Internationalization and financial constraints: Opportunities, obstacles, and strategies

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A B S T R A C T

This study delves into the relationship between financial constraints and internationalization, investigating the role and extent of variability in access to the capital market in shaping internationalization strategic choices. In detail, focusing on the Italian manufacturing industry between 2013 and 2019, we examine this relation disentangling the effect between export and import dynamics. Initially, we run various OLS regression models to investigate the profile of exporting/importing firms, providing a preliminary picture of the internationalization process of the Italian manufacturing industry. Then, we run several GMM regression models to highlight these dynamics over time and to collect robust evidence for our hypotheses. According to the results, we observe that firms under high financial constraints have the lowest intensity of import and export flows (i), firms under moderate financial constraints have the highest intensity of export flows (ii), and firms under low financial constraints have the highest intensity of import flows (iii). An interpretation of these results concerns the heterogeneity of business-to-business payment dynamics across the EU global value chain, with the Italian market characterized by the longest delay. Hence, internationalization through export flows represents an opportunity for those companies with the most aggressive business strategies, quickly raising their internal liquidity, and complementing local financial debts with international trade credits. On the other hand, only firms with no restrictions to the capital market can afford prompt payments of foreign suppliers, easily collecting the necessary liquidity to support import flows.

1. Introduction

Internationalization is an essential process to perform on the current global market (Pangarkar, 2008). Firms can create successful and profitable business relations with foreign suppliers and/or clients, significantly improving their trade balance (Minetti et al., 2019). Literature on international business has focused intensively on this process for the last decade, highlighting opportunities to grow and survive in the current age of globalization (Hsu et al., 2013; Minetti et al., 2015; Cainelli et al., 2022), and emphasizing barriers and strategies to entry in foreign markets (Child et al., 2017; Knight and Liesch, 2016; Symeonidou et al., 2017). Among these obstacles, one of the most relevant is access to the capital market to finance such strategies, and firms with restricted access to external resources could have no chances to implement their internationalization process. Indeed, evidence emphasizes that only the financially

healthy firms can overcome the sunk costs of entering export markets (Bernard et al., 2007), and that financial constraints might play a significant role in the internationalization process (Chaney, 2016; Greenaway et al., 2007; Forte and Salomé Moreira, 2018). Moreover, firms under financial constraints have a lower probability of being importers and, if they have such opportunity, they tend to import less amount of goods (Muûls, 2015; Aristei and Franco, 2014; Bas and Berthou, 2012; Fauceglia, 2015), and they tend to use intermediaries in their transactions (Nucci et al., 2023). Regardless these evidence, the internationalization could represent for financially constrained firms an opportunity, pulling their participation in the Global Value Chain (GVC). According to literature (Minetti et al., 2019; Thang and Ha, 2022), an exporting firm may extend trade credit to its customers (account receivable) and, accordingly, an importing firm may receive trade credit from its suppliers (account payables). Even if the literature is rich of case studies on the relation between financial constraints and internationalization, at our best knowledge, there are no evidence that disentangle the effect between export and import dynamics, highlighting when the difficulties in collecting external resources on the local capital market represent an obstacle or an opportunity to implement such strategies. In addition, there are no studies that interpret the collected results in terms of business-to-business payment dynamics, focusing on the strategies adopted by companies to quickly raise their internal liquidity.

Considering different levels of financial constraints (low, medium, and high), which we measure in terms of bankruptcy risk at short term (i.e., adopting credit rating scores), and assuming the delay in payment dynamics within the local market as a key determinant in the strategic choices of companies on the GVC, we imagine to identify several patterns. First, we expect that firms with high level of constraints have no opportunities to implement their strategies of internationalization. Hence, coherently with the literature, we expect to confirm that a restricted access to the capital market represents a clear obstacle to export and import dynamics since there are no resources to support such strategies (i.e., sunk costs to open international business relations and prompt payments of suppliers). Second, we expect firms with a medium level of financial constraints have the highest level of internationalization if we consider the export dynamics, i.e., the opportunities of being a supplier on the GVC. Considering these moderate difficulties on the local capital market, we expect firms can support investments in the internationalization process, overcoming the expected sunk costs. Moreover, these firms can quickly raise the internal liquidity through export flows since the payment delay is more favorable on the international GVC than on the local market. Hence, considering exports, the firms with moderate constraints have both the possibility and the opportunity to improve their financial conditions through internationalization. Finally, we expect that firms with a low level of constraints have the possibilities of being leader in the import dynamics, which means that access to the capital market can support both the sunk costs to implement such strategies and the prompt payments of suppliers. This is exactly our contribution, i.e., the possibility to disentangle the relation between financial constraints and internationalization strategies, considering in the same investigation both export and import dynamics. Moreover, according to the collected results, this work can contribute to the current literature verifying whether exists a complementary (or a substitution) effect between local capital market and international trade credits on the GVC. Obviously, this is a relevant topic and, according to the collected evidence, there might be several practical implications that could lead policy makers in supporting appropriate interventions, as well as managers in their corporate strategies on the GVC.

This manuscript proposes a specific case study to explore our expectations: the Italian manufacturing industry and its internationalization process between 2013 and 2019. In detail, we merge data extracted from several databases to create a unique pool of information, providing for each company the value of all import and export flows from/to member states of the European Union (EU), as well as the type of good according to the NACE industrial codes. Considering the amount of available information and the expected targets of this study, we have created two parallel datasets that contain information about the import flows (i.e., Import dataset) and the export ones (i.e., Export dataset), implementing a parallel analysis that focuses on these two dynamics. These flows represent exactly the observations of our empirical investigation, verifying whether difficulties in collecting financial resources on the national market affect their intensity. According to results, we cannot reject the hypotheses that specific internationalization dynamics exist according to the degree of firms' financial constraints. More specifically, we observe that: firms under high financial constraints have the lowest intensity of import and export flows (i), firms under moderate financial constraints have the highest intensity of export flows (ii), and firms under low financial constraints have the highest intensity of import flows (iii). Hence, financial constraints matter in the internationalization process of firms, creating a barrier or an opportunity according to its degree. We explain these insights recalling the business-to-business payments and the expected delay, which represents the time window between the moment in which a company receives/ships products (or semi-finished materials) and the moment in which it pays/collects the due amount of money.[1] According to the European Committee of Central Balance Sheet Data Offices (2021), we expect to observe the highest delay in the Italian market, and export flows might represent an opportunity to raise quickly internal liquidity thanks to prompt payments by foreign clients on the GVC. On the other hand, the same payment dynamics might prevent the internationalization process of firms with limited access to external financial resources. Obviously, a significant population of SMEs that could be under financial constraints due to their size and a restricted supply of external financial resources due to structural problems of the capital market might amplify these dynamics (Deloof and La Rocca, 2015; Cainelli et al., 2020), creating all the necessary conditions for an interesting case study. Therefore, considering all these elements, Italy is an interesting case study that we can use to validate the proposed hypotheses, shedding new light on the internationalization process of its manufacturing industry and showing how financial constraints can shape

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[1] This work refers generically to this time window as delay, even if there are two distinct measures (European Committee of Central Balance Sheet data Office, 2021). On the one hand, there is the Days Sales Outstanding (DSO), which is a measure of the average number of days that it takes a company to collect payment for a sale. On the other hand, there is the Days Payable Outstanding (DPO), which is a measure of the average time (in days) that a company takes to pay its bills and invoices to its trade creditors. We decided to adopt the "general" concept of delay as simplification.

business strategies.

The paper is organized as follows. Section 2 proposes a review of current literature, focusing on the relation between financial constraints and internationalization, and then formulating the main hypotheses. Section 3 describes the dataset and the econometric methodology. Sections 4 presents and discusses the empirical results, while Section 5 proposes some conclusions, highlighting practical implications.

2. Literature review and hypotheses

2.1. Literature review

In this work, the term "internationalization" refers to a broad spectrum of firms' strategies to participate in foreign markets (Brouthers et al., 2022; De Beule et al., 2023), which can be traced back to the firms' decision to import raw materials and/or semi-finished products, as well as to export final products. According to current literature, this process is a fundamental approach to grow and survive in the current age of globalization (Hsu et al., 2013; Minetti et al., 2015; Cainelli et al., 2022), even if relevant financial resources are necessary to implement such decision and, consequently, firms' access to the capital market results essential. Firms expect relevant sunk costs to open new business relations within the global value chain such as, for instance, the costs of finding new partners, collecting available information on them, and creating reliable networks (Bernard and Jensen, 1999; Manova, 2013; Roberts and Tybout, 1997). Moreover, relevant costs may be incurred to adapt the products to the regulations of the destination country, both in terms of quality and packaging (Kahiya, 2018), or other costs relating to the interpretation of contracts and expenses for new interfaces (Grossman and Helpman 2002), prompting most exporters to sell only few products to few countries (Castellani et al., 2010). Such evidence emphasizes that only the most productive and the financially healthy firms can overcome the costs of entering export markets (Bernard et al., 2007), and that financial constraints might play a significant role in the internationalization process (Chaney, 2016; Greenaway et al., 2007; Forte and Salomé Moreira, 2018). If we look at the relation between financing and imports, the situation does not change, and we might expect significant fixed and variable-type incremental costs that a firm must face when it engages in such activities (Nucci et al., 2021), pushing these businesses to use intermediaries in such transactions (Nucci et al., 2023). For instance, focusing on the Belgian manufacturing sector, Muûls (2015) shows that firms under financial constraints have a lower probability of being importers and, if they have such opportunity, they tend to import less amount of goods than firms do with no difficulties in collecting external financial resources on the capital market. This evidence is consistent with Aristei and Franco (2014), Bas and Berthou (2012) and Fauceglia (2015). Aristei and Franco (2014) investigate European manufacturing firms and find that the presence of credit constraints reduces both the probability of importing intermediate goods and the volume of imported inputs. Bas and Berthou (2012) and Fauceglia (2015) investigate the Indian manufacturing industry and firms located in several developing countries respectively, observing that credit constraints exert a negative impact on the probability of a firm importing capital goods (e.g., machinery or equipment). Hence, considering such evidence, we expect that being under financial constraints can preclude the internationalization process, both in terms of exports and imports, since the possibility to collect the necessary liquidity on the capital market is a relevant aspect of such strategy to overcome the expected costs.

