

Counterfactual analysis

The bank survey contains information on the costs of trade finance, the share of trade covered by trade finance and the trade finance gap. This information is used to generate projections of the trade effects of changes in the price and availability of trade finance. The WTO Global Trade Model (GTM), a computable general equilibrium model, is used to simulate the effects of changes in trade costs because of changes in the price and availability of trade finance. This annex describes the economic model employed, explores how the trade costs of financing international trade are modelled and outlines how trade finance shares and the costs of the trade finance instruments are calibrated in the baseline and counterfactuals.

Economic model

The GTM is a quantitative trade model describing the economic interactions between regions. It is designed to provide in-depth insights into the specific impacts of trade policy measures at both the sectoral and national levels. The model accounts for international upstream and downstream linkages between sectors through intermediate production and trade.

The GTM model incorporates three distinct types of final demand: private household expenditure; government spending; and investment. The income of a representative household in each country is allocated to private household expenditure, government expenditure and savings. Assuming a fixed trade-balance-to-GDP ratio, investment follows savings. The allocation of private household expenditure across sectors adheres to non-homothetic preferences, where the budget shares of certain sectors (primarily essential goods like food and basic manufacturing) decrease as countries become more prosperous. Conversely, the budget shares of other sectors (especially services) increase.

Firms produce with production factors and intermediate inputs, reflecting the presence of intermediate linkages. There are five primary production factors: high-skilled labour; low-skilled labour; and capital, land and natural resources. High-skilled and low-skilled labour, along with capital, are mobile; natural resources are specific to each sector; and land has limited mobility. The model incorporates various taxes, including income taxes, endowment taxes, import tariffs and export subsidies.

The baseline is calibrated to data from the Global Trade Analysis Project (GTAP) Data Base, Version 11 for 2017, projected forward to 2022 using standard techniques described for example in Fouré *et al.* (2017); that is, imposing population and labour force growth and targeting GDP per capita growth endogenizing productivity growth. A technical description of the model focusing on the code is available in Aguiar (2019), whereas a description of the model outlining the economic structure into detail is available in Bekkers *et al.* (2018).

Trade is handled through Armington preferences displaying love of variety by country of origin. The expression for the (physical) quantity (q) traded is relevant for the modelling of trade finance from source s to destination d in sector c , following a standard Armington formulation:

$$q_{sdc} = \tau_{sdc} \left(\frac{\tau_{sdc} \text{tx}_{sdc} \text{tm}_{sdc} \text{tr}_{sdc} p_{sc}}{p_{dc}} \right)^{-\sigma_c} q_{dc} \quad (1)$$

where:

- τ_{sdc} is iceberg trade costs;
- tx_{sdc} is the export tax rate (in power terms);
- tm_{sdc} is the import tax (in power terms);
- tr_{sdc} is the costs of transportation (in power terms);

p_{sc} is the export price in source s ;
 p_{dc} is the import price in destination d ;
 q_{dc} is the quantity imported in destination c ;
 σ_c is the substitution elasticity between imports from different sources.

The costs of trade finance will be incorporated in the import tax, export tax and iceberg trade costs as outlined below.

Trade costs of financing international trade

The costs of international trade are an important determinant of trade flows and comprise a range of transaction costs incurred in trading goods and services internationally – of which the costs of financing international trade are an important component. These financing costs consist of two main components which are intertwined. First, costs associated with the transaction risk that the counterparty will not pay or will not deliver the goods. Second, the financial costs relating to the cost of using an instrument mitigating such risks, consisting both of fees to cover risk and capital costs, and to bridge the time when goods are in transit.

The total costs of financing international trade transactions are determined by the instruments employed. The analysis distinguishes between four modes of payment or financing employed, each differing in cost and transaction risk:

- cash in advance (cia);
- export or import loans (loa);
- exports financed with internal working capital (int_wc);
- letters of credit (lc).

To keep the model tractable, the costs of trade finance are included as a component of trade costs. To do so, both the financial costs and the costs associated with the transaction risk of each of the instruments are expressed as an *ad valorem* share of the value of trade. The total trade costs associated with the financing of international trade are then expressed as a value-weighted average of both types of cost over each of the instruments. The two types of cost of each of the instruments and the baseline shares are based on the questionnaire (for the surveyed countries), data from international institutions and data available in the academic literature, as further detailed below.

The financial costs paid by importers and exporters are modelled as import and export taxes, respectively. This is a good approximation of a more detailed model incorporating an explicit banking sector to which trading firms would pay the financial costs given that the model features a consolidated representative household collecting both factor income and tax income. The reason is that changes in the costs of trade finance can be seen as changes in profit margins of the banking sector. Hence, the financial costs can be seen as a rent/profit collected by the banking sector and thus as an import/export tax collected by the representative household.

The costs associated with the transaction risk are modelled partially as an import/export tax and partially as an iceberg trade cost. The share of goods lost in trade calculated based on default rates is modelled as an import tax for the importer or an export tax for the exporter. Hence, the goods lost in transactions are modelled as a tax paid by one party to the other (e.g. the importer paying a tax to the representative household). Furthermore, the costs associated with risk aversion are modelled as a resource loss for agents involved in international trade in the form of an iceberg trade cost.

Limitations of the framework

Annex III first describes the calibration of the costs of each of the instruments and then the shares of the different trade finance instruments. Before turning to the details of the calibration three remarks are in order about the potential limitations of the framework employed. First, in the counterfactual experiments the shares of trade finance instruments and their costs are changed exogenously. Obviously, both these shares and costs are endogenous in the real world and driven by a variety of factors. However, modelling these shares and costs endogenously is beyond the scope of this publication and would require extending the trade-oriented model with a full-blown financial sector. Such an exercise

would be more complicated than most analyses of trade finance in the literature, given the comprehensive nature of the study, including most trade finance instruments.

Second, in the framework the financial costs associated with different instruments to finance international trade transactions vary, based on data collected in the survey and other data on lending rates. Accordingly, there is no perfect arbitrage between the different instruments equalizing financing costs. This reflects that there are differences in the degree of risk driven by among others, differences in borrowing constraints relating to the extent to which collateral is available and to which payments are guaranteed by third parties (i.e. a bank in case of letters of credit).

Third, supply chain finance (SCF)/factoring is not included in the analysis as one of the trade finance instruments. The survey indicates that the share of this type of trade finance provided by domestic financial institutions in Cambodia and Viet Nam is marginal. Furthermore, SCF is similar in structure to loans provided to the exporter (risk is not transferred to the bank and the exporter accepts a discount which from a cost perspective is similar to interest paid on loans). Hence, introducing SCF, either in the baseline in the form of SCF provided by foreign banks or in the counterfactuals in the form of an expanding trade finance coverage manifesting itself in the form of more SCF, would have a marginal impact on the effect of counterfactuals.

Hence, the listed limitations do not invalidate the analysis conducted. The necessary data are lacking for a more detailed analysis. Going into further detail would be mainly useful for a more detailed analysis of the policy interventions possible both to raise the coverage of trade finance and to reduce their costs. The current analysis instead takes these costs as given.

Costs of trade finance

The two types of cost (cost of funds, costs associated with risk) are now described for each of the four ways to finance international trade. The starting point, however, is with an exposition of the way the costs associated with risk are modelled.

Integrating risk aversion in the model

If traders are risk averse, the costs associated with risks of the transaction tend to be larger than the share of goods not arriving in the destination. Hence, the costs associated with risk can be expressed as a function of the probability that goods do not arrive, or importers do not pay for goods shipped. A transaction has a good outcome of 1 with probability $1-p$. The transaction has a bad outcome of 0 (meaning for an importer that the product is not received after paying for the goods, or the payment never occurs after an exporter shipped the goods) with a probability p .

