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# Financial Market Imperfections and the impact of exchange rate movements on exports

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## Abstract

This paper studies the role of financial market imperfections in the way countries' exports react to a currency depreciation. Using quarterly data for 27 developed and developing countries over the period 1990-2005, we show that the impact of a depreciation will be less positive - or even negative - for a country as: (i) firms borrow in foreign currency ; (ii) they are credit constrained ; (iii) they are specialized in industries that require more external capital; (iv) the depreciation's or devaluation's magnitude is large. This last result confirms the existence of a non-linear relationship between an exchange rate depreciation and a country's exports reaction when financial imperfections are observed. This work offers a new explanation for the consequences of recent currency crises in middle income countries.

Keywords: International Trade, Exchange Rate Movements, Financial Development, Financial Market Imperfections.

JEL Classification: F10, F32, F37

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# 1 Introduction

According to the traditional theory, an exchange rate depreciation usually implies a real currency depreciation which increases the volume of exports. At least four conditions have to be verified for this effect to be observed: (1) the depreciation is not transmitted to domestic prices, (2) export prices are set in the exporter's currency, (3) the foreign demand is sufficiently elastic (Marshall-Lerner condition), and (4) exporter's supply is sufficiently elastic too.

This paper does not study the existence of those conditions, since previous studies have shown that they are likely to be observed<sup>1</sup>. Nevertheless, several recent papers have underlined the non systematic character of the existence of J-Curve or competitiveness effect<sup>2</sup>. Duttagupta and Spilimbergo (2004) study the Asian 1997-1998 currency crises and show that exports did not increase during this period. More generally, recent crises events (Argentina and Uruguay, 2002, Brazil 1999) underline this lack of reaction of exports to exchange rate shocks. Our paper attempts to explain these stylized facts by studying the existing interactions between financial imperfections, exchange rate movements and the volume of exports. We show that, even if the four previous conditions are verified, a depreciation will have a less positive - or even a negative - impact on exports, if financial market imperfections are present in the economy. Moreover, we also show that countries' specialization and the depreciation's magnitude have to be taken into account to explain why the traditional competitiveness effect is not always observed.

The literature usually focuses on the impact of exchange rate *volatility* on international trade<sup>3</sup>, but very few papers concentrate on the impact of exchange rate movements, the latter being usually considered as trivial or traditional. Ma and Cheng (2003) test the influence of financial crises on international trade, by introducing crises dummies in a gravity-like equation. Their results provide quite unclear results: currency crises do not seem to have any impact in the short run - or a slightly negative impact -, and the long run impact depends on the period considered. Campa (2000) tests the impact of exchange rate movements on South American countries' exports. The impact appears to be positive or non significant, according to the specification. However, the author does not take into account control variables to capture demand and prices, so that results should be interpreted with very much care.

Economists agree to say that it is more costly to sell abroad than on its own domestic market; this is why it seems important to take into account financial factors, while speaking about the relationship between exchange rate movements and trade. Several authors, among others Bernard et Wagner (1998) and Bernard et Jensen (2001), have attested for the presence of

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<sup>1</sup>See for example Goldfajn and Werlang (2000), Bachetta et Van Wincoop (2003).

<sup>2</sup>See Bahmami-Oskooe and Ratha (2004) for a literature review on J-curve empirical existence.

<sup>3</sup>See Clark et al. (2004) for an exhaustive survey on the subject.

a fixed exporting cost, using firm level data. Melitz (2003) incorporates this additional fixed cost for export in his model with heterogeneous firms to show that only more productive firms will be able to export. Within a similar framework, Chaney (2005) shows that if firms receive an exogenous dotation in capital, some firms, although productive enough but financially constrained, will not be able to enter the export market. Given the existence of the fixed cost, exporting firms are likely to borrow if they cannot use their own resources, which make them more dependent from the financial market. We make the hypothesis that financial market imperfections can affect the way in which a country reacts to exchange rate movements through different channels. Tornell and Westermann (2003) find three main financial market imperfections affecting middle income countries: the foreign currency borrowing associated with the issue of the currency mismatch, credit constraints, and systemic guaranties generating incentives to borrow in the foreign currency. These financial imperfections are highly observed in emerging and developing countries. In 2004, the Bank of Thailand published the results of a survey concerning the use of foreign sources of finance by 2,568 Thai non-financial firms. For this panel, the foreign currency loans represented 68,9% of the total external debt<sup>4</sup>. We do not consider any theoretical foundation to explain this kind of behavior<sup>5</sup>, nor to explain the fact that firms in emerging market countries do not hedge to absorb exchange rate shocks<sup>6</sup>. Eichengreen and Hausman (2000) suggest that the absence of hedging, is likely to be a consequence of the "original sin"<sup>7</sup>: if a country's liabilities are denominated in foreign currency, this country is by definition unable to hedge. Credit constraints are even more widespread. An important number of studies underline this problem for most developing and emerging market countries, especially for small firms<sup>8</sup>. Hence, financial market imperfections are likely to concern an important share of a developing country productive sector.

We concentrate on the first two kinds of imperfections listed by Tornell and Westerman (2003). An exchange rate depreciation will increase the amount of firms' debt that is denominated in the foreign currency. As a consequence, some firms not willing to repay their loan will exit the export market, whereas other will observe the increase in the cost of borrowing in the foreign currency and will decide not to enter, or will be constrained to decrease their level of exports<sup>9</sup>. Moreover, a depreciation will lead to a drop in the collateral level if the latter is denominated in the domestic currency, which in turn decreases the firm's borrowing capacity if credit con-

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<sup>4</sup>It is likely that the importance of the debt in the foreign currency here be over-estimated because of a biased selection towards bigger firms; however, it still remains a good estimator of the dependence of Thai and South East Asian firms to foreign lenders.

<sup>5</sup>See, among others, Rajan and Zingales (1998), McKinnon and Phill (1999), Burnside and al. (2001), Schneider and Tornell (2000) or Jeanne (2000).

<sup>6</sup>See for example, Chinoy (2001).

<sup>7</sup>The well known concept of "original sin" includes the incapacity, for a country, to borrow abroad in its own currency.

<sup>8</sup>See Gelos and Werner (1999) and Terra (2003) .

<sup>9</sup>See for example Deardorff (2000), Berman and Berthou (2005).

straints are in action in the economy. If both credit constraints and foreign currency borrowing are observed, the profit reduction following the increase in the debt repayments will limit firms borrowing capacity; this will prevent some firms to invest or even stay on the export market. We can see here that the foreign currency borrowing and credit constraints mechanisms are highly complementary, as it has been extensively developed in the literature<sup>10</sup>.