Nevertheless, there are also studies that investigate the possibility of receiving credit from trading partners in the global value chain (Petersen and Rajan 1997; Berlin 2003; Minetti et al., 2019). According to this second strand of research, we can expect that the same condition of being under financial constraints could push firms towards the internationalization process. Indeed, partners with a more dynamic capital market might support their clients/suppliers on the global value chain, postponing the payment of their debts or anticipating the payment of their credits, financing them and their operating activities (Thang and Ha, 2022). Moreover, the literature emphasizes that a complementary effect between trade credit and financial credit might exist which is essentially based on the information gap between parties. Indeed, commercial partners have more information on their clients than do financial institutions (Biais and Gollier, 1997; Casey and O'Toole, 2014) and, for this reason, the banks might look at trade credits to fill the gap on the expected reliability of these firms, granting access to their financial resources (Burkart and Ellingsen, 2004; Agostino and Trivieri, 2014). In other words, recalling the "signaling hypothesis" formulated on the role of trade credit, we might expect that if commercial partners trust these businesses according to their more reliable information, financial institutions (banks) will also trust them, granting them access to their resources.

2.2. Hypotheses

This paper investigates the relation between financial constraints and intensity of import/export flows. We test whether the condition of being under financial constraints represents an obstacle to the internationalization process or, alternatively, it might represent an opportunity to collect additional external financial resources that are not available on the local market. This is the main research question of this manuscript, which we properly formulate in this sub-section, distinguishing between import and export flows since we expect a different impact according to the nature of international transactions. We expect that difficulties in collecting external financial resources on the local capital market negatively affect the decision to import raw materials and/or semi-finished goods. On the other hand, we expect that relaxing these difficulties might affect positively the decision to export products.

Considering the specificities of the Italian market and its manufacturing industry, we can explain our expectations in terms of business-to-business payments and the expected delay. Indeed, one of the highest levels of delay in EU characterizes the Italian firms and, considering their trade balance between operating credits (i.e., payments by clients) and operating debts (i.e., payments to suppliers), importing materials from foreign markets could be feasible if there is access to external financial resources, which are

fundamental to respect more strict deadlines in such payments. On the other hand, the possibility to collect promptly the due payments from foreign clients, who use to pay with a lower delay, could represent an opportunity to quickly raise the internal liquidity. Hence, considering import dynamics, financial constraints might represent a barrier to the internationalization process; while, in case of export, there might be opportunities to foster such process. Obviously, firms need the initial liquidity to start the internationalization, opening new business relations and overcoming the sunk costs.

To make a clearer statement of our expectations, let us assume an Italian manufacturing company that decides to improve the internationalization of its business, substituting Italian suppliers/clients with German ones. The German market is extremely appealing since firms located there pay with an expected delay of 1 month, while firms located in the Italian market pay with an expected delay of 2 months.[2] Let us imagine now, this hypothetical Italian manufacturing company is under financial constraints for operating activities, that is to say, no access to external financial resources to support such strategy, opening new business relations and performing the due payments according to the aforementioned thresholds (i.e., 1 month). Which option this company might adopt? On the one hand, the company cannot support an internationalization strategy based on import flows of German raw materials and/or semi-finished goods, since there are no external financial resources to perform the due (earlier) payment of its new supplier. This is exactly the expected negative impact of financial constraints on import dynamics and the related internationalization process, which is perfectly coherent with the literature (e.g., Fauceglia, 2015; Aristei and Franco, 2014). On the other hand, relaxing difficulties in collecting external financial resources, this hypothetical Italian manufacturing company might see a clear opportunity in export flows to the German market. Indeed, an export flow to that market could represent an (earlier) payment by the foreign client, quickly raising the internal liquidity and significantly improving the trade balance. Obviously, firms must be under a moderate level of financial constraints to perform this latter strategy, otherwise they cannot cover the necessary sunk costs to open these new business relations. Finally, let us imagine the third scenario: the firm is not under financial constraints, and it can support an internationalization strategy based on import flows of German raw materials and/or semi-finished goods, performing the required (earlier) payment of its new supplier.

Accordingly, we can imagine three different levels of financial constraints (low, medium, and high) and, considering both the investments and the payment dynamics, we expect to identify several patterns on the GVC. First, we expect that firms with high level of constraints have no opportunities to implement their strategies of internationalization since there are no resources to support such strategies (i.e., sunk costs to open international business relations and prompt payments of suppliers). Second, we expect firms with a medium level of financial constraints have the highest level of export trade flows. These firms can support investments in the internationalization process, overcoming the expected sunk costs, and they can quickly raise the internal liquidity through export flows since the payment delay is more favorable on the international GVC than on the local market. Third, we expect that firms with a low level of constraints have the possibilities of being leader in the import dynamics, since they have access to the capital market to fund such strategies, overcoming both the sunk costs and the prompt payments of suppliers.

It is worth noting that we are not considering the trade credit in these scenarios, i.e., we do not expect clients/suppliers on the GVC support their partners, postponing the payment of their debts or anticipating the payment of their credits. On the contrary, we expect that better conditions in the business-to-business payments make more competitive and attractive the GVC, pulling firms under moderate constraints to maximize their export trade flows and, in this way, to quickly raise their internal liquidity.

Hence, considering the proposed background, we can shed new light on the relation between internationalization and financial constraints, testing the following hypothesis:

H1. firms with the highest difficulties in collecting financial resources on the capital market are the firms with the lowest level of internationalization (i.e., firms with high financial constraints have the lowest intensity of export and import flows).

Afterwards, relaxing the level of financial constraints (i.e., medium/low restriction to financial resource on the capital market), we can disentangle its effect to import flows and to export flows. In details, we test the following hypotheses:

H2. firms with medium difficulties in collecting financial resources on the capital market are those with the highest level of internationalization, if we consider the export dynamics (i.e., firms with medium financial constraints have the highest intensity of export flows);

H3. firms with the lowest difficulties in collecting financial resources on the capital market are those with the highest level of internationalization, if we consider the import dynamics (i.e., firms with low financial constraints have the highest intensity of import flows).

Therefore, we expect to observe different levels of internationalization according to the opportunities to collect external financial resources on the capital market. Moreover, according to results, we have the possibility to highlight whether international trade credits complement external financial resources collected on the capital market. Fig. 1 sums the expected results according to the proposed hypothesis.

According to the collected results, there might be several practical implications. On the one hand, we can highlight the feasible strategies to support the internationalization process if firms are under (moderate) financial constraints. On the other hand, we can shed new light on the complementary effect between financial resources collected on the local capital market and international trade credits.
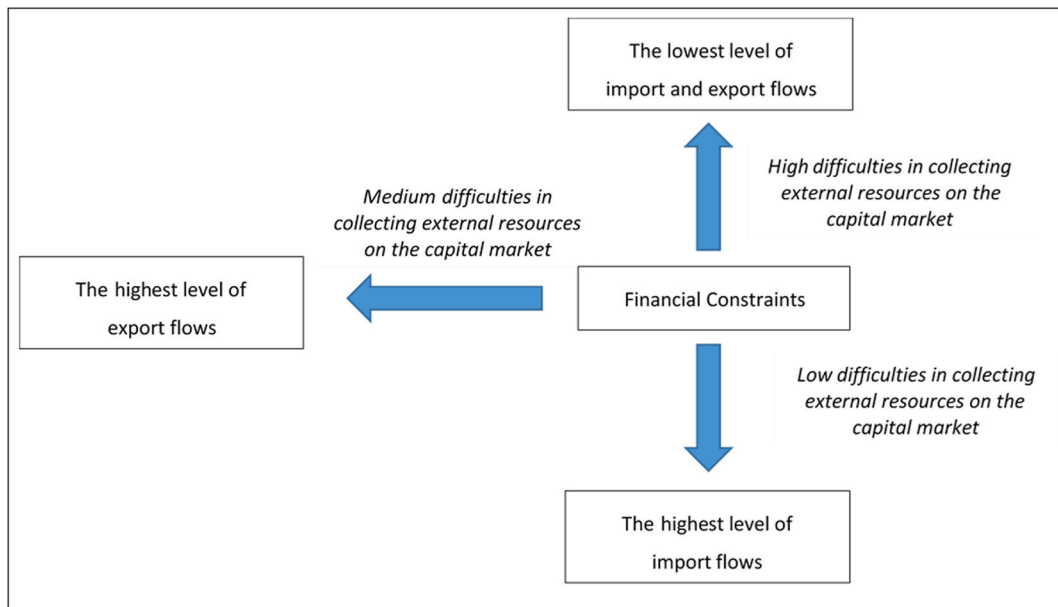

Fig. 1. Conditions and expected impacts tested in the empirical investigation.

3. Data and methodology

Authors test the proposed hypotheses investigating the internationalization process of the Italian manufacturing industry between 2013 and 2019 (both SMEs and big companies), focusing on international transactions among Italy and the other member states of the EU. We have extracted and merged data from three databases to create a unique pool of information. First, we adopt the database Aida to extract financial, economic, and administrative information of manufacturing corporations (source: Bureau van Dijk – BvD). Second, we consider a unique database with all import and export flows from Italy (source: Italian National Institute of Statistics – ISTAT). Finally, we gather information about firms' expected solvency at short run (1 year), collecting for each firm a credit rating score (source: CerisRating - CNR).