The costs associated with the risk is equal to the utility loss because of the risk. This loss is equal to the good outcome of 1 minus the certainty equivalent, which is defined as the certain value for which the agent is indifferent between engaging in the transaction or accepting this lower certain value. To calculate the costs associated with risk, a constant relative risk aversion (CRRA) utility function is assumed for agents involved in international trade with γ , the CRRA parameter:

$$U(x) = \frac{x^{1-\gamma}}{1-\gamma} \quad (2)$$

The certainty equivalent of the transaction, CE, can be calculated as follows, with p the probability of a bad outcome (goods not arriving):

$$u(CE) = E(u(x)) \quad (3)$$

$$u(CE) = p \cdot u(0) + (1-p) \cdot u(1) \quad (4)$$

$$\frac{CE^{1-\gamma}}{1-\gamma} = (1-p) \cdot \frac{1^{1-\gamma}}{1-\gamma} \quad (5)$$

Hence, the certainty equivalent is given by:

$$CE = (1-p)^{\frac{1}{1-\gamma}} \quad (6)$$

Having obtained the certainty equivalents (the certain value for which the agent is indifferent between engaging in the transaction or accepting this lower certain value), the costs associated with risk aversion, CRA, can be calculated as the difference between the expected value shipped and the certainty equivalent:

$$CRA = 1 - p - CE = 1 - p - (1 - p)^{\frac{1}{1-\gamma}} \quad (7)$$

The total costs associated with risk, TCR, can be written as the sum of the costs of risk; that is, the probability that goods are lost, CR, and the costs associated with risk aversion, CRA:

$$TCR = CR + CRA = p + 1 - p - (1 - p)^{\frac{1}{1-\gamma}} = 1 - (1 - p)^{\frac{1}{1-\gamma}} \quad (8)$$

As discussed above, the costs of risk (the probability that goods are lost or payments are not made) are modelled as an import tax for the importer and as an export tax for the exporter; whereas the costs associated with risk aversion are modelled as a resource loss for agents involved in international trade in the form of an iceberg trade cost.

As shown in Conine *et al.* (2017), the formulation of risk aversion with a CRRA parameter has been largely used in the financial and macroeconomic literature, with a large interval of values. Studies focusing on risky assets markets have privileged estimates of the CRRA above 3. Azar (2006) finds calibrated CRRAs between 4.2 and 5.4 in a study mimicking the US stock market. A large literature focusing on labour supply chose instead values of CRRA below 1, such as Chetty (2006) choosing a coefficient of 0.7. Employing this value for real economy applications instead of financial markets generates intuitive values for the costs associated with risk in the model.

Cash in advance

Under this payment option, the importer pre-finances the exporter's cash needs, while incurring the risk that goods would not be delivered. Therefore, the importer bears both a transaction risk and a financial cost linked to using own funds to make the payment. Under cash in advance (cia), exporters do not incur financial costs or costs associated with risk since they would ship the goods only upon receipt of the payment. The costs of using cash in advance (cia) in sector c from source (exporter) s to destination (importer) d thus consists of the costs of financing the transaction by the importer, CF_d^{cia} , the cost of risk in the destination, CR_d^{cia} , the costs of risk aversion in the destination, CRA_d^{cia} . The latter two can be written as the probability that goods are not delivered, ND_d^{cia} :

$$CR_d^{cia} = ND_d^{cia} \quad (9)$$

$$CRA_d^{cia} = 1 - (1 - ND_d^{cia})^{\frac{1}{1-\gamma}} \quad (10)$$

Import and export loans

Import and export loans are trade finance instruments which can be used to address the liquidity needs for both importers and exporters until they have to pay or they get paid. The financial cost of loans are the interest rates on them. With a pre-export shipment loan, the exporter also incurs the risk of not being paid – this risk is not mitigated by the loan itself. The import loan does not mitigate or alleviate the risk of not receiving the merchandise (only a letter of credit would do that), so the importer similarly bears the risk of not receiving the goods.

Hence, the costs of an import loan (export loan) consist of the costs of financing of an import loan, $CF_d^{loa,imp}$ ($CF_s^{loa,exp}$), the costs of risk, $CR_d^{loa,imp}$ ($CR_s^{loa,exp}$), and the costs of risk aversion, $CRA_d^{loa,imp}$ ($CRA_d^{loa,exp}$), which can be expressed as the probability that goods are not delivered:

$$CR_d^{loa,trad} = ND_d^{loa,trad}; trad = imp, exp \quad (11)$$

$$CRA_d^{loa,trad} = 1 - (1 - ND_d^{loa,trad})^{\frac{1}{1-\gamma}}; trad = imp, exp \quad (12)$$

Exports financed with internal working capital

In the absence of the availability of a pre-shipment export loan, an exporter can also decide or be constrained to finance the process of production for the purpose of exporting. Upon order, the exporter would typically receive a small advance from the buyer. In this case, the whole production and shipment cycle would have to be financed, including inputs purchase, salaries, machinery, packaging and shipping, before receiving its export receipt. By doing so, the exporter incurs the opportunity cost of using capital to produce the goods, and the transaction risk of sending the goods before the payment.

Hence, the costs of exports financed with internal working capital consist of the costs of financing internal working capital, $CF_s^{\text{int_wc}}$, the costs of risk, $CR_s^{\text{int_wc}}$, and the costs of risk aversion, $CRA_s^{\text{int_wc}}$, with the latter two being a function of the probability that goods are sent and no payment is received, $ND_s^{\text{int_wc}}$:

$$CR_d^{\text{int_wc}} = ND_d^{\text{int_wc}} \quad (13)$$

$$CRA_d^{\text{int_wc}} = 1 - (1 - ND_d^{\text{int_wc}})^{\frac{1}{1-\gamma}} \quad (14)$$

Letters of credit and other documentary credit

Finally, letters of credit are a payment guarantee in case of importer's default. An issuing bank commits to pay for the transaction if the importer is unable to pay. A confirming bank in the exporter's region could also bear the final payment risk if the issuing bank cannot pay either. To open a letter of credit, the importer incurs an opening fee to the issuing bank, and the exporter pays a confirmation fee to the confirming bank. Only if the exporting region is considered riskier than the importing region is a confirming bank required.

While being a guarantee of future payment after delivery, the letter of credit does not provide the exporter the required liquidity to produce and ship the goods – in other words, it is not a substitute for a pre-shipment loan. Under a letter of credit, the exporter would continue to face an opportunity cost if using its own funds for this purpose. However, there is no cost associated with the transaction risk under a letter of credit. Instead, opening and confirming fees are paid by the importer and the exporter, respectively.

Hence, the total trade finance costs of using a letter of credit consist of the costs of financing in the source country, CF_s^{lc} , consisting of the capital costs for sending the goods before payment is received, the letter of credit opening fee, OPF_d^{lc} , and the letter of credit confirmation fee, COF_s^{lc} if the destination country d is considered riskier than the source country s . For an importer, letter of credit costs include the letter of credit opening fee, since the costs of financing the transaction are borne by the exporter.

Writing trade costs as a function of the costs of trade finance

Employing data on the shares of the four ways to finance international trade, the import tax, export tax and iceberg trade costs associated with the costs of financing international trade from source s to destination d in sector c can be written as follows:

$$\text{exptax}_{sdc} = \text{sh}_{sdc}^{\text{lc}} (CF_s^{\text{lc}} + \text{COF}_s^{\text{lc}} \cdot \text{RR}_{sd}) + \text{sh}_{sdc}^{\text{loa,exp}} (CF_s^{\text{loa,exp}} + ND_d^{\text{loa,exp}}) + \text{sh}_{sdc}^{\text{int_wc}} (CF_d^{\text{int_wc}} + ND_d^{\text{int_wc}}) \quad (15)$$

$$\text{imptax}_{sdc} = \text{sh}_{sdc}^{\text{lc}} \cdot \text{OPF}_d^{\text{lc}} + \text{sh}_{sdc}^{\text{loa,imp}} (CF_d^{\text{loa,imp}} + ND_d^{\text{loa,imp}}) + \text{sh}_{sdc}^{\text{cia}} (CF_d^{\text{cia}} + ND_d^{\text{cia}}) \quad (16)$$

$$\text{itc}_{sdc} = \sum_{i \in \{\text{exp, loa, int_wc}\}} \text{sh}_{sdc}^i \left(1 - (1 - ND_s^i)^{\frac{1}{1-\gamma}} \right) + \sum_{i \in \{\text{imp, loa, cia}\}} \text{sh}_{sdc}^i \left(1 - (1 - ND_s^i)^{\frac{1}{1-\gamma}} \right) \quad (17)$$

with RR_{sd} as a dummy for the relative riskiness of source s and destination d equal to 1 if destination d is riskier than source s . The shares of the different instruments vary by sector as further detailed below. Due to a lack of survey data, the costs of the different instruments do not display sectoral variation.