Beyond the issue of financial market imperfections listed by Tornell and Westerman (2003), other factors may also induce a *more negative* reaction of exports to a currency depreciation; we list these factors as *magnification* elements. The literature on the links between finance and the real sector, has recently focused on the role of the local financial development on growth or trade, especially for industries that are more financial dependent, i.e. industries that need an extended access to credit suppliers for technological reasons. Rajan and Zingales (1998) show that financial development reduces the fixed cost of acquiring capital from financial intermediaries, and hence improves growth, especially in industries that are more financially dependent. Beck (2002, 2003) and Becker and Greenberg (2004) find a similar result for international trade. Given this asymmetry in financial dependence among industries, specialization may influence the extent to which a country will be sensitive to financial market imperfections, at a time of depreciation. As a consequence, if a country exports goods that requires an important level of external finance, it will be more likely to suffer from financial imperfections when the exchange rate depreciates. Moreover, we follow the previous theoretical work by Berman and Berthou (2005) and argue that the magnitude of the exchange rate variation is equally important. This previous work includes foreign currency borrowing in a monopolistic competition model of international trade *a la* Krugman (1980), and shows that the reaction of total exports to an exchange rate depreciation is non-linear when firms borrow in foreign currency in order to pay their fixed cost and enter the export market. This depreciation will lead to a traditional competitiveness effect associated with an increase in the volume of exports by firm, while some firms will exit since they are not able to repay their loan in the foreign currency. Results indicate that if the depreciation is too large, the volume of exports will be reduced following a decrease in the *extensive margin of trade*, i.e the number of exporting firms. More precisely, if the depreciation is too large, the competitiveness effect will be too low to counterbalance the negative effect of depreciation on the number of exporting firms.

To our best knowledge, no study considers the interaction between financial market imperfections, exchange rate movements and international trade in an empirical way<sup>11</sup>, and no other

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<sup>10</sup>For a theoretical description of these mechanisms, see Aghion et al. (2001, 2004), Bachetta (2000), Krugman (1999a, 1999b), Chang, Céspedes and Velasco (2004).

<sup>11</sup>In a small part of their work, Becker and Greenberg (2004) study the impact of financial development on exchange rate's impact on total exports, but their empirical work does not consider foreign currency borrowing, nor the potential non linearity of exchange rate impact. Moreover, their regression seem to suffer from missing variables problems.

work uses countries' specialization and the depreciation magnitude as magnification channels. Our work attempts to fill this gap. Using quarterly data for 27 developed and developing countries over the period 1990-2005, we confirm that the impact of the depreciation will be less positive - or even negative - for a country if: (i) firms borrow in the foreign currency ; (ii) they are credit constrained ; (iii) they are specialized in industries that require more external capital; (iv) the depreciation's or devaluation's magnitude is large. This last result confirms the existence of a non-linear relationship between an exchange rate depreciation and a country's exports reaction. This work offers a new explanation for the consequences of recent currency crises on trade flows in middle income countries.

The remainder of this paper is organized as follows. In the next section, we present the empirical methodology and the data used in our estimations. In the next part we study the impact of Financial Market Imperfections on the exports reaction to exchange rate movements. In section 4, we show that the specialization and the extent of the depreciation might amplify the shock. Section 5 concludes and draws some policy implications.

## 2 Theory and empirical methodology

### 2.1 Theoretical Underpinnings

#### *Financial Market Imperfections*

There exists an extensive literature on the role of the financial market in emerging economies' macroeconomic performances. Economists have shown that a better access to credit improves countries' growth path ; however, financial development and financial opening could also generate weaknesses in the economy. Tornell and Westerman (2003) define three kind of financial market imperfections that can be observed in middle income countries : foreign currency borrowing, credit constraints and systemic guaranties from authorities. According to the authors, these imperfections are responsible for "boom-bust cycles as well as other macroeconomic patterns observed at higher frequencies across middle income counties". They also insist on the fact that these *boom-busts* are not observed in countries with developed financial markets.

These financial market imperfections are more likely to hit firms that are more dependent from external capital. Recent studies in international trade have shown that exporting firms have to pay an additional fixed cost in order to enter the export market<sup>12</sup>. Hence, these firms

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<sup>12</sup>See for example Roberts and Tybout (1997) and Bernard and Jensen (1999) for an empirical proof of the existence of a fixed entry cost in order to enter the export market. See also Melitz (2003) and the growing

should be more exposed to financial imperfections - since they are likely to use a larger amount of external finance in order to enter the market and export - than firms only producing for the domestic market. Moreover, several studies have shown that these exporting firms are characterized by a higher share of foreign currency debt<sup>13</sup>. Hence, taking financial market imperfections into account seems to be particularly relevant for the analysis of trade flows. When the currency depreciates, countries in which firms borrow in a foreign currency are more exposed to "balance-sheet effect" phenomena : if domestic firms' assets are denominated in the domestic currency and their debts in a foreign currency, a depreciation will reduce their solvability ; repayment problems will occur and the next period's output will be reduced if firms are unable to invest; some of them could be forced to exit the market if they cannot repay. In the periods following the depreciation, it is also likely that a proportion of firms willing to enter the export market will not be able to do so because of an increase in the borrowing cost in the foreign currency. Theoretical papers like Deardorff (2000) and Berman and Berthou (2005) use these kinds of mechanisms to explain why some countries did not experience an increase of exports after a depreciation of their currency.

In addition, several papers have shown that credit constraints limit firms' borrowing capacity after an exogenous shock that reduces its cash flow<sup>14</sup>. We have shown that a depreciation of the domestic currency could lead firms to exit the export market, if they were not able to repay their loan contracted in the foreign currency. But even if they could, they would probably suffer from a reduction in their profit, because of an increase in the value of repayments. Thus, if firms are credit constrained, a currency depreciation will lead to larger financing problems, especially if they had previously borrowed in a foreign currency. If both foreign currency borrowing and credit constraints are observed, the depreciation will increase the cost of repayments, reduce firms' borrowing capacity in the subsequent periods ; this will have negative consequences the country's aggregate level of exports. Therefore, we introduce a credit constraint variable in our specification in order to account for the effect of this particular kind of financial market imperfection.

We have seen that theory suggests that financial market imperfections are likely to disturb

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related literature on heterogenous firms for theoretical formulations.

<sup>13</sup>See for example Martinez and Werner (2002) for Mexico. This paper uses data on publicly listed firms. The authors indicate that between 1992 and 2000, the Mexican exporting firms, in their sample, have always a USD debt share higher than 43% whereas non-exporting firms' USD debt share is always less than 12%. Other authors, like Echeverry et al. (2003) for Chile and Kawai et al. (2003) for Korea, have reported similar behaviors.

<sup>14</sup>See Aghion, Bacchetta, Banerjee (2001, 2005). These authors define credit constraints as a relative independence between firm's borrowing capacity and the project's return, the former being more linked to the level of firm's assets or profits that can be used as collateral. Note that the scarcity of capital is a different concept, since no firm will be able to borrow if there is no capital available, even if it can provide a high level of collateral.

firms' borrowing and export capacities. Consequently, we make the hypothesis that economies characterized by a higher level of financial imperfections should face a lower increase - or even a decrease - of exports when the currency depreciates, since firms should not be able to repay their loan whereas others should not be able to borrow in the periods following periods. Therefore, the shock will lead some firms to exit the export market whereas others will not be able to enter, and this will be even more the case if financial market imperfections are more widespread in the economy.

