THE BENEFITS OF ECONOMIC INTEGRATION AND MONETARY UNIONS: THE NEGATIVE IMPACT ON GROWTH OF "EXPORT PORTFOLIO VOLATILITY"*

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Abstract

The elimination of exchange rate volatility among union members is widely considered as one of the main advantages of economic integration and, specifically, of monetary unions. Nonetheless, few papers find evidence of a significant impact of (bilateral) exchange rate volatility on growth. We argue that bilateral exchange rate volatility is an insufficient measure of trading risk since it does not include the volatility induced by trading partners. By devising an "export portfolio risk approach" we find that the variance of a portfolio including exchange rates with trading partners weighted for their relative export shares has significant impact on levels and growth of per capita income after controlling for physical and human capital, institutional and macroeconomic variables, access to ICT and other variables traditionally considered in growth estimates. The effect is robust to sensitivity analysis and to changes in sample composition. Our results sugest that economic integration and monetary unions by reducing export portfolio risk imported from neighbouring partners may have significant effects on growth.

Introduction[1]

The elimination of exchange rate volatility is widely acknowledged as being one of the main advantages of monetary unions and economic integration in an increasingly integrated economic framework (Buiter et al., 1998).

Nonetheless very few empirical papers, if any, have found significant effects of exchange rate volatility on levels and growth of per capita GDP. The main channel though which volatility is expected to affect adversely growth is investment but theoretical evidence on the relationship between investment and volatility is mixed (Caballero-Corbo, 1989; Baum et al., 2001; Froot-Kemplerer, 1989; Serven, 2000). Direct evidence on the relationship between exchange rate volatility and growth is also scant (Bleaney-Greenaway, 2001). We argue that this happens because commonly used measures of exchange rate risk are inaccurate and can only partially capture the overall effects of the risks associated to international trade and their impact on growth.

In this paper we measure potential benefits of economic integration by proposing a measure of exchange rate risk called "export portfolio risk" (also EPR). The export portfolio risk is the risk of a portfolio whose assets are country's exchange rates with the main trading partners weighted by bilateral country export shares. With respect to a simple bilateral exchange rate with a leading currency (i.e. the dollar) the EPR variable has two advantages. First, it includes neighbours' (or trading partners') externalities in the evaluation of the effects of exchange rate volatility on growth. This inclusion is fundamental because a country may have good governance and good macroeconomic

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policies (and, therefore, may be likely to have a low bilateral exchange rate volatility with a leading currency, say, the dollar) but may import instability via variability of governance and economic policies of its trading partners. Individual country stability is therefore insufficient if it is not framed into regional stability and this is why the export portfolio risk variable is more likely to measure the costs of missing regional integration.[2]

A second important advantage of this measure is that favourable and unfavourable exchange rate movements with different trading partners may compensate each other thereby dampening the negative effects of individual bilateral exchange rate volatility on growth (Quian-Varangis, 1994). This effect is incorporated in our export portfolio risk measure which conveniently takes into account the potential impact of trade diversification on export risk.

The empirical findings of the paper support these arguments and show that "export portfolio risk" (more than bilateral exchange rate volatility with the dollar) significantly affects levels and rates of growth of PPP adjusted per capita income.

The paper is divided into five sections (including introduction and conclusions). In the second section we provide a short survey of the literature on the effects of exchange rate volatility on investment and growth documenting the inconclusive theoretical and empirical evidence on the subject. In the third section we describe the methodology adopted to build the "export portfolio risk" variable and present descriptive findings. In the fourth section we present and comment descriptive and econometric empirical findings documenting the effects of export portfolio risk on levels and growth of per capita income in panel estimates.

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[2] A typical example to illustrate this point is that the inspection of the volatility of the bilateral dollar-Argentinian peso exchange rate would suggest low nominal (and slightly higher real) export portfolio risk before the Argentinian crisis, while our mesure of export portfolio risk would have more wisely included the volatility generated, for instance, by the devaluation of the currency of one of its main trading partners (such as Brazil).

2. Exchange rate volatility, investment and growth

Large part of the theoretical literature emphasises that investment is the most likely channel through which volatility affects growth. There is no consensus however on the direction of the link between the two variables. Theoretical predictions on the relationship between exchange rate volatility and investment are mixed, depending on assumptions on market competitiveness, symmetry /asymmetry of investment adjustment costs and entrepreneurial attitudes toward risk.

A well known theoretical benchmark predicts a positive effect of volatility on investment (Cavallero and Corbo, 1989) under perfect competition, risk neutrality and symmetric costs of capital adjustment. The argument is that, under unfavourable exchange rate movements, the firm will remain with excess capital investment, while, under favourable exchange rate movements, it will happen to be with less capital than he needs. With a convex profit function potential losses for insufficient investment in good states are higher than potential costs for excess capacity in bad states and therefore the firm will overinvest when the exchange rate volatility is higher.

This hypothesis, though, does not hold anymore when the assumptions of risk neutrality and symmetric costs of capital adjustment are relaxed. With regard to the second point, just consider that the existence of sunk costs implies *per se* that costs of downward are higher than those of upward adjustments.[3] Nonetheless, Serven (2000) shows that irreversibility must be accompanied by imperfect competition and decreasing returns to scale to revert to the negative sign the relationship between uncertainty, investment and growth. He also shows, though, that

[3] In an empirical analysis on a sample of Italian exporters Sierra-Becchetti (2000) show that sunk costs are inversely related to size (opportunity costs of human capital) .

irreversibility affects ex ante investment choices and that ex post firms may find themselves stuck with excessive capital. The direction of the link between investment and volatility definitely changes (and becomes negative) if we also introduce risk aversion.

Theoretical papers trying to relate directly exchange rate volatility to growth also find controversial results. Baum et al. (2001) investigate the effects of permanent and transitory components of the exchange rate on firms' profitability under imperfect information. By using a signal extraction framework, they show that the variances of these components of the exchange rate process have indeterminate effects on profits growth, but predictable effects on its volatility. An increase in the variance of the permanent (transitory) component in the exchange rate process leads to greater (lesser) variability in the growth rate of firm profits, thus establishing that the source of exchange rate volatility matters in analyzing its effects. Mixed results are again found in oligopolistic models. When market shares matter exchange rate volatility may affect price and quantity of trade in either direction – regardless of risk preferences (Froot-Kemplerer, 1989)

On the empirical side Serven (2000) builds a GARCH-based measure of real exchange rate volatility and finds that it has a strong negative impact on investment. The paper also finds that the negative impact is significantly larger in countries with highly open economies and less developed financial systems.[4]

The ambiguous evidence of the effects of bilateral exchange rate volatility on growth led researchers to explore different methodological paths. An alternative approach has been that of estimating a fundamental exchange rate value and then measuring the impact of the volatility of exchange rate misalignment on growth (Razin-Collins, 1997).

[4] This is likely to occur because economies of these countries are more exposed to export portfolio risk and dispose of less financial instruments to hedge it.

A more recent approach has been that of devising a real effective (trade weighted) exchange rate (also called REER) and testing the hypothesis of a negative relationship between REER and growth. Bleaney-Greenaway (2001) examine the impact on investment and growth of the level and volatility of the terms of trade and the *real effective exchange rate* is estimated for a panel of 14 sub-Saharan African countries over the 1980-1995 period. They find that growth is negatively affected by terms of trade instability, while investment by *real exchange rate* instability. Moreover, both growth and investment increase when the terms of trade improve and *real exchange rate* overvaluation is eliminated.

Why similar results are not found for developed countries ? It may be argued that the fact that this relationship holds for some and not for other countries may also depend on the aggregate relative market power of a country with respect to their trading partners. A higher relative market power will enable country exporters to reduce (increase) pass-through effects under unfavourable (favourable) exchange rate movements, thereby increasing their capacity to get advantages from exchange rate volatility.

