# Internet Appendix

## Diversion Risk, Markups and the Financing Cost Advantage of Trade Credit

Alvaro Garcia-Marin Santiago Justel Tim Schmidt-Eisenlohr

## A Online Tables

Table A.1. Diversion Risk and its Costs

| | Cash in Advance (1) | Trade Credit (2) | Difference (1) − (2) |
|---|---|---|---|
| Firm-to-firm diversion risk | $R$ | $R$ | 0 |
| Bank loan diversion risk | $R$ | $C(1+r_b)$ | $R-(1+r_b)C$ |
| Cost of borrowing | $r_b\left(\frac{R}{1+r_b}\right)$ | $r_bC$ | $r_b\left(\frac{R}{1+r_b}-C\right)$ |
| Return on deposit | $r_d(\frac{R}{1+r_b}-C)$ | 0 | $r_d\left(\frac{R}{1+r_b}-C\right)$ |
| Net Costs | $r_b\left(\frac{R}{1+r_b}\right)-r_d\left(\frac{R}{1+r_b}-C\right)$ | $r_bC$ | $(r_b-r_d)\left(\frac{R}{1+r_b}-C\right)$ |

Table A.2. Competition, Unit Values and Trade Credit

| Dependent Variable: | Log Unit Values | | | Trade Credit Share | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| ln(# Chilean Competitors)† | -0.0217* | — | -0.0447*** | 2.018** | — | 3.212*** |
| | (0.0110) | | (0.0130) | (0.768) | | (0.794) |
| ln(Conditional Market Share)‡ | — | -0.0130*** | -0.0212*** | — | 0.514** | 1.101*** |
| | | (0.00252) | (0.00323) | | (0.200) | (0.186) |
| Firm-product-year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 89,672 | 89,672 | 89,672 | 89,672 | 89,672 | 89,672 |
| $R^2$ | 0.925 | 0.925 | 0.925 | 0.409 | 0.408 | 0.410 |

*Notes*: All regressions are estimated through OLS at the firm-product-destination level (with products defined at the HS8-level) and control for the distance between Chile and the importing country, real GDP, and per capita real GDP of the importing country (all variables in logarithms). Unit values (columns 1 through 3) are computed as the ratio of the overall FOB value and quantity within product-destination years. Trade credit share (columns 4 through 6) corresponds to the ratio of the FOB value of trade credit transactions to the FOB value of all export transactions over a year. Standard errors (in parentheses) are clustered at the destination level. Key: *** significant at 1%; ** 5%; * 10%.

†: Number of Chilean firms exporting the product (defined at the 8-digit HS level) to the same destination and year.

‡: Market share within the sample of Chilean firms exporting the product (at the 8-digit HS level) to the destination.

## Table A.3. Robustness: Markup Validation

| Dep. Variable: | TC Share | | TC Maturity | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| A. Firm-level markups. | | | | |
| ln(Markup) | 9.947** | — | 24.20* | — |
| | (4.589) | | (13.13) | |
| ln(Markup) × $r_b^*$ | — | 1.304*** | — | 3.426*** |
| | | (0.312) | | (0.664) |
| First Stage F-Statistic | 173.4 | 153.4 | 148.2 | 144.5 |
| Observations | 88,762 | 88,762 | 77,541 | 77,541 |
| B. Single-product firms. | | | | |
| ln(Markup) | 0.653 | — | 45.56*** | — |
| | (2.063) | | (8.695) | |
| log(Markup) × $r_b^*$ | — | 1.909*** | — | 4.748*** |
| | | (0.301) | | (0.664) |
| First Stage F-Statistic | 79.3 | 183.6 | 65.6 | 166.2 |
| Firm FE | Yes | No | Yes | No |
| Firm-Product-Year FE | No | Yes | No | Yes |
| Product FE | Yes | No | Yes | No |
| Destination-Year FE | Yes | Yes | Yes | Yes |
| Observations | 46,324 | 46,324 | 40,569 | 40,569 |
| C. Average Price-Cost Margin. | | | | |
| ln(Margin) | 35.32 | — | 129.6 | — |
| | (22.44) | | (84.30) | |
| ln(Margin) × $r_b^*$ | — | 2.175*** | — | 5.587*** |
| | | (0.511) | | (1.115) |
| First Stage F-Statistic | 11.9 | 127.4 | 8.5 | 117.4 |
| Observations | 88,609 | 88,609 | 77,364 | 77,364 |
| Firm FE | Yes | No | Yes | No |
| Firm-Product-Year FE | No | Yes | No | Yes |
| Product FE | Yes | No | Yes | No |
| Destination-Year FE | Yes | Yes | Yes | Yes |

*Notes*: The table replicates the baseline IV specifications in tables 2 and 3 for the sample of single-product firms. All regressions are run at the firm-product-destination level (with products defined at the HS8 level). Trade credit shares (columns 1 and 2) are computed as the ratio of the FOB value of trade credit transactions to the FOB value of all export transactions over a year. Trade credit maturity (columns 3 and 4) corresponds to the days from shipping to the agreed payment due date in the trade credit contract. Markups and TFPQ are computed at the firm-product level. All columns show IV results using TFPQ as an instrument for markups and report the (cluster-robust) Kleibergen-Paap rK Wald F-statistic; the corresponding Stock-Yogo value for 10% maximal IV bias is 16.4. Columns 1 and 3 control for the logarithm of firm employment. Standard errors (in parentheses) are clustered at the firm-product level. Key: *** significant at 1%; ** 5%; * 10%.

## Table A.4. Robustness: Varying the Set of Fixed Effects

| Dependent Variable: | Trade Credit Share | | | Trade Credit Maturity | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| ln(Markup) | 2.946 | 3.342 | 18.72 | 17.81** | 28.67*** | 30.59 |
| | (2.320) | (2.368) | (11.42) | (7.717) | (7.101) | (24.23) |
| First Stage F-Statistic | 181.1 | 197.3 | 40.07 | 175.3 | 172.8 | 40.31 |
| Firm FE | Yes | Yes | No | Yes | Yes | No |
| Country-Year FE | Yes | No | Yes | Yes | No | Yes |
| Product-Country FE | Yes | No | Yes | Yes | No | Yes |
| Country-Product-Year FE | No | Yes | No | No | Yes | No |
| Firm-Year FE | No | No | Yes | No | No | Yes |
| Observations | 89672 | 89672 | 89672 | 78277 | 78277 | 78277 |

*Notes*: The table replicates table 2 including different set of fixed effect variables. All regressions are run at the firm-product-destination level (with products defined at the HS8-level). Trade credit shares are computed as the ratio of the FOB value of trade credit transactions to the FOB value of all export transactions over a year. Trade credit maturity corresponds to the days from shipping to the agreed payment due date in the trade credit contract. Markups are computed at the firm-product level and use TFPQ as an instrument for markups. All columns show IV results using TFPQ as an instrument for markups and report the (cluster-robust) Kleibergen-Paap rK Wald F-statistic; the corresponding Stock-Yogo value for 10% maximal IV bias is 16.4. All regressions control for the logarithm of firm employment. Standard errors (in parentheses) are clustered at the firm-product level. Key: *** significant at 1%; ** 5%; * 10%.

## Table A.5. Robustness: Trade Credit, Markups and Trade Volume Size

| Dependent Variable: | Trade Credit Share | | | Trade Credit Maturity | | |
|---|---|---|---|---|---|---|
| Specification: | OLS | FS | IV | OLS | FS | IV |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| ln(Markup) | 1.938*** | — | 5.419** | 3.820* | — | 16.50** |
| | (0.491) | | (2.685) | (1.959) | | (7.778) |
| ln(TFPQ) | — | 0.0446*** | — | — | 0.0476*** | — |
| | | (0.00307) | | | (0.00342) | |
| ln(FOB) | 1.040*** | 0.0001 | 1.039*** | -0.790*** | 0.0002 | -0.795*** |
| | (0.0865) | (0.0005) | (0.0865) | (0.169) | (0.0005) | (0.169) |
| First Stage F-Statistic | — | — | 211.0 | — | 193.5 | — |
| Firm FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Product FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Country-Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 89,672 | 89,672 | 89,672 | 78,277 | 78,277 | 78,277 |

*Notes*: The table replicates results in table 2, controlling for the log traded volume of each firm-product to each destination in a year. All regressions are run at the firm-product-destination level (with products defined at the HS8 level). Trade credit shares are computed as the ratio of the FOB value of trade credit transactions to the FOB value of all export transactions over a year. Trade credit maturity corresponds to the days from shipping to the agreed payment due date in the trade credit contract. Markups and TFPQ are computed at the firm-product level, following the methodology presented in section 3.4. Columns 1 and 5 report OLS estimates. The first stage results of the IV regressions are reported in columns 2 and 6, together with the (cluster-robust) Kleibergen-Paap rKWald F-statistic. The corresponding Stock-Yogo value for 10% maximal IV bias is 16.4. IV results are reported in columns 3, 4, 7, and 8. All regressions control for the logarithm of firm employment. Standard errors (in parentheses) are clustered at the firm-product level. Key: *** significant at 1%; ** 5%; * 10%.

Table A.6. Trade Credit and Firm-Product Markup: Heterogeneity by Trade Volume

| Dependent Variable: | Trade Credit Share | | Trade Credit Maturity | |
|---|---|---|---|---|
| Relative Shipment Size: | Small | Large | Small | Large |
| | (1) | (2) | (3) | (4) |
| ln(Markup) | 3.997 | 6.150* | 17.287* | 15.094 |
| | (3.884) | (3.352) | (9.875) | (9.215) |
| First Stage F-Statistic | 181.2 | 170.4 | 148.6 | 168.4 |
| Firm FE | Yes | Yes | Yes | Yes |
| Product FE | Yes | Yes | Yes | Yes |
| Destination-Year FE | Yes | Yes | Yes | Yes |
| Observations | 41,342 | 48,330 | 34,458 | 43,819 |

*Notes*: The table reports the coefficient estimates from equation (16) in the main text, splitting the sample by total shipment size. The table defines as "large" to all observations (firm-product-destination-years) with a total FOB value larger than the median within product-destinations. All regressions are run at the firm-product-destination level (with products defined at the HS8-level). Trade credit share (columns 1 and 2) corresponds to the ratio of the FOB value of trade credit transactions to the FOB value of all export transactions over a year. Trade credit maturity (columns 3 and 4) corresponds to the days from shipping to the agreed payment due date in the trade credit contract. Markups are computed at the firm-product level. All columns show IV results using TFPQ as an instrument for markups and report the (cluster-robust) Kleibergen-Paap rK Wald F-statistic; the corresponding Stock-Yogo value for 10% maximal IV bias is 16.4. All regressions control for the logarithm of firm employment. Standard errors (in parentheses) are clustered at the firm-product level. Key: *** significant at 1%; ** 5%; * 10%.

Table A.7. Robustness: Trade Credit Share in Terms of Transactions

| Specification: | OLS | FS | IV | IV |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| ln(Markup) | 1.878*** | — | 6.005** | — |
| | (0.486) | | (2.676) | |
| ln(TFPQ) | — | 0.045*** | — | — |
| | | (0.003) | | |
| ln(Markup) $\times r_b^*$ | — | — | — | 1.494*** |
| | | | | (0.322) |
| First Stage F-Statistic | — | 211.0 | — | 147.9 |
| Firm FE | Yes | Yes | Yes | No |
| Product FE | Yes | Yes | Yes | No |
| Country-Year FE | Yes | Yes | Yes | Yes |
| Firm-Product-Year FE | No | No | No | Yes |
| Observations | 89,672 | 89,672 | 89,672 | 89,672 |

*Notes*: All regressions are run at the firm-product-destination level (with products defined at the HS8 level). Trade credit shares are computed as the ratio of the number of trade credit transactions to the total number of transactions across all payment forms over a year. Markups and TFPQ are computed at the firm-product level. Column 1 reports OLS estimates. The first stage results of the IV regressions are reported in column 2, together with the (cluster-robust) Kleibergen-Paap rKWald F-statistic. The corresponding Stock-Yogo value for 10% maximal IV bias is 16.4. Columns 3 and 4 report IV results. Columns 1 through 3 control for the logarithm of firm employment. Standard errors (in parentheses) are clustered at the firm-product level. Key: *** significant at 1%; ** 5%; * 10%.