### *Magnification Effects*

The theoretical effects mentioned above may be magnified by several elements. First, the country's specialization may have an effect through the degree of firms' dependence to external finance. Indeed, if firms use more external finance than internal cash flows to finance their activities - and especially their fixed cost of export -, the negative effect of both foreign currency borrowing and credit constraints will logically be larger.

On the other hand, we follow the previous work of Berman and Berthou (2005) and evaluate whether there should be a non-linear effect of exchange rate devaluation or depreciation on the volume of exports. In this paper, the extent of the depreciation has a negative impact on firms' entry on the export market, because it increases the cost of borrowing in the foreign currency. A larger depreciation is also likely to increase credit constraints issues, since it reduces more the cash flow of firms that have borrowed in the foreign currency. Therefore, we make the hypothesis that, while a little depreciation should benefit to the country through a pro-competitive effect, a larger shock should magnify the financial market imperfections channel and thus reduce countries' volume of exports. The main intuition may be explained by the different impacts of exchange rate movements on the two *margins* of trade: if firms borrow in foreign currency in order to pay their fixed cost and enter the export market, a depreciation, by affecting the amount of repayments, may modify the firm's export decision, and thus may have a negative impact on the extensive margin of trade (i.e. the number of exporters). On the other hand, the traditional competitiveness effect may be observed at the *intensive margin* (i.e. the volume of exports per firm) level. Large exchange rate shocks can lead the negative effect on the extensive margin of trade to overcome the positive competitiveness effect observed on the intensive margin, thus leading to a decrease of total exports.

## **2.2 The Econometric Model**

We make use of the methodology provided by Goldstein and Kahn (1978, 1985) in order to estimate demand and supply export equations for a group of developing and developed coun-



tries. Whereas the traditional pro-competitive effect of a depreciation of the exchange rate is specifically associated to the demand side of the export equation, we provide an explanation of the non-response of exports to a currency depreciation through the supply side.

A depreciation involves a positive competitiveness effect on the demand side because it induces an increase of world demand for domestic goods, consecutive to a decrease in domestic relative prices. However, the same depreciation leads to a negative supply effect: our hypothesis developed above says that, if firms borrow in a foreign currency or are subject to credit constraints, a depreciation will induce a balance-sheet effect which can in turn reduce firms' production capacities or their ability to stay on the export market. Theoretically, the demand for home produced goods should increase ; however, there is some risk that home supply decreases after the depreciation. The following equation stands for the demand side of the Goldstein and Kahn (1985) equation.

$$\log X_{it}^d = \alpha_0 + \alpha_1 \log(PX_{it}) + \alpha_2 \log PC_{it} + \alpha_3 \log E_{it} + \alpha_4 \log YW_{it} + \mu_{it} \quad (1)$$

where  $X_{it}^d$  is the demand for exports from country i,  $PX_{it}^s$  is country i's export price,  $PC_{it}$  is the competitors' price,  $E_{it}$  is the exchange rate - an increase of E means a depreciation of the local currency -, and  $YW_{it}$  is the revenue of all i's trade partner countries<sup>15</sup>. We expect the sign of the coefficient on the exchange rate to be positive, i.e. a depreciation should lead to a decrease of the export price in the foreign currency<sup>16</sup>. The export supply of country i can be expressed as follows :

$$\log X_{it}^s = \beta_0 + \beta_1 \log PX_{it} + \beta_2 \log P_{it} + \beta_3 \log Y_{it} + \beta_4 \log E_{it} * FMI + \beta_5 \log E_{it} ME_{it} + \varepsilon_{it} \quad (2)$$

where  $X_{it}^s$  is the export supply from country i,  $PX_{it}$  its export price,  $P_{it}$  the domestic producer price,  $Y_{it}$  the domestic production, and  $FMI$  the measure of financial market imperfections, i.e. foreign currency borrowing and credit constraints, as defined above. This last interaction term between financial market imperfections and the exchange rate permits us to take into account the way in which financial imperfections will modify the export supply conditions when the currency depreciates. Finally, the variable ME represents the magnification effects previously mentioned. We expect the signs of the variables traditionally employed in the Goldstein and Kahn (1985) equations to be the following :  $\beta_1 > 0$  ;  $\beta_2 < 0$  and  $\beta_3 > 0$ . Note that the coefficients on prices could be biased because of problems of aggregation, as discussed in Goldstein and Kahn (1985). However the study of the sign and value of prices' coefficients remains out

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<sup>15</sup>We come back later on the construction of each country's competitor price and trade partner revenue variables. The data appendix also provides the formulas.

<sup>16</sup>We suppose that relative prices do not adjust by the same amount as the nominal exchange rate, at least in the short run.

of the scope of our study. In addition, our hypothesis requires a negative effect of financial market imperfections when the currency depreciates ( $\beta_4 < 0$ ) - the depreciation will have a more negative impact on the export supply for a higher level of financial market imperfections in the economy. This negative impact may be magnified by the country's specialization and the depreciation's extent ( $\beta_5 < 0$ ). The last equation is equivalent to :

$$\log PX_{it} = b_0 + b_1 \log X_{it}^s + b_2 \log P_{it} + b_3 \log Y_{it} + b_4 \log E_{it} * FMI + b_5 \log E_{it} ME_{it} + \eta_{it} \quad (3)$$

From the combination of the export demand and supply equations, we obtain the equilibrium level of exports for country  $i$ <sup>17</sup> :

$$\log X_{it} = \gamma_0 + \gamma_1 \log P_{it} + \gamma_2 \log Y_{it} + \gamma_3 \log E_{it} * FMI + \gamma_4 \log E_{it} ME_{it} + \gamma_5 \log PC_{it} + \gamma_6 \log E_{it} + \gamma_7 \log YW_{it} + \nu_{it} \quad (4)$$

One can show that the coefficients of this expression are expected to be of the same sign as those discussed before :  $\gamma_1, \gamma_3, \gamma_4 < 0$ , and  $\gamma_2, \gamma_5, \gamma_6, \gamma > 0$ . A depreciation of the exchange rate should lead to a pro-competitive effect through the demand side of the equation, and to a negative impact through the supply side, for a higher level of financial market imperfections in a given economy. Therefore, a depreciation should not always lead to an increase of exports, since the final effect depends on the level of firms' debt denominated in the foreign currency, and also on the influence of credit constraints in the economy. This expectation is consistent with the evolution of exports in south east Asia after the 1997-98 crises.