The second database is clearly one of the most relevant contributions of this work, providing for each company the value of all import and export flows from/to the country of arrival/destination, specifying also the type of good according to the NACE industrial code. Note that, considering the amount of available information and the twofold targets, we have created two parallel datasets that contain respectively information about the import flows (i.e., Import dataset) and the export ones (i.e., Export dataset). Hence, we implement two parallel analyses where these two types of flows represent exactly the observations of our empirical investigation, verifying whether access to external financial resources affect their intensities. It is worth nothing that we focus on international transactions between Italy and the other member states of the EU to control for potential effects related to international trade agreements, which might influence firms' decision-making on these business strategies.

3.1. Empirical strategy

We adopt several econometric models to test the proposed hypotheses. Initially, we run some OLS regression models to investigate the profile of exporting/importing firms, providing a preliminary picture of the internationalization process of the Italian manufacturing industry; and then, we run several GMM regression models to highlight these dynamics over the time and to collect robust evidence on our hypotheses. According to our approach, we have a parallel investigation, adopting the two datasets and the relative flows as dependent variables. In detail, we propose as baseline an OLS regression model defined as follows:

$$Y_{i,t} = \beta_0 + \beta_1 Y_{i,t-1} + \beta_s \sum_{s=1}^{p} FP_{s_{i,t-1}} + \beta_k \sum_{k=1}^{m} X_{k_{i,t-1}} + \beta_2 W_{i,t-1} + \beta_j \sum_{j=1}^{n} Z_{j_i} + \varepsilon_i \qquad \text{(Model A.1)}$$

where i identifies the observations at time t. Y is the dependent variable, it represents the export/import flows and it is introduced also as lagged regressor (1 year) to catch up the dynamic aspects related to the internationalization process (i.e., the already existing international business relations with clients/suppliers). FP is a set of lagged variables that represents firm's financing strategies, X is a set of lagged control variables referring to firm's characteristics while W is a lagged variable to identify the market conditions of the arrival/destination country, and finally Z is a set of time-invariant fixed effects.

Afterwards, focusing on the key explanatory variable (i.e., FP), we propose an alternative model definition to corroborate our expectations, which is defined as follow:

$$Y_{i,t} = \beta_0 + \beta_1 Y_{i,t-1} + \beta_s \sum_{s=1}^{8} RAT_{s_{i,t-1}} + \beta_k \sum_{k=1}^{m} X_{k_{i,t-1}} + \beta_2 W_{i,t-1} + \beta_j \sum_{j=1}^{n} Z_{j_i} + \varepsilon_i \qquad \text{(Model B.1)}$$

where *RAT* is an alternative set of lagged variables that can contribute to the explanation of firms' financing strategies, proposing a credit rating scores articulated in 8 classes according to their expected solvency at short run (1 year).

Then, to verify whether our results are robust to alternative hypotheses, we improve Model A.1 and Model B.1 with an additional variable that represents firms' productivity, proposing several OLS regression models defined as follow:

$$Y_{i,t} = \beta_0 + \beta_1 Y_{i,t-1} + \beta_s \sum_{s=1}^{p} FP_{s_{i,t-1}} + \beta_k \sum_{k=1}^{m} X_{k_{i,t-1}} + \beta_2 W_{i,t-1} + \beta_j \sum_{j=1}^{n} Z_{j_i} + \beta_3 TFP_{i,t-1} + \varepsilon_i \qquad \text{(Model A.2)}$$

$$Y_{i,t} = \beta_0 + \beta_1 Y_{i,t-1} + \beta_s \sum_{s=1}^{8} RAT_{s_{i,t-1}} + \beta_k \sum_{k=1}^{m} X_{k_{i,t-1}} + \beta_2 W_{i,t-1} + \beta_j \sum_{j=1}^{n} Z_{j_i} + \beta_3 TFP_{i,t-1} + \varepsilon_i \qquad \text{(Model B.2)}$$

where *TFP* is a measure of firms' total factor productivity, which is calculated considering the added value as output (Model A.2a and Model B.2a) and then revenues as output (Model A.2 b and Model B.2 b). Accordingly, we can verify whether the hypotheses on corporate finance are robust to an alternative hypothesis that might affect firms' decision to internationalize their business, i.e., their internal efficiency and the related productivity capacity.

Finally, according to our empirical strategy, we propose the same aforementioned model definitions (i.e., Model A and B), adopting a linear dynamic panel-data model and adding a 2 years lag of the dependent variable as covariate. In detail, we adopt the Generalized Method of Moments (GMM) estimator according to Arellano and Bond (1991), which is more consistent since it is designed for datasets with many panels and few periods. Lastly, considering SMEs are the most critical firms both in the internationalization process and in the access to the capital market, we propose as last robustness test the same model definitions (i.e., Model A and B), but restricting the sample to SMEs. Hence, we can validate the proposed hypotheses focusing on all import and export flows by this sub-sample of firms.

Next sub-section presents a detailed overview of the adopted dependent and independent variables, explaining their construction and their role in the empirical investigation.

3.2. Dependent variables

The dependent variables of our empirical analyses are respectively two export/import market share indexes, which consider export/import flows according to the industrial sectors and the country of destination/arrival. In detail, the numerator of this index is equal to the export/import flows performed by a firm toward/from a member state of the EU at time *t*. The denominator of this index is equal to the total amount of export/import flows performed by all firms within the same industrial sector (i.e., 2-digit NACE code) and toward/from that member state of the EU at time *t*. Such indexes represent the proposed measure of internationalization, highlighting the involvement of each manufacturing firm on EU foreign markets, considering the specific industrial sectors. In detail, this is the formula adopted to calculate the "export market share index":

$$Export_{i,NACE,t,c} \Big/ \sum_{i=1}^{g} Export_{i,NACE,t,c}$$

while this is the formula for the "import market share index":

$$Import_{i,NACE,.t,c} \Big/ \sum_{i=1}^{h} Import_{i,NACE,t,c}$$

where *export* and *import* represent the trade flows of the *i-th* firm, at time *t*, toward/from the member state *c* of the EU, considering the 2-digit *NACE* code. It is worth nothing that we have estimated two proxies: an export market share index (considering information about the export flows, and adopting the "Export dataset"), and an import market share index (considering information about the import flows and adopting the "Import dataset"). Hence, we can implement a parallel analysis that focuses on these two types of flows as proxies of firms' internationalization process.

Note that, as well as highlighted in the previous sub-section and coherently with the theoretical background proposed in the second section, we propose this variable at time *t-1* as covariate. Accordingly, we can account for the impact of (previous) relevant sunk costs sustained by firms to open new business relations within the EU global value chain. In other words, we adopt this proxy to control for

the impact of (previous) investments performed by these companies in the internationalization process (e.g., sunk costs to create reliable business relations on that market and/or to adapt their production to the requirements fixed by the foreign markets).[3] Obviously, we expect a positive coefficient in our empirical models for these covariates.

3.3. Independent variables

Afterwards, to consider the relation between export/import market shares and firms' financing strategies (i.e., *FP*), we introduce in Model A the following variables:

- trade credits, which is a ratio equals to the total amount of firms' operating debts at time *t-1* on their total assets at time *t-1*;
- bank debts, which is a ratio equals to the total amount of firms' financial debts at time *t-1* on their total assets at time *t-1*;
- liquidity, which represents firms' monetary availability, and it is equal to the difference between current assets at time *t-1* and inventories on short-term payables at time *t-1*.

Note that, both trade credits and bank debts consider obligations at short run (i.e., debts with a deadline within 1 year).[4] The analysis of coefficients collected with the empirical analysis can explain whether access to external financial resources can prevent the internationalization process or, alternatively, the internationalization represents an opportunity to raise the available liquidity.

According to our strategy, we expect to corroborate our evidence through a model that adopt an alternative set of representative variables of corporate finance (i.e., Model B). In detail, we substitute the previous set of 3 proxies (i.e., *FP*) with a set of 8 dummies representing the related rating classes (i.e., *RAT*), which is estimated according to firms' expected solvency at short run (1 year), ranging between D (i.e., the worst expected solvency) and AAA (i.e., the best expected solvency). Hence, each dummy identifies a specific default risk and an expected risk of being under financial constraints, and it is equal to 1 if the firm is classified in that rating class, 0 otherwise (see Table A1 in the Appendix for a complete presentation of these classes, the related default risk, and the financial constraints one).[5]

Afterwards, we have a set of proxies to control for internal characteristics of firms that perform these export/import flows, which are common to both investigations[6]

- operating performance, which is an index to measure the externalization degree of firms and it is equal to Earnings Before Interest Taxes Depreciation and Amortization (EBITDA) at time *t-1* divided by total sales at time *t-1*;
- size, which is estimated according to firms' total assets at time *t-1*, and it is expressed in thousands of Euro;
- seniority, which is equal to the age of firms, and it is expressed in terms of years.

Then, considering the empirical investigation that focuses on export flows, we introduce the following control variable to detect firms' propensity to internationalize their business:

- import propensity, which is a dummy equal to 1 if the firm have at least an import flow with a (positive) economic value, 0 otherwise;

While, taking the empirical investigation that focuses on import flows into account, we introduce the following one to detect firms' propensity to internationalize their business:

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[3] This approach is coherent with current literature on internationalization, which identifies three different aspects of firms' involvement in such strategies: the intensity, the propensity, and the diversity of internationalization (Fernández and Nieto, 2006; Zahra et al., 2000). The first approach considers how critical foreign markets are (i.e., intensity), the second approach measures if a company builds some of its earnings from internalization (i.e., propensity), while the third approach focuses on the number of foreign markets (i.e., diversity). Our dependent variable represents exactly the first approach, which considers the position of our business flows with respect the industrial sector and the selected country.