Another reason for the incapacity of extending these results to other macroareas may be that some additional links between growth determinants are not properly considered. Van Foreest (2002) relates exchange rate instability to the instability of macroeconomic policies. His paper provides empirical evidence that, irrespective of the foreign exchange rate regime, countries with high monetary volatility have lower relative output growth. It is argued that, due to the forward looking nature of foreign exchange markets, exchange rate stability hinges on the stability of the institutional structure within which monetary and fiscal policies are formulated.

If real exchange rate volatility matters for growth, exchange rate regimes may have significant effects as well. Kent and Naya (2002) examine the relationship between the short-term

volatility of the Real Effective Exchange Rate (REER) and the degree of flexibility of the nominal exchange rate. Existing evidence demonstrates that the short-term variance of bilateral REERs is on average about 12 times higher under floating nominal exchange rate regimes than under fixed regimes. By comparison, analysing pooled results across a set of countries with low and stable inflation and stable growth rates from 1978 to 1994, the authors show that the REER is only twice as volatile under floating regimes as under fixed regimes. But this result is likely to be influenced by a few countries which experienced periods of hyperinflation and high volatility. Although this difference is statistically significant, results within countries show that for most countries there was no significant increase in effective REER volatility when moving to more flexible exchange-rate regimes. Surprisingly, there are even some countries for which volatility is lower under more flexible exchange-rate regimes.

3. Our methodology

Most papers measuring the effects of exchange rate volatility on investment and growth use the volatility of the country bilateral dollar exchange rate. We argue that this is not the most accurate measure of a country's exchange rate risk. We propose an alternative measure based on the idea that a country may be conceived as having a portfolio of assets represented by its relationships with trade partners.

More formally, if the i-th country has trade relationships with j (j=1,..,N) partnerns, the variance of its portfolio σ_p^2 may be written as:

$$\sigma_{p,i}^{2} = \sum_{j} x^{2}{}_{j} s^{2}{}_{j} + 2 \sum_{h<k} x_{h} x_{k} s_{hk}$$

where σ_j^2 is the variance of the return of the j-th asset, i. e. the rate of return of the bilateral exchange rate with the j-th partner. x_j are the export shares of the j-th partner on the i-th country total export, σ_{hk} is the covariance between bilateral exchange rate returns of the i-th country with partners *h* and *k*.Our measure of effective exchange rate variance is therefore a "portfolio variance." It includes the volatility of each bilateral exchange rate and their covariances weighted for their relative trade shares. To analyse the behaviour of the export portfolio risk variable we calculate moving windows of average two year variances of mean monthly exchange rate returns weighted for the export shares of trading partners in our sample period.

Our approach takes into account the criticism of Qian-Varangins (1994) arguing that exchange rate volatility *per se* does not measure the added value of foreign currency on the overall riskiness of a firm's asset portfolio. The firm may hold a porfolio of several currencies. If one exchange rate is negatively correlated with others, then its inclusion into firm portfolio will tend to reduce overall portfolio risk rather than to increase it. Therefore, if a company or a country carries on production in several foreign markets, what matters is its net exposure to exchange rate volatility.

When building the EPR index we consider that, as far as export shares of a given trading partner get lower, their contribution to the EPR becomes negligible.

For this reason and in order to avoid to include in the analysis trading partners with very small shares we consider the following three constraints: i) no more than 7 partners; ii) a cumulative export share not higher than 60 percent; iii) an individual partner share not smaller than 2 percent. When one of these constraints is

hit we do not include additional trading partners in our EPR measure.

4. Descriptive results

To facilitate comparative evaluations we report in Table 1 relative export portfolio volatilities per macroarea with respect to the overall world values of the same variable at the beginning of the period. These numbers get abnormal under two circumstances which correspond to the hyperinflation crises in Bolivia (1985-86)[5] and Nicaragua (1986-89). The table also confirms the impressive catching–up of the EU countries with respect to other OECD countries and the turbulence in Eastern European countries after the fall of the Berlin wall.

The inspection of the dynamics of the export portfolio risk variable in the EU shows a sharp rise in volatility between 1981 and 1985, a period of high regional exchange rate instability, another much smaller peak between 1991 and 1993 and a steady decline to the end of our sample period. At the end of 1997 the export portfolio volatility in the EU is more than four times smaller than at the end of 1993 (Table 1). In other (non EU) OECD countries volatility never reaches the peaks of EU members in the 1981-1985 period. Compared with itself in the sample period is higher at the end of 1985 and almost four times smaller with respect to that peak at the end of the sample period. In relative terms it is interesting to see that the end of sample period export portfolio volatility of EU members is smaller than that of other OECD members, while it almost twice as higher just at the end on 1993 (Figure 1).[6] This picture does not contradict

[5] Bolivia experienced an inflation rate of 1,281 percent in 1985 and 11,749 in 1986, while Nicaragua an inflation rate 10,205 percent in 1986, of 4,770 in 1987, of 7,485 in 1998 and if 2,945 in 1999.

[6] The extremely high EPR volatility during this period is caused by the frequent realignments among currencies in the European Monetary System (a total of 23

the hypothesis of the sensible effects of the EU on the reduction of exchange rate volatility of its members relative to other industrialised countries.

If we look at some of the Eastern countries which are now candidates for entering the EU (Poland , Hungary, Romania) we find that their export portfolio risk is almost six times smaller at the end of the period with respect to the beginning of the period. Nonetheless, their variance is still more than ten times higher than that of current EU members at the end of the period. The two periods of higher turbulence for these countries are after 1982 and after the fall of the Berlin Wall

As expected, Latinamerican countries' export portfolio volatility during the outburst of the debt crisis (after 1982) is extremely high and higher than their end of period volatility, even though the latter is still ten times higher than that of OECD countries.

Subsaharian countries have in turn the highest export portfolio volatility at the end of the sample period, still more than a hundred times higher than that of OECD countries. Contrary to other macroareas, their end of period volatility is not the lowest in the overall sample period since the end of eighties volatility is in fact smaller.[7]

Before estimating the effects of the export portfolio volatility variable on growth we want to provide descriptive evidence of its relationship with some traditional regressors included in growth estimates. By grouping countries according to the quartiles of the cross-sectional average of the variable between 1980 and 1997 we find a strong relationship of export porfolio risk with human

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realignments between 1982 and 1996 involved the French and Belgian Franc, the Danish Krone, the German Mark, the Italian lira and the Irish pound).

[7] The intuitive association between economic development and export portfolio volatility is not always respected. A somewhat surprising result is that the three North African countries included in our estimates (Algeria, Tunisia, Morocco) have an export portfolio volatility which is smaller than that of OECD countries. This result is probably affected by the fact that these are small open economies having currencies which are pegged to those of their main trading partner.

capital and with all indicators of governance and macroeconomic policies (Table 2). This evidence seems to confirm the hypothesis of Van Foreest (2002) about the relationship between exchange rate instability and the poor quality of institutions and economic policies which will be further used for instrumenting the EPR variable. A further relevant finding is the negative relationship between export portfolio volatility and market openness. This result is strongly influenced, though, by the differences between OECD and non OECD countries. The relationship is no more linear if we restrict the analysis to non OECD countries only. For these countries we find that the relatioship between EPR and trade openness is U-shaped. When trade openness is associated with good governance and macroeconomic policies EPR is low (see the first quartile in Table 2), while if trade openness is associated to poor governance and macroceonomic policies EPR is the highest (see the last quartile in Table 2). The conclusion seems to be that trade openness *per se*, if not accompanied by good results in conditional factors of convergence (human capital, macroeconomic policies, governance) may be detrimental as it raises EPR and (if the EPR/growth nexus is supported) reduces growth, while it becomes beneficial when it is accompanied by an improvement of factors of conditional convergence.