## 3 Data and Econometric Issues

### 3.1 Measuring Financial Market Imperfections

Our hypothesis stated above requires that we find a measure of countries' firms foreign currency behavior as well as a proxy for the extent of credit constraints in the economy. Measuring countries' share of firms' debt denominated in the foreign currency is not simple. Several articles have used aggregated data; in particular, Eichengreen, Hausmann and Panizza (2003) and Burger and Warnock (2003) use the data provided by the Bank for International Settlements (BIS) to measure countries' proportion of bonds and securities that have been issued in a foreign currency. However, these kind of measures remain extremely imperfect, since they are calculated for the whole economy and does not permit us to make the distinction between public and private sectors. Jeanne (2003) uses these kind of aggregate measures as well as a

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<sup>17</sup>As noted by Goldstein and Kahn (1985), it is useful to only consider the equilibrium level of exports, since we do not observe desired supply and demand levels of exports.

direct measure of Foreign Currency Borrowing (FCB) by publicly listed firms. This last kind of data is of course much more satisfying ; however, it only covers a small range of countries in South America.

Our paper makes use of a direct measure of the foreign currency borrowing, available for a large range of countries<sup>18</sup>. The World Bank recently published a survey - the World Business Environment Survey (WBES, 2000) - that provides information on firms' activity in 80 countries. This comprehensive survey of over 10,000 firms covers firms' responses to multiple questions on the investment climate and business environment as shaped by domestic economic policy: governance; regulatory, infrastructural and financial impediments, as well as assessments of public services' quality. Among other firm level data, the database indicates the origin of capital.

We use the WBES database to compute an average of the proportion of firms' debt denominated in the foreign currency, for each country in the sample. This variable is only available for the year 2000, so that we should consider it as a structural measure of firms' use of foreign currency loans. The data in our sample (see table 5) indicates that some economies in South America and South East Asia - especially Argentina, Singapore and Indonesia - are characterized by a high degree of FCB, whereas this ratio is much more lower in financial centers like UK and the United States.

Several authors have worked on the credit constraints issue. Braun (2003) shows that industries with less tangible assets perform disproportionately better in terms of growth in countries with well developed financial systems. In a related work, Manova (2005) shows that countries with better developed financial systems tend to export relatively more in sectors with fewer tangible assets that can serve as collateral. These two papers use the level of financial development as a proxy for the level of credit constraints in the economy; therefore, a better financial development should be associated with a lower level of credit constraints. In a related work, Aghion et al. (2005) use a financial development variable in order to evaluate the influence of credit constraints on countries' growth volatility.

Financial development is defined as the ratio of private credit to GDP, and is available online from Thorsten Beck's website at the Worldbank. This variable is also used in Rajan and Zingales (1998) and in the papers just cited above. We take five-year (1990-1995) averages for the financial development variable; this permits us to smooth the data and avoid short

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<sup>18</sup>In a first version of the paper, we also used aggregated measures of the FCB provided by the BIS and IMF statistics, but the coefficients on those variables in the regression suffered from a lack of robustness, and we decided to remove them. Such a lack of robustness is likely to come from the aggregation problem suggested above

run variations and cyclical effects. Data indicate a wide range of financial development levels; South American countries like Argentina and Peru report very low ratios whereas Switzerland and Japan have the highest. In contrast with precedent works, we do not suppose a linear relationship between credit constraints and financial development. Indeed, this relationship might be non-linear because credit constraints should not be observed at very low levels of financial development, since no credit market is in operation. Therefore, an increase in the level of financial development should only help to reduce the credit constraints after a sufficiently high level of financial development. We thus make use of countries' level of financial development as well as its square, in order to take into account this non-linear relationship between financial development and credit constraints.

### 3.2 Measuring the External Financial Dependence of Exports

We introduce a variable to account for countries' specialization and financial dependence of exports. Rajan and Zingales (1998) and Beck (2003) define the External Dependence as *the fraction of capital expenditures not financed with cash flow from operations*. They show that countries with a higher level financial development have a higher growth and trade levels in industries that are more dependent on the use of external funds<sup>19</sup>.

In these papers, the External Dependence of American industries is considered as being an optimal one, given the high level of financial development in the US and the low probability of firms to be financially constrained. Therefore, it is possible to apply this measure of External Dependence to other sets of countries<sup>20</sup>.

We use the data provided by Rajan and Zingales (1998) to build a structural financial dependence of exports, by country. Our measure takes into account the countries' specialization for exports in 1995<sup>21</sup>, which allows us to determine how much countries have to get external finance in order to export. More precisely, we compute, for each country in the sample, the contribution of each SITC one digit sector to the total exports. This export structure is used to calculate the financial dependence of exports, thanks to the data provided by Rajan and Zingales (1998) at a disaggregated level<sup>22</sup>.

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<sup>19</sup>The measure of external dependence come from Rajan and Zingales (1998). The authors use data on American firms to calculate an optimal external dependence by ISIC industries.

<sup>20</sup>For more information about the optimal character of the external dependence of the US industries, see Rajan and Zingales (1998).

<sup>21</sup>We use the Comtrade data from the United Nations.

<sup>22</sup>Note that Rajan and Zingales (1998) use the ISIC classification, the construction of the external dependence indicator thus requires to convert the codes from ISIC to SITC ones.

### 3.3 Trade Model Data

We concentrate our analysis on the impact of exchange rate fluctuations on the export *volume*, in order to evaluate the real impact of exchange rate fluctuations, and avoid all possible noise due to export price variations. Specifically, if we postulate that the export price - in the domestic currency - does not adjust when the currency depreciates, then the depreciation reduces this export price in the foreign currency. If the price elasticity of the foreign demand is low<sup>23</sup>, the volume of exports will remain unchanged whereas the value of exports will be reduced in the foreign currency. Hence, the use of export volumes seems to be justified and necessary. We construct our export volumes data set by taking the ratio of countries' total value of exports in USD to countries' export price index in USD. We also compute the GDP volume variable in the same way, by dividing the GDP value in the domestic currency by the GDP deflator in the domestic currency<sup>24</sup>.

In addition to the variables described above, we use exchange rates data (domestic currency in terms of SDR), country specific competitors' prices, producer prices and countries trading partners revenues<sup>25</sup>. All the above variables come from the IMF International Financial Statistics (IFS). We also use the Direction of Trade Statistics (DOTS) data in order to compute competitors' price and trading partner revenues variables. All the details about the data and their construction are provided in the appendix section.

Our panel data covers the period 1990-2005 at a quarterly frequency, for 27 developed and developing countries. Unfortunately, data availability is an impediment that constrains us in the extension of the database, at least for the moment: in particular, the use of export volume data requires the existence of export price series, and these data are only available for a few number of countries from the IFS, especially at a quarterly frequency. Nevertheless, it seems essential to take into account the export *volume*, since we concentrate our analysis on the real effect of the depreciation.

### 3.4 Econometric issues

The literature in econometrics and macroeconometrics has recently concentrated on the issue of stationarity and cointegration in panel data. According to Breitung and Pesaran (2005), using panel data increases the statistical power of these tests, and this especially explains why researchers have tried to use these late developments in econometrics, in order to test for the

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<sup>23</sup>For example, this would be the case for countries exporting primary commodities like tropical beverages.

