from Condition 2, and the equivalent condition for domestic activity, $1 + \theta_{so} > \frac{4\gamma\delta}{\beta^2 L_{so}}$, under the assumption that $d_s > t_s$. Hence, the effect of financial development on the destination country's cut-off level in Equation (B.4) is clearly positive. As the cost cut-off of exporting from country $o$ to destination $d$ is given by $c^f_{sod} = \frac{c^f_{sdd}}{\tau_{od}}$, it increases in financial development in the exporting country $\lambda_o$ as well.

By taking into account the described selection effect, the total impact of financial development on relative sales in Equation (17) can be written as follows:

$$\frac{\partial \ln r^{rel}_{sod}(c_1, c_2)}{\partial \ln \lambda_o} = \frac{\partial \ln r^{rel}_{sod}(c_1, c_2)}{\partial \ln \lambda_o}\bigg|_{c^f_{sod}} + \frac{\partial \ln r^{rel}_{sod}(c_1, c_2)}{\partial \ln c^f_{sod}} \frac{\partial \ln c^f_{sod}}{\partial \ln \lambda_o}, \quad \text{(B.7)}$$

where the direct (positive) effect is shown in Equation (B.2), and the selection effect is:

$$\frac{\partial \ln r_{sod}^{rel}(c_1,c_2)}{\partial \ln c_{sod}^f}\frac{\partial \ln c_{sod}^f}{\partial \ln \lambda_o} = \frac{\tau_{od}^2 (c_1-c_2) c_{sod}^f}{2}\frac{\Upsilon_{sod}(c_1,c_2)}{p_{sod}^f(c_1)\, p_{sod}^f(c_2)}\frac{\partial \ln c_{sod}^f}{\partial \ln \lambda_o} < 0, \tag{B.8}$$

with $\Upsilon_{sod}(c_1,c_2) \equiv \frac{4/\tau_{od}^2 p_{sod}^f(c_1) p_{sod}^f(c_2) - (1+\Gamma_{sod})\left(c_{sod}^f\right)^2 + (1-\Gamma_{sod}) c_1 c_2}{\left(c_{sod}^f - c_1\right)\left(c_{sod}^f - c_2\right)} > 0$, $c_1 < c_2$ and $\frac{\partial \ln c_{sod}^f}{\partial \ln \lambda_o} > 0$ (see Equation B.4). I further define the relative investments by comparing the unconstrained and financially constrained innovation levels of (non-)exporters:

$$z_{soo}^{rel} \equiv \frac{z_{soo}^u - z_{soo}^f}{z_{soo}^u} = \frac{2(1+\theta_{so})^{\frac{1}{2}}(\gamma\delta)^{\frac{1}{2}}}{\beta L_{so}^{\frac{1}{2}}}\frac{\beta(\gamma L_{so})^{\frac{1}{2}} - 2\gamma\left(\frac{\delta}{1+\theta_{so}}\right)^{\frac{1}{2}}}{2\gamma(1+\theta_{so})^{\frac{1}{2}}\delta^{\frac{1}{2}} - \beta(\gamma L_{so})^{\frac{1}{2}}}, \tag{B.9}$$

$$z_{sod}^{rel} \equiv \frac{z_{sod}^u - z_{sod}^f}{z_{sod}^u} = \frac{2(1+\theta_{so})^{\frac{1}{2}}(\gamma\delta)^{\frac{1}{2}}}{\beta L_{sd}^{\frac{1}{2}}}\frac{\beta(\gamma L_{sd})^{\frac{1}{2}} - 2\gamma\left(\frac{\delta}{1+\theta_{so}}\right)^{\frac{1}{2}}}{2\gamma(1+\theta_{so})^{\frac{1}{2}}\delta^{\frac{1}{2}} - \beta(\gamma L_{sd})^{\frac{1}{2}}}. \tag{B.10}$$

Taking the relative investment levels in Equations (B.9) and (B.10) into account, the direct effect of financial development outweighs the indirect effect, such that the elasticity in Equation (B.7) is positive, if and only if:

$$\frac{2\gamma\delta(k+2)\tau_{od}^k \Phi_{sod}}{L_{so}^{\frac{1}{2}} L_{sd}^{\frac{1}{2}} z_{soo}^{rel}}\left(\frac{\Phi_{sdd}}{\Phi_{sdo}} - \frac{\Phi_{sod}}{\Phi_{soo}}\right) > \Upsilon_{sod}(c_1,c_2)\left[\left(\frac{\Phi_{sdd}-\Phi_{sod}}{\Phi_{soo}-\Phi_{sdo}}\right)^{k+2} + \frac{\Phi_{sod}}{\Phi_{soo}}\left(\frac{L_{sd}}{L_{so}}\right)^{\frac{1}{2}}\frac{z_{sod}^{rel}}{z_{soo}^{rel}}\right].$$

Note that this condition is satisfied whenever trade costs and/or the Pareto shape parameter are sufficiently large. To see this clearer, I impose country symmetry with respect to market size ($L_{so} = L_{sd} = L_s$), credit frictions ($\theta_{so} = \theta_{sd} = \theta_s$), and trade costs ($\tau_{od} = \tau_{do} = \tau$), such that the condition simplifies to:

$$\frac{2\gamma\delta(k+2)\tau^k \Phi_s}{L_s z_s^{rel}}\frac{1-\tau^{-2k}}{1+\tau^{-k}} > \Upsilon_{sod}(c_1,c_2). \tag{B.11}$$

*Part (ii)* Next consider the model variant with external financing of production costs. Taking the derivative of Equation (A.12) with respect to financial development $\lambda_o$, leads to:

$$\frac{\partial \ln c_{sod}^f}{\partial \ln \lambda_o} = -\frac{\theta_{so}}{1+\theta_{so}}\frac{\partial \ln \theta_{so}}{\partial \ln \lambda_o} + \frac{\partial \ln c_{sdd}^u}{\partial \ln \lambda_o}. \tag{B.12}$$

The first term on the right-hand side of Equation (B.12) shows the direct positive effect of financial development on the extensive margin of exporting (as $\partial\theta_{so}/\partial\lambda_0 < 0$). The second term captures the impact of financial development on the production cost-cutoff in

the destination country. By differentiating the free-entry conditions (A.10) and (A.11) with respect to $\lambda_o$, this effect can be expressed as follows:

$$\frac{\partial \ln c_{sdd}^u}{\partial \ln \lambda_o} = \frac{1}{k+2} \frac{\tau_{do}^{-k} \frac{\Lambda_{sd}}{\Lambda_{so}} \left(\frac{1+2\theta_{so}}{1+2\theta_{sd}}\right)^{k+2}}{1 - \tau_{do}^{-k} \frac{\Lambda_{sd}}{\Lambda_{so}} \left(\frac{1+2\theta_{so}}{1+2\theta_{sd}}\right)^{k+2}} \left[\frac{\partial \ln \Lambda_{so}}{\partial \ln \lambda_o} - \frac{2\theta_{so}(k+2)}{1+2\theta_{so}} \frac{\partial \ln \theta_{so}}{\partial \ln \lambda_o}\right], \tag{B.13}$$

where the assumption that $\tau_{do}^k > \frac{\Lambda_{sd}}{\Lambda_{so}} \left(\frac{1+2\theta_{so}}{1+2\theta_{sd}}\right)^{k+2}$ ensures a positive cost-cutoff level $c_{sdd}^u$. Taking into account the impact of financial development $\lambda_o$ on $\Lambda_{so}$, which has been defined in Section A.2, the elasticity in Equation (B.13) can be written as:

$$\frac{\partial \ln c_{sdd}^u}{\partial \ln \lambda_o} = \frac{2k\theta_{so}(1+2\theta_{so})}{(k+2)\Lambda_{so}} \frac{\tau_{do}^{-k} \frac{\Lambda_{sd}}{\Lambda_{so}} \left(\frac{1+2\theta_{so}}{1+2\theta_{sd}}\right)^{k+2}}{1 - \tau_{do}^{-k} \frac{\Lambda_{sd}}{\Lambda_{so}} \left(\frac{1+2\theta_{so}}{1+2\theta_{sd}}\right)^{k+2}} \left[\frac{1-k\theta_{so}}{1+2\theta_{so}} \left(\frac{1+2\theta_{so}}{1+\theta_{so}}\right)^{k+2} - 1\right] \frac{\partial \ln \theta_{so}}{\partial \ln \lambda_o}.$$

As $\partial\theta_{so}/\partial\lambda_o < 0$, a sufficient condition for a positive effect of financial development on the cost-cutoff level $c_{sdd}^u$, is that $k\theta_{so} > 1$, which is satisfied whenever the Pareto shape parameter and credit frictions are sufficiently high. Under this assumption, the impact of financial development on the financially constrained export cost-cutoff in Equation (B.12) is clearly positive. This holds equivalently for the elasticity of the unconstrained export cutoff with respect to $\lambda_o$: $\frac{\partial \ln c_{sod}^u}{\partial \ln \lambda_o} = -\frac{2\theta_{so}}{1+2\theta_{so}} \frac{\partial \ln \theta_{so}}{\partial \ln \lambda_o} + \frac{\partial \ln c_{sdd}^u}{\partial \ln \lambda_o} > 0$.

