

Determinants of Export Diversification Around the World: 1962–2000

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1. INTRODUCTION

EXPORT diversification has been at the centre of the debate on how developing countries can improve economic performance and achieve higher income. The evidence suggests that there are almost no currently developed countries with the extremely high levels of export concentration found in most developing countries. Of course, this simple observation does not say anything about the causal relationship between per capita income and export diversification. While it may be argued that higher diversification affects economic growth positively,¹ 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 nonlinear 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.²

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 studies exploring the factors that are important for understanding changes in export diversification around the world.

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¹ Cross-sectional evidence of this positive effect of diversification on growth has been found by Lederman and Maloney (2003), Hesse (2008) and Agosin (2009) using panel data.

² Klinger and Lederman (2004) and Cadot et al. (2007) have found a similar pattern for exports.

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 literature suggests that export diversification can have important effects on productivity and economic growth. First, according to Melitz (2003), an increase in export variety – one of the sources of export diversification – can increase productivity given that exporters are more productive than nonexporters. This idea has also been analysed theoretically and empirically by Feenstra (2010a, 2010b). Second, export diversification can reduce exposure to external shocks, reducing macroeconomic volatility and increasing economic growth. Indeed, Lederman and Maloney (2003) find that the negative effect of natural resources abundance on growth disappears once they control for export concentration.

The objective of this study is to contribute with empirical evidence to the understanding of the determinants of export diversification (concentration). We are particularly interested in analysing the effect on export diversification of key reforms, such as financial and trade liberalisation. 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 a 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. Following recent literature, we also explore the effect of exchange rate volatility and overvaluation on export diversification (Rodrik, 2008).

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) analyse 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 studies 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, 1997). 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) and Parteka and Tamberi (2008), we are not aware of previous work on determinants of export diversification using a large sample of countries during a long period of time.³

Our study differs from the existing body of research in three main respects. First, we look at several hypotheses that have not been tested previously. Second, we use a longer dataset for 79 countries around the world covering the

³ The approach of Parteka and Tamberi (2008) is, however, different to that used in this study. Using a two-stage estimation, they attempt to identify the factors accounting for the fixed country effect in panel regression for export concentration indicators. They do not deal with endogeneity issues and use a smaller number of countries and a shorter period of time compared with our study.

period 1962–2000. Third, we use an econometric methodology that is appropriate for handling estimation in large panels.

The long data available for many countries allow 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 study, we exploit within-country changes over time. Second, we use the generalised method of moments (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 policymakers trying to identify appropriate policies to diversify exports.

The results suggest the existence of robust evidence across specifications and indicators that trade openness induces higher specialisation. In contrast, financial development (at least as proxied by our measure, the ratio of credit to the private nonbank sector to GDP) does not seem to help countries to diversify their exports. Looking at the effects of exchange rates, some of the results suggest the existence of a positive effect of real exchange rate volatility on concentration, but no significant effects of exchange rate overvaluation. There is also 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 the results suggest an interesting interaction between this variable and human capital. While improvements in the terms of trade tend to concentrate exports, this effect is lessened 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 study is structured as follows. The second section describes the dataset and presents some stylised facts on export diversification. The third section discusses the methodology and how we deal with the main econometric challenges. The results are presented in the fourth section, and the conclusions are laid out in the fifth section.

2. DATA DESCRIPTION AND STYLISED FACTS

Export data (in nominal US\$) come from the World Trade Flows dataset compiled by Feenstra et al. (2005). According to these authors, the trade data were constructed from United Nations data during two periods: (i) from 1962 to 1983, with the data classified by Standard International Trade Classification

TABLE 1
Summary Statistics: Indicators of Concentration and Number of Countries

	<i>Herfindahl</i>		<i>Gini</i>		<i>Theil</i>		<i>Countries</i>
	<i>Average</i>	<i>SD</i>	<i>Average</i>	<i>SD</i>	<i>Average</i>	<i>SD</i>	
1962	0.34	0.27	0.86	0.15	2.11	0.80	139
1970	0.27	0.22	0.88	0.09	2.22	0.79	144
1980	0.26	0.22	0.88	0.08	2.30	0.83	145
1990	0.24	0.22	0.80	0.11	1.62	0.63	148
2000	0.19	0.17	0.82	0.09	1.70	0.59	168

Source: Authors' elaboration based on Feenstra et al. (2005).