[4] According to literature (Santos and Silva, 2014; Oh and Kim, 2016), these variables represent firms' access to external financial resources, considering financial institutions and the capital market (i.e., bank debts), as well as suppliers and the opportunity of postponing the due payments (i.e., trade credits).

[5] This set of information represents a measure of financial constraints, and these classes denote which firms might encounter higher difficulties in collecting external financial resources according to their bankruptcy risk. According to Falavigna and Ippoliti (2023), we expect an inverted u-shaped relation between firms' access to external financial resources and their expected solvency. On the one hand, we expect lower access by the most performing firms (i.e., classified as A, AA and AAA) and the worst performing ones (i.e., classified as D and CCC). On the other hand, we expect the highest access to external resources for the firms with the most aggressive business strategies (i.e., classified as B, BB and BBB), which need to improve their position on the market and to conquer a higher share of profit. Accordingly, studying the relation between each class of rating and the export/input market share, we can identify the financial profile of exporting and importing firms, corroborating with more details the collected evidence.

[6] The first proxy is a measure of profitability to net income, representing the cash profit generated by the company's operations (Arnold and Rhodes, 2021; Hwang and Kim, 2016; Woo et al., 2024). The successive proxies are relevant to denote the degree of asymmetric information on the capital market, which might amplify firms' difficulties in collecting external resources (De Maeseneire and Claeys, 2012), as well as relevant factors that might explain international activities (Gashi et al., 2014; Martineau and Pastoriza, 2016; Eduardsen et al., 2022).

Table 1
Descriptive statistics of dependent and independent variables
Italian manufacturing industry between 2013 and 2019 (Export dataset).

Role	Variable	Obs.	Mean	Std. Dev.	Min	Max
Dependent variable	Export market share $_t$ $^\lambda$	4,008,198	−12.3016	2.355116	−24.0852	−0.18258
Foreign business relations	Export market share $_{t-1}$ $^\lambda$	2,644,085	−11.9151	2.297442	−23.8831	−0.18258
Internal characteristics	Import propensity $_{t-1}$	2,644,085	0.302029	0.459138	0	1
	Operating performance $_{t-1}$	2,592,780	8.384921	12.33951	−998.72	847.69
	Size $_{t-1}$	2,593,670	9.1529	1.596113	−6.90776	16.80819
	Seniority $_{t-1}$ $^\lambda$	3,980,809	2.963496	0.875281	0	4.955827
Corporate finance (I)	Trade credits $_{t-1}$	2,319,345	0.235472	0.139343	−0.23036	7.327958
	Bank debts $_{t-1}$	2,319,481	0.1822	0.177684	−2.3079	34.5089
	Liquidity $_{t-1}$	1,466,377	1.31948	1.002545	0	9.97
Corporate finance (II)	D $_{t-1}$	1,469,880	0.00339	0.05817	0	1
	CCC $_{t-1}$	1,469,880	0.00860	0.09234	0	1
	B $_{t-1}$	1,469,880	0.03486	0.18342	0	1
	BB $_{t-1}$	1,469,880	0.05781	0.23338	0	1
	BBB $_{t-1}$	1,469,880	0.16730	0.37324	0	1
	A $_{t-1}$	1,469,880	0.21208	0.40878	0	1
	AA $_{t-1}$	1,469,880	0.39398	0.48863	0	1
	AAA $_{t-1}$	1,469,880	0.12198	0.32727	0	1
Foreign market	Per-capita GDP $_{t-1}$ $^\lambda$	2,604,554	10.33822	0.668713	6.607256	11.96783
Internal organization	Total factor productivity (REV) $_{t-1}$	2,573,926	15.42369	5.605875	0.000734	737.5558
	Total factor productivity (AV) $_{t-1}$	2,528,929	5.271215	18.79864	4.55E-05	12763.75

Notes: λ denotes a logarithmic transformation for the variable.

- export propensity, which is a dummy equal to 1 if the firm have at least an export flow with a (positive) economic value, 0 otherwise.

Hence, we verify whether firms that perform some export/import flows, at the same time, they also have (at least) an import/export flow, adding more details to the profile of this internationalization process and disentangling further the relationship between importing and exporting activities.[7]

Afterwards, we propose a proxy of the foreign market, which is representative of the economic condition of the arrival/destination country and, potentially, a driver of such export/import flow. In detail, we introduce in our models the country's per-capita GDP, which is expressed in terms of Euro (source: Eurostat).

Lastly, according to the proposed empirical strategy, we introduce in the model a score of Total Factor Productivity (TFP) to test as alternative hypothesis whether the internationalization process is due to a more performing internal organization and/or to a more effective operating strategy.[8]

Tables 1 and 2 propose some descriptive statistics of dependent and independent variables, considering respectively the Export dataset and the Import dataset; while Table A2 in the Appendix presents a detailed presentation of variables, highlighting their estimation. It is worth nothing that the differences between tables are due to the number of firms with export/import flows, and the available information for each proxy.

Note that, we introduce several fixed effects in the OLS regression model: firms' industrial sectors (NACE-code, 2 digit), regions where the firms headquarter are located (NUTS-2), years, and finally the EU member state of destination/arrival.

3.4. Preliminary highlights

Considering 2019, this sub-section shows some preliminary highlights on the relation between financial constraints and intensity of import and export market share, as well as some additional information on the destination of these international trade flows and patterns among industrial sectors.

In detail, Fig. 2 shows the conditional expected intensity of market share according to the expected solvency (i.e., credit rating score), considering respectively the exports (blue lines) and imports (orange lines). Coherently with current literature, these preliminary results suggest the existence of a positive relation between access to the capital market and internationalization, considering both import and export dynamics. The successive econometric models will verify whether we cannot reject these preliminary

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[7] This strategy of using such dummies is coherent with Aristei et al. (2013). Moreover, propensity is exactly the suggested second approach to measure firms' involvement in such strategies (i.e., if a company builds some of its earnings from internalization), even if this proxy is introduced in the econometric model as a control variable to disentangle the different type of flows (i.e., export and imports).

[8] According to literature (Cassiman and Golovko, 2018), exporting and importing firms are more productive than those non-involved in such activities. On the one hand, we expect a higher propensity by productive firms to self-select them into export markets (Bernard and Jensen, 2004) while, on the other hand, a learning effect by exporting activities that brings further improvements in their productivity (Atkin et al., 2017). Similar evidence also exists for the importing firms (Bernard et al., 2012). In detail, we calculate values of TFP according to Levinsohn and Petrin (2003) and Petrin et al. (2004), considering two outputs: added value (Model A.2.a and B.2.a) and revenues (Model A.2.b and B.2.b).

Table 2

Descriptive statistics of dependent and independent variables, Models A and B,
Italian manufacturing industry between 2013 and 2019 (Import dataset).

Role	Variable	Obs.	Mean	Std. Dev.	Min	Max
Dependent variable	Import market share $_t$ $^\lambda$	1,069,052	−11.2823	2.630297	−23.1294	−0.13305
Foreign business relations	Import market share $_{t-1}$ $^\lambda$	649,388	−10.6621	2.512212	−23.1154	−0.30452
Internal characteristics	Export propensity $_{t-1}$	649,388	0.590809	0.491685	0	1
	Operating performance $_{t-1}$	637,635	7.733361	15.21033	−996.38	847.69
	Size $_{t-1}$	638,012	9.505286	1.661155	−6.90776	16.80819
	Seniority $_{t-1}$ $^\lambda$	819,556	3.026586	0.854461	0	4.955827
Corporate finance (I)	Trade credits $_{t-1}$	587,366	0.228041	0.134349	−0.23036	3.135685
	Bank debts $_{t-1}$	587,403	0.191716	0.179765	−2.3079	10.45212
	Liquidity $_{t-1}$	635,766	1.292257	1.018413	0	9.99
Corporate finance (II)	D $_{t-1}$	637,863	0.00392	0.06247	0	1
	CCC $_{t-1}$	637,863	0.01062	0.10252	0	1
	B $_{t-1}$	637,863	0.04980	0.21754	0	1
	BB $_{t-1}$	637,863	0.08105	0.27291	0	1
	BBB $_{t-1}$	637,863	0.19998	0.39999	0	1
	A $_{t-1}$	637,863	0.21060	0.40773	0	1
	AA $_{t-1}$	637,863	0.34688	0.47598	0	1
	AAA $_{t-1}$	637,863	0.09715	0.29617	0	1
Foreign market	Per-capita GDP $_{t-1}$ $^\lambda$	636,112	10.42236	0.63333	6.607256	11.96783
Internal organization	Total factor productivity (REV) $_{t-1}$	633,795	16.28463	7.998152	0.004773	2764.97
	Total factor productivity (AV) $_{t-1}$	618,728	4.796862	4.837806	0.000116	1073.419