Calibration of costs

Since there are four ways to finance international trade and two types of cost for each trade (the costs of funds and the costs associated with risk) four sets of two types of trade cost have to be calibrated.

Costs associated with risk

To calculate the costs associated with risk, data are required on the share of non-delivery or non-payment, ND, for the different trade finance instruments. To do so, data from various sources on the probability of default on loans are employed as a proxy. For cash in advance and internal working capital for exports, ND is based on the share of bank non-performing loans to total gross loans from the International Monetary Fund (IMF).¹ For import and export loans, ND is based on the International Chamber of Commerce (ICC) Obligor-weighted export and import loan default rates (ICC, 2020b).

Financial costs

Data on the costs of finance, CF, come from the survey for surveyed countries and from data provided by international organizations and available in the academic literature. The two groups of countries are discussed separately.

(1) Surveyed countries:

- (a) The costs of financing for export and import loans, $CF_s^{loa,exp}$ and $CF_d^{loa,imp}$, are based on survey answers calculated as a trade finance portfolio weighted average of the costs of funds across different banks.
- (b) The costs of financing for cash in advance and exports with internal working capital, CF_d^{cia} and $CF_s^{int_wc}$, are for the surveyed countries assumed to be equal to the cost of trade loans multiplied by a factor of two. This assumption is motivated by the fact that the survey answers combined with other data indicate that the interest rates for microfinance are at least twice as large as for trade loans. More specifically, the trade loan costs of financing for Cambodia are between 5.25 and 5.75 per cent, whereas Cambodia established a cap of 18 per cent on interest rates in 2017. In 2016, the average lending rate of banks was 12 per cent in US dollars and 21 per cent in Cambodian riels and much higher for microfinance institutions (Heng *et al.*, 2021). Hence, the ratio of 2 seems on the conservative side. For Viet Nam, the largest microfinance institutions charged annual interest rates in 2020 between 8.75 and 16 per cent (Capital Aid for the Employment of the Poor Microfinance Institution) and 7.6 percent and 17.75 percent (Tao Yêu Mây Tinh Thuong One-Member Limited Liability Microfinance Institution), whereas the trade loans costs of financing according to the survey are 6.5-6.75 per cent (Bevacqua *et al.*, 2021). In light of these numbers, a ratio of 2 is appropriate.
- (c) The letter of credit opening and confirmation fees, OPF_s^{lc} and COF_d^{lc} , are based on survey answers for Cambodia and Viet Nam.
- (d) The cost of funds for using letters of credit for an exporter, CF_s^{lc} , are calculated by multiplying the costs of financing for cash in advance (cia) and internal working capital (int_wc) for each region by the ratio of the risk on export/import letters of credit – measured by the average default rate on export and import letters of credit from the ICC (2020b) – ND_s^{lc} – and the average default rate on cash in advance and internal working capital measured as the share of bank non-performing loans also employed above, ND_s^{cia} :

$$CF_s^{lc} = \frac{ND_s^{lc}}{ND_s^{cia}} CF_s^{cia} \quad (18)$$

Therefore, the cost of funds for letters of credit is lower than for cash in advance and internal working capital, reflecting the fact that letters of credit are less risky.

(2) Non-surveyed countries:

- (a) The letter of credit opening and confirmation fees, OPF_d^{lc} and COF_s^{lc} are based on average fees in members of the Organisation for Economic Co-operation and Development.
- (b) The costs of financing for cash in advance and internal working capital, CF_d^{cia} and $CF_s^{int_wc}$, are based on lending rates from the IMF.²
- (c) To obtain the costs of financing of import and export loans, $CF_d^{loa,imp}$ and $CF_s^{loa,exp}$, the costs of financing for cash in advance/internal working capital based on lending rates from the IMF are scaled down by a factor of two reflecting that interest rates for microfinance are approximately twice as large as for trade loans as discussed for the surveyed countries.
- (d) The cost of funds for using letters of credit for an exporter, CF_s^{lc} , are calculated in the same way as for surveyed countries, using equation (18).

Calibration of trade finance shares

Since there are four ways to finance international trade in the model, four shares are calibrated for region s :

- import and export loans, $sh_s^{loa,imp}$, $sh_s^{loa,exp}$;
- letters of credit, sh_s^{lc} ;
- internal working capital, $sh_s^{int_wc,exp}$;
- cash in advance, sh_s^{cia} .

The analysis proceeds in two steps to obtain the shares of trade finance. First, insights from the survey and from the literature are employed to obtain trade finance shares at the country level. Second, data on the shares of foreign-owned firms and related-party trade per sector are employed to introduce sectoral variation in the trade finance shares.

Aggregate trade finance shares

The aggregate trade finance shares for the two groups of countries are calculated as follows:

(1) Surveyed countries:

- (a) The share of trade covered by all trade finance (letters of credit, import/export loans), sh_s^{tf} , is calculated based on the data in the survey providing the amount of trade finance relative to the value of trade (sum of exports and imports) with the amount of trade finance corrected for non-response. The shares of individual trade finance instruments (import loans, export loans, letters of credit) are also given by the survey. Since the shares of trade finance are expressed in the model as a share of respectively exports and imports, whereas the share of trade finance is a share of the sum of exports and imports in the survey, the formula is multiplied by $\frac{1}{sh_imp}$ and $\frac{1}{1-sh_imp}$ in the formula to obtain the shares of import loans and letters of credit in the importer (destination d) and the share of export loans in the exporter (source s):

$$sh_d^{loa,imp} = sh_d^{loa,imp,sur} \cdot \frac{1}{sh_imp_d} \cdot sh_d^{tf} \quad (19)$$

$$sh_d^{lc} = sh_d^{lc,sur} \cdot \frac{1}{sh_imp_d} \cdot sh_d^{tf} \quad (20)$$

$$sh_s^{loa,exp} = sh_s^{loa,exp,sur} \cdot \frac{1}{1-sh_imp_d} \cdot sh_s^{tf} \quad (21)$$

Multiplying these shares by respectively imports and exports and adding up, the baseline amount of trade finance in the model is equal to the amount of trade finance, TF_s , in the survey:

$$\begin{aligned}
TF_s &= sh_s^{loa,imp,sur} \cdot \frac{1}{sh_{imp_s}} \cdot sh_d^{tf} \cdot imp_s + (sh_s^{lc,sur} + sh_s^{loa,exp,sur}) \cdot \frac{1}{1 - sh_{imp_d}} \cdot sh_s^{tf} \cdot exp_s \\
&= (sh_s^{loa,imp,sur} + (sh_s^{lc,sur} + sh_s^{loa,exp,sur})) \cdot sh_s^{tf} \cdot (imp_s + exp_s) \\
&= sh_s^{tf} \cdot (imp_s + exp_s)
\end{aligned} \tag{22}$$