A last interesting descriptive finding comes from a comparison between EPR and exchange rate regimes (Table 3). If we exclude two cases of hyperinflation our results are somewhat surprising. By grouping the IMF classification in four categories (peg, limited flexibility, higher flexibility and total flexibility)[8] we find that countries with pegged exchange rates have higher EPR than countries with totally flexible exchange rates. Costs of imposing limits to flexibility (and maintaining pegs) under increasing capital mobility must be one of the rationales explaining the sharp

[8] We define "limited flexibility" the regime in which a currency has limited flexibility with one country or with respect to a multilateral exchange rate agreement, we define "higher flexibility" situations of floating pegs.

increase in the share of countries choosing full flexibility and the parallel reduction of those choosing floating pegs (see Figure 2).
Again the Argentinian case comes in mind. A pegged exchange rate does not imply *per se* a lower export portfolio risk since it does not absorb the impact of volatility which may come from other trading partners and may even be destablising if country fundamentals are not in line with those of the country against which the peg is fixed. These findings are consistent with the argument of Ghosh, Ostry, Gulde and Wolf (1996) that "the de facto behaviour of exchange rate may diverge from its de jure classification". Calvo and Reinhart (2000) argue that this difference may explain why results on the effects of exchange rate regimes on growth are inconclusive. Yeyati and Sturzenegger (1999) find that 12 out of 35 countries identified as free float have in fact some form of exchange rate rigidity. The phenomenon is called by them "fear of floating".

5. Econometric results

We perform our estimates on World Bank yearly data for a sample period ranging from 1983 to 1997.[9]
Table 1 clearly showed that the export portfolio risk variable in different macroareas is highly variable across time. In a cross-sectional estimate the effect of such variability on growth is not accounted for. We therefore believe that a panel estimate may better enhance the impact of the EPR variable in the estimates.
We perform level and growth fixed effect panel estimates using the basic Mankiw et al. (1992) approach in which the two main factors of growth are physical and human capital.[10] Results of

[9] We consider a limited period period, in order to provide evidence of the impact of portfolio risk management in the "ICT revolution" period, considering that the ICT revolution generated a structural break in conditional convergence process (Becchetti-Adriani 2001).
[10] To estimate our model we set the abnormal EPR levels of the two hyperinflationary countries (Bolivia and Nicaragua) at the 95th percentile value of the EPR variable.

level estimates are presented in Table 4. The baseline model (Table 4a column 1) shows that the impact of physical capital is weak while that of human capital is much stronger in the considered sample period. When we introduce the EPR variable we find that the variable is negative and significant as expected (Table 4a column 2).

A problem in these estimates is that human and physical capital shares are distant from what usually found in the literature in different and larger time periods. We argue that these findings may be partially explained by the fact that in the limited period considered by our sample the ICT revolution had a strong effect on the contribution of physical and human capital to output growth. Access to ICT technology is reasonably expected to alter even more the contribution of the traditional physical and human capital variables for several reasons. ICT factors are the highest quality part of physical capital itself and have been demonstrated to enhance human capital productivity.

Given these considerations we add to the panel regression in levels a measure of ICT fruition, $ln(A_{BR\text{-}ICT})$, or of the capacity of a country of removing bottlenecks which prevent access to ICT products.[11] ICT variables are conveniently lagged with respect to

[11] The empirical literature on growth usually neglects the impact of technological progress on the differences between rich and poor countries by implicitly assuming that knowledge and its incorporation into productive technology is a public good, freely available to individuals in all countries (Temple, 1999).

This approach cannot be applied to one of the most important sources of innovation in the last decades (Information and Communication Technology) since ICT is a bundle of quasi-public knowledge products and non public goods, needed for the fruition of the *knowledge products* themselves. Knowledge products are in fact weightless, expansible and infinitely reproducible (software, databases). They may be considered almost as public goods since expansibility and infinite reproducibility make then nonrivalrous, and copyright protection make them much less excludable than other innovation such as new drugs which are protected by patents (Quah, 1999). If ICT would consist only of knowledge products, it should be available everywhere almost immediately no matter the country in which it has been created. This does not occur though since the

the dependent variable to prevent endogeneity problems.[12] With this changes overall goodness of fit jumps from to in level estimates (Table 4a column 3). ICT factors are strongly significant and restore significance of the impact of the investment to GDP ratio which reveals to be a much weaker proxy of the contribution of physical capital investment to growth than ICT variables (Table 4a column 3). Our estimates indicate an elasticity around .025 of the level of per capita GDP with respect to the EPR variable. Therefore an EPR volatility which is twice higher corresponds on average to a 2.5 percent lower level of GDP per capita in a four-year period.

The EPR impact does not change substantially when we weight export portfolio volatility for market openness (EPR* APCOM), reasonably assuming that the export portfolio risk effect is "passed through" the degree of market openness (Table 4a column 4).[13]

To limit the problem of endogeneity between the EPR and the dependent variable we instrument it with measures of governance and macroeconomic policy with a Generalised two stage least

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immediate diffusion and availability of knowledge products is prevented by some "bottlenecks". In our opinion these "*bottlenecks*" are: i) the capacity of the network to carry the largest amount of knowledge products in the shortest time, ii) the access of individuals to the network in which knowledge products are immaterially transported and iii) the power and availability of terminals which process, implement and exchange knowledge products which flow through the network. We therefore argue that bottleneck reducing factors such as the diffusion and power of personal computers, the diffusion of internet access and the capacity of the network have been crucial determinants of the wealth of nations in these last two decades and we want to establish how deep fundamentals have affected domestic diffusion of ICT technology.

[12] The theoretical rationale for introducing ICT variables is that they explain the law of motion of the labour increasing technical progress of the Mankiw et al model. The theoretical underpinnings of the estimated model are provided in Adriani-Becchetti (2001).

[13] For the use of trade openness as control in the analysis of the effect of exchange rates on growth see Bailliu et al (2002).

squares (G2SLS) approach.[14] The usefulness of governance and economic policy indicators (EFW3,EFW4,EFW5)[15] in instrumenting export portfolio risk confirms the strong links between good governance and macroeconomic policies and export portfolio risk itself, even though we already documented that this variable includes also problems created by bad governance of the trading partners and its impact is still significant when governance indicators are included as additional regressors (Table 4 columns 5 and 6).

The re-estimation of the model with bootstrap standard errors shows that the significance of the ICT variables remains strong for all the considered indicators and robust to changes in the composition of sample countries.[16] Our results also prove to be robust to a sensitivity analysis à la Levine-Renelt (1992) performed on our sample (Table 5). The lower and the upper

[14]Our decision to use generalized 2-stage least squares instead of GMM hinges on a recent result of Erickson (Econometrica, 2001) showing that "The main advantage of GMM is its well known covariance matrix formula rather than its efficiency with respect to TSLS…the difference between GMM and TSLS estimates is likely to be small." Therefore, the difference between the two approaches is only in the computational simplicity of the variance-covariance matrix.

[15] For sources and composition of these indicators see legend of Table 2.