(SITC) Rev. 1; and (ii) from 1984 to 2000, using the SITC Rev. 2 classification. Feenstra et al. (2005) converted the SITC Rev. 1 codes to SITC Rev. 2 and also adjusted the country codes, as discussed in section 2 of that study. Thus, this dataset contains information of bilateral trade disaggregated by industries at the four-digit SITC (rev. 2) level. We proceed to aggregate countries' industry exports by summing up across importers.

We focus on different indexes of concentration rather than on the intensive/extensive margin of trade, as in Hummels and Klenow (2005) or Yoshida (2011), because our interest is on aggregate concentration/diversification measures, rather than on the emergence of new exports. We concentrate on broad indicators because the literature that investigates the impact of export diversification on growth mostly works with these aggregated concentration indexes – the Herfindahl index in particular – giving pertinence in this manner to our analysis.⁴ In order to test for the robustness of the underlying mechanisms of concentration that are detected, the analysis makes use of three measures of concentration: the Herfindahl, Gini and Theil indicators.

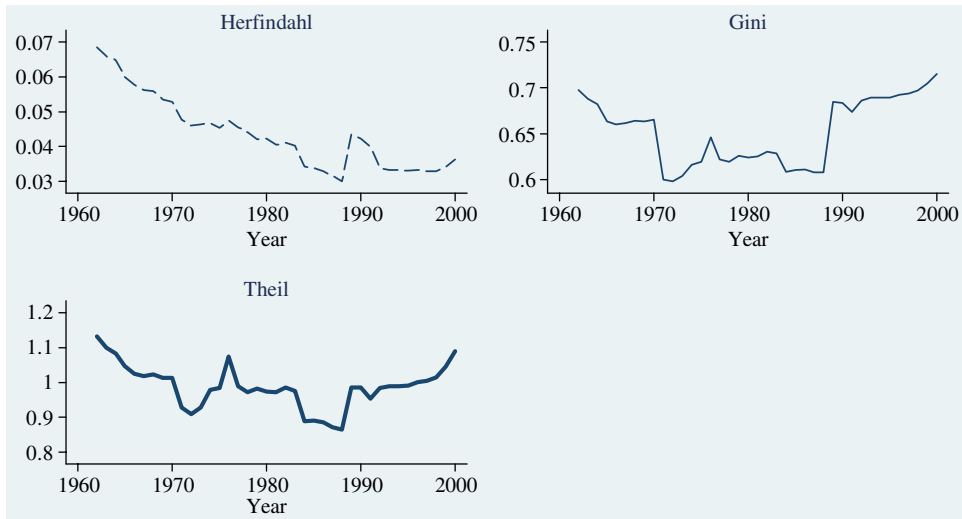
The most commonly used statistic for measuring concentration is the Herfindahl index [sometimes called the Hirschman–Herfindahl index (HHI)], which sums the squared shares of each commodity in total exports. This index takes values from 0 to 1, the higher representing greater concentration. We also use the Gini coefficient and the Theil index to measure export concentration.⁵ Since we are interested in broad measures of concentration/diversification, we use three-digit level data. With more disaggregated data, we run the risk of taking minor variations of an exported product as a sign of diversification.

Table 1 shows the basic descriptive statistics – simple average and SD – drawn from export concentration indexes for all available countries at the beginning of

⁴ See, for example, Agosin (2009), Lederman and Maloney (2003), and Hesse (2008).