- (b) The share of trade covered by internal working capital and cash in advance are assumed to be 80 and 20 per cent, respectively, of the remaining share for exports from source $s = vnm, khm$ to destination $d \neq vnm, khm$ (i.e. Viet Nam, Cambodia), reflecting that firms from developing country have less market power vis-à-vis their trading partners:

$$sh_s^{int,wc} = 0.8(1 - sh_s^{loa,imp} - sh_s^{lc} - sh_s^{loa,exp}) \tag{23}$$

$$sh_d^{cia} = 0.2(1 - sh_d^{loa,imp} - sh_d^{lc} - sh_d^{loa,exp}) \tag{24}$$

- (c) Furthermore, it is assumed that 20 and 80 per cent, respectively, of the remaining share for imports into destination $d = vnm, khm$ and $s \neq vnm, khm$ are allocated to internal working capital and cash in advance:

$$sh_s^{int,wc} = 0.2(1 - sh_s^{loa,imp} - sh_s^{lc} - sh_s^{loa,exp}) \tag{25}$$

$$sh_d^{cia} = 0.8(1 - sh_d^{loa,imp} - sh_d^{lc} - sh_d^{loa,exp}) \tag{26}$$

(2) Non-surveyed countries:

- (a) The share of trade covered by letters of credit, sh_s^{lc} , is based on trade between the United States and region s as reported in Niepmann and Schmidt-Eisenlohr (2017):³

$$sh_s^{lc} = sh_{sUSA}^{lc} \tag{27}$$

- (b) The share of trade covered by import loans and export loans is equal to the share of trade covered by letters of credit based on data in AfDB (2022), indicating that letters of credit and import plus export loans have approximately an equal share in total trade finance:

$$sh_s^{loa,exp} = 0.5sh_{sUSA}^{lc} \tag{28}$$

$$sh_s^{loa,imp} = 0.5sh_{sUSA}^{lc} \tag{29}$$

Furthermore, the Bank for International Settlements (BIS, 2014) reports a global coverage of trade by trade finance of 60 per cent. Accordingly, the share of trade finance in non-surveyed countries is rescaled to yield to a 60 per cent coverage of trade finance.

- (c) Between non-surveyed countries, the share of trade covered by internal working capital and cash in advance are each 50 per cent of the remaining share:⁴

$$sh_s^{int,wc,exp} = 0.5(1 - sh_s^{tf}) \tag{30}$$

$$sh_s^{cia,imp} = 0.5(1 - sh_s^{tf}) \tag{31}$$

Sectoral trade finance shares considering foreign-owned firms and related-party trade

The share of local trade finance is expected to be a function of the share of sales by foreign-owned firms and the share of related-party trade.⁵ The crucial reason to embark on this exercise is to ensure that the share of local trade finance in the counterfactual cannot rise if the trade by foreign-owned firms is financed by foreign banks (offshore financing). The shares of trade finance from s to d add to 1 in the model:

$$sh_s^{lc} + sh_s^{loa,exp} + sh_s^{int,wc,exp} + sh_d^{lc} + sh_d^{loa,imp} + sh_d^{cia,imp} = 1 \tag{32}$$

Given that data are available on the share of exports and imports by foreign-owned (fo) firms, sh_{sc}^{fo} , exports and imports can be divided into two components, exports/imports by domestic and by foreign-owned firms. The share of trade finance is then calculated for each of these. For sales by domestic-owned firms, the same approach is used as above, provided in equations (19)-(31).

On exports from region $s = \text{vnm, khm}$ in sector c by foreign-owned firms, the share of domestic trade finance is scaled down by a factor $sc_for_{sc}^{sur}$ (the superscript sur for surveyed countries) relative to the share of trade finance provided by domestic-owned firms:

$$sh_{sc}^{loa,exp,fo} = sc_for_{sc}^{sur} \cdot sh_s^{loa,exp} \quad (33)$$

The use of internal working capital and cash in advance on exports by foreign-owned firms from $s = \text{vnm, khm}$ is also scaled down with foreign-owned firms instead employing trade finance in the destination market in the form of offshore financing (either import loans in destination $d \neq \text{vnm, khm}$ or letters of credit from destination $d \neq \text{vnm, khm}$):

$$sh_{sc}^{int_wc,fo} = sc_for_{sc}^{sur} \cdot sh_s^{int_wc} \quad (34)$$

$$sh_{dc}^{cia,fo} = sc_for_{sc}^{sur} \cdot sh_d^{cia} \quad (35)$$

The shares of (offshore) trade finance provided by destination $d \neq \text{vnm, khm}$ are adjusted to make sure that shares add to 1:

$$sh_{dc}^{loa,imp,fo} = \frac{sh_d^{loa,imp}}{sh_d^{loa,imp} + sh_d^{lc}} \left(1 - sh_{sc}^{loa,exp,fo} - sh_{sc}^{int_wc,fo} - sh_{dc}^{cia,fo} \right) \quad (36)$$

$$sh_{dc}^{lc,fo} = \frac{sh_d^{lc}}{sh_d^{loa,imp} + sh_d^{lc}} \left(1 - sh_{sc}^{loa,exp,fo} - sh_{sc}^{int_wc,fo} - sh_{dc}^{cia,fo} \right) \quad (37)$$

Equivalently, on imports into region $d \neq \text{vnm, khm}$ in sector c , the share of domestic trade finance and cash in advance is scaled down by the same factor:

$$sh_{dc}^{loa,imp,fo} = sc_for_{sc}^{sur} \cdot sh_d^{loa,imp} \quad (38)$$

$$sh_{dc}^{lc,fo} = sc_for_{sc}^{sur} \cdot sh_d^{lc} \quad (39)$$

$$sh_{dc}^{cia,fo} = sc_for_{sc}^{sur} \cdot sh_d^{cia} \quad (40)$$

And the shares of (offshore) trade finance and the share of internal working capital provided by source $s \neq \text{vnm, khm}$ are adjusted to make sure that shares add to 1:

$$sh_{sc}^{loa,exp,fo} = \frac{sh_s^{loa,exp}}{sh_s^{loa,exp} + sh_s^{int_wc}} \left(1 - sh_{dc}^{loa,imp,fo} - sh_{dc}^{lc,fo} - sh_{dc}^{cia,fo} \right) \quad (41)$$

$$sh_{sc}^{int_wc,fo} = \frac{sh_s^{int_wc}}{sh_s^{loa,exp} + sh_s^{int_wc}} \left(1 - sh_{dc}^{loa,imp,fo} - sh_{dc}^{lc,fo} - sh_{dc}^{cia,fo} \right) \quad (42)$$

The scaling factor $sc_for_{sc}^{sur}$ is defined as the share of trade financed with local trade finance in the surveyed countries for trade by foreign-owned firms relative to domestic firms. It is determined by the share of related-party imports/exports in total imports/exports of foreign-owned firms with $sc_for_{sc}^{sur}$ inversely related to this share.⁶ Hence, when the share of related-party trade is larger, the share of trade employing offshore financing is larger and the share employing local trade finance is thus smaller. Besides sectoral variation in $sc_for_{sc}^{sur}$ determined by the share of related-party trade in trade by foreign-owned firms sc_forsec_c , there is also country-level variation in $sc_for_{sc}^{sur}$ set equal to a factor of 0.5 based on evidence from the firm-level survey that foreign firms are half as likely to use domestic trade finance:

$$sc_for_{sc}^{sur} = 0.5 sc_forsec_c^{sur} \quad (43)$$

Summarizing, the sum of shares on exports from source $s = \text{vnm, khm}$ to destination $d \neq \text{vnm, khm}$, can written as:

$$sh_{sc}^{\text{loa,exp,tot}} = \left(sc_{\text{for}_{sc}}^{\text{sur}} \cdot sh_{sc}^{\text{fo,exp}} + (1 - sh_{sc}^{\text{fo,exp}}) \right) \cdot sh_s^{\text{loa,exp}} \quad (44)$$

