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DETERMINANTS OF EXPORT DIVERSIFICATION AROUND THE WORLD: 1962 - 2000

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Abstract
Using a large dataset of countries, covering the period 1962-2000, this paper analyzes the main determinants of export diversification (concentration). We explore the role of several factors and we use three different indicators of export concentration. We find robust evidence across specifications and indicators that trade openness induces higher specialization. In contrast, financial development does not seem to help countries to diversify their exports. Looking at the effects of exchange rates, in some of our results we find a positive effect of real exchange rate volatility on concentration, but not significant effects of exchange rate overvaluation. We also find evidence that human capital accumulation contributes positively to diversify exports and that increasing remoteness tends to reduce export diversification. We also explore the role of terms-of-trade shocks. Most of our results suggest an interesting interaction between this variable and human capital: improvements in the terms of trade tend to concentrate exports, but this effect is lower for those countries with higher levels of human capital. This evidence suggests that countries with higher education can take advantage of positive terms of trade shocks to increase export diversification.

Resumen
Usando una base de datos para una muestra grande de países durante el periodo 1962-2000, este trabajo analiza los principales determinantes de la diversificación de exportaciones. Se estudia el efecto de varios factores y se utilizan diversos indicadores de concentración de exportaciones. Se encuentra evidencia robusta a través de distintas especificaciones e indicadores que la apertura comercial favorece la especialización Por el contrario, el desarrollo financiero no parece ayudar a los países a diversificar sus exportaciones. Analizando los efectos del tipo de cambio real, en algunos de los resultados, se encuentra un efecto positivo de la volatilidad cambiaria sobre la concentración, pero no así para la sobre-valoración de la moneda local. También se encuentra que la acumulación de capital humano contribuye positivamente a diversificar las exportaciones y que la mayor distancia a las principales economías del mundo reduce la diversificación. Además, se estudia el efecto de los shocks de términos de intercambio. La mayoría de lo resultados sugieren una interacción interesante entre estos shocks y el capital humano de las economías: mejoramientos en los términos de intercambio incrementan la concentración de exportaciones, pero este efecto es menor para países con altos niveles de capital humano. Este resultado sugiere que economías con mayores niveles de capital humano podría aprovechar estos mejoramientos de los términos de intercambio para diversificar sus exportaciones.

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1. Introduction

Export diversification has been at the center of the debate on how developing countries can improve economic performance and to achieve higher income. The evidence suggests that there are almost no currently developed countries with the extremely high levels of export concentration found in many developing countries. Of course, this simple observation does not say anything about the causal relationship between per capita income and export diversification. It may be argued that higher diversification affects economic growth positively,[i] but it may be also the case that richer countries are more able to diversify their production structures. The empirical evidence in this regard shows the existence of a non-linear relationship between income and production diversification (Imbs and Wacziarg, 2003): as income per capita rises, production concentration falls; but after a certain level of income has been reached, production tends to become more concentrated. Klinger and Lederman (2004) and Cadot et al (2007) have found a similar pattern for exports.

This debate, however, has most of the times lacked an understanding about what are the main drivers of export diversification. The literature is not abundant in this regard. In fact, there are few papers exploring the factors that are important for understanding changes in export diversification around the world. This is an issue particularly relevant given that several developing economies have undertaken structural reforms in recent decades aimed at improving economic performance, in general, and at diversifying exports, in particular.

The objective of this paper is to contribute with empirical evidence to the understanding of the determinants of export diversification (concentration). We are particularly interested in analyzing the effect on export diversification of several reforms,

such as financial and trade liberalization.

We also explore several hypotheses that have been discussed in the policy debate but have not been tested using a large sample of countries and long period of time. Some of them are related to structural country characteristics, such as the distance to main trading partners and countries' factor endowments. We also deal with the effect of exchange rate volatility and overvaluation on export diversification. There is a literature claiming that exchange rate overvaluation is bad for growth through its impact on export diversification, the most recent example being Rodrik (2008). By reducing their profitability, exchange rate overvaluation would discourage investment in tradables generally but particularly on marginal exports. In addition, exchange rate volatility has long been held to discourage investment in new exportables by increasing uncertainty as to future returns.

Traditional trade theory – e.g., the Hecksher-Ohlin model – highlights the welfare benefits of openness by concentrating production in those sectors in which a country has a comparative advantage. Nonetheless, traditional trade theory is silent on the dynamics of the emergence of new exporting sectors. More recently, "new trade theory"[ii] has changed the focus from conventional comparative advantage to trade in new varieties of goods, an approach that has simultaneously been adopted by the endogenous growth theory literature (Romer, 1990; Grossman and Helpman, 1991). These new growth and trade models allow us to derive some predictions for the effects of variables such as opening up to trade, the accumulation of human capital, and terms-of-trade shocks on export concentration. We present and test non-structurally some of these predictions in our empirical section by linking increases in the varieties of goods to export diversification.

In analyzing the determinants of export diversification, we use a very long dataset for several countries around the world covering the period 1962-2000. This allows us to use

standard dynamic panel data techniques to deal with two important econometric problems. First, panel information helps to isolate the effect of unobserved time-invariant country specific characteristics that may explain differences across countries. In this paper, we exploit within-country changes over time. Second, we use the GMM estimators to deal with the endogeneity of most of our explanatory variables. As we do not have a specific theoretical model for explaining export diversification, we rely on econometric specifications to identify which are the most plausible explanations for reductions in export concentration. This could be useful both for building theoretical models that explain export diversification and for policy makers trying to identify appropriate policies to diversify exports.

There are some previous empirical studies exploring similar issues. Most of them, however, focus on country-specific cases. For example, Gutierrez de Pineres and Ferrantino (1997) analyze the successful Chilean experience since the mid-1970s and find a positive effect of real exchange depreciation and trade reforms on export diversification. There are also some papers dealing with long-run trends in export diversification across low-income countries (Bonaglia and Fukasaku, 2003) and in Latin American countries (Gutierrez de Pineres and Ferrantino, 2007). Other authors have investigated the differences in export diversification patterns between developed and developing countries (Amurgo-Pacheco and Pierola, 2007). However, with the exception of Bebczuk and Berrettoni (2006), we are not aware of previous work on determinants of export diversification using a large sample of countries during a long period of time.