<sup>24</sup>We use the consumer price index when the GDP deflator is not available.

<sup>25</sup>Competitors' Prices and Producer Prices indexes are respectively denominated in SDR and in the local currency ; the combination of these price indexes with the exchange rate gives us the real exchange rate.

PPP hypothesis<sup>26</sup>. Given that our data set covers a long time period at high frequency for macroeconomic variables, it is likely that at least some of the variables, and in particular the exchange rate, are non stationary. We therefore test for the stationarity of our variables in panel, using the Fisher unit-root test developed by Maddala and Wu (1999). Fisher's test assumes that all variables are non-stationary under the null hypothesis against the alternative that at least one variable in the panel is stationary. Unlike the Im-Pesaran-Shin (1997) test, Fisher's test does not require a balanced panel. Results are provided in appendix 6.2, and indicate that all series are I(1).

These results allow us to test for cointegration among our variables of interest. Pedroni (1999) developed a cointegration residual-based test procedure for dynamic panel with multiple regressors, which provides seven normally distributed statistics. The four panel-statistics require the auto-regressive parameter be the same for all individuals, whereas the three group-statistics authorize the auto-regressive coefficient to vary among individuals in the panel. The null of no-cointegration (non-stationarity of the residuals within the relationship between our variables of interest) is rejected if the auto-regressive parameter is less than one. Results are provided in appendix 6.3 and indicate that all but one statistics reject the null of no cointegration; this is a strong evidence for the existence of a cointegration relationship between our variables.

We now turn to the estimation procedure of the long-run relationship, common to all individuals in the panel. Kao and Chiang (2000) and Mark and Sul (2002) show that the Dynamic OLS (DOLS) method of Stock and Watson (1993) outperforms both OLS and Fully Modified OLS when estimating a long run relationship between cointegrated variables. We thus estimate this long-run relationship using DOLS with one differentiated lead and one differentiated lag, which permits us to correct for serial correlation and the potential endogeneity of the regressors. We also introduce countries fixed effects, and quarterly dummies to avoid seasonality bias. We therefore get a new specification of our model :

$$\begin{aligned}
\log X_{it} = & \gamma_0 + \gamma_1 \log P_{it} + \gamma_2 \log Y_{it} + \gamma_3 \log E_{it} * FMI_{it} + \gamma_4 \log E_{it} * ME_{it} + \gamma_5 \log PC_{it} + \gamma_6 \log E_{it} \\
& + \gamma_7 \log YW_{it} + \sum_{k=-1, k \neq 0}^1 [\gamma_8 \Delta \log P_{i,t-k} + \gamma_9 \Delta \log Y_{i,t-k} + \gamma_{10} \Delta (\log E * \log FMI)_{i,t-k} \\
& + \gamma_{11} \Delta \log PmW_{i,t-k} + \gamma_{12} \Delta \log E_{i,t-k} + \gamma_{13}^k \Delta \log YW_{t-k}] + \sum_{j=1}^3 \lambda_j Q_j + \sum_{i=1}^{27} \eta_i C_i + v_{it} \quad (5)
\end{aligned}$$

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<sup>26</sup>See for example Pedroni (2001) and Choi (20041)

Where the  $\Delta$  terms indicate first differences of the independent variables, with lags at orders  $k=[-1;1]$ ,  $Q_j$  represents the quarterly dummies, and  $C_i$  the countries' dummies. All of the following hypothesis about financial market imperfections are tested using this specification.

## 4 The Role of Financial Market Imperfections

We made the hypothesis that a currency depreciation will have more negative consequences on exports if country's firms have a higher foreign currency borrowing ratio, and if firms are more credit constrained. Therefore, the empirical estimation of the exports equation contains two interaction terms that permit us to distinguish between foreign currency borrowing and credit constraints mechanisms in order to control for financial market imperfections. Our empirical methodology remains the same as in (5), but only reports our variables of interest<sup>27</sup>.

$$\begin{aligned} \log X_{i,t} = & \gamma_0 + \gamma_1 \log P_{it} + \gamma_2 \log Y_{it} + \gamma_3 \log PC_{it} + \gamma_4 \log E_{it} + \gamma_5 \log(E_{it}) \log(FCB_i) \\ & + \gamma_6 \log E_{it} * \log FD_i + \gamma_7 \log E_{it} (\log FD_i)^2 + \gamma_8 \log YW_{it} + v_{it} \end{aligned} \quad (6)$$

with FCB and FD respectively the foreign currency borrowing and financial development variables. We expect  $\gamma_5$  to be negative: a larger level of country's foreign currency borrowing should imply a more negative response of exports to a depreciation, since some firms will not be able to repay their loan whereas other should not be willing to borrow in order to enter the export market, therefore reducing the country's production and export capacity. An increase of the financial development variable is supposed to have a negative impact on exports at a low initial level ( $\alpha_6 < 0$ ), and a positive impact beyond an intermediate level ( $\alpha_7 > 0$ ).

Our estimation results are reported in table 2. The column A reports the basic specification, and does not take into account the financial market imperfections. This first specification indicates that the traditional variables in the Goldstein and Kahn equations have coefficients with the right sign: national production and world demand for exports influence positively and significantly the volume of exports, while the price ratio has a positive impact : an increase in the competitor's price relative to the producer prices increases exports. The striking result comes from the coefficient on the exchange rate: a currency depreciation leads an insignificant impact on the volume of exports, suggesting that the traditional competitiveness effect is not observed in our sample.

This puzzle disappears when we include financial imperfections. In regression (D) we test

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<sup>27</sup>To allow for a clearer reading, we only report on the equation our variable of interest, without the leads, lags nor quarterly and country dummies.

Table 1: Financial Market Imperfections

Depvar: <i>Export Volume</i>	<i>All countries</i>				<i>Developing countries only</i>	
	(A)	(B)	(C)	(D)	(E)	(F)
<b><i>Traditional Variables</i></b>						
<i>GDP Volume</i>	0.50*** (0.052)	0.405*** (0.066)	0.466*** (0.044)	0.363*** (0.051)	0.287*** (0.071)	0.316*** (0.059)
$\frac{\text{CompetitorsPrice}}{\text{DomesticPrice}}$	0.247*** (0.084)	0.256*** (0.090)	0.158** (0.069)	0.191*** (0.068)	0.311*** (0.099)	0.264*** (0.078)
<i>Foreign Demand</i>	0.632*** (0.180)	0.649*** (0.236)	0.490*** (0.141)	0.374** (0.169)	0.323 (0.232)	0.098 (0.155)
<i>Exchange rate</i>	0.027 (0.071)	0.243* (0.146)	0.492*** (0.105)	1.033*** (0.168)	0.218 (0.163)	1.020*** (0.188)
<b><i>Financial Variables</i></b>						
<i>Exch.Rate*FCB</i>		-5.625*** (2.176)		-7.183*** (1.971)	-6.817*** (2.155)	-8.061*** (1.963)
<i>exch. rate*fin.dvt</i>			-2.761*** (0.349)	-4.520*** (0.606)		-4.637*** (0.645)
<i>Exch.Rate * (Fin.Dvt)<sup>2</sup></i>			2.625*** (0.375)	5.050*** (0.787)		5.423*** (0.874)
Observations	1308	811	1336	828	604	604
R <sup>2</sup>	0.65	0.59	0.69	0.64	0.55	0.61
Estimation method	DOLS				DOLS	

Note: Significance levels: \*10%, \*\*5%, \*\*\*1%. All variables in logarithms. Robust Standard Errors into parentheses. All regressions include time, countries, quarterly dummies, and differentiated lags. Intercept not reported. Regressions (E) and (F) for developing countries only.



the role of both foreign currency borrowing and credit constraints by introducing interacted terms. Note that the number of observations is lower than for the basic specification because the WBES database does not include all the countries in our sample. The estimated coefficient of the exchange rate term becomes significant, reflecting a positive competitiveness effect. On the other hand, financial market imperfections significantly modify the impact of a depreciation on exports.