[16] Remember that bootstrapping provides an alternative way of estimating standard errors which does not rely on any a priori given distributional form (Efron, 1979, Efron and Stein, 1981; Efron and Tibshirani, 1986). More specifically, in each trial of the bootstrapping procedure we draw with replacement N observations from the N observation dataset (therefore in each trials some countries may have higher weight and other countries may not be included in the sample). We perform two thousands of trials and for each of them we calculated the coefficient magnitude. The estimate of the standard error of that statistics then depends on the variability of the estimate in the different trials. In this sense, and given that in each trial of the bootstrapping procedure we draw with replacement N observations from the N observation dataset, bootstrapping measures the sensitivity of the result to changes in the number of observations. We also estimate the model separately for OECD and non OECD countries and find that the ICT effect is significant in both subsamples, even though it appears to be stronger in OECD countries. Results are omitted for reasons of space and available upon request.

bound of the EPR coefficient in the different specifications performed under the sensititity analysis are significant and the magnitude bounds are not more than 1 percent far from the baseline estimate.

Growth estimates confirm the significance and robustness of the EPR variable (Table 6).[17] The variable is significant when evaluated both at the beginning of each time period considered in the panel (and, therefore, relative to the variance of monthly REERs of the two years before that date) and as an average of the panel time interval itself. The effect here is smaller in magnitude. The coefficient indicates that a twofold increase in volatility corresponds to a .5 percent reduction of the rate of growth of per capita GDP in a four-year period. The effect is not too small if we consider that the EPR of EU members was four times smaller in 1997 with respect to 1993 and that, therefore, the effect of convergence toward European Union may be quantified into a 2 percent higher rate of growth according to this estimates.

To provide evidence that additional information in the EPR variable is relevant we reestimate here the model for different macroareas and we compare results obtained using EPR with results using bilateral exchange rate volatility with the dollar (a variable which measures mainly the volatility generated by the observed country and by the US) and find that this variable is slightly weaker in significance in our estimates on the overall sample (see columns 4-6 in Table 6). The Levine-Renelt (1992) sensitivity analysis confirms the slight superiority of the EPR variable if we compare significance lower bounds (Table 7).

The difference in significance between the EPR variable and the bilateral volatility with the dollar is much clearer if we estimate

[17] Panel growth estimates exhibit the problem already evidenced by Islam (1995) of the low significance of human capital. A reasonable explanation is its low within variability and the deferred impact of the human capital proxy (school enrolment) on growth which can hardly be measured on small time lags like those of our panel estimates.

the model for OECD (Table 8a) and HIPC (Table 8b) countries only.
In the OECD country estimate the EPR variable is negative and significant also in bootstrap estimates. In the HIPC country estimate the bilateral volatility of the exchange rate with the dollar is strongly significant, while the EPR is not. We argue that this result is affected by the fact that the presence of a significant dollar denominated external debt in non OECD countries increases the role of volatility of the bilateral dollar exchange rate.[18] In some sense, therefore external debt creates a closer link of the domestic exchange rate with the dollar and prevents these countries from perceiving the benefits from a reduction of EPR volatility which may arise from regional integration.

6. Conclusions

The reality of growth is multifaceted. A relevant problem in understanding its determinants is the multicollinearity among factors of conditional convergence and the endogeneity between the latter and the dependent variable.

These two problems make it difficult to interpret cross-sectional results. Such results only confusedly express the reality of clusters of countries which are identifiable on the basis of strong differences in values of "orthogonal components" which include groups of these convergence factors and the dependent variable. The approach of convergence clubs (Quah, 1998) is an attempt of taking into account these problems, but at the cost of sacrificing too much the investigation of the determinants of growth and the normative suggestions which may stem from it.
A panel approach and the adoption of some new variables may still be a good way to examine the problem of growth from an original perspective in order to answer new questions and, at the

[18] Estimates on the relative effect of EPR and the bilateral exchange rate with the dollar on GDP growth on HIPC countries only support our hypothesis. They are omitted for reasons of space and are available from the authors upon request.

same time, not to loose the potential normative suggestions that policymakers expect to find solutions for the problem. One of these questions is whether and in which way regional monetary and economic integration may contribute to growth or, in other terms, which are the benefits that may compensate the costs of loosing discretionality in managing domestic economic policies (not to talk of the social costs from closer integration with foreign workers and consumers as they are perceived by different social groups).

We try to answer to this question by considering the main indisputable advantage of monetary unions, the reduction of exchange rate volatility with trading partners. To do so we devise a comprehensive indicator of export portfolio risk which goes beyond the limited approach of the bilateral exchange rate with the dollar. This variable has the advantage of measuring not only the reduction in volatility which may arise from good domestic governance and economic policies but also the impact of governance and monetary policies of the main trading partners and the positive (negative) effect on trading risk generated by high (low) trade diversification.

The paper finds that the export portfolio risk variable is strongly significant on levels and growth of per capita GDP in both cross-sectional and panel estimates contrary to the simple volatility measure of the country's bilateral exchange rate with the dollar.

Our conclusions are that the export portfolio risk variable allows us to understand that growth is conditional not only to the traditional human and physical capital factors but also to economic integration. Paper findings demonstrate that the EPR is not just a proxy of domestic governance and economic policies but also a measure of how macroeconomic and institutional behaviour of trading partners and export diversification affect country's conditional convergence.

References

Buiter, W., Corsetti, G., and Pesenti, P., 1998, Financial Markets and European Monetary Cooperation. The lessons from the 92-93 crisis, with, 1998, Cambridge University Press

Baum, C. F. Caglayan, M. and Barkoulas, J. T., 2001, Exchange Rate Uncertainty and Firm Profitability, Journal of Macroeconomics, Vol. 23, No. 4.

Bleaney M. Greenaway, D, 2001, The Impact of Terms of Trade and *Real Exchange Rate* Volatility on Investment and Growth in Sub-Saharan Africa Journal of Development Economics, 65, (2), pp. 491-500.

Calvo, G. and Reinhart, C., 2000, Fear of floating, "URL:http://www.puaf.umd.edu/papers/reinhart/rearrev.pdf.

Campa, Manuel (1993) "Entry by Foreign Firms in the U.S. Under Exchange Rate Uncertainty", The Review of Economics and Statistics 75, p. 614-622.

De Grauwe, P., Skudelny, F., 2000, The Impact of EMU on Trade Flows, Weltwirtschaftliches Archiv/Review of World Economics, v., 136, iss. 3, pp. 381-402

Dixit, Avinash and Robert Pindyck , 1994, Investment Under Uncertainty

Durlauf, S.N.and Quah D.T., 1998, The new empirics of economic growth, Center for Economic Performance Discussion Paper N. 384.

Easterly, William, Roumeen Islam, and Joseph Stiglitz, 2000, "Shaken and Stirred, Explain Growth Volatility," Annual World Bank Series of Development Economics

Efron, B., 1979, Bootstrap methods: another look at the jackknife, Annals of Statistics, 7, 1-26.
Efron, B. and Stein, C., 1981, The jackknife estimate of variance, Annals of Statistics, 9, 586-596.
Efron, B. and Tbishirani, R., 1986, Boostrap measures for standard errors, confidence intervals and other measures of statistical accuracy, Statistical Science, 1, 54-77.

Gavin, Michael, Ricardo Hausmann and Leo Leiderman (1995) "The macroeconomics of Capital lows to latin America: Recent experience and policy issues" OCE Working Paper, Inter-American Development Bank

Gosh, A.R., Ostry, J.D., Gulde A.M. Wolf, H.C., 1996, does the exchange rate regime matter for inflation and growth ?, IMF Economic Issues, 2 September.

Holzmann, Robert; Jorgensen, Steen *Social Risk Management*: A New Conceptual Framework for *Social* Protection, and Beyond International Tax and Public Finance, August 2001, v. 8, iss. 4, pp. 529-56

Islam, N., 1995, Growth empirics: a panel data approach, *Quarterly Journal of Economics*, pp.1127-1169.