Our paper differs from the existing body of research in two main respects. First, we look at several hypotheses that have not been tested previously. Second, we use an econometric methodology to deal with the endogeneity of most of the explanatory

variables.

Our results suggest the existence of robust evidence across specifications and indicators that trade openness induces higher specialization. In contrast, financial development (at least as proxied by our measure, the ratio of credit to the private non-bank sector to GDP) does not seem to help countries to diversify their exports. Looking at the effects of exchange rates, in some of our results we find a positive effect of real exchange rate volatility on concentration, but no significant effects of exchange rate overvaluation. We also find evidence that capital accumulation contributes positively to diversify exports and that increasing remoteness tends to reduce export diversification.

We explore also the role of terms-of-trade shocks. Most of our results suggest an interesting interaction between this variable and human capital. Our findings suggest that improvements in the terms of trade tend to concentrate exports, but this effect is lower for those countries with higher levels of human capital. This evidence suggests that countries with higher education can take advantage of positive terms of trade shocks to increase export diversification.

The rest of the paper is structured as follows. In the second section we describe the dataset and present some stylized facts on export diversification. The third section discusses the methodology and how we deal with the main econometric challenges. In the fourth section, we present our results. In the fifth section we conclude.

2. Data Description and Stylized Facts

In this section, we first describe the data set used to calculate the indicators of export concentration (diversification). Secondly, we describe the coverage and the main features of the data. Export data (in nominal US dollars) comes from the World Trade Flows dataset compiled by Feenstra et al (2004). This data set contains information of bilateral

trade disaggregated by industries at the 4-digit SITC (rev. 2) level. We proceed to aggregate countries' industry exports by summing up across importers.

The most commonly used statistic for measuring concentration is the Herfindahl index (sometimes called the Hirschman-Herfindahl index, HHI, in honor of the other great social scientist, Albert Hirschman, who put it into use simultaneously with Orris Herfindahl), which sums the squared shares of each commodity in total exports. This index takes values from 0 to 1, the higher representing greater concentration. We also use the Gini coefficient as a measure of export concentration. Both indicators are computed using industry exports at the 3-digit SITC level. The Gini coefficient, as the HHI, rises from 0 to 1 as the degree of concentration increases.[iii]

In Table 1 we present some basic information drawn from our data, averaging across the countries available at the beginning of the corresponding decade. We also present the simple averages for the Herfindahl and Gini coefficients and the standard deviation of both indicators. The number of countries increases steadily from 133 in 1962 to 161 in 2000. In general, both indicators show a continuous fall in export concentration throughout the entire period, with a spike in the seventies. Between 1962 and 2000, the unweighted average Herfindahl index fell form 0.31 to 0.22, and the Gini coefficient fell slightly from 0.88 to 0.84. Both indicators also show a reduction in their standard deviations.

Figure 1 shows more in detail how export diversification has evolved in the last four decades. In addition to the simple average, we also present the evolution of the world average, weighted by GDP and the median. The trends illustrated by the average and the median tend to be similar. There is a reduction in export concentration, but this is more abrupt for the Gini coefficient in the middle of the 1980's. In the case of the GDP-weighted average, the Herfindahl index shows a very slight downward trend and is much lower than

the unweighted average, reflecting the fact that developed-country indices are much lower than those for developing countries. On the other hand, the weighted Gini coefficient shows a jump in export concentration around 1990.

Figure 2 shows the evolution of export concentration for different regions of the world. Given that the median isolates better the effect of outliers, we focus our analysis in the evolution of this indicator. The evidence reveals not only significant differences across regions, but also within regions depending of the indicator analyzed. In the case of the industrial countries, the Herfindahl coefficient shows a much flatter pattern than the Gini coefficient, but both indices tend to decline over time. This would seem to contradict the findings of Imbs and Wacziarg (2004) with regard to production, which shows a reversal of the trend toward diversification, after a certain level of income is reached. As expected, concentration indicators in these countries are the lowest among all groups. For Asia and Latin America, both indicators show that exports have tended to become more diversified over time, but for African countries the Herfindahl index shows an increase in export concentration, which is much less visible in the Gini coefficient. For Eastern Europe, the Herfindahl index does not show a significant change, but the Gini coefficient reveals large fluctuations, but an overall trend towards export diversification. The Middle Eastern countries show a more volatile performance compared to the other groups. Both indicators present a similar evolution revealing an increase in export diversification.

In Figure 3 we explore how export concentration (as measured by the HHI and the Gini coefficient) has evolved according to the incomes of the countries involved. In order to do this, we split the sample of countries among four quartiles according to initial per capita GDP. The rich countries (Income Quartile 1 in the Figure) present the lowest degree of concentration and some reduction over time, especially at the beginning of the period. The

middle-high income countries (Income Quartile 2) begin the decade of the 1960's with high levels of concentration, but they evolve towards a higher degree of export diversification. This is valid for both indicators. For initially poorer countries (Quartiles 3 and 4), the Herfindahl index shows a slightly declining trend, but the Gini index tends to be constant. This evidence suggests that increasing export diversification is a characteristic of middle-income economies (Quartile 2)

To give some preliminary evidence on the role of economic polices, we analyze how export diversification evolves around episodes of structural reforms. Following Hausmann et al. (2005) we use indicators of trade and financial liberalization. The index of trade reforms, originally developed by Sachs and Warner (1995), has been subsequently revised and updated by Wacziarg and Welch (2003). The indicator of financial liberalization is a dummy for the first five years of a financial liberalization episode. The timing of financial liberalization is taken from Bekaert et al (2005). For both indicators, we present their evolution 10 years before and 10 years after the year of the corresponding reform.

Both of these event studies, shown in Figures 4 and 5, reveal a similar pattern. There is a reduction in export concentration in the years following the reforms, with some reversal after five years in the case of trade reforms. Nonetheless, the subsequent reversal is not strong enough to counteract completely the initial decline. It is interesting to note that the trend toward export diversification (lower levels of concentration) accelerates after episodes of financial reform. However, it should be noted that both indicators were already declining before the reform episodes analyzed, which casts some doubts on the causal effects of reforms on export diversification.

