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The Distorted Effect of Financial Development on International Trade Flows

Antoine Berthou

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THE DISTORTED EFFECT OF FINANCIAL DEVELOPMENT ON INTERNATIONAL TRADE FLOWS

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NON-TECHNICAL SUMMARY

Financial development is a major determinant of exports volume and specialization patterns. Countries with better financial institutions export more and specialize in industries that are more financially intensive. The real effects of finance are also usually considered as being conditioned by the level of economic development. Hence, improving domestic financing conditions is usually expected to benefit disproportionately more, in terms of exports, to countries where financial institutions are poorly developed and financial constraints more binding for starting exporting. This paper investigates how finance affects trade at different stages of economic development. The analysis first disentangles the effects of financial development on the extensive margin (number of trade partners) and the intensive margin (value exported to each partner) of countries' exports. This enables to capture the effects of finance on the geographical diversification of exports. Second, the methodology identifies the effects of financial development on the specialization patterns for countries that differ in the initial development of their financial institutions. Results show that financial development has only a small effect on the geographical diversification of exports. The effect of financial development on exports in financially intensive industries is the highest in middle income economies, and low otherwise. This contradicts the traditional expectation that financial development has the largest effect in countries where financial constraints are the most binding.

I start by developing a model of trade in partial equilibrium, where firms are liquidity constrained and productivity is heterogeneously distributed across firms. Financial development is positively related to the productivity of exporters. It increases both the probability that the country is exporting (the extensive margin) and the aggregate volume of exports to the trade partner (the intensive margin), especially in industries that rely more on external finance. The model predicts that the marginal effect of financial development is positively related to the initial development of financial institutions. The intuition is that most firms have a low productivity level, and these firms require a high level of financial development to start exporting. When financial institutions are poorly developed, financial development enables only few firms to start exporting, with only a small effect on aggregate exports. When financial institutions are better developed, financial development enables more firms to start exporting, and has a larger effect on aggregate exports. The prediction that is delivered by the model therefore contradicts the traditional expectation that the marginal effect of finance decreases for higher initial development of financial institutions.

The empirical strategy is implemented using a sample of 50 exporting countries, 85 importing countries, 26 ISIC industries over the period 1990-2000. First, estimations confirm that financial development has a positive effect on both the extensive and intensive margins of countries' exports. However, more than 60% of the effect channels through the intensive margin. Second, results show that the effect of financial development on exports is closely related to the initial development of financial institutions. (i) In industries where firms rely intensively on external finance, the effect of financial development is the highest in economies characterized by an intermediate development of financial institutions, and the lowest in countries with poor or advanced financial institutions. This results in a hump-shaped relation between the marginal effect of finance on exports and the initial development of financial institutions. (ii) In industries where firms are less dependent from external finance, the marginal effect of financial development on exports is strictly decreasing for higher initial levels of development of financial institutions. Hence, while we traditionally would expect a large effect of financial development on exports in countries where financial constraints are binding, these results suggest that this is not the case when financial institutions are underdeveloped.

ABSTRACT

This paper investigates the effects of financial development on the intensive and extensive margins of countries exports, at different stages of economic development. The paper develops a partial equilibrium model with monopolistic competition. In this model, firms are heterogeneous in terms of productivity and have access to external liquidity. The effect of financial development on the intensive and extensive margins of countries exports is predicted to be positive, especially in sectors with a higher demand for external finance. In countries with poor financial institutions though, only the most productive firms benefit from an increased access to financial resources and start exporting, with little effect on aggregate exports. The effect of financial development on exports is therefore higher for a better initial development of financial institutions. The empirical analysis confirms that financial development promotes both the intensive and extensive margins of countries' exports. This is more the case in industries with a higher demand for external finance. Though, more than 60% of the effect of financial development channels through the intensive margin. In industries where the demand for external finance is high, the effect of financial development is the highest in economies characterized by an intermediate development of financial institutions, and the lowest in countries with poor or advanced financial institutions. This contradicts the traditional expectation that financial development benefits more in terms of exports to countries where financial constraints are the most binding.

LES EFFETS DU DÉVELOPPEMENT FINANCIER SUR LES MARGES DU COMMERCE INTERNATIONAL

Antoine Berthou

RÉSUMÉ NON TECHNIQUE

Les contraintes financières auxquelles sont soumises les entreprises sont traditionnellement considérées comme un obstacle majeur aux échanges internationaux. Ainsi, les études empiriques ont mis en évidence un effet positif du niveau de développement financier sur les exportations. Il est aussi généralement attendu que les effets du développement financier sur la croissance ou les exportations sont les plus importants dans les pays où les contraintes financières soient les plus répandues.

Cet article analyse les effets du développement financier sur les flux d'exportation des pays, à différents stades de développement économique. Le développement financier est généralement mesuré comme le crédit distribué au secteur privé rapporté au Produit Intérieur Brut. L'analyse sépare les effets du développement financier sur la marge extensive (nombre de partenaires commerciaux) et sur la marge intensive (valeur des exportions vers chaque partenaire), ce qui permet de mettre en évidence les effets sur la diversification géographique des exportations. La méthodologie utilisée permet aussi d'identifier les effets du développement financier sur les exportations, pour des pays caractérisés initialement par différents niveaux de développement de leurs institutions financières.

La première partie de l'article développe un modèle de commerce international en équilibre partiel, dans un cadre de concurrence monopolistique. Les firmes sont hétérogènes en termes de productivité, et ont accès à des ressources financières externes. Le modèle prédit un effet positif du niveau de développement financier sur les deux marges des exportations du pays, en particulier dans les secteurs utilisant davantage de financements externes. Dans les économies sous-développées sur le plan financier, le modèle prédit un effet limité du développement financier sur les exportations. En effet, seules quelques firmes, très productives, sont en mesure de profiter d'un assouplissement des conditions de financement pour commencer à exporter. L'effet agrégé sur les exportations reste donc limité. Dans la seconde partie de l'article, les estimations économétriques permettent de tester les prédictions du modèle. Les tests empiriques sont opérés à partir de données de commerce international pour 50 pays exportateurs, 85 pays importateurs, 26 industries manufacturières, sur la période 1990-2000. Pour l'ensemble des pays exportateurs utilisés dans l'échantillon, les données de développement financier sont disponibles sur l'ensemble de la période, permettant ainsi de construire une mesure de qualité des institutions financières sur le début de l'échantillon. Les résultats des tests mettent en évidence un effet limité du développement financier sur la diversification géographique des exportations, la majeure partie de l'effet transitant par un accroissement des exportations vers chaque partenaire. Ainsi, plus de 60% de l'effet

total du développement financier sur les exportations agrégées transite par la marge intensive. Dans les secteurs très utilisateurs de ressources financières externes, les effets du développement financier sont les plus importants pour les pays à revenu intermédiaire, et plus faibles pour les pays financièrement sous-développés, ou disposant d'institutions financières très avancées. Ce résultat contredit l'idée selon laquelle un accroissement du niveau de développement financier bénéficie davantage, en termes d'exportations, aux pays au sein desquels les contraintes financières sont les plus fortes.

RÉSUMÉ COURT

This paper investigates the effects of financial development on the intensive and extensive margins of countries exports, at different stages of economic development. The paper develops a partial equilibrium model with monopolistic competition. In this model, firms are heterogeneous in terms of productivity and have access to external liquidity. The effect of financial development on the intensive and extensive margins of countries exports is predicted to be positive, especially in sectors with a higher demand for external finance. In countries with poor financial institutions though, only the most productive firms benefit from an increased access to financial resources and start exporting, with little effect on aggregate exports. The effect of financial development on exports is therefore higher for a better initial development of financial institutions. The empirical analysis confirms that financial development promotes both the intensive and extensive margins of countries' exports. This is more the case in industries with a higher demand for external finance. Though, more than 60% of the effect of financial development channels through the intensive margin. In industries where the demand for external finance is high, the effect of financial development is the highest in economies characterized by an intermediate development of financial institutions, and the lowest in countries with poor or advanced financial institutions. This contradicts the traditional expectation that financial development benefits more in terms of exports to countries where financial constraints are the most binding.

THE DISTORTED EFFECT OF FINANCIAL DEVELOPMENT ON INTERNATIONAL TRADE FLOWS [1]

Antoine Berthou [*]

1. INTRODUCTION

Financial development is a major determinant of exports volume and specialization patterns. Countries with better financial institutions export more and specialize in industries that are more financially intensive. The real effects of finance are also usually considered as being conditioned by the level of economic development. For instance, the World Business Environment Survey (2000) reports that more than half of firms surveyed in Senegal consider access to finance as a major obstacle for exporting, against less than 4% in the United States (see the Table A1 in Appendix). Hence, improving domestic financing conditions is usually expected to benefit disproportionately more, in terms of exports, to countries where financial institutions are poorly developed and financial constraints more binding for starting exporting.

This paper investigates how finance affects trade at different stages of economic development. The analysis first disentangles the effects of financial development on the extensive margin (number of trade partners) and the intensive margin (value exported to each partner) of countries' exports. This enables to capture the effects of finance on the geographical diversification of exports. Second, the methodology identifies the effects of financial development on the specialization patterns for countries that differ in the initial development of their financial institutions. Results show that financial development has only a small effect on the geographical diversification of exports. The effect of financial development on exports in financially intensive industries is the highest in middle income economies, and low otherwise. In countries where financial institutions are underdeveloped, the effect of financial development on exports is low as compared to what would be traditionally expected.