⁵ The Theil index is calculated as $T = \frac{1}{n} \sum_{k=1}^n \frac{x_k}{\mu} \ln \frac{x_k}{\mu}$, where $\mu = \frac{1}{n} \sum_{k=1}^n x_k$. Like the other two indexes, the higher the value, the higher export concentration.

FIGURE 1
Export Concentration, 1962–2000 (GDP-weighted average)



Source: Author's elaboration based on Feenstra et al. (2005).

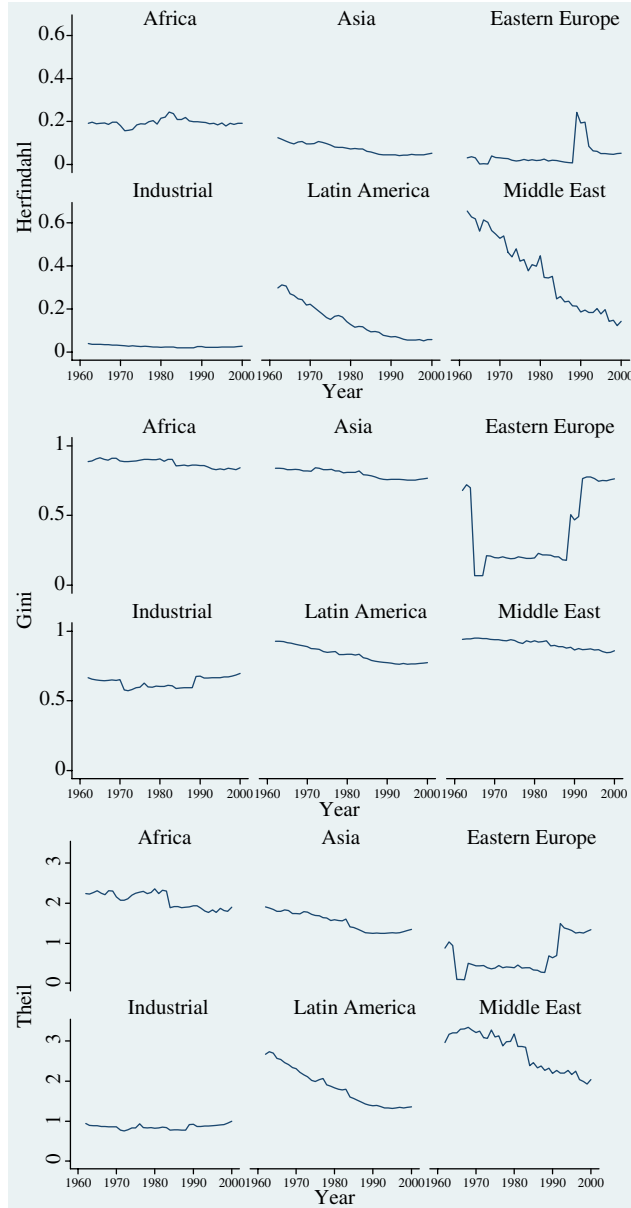
the corresponding decade. The number of countries with available information increases steadily from 139 in 1962 to 168 in 2000. In general, the three indicators show a continuous fall in export concentration throughout the entire period. Between 1962 and 2000, the average HHI fell from 0.34 to 0.19, and the Gini and the Theil indexes decreased from 0.86 to 0.82 and from 2.11 to 1.70, respectively. The three indicators also show a reduction in their SD over time.

Figure 1 shows more in detail how export diversification has evolved in the last four decades. To control for differences in country size, the averages for all three indicators are GDP weighted. The evolution of the three indicators is similar. There is a reduction in export concentration up to the end of the 1980s and an increase in the nineties (less pronounced for the HHI than for the other two indicators).

Figure 2 shows the evolution of export concentration for different regions of the world, using, again, GDP-weighted averages. In the case of industrial countries, the indicators reveal a low level of export concentration in comparison with other regions, and it tends to be stable over time. For the rest of the regions, with the exception of Eastern Europe and Africa, the three indicators show a reduction in export concentration. This decreasing concentration seems to be more pronounced in Latin America and Middle East, especially when concentration is measured by the Herfindahl and the Theil indexes.