Notes: λ denotes a logarithmic transformation for the variable.
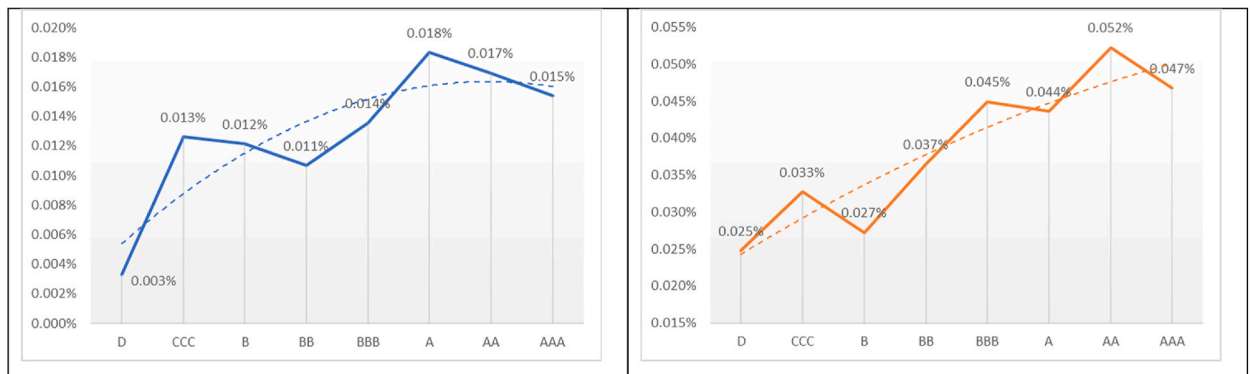
Fig. 2. Average export and import market share according to firms' credit rating score.
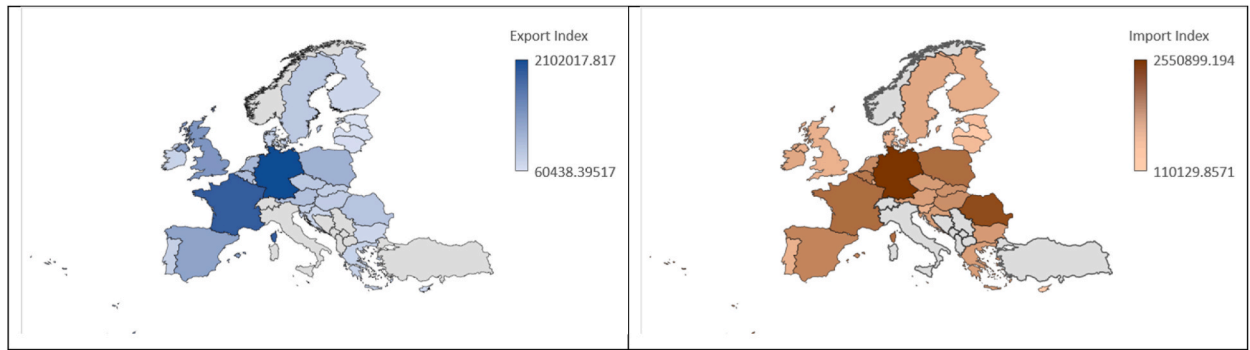Italian manufacturing industry (2019).
Notes: the export market share (expressed in %) according to firms' rating score is in blue, while the import one is in orange. The dotted line denotes the relation, assuming a function of second order. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

highlights on H1 and H3, and it will shed new lights and robust evidence on H2. On the other hand, Fig. 3 shows the main destination of these trade flows, identifying the main targets of export flows, i.e., Germany (17%), France (15%), United Kingdom (9%) and Spain (7%); as well as the main targets of import ones, i.e., Germany (10%), Romania (9%), Poland (7%) and France (7%). Except Germany, we can observe how the most relevant import countries lay in the Eastern Europe, where the costs of inputs might be significantly lower and more competitive than in Italy; while the target of final products exported by Italian firms lay in the Western Europe, where the mark up might be relevant. These highlights cannot reject our expectations on the role of business-to-business payment dynamics.

Finally, Table 3 presents the export and import trade flows across industrial sectors (2-digit NACE codes), both in terms of total flows and in terms of percentage. The readers can easily identify which sectors are export oriented (e.g., Manufacture of coke and refined petroleum products) and which ones are import oriented (e.g., Manufacture of motor vehicles, trailers and semi-trailers).

4. Results

Tables 4 and 5 report the results of the OLS regression models, adopting respectively the Export dataset and the Import dataset. Then, Tables 6 and 7 report the results of the GMM regression models, adopting respectively the Export dataset and the Import dataset. Each table proposes several models according to the empirical strategy described in the previous section. In detail, we start with the baseline models (i.e., Model A.1 and B.1) and then, to test the robustness of our results, we propose the models with TFP based on

Fig. 3. Average export and import trade flows according to country of destination/arrival.
Italian manufacturing industry (2019)
Notes: the graph on the left (blue colour) considers the average export trade flows according to the member states of destination in 2019; while the graph on the right (orange colour) considers the average import trade flows according to the member states of arrival in 2019. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

Table 3
Import and Export trade flows according to the industrial sectors (2-digit NACE codes).
Italian manufacturing industry (2019).

NACE code	Description	Import flows		Export flows	
		Total	%	Total	%
10	Manufacture of food products	1,192,704.39	3.02%	637,381.43	2.28%
11	Manufacture of beverages	1,803,551.93	4.56%	604,474.27	2.16%
12	Manufacture of tobacco products	3,500,644.54	8.85%	338,702.16	1.21%
13	Manufacture of textiles	776,057.95	1.96%	347,090.27	1.24%
14	Manufacture of wearing apparel	749,930.91	1.90%	448,722.19	1.61%
15	Manufacture of leather and related products	964,886.78	2.44%	589,723.12	2.11%
16	Manufacture of wood and of products of wood and cork	562,569.07	1.42%	327,909.23	1.17%
17	Manufacture of paper and paper products	949,721.79	2.40%	854,310.72	3.06%
18	Printing and reproduction of recorded media	579,187.72	1.46%	332,259.23	1.19%
19	Manufacture of coke and refined petroleum products	5,406,341.58	13.67%	9,498,071.07	34.00%
20	Manufacture of chemicals and chemical products	1,589,364.21	4.02%	742,654.84	2.66%
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	4,272,763.41	10.80%	2,605,567.05	9.33%
22	Manufacture of rubber and plastic products	894,943.80	2.26%	589,878.50	2.11%
23	Manufacture of other non-metallic mineral products	632,069.30	1.60%	567,705.01	2.03%
24	Manufacture of basic metals	2,443,623.24	6.18%	2,236,353.30	8.01%
25	Manufacture of fabricated metal products, except machinery and equipment	800,773.03	2.02%	469,088.40	1.68%
26	Manufacture of computer, electronic and optical products	1,173,836.65	2.97%	514,283.73	1.84%
27	Manufacture of electrical equipment	1,181,074.53	2.99%	565,446.92	2.02%
28	Manufacture of machinery and equipment	838,199.77	2.12%	440,316.11	1.58%
29	Manufacture of motor vehicles, trailers and semi-trailers	5,456,324.83	13.80%	3,236,596.18	11.59%
30	Manufacture of other transport equipment	957,860.41	2.42%	959,414.88	3.43%
31	Manufacture of furniture	509,871.49	1.29%	393,546.54	1.41%
32	Other manufacturing	1,234,709.84	3.12%	396,744.97	1.42%
33	Repair and installation of machinery and equipment	1,079,463.06	2.73%	237,835.42	0.85%

Notes: values of export and import flows are expressed in terms of thousands of Euro.

added value (i.e., Model A.2. a and B.2. a) and TFP based on revenues (i.e., Model A.2. b and B.2. b). Finally, Appendix presents the additional robustness tests, restricting the sample size to SMEs (Tables A3, A4, A5 and A6). We apply the robust option in all models, so that we can account for the presence of heteroscedasticity in our results.

Considering the OLS models, the estimated R-squared is extremely high, explaining more than 75% of the variation of the dependent variable, which is mainly due to the presence of the lagged dependent variable as covariate. Moreover, according to the F statistics, all the models are statistically significant (i.e., at least one of the regression coefficients is not equal to zero).

Then, considering Tables 6 and 7, GMM regression models require that there is no autocorrelation in the idiosyncratic errors, and we have tested this condition with successful results. In detail, we have adopted the Arellano–Bond test for serial correlation in the first-differenced errors and, according to results, we cannot reject the null hypothesis of no serial correlation in the first-differenced errors at an order greater than one, implying there is no model misspecification.

It is worth nothing that the number of observations varies according to the missing values, and the econometric models adopt lagged variables at 1 year (OLS models) and at 2 years (GMM models). For this reason, we can observe a different number of observations across the tables.

Table 4

OLS regression model with pooled sample of observations (Export dataset)

Italian manufacturing industry between 2013 and 2019, focus on exporting firms (SMEs and big companies).

Variables	(Model A.1) Export market share $_t$ $^\lambda$	(Model B.1) Export market share $_t$ $^\lambda$	(Model A.2a) Export market share $_t$ $^\lambda$	(Model B.2a) Export market share $_t$ $^\lambda$	(Model A.2 b) Export market share $_t$ $^\lambda$	(Model B.2 b) Export market share $_t$ $^\lambda$
Export market share $_{t-1}$ $^\lambda$	0.768*** (0.003)	0.766*** (0.003)	0.771*** (0.003)	0.769*** (0.003)	0.769*** (0.003)	0.766*** (0.003)
Trade credits $_{t-1}$	−0.102* (0.057)		−0.054 (0.054)		−0.080 (0.054)	
Bank debts $_{t-1}$	−0.196*** (0.035)		−0.157*** (0.040)		−0.196*** (0.036)	
Liquidity $_{t-1}$	−0.010*** (0.004)		−0.011*** (0.004)		−0.007* (0.004)	
CCC $_{t-1}$		0.452*** (0.081)		0.442*** (0.095)		0.435*** (0.082)
B $_{t-1}$		0.620*** (0.084)		0.595*** (0.096)		0.592*** (0.084)
BB $_{t-1}$		0.661*** (0.085)		0.634*** (0.096)		0.632*** (0.084)
BBB $_{t-1}$		0.660*** (0.086)		0.630*** (0.098)		0.634*** (0.085)
A $_{t-1}$		0.655*** (0.085)		0.624*** (0.097)		0.631*** (0.085)
AA $_{t-1}$		0.648*** (0.086)		0.618*** (0.098)		0.626*** (0.084)
AAA $_{t-1}$		0.641*** (0.090)		0.607*** (0.101)		0.624*** (0.087)
Import propensity $_{t-1}$	−0.013** (0.007)	−0.013** (0.006)	−0.012* (0.006)	−0.012* (0.006)	−0.012* (0.007)	−0.012* (0.006)
Operating performance $_{t-1}$	0.001 (0.000)	−0.000 (0.000)	0.002*** (0.001)	0.000 (0.001)	0.001*** (0.000)	0.000 (0.000)
Size $_{t-1}$	0.054*** (0.013)	0.038*** (0.010)	0.056*** (0.014)	0.044*** (0.011)	0.067*** (0.013)	0.051*** (0.010)
Seniority $_{t-1}$ $^\lambda$	−0.335*** (0.020)	−0.355*** (0.019)	−0.237*** (0.021)	−0.256*** (0.019)	−0.317*** (0.021)	−0.339*** (0.019)
Per-capita GDP $_{t-1}$ $^\lambda$	−0.089** (0.042)	−0.095** (0.042)	−0.092** (0.041)	−0.098** (0.042)	−0.086** (0.043)	−0.091** (0.043)
Total factor productivity (AV) $_{t-1}$			−0.000 (0.000)	−0.000 (0.000)		
Total factor productivity (REV) $_{t-1}$					−0.010*** (0.003)	−0.010*** (0.003)
Constant	−1.095** (0.478)	−1.569*** (0.472)	−1.375*** (0.451)	−1.842*** (0.462)	−1.164** (0.482)	−1.608*** (0.477)
Observations	702,729	731,068	690,464	717,644	700,891	728,936
R-squared	0.792	0.790	0.794	0.792	0.792	0.790
Year (FE)	YES	YES	YES	YES	YES	YES
Firm (FE)	YES	YES	YES	YES	YES	YES
NACE code (FE)	YES	YES	YES	YES	YES	YES
Region (FE)	YES	YES	YES	YES	YES	YES
Country of destination (FE)	YES	YES	YES	YES	YES	YES