I start by developing a model of trade in partial equilibrium, where firms are liquidity constrained and productivity is heterogeneously distributed across firms. Financial development is positively related to the productivity of exporters. It increases both the probability that the

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country is exporting (the extensive margin) and the aggregate volume of exports to the trade partner (the intensive margin), especially in industries that rely more on external finance. The model predicts that the marginal effect of financial development is positively related to the initial development of financial institutions. The intuition is that most firms have a low productivity level, and these firms require a high level of financial development to start exporting. When financial institutions are poorly developed, financial development enables only few firms to start exporting, with only a small effect on aggregate exports. When financial institutions are better developed, financial development enables more firms to start exporting, and has a larger effect on aggregate exports. The prediction that is delivered by the model therefore contradicts the traditional expectation that the marginal effect of finance decreases for higher initial development of financial institutions.

The empirical strategy is implemented using a sample of 50 exporting countries, 85 importing countries, 26 ISIC industries over the period 1990-2000. First, estimations confirm that financial development has a positive effect on both the extensive and intensive margins of countries' exports. However, more than 60% of the effect channels through the intensive margin. Second, results show that the effect of financial development on exports is closely related to the initial development of financial institutions. (i) In industries where firms rely intensively on external finance, the effect of financial development is the highest in economies characterized by an intermediate development of financial institutions, and the lowest in countries with poor or advanced financial institutions. This results in a hump-shaped relation between the marginal effect of finance on exports and the initial development of financial institutions. (ii) In industries where firms are less dependent from external finance, the marginal effect of financial development on exports is strictly decreasing for higher initial levels of development of financial institutions. This contradicts the traditional expectation that financial development has the largest effect in countries where financial constraints are the most binding.

This paper follows recent articles that have provided theoretical foundations to the finance-trade link. Limitations in the access to finance is likely to influence firm's entry decision. Chaney (2005) develops a model of trade *à la* Melitz (2003), where firms are exogenously endowed with a liquidity. Results indicate that liquidity constraints prevent a subset of - productive - firms to enter the foreign market. Manova (2008) extends the Helpman et al. (2007) paper and and shows that improvements in financial contractibility increases the number of exporting firms, as well as the volume of exports by each individual firm. In the first part of this paper (Section 2), the model predicts a positive effect of financial development on aggregate exports (due to both the intensive and extensive margins of countries' exports). Most

importantly, the size of the effect is predicted to be closely related to the initial development of financial institutions.

Empirical investigations in the literature have confirmed that finance matters for the decision to export of firms (Berman and Héricourt, 2010; Muûls, 2008; Greenaway et al., 2007) and for the volume of aggregate exports (Beck, 2002, 2003; Hur et al., 2006; Manova, 2008). One concern raised by this empirical literature is the endogeneity of financial development and the causal link between trade and finance. In Sections 3 and 4 of this paper, the empirical strategy that is developed to test the predictions from the model ultimately addresses the endogeneity issue by adapting the methodology proposed by Rajan and Zingales (1998) to a panel estimation strategy. In our preferred specification, financial development is interacted with an industry-level measure of external dependence, while financial development and all time-varying country-specific factors are captured by a set of exporter-year fixed effects. All the identification strategy therefore relies on the effect of financial development across industries characterized by their degree of external dependence. Results are robust to this sensitivity analysis.

This paper also follows a broader (and older) literature that relates finance and economic growth. Levine (1997, 2005) in particular reviews the theoretical and empirical literature, and provides strong evidence of a causal link between finance and growth. More directly related to this paper, Rioja and Valev (2004), show that the effect of financial development on economic growth is non-linear, and can be reduced in countries with poor financial institutions. I provide such evidence for international trade using panel data. Importantly, empirical results show that this non-linearity is concentrated among industries where firms rely more on external finance. The effect of financial development is found to be non-linear for both the intensive and extensive margins of countries' exports. Finally, results are independent of the overall quality of institutions in the exporting country.

Results provided in this article have important policy implications. First, trade and finance are more closely related in economies with an intermediate development of financial institutions. This implies that banking and financial crises are expected to have a more negative impact on trade in middle income economies, while negative shocks on financial development are expected to affect exports to a lower extent in advanced economies. Second, increased access to financial resources has little effect on specialization patterns in countries with poor financial institutions.

The paper proceeds as follows. Section 2 develops a simple theory with heterogenous firms facing liquidity constraints. Empirical predictions are derived from the model. Section 3 derives a testable gravity equation from the model, presents the econometric methodology and the data. Section 4 provides estimation results. Finally, Section 5 concludes.

2. THEORY

2.1. Set Up of the Model

This section develops a simple model of trade *à la* Melitz (2003), with partial equilibrium. There are two countries, Home country i and Foreign country j, and K sectors with differentiated varieties. The utility function of consumers located in Foreign country j takes the following form:

$$U_j = \prod_{k=1}^{K} \left(\int_{\delta \in \Delta_{kj}} q_{kj}(\delta)^{\rho_k} d\delta \right)^{1/\rho_k} \quad \text{with } 0 < \rho_k < 1 \tag{1}$$

Δ_{kj} is the set of varieties that are consumed within industry k in country j. $q_{kj}(\delta)$ is the quantity of each variety (δ) that is consumed in country j. $\rho_k = \frac{\sigma_k - 1}{\sigma_k}$ is a measure of product differentiation between varieties within industry k, with σ_k the elasticity of substitution. For clarity purpose, the subscript k is not reported in the following equations of the model, but the results apply for each sector.

Producers. Each firm produces its own variety under increasing returns to scale. f_{ij} is the fixed cost associated with production in country i and export to country j, expressed in terms of units of labor. τ_{ij} is the variable trade cost, that is modeled as an "iceberg" trade cost ($\tau_{ij} > 1$). Accordingly, $\tau_{ij} q_{ij}$ units of each variety have to be exported, so that q_{ij} units are finally consumed in the foreign country. Finally, firms are heterogenous in terms of their productivity within each sector, as in Melitz (2003): each firm draws a random productivity $\frac{1}{a}$, where a is the number of workers required to produce one unit of the specific variety. I follow Helpman et al. (2007) and assume that productivity $\frac{1}{a}$ is Pareto distributed across firms, with truncation $[\frac{1}{a_H}, \frac{1}{a_L}]$. $a_L < a_H$ are the lower and upper bounds of the distribution regarding the unit labor cost. This implies that the cumulative distribution of productivity takes the form $G(a) = (a^\gamma - a_L^\gamma)/(a_H^\gamma - a_L^\gamma)$ with $\gamma > \sigma - 1$.[1] γ Corresponds to the degree of heterogeneity of firms within each sector; a higher γ is associated with a lower heterogeneity.

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1. This ensures that, in equilibrium, the size distribution of firms has a finite mean (see Chaney (2008)).

Each price is expressed in terms of units of labor, which is used as the numeraire. For simplicity, $w_i = w_j = 1$ in each country. The cost of producing goods in i and shipping q_{ij} units to country j, for firm with productivity $1/a$, takes the form:

$$c_{ij}(q_{ij}) = a\tau_{ij}q_{ij} + F_{ij} \tag{2}$$

The production price p_i corresponds to a constant markup over marginal cost:

$$p_i(a) = \frac{a}{\rho} \tag{3}$$

Demand. Consumers pay the CIF price $p_{ij} = \tau_{ij}p_i$. Total demand for manufacturing goods in country j is $Y_j = L_j$. The value of demand addressed from country j to each individual variety can be expressed as:

$$x_{ij}(a) = p_{ij}(a)q_{ij}(a) = Y_j \left(\frac{p_{ij}(a)}{P_j}\right)^{1-\sigma} \tag{4}$$

with

$$P_j = \left(N_i \int_{a_L}^{a_{ij}} p_{ij}(a)^{1-\sigma}dG(a) + N_j \int_{a_L}^{a_H} p_{jj}(a)^{1-\sigma}dG(a)\right)^{\frac{1}{1-\sigma}} \tag{5}$$

Where P_j is the price index in country j. N_i and N_j correspond to the number of entrepreneurs in the Home and Foreign countries. In the Home country, only firms with productivity above $\frac{1}{a_{ij}}$ can profitably export, and enter in the price index of country j.

2.2. Liquidity constraints

In Melitz (2003) or Chaney (2008), firms can profitably export as soon as their operating profit covers the fixed entry cost. However, firms often make use of external finance before they start new projects. Rajan and Zingales (1998) show that the demand for external finance, or "external dependence" can differ a lot across sectors. These differences can be explained by the initial size of projects that differ a lot across sectors for technological reasons. Also, a mismatch between the "gestation period" and the "cash harvest period" generates incentives to borrow from financial intermediaries to pay the fixed cost. Table A5 in Appendix provides a measure of external dependence provided by Braun and Larrain (2005), using the methodology of Rajan and Zingales (1998). Data show a large heterogeneity regarding external dependence

across sectors.

In this model, firms are allowed to make use of external liquidity to finance the fixed cost of export. I follow Chaney (2005) in assuming that, in the absence of financial market imperfections, each firm inherits an exogenous amount of liquidity Ω. Each firm relies on this external liquidity (i.e. a liquidity that is not financed with the cash flow from operations) to pay the fixed entry cost and export. Hence, Ω represents the firm level of external dependence. [1] In the presence of financial market imperfections, the firm receives a liquidity that equals $\theta_i \Omega$, where $1 < \theta_i <$ represents the level of financial development in country i. The higher the level of financial development, the lower the cost of financial transactions, and the larger the liquidity that the firm ultimately receives.