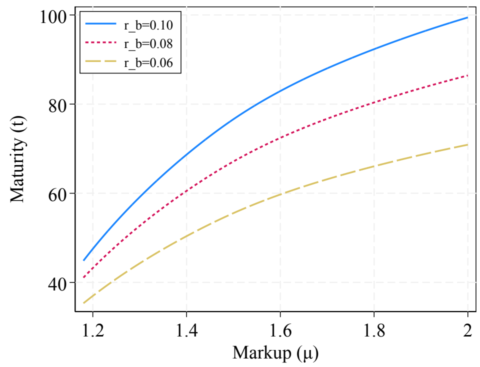
Table A.8. Trade Credit, Cash in Advance, Letters of Credit and Firm-Product Markup

| Sample: | Full sample | | | TC vs. CIA | TC vs. LC | LC vs. CIA |
|---|---|---|---|---|---|---|
| Dep. Variable: | TC share | CIA share | LC share | TC share | TC share | LC share |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| log(markup) $\times r_b^*$ | 1.343** | -1.788*** | 0.231 | 1.646*** | -0.349 | 5.399* |
| | (0.592) | (0.498) | (0.302) | (0.479) | (0.400) | (2.827) |
| First stage F-Statistic | 49.79 | 49.79 | 49.79 | 60.09 | 44.49 | 11.34 |
| Firm-Product-year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Destination-year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 89,672 | 89,672 | 89,672 | 80,490 | 76,986 | 10,425 |

*Notes*: This table replicates table 3, modifying the dependent variable (columns 1-3) and sample (columns 4-5). All regressions are run at the firm-product-destination level (with products defined at the HS8-level). Trade credit (TC), cash in advance (CIA), and letters of credit (LC) shares correspond to the ratio of the FOB value of transactions financed through each payment form to the FOB value of all export transactions over a year. Markups are computed at the firm-product level (products are defined at the 5-digit CPC level). Columns 4-6 restrict the sample, dropping transactions financed through letters of credit (column 4), cash in advance (column 5), and trade credit (column 6). All regressions are estimated using the interaction between TFPQ and the foreign borrowing rate as an instrument for markups and its interaction with the foreign borrowing rate; the (cluster-robust) Kleibergen-Paap rK Wald F-statistic is reported for each of them (the corresponding Stock-Yogo value for 10% maximal IV bias is 16.4). Standard errors (in parentheses) are clustered at the firm-destination level. Key: *** significant at 1%; ** 5%; * 10%.

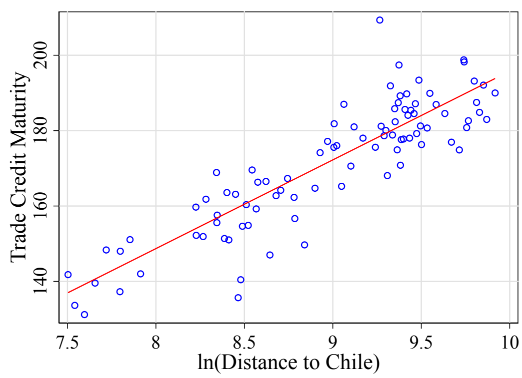
# B Online Figures

Figure B.1. Trade Credit Maturity, Markups and Interest Rates



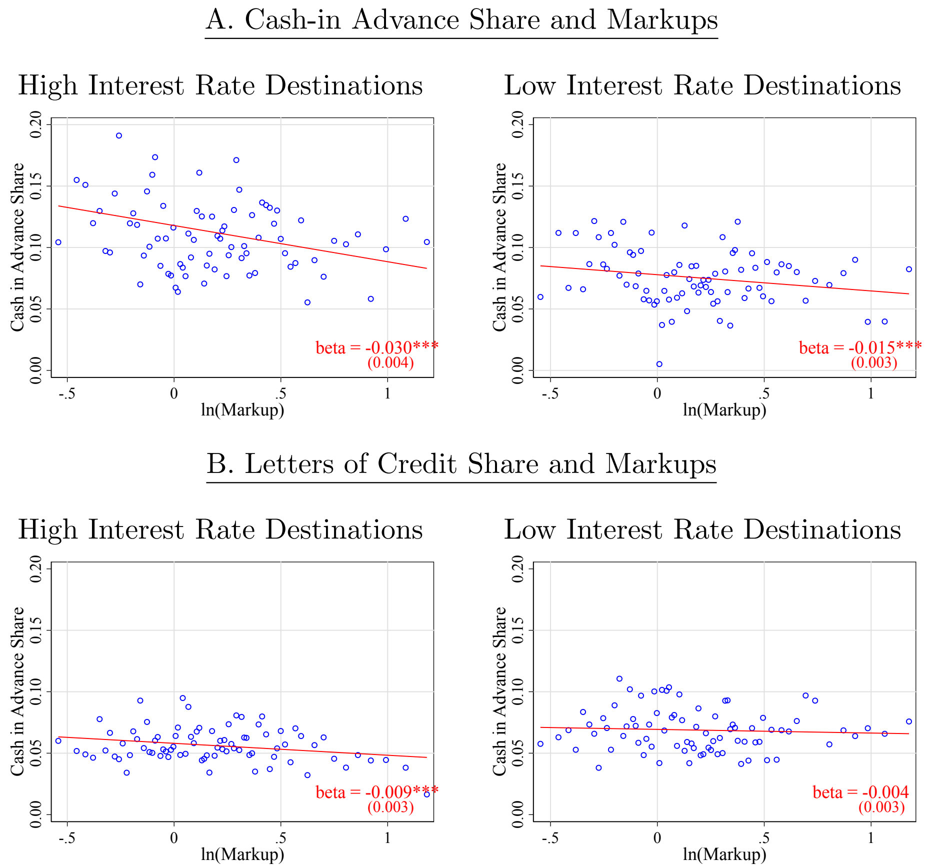

*Notes*: The figure illustrates the optimal maturity, $t$, against the markup for different borrowing rates, assuming $\tilde{\eta}(t) = 1 + (\tilde{\eta} - 1)\left(\frac{t}{T}\right)^n$, and setting $\tilde{\eta} = 0.98$, $r_d = 0.02$, $n = 3$, and $T = 180$.

Figure B.2. Trade Credit Maturity and Distance to Chile




*Notes*: The figure shows a binscatter plot of trade credit maturity (in days) against distance to Chile (in logs). The figure controls for year fixed effects. The figure excludes Paraguay, Argentina, and Uruguay for whom geographic distance is a poor proxy for shipping time.

Figure B.3. Markups, Cash in Advance, and Letters of Credit




*Notes*: The figure shows binscatter plots of the cash in advance (panel A) and the letter of credit shares (panel B) against firm-product markups (in logs), computed as in De Loecker et al. (2016). In each panel, charts on the left show data for countries with borrowing rates that are above the median rate across years and destinations, while charts on the right show data for countries where borrowing rates are below the median, respectively. All figures control for destination-year fixed effects.

# C Derivation of conditions for pooling

In the following, we derive two results. First, we show that banks always offer a pooling contract that is acceptable to both types of firms. Second, we show that for sufficiently large shares of reliable firms, $\eta$ and $\eta^*$, the only contracts that are used are those that are acceptable to both types of firms.

## C.1 Pooling and separating cases for bank lending

When banks lend out funds, they have two choices. First, offer a rate that is only accepted by unreliable firms. Second, offer a rate that is accepted by both firms.

**Lemma 1**

*The only equilibrium is where banks offer a contract that is accepted by both types.*

**Proof.** There are three cases to consider. First, banks could offer a contract aimed at reliable firms only. However, unreliable firms would always accept this contract as well, as their expected payoff is strictly higher as they may divert funds, making this contract infeasible. Second, there could be a pooling contract. In the pooling case, perfect competition in the banking sector drives the borrowing rate to $1+r_b(\tilde{\eta}) = \frac{1+r_d}{\tilde{\eta}}$. Finally, banks could offer a contract aimed at unreliable firms only. Then, perfect competition drives the borrowing rate to $1 + r_b^{SB}(\phi) = \frac{1+r_d}{\phi}$. As we assume that trade is profitable in the pooling case, that is $\frac{R}{C} = \mu > \frac{1+r_b(\tilde{\eta})}{\tilde{\eta}} = \frac{1+r_d}{\tilde{\eta}^2}$, there exists an interest rate $1 + \tilde{r}_b = 1 + r_b(\tilde{\eta}) + \epsilon$ that is acceptable to both types of firms and generates strictly positive profits for banks. As $\tilde{r}_b < r_b^{SB}(\phi)$, both types of firms would prefer this contract, which eliminates the separating contract for bad types. Therefore, the only equilibrium contract is the pooling contract where $1 + r_b = 1 + r_b(\tilde{\eta}) = \frac{1+r_d}{\tilde{\eta}}$. ■

## C.2 Pooling and separating for firm contract choice

This section derives conditions for the pooling case in the model with endogenous financing costs and a two-sided commitment problem. Specifically, it derives conditions under which it is optimal for unreliable firms to imitate reliable firms and for sellers to offer terms that both types of buyers accept. In particular, we need to derive conditions to exclude the following four cases:

1. The seller asks for a payment that is only accepted by unreliable buyers under trade credit.
2. The reliable seller chooses cash in advance, but the unreliable seller chooses trade credit.
3. The seller asks for a payment that is only accepted by unreliable buyers under cash in advance.
4. The reliable seller chooses trade credit, but the unreliable seller chooses cash in advance.

**Trade Credit - pooling case** This is the baseline case discussed in the main text. The reliable seller maximizes

$$\begin{aligned} \text{E}[\Pi_{RS}^{TC,P}] &= \tilde{\eta}^* P^{TC,P} - (1 + r_b(\tilde{\eta}))C, \\ \text{s.t. } \text{E}[\Pi_{RB}^{TC,P}] &= R - P^{TC,P} \geq 0, \end{aligned}$$

and chooses $P^{TC,P} = R$. This implies the following expected profits for reliable and unreliable sellers under pooling, respectively

$$\begin{aligned} \text{E}[\Pi_{RS}^{TC,P}] &= \tilde{\eta}^* R - (1 + r_b(\tilde{\eta}))C, \qquad \text{(C.1)} \\ \text{E}[\Pi_{US}^{TC,P}] &= \tilde{\eta}^* R - \phi(1 + r_b(\tilde{\eta}))C, \end{aligned}$$

where unreliable sellers have higher expected profits, as there is a chance that they can divert bank funds, so they only repay with probability $\phi$.