In order to show preliminary evidence on the role of economic policies, we look at how export diversification evolves around episodes of structural

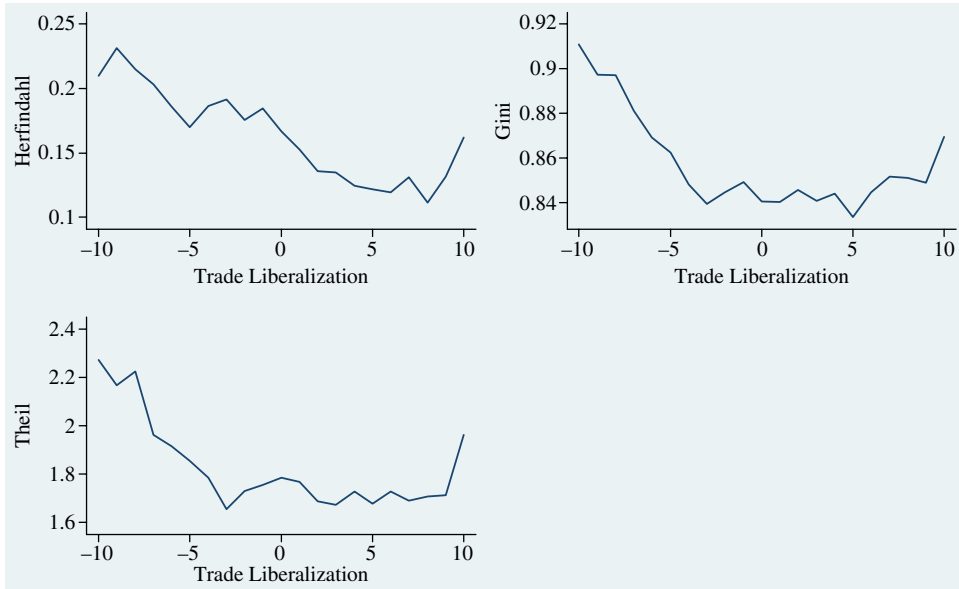
FIGURE 2
Export Concentration by Regions, 1962–2000 (GDP-weighted average)



Source: Authors' elaboration based on Feenstra et al. (2005).

reforms. Following Hausmann et al. (2005), indicators of trade and financial liberalisation are used. The index of trade reforms, originally developed by Sachs and Warner (1995), has been subsequently revised and updated by

FIGURE 3
Export Concentration and Trade Reforms



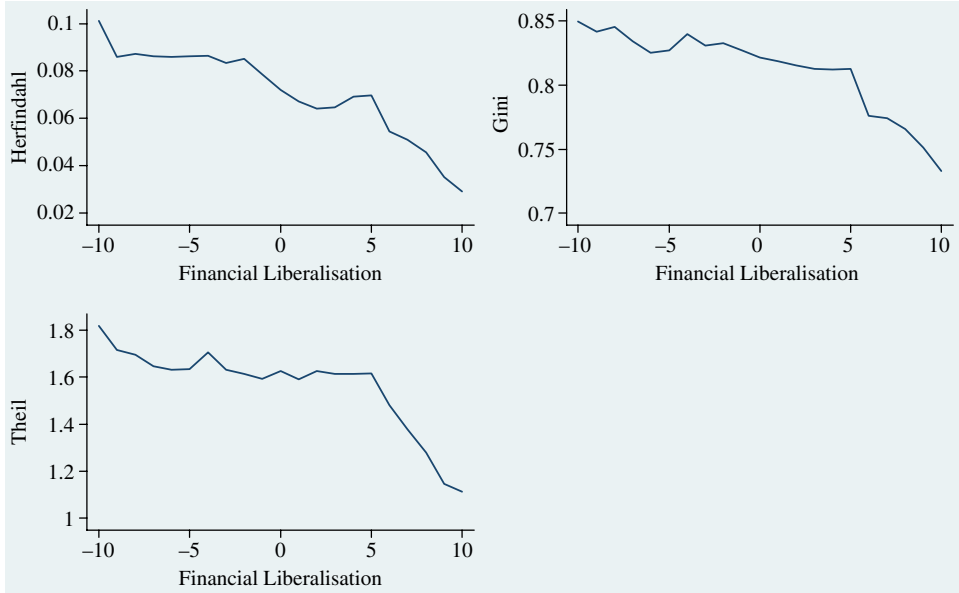
Source: Authors' elaboration based on Feenstra et al. (2005).