3. Estimation Methodology

In our empirical exercise, we estimate the following equation:

$$I_{it} = \alpha_o I_{it-1} + \alpha_1 X_{it} + \eta_i + d_t + \nu_{it} \qquad (1)$$

where I_{it} is the index of export concentration for country i at time t, which is explained as a function of its lagged value at time (t-1), a matrix X_{it} of explanatory variables, a country fixed effect, η_i, and a time dummy d_t. The term ν_{it} corresponds to the error term. The reason for lagging the endogenous variable is to account for the great persistence over time of all three concentration indices.

For estimation purposes, the period 1962 to 2000 is divided into 8 sub-periods of 5 years each (the exception is the first period which is four years: 1962-1965). For each period t, we compute the average of all variables included in the estimation.

The existence of the so-called dynamic-panel bias problem makes the econometric estimation of (1) an arduous task. In fact, when these equations are estimated by Ordinary Least Squares (OLS), the parameters are inconsistent and positively biased given that the lagged dependent variable is correlated positively with the error term. Although the fixed effects estimator (FE) eliminates the source of inconsistency by expressing the equation in terms of deviations from their time averages, the result is also inconsistent.[iv] Summarizing, OLS and the FE estimators will be biased, but these biases will be in opposite direction.[v] This fact will be useful later to prove the robustness of alternative estimators. If the estimated coefficient for the lagged dependent variable were consistent, its value would be found in the middle of the values provided by the OLS and FE estimators.

One common alternative for solving the inconsistency problem is to apply the Arellano and Bond (1991) method. This involves eliminating the source of the inconsistency, the fixed effects, by applying the first difference operator to the equation under consideration. The resulting equation is then estimated using the Generalized Method of Moments

(GMM), using lags of the explanatory variables as instruments.[vi] However, if the dependent variable is highly persistent, so that instruments correlate weakly with the endogenous variables, first-difference model estimations may present substantial bias.[vii] The high estimated persistence for our measures of export concentration described below suggests the possibility of weak instruments in the context of our study.

Blundell and Bond (1998) note that it is possible to substantially improve estimation efficiency of the equation to be estimated by combining the moment conditions of its level form and its first difference form. They suggest applying GMM, using as instruments, in the difference equation, the lagged values of the endogenous variables and, in the level equation, the first difference of the endogenous variables. Estimations for (1) are performed using this estimator, known in the literature as the "GMM system estimator".

One critical assumption for the validity of GMM estimations is that the instruments must be exogenous in order to meet orthogonality conditions. To test the validity of the instrument set used, we applied the Hansen (1982) test. However, as one increases the number of instruments the test becomes weaker.[viii] Considering that the validity of the instrument set depends on the error structure, we also report the Arellano and Bond (1991) M2 test, which allows us to detect second-order autocorrelation of the error in the first-differences equation. We use only one lagged value (either in difference or level) as instrument in order to avoid over-fitting of the instrumented variables, avoiding in this manner weak Hansen tests in our estimations. We chose sequentially the lag number according to Hansen's and second order correlation tests. This method results in using the fourth lagged values as instruments in the Gini and Theil estimations and third lagged values in the Herfindhal estimations. We instrument in this manner all controls except our

measure of remoteness and human capital, which we consider exogenous to export concentration.

Our set of explanatory variables can be divided roughly in three main groups.[ix] The first group is related to economic reforms and it is composed of trade openness and financial development. Trade openness is measured by the ratio between the sum of exports and imports to GDP and financial development as the share of domestic credit to the private non-bank sector in GDP.

The effects of both variables are theoretically ambiguous. In Heckscher-Ohlin models, openness to trade induces specialization and, therefore, higher export concentration. However, a reduction in trade costs may facilitate the setting up of new export activities, especially since trade openness, ceteris paribus, should be accompanied by a depreciation of the exchange rate.[x]

New trade theory (see, for example, Grossman and Helpman, 1991) has something to say about trade openness and the production/export of greater product variety. Most small developing economies, which dominate the sample, have a comparative advantage in homogeneous goods that are intensive in the use of either labor or land. Per contra, they do not have a comparative advantage in differentiated goods, which are intensive in the use of skilled labor (or human capital). This means that trade openness, by increasing the relative price of the homogenous product and the wage of unskilled labor, and reducing the return on human capital or skilled labor, will induce a reallocation of human capital away from production of differentiated products and toward R&D. This will eventually foster diversification.[xi]

More broadly, trade liberalization in a technologically backward small economy may lead to what Hausmann and Rodrik (2003) have called self-discovery. In countries with

potential comparative advantage in products that are intensive in unskilled labor, trade liberalization will induce a reallocation of resources away from skill-intensive goods, making skilled labor less expensive. Thus trade openness may stimulate activities leading to the production of goods that are new to the country but that are produced elsewhere. If and when trade liberalization is accompanied by real exchange rate depreciation, this effect will be greater still.

Ambiguities also surround domestic financial liberalization. On the one hand, the development of capital markets may lead to export concentration: lenders and investors may be expected not to take a risk on untried ventures and to concentrate finance in existing activities. On the other hand, since greater availability of capital outside the firm may benefit untried and riskier activities, financial deepening may be expected to foster the appearance of new comparative advantages and lower the level of export concentration.

A second group of variables considers the effect of structural determinants of export diversification, such as factor endowments and economic distance. We include a proxy for human capital, defined as average years of schooling in the population over 15 years, from Barro and Lee (2000) and updated by Bosworth and Collins (2003). For economic distance, we use the GDP-weighted average distance of each country from its trading partners, taken from Rose (2004). We expect a positive effect of human capital on export diversification if human capital accumulation allows countries to change their specialization patterns from commodities to manufactured goods or to goods or services with a greater input of knowledge. This prediction has been highlighted in the endogenous growth theory and new trade theories (Krugman, 1995; Romer, 1990; Grossman and Helpman 1991). The greater availability of specialized human capital and the lower relative cost of this input allow firms to employ a larger amount of human capital for adapting existing goods and

technologies to the national environment ("self-discovery") or for R&D, which results eventually in the competitive production of a larger number of goods and greater varieties of the same goods. In the case of economic distance, we expect greater distance to be positively associated with concentration: distance operates as a cost on trade, making goods with marginal comparative advantages less likely to be produced and exported.[xii]

A third group of variables is composed by macroeconomic factors that may reduce export profitability directly, as it is the case of an overvalued exchange rate, or indirectly through an increase in uncertainty, as would be the case of exchange rate volatility. We also examine the effect of terms-of-trade variations and its interaction with human capital. In the case of real exchange rate overvaluation and volatility, we expect negative effects of both variables on export diversification. Real exchange rate overvaluation is taken from the Global Development Network Growth Database, and it is computed using the procedure described in Dollar (1992).[xiii] Exchange rate volatility is computed using the standard deviation of monthly changes in nominal exchange rates over the entire five-year involved in each observation.