By taking into account the extensive margin effect of financial development, the total impact on relative sales (19) is given by:

$$\frac{\partial \ln r_{sod}^{rel}(c_1, c_2)}{\partial \ln \lambda_o} = \frac{\partial \ln r_{sod}^{rel}(c_1, c_2)}{\partial \ln \lambda_o}\bigg|_{c_{sdd}^u} + \frac{(1+\theta_{so})^2 c_{sod}^f \left(c_{sod}^f - 2c_2\right) + c_1^2}{(1+\theta_{so})^2 c_{sod}^f - c_1^2} \frac{c_{sod}^f}{c_{sod}^f - c_2} \frac{\partial \ln c_{sdd}^u}{\partial \ln \lambda_o},$$

where the direct effect is negative, $\frac{\partial \ln\left(r_{sod}^{rel}(c_1,c_2)\right)}{\partial \ln \lambda_o}\big|_{c_{sdd}^u} < 0$, as shown in Equation (B.3). Note further that $(1+\theta_{so})^2 c_{sod}^f \left(c_{sod}^f - 2c_2\right) + c_1^2 < 0$. This can be shown by inserting the maximum possible value for $c_1 = c_{sod}^u$ and the lowest possible value for $c_2 = c_{sod}^u$ into the inequality. By exploiting that $(1+2\theta_{so}) c_{sod}^u = (1+\theta_{so}) c_{sod}^f$, it follows that the condition is satisfied whenever credit frictions are present, i.e. $\theta_{so} > 0$. As shown above, $\partial c_{sdd}^u/\partial\lambda_o > 0$ if $k\theta_{so} > 1$, which implies that the total impact of financial development on relative sales is negative.

**Proof of Proposition 4.** Analogous to Equation (B.1), consider the relative export sales of two different varieties within the same multi-product exporter, with $v_1(c, m_1) < v_2(c, m_2)$:

$$r_{sod}^{rel}(c, m_1, m_2) \equiv \frac{r_{sod}^f(c, m_1)}{r_{sod}^f(c, m_2)} = \frac{(1+\Gamma_{sod})\, c_{sod}^f + (1-\Gamma_{sod})\, v_1}{(1+\Gamma_{sod})\, c_{sod}^f + (1-\Gamma_{sod})\, v_2} \frac{c_{sod}^f - v_1}{c_{sod}^f - v_2}. \tag{B.14}$$

Taking the derivative of Equation (B.14), by holding the export cost cut-off level $c_{sod}^f$ constant, leads to:

$$\left.\frac{\partial \ln r_{sod}^{rel}(c, m_1, m_2)}{\partial \ln \lambda_o}\right|_{c_{sod}^f} = \frac{\tau_{od}^2 (v_2 - v_1)\, c_{sod}^f \Gamma_{sod}}{2 p_{sod}^f(c, m_1)\, p_{sod}^f(c, m_2)} \frac{\partial \ln \Gamma_{sod}}{\partial \ln \lambda_o} > 0, \tag{B.15}$$

which is the multi-product equivalent to Equation (B.2). Following the proof of Proposition 1, the direct effect of financial development on relative sales in Equation (B.15) is positive, where the impact is stronger in sectors with large external finance dependence $d_s$, and weaker in sectors with high asset tangibility $t_s$.

**Proof of Proposition 5.** *Part (i)* The elasticity of relative sales with respect to financial development in Equation (B.2) can be expressed as:

$$\left.\frac{\partial \ln r_{sod}^{rel}(c_1, c_2)}{\partial \ln \lambda_o}\right|_{c_{sod}^f} = \frac{2(c_2 - c_1)\, c_{sod}^f}{\left[(1+\Gamma_{sod})\, c_{sod}^f + (1-\Gamma_{sod})\, c_1\right]\left[(1+\Gamma_{sod})\, c_{sod}^f + (1-\Gamma_{sod})\, c_2\right]} \frac{(d_s - t_s)(\gamma\delta)^{\frac{1}{2}} \Gamma_{sod}^2}{\lambda_o (1+\theta_{so})^{\frac{1}{2}} \beta L_{sd}^{\frac{1}{2}}}.$$

I insert the term $\Gamma_{sod} \equiv \frac{\beta(\gamma L_{sd})^{\frac{1}{2}}}{2\gamma(1+\theta_{so})^{\frac{1}{2}}\delta^{\frac{1}{2}} - \beta(\gamma L_{sd})^{\frac{1}{2}}}$, and I define $\Theta_{so} \equiv 2\gamma(1+\theta_{so})^{\frac{1}{2}}\delta^{\frac{1}{2}}$. After some modifications, the effect of financial development on relative sales can be written as:

$$\left.\frac{\partial \ln r_{sod}^{rel}(c_1, c_2)}{\partial \ln \lambda_o}\right|_{c_{sod}^f} = \frac{2\beta\gamma(c_2 - c_1)\, c_{sod}^f \frac{d_s - t_s}{\lambda_o}}{\left[\Theta_{so}\left(c_{sod}^f + c_1\right) - 2\beta(\gamma L_{sd})^{\frac{1}{2}} c_1\right]\left[\Theta_{so}\left(c_{sod}^f + c_2\right) - 2\beta(\gamma L_{sd})^{\frac{1}{2}} c_2\right]} \frac{\left(\frac{\gamma\delta L_{sd}}{1+\theta_{so}}\right)^{\frac{1}{2}}}{\Theta_{so} - \beta(\gamma L_{sd})^{\frac{1}{2}}}.$$

It immediately follows from this elasticity that the impact of financial development on relative sales is increasing in the taste parameter for quality differentiation $\beta$, which proves the first part of Proposition 5.

*Part (ii)* Similar to the first part of this proof, the elasticity in case of multi-product exporters in Equation (B.15) can be written as follows:

$$\left.\frac{\partial \ln r_{sod}^{rel}(c, m_1, m_2)}{\partial \ln \lambda_o}\right|_{c_{sod}^f} = \frac{2c(\omega^{-m_2} - \omega^{-m_1})\, c_{sod}^f \Gamma_{sod} \partial \ln \Gamma_{sod} / \partial \ln \lambda_o}{\left[(1+\Gamma_{sod})\, c_{sod}^f + (1-\Gamma_{sod})\, \omega^{-m_1} c\right]\left[(1+\Gamma_{sod})\, c_{sod}^f + (1-\Gamma_{sod})\, \omega^{-m_2} c\right]},$$

where I have used the product-specific marginal cost function $v(m, c) = \omega^{-m} c$, with $\omega \in$

$(0,1)$, as described in Section 2.3.4. Note that the elasticity $\partial \ln \Gamma_{sod} / \partial \ln \lambda_o$ does not depend on firm size (see the proof of Proposition 1). Hence, I derive the remaining part of the elasticity with respect to the core cost draw $c$, which leads to:

$$\frac{2\Gamma_{sod}\left(\omega^{-m_2}-\omega^{-m_1}\right)c^f_{sod}}{\left[\left(1+\Gamma_{sod}\right)c^f_{sod}+\left(1-\Gamma_{sod}\right)\omega^{-m_1}c\right]^2}\frac{\left(1+\Gamma_{sod}\right)^2\left(c^f_{sod}\right)^2-\left(1-\Gamma_{sod}\right)^2\omega^{-m_1}\omega^{-m_2}c^2}{\left[\left(1+\Gamma_{sod}\right)c^f_{sod}+\left(1-\Gamma_{sod}\right)\omega^{-m_2}c\right]^2}. \quad \text{(B.16)}$$

It follows from Equation (B.16) that the effect of financial development on relative sales between two varieties within multi-product exporters increases in a firm's core cost draw:

$$\left.\frac{\partial \ln r^{rel}_{sod}\left(c,m_1,m_2\right)}{\partial \ln \lambda_o \partial c}\right|_{c^f_{sod}} > 0, \text{ as } \left(1+\Gamma_{sod}\right)^2\left(c^f_{sod}\right)^2 > \left(1-\Gamma_{sod}\right)^2\omega^{-m_1}\omega^{-m_2}c^2. \quad \text{(B.17)}$$

Note that the inequality in Equation (B.17) is always satisfied as it holds that $\omega^{-m_1}c < \omega^{-m_2}c < c^f_{sod}$.

# C Measures of export concentration

This section presents the theoretical derivation of the measures of export concentration that are discussed in Section 3.1 of the main text, and are used as dependent variables in the empirical analysis.