Wacziarg and Welch (2008). The indicator of financial liberalisation is a dummy for the first five years of a financial liberalisation episode. The timing of financial liberalisation is taken from Bekaert et al. (2005). The evolution of both indicators of export concentration is shown for a window of 10 years before and 10 years after the year of the corresponding reform.

Both of these event studies, shown in Figures 3 and 4, 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 towards export diversification (lower levels of concentration) accelerates after episodes of financial reform, but not in the case of trade reforms. More importantly, it should be noted that both indicators were already declining before the reform episodes analysed, which casts doubt on the causal effects of reforms on export diversification.⁶

⁶ Using data for a shorter period of time (1988–2006), Cadot et al. (2009) report a similar result as regards trade liberalisation. They regress the Theil index of export concentration on a dummy for trade liberalisation and find a negative and significant coefficient, indicating that trade liberalisation may reduce export concentration. Nevertheless, as we note previously, the Theil index was declining before the year of trade liberalisation (Figure 2 in Cadot et al., 2009).

FIGURE 4
Export Concentration and Financial Reforms



Source: Authors' elaboration based on Feenstra et al. (2005).

3. ESTIMATION METHODOLOGY

In our empirical exercise, we estimate the following equation:

$$I_{it} = \alpha_0 I_{it-1} + \alpha_1 X_{it} + \eta_i + d_t + v_{it}. \quad (1)$$

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 , a time dummy d_t and an error term (v_{it}). 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 1962–2000 is divided into eight subperiods of five years each (the exception is the first period that is four years: 1962–65). For each period t , we compute the average of all variables included in the estimation. We do this because we are interested in identifying a long-run relationship between diversification and its determinants. This approach, as has been argued in the economic growth literature, allows us to eliminate the influence of the business cycle on the results. By the same

token, the use of five-year periods reduces the noise-to-signal ratio in the data.⁷

The existence of the so-called dynamic panel bias involves some econometric problems in the estimation of (1). In order to solve this problem, in the estimation of an autoregressive model with fixed effects, Blundell and Bond (1998) propose combining the moment conditions of its level form and its first-difference form. They suggest applying the 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. This estimation technique, known in the literature as the ‘GMM system estimator,’ is the one we apply to our estimations of equation (1).⁸ The estimations are carried out computing robust SE and applying the Windmeijer small-sample correction.

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 Hansen’s (1982) test. However, as one increases the number of instruments, the test becomes weaker.⁹ 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 and weak Hansen tests. We chose sequentially the number of lags 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. All controls are instrument in this manner except the measure of remoteness and human capital, which are exogenous to export concentration.

The set of explanatory variables can be divided roughly into three main groups: economic reforms, structural factors and macroeconomic variables.¹⁰ The justification for the inclusion of these variables follows the main implications of recent models of trade with firm heterogeneity (Melitz, 2003). The first group is composed of trade openness and financial development. Trade openness is measured by the ratio of the sum of exports and imports to GDP and

⁷ We also ran additional regressions using annual data. The results do not change in terms of the signs of the estimated coefficients, and most of the significance levels do not change greatly. Nonetheless, we are unable to carry out statistical inference tests given that Hansen’s tests have a p -value equal to one. This is unfortunate as this test loses power for the case of many instruments and in the case of p -values close to unity. Even reducing the number of instruments, Hansen’s test is still equal to one.