Firms use their external liquidity to pay the fixed entry cost F_{ij} and start exporting to country j. The "net" fixed cost of exports that enters the profit function ($\bar{F}_{ij}$) can be expressed as follows: [2]

$$\bar{F}_{ij} = F_{ij} - \theta_i \Omega \tag{6}$$

F_{ij} is the fixed cost of exports, and $\bar{F}_{ij} > 0$ represents the proportion of the fixed cost that has to be covered with cash flow from export activity. [3]

2.3. Firm Selection

Profits. Using Equations (4) and (6), the following expression of profit applies for a firm wishing to export to country j:

$$\pi_{ij}(a) = (1 - \rho) \left(\frac{\tau_{ij} a}{\rho P_j} \right)^{1-\sigma} Y_j - \bar{F}_{ij} \tag{7}$$

Productivity cutoff. Firms in Home country i export to Foreign country j only if they make a positive profit. This condition enables to find the productivity cutoff (a_{ij}), i.e. the level of

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1. In the empirical part of the paper, the industry-specific component of the external dependence is specifically controlled for, using data computed by Braun and Larrain (2005).

2. We assume that $\theta_i \Omega \leq F_{ij}$, so that the liquidity can cover at most the fixed entry cost.

3. This simple way to model liquidity constraints does not require to specifically model a financial sector. In this specific framework, the firm does not have to repay anything at the end of the day, and the inherited liquidity will appear like a gift in the profit function. Alternatively, the demand for external finance may be modeled as an amount of borrowing, subject to an interest rate. We would end up with a very similar functional form, and results would remain qualitatively unchanged. Let B be the desired amount of borrowing by the firm, and rB the amount of repayments with $r > 1$. In this case, $B(1 - r) < 0$ would enter the profit function, and we would obtain similar predictions.

productivity below which firms make a negative profit if they serve country j:

$$\frac{1}{a_{ij}} = \left(\frac{F_{ij} - \theta_i\Omega}{(1-\rho)Y_j}\right)^{\frac{1}{\sigma-1}} \frac{\tau_{ij}}{\rho P_j} \tag{8}$$

Hence, firms enter the export market if and only if $\frac{1}{a} > \frac{1}{a_{ij}}$, where $\frac{1}{a_{ij}}$ is the productivity cutoff obtained from condition $\pi_{ij}(a) \geq 0$. The elasticity of the productivity cutoff with respect to financial development θ_i gives the following expression:

$$\frac{\partial(\frac{1}{a_{ij}})}{\partial\theta_i} \frac{\theta_i}{\frac{1}{a_{ij}}} = \frac{\Omega\theta_i}{(1-\sigma)\bar{F}_{ij}} < 0 \tag{9}$$

The productivity cutoff $(\frac{1}{a_{ij}})$ is negatively related to financial development. The elasticity of the productivity cutoff, with respect to θ_i, increases with the demand for external finance Ω. Hence, a higher level of financial development (θ_i) enables more firms to export, especially when external dependence is high.

Considering trade between Home country i and foreign country j, the value of trade is positive if and only if the most productive firm in i has a productivity level above the productivity cutoff, i.e. $\frac{1}{a_{ij}} \leq \frac{1}{a_L}$. If this condition is not verified, no trading activity can be registered between countries i and j. Since financial development decreases the productivity threshold, the following statement can be proposed for the empirical section:

Proposition 1. *Financial development (θ_i) increases the probability that two countries are trade partners. This is even more the case when firms rely more on external finance (higher Ω).*

2.4. Aggregate Exports

The total value of exports is given by the following expression:

$$T_{ij} = \int_{a_L}^{a_{ij}} N_i x_{ij}(a)dG(a) \tag{10}$$

Where N_i is the number of entrepreneurs in Home country i, which is fixed. x_{ij} is the volume of exports to country j by each firm located in country i. Since N_i is proportional to the size of Home country, we assume $N_i = Y_i$ where Y_i is the total production of the industry in the

home country. Using Equations (3) and (4), together with the cumulative distribution function of productivity, $G(a)$, the total value of exports can be expressed as follows:

$$T_{ij} = \begin{cases} Y_i \left(\frac{\tau_{ij}}{\rho P_j} \right)^{1-\sigma} Y_j \frac{\gamma a_{ij}^{\gamma - \sigma + 1}}{(a_H^\gamma - a_L^\gamma)(\gamma - \sigma + 1)} & \text{if } \frac{1}{a_L} \geq \frac{1}{a_{ij}}; \\ 0 & \text{otherwise.} \end{cases} \tag{11}$$

Using the expression for the productivity cutoff in Equation (8), T_{ij} takes the following form: [1]

$$T_{ij} = \begin{cases} \lambda_1 Y_i Y_j^{\frac{\gamma}{\sigma - 1}} \left(\frac{\tau_{ij}}{P_j} \right)^{-\gamma} \bar{F}_{ij}^{\frac{\gamma - \sigma + 1}{1 - \sigma}} & \text{if } \frac{1}{a_L} \geq \frac{1}{a_{ij}}; \\ 0 & \text{otherwise.} \end{cases} \tag{12}$$

The elasticity (ξ) of total exports (T_{ij}) with respect to financial development (θ_i) takes the following form :

$$\xi = \frac{\partial T_{ij}}{\partial \theta_i} \frac{\theta_i}{T_{ij}} = \frac{\gamma - \sigma + 1}{\sigma - 1} \frac{\Omega}{F_{ij} - \theta_i \Omega} > 0 \tag{13}$$

Bilateral exports between between countries i and j are positively related to θ_i. Importantly, the elasticity ξ is more positive when the demand for external finance (Ω) is higher. This implies that the effect of financial development on bilateral exports is larger when the firm level of external dependence (Ω) is higher. This is a result of the expression of the profit function. A higher degree of external dependence implies that the profit of each firm is more closely related to the level of financial development. Hence, as soon as financial development increases, new firms start exporting, especially those that are more external dependent.

Proposition 2. *Financial development (θ_i) increases the value of exports between trade partners, especially in industries where firms have a higher demand for external finance (higher Ω).*

The elasticity of bilateral exports with respect to financial development, ξ, is also conditioned by the initial development of financial institutions (θ_i):

$$\frac{\partial \xi}{\partial \theta_i} = \frac{\gamma - \sigma + 1}{\sigma - 1} \frac{\Omega^2}{\bar{F}_{ij}^2} > 0 \tag{14}$$

For larger values of θ_i, the elasticity of bilateral exports with respect to financial development is more positive. This implies that the relation between financial development and bilateral

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1. with $\lambda_1 = \left(\frac{1}{\alpha} \right)^{1-\sigma} \left(\frac{1}{\rho} \right)^{\gamma - \sigma + 1} \frac{\gamma}{(a_H^\gamma - a_L^\gamma)(\gamma - \sigma + 1)} (1 - \rho)^{\frac{\gamma - \sigma + 1}{\sigma - 1}} > 0$ is a constant.

exports is convex: the effect of financial development on exports is increasing with θ_i. This result can be explained by the particular shape of the distribution of productivity across firms in the model, which follows a Pareto Law. Very few firms have a high level of productivity, while most firms are concentrated around low levels of productivity. As soon as financial development increases, more and more firms start exporting, which results in a gradual expansion of exports. When θ_i is low, only few firms can profitably start exporting consecutive to an increase of financial development, and the effect on aggregate exports is low.

It is also clear from Equation (14) that $\frac{\partial \xi}{\partial \theta_i}$ is more positive for higher values of Ω: the relation between financial development and the bilateral value of exports is more convex when firms are more external dependent (Ω is higher). When external dependence is low, the non-linearity is less pronounced. When external dependence is high, the effect of financial development on the value of bilateral exports is highly non-linear and strictly increasing with θ_i. This pattern is related to the fact that in industries where firms rely more on external finance, a majority of firms require a high level of financial development before they can profitably export. This is less the case when firms are less external dependent.

Proposition 3. *The effect of financial development on the value of bilateral exports is increasing with the initial development of financial institutions. This non-linearity is more pronounced in industries where firms have a higher demand for external finance.*

2.5.   Additional Sources of Non-Linearity

In a neoclassical framework, the effect of financial development on real economic variables is expected to be lower when financial institutions are initially more developed. We might therefore expect that this non-linear pattern is also true with respect to the intensive and extensive margins of countries' exports. The predictions from the model developed above contradicts this traditional view.

Other theoretical frameworks are consistent with the prediction that the effect of financial development on exports can be low in countries with poor financial institutions. Acemoglu and Zilibotti (1997) develop a theory of growth where risk-averse agents want to diversify their portfolio by selecting between risky projects characterized by a high return and a high start-up cost, and projects with a low start-up cost and a low return. The selection of the low-return projects, characterized by a lower size, enables a better risk diversification in an economy where capital is scarce. This results in a lower growth rate during the period of "primitive accumulation" of capital.

Accordingly, we may also expect that countries with poor financial institutions specialize in industries where firms have a low demand for external finance, allowing for better risk diversification. Such specialization would result in a low marginal effect of financial development on exports in industries with a high external dependence. This prediction is similar to the prediction from the model presented in this paper, and it applies to both the intensive and extensive margins of countries' exports.

To summarize, the effect of financial development on exports is expected to be low in countries with poor financial institutions. This contrasts with the neoclassical theory where it is expected to be the highest in these countries.