## C.1 Export share of top firms

*Consider first the model with external financing of innovation costs.* Let us denote the fraction of top exporters as $\rho \in (0,1)$. Then the share of top exporters in total export sales from origin country $o$, by sector $s$ and destination $d$ is given by:

$$Share_{sod} \equiv \frac{\int_0^{\rho c^f_{sod}} r^f_{sod}\left(c\right)dG\left(c\right)}{\int_0^{c^f_{sod}} r^f_{sod}\left(c\right)dG\left(c\right)} = \rho^k \frac{\left(k+1\right)\left[2+k\left(1-\rho^2\right)\right]+\Gamma_{sod}\left[2+k\left(\Psi_\rho-1\right)\right]}{2\left(k+1+\Gamma_{sod}\right)}, \quad \text{(C1)}$$

where $\Psi_\rho \equiv k\left(1-\rho\right)^2+\left(2-\rho\right)^2$, and the last equality in Equation (C1) uses export sales from Equation (16) and the Pareto distribution of productivity. The impact of financial development on the export share in case of innovation financing is clearly positive:

$$\frac{\partial Share_{sod}}{\partial \lambda_o} = \frac{k\left(k+1\right)\left(k+2\right)\left(1-\rho\right)^2\rho^k}{2\left(k+1+\Gamma_{sod}\right)^2}\frac{\partial \Gamma_{sod}}{\partial \lambda_o} > 0. \quad \text{(C2)}$$

*Next, note that in the model with financing of production costs*, firms are either unconstrained or financially constrained (see Section 2.3.2). Analogous to the comparison of relative sales in Equation (19), I consider the relevant case that the fraction of top exporters $\rho$ belongs to the group of unconstrained firms, i.e. $c^{\rho}_{sod} < c^{u}_{sod}$. The share of top exporters in sales to a destination is then defined as:

$$Share_{sod} \equiv \frac{\int_0^{c^{\rho}_{sod}} r^u_{sod}(c)\, dG(c)}{\int_0^{c^u_{sod}} r^u_{sod}(c)\, dG(c) + \int_{c^u_{sod}}^{c^f_{sod}} r^f_{sod}(c)\, dG(c)}, \tag{C3}$$

where export sales of unconstrained firms and financially constrained firms are given by $r^u_{sod}(c) = \frac{\tau^2_{od} L_{sd}}{4\gamma}\left[(1+2\theta_{so})^2 (c^u_{sod})^2 - c^2\right]$, and $r^f_{sod}(c) = \frac{\tau^2_{od} L_{sd}}{\gamma}(1+\theta_{so})^2 \left(c^f_{sod} - c\right) c$, respectively. For a given cutoff level of top firms $c^{\rho}_{sod}$, and Pareto distributed productivity, it can be shown that the share in Equation (C3) clearly decreases in financial development $\lambda_o$ whenever $k\left[(c^u_{sod}/c^{\rho}_{sod})^2 - 1\right] > 0$, which is always satisfied for $c^{\rho}_{sod} < c^u_{sod}$.

## C.2 Herfindahl-Hirschman Index of export sales

*If innovations costs are financed by external credit*, the Herfindahl-Hirschman Index (HHI) of export sales can be written as follows:

$$HHI_{sod} = \int_0^{c^f_{sod}} \left(\frac{r^f_{sod}(c)}{G\left(c^f_{sod}\right)\bar{r}_{sod}}\right)^2 dG(c) = \frac{\sigma^2_{sod} + \bar{r}^2_{sod}}{G\left(c^f_{sod}\right)\bar{r}^2_{sod}}, \tag{C4}$$

where $G\left(c^f_{sod}\right) = \left(\frac{c^f_{sod}}{c_M}\right)^k$ under the assumption of Pareto distributed productivity, and average export sales are given by:

$$\bar{r}_{sod} = \frac{\tau^2_{od} L_{sd}\left(1+\Gamma_{sod}\right)\left(k+1+\Gamma_{sod}\right)}{2\gamma\left(k+1\right)\left(k+2\right)}\left(c^f_{sod}\right)^2. \tag{C5}$$

Financial development clearly increases average sales through a direct effect capturing higher innovation activity of exporters, $(\partial\Gamma_{sod}/\partial\lambda_o > 0)$, and a selection effect as the export cost-cutoff increases, $\partial c^f_{sod}/\partial\lambda_o > 0$. Using export sales from Equation (16) and average sales (C5), the HHI in Equation (C4) can be explicitly solved under the assumption of Pareto distributed productivity as follows:

$$HHI_{sod} = \left(\frac{c_M}{c^f_{sod}}\right)^k \frac{2\left(k+1\right)\left(k+2\right)}{\left(k+3\right)\left(k+4\right)} \frac{\left(k+3\right)\left(k+1\right) + 3\Gamma_{sod}\left(k+2+\Gamma_{sod}\right)}{\left(k+1+\Gamma_{sod}\right)^2}. \tag{C6}$$

Holding the export cost-cutoff $c_{sod}^f$ fixed, the intensive margin effect of exporter's financial development on the HHI is clearly positive:

$$\left.\frac{\partial\left(HHI_{sod}\right)}{\partial\lambda_o}\right|_{c_{sod}^f} = k\frac{k+1+3\Gamma_{sod}}{\left(k+1+\Gamma_{sod}\right)^3}\frac{\partial\Gamma_{sod}}{\partial\lambda_o} > 0. \tag{C7}$$

Note that financial development reduces the HHI through the extensive margin of exporting as $\frac{\partial(HHI_{sod})}{\partial\lambda_o}\frac{\partial c_{sod}^f}{\partial\lambda_o} < 0$ (see the discussion in Section 3.1).

*In the model with external financing of production costs*, the HHI takes into account the variation of sales for unconstrained and financially constrained exporters:

$$HHI_{sod} = \int_0^{c_{sod}^u}\left(\frac{r_{sod}^u\left(c\right)}{G\left(c_{sod}^f\right)\bar{r}_{sod}}\right)^2 dG\left(c\right) + \int_{c_{sod}^u}^{c_{sod}^f}\left(\frac{r_{sod}^f\left(c\right)}{G\left(c_{sod}^f\right)\bar{r}_{sod}}\right)^2 dG\left(c\right). \tag{C8}$$

Define the relative cost-cutoff level as $\kappa_{so} \equiv \frac{c_{so}^u}{c_{so}^f} = \frac{1+\theta_{so}}{1+2\theta_{so}}$. Note that this ratio is independent of the destination country. Under the assumption of Pareto distributed productivity, the average sales are then given by:

$$\bar{r}_{sod} = \frac{k\tau_{od}^2 L_{sd}\left(1+\Psi_{so,\bar{r}}\kappa_{so}^{k+2}\right)}{\gamma\left(k+1\right)\left(k+2\right)}\left(1+\theta_{so}\right)^2\left(c_{sod}^f\right)^2, \tag{C9}$$

where $\Psi_{so,\bar{r}} \equiv \frac{1+4\theta_{so}(1+\theta_{so})-k(1+2\theta_{so})}{2k(1+\theta_{so})^2}$. In case of perfect financial development ($\lambda_o = 1$, $\theta_{so} = 0$), average sales in Equation (C9) simplify to $\bar{r}_{sod} = \frac{\tau_{od}^2 L_{sd} c_{sod}^2}{2\gamma(k+2)}$, where $c_{sod}$ denotes the export cost-cutoff in the absence of credit frictions. The impact of financial development on average sales can be written as follows:

$$\frac{\partial\ln\bar{r}_{sod}}{\partial\ln\lambda_o} = -\frac{\kappa_{so}^{k+2}}{1+\Psi_{so,\bar{r}}\kappa_{so}^{k+2}}\frac{\theta_{so}\left(k+1\right)}{2\left(1+\theta_{so}\right)^2\left(1-\lambda_o\right)} + 2\frac{\partial\ln c_{sdd}^u}{\partial\ln\lambda_o},$$

where the elasticity of the export cost-cutoff in Equation (B.12) has been used. Hence, conditional on sector-destination effects as captured by the last term of the derivative, the impact of financial development on average sales is negative. This effect captures that smaller exporters benefit relatively more from relaxing credit constraints.