**Trade Credit, Separating Case 1** *The seller asks for a payment that is only accepted by unreliable buyers under trade credit.*

Then, the payment exceeds revenues, $P^{TC,S} > R$. Unreliable buyers still accept this contract, as they know that they can deviate with probability $\phi$. Expected profits of an unreliable buyer under separation are

$$\mathrm{E}[\Pi_{UB}^{TC,S1}] \;=\; R - \phi P^{TC,S1}.$$

In this case, the seller picks $P^{TC,S1} = \frac{R}{\phi}$. Importantly, reliable buyers now reject the contract, so that the exporter only gets the initial contract accepted with probability $1-\eta^*$, the share of unreliable firms. Expected profits of a reliable and unreliable seller under a buyer-separating contract case 1 are hence

$$\begin{aligned}\mathrm{E}[\Pi_{RS}^{TC,S1}] &= (1-\eta^*)(R-(1+r_b(\tilde{\eta}))C), \qquad (C.2)\\ \mathrm{E}[\Pi_{US}^{TC,S1}] &= (1-\eta^*)(R-\phi(1+r_b(\tilde{\eta}))C).\end{aligned}$$

Combining equations (C.1) and (C.2), and substituting in the pooling equilibrium borrowing rate, a reliable seller picks the pooling case as long as

$$\mathrm{E}[\Pi_{RS}^{TC,P}] \geq \mathrm{E}[\Pi_{RS}^{TC,S}] \Leftrightarrow (\eta^* - (1-\eta^*)(1-\phi))\, R \geq \eta^*(1+r_b(\tilde{\eta}))C.$$

Which can be rearranged to

$$\frac{R}{C} \;\geq\; \frac{\eta^*(1+r_b(\tilde{\eta}))}{(\eta^* - (1-\eta^*)(1-\phi))} \qquad (C.3)$$

Note that for the unreliable seller the corresponding condition is always weaker and reads

$$\mathrm{E}[\Pi_{US}^{TC,P}] \geq \mathrm{E}[\Pi_{US}^{TC,S}] \Leftrightarrow (\eta^* - (1-\eta^*)(1-\phi))\, R \geq \eta^* \phi(1 + r_b(\tilde{\eta}))C.$$

That is, if a reliable seller prefers the pooling case, an unreliable seller will also prefer this contract.

**Trade Credit, Separating Case 2** *The reliable seller chooses cash in advance, but the unreliable seller chooses trade credit.* If a firm asks for a trade credit loan in this case, the bank knows it is matched with an unreliable firm, and it charges a rate to offset the risk of diversion, that is $1 + r_b^S(\phi) = \frac{1+r_d}{\phi}$. Then, expected profits of an unreliable seller are

$$\Pi_{US}^{TC,S2} = \tilde{\eta}^* R - (1 + r_d)C \tag{C.4}$$

In equilibrium, the bank can't make a loss, so net the seller can't steal anything, so they pay $1 + r_d = \phi(1 + r_b^S(\phi))$ in expectation. To rule out case 2, we need to combine the following four profit expressions. Profits of an unreliable seller under cash in advance

$$\Pi_{US}^{CIA,P} \quad = \quad (1 + r_d)\left(\frac{\tilde{\eta}R}{1 + r_b^*(\tilde{\eta}^*)} - \phi C\right)$$

Profits of a reliable seller under cash in advance

$$\Pi_{RS}^{CIA,P} \quad = \quad (1 + r_d)\left(\frac{\tilde{\eta}R}{1 + r_b^*(\tilde{\eta}^*)} - C\right)$$

Profits of an unreliable seller under trade credit separating case 2

$$\Pi_{US}^{TC,SC2} \quad = \quad \tilde{\eta}^* R - (1 + r_d)C$$

And profits of a reliable seller under trade credit with pooling

$$\Pi_{RS}^{TC,P} = \tilde{\eta}^* R - (1 + r_b(\tilde{\eta}))C$$

A sufficient condition for the separating case to be dominated is that

$$\Pi_{US}^{CIA,P} - \Pi_{US}^{TC,SC2} \geq \Pi_{RS}^{CIA,P} - \Pi_{RS}^{TC,P}.$$

If this condition holds, then the reliable seller choosing CIA implies the unreliable seller choosing CIA as well. Rearranging delivers

$$\Pi_{US}^{CIA,P} - \Pi_{RS}^{CIA,P} \geq \Pi_{US}^{TC,SC2} - \Pi_{RS}^{TC,P}$$

Plugging in from above and simplifying delivers

$$\tilde{\eta} \geq \frac{1}{2 - \phi}$$

We can rewrite to

$$\eta \geq \frac{1 - \phi}{2 - \phi} \tag{C.5}$$

**Cash in Advance, Separating Case 3** *The seller asks for a payment that is only accepted by unreliable buyers under cash in advance.* Then, the seller offers $P^{CIA,S3} = \frac{\tilde{\eta}R}{(1+r_d)}$, which is only accepted by unreliable buyers. The seller expected profits is

$$E[\Pi_{RS}^{CIA,S3}] = (1 - \eta^*)(1 + r_d)\left(\frac{\tilde{\eta}R}{(1 + r_d)} - C\right).$$

The seller prefers the pooling equilibrium where she serves both reliable and unreliable buyers as long as

$$R\,\tilde{\eta}(\tilde{\eta}^* - (1-\eta^*)) \geq C(1+r_d)\eta^*. \tag{C.6}$$

Note that a necessary condition to ensure a pooling equilibrium is that $\tilde{\eta}^* > (1-\eta^*)$. This can be rewritten to

$$\eta^* > \frac{1-\phi}{2-\phi}.$$

Then, (C.6) can be rewritten as

$$\frac{R}{C} \geq \frac{(1+r_d)\eta^*}{\tilde{\eta}(\tilde{\eta}^* - (1-\eta^*))}. \tag{C.7}$$

**Cash in Advance, Separating Case 4** *The reliable seller chooses trade credit, but the unreliable seller chooses cash in advance.* Then, the buyer knows that she is dealing with an unreliable seller and the participation constraint becomes

$$\mathrm{E}[\Pi_{RB}^{CIA,S4}] = \phi R - (1+r_b^*(\tilde{\eta}^*))P^{CIA,S4}.$$

The unreliable seller then picks the optimal payment $P^{CIA,S4} = \frac{\phi}{1+r_b^*(\tilde{\eta}^*)}R$, delivering expected profits of

$$\mathrm{E}[\Pi_{US}^{CIA,S4}] = (1+r_d)\phi\left(\frac{R}{1+r_b^*(\tilde{\eta}^*)} - C\right).$$

A sufficient condition for the pooling case to dominate is

$$\Pi_{US}^{TC,P} - \Pi_{US}^{CIA,SC4} \geq \Pi_{RS}^{TC,P} - \Pi_{RS}^{CIA,P}.$$

Which can be rewritten to

$$\Pi_{US}^{TC,P} - \Pi_{RS}^{TC,P} \geq \Pi_{US}^{CIA,SC4} - \Pi_{RS}^{CIA,P}.$$

Plugging in the profits and simplifying delivers

$$\frac{R}{C} \quad > \quad \frac{(1 + r_b^*(\tilde{\eta}^*))}{\eta(1-\phi)} \left[ (1-\phi) - \frac{(1-\phi)}{\tilde{\eta}} \right].$$

Can cancel further to get

$$\frac{R}{C} \quad \geq \quad \frac{(1 + r_b^*(\tilde{\eta}^*))}{\eta} \left[ 1 - \frac{1}{\tilde{\eta}} \right].$$

This condition holds if

$$\tilde{\eta} \leq 1. \tag{C.8}$$

**Combining the conditions** To summarize, pooling requires the following three conditions:

$$\frac{R}{C} \quad \geq \quad \frac{\eta^*(1+r_d)}{\tilde{\eta}(\eta^* - (1-\eta^*)(1-\phi))}, \tag{C.9}$$

$$\eta \quad \geq \quad \frac{1-\phi}{2-\phi} \tag{C.10}$$

$$\frac{R}{C} \quad \geq \quad \frac{\eta^*(1+r_d)}{\tilde{\eta}(\eta^* - (1-\eta^*)(1-\phi))}, \tag{C.11}$$

$$\tilde{\eta} \quad \leq \quad 1. \tag{C.12}$$

Now, rewriting equation (C.9), focusing on the symmetric case

$$\frac{\eta}{\tilde{\eta}(\tilde{\eta} - (1-\eta))} \leq \tilde{X},$$

with $\tilde{X} = \frac{R}{(1+r_d)C}$. And taking the derivative with respect to $\eta$ delivers

$$\frac{\tilde{\eta}(\tilde{\eta} - (1-\eta)) - \eta\left((1-\phi)(\tilde{\eta} - (1-\eta)) + \tilde{\eta}(2-\phi)\right)}{\left(\tilde{\eta}(\tilde{\eta} - (1-\eta))\right)^2} < 0.$$

This can be simplified to

$$-(1-\phi)[\eta^2(2-\phi) + \phi] < 0. \tag{C.13}$$

Thus, we now know that condition (C.9) gets weaker as $\eta$ increases. So there is always a level of $\eta$ for which the condition holds.

Finally, for $\eta \rightarrow 1$, the above conditions converge to

$$\frac{R}{C} > 1 + r_d, \tag{C.14}$$

$$1 > 0, \tag{C.15}$$

$$\frac{R}{C} > 1 + r_d. \tag{C.16}$$

We thus know, that there exists an $\eta, \eta^* > 0$ for which all pooling conditions hold. Intuitively, as the fraction of unreliable firms converges to zero, it is always optimal to offer contracts that are also acceptable to reliable firms to maximize expected profits.

# D Model Extensions

## D.1 Trade Credit Maturity

### Proof for proposition 3

**Part (i)**: At t=0, the FOC, given by equation (16), is strictly positive, as only the financing cost channel is active:

$$\frac{\partial \mathrm{E}[\Pi_S^{TC,I}]/C}{\partial t}|_{t=0} = (r_b - r_d)\left(\frac{\mu}{(1+r_bT)^2} - 1\right) > 0.$$

At t =T, equation (16) simplifies to:

$$\frac{\partial \mathrm{E}[\Pi_S^{TC,I}]/C}{\partial t}|_{t=T} = (r_b - r_d)\left(\tilde{\eta}\mu - 1\right) + \mu\tilde{\eta}(T)'.$$

This expression is negative if:

$$\tilde{\eta}(T)' < -\frac{r_b - r_d}{\mu}(\tilde{\eta}\mu - 1)$$

Due to continuity, this implies that the first order condition is zero at least once between $t = 0$ and $t = T$. To ascertain that we have a unique solution that represents a maximum, we look at the second-order condition of the problem next. Taking derivatives of equation (16) with respect to $t$ we find

$$\begin{aligned} \frac{\partial^2(\Pi^{TC,I}/C)}{\partial t^2} &= (r_b - r_d)\left[\frac{\tilde{\eta}(t)'\mu}{(1+r_b(T-t))^2} + \frac{2\tilde{\eta}(t)\mu r_b}{(1+r_b(T-t))^3}\right] \\ &+ \tilde{\eta}(t)''\mu\frac{(1+r_d(T-t))}{(1+r_b(T-t))} - \frac{\tilde{\eta}(t)'\mu r_d}{(1+r_b(T-t))} \\ &+ \tilde{\eta}(t)'\mu r_b\frac{(1+r_d(T-t))}{(1+r_b(T-t))^2}. \end{aligned} \tag{D.1}$$

Gathering terms

$$\frac{\partial^2(\Pi^{TC,I}/C)}{\partial t^2} = \frac{2(r_b - r_d)\mu}{(1+r_b(T-t))^2}\left[\tilde{\eta}(t)' + \frac{\tilde{\eta}(t)r_b}{(1+r_b(T-t))}\right] + \underbrace{\tilde{\eta}(t)''\mu\frac{(1+r_d(T-t))}{(1+r_b(T-t))}}_{<0 \text{ as } \tilde{\eta}(t)''<0}.$$

A sufficient condition for $\frac{\partial^2(\Pi^{TC,I}/C)}{\partial t^2} < 0$ is that the term in the square brackets is negative

$$\tilde{\eta}(t)' + \frac{\tilde{\eta}(t)r_b}{(1+r_b(T-t))} < 0. \tag{D.2}$$

This can be rewritten to

$$-\frac{\tilde{\eta}(t)'}{\tilde{\eta}(t)} > \frac{r_b}{1+r_b(T-t)}, \tag{D.3}$$

which is one of the conditions we required for the function $\tilde{\eta}(t)$. Intuitively, this condition requires that the diversion risk rises sufficiently quickly with maturity, $t$. When this condition holds, the SOC is always negative in the range $t \in [0, T]$ and there exists a unique interior solution for $t$ that maximizes expected seller profits.