$$sh_{sc}^{\text{int_wc,tot}} = \left(sc_{\text{for}_{sc}}^{\text{sur}} \cdot sh_{sc}^{\text{fo,exp}} + (1 - sh_{sc}^{\text{fo,exp}}) \right) \cdot sh_s^{\text{int_wc}} \quad (45)$$

$$sh_{dc}^{\text{cia,tot}} = \left(sc_{\text{for}_{sc}}^{\text{sur}} \cdot sh_{sc}^{\text{fo,exp}} + (1 - sh_{sc}^{\text{fo,exp}}) \right) \cdot sh_{dc}^{\text{cia}} \quad (46)$$

$$sh_{dc}^{\text{loa,imp,tot}} = \frac{sh_d^{\text{loa,imp}}}{sh_d^{\text{loa,imp}} + sh_d^{\text{lc}}} \left(1 - sh_{sc}^{\text{loa,exp,fo}} - sh_{sc}^{\text{int_wc,fo}} - sh_{dc}^{\text{cia,fo}} \right) \cdot sh_{sc}^{\text{fo,exp}} + (1 - sh_{sc}^{\text{fo,exp}}) \cdot sh_d^{\text{loa,imp}} \quad (47)$$

$$sh_{dc}^{\text{lc,tot}} = \frac{sh_d^{\text{lc}}}{sh_d^{\text{loa,imp}} + sh_d^{\text{lc}}} \left(1 - sh_{sc}^{\text{loa,exp,fo}} - sh_{sc}^{\text{int_wc,fo}} - sh_{dc}^{\text{cia,fo}} \right) \cdot sh_{sc}^{\text{fo,exp}} + (1 - sh_{sc}^{\text{fo,exp}}) \cdot sh_d^{\text{lc}} \quad (48)$$

Next, on imports from source $s \neq \text{vnm, khm}$ into $d = \text{vnm, khm}$ yields:

$$sh_{dc}^{\text{loa,imp,tot}} = \left(sc_{\text{for}_{sc}}^{\text{sur}} \cdot sh_{sc}^{\text{fo,imp}} + (1 - sh_{dc}^{\text{fo,imp}}) \right) \cdot sh_d^{\text{loa,imp}} \quad (49)$$

$$sh_{dc}^{\text{lc,tot}} = \left(sc_{\text{for}_{sc}}^{\text{sur}} \cdot sh_{dc}^{\text{fo,imp}} + (1 - sh_{dc}^{\text{fo,imp}}) \right) \cdot sh_d^{\text{lc}} \quad (50)$$

$$sh_{dc}^{\text{cia,tot}} = \left(sc_{\text{for}_{sc}}^{\text{sur}} \cdot sh_{dc}^{\text{fo,imp}} + (1 - sh_{dc}^{\text{fo,imp}}) \right) \cdot sh_d^{\text{cia}} \quad (51)$$

$$sh_{sc}^{\text{loa,exp,tot}} = \frac{sh_s^{\text{loa,exp}}}{sh_s^{\text{loa,exp}} + sh_s^{\text{int_wc}}} \left(1 - sh_{dc}^{\text{loa,imp,fo}} - sh_{dc}^{\text{lc,fo}} - sh_{dc}^{\text{cia,fo}} \right) \cdot sh_{dc}^{\text{fo,imp}} + (1 - sh_{sc}^{\text{fo,imp}}) \cdot sh_s^{\text{loa,exp}} \quad (52)$$

$$sh_{sc}^{\text{iwc,tot}} = \frac{sh_s^{\text{iwc}}}{sh_s^{\text{loa,exp}} + sh_s^{\text{iwc}}} \left(1 - sh_{dc}^{\text{loa,imp,fo}} - sh_{dc}^{\text{lc,fo}} - sh_{dc}^{\text{cia,fo}} \right) \cdot sh_{dc}^{\text{fo,imp}} + (1 - sh_{dc}^{\text{fo,imp}}) \cdot sh_s^{\text{iwc}} \quad (53)$$

Hence, for exports from $s = \text{vnm, khm}$, trade by foreign-owned firms does not use any cash in advance in the destination $d \neq \text{vnm, khm}$ or internal working capital in the source $s = \text{vnm, khm}$. For imports into $d = \text{vnm, khm}$, foreign firms do not use cia, but they do use iwc in the source $s \neq \text{vnm, khm}$.

The initial parameter for the share of trade covered by trade finance, sh_d^{tf} , is adjusted to make sure that the trade-weighted average of trade finance provided by domestic financial institutions is equal to the values in the survey – 3 per cent for Cambodia and 20.5 per cent for Viet Nam.

Figure III.1 displays the share of different trade finance instruments in the baseline and the counterfactual Scenarios 1 and 2.