The intensive margin components of the HHI for unconstrained and financially constrained exporters are:

$$HHI_{sod}^u \equiv \frac{1}{G\left(c_{sod}^f\right)}\int_0^{c_{sod}^u}\left(\frac{r_{sod}^u\left(c\right)}{\bar{r}_{sod}}\right)^2 dG\left(c\right) = \frac{\left(k+1\right)^2\left(k+2\right)}{k^2\left(k+4\right)}\frac{\Psi_{so,u}\kappa_{so}^{k+4}}{\left(1+\Psi_{so,\bar{r}}\kappa_{so}^{k+2}\right)^2}, \tag{C10}$$

$$HHI^f_{sod} \equiv \frac{1}{G\left(c^f_{sod}\right)} \int_{c^u_{sod}}^{c^f_{sod}} \left(\frac{r^f_{sod}(c)}{\bar{r}_{sod}}\right)^2 dG(c) = \frac{(k+1)^2(k+2)}{k(k+4)(k+3)} \frac{2-\Psi_{so,f}\kappa_{so}^{k+2}}{\left(1+\Psi_{so,\bar{r}}\kappa_{so}^{k+2}\right)^2}, \quad \text{(C11)}$$

with $\Psi_{so,u} \equiv \frac{1+2\theta_{so}(1+\theta_{so})(k+4)[1+\theta_{so}(1+\theta_{so})(k+2)]}{2(1+\theta_{so})^4}$, and $\Psi_{so,f} \equiv \frac{2(1+2\theta_{so})[1+\theta_{so}(k+4)]+(k+2)(k+3)\theta_{so}^2}{(1+2\theta_{so})^2}$. Note that the intensive margin components of the HHI are only functions of financial parameters captured by $\theta_{so}$, and of the Pareto shape parameter $k$, where $\frac{\partial HHI^f_{sod}}{\partial \lambda_o} < 0$, and $\frac{\partial HHI^u_{sod}}{\partial \lambda_o} > 0$. If financial development is perfect, $\lambda_o = 1$, then $\theta_{so} = 0$, and $\kappa_{so} = 1$, capturing that there are no financially constrained firms. It follows immediately from Equations (C10) and (C11) that $HHI^f_{sod}|_{\lambda=1} = 0$, while $HHI^u_{sod}|_{\lambda=1} = \frac{2k+4}{k+4}$, which is the maximum value of the unconstrained component. In contrast, if financial development $\lambda_o \to 0$, then $\theta_{so} \to \infty$, implying that the intensive margin component of unconstrained exporters reaches its minimum value:

$$HHI^u_{sod}|_{\lambda\to 0} \to \frac{(k+1)^2(k+2)^2(1/2)^{k+4}}{k^2\left(1+2/k\,(1/2)^{k+2}\right)^2},$$

while the intensive margin of financially constrained exporters is at its maximum:

$$HHI^f_{sod}|_{\lambda\to 0} \to \frac{(k+1)^2(k+2)}{k(k+4)(k+3)} \frac{2-(k+4+(k+2)(k+3)/4)(1/2)^{k+2}}{\left(1+2/k\,(1/2)^{k+2}\right)^2}.$$

The intensive margins of the Herfindahl-Hirschman Index (HHI) are illustrated in Figure 2, where exporter's financial development $\lambda_o$ ranges from zero to one on the horizontal axis. The graphs in Panel (a) show a situation with low external finance dependence, $d_s = 0.5$, while the case of high external finance dependence in Panel (b) is based on the parameter value $d_s = 1$. For simplicity, asset tangibility is set to zero ($t_s = 0$). In both scenarios, the Pareto shape parameter is set to $k = 5$. The upper graphs plot the intensive margin components in Equations (C10) and (C11), while the lower graphs show the total intensive margin $HHI_{sod}$ as the sum of both parts defined in Equation (C8).

From the proof of Proposition 3, it follows that exporter's financial development has a positive impact on the cost-cutoff level $c_{sdd}$ whenever $\theta_{so}k > 1$. Under this condition, which defines a relevant range with sufficiently large Pareto shape parameter and level of credit frictions, it holds that $\frac{\partial HHI^u_{sod}}{\partial \lambda_o} + \frac{\partial HHI^f_{sod}}{\partial \lambda_o} < 0$. The dashed lines in Figure 2 show the threshold values of financial development below which this condition is satisfied. Note that this range is larger in the case of high external finance dependence. Intuitively, financial development reduces credit frictions and hence the variation of sales among constrained firms. If credit frictions are sufficiently strong, this negative effect dominates the increase in the intensive margin HHI among unconstrained firms.

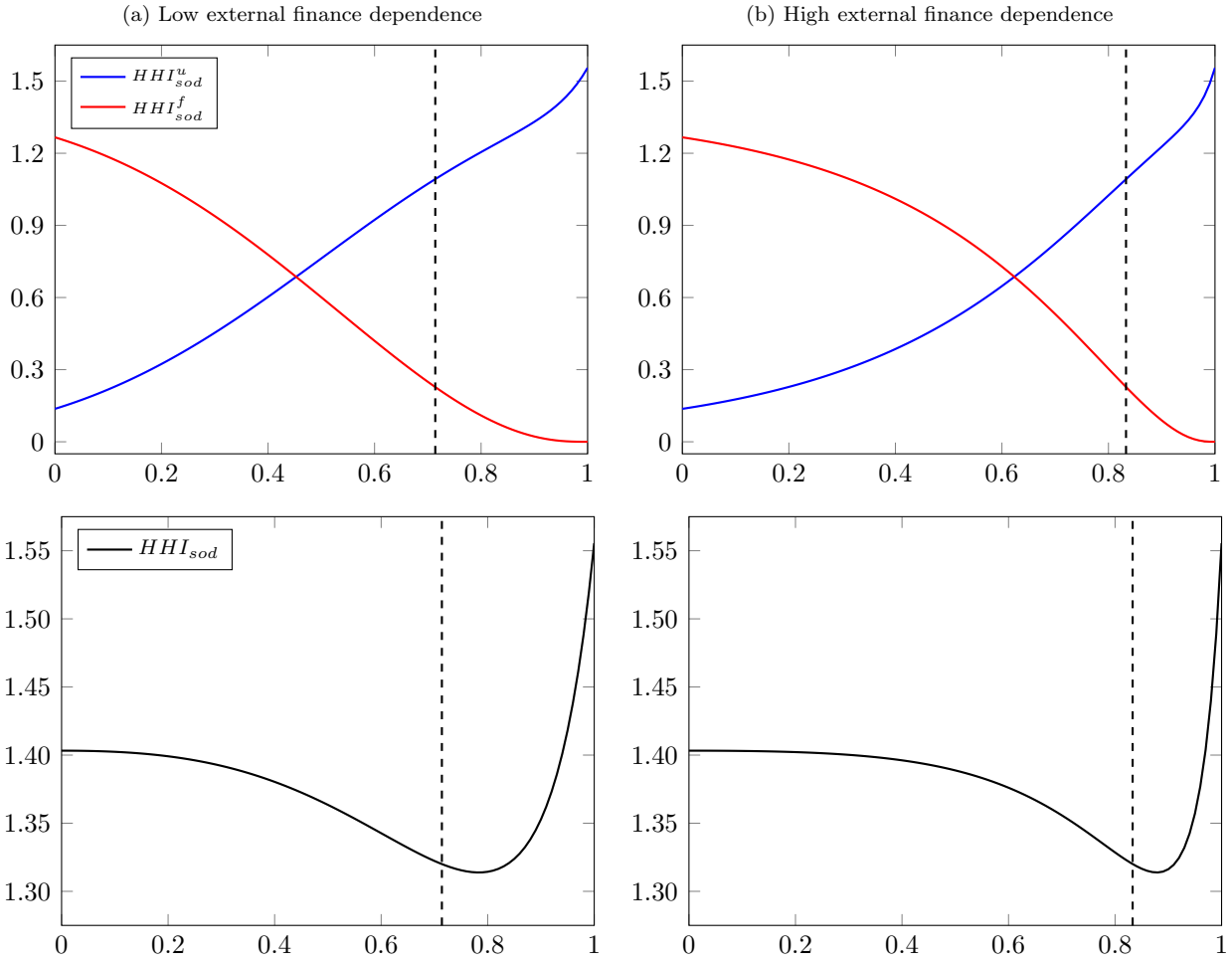



Figure 2: Effect of financial development $\lambda_o$ (horizontal axis) on intensive margin of the Herfindahl-Hirschman Index (HHI). Panel (a) shows a case of low external finance dependence with $d_s = 0.5$, whereas external finance dependence is high ($d_s = 1$) in panel (b). In both cases, the Pareto shape parameter is set to $k = 5$, and asset tangibility $t_s = 0$. The upper graphs show the intensive margin components for unconstrained exporters ($HHI^u_{sod}$) and financially constrained exporters ($HHI^f_{sod}$), respectively. The lower graphs plot the total intensive margin $HHI_{sod}$ as the sum of both components. The dashed lines show the threshold values of $\lambda_o$ below which the condition $\theta_{so}k > 1$ from Proposition 3 is satisfied.