**Part (ii)**: The cross-derivative of expected seller profits over $C$ w.r.t. $t$ and $\mu$ is given by

$$\frac{\partial^2 \Pi^{TC,I}}{\partial t \partial \mu}/C = (r_b - r_d)\left(\frac{\tilde{\eta}(t)}{(1+r_b(T-t))^2}\right) + \frac{1}{1+r_b(T-t)}\left[(1+r_d(T-t))(\tilde{\eta}(t)')\right].$$

As long as the financing cost advantage effect weakly dominates the diversion effect, it is the case that

$$\frac{1}{1+r_b(T-t)}\left[(1+r_d(T-t))(\tilde{\eta}(t)')\right] \geq -\frac{r_b - r_d}{\mu}\left(\frac{\tilde{\eta}(t)\mu}{(1+r_b(T-t))^2} - 1\right).$$

Substitute this expression in to get

$$
\begin{aligned}
\frac{\partial^2 \Pi^{TC,I}}{\partial t \partial \mu}/C &= (r_b - r_d)\left(\frac{\tilde{\eta}(t)}{(1+r_b(T-t))^2}\right) + \frac{1}{1+r_b(T-t)}\left[(1+r_d(T-t))(\tilde{\eta}(t)')\right] \\
&\geq (r_b - r_d)\left(\frac{\tilde{\eta}(t)}{(1+r_b(T-t))^2}\right) - \frac{r_b - r_d}{\mu}\left(\frac{\tilde{\eta}(t)\mu}{(1+r_b(T-t))^2} - 1\right) \\
&= \frac{r_b - r_d}{\mu} > 0.
\end{aligned}
$$

That is, the effect of the maturity on profits increases in the markup $\mu$. In addition, this expression increases in the borrowing rate $r_b$, implying that the effect of the markup on the optimal maturity increases in $r_b$.

## D.2 Variable Markups

This subsection presents additional details and derivations for the variable markup extension presented in section 3.4.1. Let the linear demand take the form $Q(p) = 1 - p$. Profits can be represented by: $\Pi = \alpha p Q(p) - \beta c Q(p) = (\alpha p - \beta c)(1-p)$. With: $\alpha^{TC} = 1$; $\beta^{TC} = 1 + r_b$; $\alpha^{CIA} = \frac{1+r_d}{1+r_b^*}$; $\beta^{CIA} = 1 + r_d$. Solving for the optimal price charged to final consumers, we find: $p_d = \frac{1}{2} + \frac{\beta c}{2\alpha}$; $p_d^{TC} = \frac{1}{2} + \frac{(1+r_b)c}{2}$; $p_d^{CIA} = \frac{1}{2} + \frac{(1+r_b^*)c}{2}$.

To derive upstream markups, we need to calculate the ratio of the payments $P^{CIA}$ and $P^{TC}$ over production costs with cash in advance and trade credit, respectively. As derived in the main text, these markups are given by $p_d^{TC}/c(1+r_b)$ and $p_d^{CIA}/c(1+r_b^*)$, respectively. Plugging in delivers

$$
\mu^{TC} = \frac{p_d^{TC}}{(1+r_b)c} = \frac{1}{2c(1+r_b)} + \frac{1}{2} \tag{D.4}
$$

$$
\mu^{CIA} = \frac{p_d^{CIA}}{(1+r_b^*)c} = \frac{1}{2c(1+r_b^*)} + \frac{1}{2}. \tag{D.5}
$$

It is easy to see that markups decrease (increase) in the marginal cost (productivity). We can now derive profits as $\Pi = \alpha\left(\frac{1}{2} - \frac{\beta c}{2\alpha}\right)^2$; $\Pi^{TC} = \left(\frac{1}{2} - \frac{(1+r_b)c}{2}\right)^2$; $\Pi^{CIA} = \frac{1+r_d}{1+r_b^*}\left(\frac{1}{2} - \frac{(1+r_b^*)c}{2}\right)^2$. From this we can calculate the difference in profits between trade credit and cash in advance as:

$$\Delta\Pi = \left[\left(\frac{1}{2} - \frac{(1+r_b)c}{2}\right)^2 - \frac{1+r_d}{1+r_b^*}\left(\frac{1}{2} - \frac{(1+r_b^*)c}{2}\right)^2\right] \tag{D.6}$$

Taking the derivative with respect to $c$ delivers $\frac{\partial\Delta\Pi}{\partial c} = -(1+r_b)\left(\frac{1}{2} - \frac{(1+r_b)c}{2}\right) + (1+r_d)\left(\frac{1}{2} - \frac{(1+r_b^*)c}{2}\right)$. This derivative is negative as long as $r_b > r_d$ and $r_b^*$ and $r_b$ are not too different. To see this, rewrite the derivative as

$$\begin{aligned}
\frac{\partial\Delta\Pi}{\partial c} &= -(r_b - r_d)\left(\frac{1}{2} - \frac{(1+r_b)c}{2}\right) + \frac{c}{2}(1+r_d)(r_b - r_b^*) \\
&= -(r_b - r_d)\left(p_d^{TC}(c) - (1+r_b)c\right) + \frac{c}{2}(1+r_d)(r_b - r_b^*) \qquad \text{(D.7)} \\
&= -\left((r_b - r_d)\left(\mu^{TC}(c) - 1\right)(1+r_b) + \frac{1}{2}(1+r_d)(r_b - r_b^*)\right)c. \qquad \text{(D.8)}
\end{aligned}$$

So as long as $r_b > r_d$, $\mu^{TC} > 1$, and interest rates across countries are not too different ($\epsilon$ is not too large), this derivative will be negative.

## D.3 CES Extension

Consider a standard CES demand with:

$$q = (p_d)^{-\sigma}A, \tag{D.9}$$

where A reflects aggregate demand and $p_d$ is the price charged to final consumers. In addition, assume that firms produce with constant marginal cost $c$. From equations (1) and (2), we can derive a general expression for profits:

$$\Pi_S^i = \alpha R - \beta C, \tag{D.10}$$

with $\alpha^{TC} = 1$ and $\alpha^{CIA} = \frac{1+r_d}{1+r_b^*}$ and $\beta^{TC} = 1 + r_b$ and $\beta^{CIA} = 1 + r_d$. Now, with CES, we need to solve the following problem:

$$\max_{p_d^i} \Pi_s^i = (\alpha p_d^i - \beta c)(p_d^i)^{-\sigma} A. \tag{D.11}$$

Solving this problem delivers the optimal price:

$$p_d^i = \frac{\sigma}{\sigma - 1} \frac{\beta}{\alpha} c. \tag{D.12}$$

Plugging in delivers:

$$p_d^{TC} = \frac{\sigma}{\sigma - 1}(1 + r_b)c, \tag{D.13}$$

$$p_d^{CIA} = \frac{\sigma}{\sigma - 1}(1 + r_b^*)c. \tag{D.14}$$

That is, exporters charge a constant markup over effective costs.

Profits are given by:

$$\Pi_S^i = \frac{\beta}{\sigma} \left(\frac{\sigma}{\sigma - 1}\right)^{1-\sigma} \left(\frac{\beta}{\alpha}\right)^{-\sigma} c^{1-\sigma} A. \tag{D.15}$$

Which implies:

$$\Pi_S^{TC} = \frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}(1+r_b)^{1-\sigma}c^{1-\sigma}A, \tag{D.16}$$

$$\Pi_S^{CIA} = \frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}(1+r_d)\,(1+r_b^*)^{-\sigma}\,c^{1-\sigma}A. \tag{D.17}$$

Taking the difference delivers:

$$\Pi_S^{TC} - \Pi_S^{CIA} = \frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}c^{1-\sigma}A\left((1+r_b)^{1-\sigma} - (1+r_d)\,(1+r_b^*)^{-\sigma}\right), \tag{D.18}$$

$$= \frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}c^{1-\sigma}A\left((1+r_b)^{1-\sigma} - \frac{1+r_d}{1+r_b^*}\,(1+r_b^*)^{1-\sigma}\right). \tag{D.19}$$

Note that for $\sigma$ going to 1 we get:

$$\Delta\Pi = A\left(1 - \frac{1+r_d}{1+r_b^*}\right) > 0 \tag{D.20}$$

For $\sigma$ to $\infty$:

$$\Delta\Pi = 0 \tag{D.21}$$

In the symmetric case, the profit difference is given by:

$$\Delta\Pi = \frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma}c^{1-\sigma}A(1+r_b)^{1-\sigma}\left(1 - \frac{1+r_d}{1+r_b}\right), \tag{D.22}$$

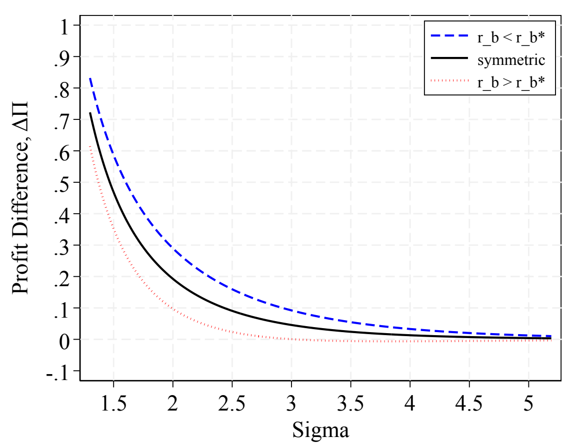
We can rewrite the equation in the following way:

$$\underbrace{\frac{1}{\sigma}}_{\text{Profitability due to markup}}\;\underbrace{\left(1 - \frac{1+r_d}{1+r_b}\right)}_{\text{Financing Cost Difference}}\;\underbrace{\left((1+r_b)\frac{\sigma}{\sigma-1}\right)^{1-\sigma}Ac^{1-\sigma}}_{\text{Revenues}} \tag{D.23}$$

The profitability term not surprisingly decreases in $\sigma$. This reflects the fact that the firm charges a lower markup as $\sigma$ rises. The financing cost difference itself is independent of $\sigma$ and given by the second term. The combination of the first two terms reflects the financing cost advantage in our paper. If the markup is higher (lower $\sigma$) and there is an interest rate spread ($r_b > r_d$), then this increases the preference for trade credit. Holding $Ac^{1-\sigma}$ constant, revenues also decrease in $\sigma$ as long as $\log\left((1+r_b)\frac{\sigma}{\sigma-1}\right) > \frac{1}{\sigma(1+r_b)}$, which holds as $(1+r_b) \geq 1$.[1] Of course, in GE, $\sigma$ may also affect the aggregate price level and aggregate demand, with effects depending on specific assumptions about entry and fixed costs.

The relationship between the trade credit profit advantage and elasticity $\sigma$ is illustrated in Figure D.4 below. The black solid line shows the case of symmetric borrowing costs. The red dotted line shows the case where the exporter's borrowing rate is higher, which makes TC less attractive and the blue dashed line shows the case where the exporter's borrowing rate is below that of the importer. In all three cases, the TC advantage clearly declines in $\sigma$.

Figure D.4. Trade credit profit advantage for different $\sigma$ and $r_b$




*Notes*: This figure plots the profit difference $\Pi_S^{TC} - \Pi_S^{CIA}$ as a function of the elasticity of substitution $\sigma$. The parameters are set to $A = 100$, $c = 2$, $r_d = 0.04$, and $r_b^* = 0.08$. The three cases correspond to $r_b = 0.06$ (dashed blue line), $r_b = r_b^* = 0.08$ (solid black line), and $r_b = 0.10$ (dotter red line).