Kent C., Naja R., 1998, Effective real exchange rates and irrelevant nominal exchange rate regimes, Research Discussion paper n. 9811

Leahy and Whited (1995) "The Effect of Uncertainty on Investment: Some Stylized Facts", NBER WP no. 4986.

Levine, R. and Renelt, D., 1992, A sensitivity analysis of cross-country growth regressions, *American Economic Review*, 82(4), 942-63.

Qian, Ying and Panos Varangis, " Does Exchange Rate Volatility Hinder Export Growth?", *Empirical Economics* 1994, 19, 371-396

Van Foreest, P. de Vries, C., the Forex regime and EMU expansion, Tinbergen Institute Discussion Papers 02-010/2 / Tinbergen

Yeyati,E.L., and Sturzenegger, F.,"Classifying Exchange Rate Regimes: Deeds vs. Words," URL:http://www.utdt.edu/~ely/Regimes_final.pdf

Figure 1

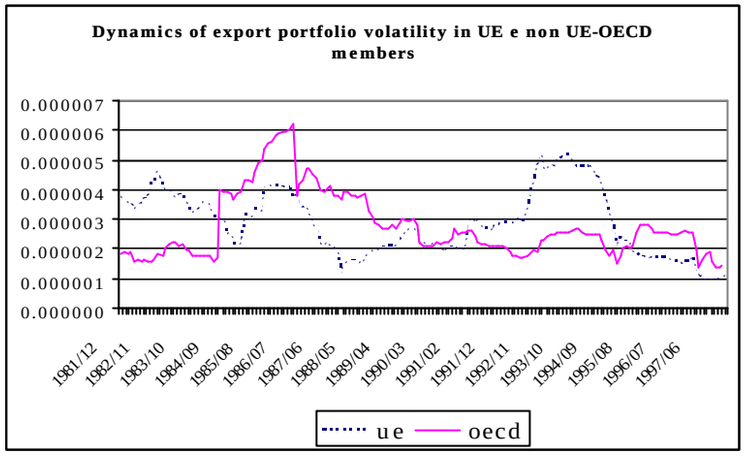
Dynamics of export portfolio volatility in UE e non UE-OECD members
0.000007
0.000006
0.000005
0.000004
0.000003
0.000002
0.000001
0.000000
1981/12
1982/11
1983/10
1984/09
1985/08
1986/07
1987/06
1988/05
1989/04
1990/03
1991/02
1991/12
1992/11
1993/10
1994/09
1995/08
1996/07
1997/06
ue
oecd

Figure 2

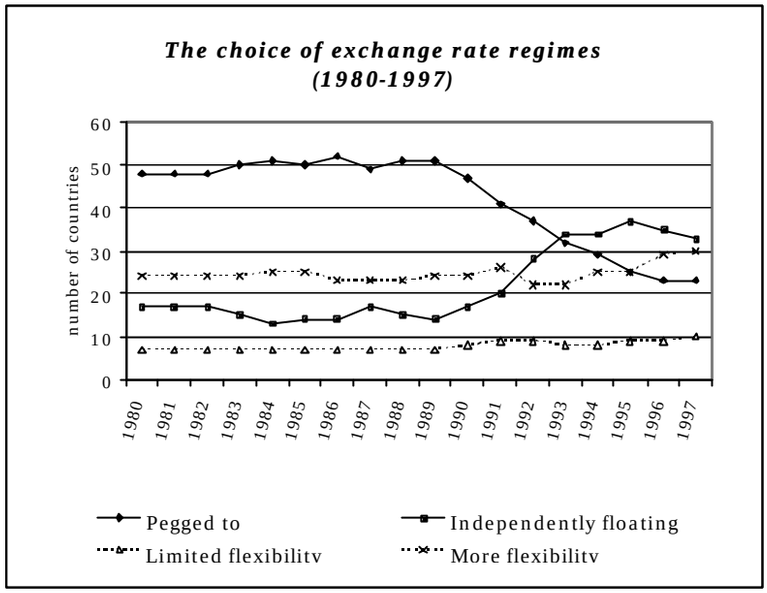
The choice of exchange rate regimes
(1980-1997)
number of countries
60
50
40
30
20
10
0
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
Pegged to
Independently floating
Limited flexibility
More flexibility

Table 1. The relative dynamics of export portfolio volatility across macroareas

(Export portfolio volatility: moving windows of average two year variance of mean monthly exchange rate returns weighted for export share for each country in our sample period)

Month	World	Current EU members	OECD (non EU)	Latinamerican countries	Eastern European countries (EU candidates)	Sub-saharian Africa
1981/12	1.000	0.031	0.015	0.130	0.611	2.900
1983/12	2.236	0.027	0.015	6.028	8.347	4.244
1985/12	>100	0.034	0.047	>100	1.279	0.485
1987/12	8.777	0.013	0.032	40.720	0.717	7.701
1989/12	>100	0.018	0.017	2.408	0.782	0.535
1991/12	1.619	0.023	0.017	6.738	2.685	1.862
1993/12	5.375	0.039	0.022	2.057	0.146	17.746
1995/12	3.060	0.014	0.023	3.354	38.009	5.234
1997/12	0.476	0.009	0.012	0.098	0.112	1.580

Table 2 Descriptive evidence on the relationship between export portfolio volatility, indicators of governance and macroeconomic policies, physical and human capital (Export portfolio volatility: moving windows of average two year variance of mean monthly exchange rate returns weighted for export share for each country in our sample period)

Variable legend: Sk: investment to GDP ratio; Sh: high school gross enrolment

	ALL COUNTRIES			
	QUARTILES OF THE EXPORT PORTOLIO RISK			
	1ST QUARTILE	2ND QUARTILE	3RD QUARTILE	4TH QUARTILE
Sk	21.993	21.909	21.260	20.975
Sh	93.652	65.994	58.074	39.661
efw1	5.943	6.989	7.403	7.899
efw2	5.134	4.274	4.069	4.136
efw3	9.061	8.594	7.971	5.088
efw4	8.731	7.105	6.717	5.113
efw5	8.846	7.241	6.674	5.043
efw6	8.207	6.749	6.311	5.413
efw7	7.896	6.453	5.896	4.657
Apcom8597	98.071	76.541	70.088	68.277
MO8597	0.536	0.525	0.543	0.566
	NON OECD COUNTRIES ONLY			
	QUARTILES OF THE EXPORT PORTOLIO RISK			
	1ST QUARTILE	2ND QUARTILE	3RD QUARTILE	4TH QUARTILE
Sh	60.90	37.607	31.288	39.378
Sk	26.74	21.195	18.459	21.313
efw1	8.04	8.114	8.659	7.823
efw2	6.01	3.207	3.416	4.295
efw3	9.12	7.823	6.153	5.246
efw4	7.19	5.289	5.540	4.785
efw5	6.82	5.208	4.614	5.010
efw6	7.49	5.349	4.823	5.314
efw7	6.96	4.748	4.540	4.728
Apcom8597	98.12	62.892	51.477	70.923
MO8597	0.57	0.538	0.580	0.553