The effect of improvements in the terms of trade is expected to be, in general, to raise concentration:[xiv] an increase in the price of the main exported product induces factor reallocation towards this sector, reducing the availability (or increasing the cost) of inputs for new export activities. This is the classical Dutch-disease phenomenon. However, the effect on concentration of positive terms-of-trade shocks may be lower in countries with higher levels of human capital. In order to test this hypothesis, we include an interaction terms between terms-of-trade changes and human capital levels.

We can also recall the endogenous growth literature in order to analyze this historical evidence and derive some testable predictions. An improvement in the terms of trade is

akin to the opening to trade: as a country reduces trade barriers, the price of its exported product rises. Thus, in small open economies with an abundance of unskilled labor, land or mineral resources, an improvement in the terms of trade should lead to higher relative rewards for their abundant factor and a lower relative price for their scarce factor, usually human capital or skilled labor. This will raise the profitability of sectors producing varieties of a non-homogeneous product, which is intensive in skilled labor, and, via this effect, encourage production and export diversification.

On the other hand, when the exported goods are different varieties of a non-homogeneous good, an improvement in the terms of trade will produce a rise in the return to human capital, reallocating human capital away from producing new goods or new varieties of existing goods, decreasing the rate of growth of the economy and the number of varieties it produces.

The upshot is that the impact of improving terms of trade on export concentration/diversification is an empirical matter. Our main hypothesis is that terms-of-trade improvements ought to have a Dutch-disease effect on export concentration, as evidenced in a number of primary producing countries: a rise in the relative price of a primary commodity export tends to crowd out the production and exports of other products in which a country may have had a comparative advantage prior to the increase in price. The more interesting question is whether this effect can be countered in countries with relatively high levels of skilled labor. In other words, do these latter countries take advantage of the positive real-income effects of terms of trade improvements to diversify their exports? This is one of the hypotheses that we test empirically and the results of which we report below.

4. Results

We present two-step GMM system estimations for three indicators of export concentration: Herfindahl, Gini and Theil indices.[xv] This allows us to check the robustness of our findings to alternative definitions of export concentration. Given that the Gini and the Herfindahl indexes vary between 0 and 1, we use the logistic transformation for our estimations.

In the estimations, based on the evidence of a non-linear relationship between diversification and income provided by Imbs and Wacziarg (2003) and Klinger and Lederman (2004), we also analyzed the robustness of our results when we control for per capita income and its squared term. In general, both terms are not-significant and their inclusion does not change the main results presented below.[xvi]

Table 3 shows the results for the Gini export concentration index. Most of the explanatory variables are significant and with the expected signs. In terms of reform-related variables, trade openness seems to favor specialization, but financial development has no significant effect. Regarding factor endowments, as shown in column (1), we find that human capital accumulation tends to reduce export concentration, but this result is not robust across specifications. As expected, our results show that remoteness increases export concentration.

As regards variables related to the exchange rate, we do not find any significant effect of real exchange rate overvaluation and real exchange rate volatility on export concentration. Our results suggest that positive terms of trade shocks are associated with an increase in export concentration. Including the interaction with human capital, we find that the effect is positive for low levels of schooling (roughly, less than three years of education in the population aged 15 and above) and negative for higher levels of human capital (over three years of schooling in the population aged 15 and above). This may be consistent with

the idea that countries with higher education can take advantage of positive terms of trade shock to develop new export sectors.

Table 4 shows our estimates for the Herfindahl export concentration index. The results are somewhat different from the previous ones. Trade openness continues to have a concentrating impact, and the accumulation of human capital is still favorable to diversification. But now we find no relationship between terms-of-trade changes (and its interaction with human capital) and export concentration. Interestingly, exchange rate volatility now appears to be a factor leading to more concentrated exports. Similarly to what we find using the Gini index, financial development and exchange rate overvaluation are not significant determinants of export concentration.

Table 5 reports our estimations for the Theil index of export concentration. These results present some similarities with those obtained with other indicators. In all of our specifications, trade openness and economic distance increase export concentration. On the other hand, similar to the Gini index, the effect of changes in terms of trade is positive and its interaction with human capital is negative. These findings confirm previous evidence that positive terms of trade shocks increase concentration only in low human capital countries. Note that, as in most of our regressions, financial development and exchange rate variables do not affect export concentration

5. Conclusions

Using a large dataset of countries during the last forty years of the twentieth century, this paper analyzes the role of several potential determinants of export diversification. There are no studies that we know that have used a long panel of countries to shed light on what are the main factors driving changes in export diversification in a broad sample of countries and through time.

We have explored the role of several factors, and we use three different indicators of export diversification. First, we look at the effect of trade openness and financial development. We find robust evidence across specifications and indicators that trade openness induces specialization and not export diversification. In contrast, we find that financial development, at least with the proxy that we can estimate for all a large number of countries over time (credit to the private non-bank sector as a share of GDP), does not affect export diversification.

Second, we also analyze the effect of real exchange volatility and overvaluation. In general, our results do not reveal a significant role for these variables. In fact, none of regressions show a negative effect of real exchange rate overvaluation on diversification. In addition, only for one of the indexes we find that exchange rate volatility is associated with higher export concentration.