3.   EMPIRICAL METHODOLOGY AND DATA

This Section starts with a presentation of the empirical methodology and then presents the data that are used for the estimations.

3.1.   Empirical Methodology

3.1.1.   *Extensive and intensive margins*

Equation (12) from the theoretical section can be log-linearized to get a testable gravity equation :

$$\log(T_{ij}) = \log(\lambda_2) + \log(Y_i) + \left(\frac{\gamma}{\sigma - 1}\right)\log(Y_j) + \gamma \log(P_j) - \gamma \log(\tau_{ij})$$

$$- \left(\frac{\gamma - \sigma + 1}{\sigma - 1}\right)\log(\bar{F}_{ij}(\theta_i)) \tag{15}$$

Where $\bar{F}_{ij}(\theta_i) = F_{ij} - \theta_i\Omega$ is a linear function of financial development θ_i. The gravity equation can be estimated in two steps, using a Probit estimator for the probability of exports (extensive margin), and a Random Effect GLS estimator over positive values of trade for the value of bilateral exports.

The two equations are estimated using bilateral export flows measured at the level of the industry. Production is also measured at the level of the industry. The estimated equation additionally controls for the evolution of prices in the exporting country (in the model, wages

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were normalized to unity and therefore do not appear in the equations). Bilateral distance is used as a proxy for the variable trade costs. We use a measure of financial development FD_i as a proxy for $\bar{F}_{ij}(\theta_i)$: an increase of financial development decreases the fixed entry cost. Finally, the estimated equation includes a vector of controls for exporting country i, destination country j and the pair of the two countries ij. These control variables are detailed in the data section. The selection of countries into trade is estimated using a Probit estimator:

$$\Pr(T_{ijkt} > 0) = \beta_0 + \beta_1 \log(Y_{ikt}) + \beta_2 \log(Y_{jkt}) + \beta_3 \log(P_{it}) + \beta_4 \log(P_{jt}) + \beta_5 \log(D_{ij})$$

$$+\beta_6 FD_{it} + \beta_7(FD_{it} \times external_k) + \beta_8 C_{ij} + \beta_9 C_i + \beta_{10}C_j + \mu_t + \mu_k + \nu_{ijkt} \qquad (16)$$

Where T_{ijkt} is the value of bilateral exports when we observe a positive flow of exports between Home and Foreign countries in industry k. The left hand side variable therefore takes the value of 1 if country i exports to country j in industry k at time t, and 0 otherwise. Y_{ikt} and Y_{jkt} are the productions in countries i and j and industry k at time t. P_{it} and P_{jt} are the price indexes of the two countries, in US dollars, and capture variations in the real exchange rate. D_{ij} is the bilateral distance. FD_{it} is the level of financial development in the economy at time t. [1] $external_k$ is the demand for external finance at the sectoral level, and is used as a proxy for Ω. We therefore neglect the distribution of Ω between firms within sectors, and only measure the average level of external dependence for each sector. Industry fixed effects are used in the estimation and control for the differences in the pattern of distribution of external dependence within industries. $FD_{it} \times external_k$ is the interaction term between financial development and industry specific need for external finance. C_{ij}, C_i and C_j are a set of controls for country pairs, exporting and importing countries. μ_t and μ_k are the time and industry fixed effects, ν_{ijkt} is the error term.

The second step estimation is carried out using a Random Effect GLS estimator on positive values of trade:

$$\log(T_{ijkt}) = \alpha_0 + \alpha_1 \log(Y_{ikt}) + \alpha_2 \log(Y_{jkt}) + \alpha_3 \log(P_{it}) + \alpha_4 \log(P_{jt}) + \alpha_5 \log(D_{ij})$$

$$+\alpha_6 FD_{it} + \alpha_7(FD_{it} \times external_k) + \alpha_8 C_{ij} + \alpha_9 C_i + \alpha_{10}C_j + \eta_k + \eta_t + \epsilon_{ijkt} \quad \text{if} \quad T_{ijk} > 0 \ (17)$$

Where T_{ijkt} is the value of exports from i to j in industry k at year t and ϵ_{ijkt} the error term.

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1. Measures of financial development are expressed in percentage; we therefore use it without logs since the coefficient can directly be interpreted as an elasticity (or a semi-elasticity when it is interacted with the measure of external dependence).

3.1.2. *Non-Linear Effect of Financial Development*

I start by exploiting the heterogeneity of countries in terms of financial development. Exporting countries are ranked according to their initial level of financial development during the early 1990's. Three regions are defined : the *Low Region*, the *Intermediate Region*, and the *High Region*, corresponding to countries characterized respectively by a weak, intermediate or high development of their financial institutions during this sample period. [1] Accordingly, a $high_i$ and a low_i region dummy variables are generated, which are equal to one if the country belongs respectively to the High or Low Region, and zero otherwise.

The first and second step equations are modified to include interaction variables between the financial development (FD_{it}) variable, and the low_i and $high_i$ region dummies. The $FD_{it} \times external_k$ variable is also interacted with the low_i and $high_i$ Region dummies. The Intermediate Region is omitted, and is therefore considered as the benchmark. This modifies the Probit as follows:

$$\Pr(T_{ijkt} > 0) = [...] + \beta_6 FD_{it} + \beta_7(FD_{it} \times low_i) + \beta_8(FD_{it} \times high_i)$$

$$+\beta_9(FD_{it} \times external_k) + \beta_{10}(FD_{it} \times external_k \times low_i) + \beta_{11}(FD_{it} \times external_k \times high_i)$$

$$+\beta_{12}low_i + \beta_{13}high_i + \beta_{14}C_{ij} + \beta_{15}C_i + \beta_{16}C_j + \mu_t + \mu_k + \nu_{ijkt}$$

The marginal effect of financial development on the extensive margin is therefore equal to $\beta_6 + \beta_7 + \beta_9 + \beta_{10}$ in the Low Region, $\beta_6 + \beta_9$ in the Intermediate Region and $\beta_6 + \beta_8 + \beta_9 + \beta_{11}$ in the High Region. The total effect therefore depends on the degree of external dependence in the industry; hence, each marginal effect corresponds to a semi-elasticity. The second step estimation on positive trade values is also modified as follows:

$$\log(T_{ijkt}) = [...] + \alpha_6 FD_{it} + \alpha_7(FD_{it} \times low) + \alpha_8(FD_{it} \times high)$$

$$+\alpha_9(FD_{it} \times external_k) + \alpha_{10}(FD_{it} \times external_k \times low) + \alpha_{11}(FD_{it} \times external_k \times high)$$

$$+\alpha_{12}low_i + \alpha_{13}high_i + \alpha_{14}C_{ij} + \alpha_{15}C_i + \alpha_{16}C_j + \eta_k + \eta_t + \epsilon_{ijkt} \quad \text{if} \quad T_{ijk} > 0$$

The marginal effect of financial development on the intensive margin is therefore equal to $\alpha_6 + \alpha_7 + \alpha_9 + \alpha_{10}$ in the Low Region, $\alpha_6 + \alpha_9$ in the Intermediate Region and $\alpha_6 + \alpha_8 + \alpha_9 + \alpha_{11}$ in the High Region. As for the extensive margin, the marginal effect of financial development depends on the degree of external dependence in each industry.

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1. The exact definition of the three regions is discussed in the data section.

3.1.3. Endogeneity issues

Endogeneity has been a major concern in the literatures linking financial development with long-run growth and trade. Firstly, the effect of financial development on exports may be related to missing variables in the basic specification, therefore leading to an omitted variable bias. Countries characterized by better financial institutions may also report a better legal environment, enforcement of public policies, or a lower level of corruption. The literature on trade and institutions indeed shows that a better institutional environment reduces uncertainty, trade costs, and promotes both exports and imports (Berkowitz et al., 2006; Levchenko, 2007; Nunn, 2007). Hence, a positive effect of financial development on bilateral exports may actually be related to the fact that the exporting country has, overall, a better institutional environment. More generally, any country-level characteristics, both positively related with financial development and with trade, can create an omitted variable bias. Also, the effect of financial development on exports may be conditioned by the overall quality of institutions.[1] Secondly, estimation results may also be influenced by reverse causality. Indeed, higher export revenues contribute to increase the amount of liquidity in the domestic economy, and therefore the level of financial development. Do and Levchenko (2007) also argue that specialization in financially intensive sectors exerts an incentive to further develop financial institutions.

Those issues are tackled by using several strategies. First, controls for the quality of institutions are added to the basic specification for the exporting and importing countries. These controls are time-varying. Estimations also control for a measure of the trade-related regulations; this measure however is provided for a single year. Second, exporter and importer fixed effects are included to control for countries unobserved characteristics that are stable over time. Third, a 3-year moving average of financial development, with one lag, is used as a measure of financial development. This reduces the possibility of simultaneous adjustment of trade and finance.

Finally, $exporter \times year$ fixed effects are included in the basic specification. This methodology enables us to control for all exporting country's characteristics that are moving over time. Accordingly, the identification of the effect of financial development relies on a cross-industry identification, in line with the methodology developed by Rajan and Zingales (1998). This methodology does not allow us to use the two-step estimation strategy developed above. However, the industry-level of external dependence can be considered as exogenous to the exporting countries' characteristics, which enables us to identify an unbiased effect of financial

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1. Bekaert et al. (2005) for example shows that equity market liberalizations result into a higher growth rate in countries with a better quality of institutions.

development in the cross-section of industries. In particular, the coefficient on the interaction between financial development and exports is not related to the evolution of financial development alone. Note that this methodology is highly consuming in terms of computing resources, since we have as many fixed effects as $exporters \times year$ combinations. Therefore, a single gravity equation is estimated using a Random Effect GLS estimator, where the dependent variable includes both positive and zero trade flows.