[1] Note that $\log x > \frac{x-1}{x}$. Define $x = \frac{\sigma}{\sigma-1}$ to see that $\log\left(\frac{\sigma}{\sigma-1}\right) > \frac{1}{\sigma}$.

## D.4 Double Marginalization

In the baseline model, we assume that the seller can set both the price and the quantity. We now consider the alternative where the seller sets the prices and the buyer picks the quantity. This setting gives rise to double-marginalization.

### Trade Credit

We need to solve the problem backwards.

**Step 2:** The downstream firm picks the optimal downstream price given the upstream price offered by the seller.

$$\max_{p_d^{TC}} \Pi_B^{TC} = \left(p_d^{TC} - p_u^{TC}\right)(p_d^{TC})^{-\sigma} A. \tag{D.24}$$

With optimal price

$$p_d^{TC} = \frac{\sigma}{\sigma - 1} p_u^{TC}. \tag{D.25}$$

**Step 1:** The upstream firm picks the optimal upstream price.

$$\begin{aligned}
\max_{p_u^{TC}} \Pi_S^{TC} &= \left(p_u^{TC} - (1 + r_b)c\right)(p_d^{TC})^{-\sigma} A, & \text{(D.26)} \\
&= \left(p_u^{TC} - (1 + r_b)c\right)\left(\frac{\sigma}{\sigma - 1} p_u^{TC}\right)^{-\sigma} A & \text{(D.27)} \\
&= \left(p_u^{TC} - (1 + r_b)c\right)(p_u^{TC})^{-\sigma}\left(\frac{\sigma}{\sigma - 1}\right)^{-\sigma} A. & \text{(D.28)}
\end{aligned}$$

With optimal prices

$$p_u^{TC} = \frac{\sigma}{\sigma-1}(1+r_b)c, \tag{D.29}$$

$$p_d^{TC} = \left(\frac{\sigma}{\sigma-1}\right)^2 (1+r_b)c. \tag{D.30}$$

**Cash in Advance**

**Step 2:** The downstream firm picks the optimal downstream price given the upstream price offered by the seller.

$$\max_{p_d^{CIA}} \Pi_B^{CIA} = \left(p_d^{CIA} - (1+r_b^*)p_u^{CIA}\right)(p_d^{CIA})^{-\sigma} A. \tag{D.31}$$

With optimal price

$$p_d^{CIA} = \frac{\sigma}{\sigma-1}(1+r_b^*)p_u^{CIA}. \tag{D.32}$$

**Step 1:** The upstream firm picks the optimal upstream price.

$$\max_{p_u^{CIA}} \Pi_S^{CIA} = (1+r_d)\left(p_u^{CIA} - c\right)(p_d^{CIA})^{-\sigma} A, \tag{D.33}$$

$$= (1+r_d)\left(p_u^{CIA} - c\right)\left(\frac{\sigma}{\sigma-1}(1+r_b^*)p_u^{CIA}\right)^{-\sigma} A, \tag{D.34}$$

$$= \left(p_u^{CIA} - c\right)\left(p_u^{CIA}\right)^{-\sigma}(1+r_d)\left(\frac{\sigma}{\sigma-1}(1+r_b^*)\right)^{-\sigma} A. \tag{D.35}$$

With optimal prices

$$p_u^{CIA} = \frac{\sigma}{\sigma-1}c, \tag{D.36}$$

$$p_d^{CIA} = \left(\frac{\sigma}{\sigma-1}\right)^2 (1+r_b^*)c. \tag{D.37}$$

**Profit Comparison** Which implies

$$\Pi_S^{TC} = \frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-2\sigma}(1+r_b)^{1-\sigma}c^{1-\sigma}A, \tag{D.38}$$

$$\Pi_S^{CIA} = \frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-2\sigma}(1+r_d)\left(1+r_b^*\right)^{-\sigma}c^{1-\sigma}A. \tag{D.39}$$

**Payment Choice** Taking the difference delivers

$$\Pi_S^{TC} - \Pi_S^{CIA} = \frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-2\sigma}c^{1-\sigma}A\left((1+r_b)^{1-\sigma} - (1+r_d)\left(1+r_b^*\right)^{-\sigma}\right), \tag{D.40}$$

$$= \frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-2\sigma}c^{1-\sigma}A\left((1+r_b)^{1-\sigma} - \frac{1+r_d}{1+r_b^*}\left(1+r_b^*\right)^{1-\sigma}\right). \tag{D.41}$$

In the symmetric case, this simplifies to

$$\frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-2\sigma}c^{1-\sigma}A(1+r_b)^{1-\sigma}\left(1-\frac{1+r_d}{1+r_b}\right). \tag{D.42}$$

We can rewrite the equation in the following way

$$\underbrace{\frac{1}{\sigma}}_{\text{Profitability due to markup}} \quad \underbrace{\left(1-\frac{1+r_d}{1+r_b}\right)}_{\text{Financing Cost Difference}} \quad \underbrace{\left(\frac{\sigma}{\sigma-1}\right)^{1-2\sigma} Ac^{1-\sigma}(1+r_b)^{1-\sigma}}_{\text{Revenues}}, \tag{D.43}$$

which is positive as long as $r_d < r_b$. The expression is very similar to the CES case without double marginalization analyzed before. Note that the extra factor from double marginalization is $\left(\frac{\sigma}{\sigma-1}\right)^{-\sigma} < 1$. That is, the absolute cost advantage of trade credit goes down, because double marginalization reduces revenues. There is, however, no change to the first two components that are central to the financing cost advantage of trade credit.

## D.5 Partial Prepayments

This section provides the details on the partial prepayments extension and shows that the only partial payment that can be optimal is one that equals the production costs, $C$. There are two cases to consider.

**Case 1** In the first case, the buyer pays at least the production cost $C$ in advance ($\chi P^{PP} \geq C$, where $\chi \leq 1$ denotes the fraction of ). Then, profits can be written as $\Pi_S^{PP} = (1 + r_d)(\chi P^{PP} - C) + (1 - \chi)P^{PP}; \quad \Pi_B^{PP} = R - (1 + r_b^*)\chi P^{PP} - (1 - \chi)P^{PP}$. Solving for the maximum payment that satisfies the participation constraint of the buyer implies $P^{PP} = \frac{R}{1+\chi r_b^*}$. Plugging $P^{PP}$ back into seller profits gives $\Pi_S^{PP} = (1 + r_d)\left(\frac{\chi R}{1+\chi r_b^*} - C\right) + \frac{(1-\chi)R}{1+\chi r_b^*}$. Then, taking the derivative with respect to $\chi$ delivers

$$\frac{\partial \Pi_S^{PP}}{\partial \chi} = -(r_b^* - r_d)\frac{R}{(1 + \chi r_b^*)^2}. \tag{D.44}$$

Equation (D.44) implies that profits fall in the prepayment share if the foreign borrowing rate exceeds the deposit rate, $r_b^* > r_d$. Thus, if $r_b^* > r_d$, the optimal prepayment is less or equal to production costs, $C$. If borrowing abroad is very cheap and $r_b^* < r_d$, equation (D.44) becomes positive and full prepayment (cash in advance) is optimal.

**Case 2** In the second case, the buyer pays less than $C$ in advance ($\chi P^{PP} < C$). The problem then reads $\Pi_S^{PP} = (1 + r_b)(\chi P^{PP} - C) + (1 - \chi)P^{PP}; \quad \Pi_B^{PP} = R - (1 + r_b^*)\chi P^{PP} - (1 - \chi)P^{PP}$. As the buyer profits do not change, the payment remains $P = \frac{R}{1+\chi r_b^*}$. Plugging into seller profits delivers $\Pi_S^{PP} = (1 + r_b)\left(\frac{\chi R}{1+\chi r_b^*} - C\right) + \frac{(1-\chi)R}{1+\chi r_b^*}$. Taking the derivative with respect to $\chi$ delivers

$$\frac{\partial \Pi_S^{PP}}{\partial \chi} = (r_b - r_b^*)\frac{R}{(1 + \chi r_b^*)^2}. \tag{D.45}$$

Equation (D.45) is driven by the difference in borrowing rates, $r_b - r_b^*$. If the domestic borrowing rate exceeds the foreign borrowing rate, the optimal prepayment is greater or equal to the production costs. If the foreign borrowing rate is higher than the domestic borrowing rate, the optimal prepayment is zero.

**The optimal prepayment** To summarize, there are three cases:

i) Suppose $r_b^* > r_b$. Then, $r_b^* > r_d$ because $r_b > r_d$. And equation (D.44) implies $\chi P^{PP} \leq C$ and equation (D.45) implies $\chi P^{PP} = 0 \Rightarrow \chi P^{PP} = 0$. The seller provides trade credit.

ii) Suppose $r_b^* > r_d$ and $r_b > r_b^*$. Then, equation (D.44) implies $\chi P^{PP} \leq C$ and equation (D.45) implies $\chi P^{PP} \geq C \Rightarrow \chi P^{PP} = C$. The seller asks for a prepayment of $C$.

iii) Suppose $r_d > r_b^*$. Then, $r_b > r_b^*$ because $r_b > r_d$. And equation (D.44) implies that $\chi = 1$ and equation (D.45) implies that $\chi P^{PP} \geq C \Rightarrow \chi P^{PP} = 1$. The seller asks for cash in advance.

## D.6 Nash Bargaining

This section provides details for the Nash-Bargaining extension. The bargaining model is solved in two steps. First, profits under the two payment options are derived. Then, firms pick the payment option that maximizes joint surplus. Let $\theta$ $(1-\theta)$ be the bargaining power of the seller (buyer).

**Trade Credit** With trade credit, the bargaining problem reads

$$NP^{TC} = \left(\Pi_S^{TC}\right)^{\theta}\left(\Pi_B^{TC}\right)^{1-\theta} = (\underbrace{P^{TC} - (1+r_b)C}_{\text{Seller Profit}})^{\theta}(\underbrace{R - P^{TC}}_{\text{Buyer Profit}})^{1-\theta}.$$

Solving the problem delivers an optimal payment $P^{TC} = \theta R + (1-\theta)(1+r_b)C$ and a Nash Product with trade credit of

$$NP^{TC} = \theta^{\theta}(1-\theta)^{1-\theta}\left(R-(1+r_b)C\right). \tag{D.46}$$

**Cash in Advance** With cash in advance, the bargaining problem reads

$$NP^{CIA} = \left(\Pi_S^{CIA}\right)^{\theta}\left(\Pi_B^{CIA}\right)^{1-\theta} = \underbrace{\left[(1+r_d)(P^{CIA}-C)\right]^{\theta}}_{\text{Seller Profit}}\underbrace{(R-(1+r_b^*)P^{CIA})}_{\text{Buyer Profit}}^{1-\theta}.$$

Solving the problem delivers an optimal payment $P^{CIA} = \frac{\theta R+(1-\theta)(1+r_b^*)C}{1+r_b^*}$ and Nash product under cash in advance

$$NP^{CIA} = \theta^{\theta}(1-\theta)^{1-\theta}(1+r_d)^{\theta}(1+r_b^*)^{-\theta}\left(R-(1+r_b^*)C\right). \tag{D.47}$$

Combining equations (D.46) and (D.47), the two firms prefer trade credit if

$$(\mu-(1+r_b))(1+r_b^*)^{\theta} - (\mu-(1+r_b^*))(1+r_d)^{\theta} > 0. \tag{D.48}$$

**Proof for predictions from Proposition 1** Suppose the foreign borrowing rate is above the domestic deposit rate ($r_b^* > r_d$). and the seller charges a positive markup over effective costs ($\mu > 1 + r_b$). Then:

i) If the buyer and seller face equal borrowing costs ($r_b = r_b^*$), the seller always prefer trade credit.

ii) There is always a markup, $\mu$, that is large enough to make the seller choose trade credit over cash in advance.