Third, we shed light on the effects of factor endowment, exploring how human capital accumulation is associated with diversification. We find some evidence, although less robust across indicators and specifications, that higher schooling helps to diversity exports. This could be consistent with the idea that factor accumulation moves countries across diversification cones, going from primary exports to manufactured goods and high-value services. In these latter two categories, the scope for diversification is likely to be higher.

We also look at how economic distance affects specialization patterns. Our results show, in general, that more remote countries tend to have more concentrated exports. Finally, we explore the role of terms-of-trade shocks. For most of our estimations, we are able to uncover an interesting interaction between this variable and human capital. We find that improvements in the terms of trade tend to concentrate exports, but this effect is lower for those countries with higher levels of human capital. This evidence suggests that

countries with higher education can take advantage of positive terms-of-trade shocks to develop new exporter sectors.

This evidence has relevant implications for export diversification in developing countries. It suggests that some policies are better than others for reducing dependency on few exported goods. We find that financial development does not affect export concentration. This implies that policies aimed at deepening financial markets are unlikely to improve export performance. Also, not too much may be expected of opening the economy to international trade. In addition, efforts to accumulate human capital may be a good policy to diversify exports. There is some evidence that avoiding exchange rate volatility can be useful.

Finally, although economic distance is exogenous to the economy, there are policies that can reduce its negative effects on export diversification. Indeed, the negative impact of trade costs means that countries furthest from the main centers of global trade have a natural disadvantage that needs to be offset by improvements in the relevant physical and information infrastructure. The challenges in these respects are greater for distant economies than for those more favorably located.

We believe that the understanding of the determinants of export concentration is a contribution to the development of new theoretical literature that could closely link openness, terms of trade shocks, diversification, human capital and economic growth, unveiling its interactions and mechanisms at play.

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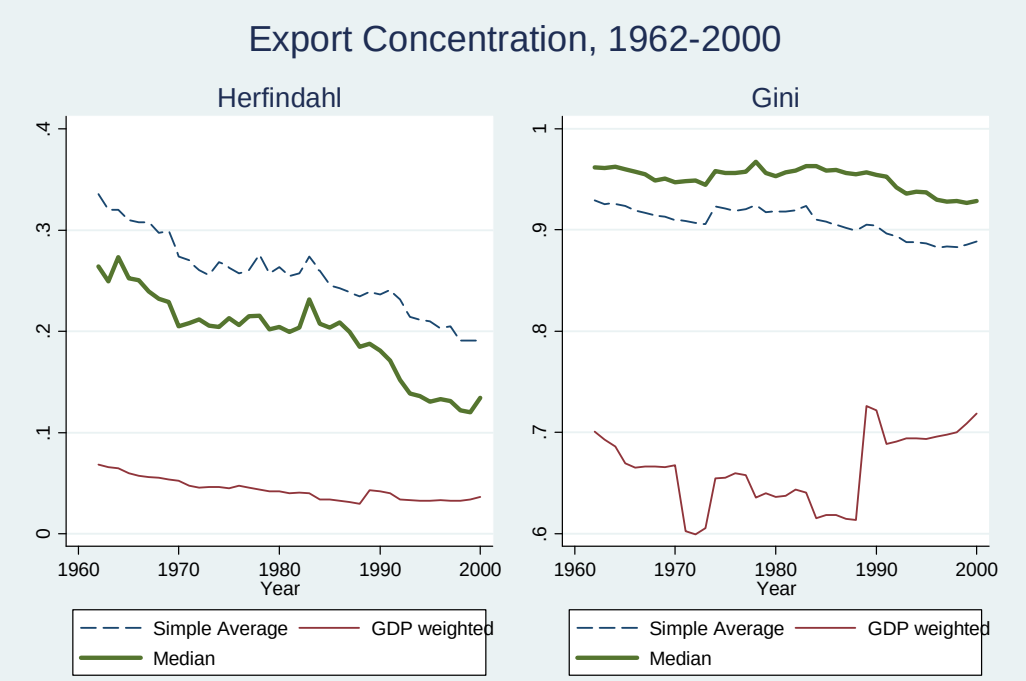
Figure 1



Source: Author's elaboration based on Feenstra et al. (2004)