3.2. Data

3.2.1. Trade Model Data

All trade model data are from the "Trade and Production" database provided by the CEPII.[1] The final database covers trade flow data for 50 exporting countries, 85 importing countries and 26 ISIC industries for the years 1990 to 2000.[2] A full list of exporting and importing countries used for estimations is provided in Tables Appendix. Zeros in the database are not missing observations. A zero corresponds to a situation where both the importer and the exporter report no bilateral trade in a given industry and year, but at least one of the two countries declares its trade to the United Nations (COMTRADE) for that specific year. 29% of bilateral trade flows are zeros. The Netherlands, Switzerland, France, Italy, the United Kingdom, Germany and the United States have 5% or less zero trade flows, whereas Bolivia, Honduras, Cameroon, Senegal and Malawi have more than 70% of zeros. Production data are country-industry-year specific. Prices are GDP prices relative to that of the United States, and are from the Penn World Tables. The distance between country pairs is weighted by the distribution of the population within each country.[3]

Controls for country pairs include the contiguity of countries, the existence of a common official language, the existence of a colonial relationship after 1945. Estimations also control for each country's geographical size, the fact that countries are landlocked. All these data are from the Distances provided by the CEPII.[4]

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1. http://www.cepii.fr/anglaisgraph/bdd/TradeProd.htm
2. We are constrained in the number of exporting countries because of data availability for financial development in 1990, which are used for the creation of the Low and High regions
3. See Head and Mayer (2002)
4. http://www.cepii.fr/francgraph/bdd/distances.htm

3.2.2.   *Financial Development*

The main measure of financial development is provided by the Financial Structure Database provided by the Worldbank. [1] Financial Development measures the size of each country's financial system, and has been traditionally used in the literature on finance as a proxy for the cost of external capital. According to Levine et al. (2000), Financial Development measures the capacity of financial intermediaries to channel credit to investors. Estimations primarily rely on a measure of "private credit", which is defined as the credit distributed by deposit money banks and other financial institutions to the private sector, over GDP. This variable is computed by the World Bank, using data from the International Financial Statistics (IFS) of the International Monetary Fund.

The initial development of the financial institutions is computed by taking, for each individual country, the average level of Financial Development over the years 1990 to 1992. Countries are then distributed across a *Low Region*, an *Intermediate Region*, and a *High Region* according to their initial level of financial development. The Low and High Regions correspond respectively to countries characterized by a low or a high initial development of financial institutions. The *Low Region* is defined as countries with an initial level of financial development below the first quartile of the distribution. The Intermediate Region is defined as countries in the inter-quartile range. Finally, the High Region is defined as countries with an initial level of financial development above the 3rd quartile threshold.

The definition of the regions thresholds matters for the distribution of countries across the three regions. In a robustness exercise, different thresholds are defined to test the sensibility of our results. In this robustness analysis, the *Low Region* is defined as countries in the first three deciles of the initial financial development, the *Intermediate Region* is defined as countries with an initial financial development located between the 3rd and the 7th deciles; finally, the *High Region* is defined as countries in the last three deciles of the initial financial development.

Table A2 in Appendix reports a large heterogeneity with regard to the initial developments of financial institutions. Indeed, Japan channels about 30 times more credit to the private sector in proportion of its GDP, in the early 1990's, than Peru. Germany has a lower level of financial development than the United Kingdom and the United States, over the 1990-1992 period. This is not surprising though, given the unification of Eastern and Western Germany in 1990. Table A3 in Appendix ranks the exporting countries in the data according to their

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1. See Beck et al. (2000)

initial level of financial development, and also reports the distribution of countries in the Low, Intermediate and High Regions with both definitions of thresholds. The Table confirms that the definition of thresholds matters. With the first definition Cameroon, Bolivia, Austria and Germany are in the Intermediate Region. With the second definition, the first two countries are located in the Low Region, while Austria and Germany are in the High Region.

3.2.3. *External Dependence*

Rajan and Zingales (1998) define the external dependence as the proportion of *capital expenditures* that are not financed with cash flow from operations. The authors use the Compustat data on U.S. listed firms, and compute the average use of external finance of listed firms, by industry. Since the US can be considered as a place where firms face little credit constrained, the level of external dependence observed by industry in the US can be considered as the true demand for external finance in each industry. Accordingly, the measure of external dependence computed for the US is applied to all countries in the sample. The measure of external dependence has been extensively used in the literature for cross-country analysis of the effects of financial development on growth and international trade.

The measure of external dependence that is used in the empirical analysis is provided by Braun and Larrain (2005), which relies on the methodology proposed in Rajan and Zingales (1998). Braun and Larrain (2005) computes these data for 26 ISIC manufacturing industries over the 1976-1995 period. The data are reported in Table A5 in Appendix.

3.2.4. *Institutions and Barriers to Entry*

As discussed in the empirical methodology section above, controls for importing and exporting countries' characteristics include measures of the institutional quality. Data are provided by the International Country Risk Guide (ICRG, 2003). These data include grades regarding corruption, the extent of bureaucracy, the democratic environment, the transparency of the legal system, the enforcement of laws, and finally the environment that is offered to investors. These data are time varying, and cover the full period of the sample that is used for estimation. A complete description of these measures of the quality of institutions is provided in the data appendix. A single index of the institution quality is created for each country. Each grade is divided by the maximum in order to make all indicators comparable. The index is computed by taking the mean of the grades for all components.

Data measuring the trade-related regulations are provided by Djankov et al. (2006). The vari-

able measures the time necessary to comply with all procedures required to export or import goods. This variable is available for the year 2005, and is used in alternative specification.

4. EMPIRICAL RESULTS

4.1. Marginal Effect of Finance on Exports

Table 1 reports the estimation of Equations (16) and (17). In the Probit, the marginal effect of each independent variable is reported at mean sample. The extensive margin corresponds to the probability that a country pair reports a positive trade. The intensive margin corresponds to the value of bilateral exports when countries are trade partners. Estimations control for the quality of institutions, trade-related regulations and also High Region and Low Region dummies, since those variables are expected to influence the marginal effect of financial development.

- Table 1 here -

Control variables have the expected sign. Industrial production in both countries has a positive influence on both the extensive and intensive margins. Bilateral distance has a negative impact. The price in the exporting country negatively affects both margins of countries' exports, while the price of the importing country has a positive effect. Institutions have a positive effect on trade, with the exception of the quality of institutions in the importing country in the probit equation. However, the coefficient on this variable is close to zero. Finally, trade-related regulations have always a negative effect.

Estimation results confirm that financial development has a positive influence on the two margins of countries' exports. Financial development has a positive influence on exports in all sectors, but the positive effect is more pronounced for industries that rely more on external finance. These results are consistent with propositions 1 and 2 from the model, and confirm previous empirical findings in the literature.

Using these first estimates from Table 1, it is possible to compute how the effect of financial development on aggregate exports is distributed across the extensive and intensive margins. In industries with a low external dependence (External dependence = 0), 65% $(0.072/(0.038 + 0.072))$ of the effect of financial development channels through the intensive margin. In industries with a large external dependence, (External dependence = 1) 82% $((0.072+0.383)/(0.038+$

$0.056 + 0.072 + 0.383))$ channels through the intensive margin. Hence, financial development has a greater capacity to promote the value of bilateral exports between trade partners, rather than the probability that two countries enter in a trade relationship. This implies that financial development has a low effect on the geographical diversification of exports.

4.2. Non-linear Influence of Finance

This section investigates whether the influence of finance on exports depends on the initial development of financial institutions in the exporting country. The initial development of financial institutions is identified using the definition of the Low, Intermediate and High Regions as discussed above. Table 2 reports the estimation results of Equations (16) and (17) with the inclusion of four additional controls, that correspond to interactions of FD_{it} and $FD_{it} \times external_k$ with the Low and High Region dummy variables. Estimations also control for the low_i and $high_i$ dummy variables alone. The marginal effect of financial development on exports is therefore obtained, for each Region (Low, Intermediate and High), and each industry according to its level of external dependence. The second set of estimates in Table 2 additionally controls for the quality of institutions, trade-related regulations, contiguity, common language, common colonizer, past colonial relationship, geographical size of each country and includes dummies for landlocked countries (unreported in the table).

- Table 2 here -

Estimation results in Table 2 show that the elasticity on the financial development variable FD_{it} is similar between the Low and Intermediate Regions, but is much lower in the High Region. This is verified for the extensive margin in the first column, and also the intensive margin in the second column. The coefficient on the interaction between financial development and external dependence is lower in the Low Region, as compared to the Intermediate Region, for both margins of exports. In the High Region, the coefficient on the interaction between financial development and external dependence is only reduced in the case of the intensive margin estimation.

Results can be summarized as follows. In industries where firms require little external finance, the effect of financial development on the margins of exports is lower for a higher initial development of financial institutions. This first empirical pattern is traditionally expected and consistent with the neoclassical theory. However, this pattern is distorted in industries where

firms are more dependent from external finance. In these industries the marginal effect of financial development on exports is low when financial institutions are either underdeveloped or advanced. In external dependent industries, the relation between the marginal effect of financial development, and the initial development of financial institutions, is therefore hump-shaped.