⁸ For a theoretical presentation and examples, see Bond (2002) and Arellano (2003a, 2003b). For an application, see Bravo-Ortega and García (2011).

⁹ 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.

¹⁰ Table 2 shows the descriptive statistics for dependent and explanatory variables.

TABLE 2
Summary Statistics. Overall, Within and Between Statistics

<i>Variable</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	<i>Observations</i>
Gini					
Overall	0.8434846	0.096	0.430	0.984	$N = 1,089$
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	$N = 1,089$
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	$N = 1,089$
Between		0.182	0.014	0.785	$n = 165$
Within		0.101	-0.154	0.786	T-bar = 6.6
Trade openness					
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 of trade					
Overall	4.849222	9.085	-72.972	55.938	$N = 811$
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	$N = 1,009$
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	$N = 1,017$
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

TABLE 2 *Continued*

<i>Variable</i>	<i>Mean</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	<i>Observations</i>
Per capita GDP					
Overall	6987.509	7341.375	289.462	43896.930	$N = 1,102$
Between		6738.743	506.940	31340.070	$n = 165$
Within		2644.296	-9812.177	24226.420	$T\text{-bar} = 6.67879$

financial development as the share of domestic credit to the private nonbank sector in GDP. Both indicators are taken from the World Development Indicators of the World Bank.

According to Melitz (2003), trade liberalisation can induce export diversification through an increase in the number of exporters in those sectors facing improved export opportunities. This effect comes from the fact that in a monopolistic competition model, each firm produces a different variety of the exported good. However, in countries where exports are concentrated in primary commodities, traditional explanations such as the factor-endowment Heckscher–Ohlin model can be more appropriate for explaining the potential effect of trade liberalisation on diversification. In those countries, by raising the profitability of traditional sectors, trade reforms can affect export diversification negatively.

In the case of domestic financial liberalisation, Melitz (2003) does not explore specifically the relationship between this variable and exports. However, extensions of this model including financial considerations show that liquidity constraints may affect entry into international markets (Chaney, 2005; Manova, 2008). In this context, financial development reduces liquidity constraints and, through the increase in the number of exporters, can facilitate export diversification. In a multisector model, where industries differ in their financing needs, Manova (2008) shows that the positive effect of financial development will be larger in sectors with greater requirements for outside finance or fewer collateralisable assets. Then, financial liberalisation may induce export diversification if financing-dependent industries produce more differentiated products. On the one hand, the development of capital markets may lead to export concentration because investors do not want to take risk on untried ventures, and they decide to concentrate financial resources in existing activities where the economy has been already shown to be competitive.

A second group of variables considers the effect of structural determinants of export diversification, such as factor endowments and economic distance. Melitz (2003) provides some of the microeconomic foundations for the potential effects of these variables. Based on this model, we may expect a positive

effect of human capital on export diversification if human capital accumulation allows countries to change their specialisation patterns from commodities to manufactured goods.

In the case of economic distance, we expect a negative effect on economic diversification. Melitz (2003) shows that high variable and fixed trade costs reduce export opportunities and the number of exporters (and varieties). In this context, distance operates as a cost on trade, making goods with marginal comparative advantages less likely to be produced and exported. The implication is that one should find a negative relationship between trade costs (distance) and export diversification.¹¹

As explanatory variables, 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).

A third group of variables is composed of 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. Real exchange rate overvaluation is taken from the Global Development Network Growth Database, and it is computed using the procedure described in Dollar (1992).¹² Exchange rate volatility is computed using the SD of monthly changes in nominal exchange rates over the entire five year involved in each observation. Data for the terms of trade were taken from World Bank, World Development Indicators.