**Proof.** i) if $r_b = r_b^*$, then condition (D.48) simplifies to: $(\mu-(1+r_b))((1+r_b)^{\theta}-(1+r_d)^{\theta}) > 0$.

Under the assumption stated in the proposition, trade credit is then always preferred over cash in advance, as long as $\theta > 0$.

ii) let $\mu$ go to infinity. Then, condition (D.48) becomes: $(1+r_b^*)^\theta - (1+r_d)^\theta > 0$, which always holds, as long as $\theta > 0$. ■

**Proof for predictions from Proposition 2** Suppose $r_b^* > r_d$. Then:

i) The use of trade credit increases with the markup $\mu$.

ii) This effect increases with $r_b^*$ and decreases with $r_d$.

**Proof.** i) Taking the derivative of condition (D.48) with respect to $\mu$ delivers: $\frac{\partial Equ.(D.48)}{\partial \mu} = (1+r_b^*)^\theta - (1+r_d)^\theta$. This derivative is positive if $r_b^* > r_d$ and $\theta > 0$. ii) Taking the cross derivatives with respect to $\mu$ and $1+r_b^*$ and $1+r_d$, respectively, delivers: $\frac{\partial Equ.(D.48)^2}{\partial \mu \partial (1+r_b^*)} = \theta(1+r_b^*)^{\theta-1}$ and $\frac{\partial Equ.(D.48)^2}{\partial \mu \partial (1+r_d)} = -\theta(1+r_d)^{\theta-1}$. These two cross-derivatives are positive and negative, respectively, as long as $\theta$ is larger than zero. ■

## D.7 Letters of Credit

This section provides details for the extension with letters of credit that builds on the model with diversion risk in section 3.2.

**Letter of Credit** Letters of credit are a payment form that is used exclusively in international trade transactions. With a letter of credit, banks serve as intermediaries in the transaction to resolve diversion problems between buyers and sellers. Assume that a bank can incur monitoring costs to perfectly verify delivery of goods before paying out funds to the seller. For this service, the buyer pays a fee to the bank and commits to paying the seller.[2] Assume that this fee

[2]This commitment can either reflect a long-term relationship with the bank or may require a deposit in the bank up to the value of the letter of credit. For tractability, we assume that it is sufficient for the buyer to pay

is proportional to the transaction size: $F^{LC} = f^{LC}P^{LC}$. The seller only receives payment from the bank after providing proof of shipment or delivery. Assuming that firms are still able to divert bank funds as before, profits are given by $\Pi_S^{LC} = P^{LC} - (1 + r_b(\tilde{\eta}))C$ and $\Pi_B^{LC} = R - P^{LC} - (1 + r_b^*(\tilde{\eta}^*))(f^{LC}P^{LC})$. With a letter of credit, there is no risk and the seller receives $P^{LC}$ with certainty and the buyer generates revenues $R$ with certainty.[3] Solving for the optimal $P^{LC}$ that makes the buyer indifferent delivers $P^{LC} = \frac{R}{1+f^{LC}(1+r_b^*(\tilde{\eta}^*))}$. And plugging back into seller profits leads to

$$\Pi_S^{LC} = \frac{R}{1 + f^{LC}(1 + r_b^*(\tilde{\eta}^*))} - (1 + r_b(\tilde{\eta}))C.$$

**Optimal Payment Choice** Comparing trade credit with a letter of credit delivers

$$\mathrm{E}[\Pi_S^{TC}] - \mathrm{E}[\Pi_S^{LC}] = \left( \underbrace{\tilde{\eta}^*}_{\text{payment probability TC}} - \underbrace{\frac{1}{1 + f^{LC}(1 + r_b^*(\tilde{\eta}^*))}}_{\text{1 / cost of resolving risk LC}} \right) \mu C > 0. \tag{D.49}$$

Simplifying notation, we can write down profits from the three payment forms as

$$\begin{aligned}
\Pi^{TC} &= \tilde{\eta}^* R - (1 + r_b)C, \\
\Pi^{CIA} &= \frac{\tilde{\eta}(1 + r_d)}{1 + r_b^*} R - (1 + r_d)C, \\
\Pi^{LC} &= \frac{1}{1 + f(1 + r_b^*)} R - (1 + r_b)C.
\end{aligned}$$

the letter of credit fee in advance.

[3]This is a simplifying assumption, as, in reality, letters of credit are not completely risk-free. Relaxing this assumption should not affect any of our results. For a detailed analysis of letter of credit risk see Niepmann and Schmidt-Eisenlohr (2017b).

Taking derivatives with respect to $\mu$ delivers

$$\frac{\partial \Pi^{TC}}{\partial \mu} = \tilde{\eta}^* C,$$
$$\frac{\partial \Pi^{CIA}}{\partial \mu} = \frac{\tilde{\eta}(1+r_d)}{1+r_b^*} C,$$
$$\frac{\partial \Pi^{LC}}{\partial \mu} = \frac{1}{1+f(1+r_b^*)} C.$$

**Proof of Proposition 8:** Suppose $\frac{1}{1+f(1+r_b^*)} > \frac{\tilde{\eta}(1+r_d)}{(1+r_b^*)}$. Then, $\frac{\partial \Pi^{LC}}{\partial \mu} > \frac{\partial \Pi^{CIA}}{\partial \mu}$. There is no clear sign on $\frac{\partial \Pi^{TC}}{\partial \mu}$ vs. $\frac{\partial \Pi^{LC}}{\partial \mu}$, as this depends on whether $\tilde{\eta}^* <> \frac{1}{1+f(1+r_b^*)}$. For trade credit profits to increase faster in the markup, $\mu$, it needs to be the case that $\tilde{\eta}^* > \frac{1}{1+f(1+r_b^*)} \iff f > \frac{1-\tilde{\eta}^*}{1+r_d}$.

## D.8 Financing Costs that Depend on Productivity

This section illustrates an extension to the model where financing costs depend on firm productivity. Let $\varphi$ denote a firm's productivity $(1/c)$. Suppose $r_b'(\varphi) < 0$. Then, the optimal payment term depends on the following modified equation

$$\Pi_S^{TC} - \Pi_S^{CIA} = \frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} \varphi^{\sigma-1} A \left((1+r_b(\varphi))^{1-\sigma} - \frac{1+r_d}{1+r_b^*}\left(1+r_b^*\right)^{1-\sigma}\right). \quad \text{(D.50)}$$

Taking the derivative w.r.t. $\varphi$ delivers

$$\frac{\partial \Delta \Pi_S}{\partial \varphi} = B\left[\underbrace{\frac{1}{\varphi}\left((1+r_b(\varphi))^{1-\sigma} - \frac{1+r_d}{1+r_b^*}\left(1+r_b^*\right)^{1-\sigma}\right)}_{\text{Baseline Effect }>0} \underbrace{-r_b'(\varphi)(1+r_b(\varphi))^{-\sigma}}_{\text{Additional Effect }>0}\right], \quad \text{(D.51)}$$

with $B = \frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1}\right)^{1-\sigma} A(\sigma-1)\varphi^{\sigma-1} > 0$. That is, now the choice between trade credit and cash in advance is affected by the effect of productivity on the borrowing rate $r_b$. This is a potential concern when looking at the baseline effect of the markup on trade credit use. We address this concern in two ways. First, by running a specification with firm-year FE (Table A.3, column

3). Second, by taking the cross-derivative w.r.t. $\varphi$ and $1+r_b^*$, which delivers

$$\frac{\partial\left(\Delta\Pi_S\right)^2}{\partial\varphi\partial(1+r_b^*)}=B\frac{\sigma}{\varphi}\frac{1+r_d}{(1+r_b^*)^{\sigma+1}}>0. \tag{D.52}$$

Importantly, this cross-derivative is no longer affected by the seller's financing costs.

To summarize, in general, in the extended model, a higher level of productivity increases the use of trade credit through its effect on the sellers' borrowing cost. However, this concern is addressed in two ways. First by the inclusion of firm-time fixed effects. Second, by running the interaction term specification, as the endogenous interest rate channel on the seller side drops out once we take the cross-derivative with respect to the buyer's borrowing rate.

## D.9 Financing cost savings calculations

Financing cost under trade credit:

$$FC^{TC}=r_bC \tag{D.53}$$

Financing cost under cash in advance:

$$FC^{CIA}=r_b\frac{R}{1+r_b}-r_d\left(\frac{R}{1+r_b}-C\right) \tag{D.54}$$

Financing cost difference:

$$\Delta FC=FC^{CIA}-FC^{TC} \tag{D.55}$$

$$=(r_b-r_d)\left(\frac{R}{1+r_b}-C\right) \tag{D.56}$$

$$=(r_b-r_d)\left(\frac{\mu}{1+r_b}-1\right)C \tag{D.57}$$

Financing cost savings as a percent of costs:

$$\frac{\Delta FC}{C} = (r_b - r_d)\left(\frac{\mu}{1+r_b} - 1\right) \tag{D.58}$$

Financing cost savings as a percent of revenues:

$$\frac{\Delta FC}{R} = (r_b - r_d)\left(\frac{\mu}{1+r_b} - 1\right)\frac{1}{\mu} \tag{D.59}$$

Total cost savings from TC:

$$\Delta FC = (r_b - r_d)\left(\frac{\mu}{1+r_b} - 1\right)\frac{R}{\mu} \tag{D.60}$$

**Reduction in formal financing.** To calculate the reduction in formal financing, we compare the amount of bank credit needed when relying on trade credit to the amount of bank credit needed when relying instead on cash-in-advance. With trade credit, bank credit simply equals trade credit.

$$B^{TC} = TC.$$

If switching to cash in advance, the borrowing amount becomes larger because the importer pays the markup. However, there is an offset from borrowing costs because the importer payment is adjusted down to account for the importer's financing costs.

$$B^{CIA} = \frac{R}{1+r_b} = \frac{\mu TC}{1+r_b}.$$

We can now calculate the total bank savings as

$$\Delta B = TC\left(\frac{\mu}{1+r_b} - 1\right).$$

**Calculating back-of-the-envelope numbers for the main text.** Amount of savings per dollar of trade credit: $\mu = 1.3$, $r_b = 1.07^{1/4} - 1$, $r_d = 1.04^{1/4} - 1$.

$$\frac{\Delta FC}{C} = (r_b - r_d)\left(\frac{\mu}{1+r_b} - 1\right) = \left(1.07^{1/4} - 1.03^{1/4}\right)\left(\frac{1.3}{1.07^{1/4}} - 1\right) \approx 20bps. \tag{D.61}$$

Total savings in \$:

$$\Delta FC = 20\ bps \times \$4.897\ trillion \times 4\ quarters = \$39.26\ trillion. \tag{D.62}$$

The total financing costs are 20 basis points of the \$4.897 trillion in trade credit payable. This amount needs to be multiplied by four because we assumed an average maturity of 3 months.

To obtain the counterfactual reduction in formal borrowing, we need to calculate

$$\Delta B = TC\left(\frac{\mu}{1+r_b} - 1\right) = \$4.897\ trillion \times \left(\frac{1.3}{1.07^{1/4}} - 1\right) = \$1.362\ trillion.$$

# E Additional Details on Markups Estimation

To test the predictions of the theory, we compute markups at the seller-product level using the methodology proposed by De Loecker et al. (2016). The main advantage of this methodology is that it allows us to compute markups abstracting from market-level demand information. It only requires to assume that firms minimize cost for each product and that at least one input is fully flexible.