To illustrate this, coefficients from estimation results in Table 2 are used to compute the marginal effect of financial development on exports for the Low, Intermediate and High Regions. Results are detailed for industries with a low or high level of external dependence.[1] The marginal effects are reported in Table 3. Financial development has a larger effect on exports in industries characterized by a high dependence on external finance. In industries characterized by a low external dependence, the marginal effect of financial development is the lowest in the High Region. This pattern is verified for the intensive and extensive margins of countries exports. In industries with a high external dependence, financial development has the largest marginal effect in the Intermediate Region.

- Table 3 here -

These results show that the capacity of banking credit to promote exports in sectors that require the most an access to external finance, can be low in countries with poor or advanced financial institutions. Accordingly, these results partially contradict the traditional expectation that the effect of finance is the largest in countries where financial constraints are more binding. The low marginal effect of financial development, in the High Region, confirms the expectations from neoclassical theory. However, the low marginal effect of financial development on trade margins, in the Low Region, is consistent with Proposition 3 from the model.

4.3. Robustness

Endogeneity issues

Export revenues can possibly lead to an increase in the amount of liquidity available for new exporters, generating a biased effect of financial development due to reverse causality. A 3-year moving average of private credit, with one lag, is computed to proxy for financial development. Results may also be subject to a bias due to omitted variables. In an alternative specification, importer and exporter fixed effects are introduced to control for unobserved country-level characteristics. Estimation results in Table 4.

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1. We consider an industry with a low level of external dependence (*external* = 0), and an industry with a high level of external dependence (*external* = 1)

- Table 4 here -

The coefficient on the financial development variable is now strictly lower for a higher initial development of financial institutions, consistent with the neo-classical view. This result is verified for both the estimation with country fixed effects and when the lagged moving average of financial development is used. On average, all industries report a higher marginal effect of financial development on trade in the Low Region, and a lower marginal effect in the High Region, as compared to the Intermediate Region. However, the coefficient on the interaction between financial development and external dependence is reduced in the Low and High Regions, as compared to the Intermediate Region. This confirms the results from the previous estimations.

The empirical strategy developed above enables us to control for unobserved characteristics. However, biases in estimations may arise because of unobserved characteristics that are actually moving over time. Also, specialization in external dependent industries may be an incentive to develop financial institutions, generating a positive coefficient on the interaction between financial development and external dependence. As discussed in the empirical methodology section, it is possible to deal with these two issues by including $exporter \times year$ fixed effects in the estimation. This methodology enables us to control for all country-level characteristics that are moving over time, including financial development. Hence, the identification of the effects of finance relies only on the interaction variable $FD_{it} \times external$, as proposed by Rajan and Zingales (1998). Estimation results are therefore independent from the evolution of financial development alone. We rely, for this sensitivity analysis, on the estimation of a single gravity equation where the dependent variable is the value of bilateral trade, including zeros. Estimation results are provided in Table 5.

- Table 5 here -

The estimation results confirm that, in external dependent industries, the relation between the marginal effect of finance and the initial development of financial institutions follows a hump-shape. This confirms that the effect of financial development on exports is low when financial institutions are underdeveloped. Most importantly, this result implies that the specialization pattern is not modified when access to financial resources increases and financial institutions are initially underdeveloped, since the effect of financial development is similar across industries.

Definition of the thresholds

Last, Regions thresholds are changed to determine whether the previous results are influenced by the definition of the Low Region and High Region Thresholds. The Low Region threshold, and the High Region threshold, are modified in a sequence of two estimations. These estimations are similar to the ones that were provided in Table 2, i.e. estimations include controls for the quality of institutions in both countries, but not importer or exporter fixed effects. In Table 6, the Low Region now corresponds to the first three deciles of countries with the lowest level of financial development during the period 1990-1992, and the High Region is unchanged. In Table 7, the High Region corresponds to the last three deciles of countries with the highest level of financial development in 1990-1992, and the Low Region remains the first quartile as in the baseline estimation. Our results remain qualitatively unchanged : the coefficient on the interaction between financial development and external dependence is always reduced in the Low Region, as compared to the Intermediate Region. It is also reduced in the High Region, but only for the intensive margin. This confirms the previous estimation results.

- Table 6 here -
- Table 7 here -

5. CONCLUSION

This article investigates the effects of financial development on the intensive and extensive margins of countries' exports, at different stages of economic development. A simple model of trade with liquidity-constrained exporting firms is developed. Firms are also heterogenous in terms of productivity, and have to pay a fixed entry cost to start exporting. The model has two main empirical predictions. First, financial development has a positive effect on the intensive and extensive margins of countries' exports, especially in sectors with a high demand for external finance. Second, when financial institutions are underdeveloped, financial development enables only few firms to start exporting, with little effect on aggregate exports. The effect of financial development on aggregate exports is therefore predicted to increase with the initial development of financial institutions.

These predictions are confronted to empirical tests using industry-level bilateral trade data. Results confirm that financial development has a positive effect on both margins of world trade. More than 60% of the effect channels through the intensive margin. The effect of financial development on both margins is highly non linear. In external dependent industries, the

effect of financial development on exports is low for countries with poor financial institutions, as well as for countries with advanced financial institutions. The effect is the highest in countries with an intermediate development of financial institutions. When financial institutions are underdeveloped, new financial resources appear to be used for domestic-oriented projects, or export projects in sectors that require little external finance.

Results provided in this article have several policy implications. First, trade and finance are more closely related in economies with an intermediate development of financial institutions. This implies that banking and financial crises are expected to have a more negative impact on trade in these countries, while negative shocks on financial development are expected to affect exports to a lower extent in advanced economies. Second, increased access to financial resources does not affect specialization patterns in countries with poor financial institutions.

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APPENDIX

DATA APPENDIX

ICRG index of institutional quality

This data appendix provides a complete description of the measures of institutional quality, provided by the ICRG, that is used for estimations. A lower grade for each index corresponds to a lower quality of institutions.

- The bureaucracy quality index (1 to 4 scale) measures the risk of a policy revision when the government changes.

- The corruption index (1 to 6 scale) is an assessment of corruption within the political system.

- The democratic accountability index (1 to 6 scale) is a measure of how responsive a government is to its people.

- The law and order index (1 to 6 scale) is decomposed into two sub-components. The law sub-component is an assessment of the strength and impartiality of the legal system, while the order sub-component is related to the law enforcement.

- The investment profile index (1 to 12 scale) measures the factors that affect the risk to invest, and in particular the risk related to the contract viability and expropriation, profit repatriation and payment delays.

A single index of the institution quality is created for each country. Each grade is divided by the maximum in order to make all indicators comparable. The index is computed by taking the mean of the grades for all components.

Table A1 : Do you consider export finance as a major obstacle for doing business?
Source : World Business environment survey, year 2000

	% of firms with answer = yes		% of firms with answer = yes
Portugal	1.10%	Indonesia	16.70%
Canada	1.20%	Lithuania	16.70%
South Africa	1.80%	El Salvador	16.90%
Armenia	1.90%	Poland	17.50%
Tunisia	2.60%	Pakistan	17.80%
Czech Rep	3.30%	Gaza	18.80%
France	3.40%	Colombia	19.40%
US	3.90%	Mexico	19.50%
Singapore	4.50%	Kenya	20%
Belarus	4.90%	Ecuador	23.10%
Panama	5.10%	Bulgaria	23.80%
Trinidad and Tobago	5.10%	Slovakia	24.80%
Egypt	5.30%	Zambia	25%
Malaysia	5.90%	Malawi	25.50%
Hungary	6.20%	Haiti	25.60%
Sweden	7.60%	Dominican Republic	26%
Spain	8.10%	Bangladesh	26.90%
Albania	8.40%	Thailand	27%
Germany	9.10%	Bolivia	27.50%
Botswana	9.20%	Cote D'Ivoire	28.20%
Estonia	9.40%	Venezuela	28.30%
Chile	9.70%	Nigeria	28.80%
Namibia	9.90%	Ethiopia	29.20%
Nicaragua	10.30%	Russia	31.40%
China	10.70%	Uganda	31.50%
Argentina	10.80%	Romania	32.80%
UK	10.80%	Uzbekistan	33%
Philippines	11.30%	Cameroon	33.30%
Brazil	11.50%	Kazakhstan	36.40%
Italy	11.80%	Georgia	36.80%
India	12.20%	Moldova	40%
Costa Rica	12.30%	Azerbaijan	42.20%
Central America	12.30%	Tanzania	42.90%
Uruguay	13%	Bosnia	45.30%
Slovenia	13.20%	Madagascar	45.70%
Belize	13.50%	Croatia	46.30%
Ghana	13.80%	Kyrgizstan	48.50%
Honduras	15%	Ukraine	50.70%
Guatemala	15.40%	Senegal	51.50%
Zimbabwe	16.10%		