# D Additional empirical results

Table D1: Effect of financial development on log number of exporting firms

| Dependent variable: Log number of exporters by sector and destination | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $\ln FinDev_{ot}$ | 0.401*** | 0.426*** | | | |
| | (0.0210) | (0.0206) | | | |
| $\ln FinDev_{ot} \times ExtFin_s$ | 0.300*** | 0.353*** | 0.314*** | 0.359*** | 0.377*** |
| | (0.0211) | (0.0206) | (0.0212) | (0.0205) | (0.0216) |
| $\ln FinDev_{ot} \times Tang_s$ | −0.712*** | −0.822*** | −0.784*** | −0.896*** | −0.918*** |
| | (0.0437) | (0.0402) | (0.0447) | (0.0406) | (0.0432) |
| $\ln GDP_{ot}$ | 0.356*** | 0.371*** | | | |
| | (0.0113) | (0.0116) | | | |
| $\ln Dist_{od}$ | −0.492*** | −0.504*** | −0.502*** | −0.518*** | −0.522*** |
| | (0.0208) | (0.0212) | (0.0200) | (0.0203) | (0.0216) |
| Common border | 0.362*** | 0.373*** | 0.371*** | 0.386*** | 0.385*** |
| | (0.0780) | (0.0796) | (0.0730) | (0.0744) | (0.0788) |
| Common language | 0.346*** | 0.365*** | 0.443*** | 0.465*** | 0.469*** |
| | (0.0370) | (0.0384) | (0.0349) | (0.0361) | (0.0383) |
| Colonial link | 0.660*** | 0.662*** | 0.401*** | 0.412*** | 0.406*** |
| | (0.0759) | (0.0771) | (0.0595) | (0.0613) | (0.0641) |
| RTA | 0.0572** | 0.0606** | 0.127*** | 0.133*** | 0.132*** |
| | (0.0274) | (0.0279) | (0.0226) | (0.0233) | (0.0246) |
| Year FE | yes | yes | no | no | no |
| Sector FE | yes | no | yes | no | no |
| Importer FE | yes | no | no | no | no |
| Importer-sector FE | no | yes | no | yes | no |
| Exporter-year FE | no | no | yes | yes | yes |
| Importer-year FE | no | no | yes | yes | no |
| Importer-sector-year FE | no | no | no | no | yes |
| $N$ | 540,505 | 540,435 | 540,405 | 540,328 | 528,809 |
| $R^2$ | 0.418 | 0.454 | 0.494 | 0.528 | 0.544 |

*Notes*: This table estimates the effect of exporter's log financial development $FinDev_{ot}$ on the log number of exporting firms using sector-country-pair data, as summarized in Panel A of Table 1. Financial development, measured as ratio of private credit to GDP, is interacted with sectoral external finance dependence, $ExtFin_s$, as well as with asset tangibility $Tang_s$. All columns include log bilateral distance, and dummy variables for common border, common language, colonial links between countries, as well as a dummy that takes a value of one if a country pair belongs to a regional trade agreement (RTA). Columns (1) and (2) additionally control for exporter's log GDP, while columns (3) and (4) include exporter-year and importer-year fixed effects. The last column accounts for importer-sector-year fixed effects and exporter-year fixed effects. Standard errors in parentheses are clustered by exporter-importer pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table D2: Effect of financial development on Herfindahl-Hirschman Index

| Dependent variable: Herfindahl-Hirschman Index by sector and destination | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $\ln FinDev_{ot}$ | −5.735*** | −5.930*** | | | |
| | (0.364) | (0.365) | | | |
| $\ln FinDev_{ot} \times ExtFin_s$ | −4.716*** | −5.483*** | −4.303*** | −4.933*** | −5.217*** |
| | (0.364) | (0.355) | (0.354) | (0.342) | (0.359) |
| $\ln FinDev_{ot} \times Tang_s$ | 9.872*** | 11.01*** | 10.09*** | 11.22*** | 11.54*** |
| | (0.832) | (0.828) | (0.785) | (0.759) | (0.806) |
| $\ln GDP_{ot}$ | −4.643*** | −4.870*** | | | |
| | (0.164) | (0.166) | | | |
| $\ln Dist_{od}$ | 6.642*** | 6.861*** | 5.372*** | 5.672*** | 5.734*** |
| | (0.312) | (0.314) | (0.262) | (0.267) | (0.281) |
| Common border | −3.730*** | −3.975*** | −5.255*** | −5.558*** | −5.422*** |
| | (0.945) | (0.954) | (0.905) | (0.909) | (0.954) |
| Common language | −2.744*** | −3.169*** | −5.524*** | −5.917*** | −5.954*** |
| | (0.617) | (0.628) | (0.525) | (0.538) | (0.567) |
| Colonial link | −10.88*** | −10.84*** | −4.767*** | −4.973*** | −4.873*** |
| | (1.156) | (1.150) | (0.793) | (0.812) | (0.844) |
| RTA | −0.430 | −0.396 | −1.487*** | −1.492*** | −1.483*** |
| | (0.459) | (0.462) | (0.354) | (0.363) | (0.381) |
| Year FE | yes | yes | no | no | no |
| Sector FE | yes | no | yes | no | no |
| Importer FE | yes | no | no | no | no |
| Importer-sector FE | no | yes | no | yes | no |
| Exporter-year FE | no | no | yes | yes | yes |
| Importer-year FE | no | no | yes | yes | no |
| Importer-sector-year FE | no | no | no | no | yes |
| $N$ | 540,505 | 540,435 | 540,405 | 540,328 | 528,809 |
| $R^2$ | 0.170 | 0.205 | 0.233 | 0.265 | 0.310 |

*Notes*: This table estimates the effect of exporter's log financial development $FinDev_{ot}$ on the Herfindahl-Hirschman Index of exports using sector-country-pair data, as summarized in Panel A of Table 1. Financial development, measured as ratio of private credit to GDP, is interacted with sectoral external finance dependence, $ExtFin_s$, as well as with asset tangibility $Tang_s$. All columns include log bilateral distance, and dummy variables for common border, common language, colonial links between countries, as well as a dummy that takes a value of one if a country pair belongs to a regional trade agreement (RTA). Columns (1) and (2) additionally control for exporter's log GDP, while columns (3) and (4) include exporter-year and importer-year fixed effects. The last column accounts for importer-sector-year fixed effects and exporter-year fixed effects. Standard errors in parentheses are clustered by exporter-importer pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table D3: Sensitivity check: Effect of financial development on share of top 25% exporters (excluding extreme values of concentration)

| Dependent variable: Share of top 25% exporters by sector and destination | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $\ln FinDev_{ot}$ | 2.281*** | 2.576*** | | | |
| | (0.215) | (0.216) | | | |
| $\ln FinDev_{ot} \times ExtFin_s$ | 1.288*** | 0.915*** | 1.438*** | 1.092*** | 1.293*** |
| | (0.203) | (0.200) | (0.203) | (0.197) | (0.226) |
| $\ln FinDev_{ot} \times Tang_s$ | −2.200*** | −3.047*** | −2.682*** | −3.804*** | −3.954*** |
| | (0.542) | (0.557) | (0.538) | (0.549) | (0.628) |
| $\ln GDP_{ot}$ | 2.219*** | 2.315*** | | | |
| | (0.082) | (0.083) | | | |
| $\ln Dist_{od}$ | −3.325*** | −3.310*** | −3.988*** | −4.062*** | −3.991*** |
| | (0.164) | (0.167) | (0.149) | (0.152) | (0.160) |
| Common border | 1.944*** | 2.286*** | 1.830*** | 2.115*** | 2.130*** |
| | (0.469) | (0.482) | (0.421) | (0.436) | (0.461) |
| Common language | 3.469*** | 3.626*** | 3.789*** | 3.898*** | 3.827*** |
| | (0.296) | (0.297) | (0.285) | (0.306) | (0.302) |
| Colonial link | 2.173*** | 2.723*** | 2.109*** | 2.293*** | 2.135*** |
| | (0.560) | (0.562) | (0.442) | (0.448) | (0.463) |
| RTA | 0.446** | 0.432* | 0.851*** | 0.886*** | 0.950*** |
| | (0.227) | (0.224) | (0.205) | (0.203) | (0.216) |
| Year FE | yes | yes | no | no | no |
| Sector FE | yes | no | yes | no | no |
| Importer FE | yes | no | no | no | no |
| Importer-sector FE | no | yes | no | yes | no |
| Exporter-year FE | no | no | yes | yes | yes |
| Importer-year FE | no | no | yes | yes | no |
| Importer-sector-year FE | no | no | no | no | yes |
| $N$ | 241,187 | 241,035 | 241,062 | 240,897 | 225,353 |
| $R^2$ | 0.104 | 0.142 | 0.143 | 0.181 | 0.281 |