ratio; Apcom8597. average market openness in the 1985-97 period; MO8597: export concentration ratio (share of export of the first four partners).Governance indicators are taken from the index of economic freedom published in the *Economic Freedom of the World: 2000 Annual Report* (EFW COMPOSITE) is a weighted average of the seven following composed indicators designed to identify the consistency of institutional arrangements and policies with economic freedom in seven major areas: EFW(I) Size of Government: Consumption, Transfers, and Subsidies [11.0%], i) General Government Consumption Expenditures as a Percent of Total Consumption (50%), ii) Transfers and Subsidies as a Percent of GDP (50%). EFW(II) Structure of the Economy and Use of Markets *(Production and allocation via governmental* [14.2%] *and political mandates rather than private enterprises and market*s) i) Government Enterprises and Investment as a Share of the Economy (32.7%); ii) Price Controls: Extent to which Businesses Are Free to Set Their Own Prices (33.5%); iii) Top Marginal Tax Rate *(and income threshold at which it applie*s) (25.0%); iv) The Use of Conscripts to Obtain Military Personnel (8.8%). EFW(III) Monetary Policy and Price Stability *(Protection of money as a store of value and medium of exchang*e)[9.2%], i) Average Annual Growth Rate of the Money Supply during the Last Five Years (34.9%) minus the Growth Rate of Real GDP during the Last Ten Years; ii) Standard Deviation of the Annual Inflation Rate during the Last Five Years (32.6%); iii) Annual Inflation Rate during the Most Recent Year (32.5%). EFW(IV) Freedom to Use Alternative Currencies *(Freedom of access to alternative currencie*s) [14.6%] i) Freedom of Citizens to Own Foreign Currency Bank Accounts Domestically and Abroad (50%); ii) Difference between the Official Exchange Rate and the Black Market Rate (50%). EFW(V): Legal Structure and Property Rights *(Security of property rights and viability of contract*s) [16.6%] i) Legal Security of Private Ownership Rights *(Risk of confiscatio*n) (34.5%); ii) Viability of Contracts *(Risk of contract repudiation by the governmen*t) (33.9%); iii) Rule of Law: Legal Institutions Supportive of the Principles of Rule of Law (31.7%) and Access to a Nondiscriminatory Judiciary. EFW(VI) International Exchange: Freedom to Trade with Foreigners [17.1%] i) Taxes on International Trade, ia Revenue from Taxes on International Trade as a Percent of Exports plus Imports (23.3%), ib Mean Tariff Rate (24.6%), ic Standard Deviation of Tariff Rates (23.6%), ii) Non-tariff Regulatory Trade Barriers, iib Percent of International Trade Covered by Non-tariff Trade Restraints (19.4%), iic Actual Size of Trade Sector Compared to the Expected Size (9.1%). EFW(VII) Freedom of Exchange in Capital and Financial Markets [17.2%], i) Ownership of Banks: Percent of Deposits Held in Privately Owned Banks (27.1%); ii) Extension of Credit: Percent of Credit Extended to Private Sector (21.2%); iii) Interest Rate Controls and Regulations that Lead to Negative Interest Rates (24.7%); iv) Restrictions on the Freedom of Citizens to Engage in Capital Transactions with Foreigners (27.1%). *Any of the considered freedom indicators has a 0-10 value range. A higher value means a higher level in the item considered by the indicator* .

Table 3 Export portfolio volatility under different exchange rate regimes

	PEGGED	LIMITED FLEXIBILITY	MORE FLEXIBILITY	INDEPENDENT
Sample period	.0021109	.0001433	.0015513	.0011945
1983-85	.0013476	.0001752	.001191	.0002145
1986-88	.0016687	.0001415	.0017515	.0032114
1989-91	.0045063	.0001372	.0017519	.0005763
1992-94	.0015625	.0002458	.0014416	.002748
1994-97	.0006838	.0000449	.0016365	.0003273
	PEGGED	LIMITED FLEXIBILITY	MORE FLEXIBILITY	INDEPENDENT
Sample period	.0037623	9.64e-06	.0020573	.0186983
1983-85	.0006269	-.000091	.0012254	-.0004256
1986-88	.0007403	.0000467	.0026236	.1338982
1989-91	.013377	.0000897	.0025194	-.0003471
1992-94	.0019176	-.000094	.0008077	.0016092
1994-97	.0003249	.0000774	.0029069	.0005423

Countries pegged to the dollar: Angola (with exception of 1995-1996), Argentina from 1992,
Dominican Republic until 1986 and in 1990-1991, Ecuador in 1989, Egypt until 1988, El Salvador until 1989, Ethiopia until 1993, Guatemala until 1989, Haiti until 1991, Honduras until 1990, Mozambique between 1988 and 1989, Nicaragua until 1990 and between 1992/1993, Nigeria from 1994, Panama, Paraguay between 1983 and 1989, Peru until 1990, Sierra Leone between 1988 and 1990, Somalia between 1980 and 1986, Sudan between 1980 and 1986 and between 1989 and 1991, Sweden between 1980 and 1986, Syrian Arab Republic, Uganda between 1980 and 1989, Venezuela until 1989 and between 1995 and 1996. Countries pegged to the British pound: Bangladesh until 1982, Ivory Coast between 1991 and 1993. Countries pegged to the French Franc: Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Ivory Coast except between 1991 and 1993, Madagascar until 1982, Mali, Niger, Senegal, Togo. Countries pegged to a basket of currencies: Austria between 1983 and 1994; Bangladesh from 1982, Finland until 1991, Hungary between 1986 al 1995, Iceland from 1989, Israel between 1986 and 1992, Jordan (to the SDR), Kenya to the SDR until 1993, Madagascar between 1983 al 1985, Malati until 1993, Malaysia until 1992, Malta, Mauritania until 1988 and between 1993 and 1995, Morocco from 1991, Mozambique between 1984 and 1987 and in the year 1990, Myanmar (to the SDR), Nepal with the exception of 1993, New Zealand until 1984, Norway until 1992, Poland until 1991, Romania until 1991, Randa until 1994 Sierra Leone between 1980 and 1986, Singapore between 1980 and 1988, Somalia between 1988 and 1990, Sudan between 1987 and 1988, Sweden between 1987 and 1992, Tanzania until 1993, Thailand, Uganda between 1991and 1992, Zambia until 1986 and between 1989 and 1990, Zimbabwe until 1994. Limited flexibility countries*:* Austria, Belgium, Denmark, France, Finland, Ireland, Italy, Luxembourg, Netherland, Portugal, Spain, United Kingdom. Higher flexibility countries*:* Brazil (s.i. from 1980 to 1990,m.f. from 1995 to 1997), Chile (s.i.) , Colombia (s.i. from 1980 to 1994,m.f. from 1995 to 1997), Madagascar (s.i. from 1986 to 1994), Mozambique (s.i. nel 1991), Nicaragua (s.i from 1994 to 1996, m.f. nel 1991 e nel 1997), Portugal (s.i. from 1980 to 1990,m.f. nel 1991), Somalia (s.i. nel 1987,m.f. from 1991 to 1994), Zambia (s.i. from 1991 to 1992). Countries with totally flexible exchange rates*:* Algeria (from 1980 to 1986), Argentina (from 1990 to 1991), Australia, Austria (from 1980 to 1982), Bolivia, Brazil(from 1991 to 1994), Canada, Costa Rica (from 1992 to 1995), Dominican Republic (from 1987 to 1988 e from 1992 to 1994), El Salvador (from 1991 to 1995), Ethiopia (from 1994 to 1997), Finland(from 1992 to 1996), Ghana , Greece (from 1980 to 1983), Guatemala (from 1990 to 1997), Guinea (nel 1987 and from 1995 to 1997), Haiti(from 1992 to 1997), Honduras (from 1992 to 1994), India (from 1993 to 1997), Italy (from 1992 to 1996), Japan, Kenia (from 1994 to 1997), Madagascar (from 1995 to 1997), Malawi (from 1994 to 1997), Mauritania (from 1996 to 1997), Mexico (from

1995 to 1997), Mozambique (from 1980 to 1983 and from 1992 to 1997), Nepal (from 1993 to 1997), New Zealand (from 1985 to 1997), Nigeria (from 1980 to 1993), Norway (from 1993 to 1995), Paraguay (from 1980 to 1982 and from 1990 to 1997), Peru (from 1991 to 1997), Philippines, Romania (from 1992 to 1997), Rwanda (from 1995 to 1997), Sierra Leone (nel 1987 and from 1991 to 1997), Somalia (nel 1995 and nel 1997), South Africa, Spain (nel 1989), Sudan(from 1992 to 1993 and in 1996), Sweden(from 1993 to 1997), Switzerland, Tanzania(from 1994 to 1997), Uganda (from 1993 to 1997), United Kingdom (from 1980 to 1990 and from 1993 to 1997), United States, Uruguay (from 1980 to 1992), Venezuela (from 1990 to 1993), Zambia (from 1987 to 1988 and from 1993 to 1997), Zimbabwe(from 1995 to 1997).