In the case of real exchange rate overvaluation and volatility, we expect negative effects of both variables on export diversification. Overvaluation can be considered as having the same effects of an increase in trade costs in the Melitz (2003) model, considering that an appreciated exchange rate reduces the profitability of exports and the number of exporters. In the case of exchange rate volatility, the expected sign comes from the literature on hysteresis, where the existence of trade costs implies that uncertainty generates persistence in firm decisions. According to Melitz (2003), a depreciation of the exchange rate should induce entry of new exporters, but where fixed entry costs are important, firms can decide to stay out of international markets if expected gains are lower than entry costs. In this case, exchange rate volatility increases uncertainty and may affect diversification negatively.

¹¹ For recent evidence on the negative effect of trade costs on entry and export diversification, see Dennis and Shepherd (2007).

¹² We also used the overvaluation measure of Rodrik (2008), and results were similar to those reported in the next section.

In a simple factor-endowment model, the effect of improvements in the terms of trade can generally be expected to raise concentration: 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. In the context of the Melitz (2003) model, terms of trade improvements can be thought of as having analogous effects to an increase in export profitability and would lead to more diversification. Thus, the sign of the terms of trade coefficient is an empirical matter.

We did attempt to verify whether the impact of terms of trade changes on export diversification varies among countries with different human capital endowments. Given that higher levels of human capital can be associated with a comparative advantage in differentiated products, we include as an explanatory variable the interaction between terms of trade changes and the level of human capital. In this context, we hypothesise that terms of trade improvements ought to have a Dutch disease effect on export concentration in countries with low human capital. On the other hand, the effect of improving export prices could be positive in countries with relatively high levels of skilled labour and an already diversified export base. In other words, do these latter countries take advantage of the positive real-income effects of terms of trade improvements to diversify even more 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.¹³ This allows us to check the robustness of our findings to alternative definitions of export concentration. Given that the Gini and the Herfindahl indicators vary between 0 and 1, we use the logistic transformation for our estimations.

Table 3 shows the results for the Gini export concentration index. Most of the explanatory variables are significant and have the expected signs. With regard to reform-related variables, trade openness seems to favour specialisation, but financial development has no significant effect. On the other hand, as shown in column (1), human capital accumulation tends to reduce export concentration, but this result is not robust across specifications. As expected, we find that remoteness increases export concentration.

¹³ 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.

TABLE 3
Export Concentration and its Determinants Logistic Transform of Gini Index

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

Notes:

(i) Robust standard errors in parentheses. Windmeijer small sample correction applied.

(ii) *Significant at 5%; **significant at 1%; [†]significant at 10%.

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. The results also 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 nine years of education in the population aged 15 and above) and negative for higher levels of human capital. 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. It is also consistent with the notion that countries with high levels of human capital have already a diversified export base consisting probably not of commodities but of differentiated manufactures.

TABLE 4
Export Concentration and its Determinants Logistic Transform of Herfindhal Index

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

Notes:

(i) Robust standard errors in parentheses. Windmeijer small sample correction applied.

(ii) *Significant at 5%; **significant at 1%; [†]significant at 10%.

Table 4 shows 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 favourable 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 estimations for the Theil index of export concentration. These results present some similarities with those obtained with other indicators.

TABLE 5
Export Concentration and its Determinants Theil Index

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

Notes:

(i) Robust standard errors in parentheses. Windmeijer small sample correction applied.

(ii) *Significant at 5%; **significant at 1%; [†]significant at 10%.

In all of the specifications, trade openness and economic distance increase export concentration. On the other hand, similar to the results obtained with the Gini index, the effect of changes in the 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 the regressions, financial development and exchange rate variables do not affect export concentration.