First, we find a negative impact of foreign currency borrowing: countries in which firms use a large share of foreign currency borrowing on their total financing will react more negatively to an exchange rate shock, which is consistent with the theory. This first result allows us to explain why Argentina or Singapore, that report the highest ratios of foreign currency borrowing in the sample, did not experience a competitiveness right after their respective currency crises.

Estimation (D) underlines the significant influence of the financial development as well. The coefficients on the interaction terms between the exchange rate and financial development terms confirm the existence of a non-linear relationship between credit constraints and financial development, which influences countries' reaction to a depreciation: a better level of financial development is associated to a lower level of credit constraints, beyond an *intermediate* level of financial development. Therefore, a deeper financial market will help improve exports' reaction to a depreciation, but only if the country demonstrates a sufficiently high level of financial development. We find that this *intermediate* level of financial development corresponds to a ratio of private credit GDP equal to 0,56 which is consistent with the data. Beyond this ratio, a marginal increase in financial development will help countries to better react to a depreciation through a lower level of credit constraints. Besides this result, we see that countries located "below the threshold" should only be able to remove credit constraints through a very high increase in their level of financial development.

The role of financial market imperfections in the way countries' exports react to an exchange rate depreciation is robust to the different specifications - columns (B) and (C). This confirms our main result : taking financial market imperfections into account permit us to remove the striking initial result on the coefficient on exchange rate; a country characterized by a very few level of financial market imperfections should experience the theoretical - and expected - competitiveness effect. Typically, countries like Indonesia, which are characterized by an intermediate level of financial development and important amount of foreign currency borrowing, will react very negatively to an exchange depreciation because of larger balance-sheets effects.

In Columns (E) and (F), we only consider developing countries. The results are still consistent with our hypotheses, even if the negative effects of financial imperfections are magnified. The interesting point comes from the significance of the interaction terms' coefficients. Indeed, one

can suppose that the existence of financial market imperfections is an element that characterizes developing and emerging countries as two different homogenous groups. On the contrary, our results suggest that important differences exist *within* the group of developing countries, regarding financial markets<sup>28</sup>. Some developing countries have a sufficiently low level of financial imperfections to get a positive competitiveness effect after a currency depreciation, while some others do not. Thus, the negative coefficient on the interaction between financial market imperfections and exchange rate should not only be seen as a result of the different level of financial markets development between developing and developed countries, the data in appendix indicates that this kind of heterogeneity is also observed within the group of developing countries and is likely to explain countries' different paths to recovery consecutive to the recent currency crises.

## 5 The Role of Amplification Effects

Following our assumptions in the theoretical underpinnings section of the paper, we investigate the role of financial dependence of exports and the role of the magnitude of the depreciation, on the way a country's exports react to an exchange rate shock. We previously mentioned that countries characterized by a high level of financial dependence of exports should be more sensible to financial market imperfection channels when the currency depreciates, since firms have to use a higher share of external capital. Moreover, we consider here the potential non-linear effect of the exchange rate depreciation by introducing a squared exchange rate term. Our analysis leads us to estimate the following equation<sup>29</sup>:

$$\begin{aligned} \log X_{i,t} = & \gamma_0 + \gamma_1 \log P_{it} + \gamma_2 \log Y_{it} + \gamma_3 \log PC_{it} + \gamma_4 \log E_{it} + \gamma_5 \log YW_{it} \\ & + \gamma_6 [\log E_{it} * \log FCB_i] + \gamma_7 [\log E_{it} * \log F Dvt_{it}] + \gamma_8 [\log E_{it} * \log (F Dvt^2)_i] \\ & + \gamma_9 [\log E_{it} * \log F D_i] + \gamma_{10} [\log E_{it} * \log E_{it}] + v_{it} \end{aligned} \quad (7)$$

We expect  $\gamma_9$  to be negative - more financial dependent countries should react more negatively to a depreciation of the exchange rate. Moreover, we expect a positive sign on the coefficient of exchange rate and a negative sign on the coefficient of the square of exchange rate, so that the result should report an inverted "U-shaped" curve to describe the impact of exchange rate on the volume of exports.

Our results are reported in estimations A, B and C of table 3. These regressions indicate

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<sup>28</sup>If there was no significant difference between those countries, the estimated coefficient of the interacted term between financial market imperfections and exchange rate would become insignificant.

<sup>29</sup>Once again, to allow for clearer reading, we do not report in this equation neither the leads / lagged variables, nor the dummies.

Table 2: Magnification effects

Depvar: <i>Export Volume</i>				<i>Robustness checks</i>		
	(A)	(B)	(C)	(D)	(E)	(F)
<b><u>Traditional Variables</u></b>						
<i>GDP Volume</i>	0.405*** (0.067)	0.353*** (0.059)	0.281*** (0.052)	0.372*** (0.058)	0.298*** (0.072)	0.286*** (0.051)
$\frac{\text{CompetitorsPrice}}{\text{DomesticPrice}}$	0.308*** (0.070)	0.135* (0.076)	-0.006 (0.083)	0.311*** (0.083)	0.049 (0.081)	0.024 (0.066)
<i>Foreign Demand</i>	0.163 (0.187)	0.417** (0.171)	0.376* (0.20)	0.389* (0.232)	0.585*** (0.185)	0.321** (0.162)
<i>Exchange rate</i>	2.757*** (0.282)	0.993*** (0.169)	3.886*** (0.307)	1.878*** (0.197)	0.675*** (0.175)	3.101*** (0.255)
<b><u>Financial Variables</u></b>						
<i>exch.rate*FCB</i>	-19.127*** (2.339)	-6.637*** (1.856)	-23.891*** (1.916)	-16.948*** (2.274)	-4.926** (1.957)	-19.035*** (1.718)
<i>exch. rate*fin.dvt</i>	-4.782*** (0.583)	-3.430*** (0.779)	-3.320*** (0.805)			
<i>exch.rate * (fin.dvt)<sup>2</sup></i>	6.606*** (0.774)	3.805*** (0.953)	4.356*** (0.873)			
<b><u>Magnification Variables</u></b>						
<i>exch.rate*ext.dep</i>	-6.753*** (0.873)		-12.158*** (0.984)	-6.118*** (0.616)		-8.207*** (0.670)
<i>exch.rate<sup>2</sup></i>		-0.011* (0.006)	-0.083*** (0.007)		-0.031*** (0.005)	-0.047*** (0.005)
Observations	828	828	828	828	828	828
R <sup>2</sup>	0.69	0.65	0.76	0.65	0.64	0.71
Estimation method		DOLS			DOLS	