Table 4 Panel regressions in levels

DEPENDENT VARIABLE: LEVEL OF PER CAPITA GDP IN PPP	BASELINE MODEL	BASELINE MODEL + EPR	BASELINE MODEL + EPR+ ICT	BASELINE MODEL + EPR WEIGHTED BY TRADE OPENNESS	BASELINE MODEL + EPR (INSTRUMENTED BY INSTITUTIONAL VARIABLES)	BASELINE MODEL + +ICT+EPR (INSTRUMENTED BY INSTITUTIONAL VARIABLES)
ln(s_k)	0.100	0.085**	0.240**	0.095**	-0.092	0.119
	1.56	1.34	3.37	1.50	-0.54	0.89
ln(s_h)	0.814**	0.803**	0.711**	0.806**	0.441**	0.705**
	11.78	11.75	7.40	11.74	2.48	4.64
ln(n+g+d)	-0.769**	-0.778**	-0.186	-0.781**	-0.767	-0.504
	-3.81	-3.91	-0.93	-3.9	-1.02	-1.52
Ln(A_{BR-ICT})IN					0.231**	
					1.47	
Ln(A_{BR-ICT})AVG			0.307**			0.580**
			4.75			4.12
ln(EPR_{IN})					-0.048*	
					-2.23	
ln(EPR_{AVG})		-0.025**	-0.018**			-0.074**
		-3.04	-2.37			-2.25
*ln(EPR_{AVG}*APCOM)*				-0.02**		
				-2.38		
Constant	3.608**	3.460**	4.709**	3.532**	5.130*	3.450**
	6.30	6.09	7.44	6.2	2.53	3.35
F test / χ test	F(3,319) =61.21	F(4,318) = 49.41	F(5, 232) = 34.21	F(4,318)= 48,00	χ^2(5)=9177 62.18	χ^2(5)=3418 52.09
F test u_i=0 (joint significance of fixed effects)	F(90,319) =23.18	F(90, 318) = 22.56	F(87,232)= 17.57	F(90,318)=22, 86	F(76,60)=2 1,64	F(77,127)= 7.52
Observations	413	413	325	413	142	210
Groups	91	91	88	91	77	78
Instrumented variables					*Ln(volatilità iniziale)*	*Ln(volatilità media)*
Instruments					Efw3, efw4, efw5, efw6, efw7	Efw3, efw4, efw5, efw6, efw7

Variable legend: *ln(*EPR_{IN}*):* log of the beginning of period export portfolio risk; *ln(*EPR_{AVG}*)* log of the average period export portfolio risk. For the definition of the other variables see table 4 ** 95 percent significance with bootstrap standard errors, * 90 percent significance with bootstrap standard errors. We use the percentile and bias corrected approach with 2000 replications.

Table 5. Sensitivity analysis on panel regressions in level (1980-1997)

Repressori		*Coefficiente*	*T-stat.*	R^2	*Osservazioni*	*Variabili Addizionali*		
$ln(EPR_{AVG})$	*High*	-0.017	-1.90	0.641	290	CIVLIB	DEB	INFL
	Base	-0,025	-3.04	0.771	413			
	Low	-0.043	-3.74	0.821	287	CIVLIB	BMP	INTSPREAD
$ln(EPR_{AVG})$ *APCOM	*High*	-0.017	-1.92	0.641	290	CIVLIB	DEB	INFL
	base	-0,022	-2.89	0.771	413			
	Low	-0.037	-3.3	0.813	305	CIVLIB	INFL	INTSPREAD

The sensitivity analysis is run by adding to the benchmark model all three by three conbinations of the following variables: *DEB:* debt NPV value to export, *INTSPREAD:* average difference between lending and borrowing rate in the domestic banking system, *INFL*: inflation, standard deviation of inflation, *ECONFREE*: economic freedom indicator calculated as a weigthed average of the seven EFW variables in the *Economic Freedom of the World: 2000 Annual Report* see legend of Table 2, *CIVLIB*: libertà civile, *BMP* : Black Market Premium.

In the table we select for each regressor of the base model only the benchmark estimate and the two replications in which the coefficient has the highest and the lowest significance.

Table 6 A comparison between the effect of EPR and volatility of the bilateral exchange rate with the dollar in growth panel regressions

Variabile	BASELINE MODEL	BASELINE MODEL + EPR+ TERMS OF TRADE	BASELINE MODEL + EPR+TRADE OPENNESS + TERMS OF TRADE	BASELINE MODEL + BILATERAL VOLATILITY WITH THE DOLLAR	BASELINE MODEL + BILATERAL VOLATILITY WITH THE DOLLAR +TERMS OF TRADE	BASELINE MODEL + BILATERAL VOLATILITY WITH THE DOLLAR +TRADE OPENESS + TERMS OF TRADE
ln(s_k)	0.136**					0.096**
	5.37	0.132**	0.084**	0.087**	0.139**	0.092**	3.54
ln(s_h)	-0.015*[1]	5.18	3.10	3.21	5.46	3.43	-0.024**
	-0.44	-0.012	-0.045**	-0.046*[1]	0.010	-0.024**	-0.70
ln(n+g+d)	-0.003	-0.37	-1.36	-1.39	0.30	-0.70	-0.082*[1]
	-0.04	-0.007	-0.041	-0.040	-0.044	-0.084*[2]	-0.93
Ln(Y/L_{1985})	-0.209**	-0.09	-0.46	-0.45	-0.54	-0.94	-0.213
	-11.20	-0.214**	-0.206**	-0.204**	-0.224**	-0.215**	-11.01
Ln(varToT)		-11.34	-10.71	-10.64	-11.77	-11.07	
			0.002	0.002		0.002	
ln(EPR_{AVG})			0.67	0.65		0.61	0.002*[2]
		-0.005	-0.007				0.57
ln($TCDOLR_{AVG}$)		-1.60	-1.94				
					-0.005	-0.006	
*ln(EPR_{AVG}*APCOM)*					-1.60	-1.74	
				-0.005			
*ln($TCDOLR_{AVG}$*APCOM)*				-1.63			-0.005

							-1.45
Constant	1.644 7.11	1.634 7.07	1.739 7.14	1.748 7.17	1.523 6.55	1.613 6.54	1.619 6.55
F test	F(4,312)= 67.23	F(5.311)=54.56	F(6.279)=43.74	F(6.279)=4 3.39	F(5.310)= 55.05	F(6.278)=4 3.47	F(6.278)=43.17
F test u_i=0 (joint significance of fixed effects)	F(90,312)= 3.21	F(90.311)=3.19	F(82.279)=3.41	F(82.279)= 3.39	F(90.310) =3.25	F(82.278)= 3.43	F(82.278)=3.41
Observations	407	407	368	368	406	367	367
Groups	91	91	83	83	91	83	83

Variable legend: *ln(TCDOLR$_{AVG}$):* log of the average period volatility of the bilateral exchange rage with the dollar. For the definition of the other variables see table 4 . ** 95 percent significance with bootstrap standard errors, * 90 percent significance with bootstrap standard errors. We use the percentile and bias corrected approach with 2000 replications.