Figure 2

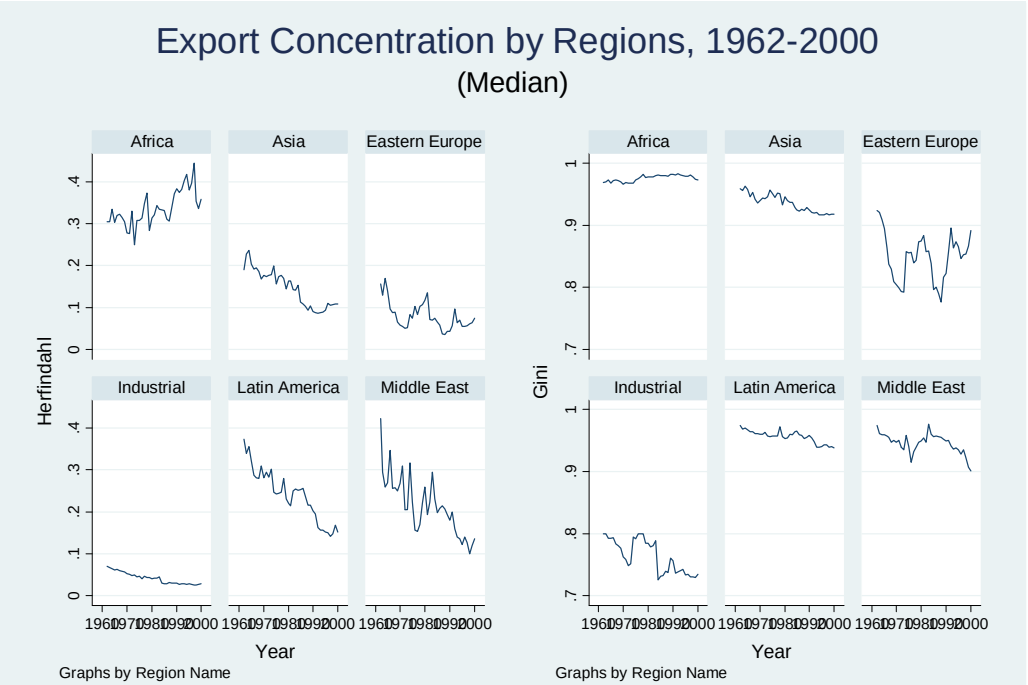


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Figure 3

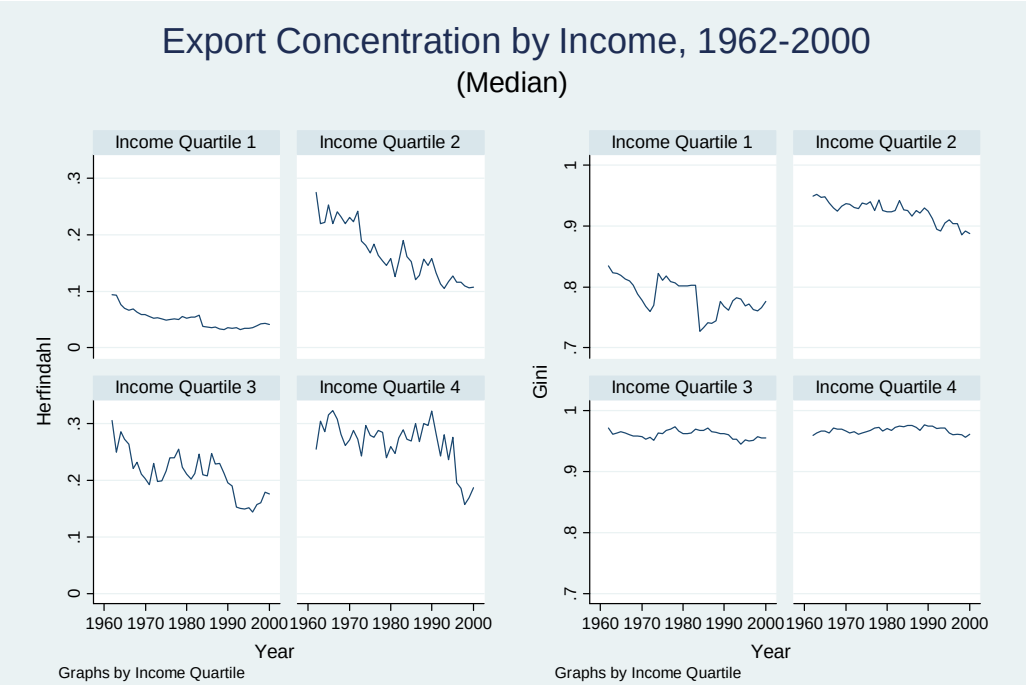

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Figure 4

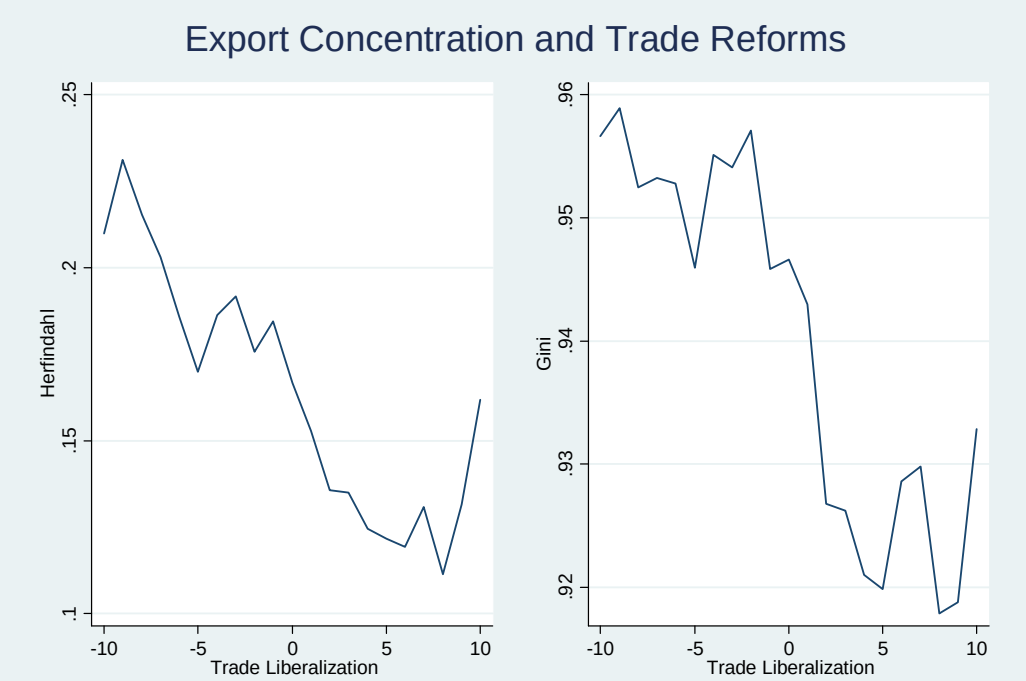

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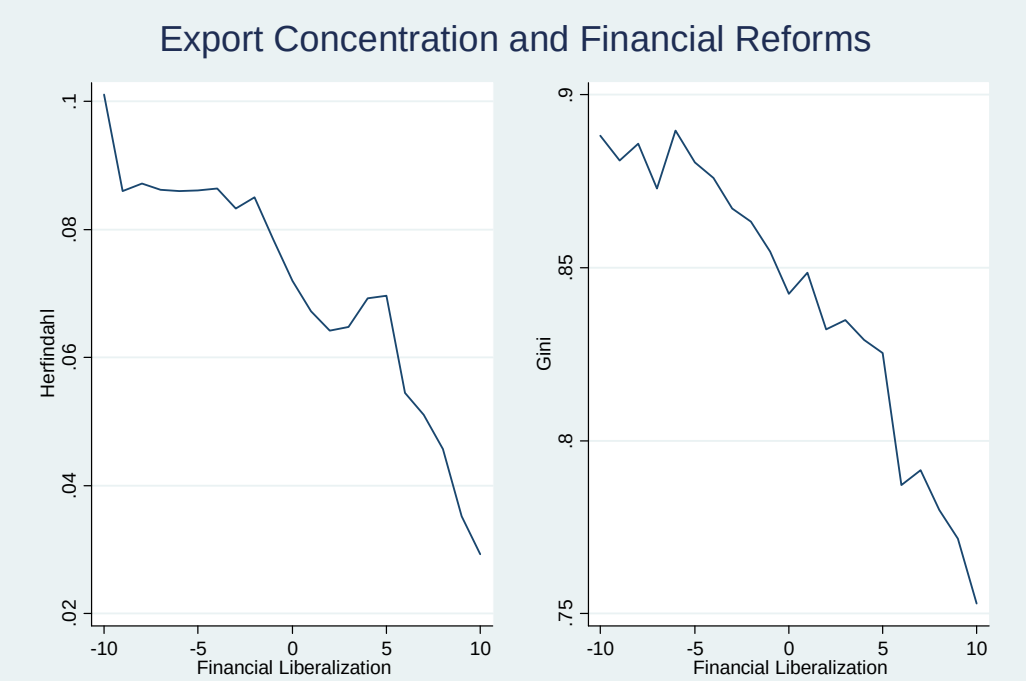
Figure 5