*Notes*: This table estimates the effect of exporter's log financial development $FinDev_{ot}$ on the share of top 25% exporters in exports using sector-country-pair data, as summarized in Panel A of Table 1. Financial development, measured as ratio of private credit to GDP, is interacted with sectoral external finance dependence, $ExtFin_s$, as well as with asset tangibility $Tang_s$. All columns include log bilateral distance, and dummy variables for common border, common language, colonial links between countries, as well as a dummy that takes a value of one if a country pair belongs to a regional trade agreement (RTA). Columns (1) and (2) additionally control for exporter's log GDP, while columns (3) and (4) include exporter-year and importer-year fixed effects. The last column accounts for importer-sector-year fixed effects and exporter-year fixed effects. The estimations exclude obvservations for which the share of top 25% exporters is larger than 90%. Standard errors in parentheses are clustered by exporter-importer pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table D4: Sensitivity check: Effect of financial development on share of top 25% exporters, 2007-2014

| Dependent variable: Share of top 25% exporters by sector and destination | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $\ln FinDev_{ot}$ | 2.777*** | 3.065*** | | | |
| | (0.258) | (0.264) | | | |
| $\ln FinDev_{ot} \times ExtFin_s$ | 0.967*** | 0.800*** | 1.246*** | 1.075*** | 1.002*** |
| | (0.222) | (0.225) | (0.222) | (0.224) | (0.233) |
| $\ln FinDev_{ot} \times Tang_s$ | −1.689*** | −2.375*** | −2.028*** | −2.918*** | −2.814*** |
| | (0.583) | (0.597) | (0.557) | (0.580) | (0.609) |
| $\ln GDP_{ot}$ | 3.251*** | 3.321*** | | | |
| | (0.118) | (0.119) | | | |
| $\ln Dist_{od}$ | −4.191*** | −4.135*** | −5.187*** | −5.208*** | −5.171*** |
| | (0.202) | (0.204) | (0.171) | (0.174) | (0.182) |
| Common border | 3.172*** | 3.310*** | 2.480*** | 2.600*** | 2.589*** |
| | (0.651) | (0.664) | (0.538) | (0.556) | (0.584) |
| Common language | 5.384*** | 5.480*** | 5.455*** | 5.548*** | 5.535*** |
| | (0.405) | (0.407) | (0.367) | (0.369) | (0.385) |
| Colonial link | 1.392* | 1.215* | 2.445*** | 2.354*** | 2.298*** |
| | (0.719) | (0.724) | (0.547) | (0.553) | (0.581) |
| RTA | 1.057*** | 1.170*** | 1.331*** | 1.436*** | 1.447*** |
| | (0.324) | (0.326) | (0.248) | (0.250) | (0.262) |
| Year FE | yes | yes | no | no | no |
| Sector FE | yes | no | yes | no | no |
| Importer FE | yes | no | no | no | no |
| Importer-sector FE | no | yes | no | yes | no |
| Exporter-year FE | no | no | yes | yes | yes |
| Importer-year FE | no | no | yes | yes | no |
| Importer-sector-year FE | no | no | no | no | yes |
| $N$ | 247,428 | 247,321 | 247,411 | 247,296 | 242,194 |
| $R^2$ | 0.206 | 0.246 | 0.253 | 0.291 | 0.338 |

*Notes*: This table estimates the effect of exporter's log financial development $FinDev_{ot}$ on the share of top 25% exporters in exports using sector-country-pair data over the period 2007-2014. Financial development, measured as ratio of private credit to GDP, is interacted with sectoral external finance dependence, $ExtFin_s$, as well as with asset tangibility $Tang_s$. All columns include log bilateral distance, and dummy variables for common border, common language, colonial links between countries, as well as a dummy that takes a value of one if a country pair belongs to a regional trade agreement (RTA). Columns (1) and (2) additionally control for exporter's log GDP, while columns (3) and (4) include exporter-year and importer-year fixed effects. The last column accounts for importer-sector-year fixed effects and exporter-year fixed effects. Standard errors in parentheses are clustered by exporter-importer pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table D5: Effect of financial development on share of top 5% exporters

| Dependent variable: Share of top 5% exporters by sector and destination | | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| $\ln FinDev_{ot}$ | 4.094*** | 3.617*** | | | |
| | (0.561) | (0.587) | | | |
| $\ln FinDev_{ot} \times ExtFin_s$ | 1.116** | 1.333** | 1.131** | 1.451*** | 1.233** |
| | (0.479) | (0.541) | (0.497) | (0.560) | (0.619) |
| $\ln FinDev_{ot} \times Tang_s$ | −8.158*** | −6.658*** | −7.769*** | −6.572*** | −6.496*** |
| | (1.467) | (1.610) | (1.449) | (1.575) | (1.750) |
| $\ln GDP_{ot}$ | 3.671*** | 3.801*** | | | |
| | (0.200) | (0.210) | | | |
| $\ln Dist_{od}$ | −4.868*** | −4.989*** | −5.373*** | −5.607*** | −5.530*** |
| | (0.305) | (0.328) | (0.270) | (0.295) | (0.321) |
| Common border | 2.893*** | 2.996*** | 2.675*** | 2.576*** | 2.692*** |
| | (0.951) | (0.987) | (0.793) | (0.841) | (0.924) |
| Common language | 5.059*** | 4.837*** | 5.937*** | 5.891*** | 5.878*** |
| | (0.695) | (0.723) | (0.687) | (0.713) | (0.777) |
| Colonial link | 0.970 | 0.913 | 1.831** | 2.003** | 1.860** |
| | (0.985) | (1.015) | (0.792) | (0.836) | (0.903) |
| RTA | 0.869* | 1.001* | 0.530 | 0.756 | 0.795 |
| | (0.509) | (0.540) | (0.449) | (0.472) | (0.522) |
| Year FE | yes | yes | no | no | no |
| Sector FE | yes | no | yes | no | no |
| Importer FE | yes | no | no | no | no |
| Importer-sector FE | no | yes | no | yes | no |
| Exporter-year FE | no | no | yes | yes | yes |
| Importer-year FE | no | no | yes | yes | no |
| Importer-sector-year FE | no | no | no | no | yes |
| $N$ | 83,733 | 83,584 | 83,665 | 83,518 | 75,590 |
| $R^2$ | 0.261 | 0.357 | 0.304 | 0.397 | 0.445 |

*Notes*: This table estimates the effect of exporter's log financial development $FinDev_{ot}$ on the share of top 5% exporters in exports using sector-country-pair data, as summarized in Panel A of Table 1. Financial development, measured as ratio of private credit to GDP, is interacted with sectoral external finance dependence, $ExtFin_s$, as well as with asset tangibility $Tang_s$. All columns include log bilateral distance, and dummy variables for common border, common language, colonial links between countries, as well as a dummy that takes a value of one if a country pair belongs to a regional trade agreement (RTA). Columns (1) and (2) additionally control for exporter's log GDP, while columns (3) and (4) include exporter-year and importer-year fixed effects. The last column accounts for importer-sector-year fixed effects and exporter-year fixed effects. The estimations include observations over the period 2007-2014, for which the share of top 5% exporters is lower than 90%. Standard errors in parentheses are clustered by exporter-importer pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table D6: Alternative measures of within-firm export concentration by sector and destination

| Dependent variable: | Firm-level share of top 2 products | | | Firm-level share of top 1 product | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\ln FinDev_{ot} \times ExtFin_s$ | 5.974*** | 4.957*** | 7.242*** | 5.093*** | 4.013*** | 5.925*** |
| | (0.838) | (0.781) | (0.881) | (0.770) | (0.767) | (0.795) |
| $\ln FinDev_{ot} \times Tang_s$ | −8.390*** | −5.595** | −11.52*** | −4.292* | −1.223 | −6.835*** |
| | (2.385) | (2.374) | (2.493) | (2.298) | (2.382) | (2.370) |
| Gravity controls | yes | yes | yes | yes | yes | yes |
| Sector FE | yes | no | yes | yes | no | yes |
| Firm FE | yes | yes | no | yes | yes | no |
| Exp.-year FE, imp.-year FE | yes | yes | yes | yes | yes | yes |
| Imp.-sec. FE | no | yes | no | no | yes | no |
| Imp.-firm FE | no | no | yes | no | no | yes |
| $N$ | 222,010 | 221,144 | 206,864 | 220,909 | 220,035 | 205,752 |
| $R^2$ | 0.400 | 0.434 | 0.473 | 0.334 | 0.361 | 0.412 |

*Notes*: This table estimates the effect of exporter's log financial development, $FinDev_{ot}$, interacted with sectoral external finance dependence, $ExtFin_s$, as well as with asset tangibility $Tang_s$, on the firm-level share of top 2 products by sector and destination in columns (1)-(3), and on the firm-level share of the top 1 product by sector and destination in columns (4)-(6). The estimation excludes observations whose corresponding number of products per destination and 2-digit-sector is smaller than 3, as well as observations for which the dependent variable is larger than the 95% percentile. All columns include log bilateral distance, and dummy variables for common border, common language, colonial links between countries, as well as a dummy that takes a value of one if a country pair belongs to a regional trade agreement (RTA). Standard errors in parentheses are clustered by firm-destination pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table D7: Effect of financial development and R&D intensity on share of top 3 products

| Dependent variable: Firm-level share of top 3 products by sector and destination | | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\ln FinDev_{ot} \times (adv. + R\&D)_s$ | 42.04*** | 34.21*** | | | | |
| | (8.73) | (8.95) | | | | |
| $\ln FinDev_{ot} \times R\&D_s$ | | | 47.59*** | 38.56*** | | |
| | | | (10.08) | (9.56) | | |
| $\ln FinDev_{ot} \times high\ R\&D_s$ | | | | | 4.164*** | 3.227*** |
| | | | | | (0.647) | (0.580) |
| Gravity controls | yes | yes | yes | yes | yes | yes |
| Sector FE | yes | no | yes | no | yes | no |
| Firm FE | yes | yes | yes | yes | yes | yes |
| Importer-Sector FE | no | yes | no | yes | no | yes |
| Exporter-year, importer-year FE | yes | yes | yes | yes | yes | yes |
| $N$ | 146,596 | 145,987 | 233,453 | 232,599 | 233,453 | 232,599 |
| $R^2$ | 0.477 | 0.517 | 0.432 | 0.473 | 0.433 | 0.473 |