Notes: robust standard errors in parentheses. λ denotes a logarithmic transformation for the variable. ***p < 0.01, **p < 0.05, *p < 0.1.

4.1. Discussion (main hypotheses)

According to results in Table 4 (Export dataset), firms with a lower level of financial debts are those with higher export flows since we observe a negative coefficient, which is statistically significant (*p-value* < 0.01); while access to trade credits is not statistically significant. On the other hand, according to results in Table 5 (Import dataset), we can observe that firms with a lower level of operating debts are those with higher import flows since we obtain a negative coefficient, which is statistically significant (*p-value* < 0.01). Moreover, we observe a negative coefficient in the level of financial debts, even if it is slightly statistically significant in one case (i.e., Model A.2a, with a *p-value* < 0.1). We might interpret these insights arguing that firms with the highest level of debts are those with the lowest internationalization levels, concluding that their indebtedness prevents such strategy. However, these proxies cannot stratify firms according to their difficulties in collecting external financial resources. Hence, to corroborate the first hypothesis and to test the other ones, we must look at the models with credit rating scores, focusing on the alternative set of variables introduced to explain the internationalization process in terms of firms' financial constraints.

According to the coefficients in Table 4 (Export dataset), we can observe an inverted U-shaped relation between intensity of exports and firms' expected solvency, which is a measure of their difficulties in collecting external financial resources (Czarnitzki and Hottenrott, 2011a, 2011b). The peak of this U-shaped relation is with a rating class "BB", and it decreases on the other sides, that is to say, if firms reduce their expected solvency (i.e., firms rated as classes "B" or "CCC"), as well as if firms increase their expected solvency (i. e., firms rated as classes "BBB", "A", "AA" and "AAA"). We can consider the firms at the peak of this curve as those with the most aggressive business strategies, which are under a medium level of financial constraints and the export dynamics might represent an opportunity for them to raise quickly internal liquidity through prompt payments by foreign importers. Obviously, this might also represent an opportunity to improve their position on the market and to conquer a higher share of profit. Note that, even if exports might represent an opportunity, firms with the highest level of financial constraints (i.e., firms rated as "CCC" or "D") are those with the lowest export flows. This result might be ascribable to the significant sunk costs that firms might have to support in these operating activities, precluding their implementation.

Afterwards, according to the coefficients in Table 5 (Import dataset), we can observe a completely different story. Indeed, we

Table 5
OLS regression model with pooled sample of observations (Import dataset)
Italian manufacturing industry between 2013 and 2019, focus on importing firms (SMEs and big companies).

Variables	(Model A.1)	(Model B.1)	(Model A.2a)	(Model B.2a)	(Model A.2 b)	(Model B.2 b)
	Import market share $_t$ $^\lambda$	Import market share $_t$ $^\lambda$	Import market share $_t$ $^\lambda$	Import market share $_t$ $^\lambda$	Import market share $_t$ $^\lambda$	Import market share $_t$ $^\lambda$
Import market share $_{t-1}$ $^\lambda$	0.780*** (0.004)	0.778*** (0.004)	0.783*** (0.004)	0.781*** (0.004)	0.780*** (0.004)	0.778*** (0.004)
Trade credits $_{t-1}$	−0.312*** (0.089)		−0.245*** (0.079)		−0.304*** (0.089)	
Bank debts $_{t-1}$	−0.145*** (0.045)		−0.076* (0.043)		−0.133*** (0.047)	
Liquidity $_{t-1}$	0.006 (0.009)		0.006 (0.009)		0.006 (0.009)	
CCC $_{t-1}$		0.536*** (0.125)		0.446*** (0.129)		0.506*** (0.118)
B $_{t-1}$		0.648*** (0.106)		0.545*** (0.122)		0.619*** (0.102)
BB $_{t-1}$		0.721*** (0.102)		0.601*** (0.119)		0.690*** (0.099)
BBB $_{t-1}$		0.736*** (0.103)		0.603*** (0.124)		0.707*** (0.101)
A $_{t-1}$		0.728*** (0.105)		0.592*** (0.123)		0.700*** (0.103)
AA $_{t-1}$		0.738*** (0.102)		0.598*** (0.124)		0.708*** (0.101)
AAA $_{t-1}$		0.742*** (0.103)		0.599*** (0.121)		0.713*** (0.101)
Export propensity $_{t-1}$	0.055*** (0.011)	0.056*** (0.011)	0.053*** (0.011)	0.055*** (0.011)	0.055*** (0.011)	0.056*** (0.011)
Operating performance $_{t-1}$	0.001** (0.000)	0.000 (0.000)	0.003*** (0.001)	0.001 (0.001)	0.001*** (0.000)	0.000 (0.000)
Size $_{t-1}$	−0.084*** (0.015)	−0.101*** (0.015)	−0.090*** (0.016)	−0.099*** (0.016)	−0.085*** (0.016)	−0.101*** (0.016)
Seniority $_{t-1}$ $^\lambda$	−0.359*** (0.040)	−0.354*** (0.038)	−0.243*** (0.039)	−0.240*** (0.035)	−0.351*** (0.040)	−0.347*** (0.038)
Per-capita GDP $_{t-1}$ $^\lambda$	−0.355*** (0.091)	−0.346*** (0.091)	−0.316*** (0.102)	−0.312*** (0.103)	−0.345*** (0.091)	−0.337*** (0.092)
Total factor productivity (AV) $_{t-1}$			0.000 (0.002)	0.001 (0.002)		
Total factor productivity (REV) $_{t-1}$					−0.001 (0.002)	−0.001 (0.002)
Constant	3.460*** (0.954)	2.670*** (0.951)	2.754** (1.086)	2.098* (1.095)	3.357*** (0.958)	2.593*** (0.950)
Observations	298,462	313,360	291,642	306,120	297,746	312,571
R-squared	0.761	0.761	0.764	0.764	0.761	0.761
Year (FE)	YES	YES	YES	YES	YES	YES
Firm (FE)	YES	YES	YES	YES	YES	YES
NACE code (FE)	YES	YES	YES	YES	YES	YES
Region (FE)	YES	YES	YES	YES	YES	YES
Country of arrival (FE)	YES	YES	YES	YES	YES	YES

Notes: robust standard errors in parentheses. λ denotes a logarithmic transformation for the variable. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

cannot observe anymore an inverted U-shaped relation but, in this case, a more linear relation between intensity of import flows and their expected risk of being under financial constraints. Accordingly, firms with no difficulties to collect external financial resources on the capital market are those firms with the highest import flows, which might be a consequence of payments dynamics on foreign markets. In other words, importing firms must pay these foreign suppliers with a shorter deadline than the Italian ones, and this is possible if, and only if, importers have access to financial resources to fund their operating activities. Accordingly, we can argue that increasing difficulties in collecting external financial resources, there are lower and lower possibilities to foster the internationalization process through imports, and financial constraints represent a barrier that might prevent the implementation of such strategy. Note that all these coefficients are statistically significant in Tables 4 and 5 (*p-value* < 0.01), highlighting robust evidence on the proposed interpretation. What about the GMM regression models?

According to evidence in Tables 6 and 7, the panel dynamic models emphasize that decreasing the level of financial debts we expect to increase the intensity of import and export flows (*p-value* < 0.01), while the level of trade credits is not statistically significant (*p-value* > 0.5). Looking at the alternative measure, we can confirm the inverted U-shaped relation between intensity of exports and their expected solvency even if, in this case, we have a peak shifted to the right, i.e., with a rating class "A". Moreover, we can confirm a more linear relation between intensity of imports and expected solvency even if, in this case, that relation is less strict than in the OLS models. Taking Models B.1 and the estimated coefficients, Figs. 4 and 5 plot the two observed relations. Note that, the graphical interpretation of the observed relations is coherent with Benito-Osorio et al. (2016) even if, in this case, we adopt a set of dummy variables instead of a quadratic and cubic form of our explanatory variable.