Note: Significance levels: \*10%, \*\*5%, \*\*\*1%. All variables in logarithms. Robust Standard Errors into parentheses. All regressions include time, countries, quarterly dummies, and differentiated lags. One differentiated lead an lag introduced for each independent variable. Intercept not reported.

that, while the coefficient on the exchange rate is always positive - indicating a pro-competitive effect of the depreciation - the coefficient on the interaction term with the financial dependence is negative and highly significant, suggesting that the financial market imperfections channel is magnified when countries have a more financially dependent structure of exports. We can see from table 1 that Singapore, Thailand and Malaysia are more financially dependent than Brazil, Argentina and Colombia; this would be an explanation for the low degree of response of the South-East Asian volume of exports, after the currency crisis that occurred in the region in 1997-98, as described in Duttagupta and Spilimbergo (2004).

Moreover, we can see that the coefficient on the exchange rate is always positive and significant while the square of the exchange rate has always a significantly negative influence. This confirms the negative impact of large depreciations, that contribute to amplify the financial market imperfections channel. This result contributes to the literature on the specificity of large exchange rate swings in comparison to smaller shocks. In particular, Baldwin and Krugman (1989) show that, given that firms have to pay a fixed - sunk - cost in order to enter the export market and another fixed cost at the beginning of each period in order to stay, only large exchange rate movements will be likely to modify significantly the profitability of the export activity, and thus the entry and exit behavior of firms that will stay durably in or out of the export market. Our results offer a slightly different explanation. Since the export activity is associated with a fixed cost, firms have to borrow in order to enter<sup>30</sup>. As a consequence, a large depreciation of the exchange rate should not lead to the entry of new firms if the country is characterized by a high degree of financial market imperfections : the large depreciation will enhance the foreign currency borrowing channel through a higher value of repayments, as well as the credit constraints channel through a lower level of profits and borrowing capacity, for the firms that have previously borrowed in a foreign currency. Of course, we should expect the theoretical result provided by Baldwin and Krugman (1989) if the local financial market was perfectly working; however, the existence of financial market imperfections help us understand why large exchange rate depreciation should lead to a lower increase - or a decrease - of exports, in emerging market economies.

The last three columns in table 3 present some robustness checks, which confirm the stability and the significance of the coefficients presented in the previous estimations. According to our results, the impact of a depreciation on exports can be either positive or negative. We compute the estimated impact of a currency depreciation on exports for each country of the sample, by using the real country's characteristics given in the appendix<sup>31</sup>. Results indicate that very few countries are likely to experience a - final - positive competitiveness effect: exports are only predicted to increase after an exchange rate depreciation in Ecuador and Peru. These countries

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<sup>30</sup>Of course, the use of the local financial market depends on the industry we consider.

<sup>31</sup>Our computations are based on regression (C).

are characterized by important level of foreign currency borrowing, but at the same time, by a very low level of financial development and a specialization biased towards productions that use very little external finance. As mentioned above, countries with a very low level of financial development will not face credit constraints; in those countries, firms are more constrained by the scarcity of capital than by the amount of collateral they need to provide to financial institutions. Thus, even if the share of firms' level of foreign currency borrowing is high, the traditional competitiveness effect may be observed in some countries, especially if exports do not heavily rely on finance. This is especially the case of primary commodity exporters. Finally, we should note that the final effect of the depreciation is likely to be negative for countries like Ecuador and Peru, if they face a large depreciation, as suggested by our last result. This would correspond to a depreciation of 17 percent for Peru and 400 percent for Ecuador.

Once again, the negative influence of large depreciations will be only observed if financial market imperfections are present in the economy; otherwise, a large depreciation should lead to the traditional impact predicted by Baldwin and Krugman (1989)<sup>32</sup>.

## 6 Conclusion and Directions for further Research

This paper examines how financial factors determine countries' exports reaction to a currency's variations. In particular, we consider the role of countries' financial market imperfections, i.e. foreign currency borrowing and credit constraints. We also investigate the role of the financial structure of exports and the extent of the depreciation as magnification factors. Taking these financial factors into account allows us to show why some currency crises did not led to an increase in the volume of exports, as the traditional theory would expect.

Our results indicate that financial market imperfections have a negative impact on countries' exports reaction to the depreciation. While the level of foreign currency borrowing has always a negative impact when the shock happens, the level of financial development - which is inversely related to the level of credit constraints - has a positive impact beyond an *intermediate* level of Financial Development, which is consistent with our data. Our results explain why exports did not increase after the currency crises that happen in Latin American countries at the end of the 1990's, since countries like Argentina and Brazil are characterized by low levels of financial development and high shares of foreign currency borrowing.

We also show that amplification effects are in action: a more financial dependent structure of exports and a larger depreciation are associated with a more negative reaction of exports,

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<sup>32</sup>We ran estimation (C) for developed countries alone, results indicate that interaction terms are not significant. This last result is consistent with our assumptions, since financial market imperfections are seldom observed in rich countries

since these two variables amplify the financial market imperfections channel. Here, the financial dependence of exports is especially useful to understand why South-East Asian economies did not demonstrate an increase of exports after the currency crisis in 1997.

Our results have several policy implications. They stress in particular the importance to consider financial factors when studying the expected impact of exchange rate movements on trade, especially when an exchange rate depreciation or devaluation is expected to start again in an economy in a period of recession. Our results emphasize the fact that such a depreciation or devaluation can either improve the trade balance or magnify the recession by decreasing the volume of exports, the final result depending principally on firms' financial behavior and country's specialization.

An interesting point for further research would be to determine whether the potentially negative reaction of exports flows after an exchange rate depreciation principally comes from an adjustment of the extensive or intensive margin of trade. If the lack of consistent data prevents us from testing this question empirically, it seems nevertheless that financial factors are more prone to impact the extensive margin of trade, in particular because of the existence of important fixed costs of exports that have to be financed.

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## 7 Appendix

### 7.1 Data Appendix

The sample covers quarterly data between the first quarter of 1990 and the first quarter of 2005. We provide a complete description of the variables and the data source below:

**Volume of Exports:** Export prices are used to deflate export revenues in order to obtain the volume of exports. Exports' value and export price indexes are both denominated in USD. As we reported above, export price indexes at a quarterly frequency are only available for a restricted number of countries ; this is the main reason why our database only contains 27 countries. All these data are available online from the IMF International Financial Statistics (IFS).