*Notes*: This table estimates the effect of exporter's log financial development, $FinDev_{ot}$, interacted with sectoral measures of R&D intensity, on the share of top 3 products by sector and destination. In columns (1) and (2), I use the advertising and R&D intensity from Kugler and Verhoogen (2012). For regressions in columns (3) and (4), information on R&D intensity is taken from Kroszner et al. (2007). Based on this measure, columns (5)-(6) show an interaction of financial development with a dummy variable=1 if R&D intensity is above the median value across sectors. All columns include exporter-year and importer-year fixed effects, as well as log bilateral distance, dummy variables for common border, common language, colonial links between countries, and a dummy that takes a value of one if a country pair belongs to a regional trade agreement (RTA). Columns (1), (3) and (5) further control for sector fixed effects, which are replaced by importer-sector fixed effects in columns (2), (4) and (6). Standard errors in parentheses are clustered by firm-destination pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table D8: Effect of financial development on share of top 3 products & exported products

| Dependent variable: Firm-level share of top 3 products by sector and destination | | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| $\ln FinDev_{ot} \times ExtFin_s$ | 9.071*** | 7.954*** | 11.02*** |
| | (0.972) | (0.794) | (0.983) |
| $\ln FinDev_{ot} \times Tang_s$ | −18.73*** | −15.65*** | −23.31*** |
| | (2.132) | (1.866) | (2.102) |
| $\ln Number\_products_{it}$ | −5.212*** | −5.376*** | −5.844*** |
| | (0.140) | (0.150) | (0.144) |
| $\ln FinDev_{ot} \times ExtFin_s \times \ln Number\_products_{it}$ | −0.569*** | −0.691*** | −0.701*** |
| | (0.075) | (0.071) | (0.072) |
| $\ln FinDev_{ot} \times Tang_s \times \ln Number\_products_{it}$ | 2.407*** | 2.810*** | 2.976*** |
| | (0.173) | (0.164) | (0.168) |
| Gravity controls | yes | yes | yes |
| Sector FE | yes | no | yes |
| Firm FE | yes | yes | no |
| Exporter-year FE, importer-year FE | yes | yes | yes |
| Importer-sector FE | no | yes | no |
| Importer-firm FE | no | no | yes |
| $N$ | 235,004 | 234,132 | 219,447 |
| $R^2$ | 0.445 | 0.486 | 0.513 |

*Notes*: This table estimates the effect of exporter's log financial development, $FinDev_{ot}$, on exporters' share of top 3 products per destination and sector. Additional to the interaction of financial development with sectoral external finance dependence, triple interaction effects with a firm's total number of exported products are included. All columns control for log bilateral distance, dummy variables for common border, common language, colonial links between countries, and a dummy that takes a value of one if a country pair belongs to a regional trade agreement. The estimating sample excludes observations whose corresponding number of products per destination and 2-digit-sector is smaller than 4. Standard errors in parentheses are clustered by firm-destination pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

# E Robustness checks

Table E1: Effect of contract enforcement indices on share of top 25% exporters

| Dependent variable: Share of top 25% exporters by sector and destination | | | | | | |
|---|---|---|---|---|---|---|
| Fin. dev. measure | Accounting standards | | Contract repudiation | | Risk of expropriation | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\ln FinDev_o \times ExtFin_s$ | 5.600*** | 5.753*** | 9.693*** | 10.31*** | 10.19*** | 10.57*** |
| | (0.732) | (0.706) | (1.045) | (0.961) | (1.088) | (1.051) |
| $\ln FinDev_o \times Tang_s$ | −12.17*** | −13.44*** | −11.30*** | −13.55*** | −15.87*** | −18.51*** |
| | (1.962) | (1.850) | (2.440) | (2.479) | (2.674) | (2.697) |
| Gravity controls | yes | yes | yes | yes | yes | yes |
| Sector FE | yes | no | yes | no | yes | no |
| Importer-Sector FE | no | yes | no | yes | no | yes |
| Exporter-year FE | yes | yes | yes | yes | yes | yes |
| Importer-year FE | yes | yes | yes | yes | yes | yes |
| $N$ | 257,011 | 256,842 | 291,403 | 291,257 | 291,403 | 291,257 |
| $R^2$ | 0.272 | 0.316 | 0.268 | 0.308 | 0.268 | 0.308 |

*Notes*: This table estimates the effect of contract enforcement indices from La Porta et al. (1997), interacted with sectoral external finance dependence, $ExtFin_s$, as well as with asset tangibility $Tang_s$, on the share of top 25% exporters by 2-digit-sector and destination. The main regressor is accounting standards in columns (1)-(2), contract repudiation in columns (3)-(4), and risk of expropriation in columns (5)-(6). All columns include log bilateral distance, and dummy variables for common border, common language, colonial links between countries and membership in regional trade agreements, as well as exporter-year and importer-year fixed effects. Columns (1), (3) and (5) further control for sector fixed effects, while the latter are replaced by importer-sector fixed effects in columns (2), (4) and (6). Standard errors in parentheses are clustered by exporter-importer pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table E2: Effect of contract enforcement indices on intensive margin HHI

| Dependent variable: Intensive margin of Herfindahl-Hirschman Index by sector and destination | | | | | | |
|---|---|---|---|---|---|---|
| Fin. dev. measure | Accounting standards | | Contract repudiation | | Risk of expropriation | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\ln FinDev_o \times ExtFin_s$ | 0.596*** | 0.724*** | 0.932*** | 1.081*** | 0.999*** | 1.135*** |
| | (0.042) | (0.041) | (0.056) | (0.049) | (0.061) | (0.055) |
| $\ln FinDev_o \times Tang_s$ | −1.359*** | −1.716*** | −1.380*** | −1.623*** | −1.813*** | −2.058*** |
| | (0.097) | (0.084) | (0.136) | (0.115) | (0.155) | (0.134) |
| Gravity controls | yes | yes | yes | yes | yes | yes |
| Sector FE | yes | no | yes | no | yes | no |
| Importer-Sector FE | no | yes | no | yes | no | yes |
| Exporter-year FE | yes | yes | yes | yes | yes | yes |
| Importer-year FE | yes | yes | yes | yes | yes | yes |
| $N$ | 336,761 | 336,658 | 392,114 | 392,014 | 392,114 | 392,014 |
| $R^2$ | 0.485 | 0.526 | 0.462 | 0.499 | 0.462 | 0.499 |

*Notes*: This table estimates the effect of contract enforcement indices from La Porta et al. (1997), interacted with sectoral external finance dependence, $ExtFin_s$, as well as with asset tangibility $Tang_s$, on the intensive margin of the Herfindahl-Hirschman Index by 2-digit-sector and destination. The main regressor is accounting standards in columns (1)-(2), contract repudiation in columns (3)-(4), and risk of expropriation in columns (5)-(6). All columns include log bilateral distance, and dummy variables for common border, common language, colonial links between countries and membership in regional trade agreements, as well as exporter-year and importer-year fixed effects. Columns (1), (3) and (5) further control for sector fixed effects, while the latter are replaced by importer-sector fixed effects in columns (2), (4) and (6). Standard errors in parentheses are clustered by exporter-importer pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table E3: Effect of contract enforcement, law, capital, and TFP on share of top 25% exporters

| Dependent variable: Share of top 25% exporters | | | | | | |
|---|---|---|---|---|---|---|
| Fin. dev. measure | Accounting standards | | Contract repudiation | | Risk of expropriation | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\ln FinDev_o \times ExtFin_s$ | 4.445*** | 4.412*** | 7.077*** | 8.488*** | 7.012*** | 7.765*** |
| | (0.754) | (0.715) | (2.038) | (1.787) | (2.512) | (2.364) |
| $\ln FinDev_o \times Tang_s$ | −10.30*** | −11.95*** | −7.073 | −14.28*** | −22.27*** | −34.46*** |
| | (2.159) | (2.001) | (4.979) | (4.679) | (7.509) | (6.928) |
| $Rule\_law_o \times ExtFin_s$ | 0.454*** | 0.539*** | 0.179 | 0.153 | 0.167 | 0.166 |
| | (0.101) | (0.098) | (0.155) | (0.142) | (0.197) | (0.187) |
| $Rule\_law_o \times Tang_s$ | −0.619* | −1.024*** | −0.431 | −0.200 | 0.475 | 0.980* |
| | (0.375) | (0.364) | (0.445) | (0.425) | (0.538) | (0.527) |
| $\ln (K/L)_{ot} \times K\_Intensity_s$ | −8.488** | −7.643** | −7.618** | −9.074*** | −5.019 | −5.190* |
| | (3.375) | (3.159) | (2.976) | (2.786) | (3.269) | (3.003) |
| $\ln (H/L)_{ot} \times H\_Intensity_s$ | 0.854** | 1.297*** | 0.852** | 1.345*** | 0.769** | 1.215*** |
| | (0.396) | (0.436) | (0.362) | (0.406) | (0.366) | (0.410) |
| $\ln (N/L)_{ot} \times N\_Intensity_s$ | 2.221*** | 2.446*** | 2.017*** | 2.221*** | 1.908*** | 2.063*** |
| | (0.271) | (0.254) | (0.255) | (0.241) | (0.261) | (0.247) |
| $\ln (TFP)_{ot} \times ExtFin_s$ | 3.834 | 6.207** | 7.875*** | 10.78*** | 9.508*** | 12.44*** |
| | (3.097) | (3.002) | (3.034) | (2.901) | (3.092) | (2.896) |
| $\ln (TFP)_{ot} \times Tang_s$ | 42.71*** | 42.63*** | 32.23*** | 29.87*** | 31.95*** | 29.23*** |
| | (8.760) | (8.442) | (8.901) | (8.557) | (8.700) | (8.364) |
| Gravity controls | yes | yes | yes | yes | yes | yes |
| Sector FE | yes | no | yes | no | yes | no |
| Importer-Sector FE | no | yes | no | yes | no | yes |
| Exporter-year FE | yes | yes | yes | yes | yes | yes |
| Importer-year FE | yes | yes | yes | yes | yes | yes |
| $N$ | 233,714 | 233,552 | 250,320 | 250,170 | 250,320 | 250,170 |
| $R^2$ | 0.268 | 0.312 | 0.263 | 0.305 | 0.263 | 0.305 |