In the estimations, based on the evidence of a nonlinear relationship between diversification and income provided by Imbs and Wacziarg (2003) and Klinger and Lederman (2004), we also analysed 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 previously.¹⁴

Summarising the results across different specifications and export concentration indicators, a robust finding is that trade openness induces higher specialisation. In contrast to implications of recent theoretical models with product differentiation and heterogeneous firms, trade liberalisation is associated with export concentration. This suggests that these reforms, more in line with neo-classical trade models, stimulate specialisation in traditional sectors and have not been associated with significant entry of new products and exporters. This is not inconsistent with the event study presented in the previous section and with similar evidence provided by Cadot et al. (2009). In fact, the event study does not control for changes in other determinants of export diversification, as does the econometric specification. In addition, these event studies also show that export concentration had already been declining before the introduction of trade reforms.

Regarding financial development, our findings indicate it does not seem to help countries to diversify their exports. In all of our regressions, the parameter for this variable is not significant. This can be explained by the theoretical ambiguity about the effects of financial development. Financial development may reduce liquidity constraints and, through the increase in the number of exporters, stimulates export diversification, as argued by Chaney (2005) and Manova (2008). However, development of capital markets may also lead to export concentration whether investors do not take a risk on untried ventures and concentrate in financing activities where the economy has proven to be competitive.

Looking at the effects of exchange rates, in some of the results, a negative effect of real exchange rate volatility on export diversification is detected, but no significant effects of exchange rate overvaluation. This does not suggest that exchange rates policies are not important for the development of the export sector, but it seems that other structural factors, as human capital and remoteness, dominate over the potential negative consequences of exchange rate undervaluation and volatility.

We have also found evidence that human capital accumulation contributes positively to diversify exports. This would be consistent with the idea that human capital accumulation allows countries to change their specialisation patterns from commodities to manufactured goods or services with a greater input of knowledge. The greater availability of specialised 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 or for R&D, which induce export diversification.

¹⁴ Owing to space considerations, we do not present these results, but they are available upon request.

Another relatively robust result is the important role of structural characteristics of the countries. In most of our regressions, we find that increasing remoteness tends to reduce export diversification. In line with recent literature on the role of trade costs and the empirical evidence provided by gravity equations, our findings show that economic distance generate costs that reduce export diversification.

Regarding the role of terms of trade shocks, most of our results suggest an interesting interaction between this variable and human capital. Our results reveal 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 is consistent with the idea that terms of trade improvements have a Dutch disease effect on export concentration in countries with low human capital. However, we find that the effect of improving export prices has positive effect on export diversification for those countries with relatively high levels of skilled labour. In other words, we find evidence that skill-abundant countries take advantage of the positive real-income effects of terms of trade improvements to diversify even more their exports.

5. CONCLUSIONS

Using a large dataset of countries during the last forty years of the twentieth century, this study analyses 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 explore 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 specialisation and not export diversification. In contrast, financial development, at least with the proxy that we can estimate for a large number of countries over time (credit to the private nonbank sector as a share of GDP), does not affect export diversification.

Second, we also analyse the effect of real exchange rate volatility and overvaluation. In general, the results do not reveal a significant role for these variables. In fact, none of the regressions show a negative effect of real exchange rate overvaluation on diversification. In addition, only for one of the concentration indicators is exchange rate volatility 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 diversify 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 specialisation patterns. The 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 the estimations, we are able to uncover an interesting interaction between this variable and human capital. Improvements in the terms of trade tend to concentrate exports, but this effect is less pronounced for those countries with higher levels of human capital. This evidence suggests that countries where human capital is abundant specialise in differentiated manufactured products. In these countries, a positive terms of trade shock affects a broad spectrum of sectors and elicits the export of new varieties. Alternatively, higher levels of education in the labour force allow countries to take advantage of the higher income stemming from positive terms of trade shocks to develop new export sectors.

The evidence presented in this study 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. Financial development does not affect export concentration. This implies that policies aimed at deepening financial markets are unlikely to improve export performance. Also, opening the economy to international trade is unlikely to assist in diversifying production and export structures. 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 centres 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 favourably located.

The understanding of the determinants of export concentration is a contribution to the development of new theoretical literature linking diversification to openness, terms of trade shocks, human capital and economic growth, unveiling their interactions and some of the mechanisms at play.

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