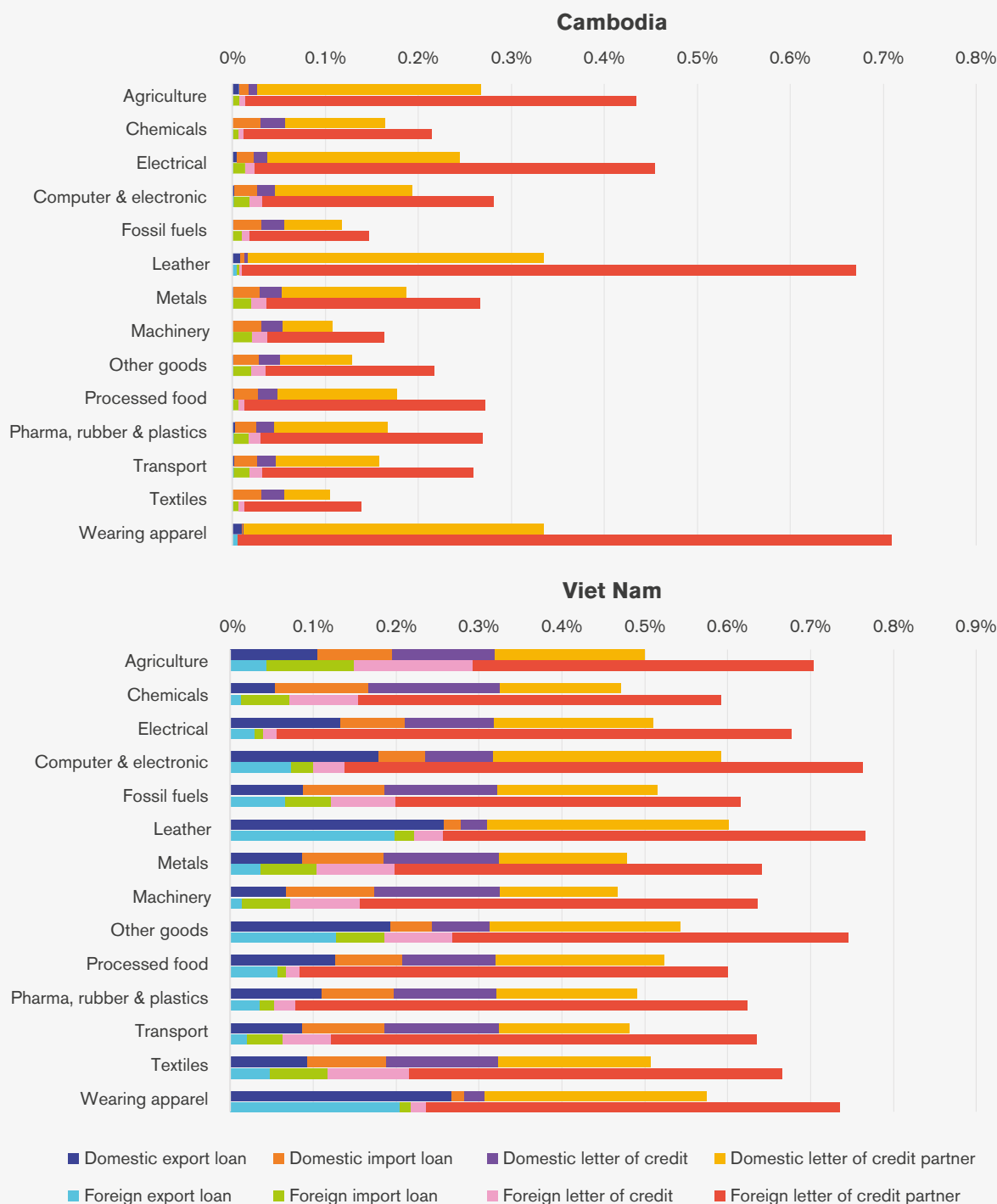
Construction of counterfactuals

In Scenarios 1 and 2, the coverage of trade by trade finance instruments are raised by 10 and 20 percentage points, respectively. To obtain this change, the overall share of trade finance, sh_s^{tf} in equations (19)–(21) is increased until the trade-weighted average of trade (exports plus imports) covered by trade finance instruments is increased by 10 and 20 percentage points. When the share of trade finance instruments increase, the shares of other instruments (cash in advance, internal working capital) fall proportionally. For some sector–importer–exporter combinations, however, this would imply that shares would become negative. Therefore, the shares of domestic and foreign trade finance are reduced to make sure that shares always add to 1.

Letters of credit fees are reduced to the level of China in Scenario 3, and the costs of financing for import and export loans and letters of credit are reduced in Scenario 4, employing a double differencing approach. The difference between the costs of financing and the interbank rates are reduced to 50 per cent of this difference on average globally in the model. Scenario 5 combines the shocks from Scenarios 2–4.

FIGURE III.1

Share of different trade finance instruments by domestic and partner banks for domestic and foreign-owned firms, by sector (in per cent)



Source: IFC–WTO calculations based on the 2023 IFC survey of trade finance in the Mekong-3, various sources described in the text and data on the share of foreign-owned firms and the share of related-party trade. The figure displays the share of different trade finance instruments provided by domestic banks (export loans, import loans, letters of credit) and by foreign banks (letter of credit partner) for domestic firms and for foreign firms.

Figure III.2 displays the share of trade covered by different trade finance instruments. This figure differs from III.1 since it includes also foreign trade finance instruments, such that shares add to 1.

Figure III.3 shows the projected reduction in trade costs for exports and imports by trading partner. Although for many trading partners, the projected reduction in trade costs is larger on the import side than on the export side, the regions where it is opposite are more important trading partners – implying that for total trade costs the reduction is larger on the export side. The larger trade cost reductions on the export side are one explanation for the larger projected changes in the export side as explained in the main text.

However, there is a second reason related to the general equilibrium nature of the model: services trade is excluded from the results, since trade costs are assumed to stay constant for services trade. On the export side, services trade is projected to fall because of rising factor costs due to the reduced trade costs for merchandise trade and thus the increased demand for factor inputs. On the import side, services trade is projected to rise because of increased demand for intermediate inputs. Given that a fixed trade-balance-to-GDP ratio is assumed, this implies that merchandise exports have a tendency to rise more than imports, since changes in the total value of exports and imports (including services trade) relative to GDP should be the same.

Robustness checks

Robustness checks are conducted on two assumptions with limited empirical underpinning. First, the survey results only provide information on the share of trade covered by trade finance instruments. However, the distribution of the remaining share of trade between cash in advance and internal working capital is unknown. In the baseline, the assumption is made that 80 per cent of imports into Cambodia and Viet Nam not covered by trade finance were financed by cash in advance and 20 per cent by internal working capital; whereas for exporters from Cambodia and Viet Nam, the share of cash in advance is 20 per cent and the share of internal working capital 80 per cent. For trade between other regions, the shares are assumed to be 50 per cent. A robustness check is conducted assuming that the shares are also 50 per cent for trade with Cambodia and Viet Nam.

Second, for the surveyed countries, literature indicates that the assumption is backed up by empirical evidence that the costs of financing of employing cash in advance and internal working capital are twice as large as the financing costs for import and export loans (see Heng *et al.*, 2021, for Cambodia, and Bevacqua *et al.*, 2021, for Viet Nam). For the other regions, the same assumption is made; that is, that the interest rates on trade finance instruments are half of that of other forms of financing. In those regions, however, data on lending rates for other forms of financing are available (through IMF data) and the costs of trade finance were thus calculated by dividing these lending rates by 2. Two robustness checks are conducted first reducing the premium to 1.5 and then raising it to 2.5.

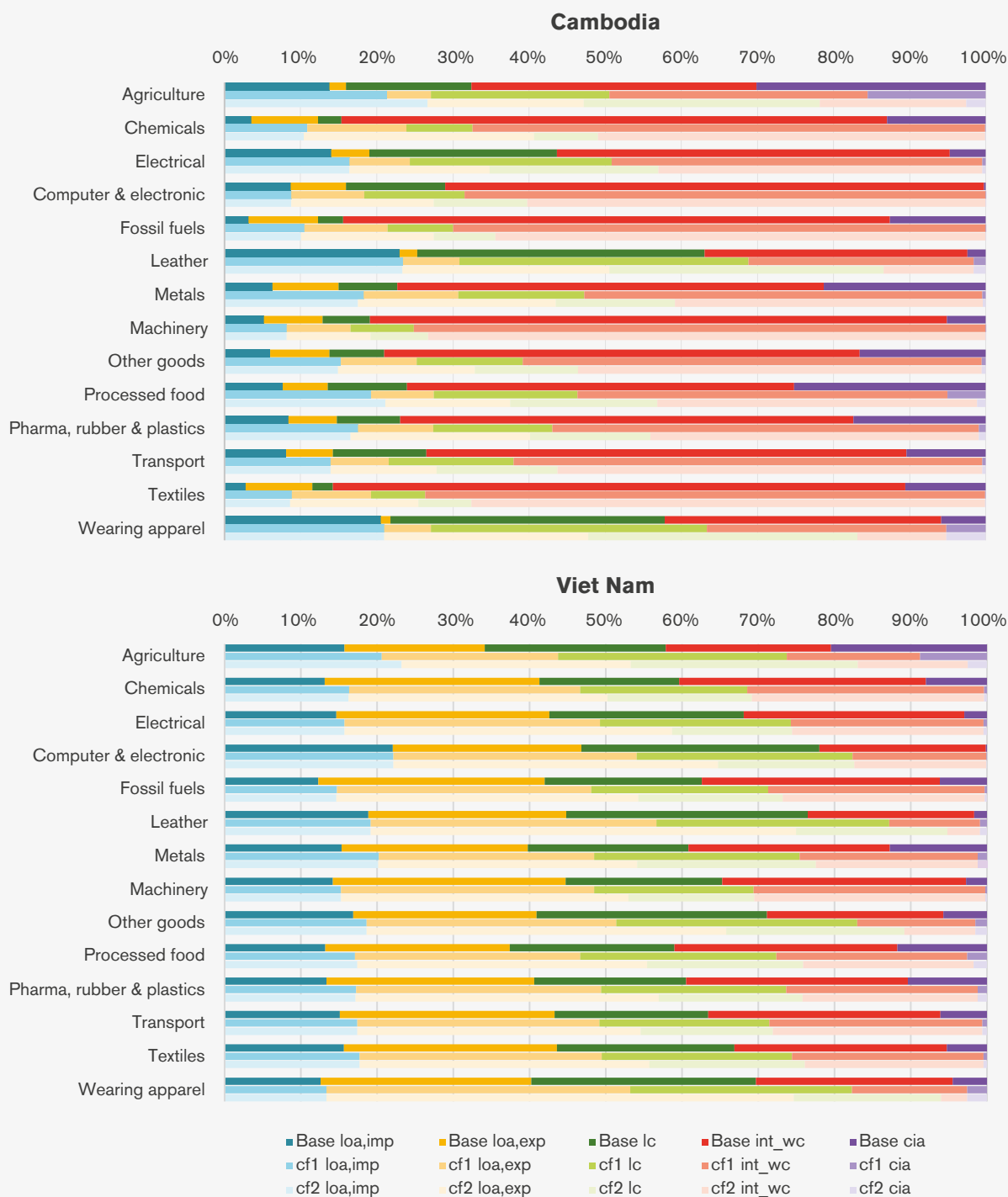
Figure III.4 shows that the impact of changing the assumptions on the distribution between cash in advance and internal working capital is relatively modest. With a 50/50 split between cash in advance and internal working capital, the projected increase of both exports and imports is smaller than in the benchmark because there is less scope to expand trade finance. The reason is that trade finance is replacing cash in advance and internal working capital and with the assumed 80/20 split trade finance can be expanded more.