Table A2 : Sample of Exporting Countries and related descriptive statistics

Country	Private Credit (1990-1992 average)	Liquid Liabilities (1990-1992 average)	Share of zero trade flows	Country	Private Credit (1990-1992 average)	Liquid Liabilities (1990-1992 average)	Share of zero trade flows
Argentina	0,13	0,08	0,31	Italy	0,55	0,62	0,03
Australia	0,59	0,53	0,25	Japan	1,91	1,78	0,07
Austria	0,87	0,85	0,12	Kenya	0,32	0,43	0,61
Belgium	0,43	0,52	0,07	Korea	0,93	0,36	0,11
Bolivia	0,25	0,25	0,73	Malawi	0,13	0,21	0,84
Brazil	0,24	0,18	0,13	Malaysia	0,75	0,67	0,25
Cameroon	0,25	0,23	0,77	Mexico	0,18	0,21	0,24
Canada	0,92	0,74	0,10	Netherlands	1,28	0,80	0,05
Chile	0,46	0,35	0,40	Norway	1,01	0,58	0,22
Colombia	0,22	0,23	0,47	Pakistan	0,22	0,38	0,44
Costa Rica	0,12	0,33	0,60	Panama	0,40	0,39	0,57
Cyprus	0,97	0,76	0,55	Peru	0,06	0,11	0,49
Denmark	0,46	0,56	0,10	Philippines	0,21	0,33	0,33
Ecuador	0,13	0,19	0,56	Portugal	0,51	0,82	0,23
Egypt	0,26	0,80	0,40	Senegal	0,28	0,23	0,78
Finland	0,89	0,59	0,20	South Africa	0,68	0,42	0,29
France	0,92	0,60	0,03	Spain	0,78	0,69	0,06
Germany	0,88	0,60	0,02	Sweden	1,31	0,45	0,09
Greece	0,32	0,62	0,27	Switzerland	1,58	1,10	0,04
Guatemala	0,12	0,21	0,63	Thailand	0,77	0,71	0,21
Honduras	0,27	0,30	0,74	United Kingdom	1,11	0,85	0,02
India	0,24	0,41	0,14	United States	1,23	0,63	0,01
Indonesia	0,41	0,37	0,24	Uruguay	0,22	0,40	0,59
Ireland	0,64	0,43	0,24	Venezuela	0,23	0,34	0,49
Israel	0,51	0,62	0,26	Zimbabwe	0,22	0,34	0,66

Source : Financial Structure Database (Worldbank), Trade and Production database (CEPII) and author's calculations

Table A3 : Groups of countries by Regions of Financial Development

Exporting countries	Private Credit (PC) (1990-1992)	LR=1st quartile of PC HR=4th quartile of PC	LR=first 3 deciles of PC HR=higher 3 deciles of PC
Peru	0,06		
Guatemala	0,12		
Costa Rica	0,12		
Malawi	0,13		
Argentina	0,13		
Ecuador	0,13		
Mexico	0,18		
Philippines	0,21	Low Region	
Zimbabwe	0,22		Low Region
Uruguay	0,22		
Pakistan	0,22		
Colombia	0,22		
Venezuela	0,23		
India	0,24		
Brazil	0,24		
Cameroon	0,25		
Bolivia	0,25		
Egypt	0,26		
Honduras	0,27		
Senegal	0,28		
Kenya	0,32		
Greece	0,32		
Panama	0,40		
Indonesia	0,41		
Belgium	0,43		
Denmark	0,46	Intermediate Region	Intermediate Region
Chile	0,46		
Portugal	0,51		
Israel	0,51		
Italy	0,55		
Australia	0,59		
Ireland	0,64		
South Africa	0,68		
Malaysia	0,75		
Thailand	0,77		
Spain	0,78		
Austria	0,87		
Germany	0,88		
Finland	0,89		
Canada	0,92		
France	0,92		
Korea	0,93		
Cyprus	0,97		High Region
Norway	1,01	High Region	
United Kingdom	1,11		
United States	1,23		
Netherlands	1,28		
Sweden	1,31		
Switzerland	1,58		
Japan	1,91		

Source : Financial Structure Database (Worldbank) and author's calculations

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Table A4 : Sample of Importing Countries

Albania	Colombia	Hong Kong	Lithuania	Philippines
Argentina	Costa Rica	Honduras	Latvia	Poland
Armenia	Cyprus	Hungary	Morocco	Portugal
Australia	Germany	Indonesia	Mexico	Paraguay
Austria	Denmark	India	Malta	Senegal
Azerbaijan	Algeria	Ireland	Myanmar	Singapore
Belgium	Ecuador	Iceland	Mongolia	Slovenia
Bangladesh	Egypt	Israel	Malawi	Sweden
Bulgaria	Spain	Italy	Malaysia	Thailand
Bahamas	Estonia	Jamaica	Niger	Tunisia
Bolivia	Ethiopia	Jordan	Nigeria	Turkey
Brazil	Finland	Japan	Netherlands	Taiwan
Canada	France	Kazakhstan	Norway	Uruguay
Switzerland	Gabon	Kenya	Oman	United States
Chile	United Kingdom	Korea	Pakistan	Venezuela
China	Greece	Kuwait	Panama	South Africa
Cameroon	Guatemala	Lebanon	Peru	Zimbabwe

Table A5 : External Dependence for 26 ISIC manufacturing industries

ISIC Code	Manufacturing Industry	External Dependence
311	Food products	0,137
313	Beverages	0,077
314	Tobacco	-0,451
321	Textiles	0,400
322	Wearing apparel except footwear	0,029
323	Leather products	-0,140
324	Footwear except rubber or plastic	-0,078
331	Wood products except furniture	0,284
332	Furniture except metal	0,236
341	Paper and products	0,176
342	Printing and publishing	0,204
351	Industrial chemicals	0,205
352	Other chemicals	0,219
353	Petroleum refineries	0,042
354	Misc. petroleum and coal products	0,334
355	Rubber products	0,227
356	Plastic products	1,140
361	Pottery china earthenware	-0,146
362	Glass and products	0,529
369	Other non-metallic mineral products	0,062
371	Iron and steel	0,087
372	Non ferrous metals	0,005
381	Fabricated metal products	0,237
382	Machinery except electrical	0,445
383	Machinery electric	0,767
384	Transport equipment	0,307
385	Professional and scientific equipment	0,961
390	Other manufactured products	0,470

Data on external dependence come from Braun and Larrain (2005)

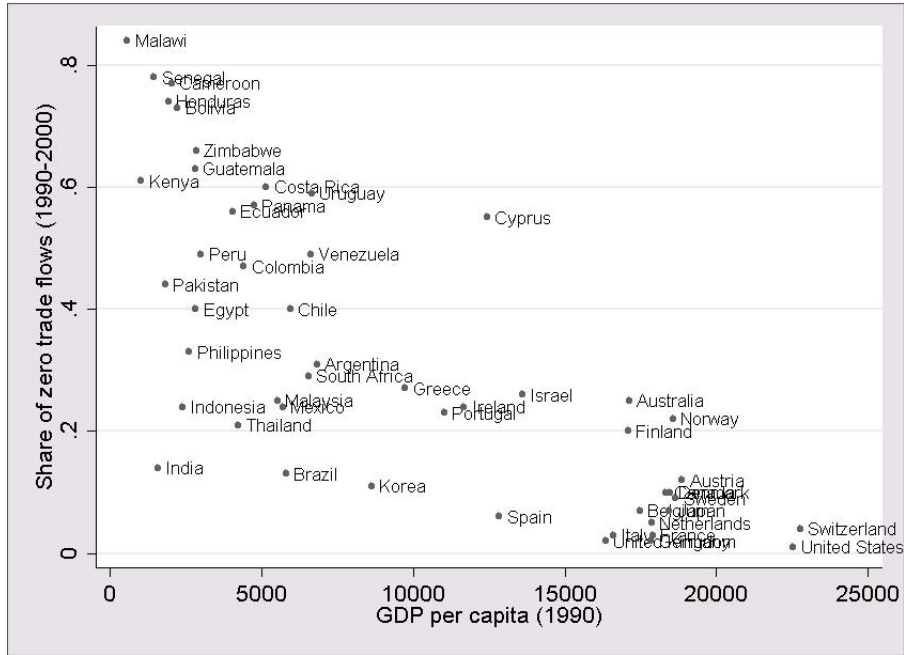**Figure 1 – GDP per capita and zero trade flows**

Table 1 – Influence of Finance on Exports

Dependent variable	Extensive $P(T > 0\|Z)$	Intensive $E(T\|Z, T > 0)$
$Fin.Dev._{it}$	0.038***	0.072***
	(0.002)	(0.008)
$Fin.Dev._{it} \times Ext.Dep._k$	0.056***	0.383***
	(0.003)	(0.017)
$Production_{ikt}$	0.035***	0.612***
	(0.001)	(0.005)
$Production_{jkt}$	0.016***	0.281***
	(0.000)	(0.004)
$Price_{it}$	-0.018***	-0.422***
	(0.001)	(0.016)
$Price_{jt}$	0.059***	0.764***
	(0.002)	(0.014)
$Distance_{ij}$	-0.068***	-1.456***
	(0.001)	(0.009)
$Institutions_{it}$	0.023***	0.145***
	(0.003)	(0.033)
$Institutions_{jt}$	-0.009***	0.176***
	(0.003)	(0.028)
$Regulations_i$	-0.073***	-0.598***
	(0.002)	(0.022)
$Regulations_j$	-0.025***	-0.359***
	(0.001)	(0.015)
Estimator	Random effect probit	Random effect GLS
Measure of financial development	Private credit	
Number of observations	629,851	449,884
R-square	-	0.61

Note: $*p < 0.05, **p < 0.01, ***p < 0.001$. All the coefficients reported are marginal effects computed at mean sample. All estimations include Low Region and High Region dummies, controls for contiguity, common language, common colonizer, colonial relationship, geographical size of each country and dummies for landlocked countries. Estimations also include industry and year fixed effects. Robust standard errors are in parentheses.