The starting point in De Loecker et al. (2016), is to consider the firm's cost minimization problem. After rearranging the first-order condition of the problem for any flexible input $V$, the markup of product $p$ produced by firm $i$ in year $t$ ($\mu_{ipt}$) can be computed as the ratio between the output elasticity of product $p$ with respect to the flexible input $V$ ($\theta^V_{ipt}$) and expenditure share of the flexible input $V$ (relative to the sales of product $p$; $s^V_{ipt} \equiv P^V_{ipt}V_{ipt}/P_{ipt}Q_{ipt}$):

$$\underbrace{\mu_{ipt}}_{\text{Markup}} \equiv \frac{P_{ipt}}{MC_{ipt}} = \frac{\theta^V_{ipt}}{s^V_{ipt}} , \tag{E.1}$$

where $P$ ($P^V$) denotes the price of output $Q$ (input $V$), and $MC$ is marginal cost. While the numerator of equation (E.1) – the input-output elasticity of product $p$ – needs to be estimated, the denominator is directly observable in our data. Next, we explain the procedure we follow for deriving each of these elements.

**Input-output elasticity.** To estimate the input-output elasticities, we specify production functions for each product $p$ using labor ($L$), capital($K$), and materials ($M$) as production inputs:

$$Q_{ipt} = \Omega_{ipt}F(K_{ipt}, L_{ipt}, M_{ipt}) \tag{E.2}$$

where $Q$ is physical output, and $\Omega$ denotes productivity. There are two important assumptions on equation (E.2). First, the production function is product-specific, which implies that single and multi-product firms use the same technology to produce a given product. Second, as is standard in the estimation of production functions, we assume Hicks-Neutrality, so that $\Omega$ is log-additive.

The estimation of (E.2) follows De Loecker et al. (2016) in using the subset of single-product firms to identify the coefficients of the production function. The reason for using only single-product firms is that, for this set of firms, there is no need of specifying how inputs are distributed across individual outputs. Different from De Loecker et al., we deflate inputs expenditure with firm-specific input price indexes to avoid that the so-called input price bias affect the estimated coefficients (see De Loecker and Goldberg, 2014).[4]

Our baseline specification assumes a Cobb-Douglas production function, and allows for the presence of a log-additive non-anticipated shock ($\varepsilon$). A shortcoming of the Cobb-Douglas specification is that it assumes that input-output elasticities are constant across firms and over time. On the other hand, the Cobb-Douglas specification is widely used, allowing for a more direct comparison of our results with other estimates in the literature. Taking logs to (E.2), we obtain (lower cases denote logarithm of the variables)

$$q_{ipt} = \alpha_k^p k_{ipt} + \alpha_l^p l_{ipt} + \alpha_m^p m_{ipt} + \omega_{ipt} + \varepsilon_{ipt} \tag{E.3}$$

The estimation of (E.3) follows Ackerberg et al. (2015) (henceforth, ACF), who extend the methodology proposed by Olley and Pakes (1996) and Levinsohn and Petrin (2003) to control for the endogeneity of firms' inputs choice –which is based on the actual level of firms'

[4]In De Loecker et al. (2016), input prices are not available in their sample of Indian firms, so they implement a correction to control for input price variation. We discuss below the construction of the input price index we use in our sample of Chilean firms.

productivity.[5] To identify the coefficients of the production function, we build moments based on the productivity innovation $\xi$. We specify the following process for the law of motion of productivity

$$\omega_{ipt} = g(\omega_{ipt-1}, d^x_{ipt-1}, d^i_{ipt-1}, d^x_{ipt-1} \times d^i_{ipt-1}, \hat{s}_{ipt-1}) + \xi_{ipt} \tag{E.4}$$

where $d^x$ is an export dummy, $d^i$ is a categorical variable for periods with positive investment, and $\hat{s}$ is the probability that the firm remains single-product. The endogenous productivity process (E.4) allows the firms' productivity path to be affected by past exporting and investment decisions. In addition, it follows De Loecker et al. (2016) in including the probability of remaining single-product to correct for the bias that results from firm switching non-randomly from single to multi-product.

The first step of the ACF procedure involves expressing productivity in terms of observables. To do so, we use inverse material demand $h_t(\cdot)$ as in Levinsohn and Petrin (2003) to proxy for unobserved productivity, and estimate expected output $\phi_t(k_{ipt}, l_{ipt}, m_{ipt}; \mathbf{x}_{ipt})$ to remove the unanticipated shock component $\varepsilon_{ipt}$ from (E.3).[6] Then, the ACF procedure exploits this representation to express productivity as a function of data and parameters: $\omega_{ipt}(\boldsymbol{\alpha}) = \hat{\phi}_t(\cdot) - \alpha_k k_{ipt} - \alpha_l l_{ipt} - \alpha_m m_{ipt}$, and form the productivity innovation $\xi_{ipt}$ from (E.4) as a function of the parameters $\boldsymbol{\alpha}$. The second step of ACF routine forms moment conditions on $\xi_{ipt}$ to identify all parameters $\boldsymbol{\alpha}$ through GMM

$$\mathbb{E}(\xi_{ipt}(\boldsymbol{\alpha}) \cdot \mathbf{Z}_{ipt}) = 0, \tag{E.5}$$

[5] ACF show that the labor elasticity is in most cases unidentified by the two-stage method of Olley and Pakes (1996) and Levinsohn and Petrin (2003).

[6] The vector $\mathbf{x}_{ipt}$ includes other variables affecting material demand, such as time and product dummies. We approximate $\phi_t(\cdot)$ with a full second-degree polynomial in capital, labor, and materials.

where $\mathbf{Z}_{ipt}$ contains lagged materials, labor, and capital, and current capital. Once the parameters are estimated, the input-output elasticities are recovered for each product as $\theta^V_{ipt} \equiv \partial \ln Q_{ipt}/\partial \ln V_{ipt}$. For the Cobb-Douglas case, $\theta^V_{ipt} = \alpha^p_V$, so that the input-output elasticity is constant for all plants producing a given product $p$.

**Implementation.** To derive markups, we use materials as the relevant flexible input to compute the output elasticity. While in principle, labor could also be used to compute markups, the existence of long-term contracts and firing costs make firms less likely to adjust labor after the occurrence of shocks. The second component needed in (E.1) to compute markups is the expenditure share, which requires to identify the assignment of firms' inputs across outputs produced by the firm. To implement this, we follow Garcia-Marin and Voigtländer (2019) and exploit a unique feature of our data: ENIA provides information on total variable costs (labor cost and materials) for each product produced by the firms. We use this information to proxy for product-specific input use assuming that inputs are used approximately in proportion to the variable cost shares, so that the value of materials' expenditure $M_{ipt} = P^V_{ipt} V_{ipt}$ is computed as

$$\tilde{M}_{ipt} = \rho_{ipt} \cdot \tilde{M}_{it}, \quad \text{where} \quad \rho_{ipt} = \frac{TVC_{ipt}}{\sum_j TVC_{ijt}}. \tag{E.6}$$

Finally, we compute the expenditure share by dividing the value of material inputs by product-specific revenues, which are observed in the data.

**Input Price Index.** To avoid input price bias in the estimation of the production function parameters (see De Loecker and Goldberg, 2014, for details), we deflate materials' expenditure using firm-specific price indexes. The construction of the input price deflator involves five steps. First, we define the unit value of input $p$ purchased by firm $i$ in period $t$ as $P_{ipt} = V_{ipt}/Q_{ipt}$, where $V_{ipt}$ denotes input $p$ value, and $Q_{ipt}$ denotes the corresponding quantity purchased. Next, we calculate the (weighted) average unit value of input $p$ across all firms purchasing the input in year $t$. Then, for each firm, we compute the (log) price deviation from the (weighted) average for all the inputs purchased by the firm in year $t$. The next step involves averaging the resulting price deviations at the firm level, using inputs' expenditure as weight. Finally, we anchor the resulting average firm-level input price deviation to aggregate (4-digit) input price deflators provided by the Chilean statistical agency. Therefore, the resulting input price index reflects both, changes in the aggregate input price inflation, as well as firm-level heterogeneity in the price paid by firms for their inputs.

# F Data Appendix

In this appendix we provide additional details on the construction of the dataset we use in the main empirical analysis. In the following, we briefly discuss the procedure we follow to combine the production data in ENIA with the customs-level data at the firm-product level. We also explain the data cleaning procedure we apply to avoid inconsistencies.

The main issue in combining data from Customs and ENIA at the firm-product level is that products are classified using different nomenclatures in both datasets: ENIA classifies products according to the Central Product Classification (CPC), while the Chilean Customs Administration classifies products according to the Harmonized System (HS). To deal with this issue, we follow several steps. First, we use the United Nations' correspondence tables to determine the list of HS products that could potentially be matched to each CPC product in ENIA.[7] We then merge the resulting dataset with customs data at the firm-HS-year level. This procedure results in two cases: (i) All exported HS products in customs within a firm-year pair are merged to ENIA, and (ii) Only a fraction (or none) of the exported products are matched to ENIA within a firm-year pair. For the latter cases, whenever there is concordance within 4-digit

[7] The correspondence table establishes matches between 5-digit CPC and 6-digit HS products.

HS categories, we manually merge observations based on HS and CPC product descriptions. Borderline cases (no clear connection between product descriptions), as well as cases with no concordance at the 4-digit HS level are dropped.

In addition, to ensure a consistent dataset, we follow several steps. In particular, we exclude: (i) firm-year observations that have zero values for raw materials expenditure or employment, (ii) firm-product-year observations with zero or missing sales, product quantities, or with extreme values for markups (above the 98th or below the 2nd percentiles, or with large unplausible variations in markups within firm-products), and (iii) destination-year pairs with extreme values of the real ex-post borrowing rates, to avoid the influence of extreme values resulting from inflationary or deflationary episodes.[8] The final dataset consists of 89,672 firm-product-destinations-year observations. The sample represents 67.7% of the value of Chilean (non-copper) exports over the period 2003-2007. Table F.9 presents the estimated markups at the level of 2-digit industries.

Table F.9. Estimated Markups

| Product | Mean | Median | St. Deviation |
|---|---|---|---|
| Food and Beverages | 1.265 | 1.133 | 0.507 |
| Textiles | 1.517 | 1.432 | 0.535 |
| Apparel | 1.259 | 1.226 | 0.446 |
| Wood and Furniture | 1.115 | 1.005 | 0.442 |
| Paper | 1.140 | 1.023 | 0.451 |
| Basic Chemicals | 1.365 | 1.184 | 0.633 |
| Plastic and Rubber | 1.198 | 1.079 | 0.483 |
| Non-Metallic Manufactures | 1.596 | 1.483 | 0.700 |
| Metallic Manufactures | 1.169 | 0.995 | 0.487 |
| Machinery and Equipment | 1.116 | 0.980 | 0.458 |
| Total | 1.246 | 1.113 | 0.519 |

[0.1cm] *Notes*: This table reports the average markup by aggregate sector for the sample Chilean exporters over the period 2003-2007.

[8] In practice, this correction drops country-years with real borrowing rates above 35%, and below -4%.

# G Evidence from the United States

In this section, we repeat the main empirical analysis using firm-level data from the United States for the period 1965-2016 from Compustat. This dataset has been used extensively across different fields (more recently in De Loecker et al., 2020, who document the evolution of market power in the United States). Compustat samples relatively few U.S. companies each year. However, these companies tend to be large and account for a large share of private sector employment and sales.

In the Compustat data, we calculate trade credit use as the ratio of accounts receivables over sales. Account receivables are the total value of trade credit outstanding and therefore reflect both the extensive and the intensive margins of trade credit. As before, markups are estimated following the methodology in De Loecker et al. (2016). In the computation of markups, we consider the cost of goods sold (COGS) as the relevant flexible input.[9] We take the elasticity of COGS with respect to output directly from De Loecker et al. (2020), and calculate the share of COGS in sales from the data. As for the case of the Chilean data, we exclude companies with missing or zero NAICS code, sales, or COGS, and firm-years with trade credit share above 100 percent or with extreme values for markups (below the 2nd or above the 98th percentiles of the markups distribution).