For imports into the surveyed countries, there is more cash in advance in the surveyed countries with 80/20 in the benchmark implying that there is more scope to replace this with trade finance. For exports from the surveyed countries there is more internal working capital in the surveyed countries 20/80 in the benchmark, which implies again that there is more scope to replace the use of internal working capital with trade finance. The assumed split is intuitive because in exports from Cambodia and Viet Nam to other more developed regions less use of cash in advance is expected; whereas for imports into the surveyed countries, there is more scope for cash in advance.

Moving to the next set of robustness checks, reducing the difference between financing costs on trade finance and non-trade finance instruments will reduce the projected increase in exports and imports, whereas increasing this

FIGURE III.2

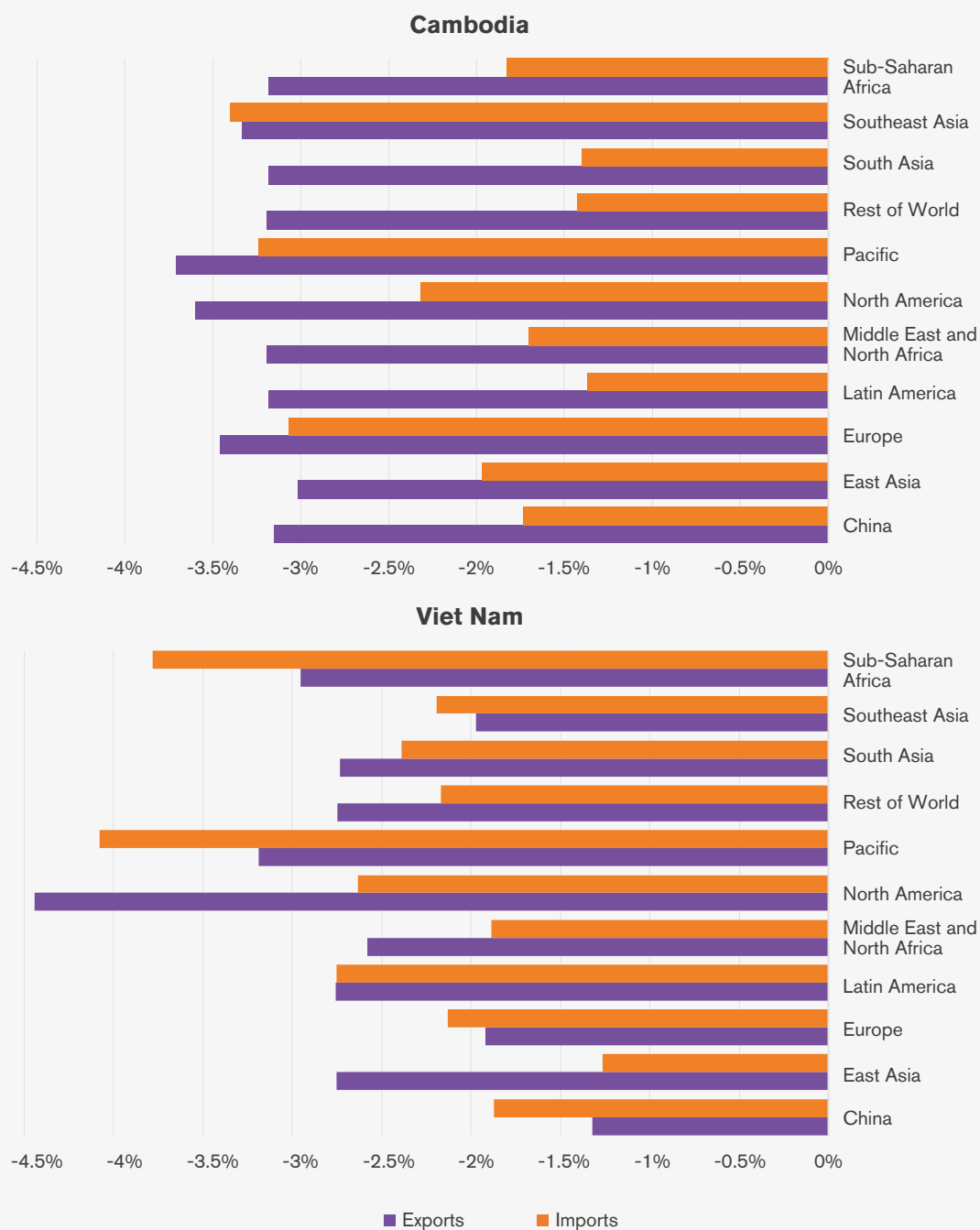
Share of trade covered by different trade finance instruments in baseline and counterfactual Scenarios 1 and 2 (in per cent)



Source: IFC–WTO calculations based on the 2023 IFC survey of trade finance in the Mekong-3, various sources described in the text and data on the share of foreign-owned firms and the share of related-party trade. The figure displays the share of different instruments employed to finance international trade in the baseline and for counterfactual Scenarios 1 (cf1) and 2 (cf2): import loans (loa,imp); export loans (loa,exp), letters of credit (lc), internal working capital (int_wc) and cash in advance (cia).

FIGURE III.3

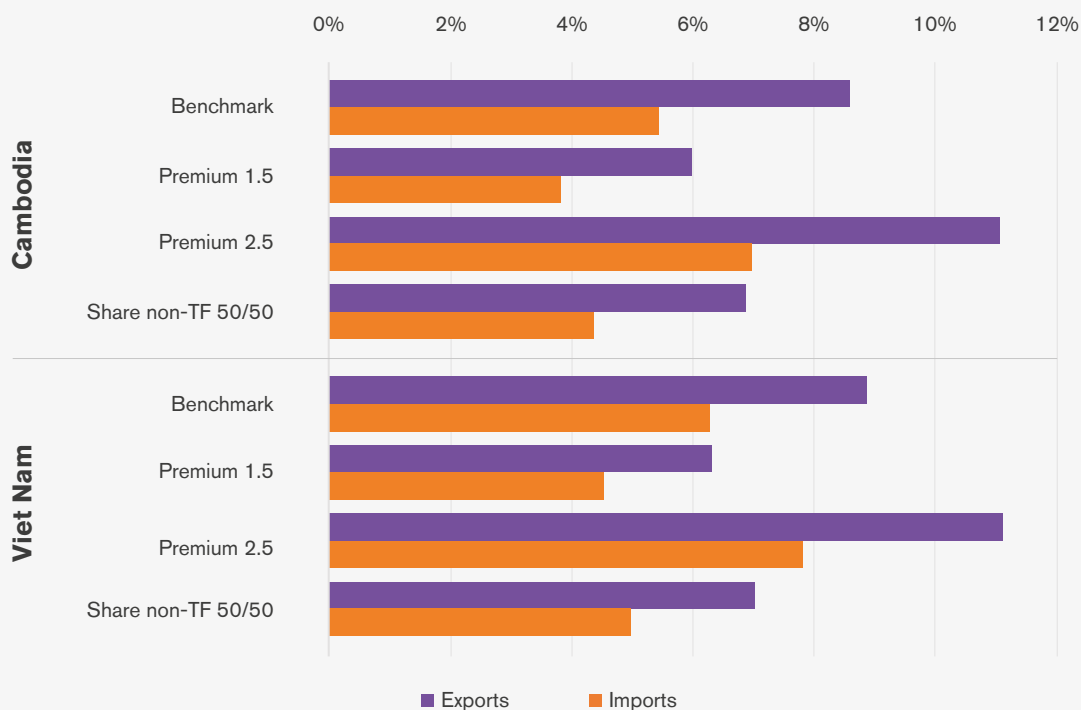
Projected changes in trade costs by trading partner (in per cent)



Source: IFC–WTO calculations based on the 2023 IFC survey of trade finance in the Mekong-3 and various sources described in the text. The figure displays the projected reduction in total trade costs for imports and exports to and from Cambodia and Viet Nam for the combined scenario.