Hence, according to the collected evidence, we cannot reject our three hypotheses. First, we observe that difficulties in collecting financial resources on the capital market negatively affect firms under high financial constraints (H1), which show the lowest level of import and export flows. Therefore, we can sustain that financial constraints distress the internationalization strategies of Italian firms in the EU global value chain. Second, we observe that difficulties in collecting financial resources on the local capital market drives Italian firms with medium risk of being under financial constraints to export their products towards foreign markets and, accordingly, financial constraints pull internationalization strategies of Italian firms in the EU global value chain if we consider their export dynamics (H2). Third, we observe that firms with the highest rating score, which means firms with the lowest risk of being under financial

Table 6

GMM regression model with panel sample of observations (Export dataset)

Italian manufacturing industry between 2013 and 2019, focus on exporting firms (SMEs and big companies).

Variables	(Model A.1)	(Model B.1)	(Model A.2a)	(Model B.2a)	(Model A.2 b)	(Model B.2 b)
	Export market share $_t$ $^\lambda$	Export market share $_t$ $^\lambda$	Export market share $_t$ $^\lambda$	Export market share $_t$ $^\lambda$	Export market share $_t$ $^\lambda$	Export market share $_t$ $^\lambda$
Export market share $_{t-1}$ $^\lambda$	0.169*** (0.018)	0.171*** (0.018)	0.168*** (0.019)	0.169*** (0.018)	0.170*** (0.018)	0.171*** (0.018)
Export market share $_{t-2}$ $^\lambda$	0.027*** (0.006)	0.029*** (0.006)	0.026*** (0.006)	0.028*** (0.006)	0.027*** (0.006)	0.029*** (0.006)
Trade credits $_{t-1}$	−0.020 (0.044)		−0.022 (0.045)		−0.014 (0.045)	
Bank debts $_{t-1}$	−0.161*** (0.034)		−0.148*** (0.034)		−0.162*** (0.034)	
Liquidity $_{t-1}$	−0.020*** (0.005)		−0.014*** (0.005)		−0.017*** (0.005)	
CCC $_{t-1}$		0.483*** (0.070)		0.474*** (0.076)		0.482*** (0.071)
B $_{t-1}$		0.604*** (0.069)		0.587*** (0.073)		0.596*** (0.070)
BB $_{t-1}$		0.643*** (0.069)		0.624*** (0.073)		0.636*** (0.070)
BBB $_{t-1}$		0.658*** (0.069)		0.631*** (0.074)		0.652*** (0.070)
A $_{t-1}$		0.659*** (0.070)		0.632*** (0.074)		0.653*** (0.071)
AA $_{t-1}$		0.642*** (0.071)		0.620*** (0.074)		0.639*** (0.072)
AAA $_{t-1}$		0.639*** (0.072)		0.621*** (0.075)		0.638*** (0.073)
Import propensity $_{t-1}$	0.001 (0.005)	0.002 (0.005)	−0.001 (0.005)	0.001 (0.005)	0.001 (0.005)	0.002 (0.005)
Operating performance $_{t-1}$	0.001*** (0.000)	0.000 (0.001)	0.002*** (0.001)	0.001 (0.001)	0.002*** (0.000)	0.000 (0.001)
Size $_{t-1}$	0.201*** (0.015)	0.168*** (0.014)	0.190*** (0.016)	0.164*** (0.014)	0.201*** (0.015)	0.170*** (0.014)
Seniority $_{t-1}$ $^\lambda$	−0.238*** (0.025)	−0.260*** (0.024)	−0.226*** (0.025)	−0.248*** (0.025)	−0.233*** (0.025)	−0.258*** (0.024)
Per-capita GDP $_{t-1}$ $^\lambda$	−0.498*** (0.055)	−0.428*** (0.054)	−0.494*** (0.056)	−0.425*** (0.055)	−0.488*** (0.055)	−0.417*** (0.054)
Total factor productivity (AV) $_{t-1}$			−0.006*** (0.002)	−0.005*** (0.002)		
Total factor productivity (REV) $_{t-1}$					−0.005*** (0.002)	−0.005*** (0.002)
Constant	−5.001*** (0.669)	−6.029*** (0.662)	−4.977*** (0.681)	−6.028*** (0.676)	−5.027*** (0.670)	−6.063*** (0.664)
Observations	395,584	415,106	387,378	406,306	394,699	414,098
Number of firms	119,861	123,824	118,391	122,233	119,618	123,532

Notes: robust standard errors in parentheses. λ denotes a logarithmic transformation for the variable. ***p < 0.01, **p < 0.05, *p < 0.1.

constraints, are those with the highest levels of imports, suggesting that financial constraints prevent internationalization strategies of Italian firms in the EU global value chain if we consider their import dynamics (H3). These results are coherent with the proposed explanation of different payment dynamics and the related delays across EU national markets, which might create opportunities or barriers to Italian manufacturing firms.

Lastly, the Appendix presents the same model definitions discussed here, but restricting the sample size to the most critical firms, i. e., SMEs. Results of this additional robustness test confirm the same relations observed so far, providing further evidence on the proposed hypotheses (Tables A3, A4, A5 and A6).

The next sub-section highlights some of the other results, emphasizing those related to the internationalization process and the alternative hypothesis (i.e., firms' productivity).

4.2. Discussion (control variables and alternative hypothesis)

As we expected, the lagged dependent variable at time *t-1* is statistically significant (*p-value* < 0.01) and it presents a positive coefficient in all models. Accordingly, companies that invested in the previous year, creating or improving business relations in that foreign market, have a clear incentive to continue that operating activity in the following year, amplifying their import/export flows. However, looking at the GMM model, this impact is less relevant in the lagged dependent variable at time *t-2* since it is statistically significant only in one case (Model B.2a). On the other hand, considering the crossed internationalization (i.e., import propensity if we focus on exports, and export propensity if we focus on imports), OLS models suggest an inverted effect: firms with imports are the those with higher export flows, while firms with exports are the those with lower import flows. These results confirm our thesis that export and import represent two distinct dynamics in the internationalization strategies of manufacturing companies, which might be affected by their financing strategies. Nevertheless, the GMM models do not confirm these coefficients since they do not present statistically significant coefficients (*p-value* > 0.05), and therefore we should interpret with caution this evidence. Finally, taking the per-capita GDPs into account, all models present a negative coefficient that is statistically significant. Accordingly, both export and import flows increase towards the foreign markets whose per-capita GDP is lower (OLS models), and they increase over time if the per-capita GDP decreases further (GMM models). Obviously, this result is clearly due to the targeted markets of these internationalization processes and the type of product and/or semi-finished material that are involved in these transactions.

Considering the alternative hypothesis, there are some additional interesting insights. First, the main hypotheses are confirmed even if we introduce a measure of internal productivity that might affect firms' decision to internationalize. Second, if we consider the
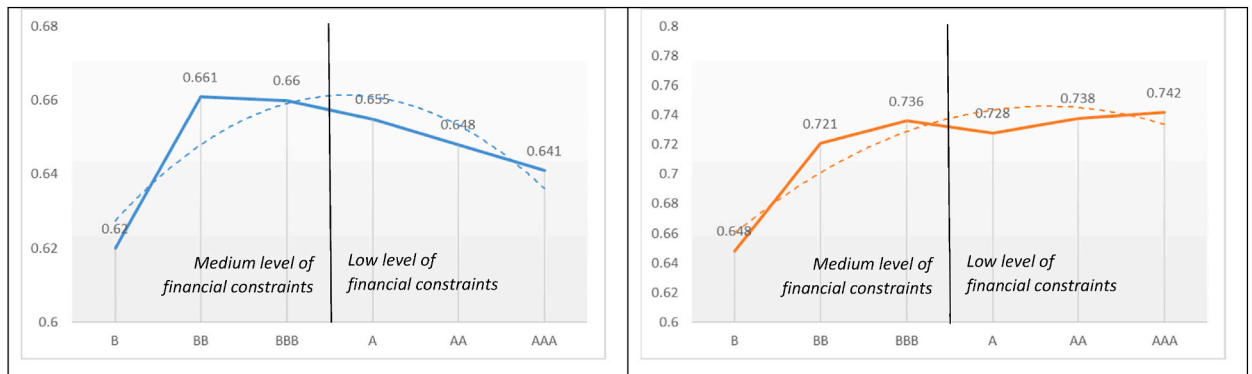
Table 7

GMM regression model with panel sample of observations (Import dataset)

Italian manufacturing industry between 2013 and 2019, focus on importing firms (SMEs and big companies).