One important limitation of Compustat relative to the Chilean export data is that it does not provide information for output in terms of physical units. This prevents us from estimating physical productivity and using the IV approach that we use in the main analysis.

We find very similar results in the U.S. data as in the Chilean data. As shown in figure G.1, the U.S. data also exhibit a clear positive relationship between trade credit use and markups, that seems to be even stronger than the one we found for Chile. This is confirmed in columns

[9]COGS is a composite that includes all expenditure incurred by firms in the production of the goods. While its specific composition varies across sectors, it mostly reflects variation in intermediate inputs, labor cost, and energy.

1 and 2 of table G.1, that show a strong positive correlation between markups and trade credit, controlling for industry-year (at the 2-digit level) and firm fixed-effects.[10] In column 3, we present results on an interaction between the markup and the real (ex-post) effective Fed Funds Rate, our measure of borrowing costs in the U.S. data. Consistent with our theory and the evidence for Chile, the interaction term is positive and highly significant (again, with a similar magnitude as the OLS estimate for Chile). Altogether, the results for the United States suggest that our findings for Chile generalize to the case of large U.S. firms as measured in Compustat: Total trade credit use increases with markups, especially when borrowing is more expensive, which is consistent with the financing motive for trade credit use outlined in our model.

Table G.1. Trade Credit Share and Markups in the United States

| | (1) | (2) | (3) |
|---|---|---|---|
| log(markup) | .0261*** | .0124*** | .0116*** |
| | (.0021) | (.0016) | (.0015) |
| log(markup) × Real Effective Fed Funds Rate | — | — | .359*** |
| | | | (.0031) |
| Industry-year FE | Yes | Yes | Yes |
| Firm FE | No | Yes | Yes |
| Observations | 280,431 | 278,760 | 278,760 |

*Notes*: The table estimates the main specifications using data for U.S. companies included in Compustat between 1965 and 2016. Trade credit share corresponds to the ratio of account receivables to sales. Markups are computed at the firm level using the cost of goods sold (COGS) as variable input, following De Loecker et al. (2020). All regressions control for the logarithm of firm employment. Standard errors (in parentheses) are clustered at the firm level. Key: *** significant at 1%; ** 5%; * 10%.

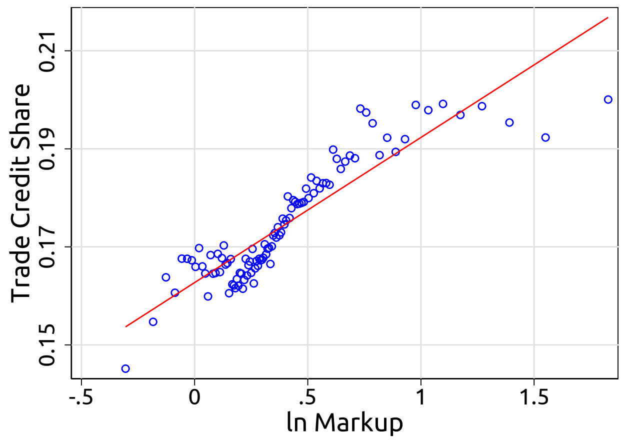
# H Additional Details on Robustness Checks

In this section, we provide details on the robustness checks mentioned in section 6.2:

**Average product margin.** An additional proxy for markups that we can compute in our sample is product-level price-cost margins. ENIA reports the variable production cost per

[10] As the data varies at the firm-year level, we only control for firm and industry-year fixed effects, and cluster standard errors at the firm level.

Figure G.1. Trade Credit Increases with Markups: U.S. Evidence



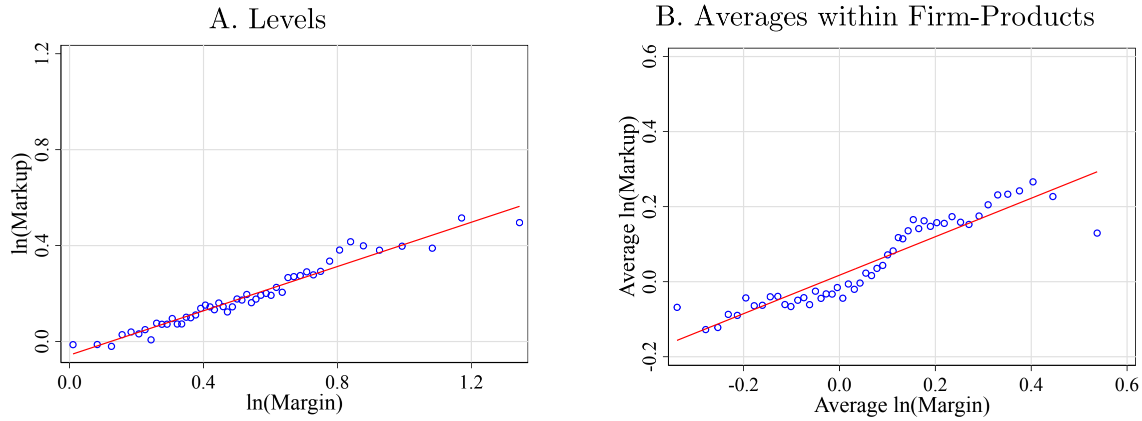

*Notes*: The figure shows a binscatter diagram where the average trade credit share in each bin is plotted against markups. Markups are computed at the firm level as in De Loecker et al. (2020), using Compustat data for 1965-2016 (see appendix G for details). Markups are in terms of natural logarithms. The figure controls for 2-digit industry-year fixed effects.

product, defined as the sum of raw material and direct labor costs involved in the production of each product. Product margins can be derived by dividing prices (unit values) over this reported measure of average variable cost. Note that the average variable cost is self-reported by managers, making the application of rules of thumb likely.

Figure H.1 shows binscatter plots for firm-product markups and sales-cost margins (with products defined at the HS-8 level), for the raw data (left panel), and averaging across observations within firm-product pairs (right panel). Both figures control for country-year fixed effects (that is, the figure plots the within plant-product variation that we exploit empirically). There is a remarkable positive relationship between markups and reported margins, suggesting that our markup estimates yield sensible information about the profitability of the products produced by the firm. This lends strong support to the markup-based methodology for backing out marginal costs by De Loecker et al. (2016). In addition, there seems to be a tighter relationship between markups and margins when both variables are averaged within firm-products.[11]

[11]One reason why both measures could be more correlated over longer periods of time is that the sales-cost margin measure relies on self-reported average variable cost. If managers measure product-level variable costs with error, then the sales-cost margin may be a poorer approximation of markups in the short run. However, if managers do not make systematic mistakes when reporting average variable costs, the measurement error

Figure H.1. Firm-Product level Markup and Sales-Cost Margin




*Notes*: The figure plots a binscatters diagram for firm-product markups and sales-cost margins.

**First Stage Estimates** Table H.1 shows first stage estimates for the IV specifications in table 20 (columns 4-6), where we instrument firm-product markups and its interaction with the borrowing rate with firm-product physical productivity (TFPQ) and its interaction with the borrowing rate. Across specifications, we obtain strong first stages, with stable coefficients for the first stage regression for the interaction between markups and the borrowing rate.

**Accounting for the Domestic Deposit Rate.** Table H.2 replicates table 3 when interacting the markup with the difference between the foreign borrowing rate and the domestic deposit rate. Estimated coefficients are very similar to the ones presented in table 3. In fact, in columns 2, 4, 6, and 8, the firm-product-year FEs eliminate any effect of rd and its interaction with the markup, and results are therefore identical for those columns.

cancels out when averaging over longer periods.

## Table H.1. First Stage Regressions, Table 3

| Specification | Spec. (3) | | Spec. (4) | Spec. (7) | | Spec. (8) |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | ln(markup) | ln(markup)$\times r_b^*$ | ln(markup)$\times r_b^*$ | ln(markup) | ln(markup)$\times r_b^*$ | ln(markup)$\times r_b^*$ |
| ln(TFPQ) | 0.0462*** | 0.0890*** | — | 0.0491*** | 0.1016*** | — |
| | (0.0025) | (0.0257) | | (0.0028) | (0.0283) | |
| ln(TFPQ)$\times r_b^*$ | -0.0002*** | 0.0278*** | 0.0301*** | -0.0002*** | 0.0287*** | 0.0311*** |
| | (0.0001) | (0.0036) | (0.0043) | (0.0001) | (0.0040) | (0.0046) |
| First Stage F-statistic | 181.0 | | 49.8 | 161.9 | | 45.4 |
| Firm-Year FE | Yes | Yes | — | Yes | Yes | — |
| Product FE | Yes | Yes | — | Yes | Yes | — |
| Country-Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm-Product-Year FE | — | — | Yes | — | — | Yes |
| Observations | 89,672 | 89,672 | 89,672 | 78,277 | 78,277 | 78,277 |

*Notes*: The table show first-stage regressions for the IV specifications (equation 20 in the main text) in table 3. Columns 1 and 2 show the first stage regressions for the two instrumented variables used in specification (3). Column 3 shows the first stage regression for the interaction term between markups (in logs) and the borrowing rate – the only variable not absorbed by the fixed effects – in specification (4). Columns 4 and 5 show the first stage regressions for specification (7). Finally, column 6 shows the first stage regression for specification (8). All regressions are run at the firm-product-destination level (with products defined at the HS8-level). Markups and TFPQ are computed at the firm-product level (products are defined at the 5-digit CPC level). The (cluster-robust) Kleibergen-Paap rK Wald F-statistic is at the bottom of each column specification. The corresponding Stock-Yogo value for 10% (15%) maximal IV bias is 16.4 (8.96). Standard errors (in parentheses) are clustered at the firm-destination level. Key: ** significant at 1%; ** 5%; * 10%.

## Table H.2. Main Specification: Accounting for the Domestic Deposit Rate

| Dependent Variable: | Trade Credit Share | | | | Trade Credit Maturity | | | |
|---|---|---|---|---|---|---|---|---|
| Specification: | OLS | | IV | | OLS | | IV | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| ln(Markup) | 0.507 | — | -1.525 | — | 2.598 | — | 2.720 | — |
| | (0.892) | | (4.732) | | (2.513) | | (11.07) | |
| ln(Markup)$\times(r_b^* - r_d)$ | 0.317** | 0.317** | 1.385** | 1.343** | 0.267 | 0.524 | 2.615 | 3.493** |
| | (0.143) | (0.148) | (0.625) | (0.592) | (0.303) | (0.403) | (1.613) | (1.661) |
| First Stage F-Statistic | — | — | 178.9 | 49.8 | — | — | 160.5 | 45.4 |
| Firm FE | Yes | No | Yes | No | Yes | No | Yes | No |
| Product FE | Yes | No | Yes | No | Yes | No | Yes | No |
| Destination-Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm-product-year FE | No | Yes | No | Yes | No | Yes | No | Yes |
| Observations | 89,672 | 89,672 | 89,672 | 89,672 | 78,277 | 78,277 | 78,277 | 78,277 |

*Notes*: The table replicates table 3 when interacting the markup with the difference between the foreign borrowing rate and the domestic deposit rate. All regressions are run at the firm-product-destination level (with products defined at the HS8-level). Trade credit share corresponds to the ratio of the FOB value of trade credit transactions to the FOB value of all export transactions over a year. Markups are computed at the firm-product level (products are defined at the 5-digit CPC level). Columns 1-3 report OLS, while columns 4-6 report IV results using TFPQ (and its interaction with the interest rate spread) as an instrument for markups(and its interaction with the interest rate spread). All IV regressions report the (cluster-robust) Kleibergen-Paap rK Wald F-statistic; the corresponding Stock-Yogo value for 10% maximal IV bias is 16.4. All regressions control for the logarithm of firm employment. Standard errors (in parentheses) are clustered at the firm-destination level. Key: *** significant at 1%; ** 5%; * 10%.