FIGURE III.4

Projected increase in the volume of trade for different assumptions in Scenario 5 (combined) (in per cent)



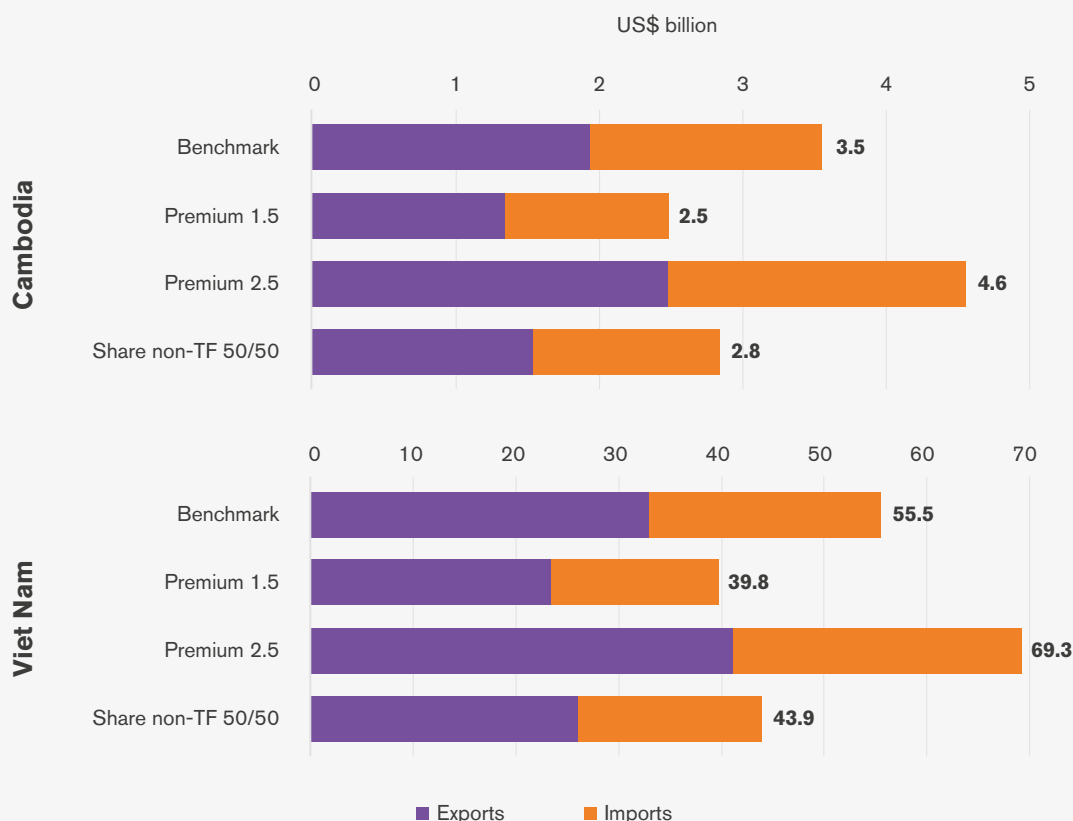
Source: Simulations with the comparative static version of the WTO Global Trade Model extended with trade costs being a function of the costs and shares of trade finance. The figure displays the projected change in the volume of real imports and exports for Cambodia and Viet Nam for Scenario 5 (combined) under different assumptions. Share non-TF 50/50 assumes a 50 per cent share for cash in advance and internal working capital for trade not financed with trade finance (letters of credit, import and export loans).

difference would make the projected increases larger. With a premium of 1.5, the projected expansion of trade is only about 4 per cent for imports and 6 per cent for exports for both countries, compared to 5-6 per cent for imports and 8-9 per cent for exports in the benchmark. With a premium of 2.5, the increase would be 7-8 per cent for imports and more than 10 per cent for exports. This would translate into projected changes in the value of trade of only US\$ 2.5 billion for Cambodia and US\$ 40 billion for Viet Nam for a premium of 1.5, and increases of US\$ 3.5 billion and US\$ 55 billion in the benchmark (see Figure III.5).

These results are expected, since expanding the coverage of trade by trade finance instruments will lead to a larger reduction in total trade finance and thus trade costs when the reduction in the costs of financing drop more. It is important to observe here that in the robustness checks the premium for the costs of trade finance instruments are also modified in the surveyed countries – although the literature provides support for the assumption of a premium of 2 for the surveyed countries. Therefore, the benchmark results are considered robust.

FIGURE III.5

Projected increase in the volume of trade for different assumptions in Scenario 5 (combined) (in US\$ billion)



Source: IFC–WTO calculations based on the 2023 IFC survey of trade finance in the Mekong-3 and various sources described in the text. The figure displays the projected reduction in total trade costs for imports and exports to and from Cambodia and Viet Nam for the combined scenario.

Endnotes

1. See Financial Soundness Indicators, available at <https://data.imf.org/?sk=51b096fa-2cd2-40c2-8d09-0699cc1764da>.
2. See International Financial Statistics for data files on lending interest rates for 2022, available at <https://data.imf.org/?sk=4c514d48-b6ba-49ed-8ab9-52b0c1a0179b>. The data for December 2022 are updated to 30 June 2023, using the change in interbank rates for the same period from a range of sources.
3. To obtain numbers for aggregate regions, trade-weighted averages are employed.
4. This assumption is inconsequential for the working of the model, since trade costs between non-surveyed countries are not modified in the counterfactuals.
5. Only adjustments for trade between $s = \text{vnm, khm}$ and trading partners are incorporated because only for these trade flows will counterfactuals be implemented.
6. The share of trade by foreign-owned firms is based on census data for Viet Nam. The share of related-party trade US data is proxied by shares of related-party trade between the United States and the surveyed countries (see https://www.census.gov/foreign-trade/Press-Release/related_party/index.html).

Abbreviations

CBR	correspondent banking relationship
CRRA	constant relative risk aversion
GTM	Global Trade Model
GVC	global value chain
ICC	International Chamber of Commerce
IFC	International Finance Corporation
IMF	International Monetary Fund
MSME	micro, small and medium-sized enterprise
SCF	supply chain finance
SME	small and medium-sized enterprise
UNCTAD	United Nations Conference on Trade and Development
WEO	World Economic Outlook
WITS	World Integrated Trade Solution

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Cambodia, the Lao People's Democratic Republic and Viet Nam – the so-called Mekong-3 – have experienced rapid trade growth over the last ten years. However, growth could be boosted even further by improving access to trade finance, such as loans and guarantees, for locally owned businesses seeking to trade globally.

This publication presents the results of two surveys undertaken by the IFC to determine the level of trade finance available to businesses in the Mekong region. An analysis of the data conducted by the WTO explores the potential impact of an expansion in trade finance and how this could lead to greater integration into world trade and more inclusiveness, with increased participation in global supply chains by small businesses and women-owned enterprises.

The publication is intended to serve as a guide to how domestic financial sectors can reorient their operations to support cross-border trade and enhanced access to global markets.