**Volume of GDP:** In the same way, we compute GDP volumes for each country as a ratio between the value of GDP and the GDP deflator. When the latter was unavailable, we used the country's Consumer Price Index. All these data also come from the IFS.

**Trading Partners Revenue:** We have computed an index foreign demand based on the country's trading partners. The index is computed as follows:

$$YW_i = \sum_{k=1}^N \omega_{ij} X_{ij} \quad \text{with} \quad \omega_{ij} = \frac{X_{ij}}{X_i}$$

where  $X_{ij}$  represents total exports of country i to country j, and  $\omega_{ij}$  the share this trade flows with respect to the total exports of country i. Bilateral trade data comes from the DOTS database.

**Prices:** Producer Price Indexes come from the IFS, and are denominated in the local currency. In addition, we constructed an index of competitors' prices as a weighted average of countries' trading partners import prices. More precisely, we used the following methodology so as to compute our competitors' price indexes:

$$PC_i = \sum_{k=1}^K \sum_{j=1, j \neq i}^J s_k s_j P X_{jk} \quad \text{with} \quad s_k = \frac{X_{ik}}{X_i} \quad \text{and} \quad s_j = \frac{X_{jk}}{X_{jk}}$$

where  $CP_i$  is country  $i$ 's competitor price index given its  $K$  trading partner countries ;  $s_k$  is the share of country  $k$  in  $i$ 's total exports ;  $s_j$  is the share of country  $j$  in  $k$ 's total imports ; and  $PX_{jk}$  is the bilateral export price from country  $j$  to country  $k$ . Since this last variable is not available at a quarterly frequency, we adapt this *ideal* competitor price index in order to match the available data. We therefore use the following competitor price index :

$$PC_i = \sum_{k=1}^K s_k PM_k$$

Where  $PM_k$  is country  $k$ 's import price at a quarterly frequency, as reported in the IFS.  $s_k$  is calculated for the year 2000 from the DOTS trade data. The  $CP_i$  remains imperfect since it does not take into account exporting countries' specialization; however, it better fits price dynamics than a world import price.

**Exchange Rate:** The exchange rate data come from the IFS. We consider the number of each country's currency units for one unit of SDR - an increase in the exchange rate term means a depreciation of the currency. We choose the SDR value of the exchange rate rather than the dollar one in order to better take into account the competitiveness effect of a currency depreciation. In addition, we should note that effective exchange rates were not available at a quarterly frequency for a sufficiently large number of countries.

**Foreign Currency Borrowing:** We constructed indexes of countries' level of foreign currency borrowing, using the WBES database provided by the Worldbank online. From this database, we more precisely learn which share of exporting firms' total external debt is denominated in a foreign currency, and compute a simple average of firms' foreign currency borrowing ratio in each country. Results are reported in table 5. Since the WBES database mostly includes small and medium size firms, ratios are quite low. Nevertheless, the ranking of countries in respect to this ratio is consistent with previous empirical studies ; in particular, the level of foreign currency borrowing in Argentina - a very "dollarized" economy - is by far higher than that level in the United States.

**Financial Development:** The data are available from Thorsten Beck's website. We use the ratio of Private Credit on GDP, and take five-years averages in order to smooth the data and avoid short-run variations and cyclical effects.

**Financial External Dependence:** We use the sectoral data of Rajan and Zingales (1998). These authors define the financial external dependence as the fraction of capital expenditures not financed with cash flows from operations. The authors computed levels of external dependence for 27 ISIC US industries. We use this data to compute a structural financial dependence of exports for each country, according to the share of each sector in the country's total exports. Sectoral trade data come from the COMTRADE dataset (United Nations). The computed index is simply:

$$ED_i = \sum_{j=1}^k \alpha_{ij} ED_j$$

where  $\alpha_{ij}$  is the share of sector  $j$  in the exports of country  $i$ , and  $ED_j$  the external financial dependence of the sector as given by Rajan and Zingales (1998).

## 7.2 Stationarity Tests

Table 3: Fisher Stationarity Tests

Variable	Number of Lags	<i>Without Trend</i>		<i>With Trend</i>	
		Chi-2	Probability	Chi-2	Probability
<i>Volume of Exports</i>	3	54,7371	0,4465	29,7221	0,9971
<i>Volume of GDP</i>	4	63,4225	0,1782	49,7318	0,7481
<i>Exchange Rate</i>	3	57,2273	0,3563	39,3344	0,933
<i>World Imports</i>	6	2,0261	1	41,0676	0,9023
<i>Producer Price</i>	4	69,5416	0,0757	54,1325	0,4693
<i>Competitors Price</i>	4	60,7022	0,2471	17,2438	1
$\frac{\text{CompetitorsPrice}}{\text{ProducerPrice}}$	3	61,185	0,2358	20,4149	1

The number of lags is obtained by minimizing the Bayesian criteria for each variable and each individual, and then taking the average for each variable.

## 7.3 Cointegration test

Table 4: Pedroni cointegration test

<i>panel v-stat</i>	2.33939
<i>panel rho-stat</i>	-8.58166
<i>panel pp-stat</i>	-11.87111
<i>panel adf-stat</i>	-3.18544
<i>group rho-stat</i>	-8.53852
<i>group pp-stat</i>	-14.73760
<i>group adf-stat</i>	-0.75360

Results for 27 individuals and 61 time periods, for a cointegration relationship between the volume of exports (dependent variable) and four regressors : the volume of GDP, the exchange rate, world imports, and the ratio competitor price/producer price. All statistics are distributed  $N(0,1)$  under null of unit root or no cointegration

Table 5: Descriptive Statistics

Country	Foreign currency borrowing	Financial Development	External Dependence
Argentina	0.08	0.15	0.26
Australia	-	0.79	0.27
Brazil	0.04	0.27	0,28
Canada	0.02	0.80	0.38
Colombia	0.06	0.30	0.23
Ecuador	0.03	0.19	0.17
Hong Kong	0.01	1.35	0.42
Hungary	0	0.3	0.38
Indonesia	0.4	0.47	0,23
Israel	-	0.58	0.39
Japan	-	2.06	0.56
Jordan	-	0.58	0.42
Korea	-	1.07	0.48
Latvia	-	0.10	0.26
Malaysia	0.03	1	0.46
New Zealand	-	0.83	0.23
Norway	-	0.92	0.24
Peru	0.06	0.09	0.14
Philippines	0.03	0.28	0.24
Poland	0.04	0.17	0.33
Singapore	0.07	0.8	0.53
South Africa	-	0.53	0.26
Switzerland	-	2.05	0.55
Thailand	0.05	1.02	0.37
Turkey	0.03	0.12	0.27
United Kingdom	0.01	1.12	0.48
United States	0.01	1.49	0.49

Sources : External Dependence data from Rajan and Zingales (1998). Foreign currency borrowing : authors computations from WBES (Worldbank) data. Financial Development: WorldBank.