Table 7.Sensitivity analysis on growth panel regressions (overall sample)

Regressors		*Coefficient*	*T-stat.*	R^2	*Observations*	*Additional variables*		
	High	-0.007	-1.78	0.0087	285	CIVLIB	INFL	ECOFRE
Ln(EPR_{AVG}***)***	base	-0,007	-1.94	0.0129	368			
	Low	-0.011	-2.56	0.0162	271	INTSPREAD	INFL	BMP
	High	-0.006	-1.52	0.0687	268	BMP	INFL	DEB
Ln($TCDOLR_{AVG}$***)***	base	-0,005	-1.60	0.0198	406			
	Low	-0.009	-2.08	0.0133	288	INTSPREAD	BMP	INFL

The Sensitivity analysis is run by adding to the benchmark model all three by three conbinations of the following variables: *DEB:* debt NPV value to export, *INTSPREAD:* average difference between lending and borrowing rate in the domestic banking system, *INFL*: inflation, standard deviation of inflation, *ECONFREE*: economic freedom indicator calculated as a weigthed average of the seven EFW variables in the *Economic Freedom of the World: 2000 Annual Report* see legend of Table 2, *CIVLIB*: libertà civile, *BMP* : Black Market Premium.In the table we select for each regressor of the base model only the benchmark estimate and the two replications in which the coefficient has the highest and the lowest significance.

Table 8a A comparison between the effect of EPR and volatility of the bilateral exchange rate with the dollar in growth panel regressions – OECD countries only

Variable	BASELINE MODEL	BASELINE MODEL + EPR	BASELINE MODEL + EPR+ TERMS OF TRADE	BASELINE MODEL + BILATERAL VOLATILITY WITH THE DOLLAR	BASELINE MODEL + BILATERAL VOLATILITY WITH THE DOLLAR + TERMS OF TRADE
$ln(s_k)$	0.115	0.109**	0.089	0.127**	0.098
	1.95	1.88	1.22	2.13	1.29
$ln(s_h)$	-0.001	0.009	0.019	-0.006	-0.004
	-0.01	0.12	0.26	-0.07	-0.05
ln(n+g+d)	-0.363	-0.337	-0.281	-0.411	-0.351
	-2.22	-2.10	-1.59	-2.53	-1.95
$Ln(Y/L_{1985})$	-0.22**	-0.226**	-0.233**	-0.230**	-0.236**
	-7.23	-7.53	-7.29	-7.31	-7.06
Ln(VARToT)			0.006		0.006
			1.26		1.38
$ln(EPR_{AVG})$		-0.012*	-0.013*		
		-2.22	-2.39		
$ln(TCDOLR_{AVG})$				-0.009	-0.012
				-1.30	-1.56
Constant	1.012*	0.999*	1.215**	0.872**	1.160
	2.30	2.32	2.32	1.98	2.15
F test	F(4,90)=37.77	F(5,89)=32.53	F(6,82)=25.21	F(5,89)=31.53	F(6,82)=24.51
F test u_i=0 (join significance of fixed effects)	F(24,90)=2.97	F(24,89)=2.91	F(23,82)=2.40	F(24,89)=3.54	F(23,82)=3.26
R2	0.40	0.41	0.46	0.31	0.34
Observations	119	119	112	119	112
Groups	25	25	24	25	24

Variable legend: *ln(VARTOT):* log of country's terms of trade volatility. For the definition of the other variables see table 4. ** 95 percent significance with bootstrap standard errors, * 90 percent significance with bootstrap standard errors. We use the percentile and bias corrected approach with 2000 replications.

Table 8b A comparison between the effect of EPR and volatility of the bilateral exchange rate with the dollar in growth panel regressions – OECD countries only

Variabile	BASELINE MODEL + EPR	BASELINE MODEL + EPR+ TRADE OPENESS	BASELINE MODEL + BILATERAL VOLATILITY WITH THE DOLLAR	BASELINE MODEL + BILATERAL VOLATILITY WITH THE DOLLAR + TRADE OPENESS
$ln(s_k)$	0.090**	0.108**	0.115**	0.126**
	1.53	1.87	1.95	2.13
$ln(s_h)$	0.009	0.013	0.003	-0.001
	0.13	0.18	0.04	-0.02
$ln(n+g+d)$	-0.307	-0.33	-0.422	-0.406
	-1.90	-2.05	-2.62	-2.50
$Ln(Y/L_{1985})$	-0.223**	-0.226**	-0.230**	-0.231**
	-7.48	-7.54	-7.37	-7.32
$ln(EPR_{IN})$	-0.011**			
	-2.30			
$ln(EPR_{AVG}*APCOM)$		-0.011*$_1$		
		-2.23		
$ln(TCDOLR_{IN})$			-0.012**	
			-1.86	
$ln(TCDOLR_{AVG}*APCOM)$				-0.009
				-1.29
Constant	1.119**	1.051*$_1$	0.810**	0.910*$_1$
	2.59	2.44	1.85	2.06
F test	F(5,89)=32.71	F(5,89)=32.55	F(5,89)=32.49	F(5,89)=31.52
F test u_i=0 (join significance of fixed effects)	F(24,89)=2.72	F(24,89)=2.97	F(24,89)=3.37	F(24,89)=3.62
R^2	0.4177	0.4069	0.3218	0.3094
Observations	119	119	119	119
Groups	25	25	25	25

** 95 percent significance with bootstrap standard errors, * 90 percent significance with bootstrap standard errors. We use the percentile and bias corrected approach with 2000 replications.

Table 8c A comparison between the effect of EPR and volatility of the bilateral exchange rate with the dollar in growth panel regressions – HIPC countries only

Variabile	BASELINE MODEL	BASELINE MODEL + EPR + ICT		BASELINE MODEL + BILATERAL VOLATILITY WITH THE DOLLAR+ICT	
ln(s_k)	0.094	0.076	0.082	0.052	0.062
	1.09	0.90	0.98	0.64	0.76
ln(s_h)	0.113	0.084	0.082	0.066	0.063*[1]
	1.01	0.77	0.76	0.105	0.61
ln(n+g+d)	0.144	0.182	0.174	0.167	0.156
	0.51	0.67	0.64	0.65	0.60
Ln(Y/L_{1985})	-0.544*[1]	-0.589*	-0.588*	-0.605**	-0.603**
	-4.72	-5.16	-5.16	-5.56	-5.55
Ln($A_{BR\text{-}ICT(IN)}$)		0.043	0.045	0.036	0.039
		0.80	0.84	0.72	0.78
Ln($A_{BR\text{-}ICT(AVG)}$)					
LnvolatilitàToT)					
Ln(EPR_{AVG})		-0.014			
		-1.85			
Ln($TCDOLR_{AVG}$)				-0.022	
				-2.64	
*ln($TCDOLR_{AVG}$*APCOM)*					-0.022
					-2.65
*ln(EPR_{AVG}*APCOM)*			-0.014		
			-1.86		
Constant	4.079	4.534	4.549	4.708	4.727
	3.42	3.85	3.86	4.18	4.20
F test	F(5,34)=5.16	F(6,33)=5.17	F(6,33)=5,19	F(6,33)=6,21	F(6,33)=6,22
F test u_i=0 (joint significance of fixed effects)	F(25,34)=1.98	F(25,33)=2.23	F(25,33)=2.23	F(25,33)=2.60	F(25,33)=2.61
Observations	65	65	65	65	65
	26	26	26	26	26

** 95 percent significance with bootstrap standard errors, * 90 percent significance with bootstrap standard errors. We use the percentile and bias corrected approach with 2000 replications.