Source: Author's elaboration based on Feenstra et al. (2004)

Table 1

Summary Statistics: Indicators of Concentration and Number of Countries

	Herfindahl		Gini		Countries
	Average	St. Dev.	Average	St. Dev.	
1962	0,31	0,25	0,88	0,14	133
1970	0,26	0,23	0,89	0,09	138
1980	0,27	0,25	0,90	0,09	139
1990	0,25	0,24	0,82	0,12	142
2000	0,22	0,22	0,84	0,08	161

Source: Author's elaboration based on Feenstra et al. (2004)

Table 2
Summary Statistics. Overall, Within and Between Statistics.

Variable		Mean	Std. Dev.	Min	Max	Observations
Gini	overall	0,8434846	0,096	0,430	0,984	N = 1089
	between		0,084	0,581	0,967	n = 165
	within		0,050	0,460	1,024	T-bar = 6.6
Theil	overall	1,946354	0,737	0,375	4,249	N = 1089
	between		0,627	0,605	3,767	n = 165
	within		0,403	0,412	3,421	T-bar = 6.6
Herfindahl	overall	0,2429515	0,207	0,013	0,955	N = 1089
	between		0,182	0,014	0,785	n = 165
	within		0,101	-0,154	0,786	T-bar = 6.6
Trade Opennes	overall	65,11523	44,480	3,462	326,179	N = 929
	between		40,082	10,912	246,168	n = 150
	within		22,518	-19,917	272,627	T-bar = 6.19333
Log(Schooling)	overall	1,485382	0,718	-1,854	2,491	N = 659
	between		0,663	-0,627	2,395	n = 84
	within		0,282	0,234	2,625	T-bar = 7.84524
Change Terms	overall	4,849222	9,085	-72,972	55,938	N = 811
of Trade	between		7,343	-33,330	42,433	n = 149
	within		7,489	-40,185	44,492	T-bar = 5.44295
Financial Development	overall	34,96435	31,767	0,000	218,189	N = 928
	between		27,625	0,000	156,276	n = 157
	within		15,590	-29,953	120,168	T-bar = 5.91083
Exch. Rate Volatility	overall	0,027347	0,071	0,000	1,601	N = 1009
	between		0,041	0,000	0,291	n = 156
	within		0,063	-0,195	1,406	T-bar = 6.46795
Log(Ec. Distance)	overall	-10,74353	0,539	-12,226	-9,231	N = 1017
	between		0,462	-11,987	-9,894	n = 149
	within		0,350	-11,425	-9,958	T-bar = 6.8255
Log(Overvaluation)	overall	4,661939	0,391	3,406	7,210	N = 732
	between		0,282	4,021	5,475	n = 100
	within		0,283	3,615	6,619	T-bar = 7.32
Per Capita GDP	overall	6987,509	7341,375	289,462	43896,930	N = 1102
	between		6738,743	506,940	31340,070	n = 165
	within		2644,296	-9812,177	24226,420	T-bar = 6.67879

Table 3

Export Concentration and its Determinants
Logistic Transform of Gini Index.

	1	2	3	4
	lgini	lgini	lgini	lgini
Lagged logist Gini	**0.8392****	**0.7718****	**0.6896****	**0.7217****
	(0.0899)	**(0.0796)**	**(0.0873)**	**(0.0820)**
Openness	**0.0061***	**0.0046+**	**0.0047+**	**0.0044***
	(0.0029)	**(0.0027)**	**(0.0024)**	**(0.0022)**
Human capital (HC)	-0.0649*	-0.0019	-0.0220	-0.0379
	(0.0249)	(0.0586)	(0.0650)	(0.0776)
Remoteness	**0.1595+**	**0.1964+**	**0.2699***	**0.2219***
	(0.0879)	**(0.1011)**	**(0.1068)**	**(0.1051)**
Terms of Trade	**0.0137+**	**0.0477***	**0.0445***	**0.0429+**
	(0.0076)	**(0.0226)**	**(0.0211)**	**(0.0216)**
HC*Termsof Trade		**-0.0231+**	**-0.0217+**	**-0.0211**
		(0.0133)	**(0.0126)**	**(0.0132)**
Domestic Credit		0.0005	0.0003	0.0008
		(0.0010)	(0.0010)	(0.0011)
Exchange Rate Vol			0.1311	0.3855
			-10.730	-10.589
Overvaluation				-0.0874
				(0.0958)
Constant	16.753	2.1876+	3.1777*	3.0393*
	-10.119	-11.991	-12.791	-14.597
Observations	500	498	486	464
Number of wbcoden	79	79	79	77
Obs.	500	498	486	464
Hansen p-value	0.50	0.70	0.43	0.19
AR(1) p-value	0.01	0.02	0.03	0.02
AR(2) p-value	0.02	0.08	0.10	0.01

Standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

Table 4

Export Concentration and its Determinants
Logistic Transform of Herfindhal Index

	1	2	3	4
	lhh	lhh	lhh	lhh
lagged HH	**0.8168****	**0.8196****	**0.8075****	**0.8393****
	(0.0431)	**(0.0670)**	**(0.0530)**	**(0.0495)**
Openness	**0.0051***	**0.0043***	**0.0040+**	**0.0040+**
	(0.0020)	**(0.0020)**	**(0.0021)**	**(0.0022)**
Human capital (HC)	**-0.1862****	**-0.2126***	**-0.2531****	**-0.2010+**
	(0.0586)	**(0.0857)**	**(0.0835)**	**(0.1024)**
Remoteness	0.1348	0.1369	0.1553*	0.1067
	(0.0813)	(0.0865)	(0.0723)	(0.0723)
Terms of Trade	-0.0108	-0.0139	-0.0159	-0.0222
	(0.0091)	(0.0197)	(0.0175)	(0.0208)
HC*Termsof Trade		0.0037	0.0094	0.0126
		(0.0132)	(0.0142)	(0.0161)
Domestic Credit		0.0000	-0.0000	-0.0005
		(0.0017)	(0.0014)	(0.0015)
Exchange Rate Vol			**1.8768+**	**1.7545+**
			(0.9933)	**(0.9339)**
Overvaluation				0.0548
				(0.1362)
Constant	11.320	12525	1.4291+	0.6367
	(0.8183)	(0.8871)	(0.7227)	(0.9361)
Observations	500	498	486	464
Number of wbcoden	79	79	79	77
Obs.	500	498	486	464
Hansen p-value	0.38	0.28	0.34	0.41
AR(1) p-value	0.00	0.00	0.00	0.00
AR(2) p-value	0.55	0.60	0.58	0.55

Standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

Table 5

Export Concentration and its Determinants
Theil Index

	1	2	3	4
	theil	theil	theil	theil
lagged Theil	**0.8049****	**0.7813****	**0.6742****	**0.6983****
	(0.1126)	**(0.0789)**	**(0.0955)**	**(0.0837)**
Openness	**0.0064**	**0.0046+**	**0.0047***	**0.0041***
	(0.0046)	**(0.0027)**	**(0.0021)**	**(0.0019)**
Human capital (HC)	-0.0460	-0.0139	-0.0199	-0.0285
	(0.0596)	(0.0495)	(0.0656)	(0.0714)
Remoteness	**0.2008+**	**0.2058+**	**0.3150****	**0.2486***
	(0.1029)	**(0.1035)**	**(0.1141)**	**(0.1007)**
Terms of Trade	**0.0134**	**0.0464***	**0.0435+**	**0.0406+**
	(0.0118)	**(0.0200)**	**(0.0245)**	**(0.0219)**
HC*Termsof Trade		**-0.0197+**	**-0.0209**	**-0.0208+**
		(0.0115)	**(0.0155)**	**(0.0121)**
Domestic Credit		0.0012	0.0010	0.0010
		(0.0008)	(0.0010)	(0.0012)
Exchange Rate Vol			-0.2422	-0.2020
			-14.976	-11.911
Overvaluation				-0.0650
				(0.1142)
Constant	2.1503+	2.2516+	3.7022**	3.3126**
	-11.227	-12.123	-13.751	-11.999
Observations	500	498	486	464
Number of wbcoden	79	79	79	77
Obs.	500	498	486	464
Hansen p-value	0.31	0.83	0.48	0.23
AR(1) p-value	0.02	0.01	0.03	0.03
AR(2) p-value	0.01	0.09	0.11	0.01

Standard errors in parentheses
+ significant at 10%; * significant at 5%; ** significant at 1%

Endnotes

[i] Cross-section evidence of this positive effect of diversification on growth has been found by Agosin (2009), and Lederman and Maloney (2007) and Hesse (2008) using panel data.

[ii] See Krugman (1995) and Grossman and Helpman (1991).

[iii] In our empirical work we also use the Theil index for measuring export concentration.

[iv] Expanding terms for average deviation reveals the presence of terms with other than zero expectations. For more details, see Bond (2002).

[v] In fact, the OLS estimator is positively biased because the lagged dependent variable correlates positively with the error term. In contrast, the FE estimator is negatively biased since the correlation has the opposite sign. The interested reader in more details is referred to Arellano (2003).

[vi] This discussion follows that of Bravo-Ortega and Garcia (2008) on the estimation of models of lagged dependent variables with fixed effects.

[vii] See work by Blundell and Bond (1998) and Blundell, Bond and Windmeijer (2000).

[viii] In fact, Bowsher (2002) shows that the use of too many moment conditions causes the Sargan /Hansen test to be undersized and to have extremely low power.

[ix] Table 2 shows the descriptive statistics for dependent and explanatory variables.

[x] This is in line with the traditional argument for trade liberalization, which, through induced real exchange rate depreciation, would lead to export diversification. See, for example, the country studies in the major OECD project directed by Little, Scott, and Scitovsky (1972); or those in the NBER project directed by Anne Krueger and contained in Krueger, Lary, Monson, and Akrasanee (1980). The notion of effective protection, and the two major ways of measuring it, entered the economic literature with these studies. The empirical record on the diversification benefits of trade liberalization is mixed, mainly because, in the era of financial globalization it often has been accompanied by real exchange rate *appreciation* rather than by depreciation, as a result of large accompanying capital flows. For the Latin American experience, see Agosin and Ffrench-Davis (1995).

[xi] The opposite would be true of small economies with a comparative advantage in differentiated products that are intensive in human capital: trade openness will make human capital more expensive and will discourage R&D and the production of new goods. Of course, countries with this kind of factor endowment tend to be developed economies and have many ways, in practice, to counteract these effects of trade liberalization.

[xii] Melitz (2003) provides the microeconomic foundation for this relationship. For recent evidence on the negative effect of trade costs on entry and export diversification, see Dennis and Shepherd (2007).

[xiii] We also used the overvaluation measure of Rodrik (2008) and results were similar to those reported in the next section.

[xiv] Data for the terms of trade were taken from World Bank, *World Development Indicators*.

[xv] Our estimations, in general, pass the standard statistical tests for this type of regressions. The Hansen test does not reject the null of valid instruments and the AR(2) test shows mostly no evidence of second order residuals autocorrelation. Both tests are presented in the last rows of Tables 3, 4, and 5.

[xvi] Due to space considerations we do not present these results, but they are available upon request.

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