Table 2 – Non-Linear Influence of Finance on Exports

Dependent variable	Extensive $P(T > 0\|Z)$	Intensive $E(T\|Z, T > 0)$
$Fin.Dev._{it}$	0.065***	0.451***
	(0.002)	(0.021)
$Fin.Dev._{it} \times low_i$	-0.005	-0.091
	(0.006)	(0.070)
$Fin.Dev._{it} \times high_i$	-0.050***	-0.456***
	(0.003)	(0.022)
$Fin.Dev._{it} \times Ext.Dep._k$	0.042***	0.660***
	(0.004)	(0.042)
$Fin.Dev._{it} \times Ext.Dep._k \times low_i$	-0.031***	-0.232*
	(0.011)	(0.136)
$Fin.Dev._{it} \times Ext.Dep._k \times high_i$	0.002	-0.334***
	(0.005)	(0.043)
$Production_{ikt}$	0.035***	0.599***
	(0.001)	(0.004)
$Production_{jkt}$	0.016***	0.281***
	(0.000)	(0.003)
$Price_{it}$	-0.018***	-0.419***
	(0.001)	(0.014)
$Price_{jt}$	0.060***	0.764***
	(0.002)	(0.012)
$Distance_{ij}$	-0.069***	-1.463***
	(0.001)	(0.009)
Estimator	Random effect probit	Random effect GLS
Measure of financial development	Private credit	
Controls for institutions and regulations	YES	YES
Number of observations	629,851	449,884
R-square	-	0.61

Note: Significance levels: *10%, ** 5% and *** 1%. All the coefficients reported are marginal effects computed at mean sample. All estimations include Low Region and High Region dummies, controls for contiguity, common language, common colonizer, colonial relationship, geographical size of each country and dummies for landlocked countries. Controls for institutions and trade-related regulations are also included. Robust standard errors are in parentheses.

Table 3 – Marginal effect of Financial Development by Region

Industries with low external dependence		
	Extensive	Intensive
Low Region	0.07	0.45
Intermediate Region	0.07	0.45
High Region	0.02	-0.01
Industries with high external dependence		
	Extensive	Intensive
Low Region	0.076	0.879
Intermediate Region	0.107	1.111
High Region	0.057	0.321

Table 4 – Non-Linear Influence of Finance on Exports: Robustness Checks

Dependent variable	Extensive $P(T > 0\|Z)$	Intensive $E(T\|Z, T > 0)$	Extensive $P(T > 0\|Z)$	Intensive $E(T\|Z, T > 0)$
$Fin.Dev._{it}$	0.022***	0.827***	0,030***	0,357***
	(0.001)	(0.024)	(0,002)	(0,021)
$Fin.Dev._{it} \times low_i$	0.021***	0.644***	0,011**	0,202***
	(0.005)	(0.090)	(0,005)	(0,070)
$Fin.Dev._{it} \times high_i$	-0.003**	-0.816***	-0,024***	-0,431***
	(0.001)	(0.025)	(0,002)	(0,023)
$Fin.Dev._{it} \times Ext.Dep._k$	0.036***	0.460***	0,045***	0,803***
	(0.003)	(0.041)	(0,003)	(0,038)
$Fin.Dev._{it} \times Ext.Dep._k \times low_i$	-0.017***	-0.490***	-0,038***	-0,836***
	(0.006)	(0.129)	(0,007)	(0,126)
$Fin.Dev._{it} \times Ext.Dep._k \times high_i$	-0.001	-0.166***	-0,005*	-0,413***
	(0.003)	(0.042)	(0,003)	(0,039)
$Production_{ikt}$	0.020***	0.604***	0,010***	0,428***
	(0.001)	(0.004)	(0,000)	(0,004)
$Production_{jkt}$	0.009***	0.298***	0,0005**	0,119***
	(0.000)	(0.003)	(0,0002)	(0,003)
$Price_{it}$	-0.010***	-0.349***	-0,014***	-0,470***
	(0.001)	(0.015)	(0,001)	(0,015)
$Price_{jt}$	0.036***	0.684***	0,039***	0,998***
	(0.001)	(0.014)	(0,001)	(0,014)
$Distance_{ij}$	-0.041***	-1.489***	-0,064***	-1,884***
	(0.001)	(0.009)	(0,001)	(0,008)
Estimator	RE Probit	RE GLS	RE Probit	RE GLS
Measure of financial development	Moving average PC		Private Credit	
Importer and exporter fixed effects	NO	NO	YES	YES
Controls for institutions	YES	YES	YES	YES
Controls for regulations	YES	YES	NO	NO
Number of observations	533,785	391,616	629,851	449,884
R-square	-	0.62	-	0.70

Note: Significance levels: *10%, ** 5% and *** 1%. All the coefficients reported are marginal effects computed at mean sample. All estimations include Low Region and High Region dummies, controls for contiguity, common language, common colonizer, colonial relationship, geographical size of each country and dummies for landlocked countries. Estimations include industry and year fixed effects. Controls for institutions and trade-related regulations are also included. Robust standard errors are in parentheses.

Table 5 – Non-Linear Influence of Finance on Exports: $exporter \times year$ **fixed effects**

Dependent variable	Bilateral exports	
	$E(T)$	
$Fin.Dev._{it} \times Ext.Dep._k$	0.717***	1.241***
	(0.019)	(0.041)
$Fin.Dev._{it} \times Ext.Dep._k \times low_i$		-1.085***
		(0.121)
$Fin.Dev._{it} \times Ext.Dep._k \times high_i$		-0.651***
		(0.041)
$Production_{jkt}$	0.085***	0.084***
	(0.004)	(0.004)
$Price_{jt}$	0.947***	0.947***
	(0.016)	(0.016)
$Distance_{ij}$	-1.876***	-1.876***
	(0.009)	(0.009)
Estimator	Random effect GLS	
Measure of financial development	Private Credit	
Fixed effects	Exporter-year and Importer	
Number of observations	655,774	655,774
R-square	0.73	0.73

Note: Significance levels: *10%, ** 5% and *** 1%. Controls: all exporting countries characteristics are captured by time-varying exporter fixed effects. Country-pair controls include contiguity, common language, common colonizer, colonial relationship. Destination time-varying controls include institutions as listed in data section. Estimations also include industry and year fixed effects. Robust standard errors are in parentheses.

Table 6 – Low Region: lower three deciles of private credit 1990-1992

Low Region	High Region: 4th quartile of private credit 1990-1992	
	Lower three deciles	
	Intensive	Extensive
Dependent variable	$P(T > 0\|Z)$	$E(T\|Z, T > 0)$
$Fin.Dev._{it}$	0.072***	0.603***
	(0.003)	(0.021)
$Fin.Dev._{it} \times low_i$	-0.041***	-0.206***
	(0.006)	(0.064)
$Fin.Dev._{it} \times high_i$	-0.053***	-0.593***
	(0.003)	(0.023)
$Fin.Dev._{it} \times Ext.Dep._k$	0.050***	0.579***
	(0.005)	(0.041)
$Fin.Dev._{it} \times Ext.Dep._k \times low_i$	-0.052***	-0.416***
	(0.011)	(0.124)
$Fin.Dev._{it} \times Ext.Dep._k \times high_i$	-0.007	-0.307***
	(0.005)	(0.042)
Estimator	Random effect probit	Random effect GLS
Measure of financial development	Private credit	
Number of observations	629,851	449,884
R-square	-	0.61

Note: Significance levels: *10%, ** 5% and *** 1%. All the coefficients reported are marginal effects computed at mean sample. All estimations include Low Region and High Region dummies, controls for contiguity, common language, common colonizer, colonial relationship, geographical size of each country and dummies for landlocked countries. Estimations include industry and year fixed effects. Controls for institutions and trade-related regulations are also included. Robust standard errors are in parentheses.

Table 7 – High Region : upper three deciles of private credit 1990-1992

	Low Region: 1st quartile of private credit 1990-1992	
High Region	Upper three deciles	
	Intensive	Extensive
Dependent variable	$P(T > 0|Z)$	$E(T|Z, T > 0)$
$Fin.Dev._{it}$	0.069***	0.617***
	(0.003)	(0.021)
$Fin.Dev._{it} \times low_i$	0.003	-0.072
	(0.008)	(0.07)
$Fin.Dev._{it} \times high_i$	-0.052***	-0.622***
	(0.003)	(0.023)
$Fin.Dev._{it} \times Ext.Dep._k$	0.042***	0.532***
	(0.005)	(0.043)
$Fin.Dev._{it} \times Ext.Dep._k \times low_i$	-0.039***	-0.263**
	(0.013)	(0.135)
$Fin.Dev._{it} \times Ext.Dep._k \times high_i$	0.004	-0.242***
	(0.005)	(0.044)
Estimator	Random effect probit	Random effect GLS
Measure of financial development	Private credit	
Number of observations	629,851	449,884
R-square	-	0.61

Note: Significance levels: *10%, ** 5% and *** 1%. All the coefficients reported are marginal effects computed at mean sample. All estimations include Low Region and High Region dummies, controls for contiguity, common language, common colonizer, colonial relationship, geographical size of each country and dummies for landlocked countries. Estimations include industry and year fixed effects. Controls for institutions and trade-related regulations are also included. Robust standard errors are in parentheses.

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