Variables	(Model A.1)	(Model B.1)	(Model A.2a)	(Model B.2a)	(Model A.2 b)	(Model B.2 b)
	Import market share $_t$ $^\lambda$	Import market share $_t$ $^\lambda$	Import market share $_t$ $^\lambda$	Import market share $_t$ $^\lambda$	Import market share $_t$ $^\lambda$	Import market share $_t$ $^\lambda$
Import market share $_{t-1}$ $^\lambda$	0.213*** (0.027)	0.222*** (0.027)	0.231*** (0.028)	0.240*** (0.027)	0.215*** (0.027)	0.224*** (0.027)
Import market share $_{t-2}$ $^\lambda$	0.011 (0.008)	0.014* (0.008)	0.016* (0.008)	0.018** (0.008)	0.012 (0.008)	0.014* (0.008)
Trade credits $_{t-1}$	0.001 (0.087)		0.039 (0.087)		0.008 (0.087)	
Bank debts $_{t-1}$	−0.214*** (0.064)		−0.191*** (0.061)		−0.207*** (0.064)	
Liquidity $_{t-1}$	−0.001 (0.010)		−0.002 (0.010)		−0.007 (0.010)	
CCC $_{t-1}$		0.318*** (0.122)		0.296** (0.128)		0.324*** (0.121)
B $_{t-1}$		0.368*** (0.120)		0.308** (0.125)		0.368*** (0.118)
BB $_{t-1}$		0.459*** (0.119)		0.392*** (0.126)		0.458*** (0.118)
BBB $_{t-1}$		0.504*** (0.119)		0.424*** (0.126)		0.500*** (0.118)
A $_{t-1}$		0.494*** (0.120)		0.415*** (0.127)		0.487*** (0.119)
AA $_{t-1}$		0.503*** (0.121)		0.422*** (0.128)		0.493*** (0.120)
AAA $_{t-1}$		0.501*** (0.122)		0.428*** (0.129)		0.490*** (0.121)
Export propensity $_{t-1}$	−0.003 (0.014)	−0.005 (0.014)	−0.006 (0.014)	−0.007 (0.014)	−0.003 (0.014)	−0.005 (0.014)
Operating performance $_{t-1}$	0.002*** (0.001)	0.001** (0.001)	0.002* (0.001)	0.001 (0.001)	0.002*** (0.001)	0.001** (0.001)
Size $_{t-1}$	0.099*** (0.028)	0.054** (0.025)	0.095*** (0.029)	0.053** (0.026)	0.100*** (0.028)	0.053** (0.025)
Seniority $_{t-1}$ $^\lambda$	−0.293*** (0.048)	−0.308*** (0.047)	−0.256*** (0.049)	−0.273*** (0.048)	−0.307*** (0.048)	−0.320*** (0.047)
Per-capita GDP $_{t-1}$ $^\lambda$	−1.480*** (0.133)	−1.410*** (0.129)	−1.494*** (0.135)	−1.437*** (0.131)	−1.476*** (0.133)	−1.405*** (0.129)
Total factor productivity (AV) $_{t-1}$			0.002 (0.002)	0.002 (0.002)		
Total factor productivity (REV) $_{t-1}$					0.006** (0.002)	0.006** (0.002)
Constant	7.707*** (1.438)	7.020*** (1.394)	7.991*** (1.471)	7.497*** (1.422)	7.610*** (1.438)	6.944*** (1.394)
Observations	143,475	151,814	139,396	147,454	143,127	151,420
Number of firms	52,556	55,327	51,575	54,291	52,470	55,231

Notes: robust standard errors in parentheses. λ denotes a logarithmic transformation for the variable. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

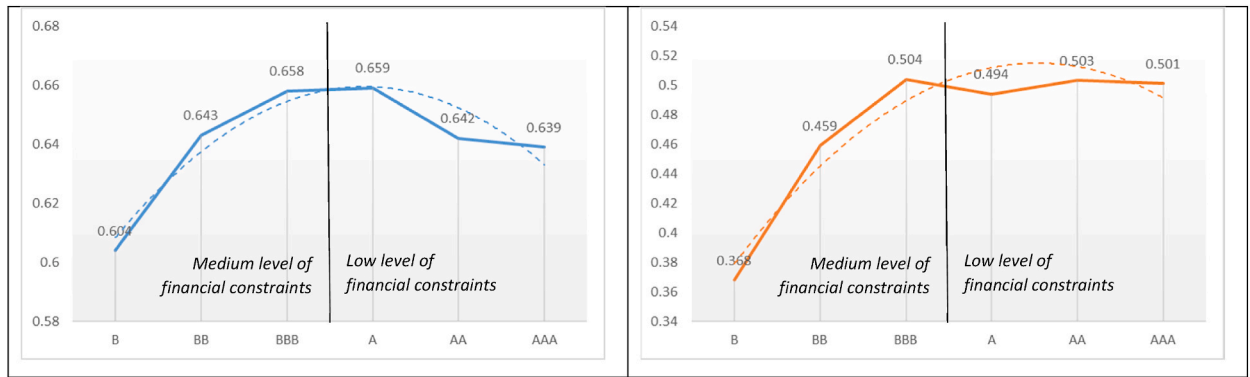**Fig. 4.** Flows according to medium and low risk of being under financial constraints.

Coefficients extracted from Table 4 (blue lines) and Table 5 (orange lines)

Notes: export flows according to the rating score are in blue, while import flows according to the rating score are in orange.

The dotted line denotes the relation, assuming a function of second order. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

export flows in the GMM models, both the TFP scores based on revenues and those based on added values present a negative and statistically significant impact (*p-value* < 0.01). If we consider the import flows in the GMM models, the TFP scores based on revenues present a positive and statistically significant impact (*p-value* < 0.05), while those based on added values are not statistically significant (*p-value* > 0.1). Hence, we can imagine that the most efficient firms (based on their revenues) are those that import more products from foreign markets, which is coherent with the interpretation of the corporate financing strategies introduced in the previous sub-section. On the other hand, the least efficient firms (based on their added values or their revenues) are those that export more products towards foreign markets, which is again perfectly coherent with the interpretation of financing strategies adopted by firms with a medium risk of financial constraints (i.e., classified as B, BB and BBB).

Fig. 5. Flows according to medium and low risk of being under financial constraints.
Coefficients extracted from Table 6 (blue lines) and Table 7 (orange lines)
Notes: export flows according to the rating score are in blue, while import flows according to the rating score are in orange.
The dotted line denotes the relation, assuming a function of second order. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

5. Conclusions

This manuscript investigates the Italian manufacturing industry and its internationalization process between 2013 and 2019, implementing a parallel analysis that focuses on the intensity of import and export flows between Italy and member states of the EU. These flows represent the observations of our empirical investigation, verifying whether financial constraints affect their intensity, and disentangling this impact between import and export.

According to results, we cannot reject the hypotheses that specific internationalization dynamics exist according to the degree of firms' financial constraints, pulling/preventing firms to implement such strategies. Indeed, we observe that firms under high financial constraints have the lowest intensity of import and export flows (i), firms under moderate financial constraints have the highest intensity of export flows (ii), and firms under low financial constraints have the highest intensity of import flows (iii). Hence, considering the heterogeneity of business-to-business payments and the related delay across the EU global value chain, evidence suggests that financial constraints matter in the internationalization process of firms, creating an obstacle or an opportunity according to its degree. On the one hand, export flows might represent an opportunity to quickly raise internal liquidity thanks to prompt payments by foreign clients; while, on the other hand, the same payment dynamics might prevent imports by firms with restricted access to external financial resources. Moreover, considering the insights on export flows, we can argue that firms complement their access to the local capital market with international trade credits, thanks to shorter delay in the payments of credits by their foreign clients.

Even if these results are interesting, there are clear limits that we must acknowledge. First, we interpret the collected evidence recalling the business-to-business payments and the expected delay, assuming that importing and exporting firms adopt the national values as reference thresholds in their transactions. Even if this assumption is quite reasonable, we must acknowledge that more detailed data would be necessary for its validation. Second, we broadly discuss firms' strategy to internationalize their business, focusing on import and export flows, and we do not enter in the details of such strategies. For instance, we do not distinguish among alternative commercialization strategies and types of products, which might affect firms' dependence on external resources (Symeonidou et al., 2017). Hence, the interpretation of our results must account the presence of factors that we cannot control, suggesting the adoption of an appropriate level of caution. Third, this work investigates two key proxies of internationalization (i.e., intensity and propensity), restricting the sample under investigation to the European Union GVC. Even if we adopt country fixed effects in the OLS models, we do not focus on the last proxy, i.e., the diversity (Vanninen et al., 2017; Miller et al., 2016). Obviously, this choice is due to the necessity of maintaining an equilibrium between the proposed targets and the readability of this work, postponing to a new investigation the possibility of a comparative analysis within the EU and/or with other extra-EU countries.

Practical implications for firms characterized by a medium level of financial constraints concern business strategies with a diversification of the markets where clients and suppliers are located. Indeed, according to our evidence and assuming a market used to have very high delay in the due payments (e.g., Italy), we can imagine a successful strategy based on local suppliers and foreign clients. The former businesses might accept high levels of delay for the payment of raw materials and/or semi-finished products that we purchase, while the latter ones might accept low levels of delay for the payment of finished products that we supply. Obviously, the trade balance and the related internal liquidity would be affected positively by such strategy even if, considering the initial investments necessary to create international business relations, only firms with a medium level of financial constraints would implement.

Obviously, there are also some important policy implications. Our findings may support the adoption of interventions aimed at sustaining the internationalization process of manufacturing companies. This would be extremely relevant in case of areas and/or industrial sectors with firms under high financial constraints, i.e., when restrictions to the capital market represent a barrier to this strategy. For instance, the policy makers might adopt a scheme of public guarantees to support access to the capital market, creating ad-hoc interventions for the weakest firms in the internationalization process (Calabrese et al., 2024). Afterwards, according to EU

directive 2011/7/UE and coherently with the current debate on the SME Relief Package (European Commission, 2023), another implication might concern the payment dynamics and interventions to decrease the related delay, with a particular attention to the public institutions (Checcherita-Westphal et al., 2016).

Considering the limits of this investigation, our agenda concerns the validation of the main assumptions here formulated to explain the collected results. For instance, we assume the presence of national thresholds as reference delays in these international transactions and, if data will become available, we plan to validate this assumption and to shed new light on this topic. Moreover, we plan to investigate further these dynamics with respect to the third measure of internationalization, i.e., diversity. We expect to explore the heterogeneity of import and export flows among EU and non-EU member states, comparing a global market with no restriction (i.e., the EU one) with a market characterized by alternative international trade agreements (e.g., the North American and/or the Asiatic one). Lastly, we plan further investigations on the substitution effect between operating debts and financial debts, as well as the role of positive signals within the GVC. We imagine that if commercial (foreign) partners trust these businesses according to their information, financial (local) institutions could also trust them, granting access to their financial resources. Accordingly, we plan to investigate whether international trade credits might support access to local bank debts, exploring the relation between the institutions on the local capital market and foreign operating partners on the GVC.

CRediT authorship contribution statement

G. Falavigna: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **V. Giannini:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. **R. Ippoliti:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing.

Declaration of competing interest

On behalf of my co-authors, I declare there are no financial and personal relationships with other people or organizations that could inappropriately influence (bias) this work.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.inteco.2024.100510.

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