*Notes*: This table estimates the effect of contract enforcement indices from La Porta et al. (1997), interacted with sectoral external finance dependence, $ExtFin_s$, as well as with asset tangibility $Tang_s$, on the share of top 25% exporters by 2-digit-sector and destination. The main regressor is accounting standards in columns (1)-(2), contract repudiation in columns (3)-(4), and risk of expropriation in columns (5)-(6). As further controls, the regressions include exporter's log capital stock per worker interacted with physical capital intensity by sector, log human capital per worker interacted with human capital intensity, and the interaction of log natural capital per worker with natural resource intensity, as well as log total factor productivity interacted with sectoral measures of external finance dependence. All columns include log bilateral distance, and dummy variables for common border, common language, colonial links between countries and membership in regional trade agreements, as well as exporter-year and importer-year fixed effects. Columns (1), (3) and (5) further control for sector fixed effects, while the latter are replaced by importer-sector fixed effects in columns (2), (4) and (6). Standard errors in parentheses are clustered by exporter-importer pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table E4: Effect of contract enforcement, law, capital, and TFP on intensive margin HHI

| Dependent variable: Intensive margin of Herfindahl-Hirschman Index | | | | | | |
|---|---|---|---|---|---|---|
| Fin. dev. measure | Accounting standards | | Contract repudiation | | Risk of expropriation | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\ln FinDev_o \times ExtFin_s$ | 0.380*** | 0.459*** | 0.925*** | 1.162*** | 1.210*** | 1.464*** |
| | (0.0385) | (0.0367) | (0.089) | (0.087) | (0.130) | (0.132) |
| $\ln FinDev_o \times Tang_s$ | −0.980*** | −1.295*** | −1.013*** | −1.639*** | −3.174*** | −4.271*** |
| | (0.101) | (0.091) | (0.224) | (0.198) | (0.366) | (0.332) |
| $Rule\_law_o \times ExtFin_s$ | 0.031*** | 0.035*** | −0.013* | −0.021*** | −0.034*** | −0.044*** |
| | (0.006) | (0.005) | (0.007) | (0.007) | (0.011) | (0.010) |
| $Rule\_law_o \times Tang_s$ | −0.047*** | −0.053*** | −0.014 | 0.013 | 0.155*** | 0.168*** |
| | (0.018) | (0.015) | (0.019) | (0.017) | (0.026) | (0.023) |
| $\ln (K/L)_{ot} \times K\_Intensity_s$ | −0.218 | −0.182 | −0.328*** | −0.364*** | −0.011 | 0.051 |
| | (0.133) | (0.122) | (0.116) | (0.108) | (0.126) | (0.117) |
| $\ln (H/L)_{ot} \times H\_Intensity_s$ | 0.078*** | 0.107*** | 0.090*** | 0.123*** | 0.081*** | 0.110*** |
| | (0.019) | (0.020) | (0.017) | (0.017) | (0.017) | (0.018) |
| $\ln (N/L)_{ot} \times N\_Intensity_s$ | 0.079*** | 0.081*** | 0.068*** | 0.069*** | 0.054*** | 0.050*** |
| | (0.010) | (0.009) | (0.010) | (0.009) | (0.010) | (0.009) |
| $\ln (TFP)_{ot} \times ExtFin_s$ | −0.034 | 0.122 | 0.291** | 0.598*** | 0.415*** | 0.717*** |
| | (0.146) | (0.138) | (0.141) | (0.141) | (0.149) | (0.140) |
| $\ln (TFP)_{ot} \times Tang_s$ | 2.167*** | 2.405*** | 1.116*** | 0.853** | 1.214*** | 0.963*** |
| | (0.384) | (0.346) | (0.377) | (0.359) | (0.386) | (0.348) |
| Gravity controls | yes | yes | yes | yes | yes | yes |
| Sector FE | yes | no | yes | no | yes | no |
| Importer-Sector FE | no | yes | no | yes | no | yes |
| Exporter-year FE | yes | yes | yes | yes | yes | yes |
| Importer-year FE | yes | yes | yes | yes | yes | yes |
| $N$ | 309,076 | 308,976 | 338,463 | 338,368 | 338,463 | 338,368 |
| $R^2$ | 0.469 | 0.507 | 0.460 | 0.496 | 0.460 | 0.496 |

*Notes*: This table estimates the effect of contract enforcement indices from La Porta et al. (1997), interacted with sectoral external finance dependence, $ExtFin_s$, as well as with asset tangibility $Tang_s$, on the intensive margin of the Herfindahl-Hirschman Index by 2-digit-sector and destination. The main regressor is accounting standards in columns (1)-(2), contract repudiation in columns (3)-(4), and risk of expropriation in columns (5)-(6). As further controls, the regressions include exporter's log capital stock per worker interacted with physical capital intensity by sector, log human capital per worker interacted with human capital intensity, and the interaction of log natural capital per worker with natural resource intensity, as well as log total factor productivity interacted with sectoral measures of external finance dependence. All columns include log bilateral distance, and dummy variables for common border, common language, colonial links between countries and membership in regional trade agreements, as well as exporter-year and importer-year fixed effects. Columns (1), (3) and (5) further control for sector fixed effects, while the latter are replaced by importer-sector fixed effects in columns (2), (4) and (6). Standard errors in parentheses are clustered by exporter-importer pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table E5: Effect of financial development on margins of trade

| Dependent variable | Average exports (1) | Number of exporters (2) | Total exports (3) |
|---|---|---|---|
| $\ln FinDev_{ot}$ | 0.168*** | 0.433*** | 0.601*** |
| | (0.0369) | (0.0243) | (0.0520) |
| $\ln FinDev_{ot} \times ExtFin_s$ | 0.163*** | 0.306*** | 0.469*** |
| | (0.0269) | (0.0202) | (0.0405) |
| $\ln FinDev_{ot} \times Tang_s$ | −0.400*** | −0.607*** | −1.007*** |
| | (0.102) | (0.0457) | (0.125) |
| $\ln GDP_{ot}$ | 0.324*** | 0.395*** | 0.719*** |
| | (0.0119) | (0.0126) | (0.0198) |
| $\ln (K/L)_{ot}$ | −0.239*** | 0.0203 | −0.218*** |
| | (0.0339) | (0.0290) | (0.0483) |
| $\ln (K/L)_{ot} \times K\_Intensity_s$ | 0.067 | −1.373*** | −1.307*** |
| | (0.196) | (0.128) | (0.225) |
| $\ln (H/L)_{ot}$ | −0.169*** | −0.352*** | −0.520*** |
| | (0.0508) | (0.0414) | (0.0773) |
| $\ln (H/L)_{ot} \times H\_Intensity_s$ | 0.485*** | 0.380*** | 0.865*** |
| | (0.0303) | (0.0201) | (0.0459) |
| Gravity controls | yes | yes | yes |
| Year FE | yes | yes | yes |
| Importer-sector FE | yes | yes | yes |
| $N$ | 539,593 | 539,593 | 539,593 |
| $R^2$ | 0.289 | 0.463 | 0.371 |

*Notes*: This table estimates the effect of exporter's log financial development $FinDev_{ot}$ on average exports (column 1), the number of exporters (2) and total exports (3). Financial development, measured as ratio of private credit to GDP, is interacted with sectoral external finance dependence, $ExtFin_s$, as well as with asset tangibility $Tang_s$. All columns include year fixed effects, importer-sector fixed effects, as well as distance, dummy variables for common border, common language, colonial links between countries, and regional trade agreements. Standard errors in parentheses are clustered by exporter-importer pair, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The estimated coefficients are used in the counterfactual analysis as reported in Panel B of Table 10.