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WEAK LINKS AND DIVERSIFICATION

by

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Abstract

An important literature has shown that the relationship between economic diversification and income per capita is non-monotonic (Imbs and Wacziarg, 2003 and Koren and Tenreyro, 2007). At early stages of development countries diversify as income increases and new economic opportunities emerge, but at later stages of development the production bundle becomes more concentrated as income rises. The aim of this paper is to explore the role played by *Weak Links* effects à la Jones (2011) in explaining the non-monotonic relationship between income per capita and economic diversification. To do so, we first construct a measure of the probability of observing *Weak Links* in a given country. Results show that economies where *Weak Links* are more likely to be observed tend to have a more concentrated production bundle. Moreover the inverted u-shape relationship between income per capita and economic diversification tends to be stronger in countries where *Weak Links* are more likely to be observed.

Keywords:Economic Diversification, Development, Productivity, Weak Links

JEL Classification:F14, F43, O14

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Any mistakes or errors remain the author's own.

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1. INTRODUCTION

Early stages of development are often accompanied by diversification of the production bundle as more economic opportunities become available. There is evidence, however, that the relationship between diversification and development is non-monotonic. Imbs and Wacziarg (2003) and Koren and Tenreyro (2007) show that if the two are positively correlated at low levels of development, once countries reach a certain income per capita threshold concentration of production increases with income levels. Cadot, Carrere and Strauss-Khan (2011) show that the u-shape relationship between economic concentration and income holds not only for production but also for export diversification.

A potential explanation for this empirical regularity is the tendency to diversify production (or investment opportunities) in the presence of incomplete financial markets at very low levels of development and the forces of comparative advantage that push towards concentration as financial markets develop (Gilles Saint Paul, 1992 and Acemoglu and Zillibotti, 1997). Faini (2004) suggests a similar explanation: at early stages of development as income rises the opportunities for risk diversification through sectorally diversified investment become stronger which initially leads to diversification. However as economies become richer, they also become economically and institutionally more stable, and this reduces business risks which reduces the incentives to diversify.

The presence of *Weak Links* à la Jones (2011) can have an impact on this relationship. Jones (2011) defines *Weak Links* building on the earlier work by Hirschman (1958) and Kremer (1993) that emphasize the role played by linkages and complementarities in economic development. Low productivity in one input sector for which there is little substitutability will act as a weak link in the production chain, hurting all downstream sectors and the overall development prospects of the country. Thus, the presence of *Weak Links* is likely to lead to a less diversified production bundle (ceteris paribus) as downstream sectors are hurt by higher input and associated factor prices due to the low productivity of this input sector for which there is little substitutability. On the other hand, in economies with a higher probability of observing a weak link, there are higher risks for investors which creates incentives for portfolio diversification to minimize the value at risk which would lead to a more diversified production bundle.

Therefore, the effect of *Weak Links* on economic diversification is ambiguous and remains an empirical matter. The aim of this paper is twofold. First, to explore the impact that the presence of *Weak Links* could have on the concentration of the production bundle. Second, to try to examine whether the presence of *Weak Links* could help explain the u-shaped relationship between income per capita and diversification. Thus, after creating a proxy for *Weak Links* that captures the probability that there exists a relatively low productive sector which is heavily used as an input by the rest of the economy, we estimate its impact on the degree of economic diversification and explore how the the relationship between economic diversification and income per capita varies across economies with high and low propensity of observing *Weak Links*[1].

Empirical results show that economies where *Weak Links* are more likely to be observed tend to have a more concentrated production bundle. Also the inverted u-shaped relationship between income per capita and economic diversification tends to be steeper for countries where *Weak Links* are more likely to be observed. However, it is important to notice that turning points (GDP levels) at which the slopes change sign are similar for economies with low and high levels of *Weak Links*.

The rest of the paper is organized as follows. Section 2 describes the empirical methodology and how the proxy for *Weak Links* is built. Section 3 presents the results and shows some robustness checks. Finally, section 4 concludes.

[1] This paper is closely related to the work by Olarreaga and Ugarte (2012) where authors use a *Weak Links'* measure to explain the tendency towards concentration of *Weak Links'* countries while using non-parametric and fourth order regressions to describe their development patterns. However, they do not estimate the impact of *Weak Links* on the well-established U-shaped pattern of development suggested by Imbs and Wacziarg (2003) as done here.

2. EMPIRICAL METHODOLOGY

Our starting point is Imbs and Wacziarg (2003) where the following relationship is estimated parametrically :

(1) $$Concentration_{c,t} = f\left(\text{income}_{c,t}\right) + \sum_c \gamma_c D_c + \varepsilon_{c,t}$$

where $Concentration_{c,t}$ measures the lack of sectoral diversification[2]using different indices and along the value-added dimension for country c in year t , income is the GDP per capita at constant prices, noted $GDPpc_{c,t}$ hereafter, and $\varepsilon_{c,t}$ is an error term. The relationship, f , is estimated in an unbalanced panel of 98 countries over the period 1963-2001, and in order to control for unobserved heterogeneity country fixed effects (D_c) are included in all our estimations. Imbs and Wacziarg (2003) found a quadratic relationship between sectoral concentration and income per capita and this is our starting point.

We then explore how Weak Links affect the relationship between development and diversification. First, we simply add the proxy for *Weak Links* to Equation (1) :

(2) $$Concentration_{c,t} = f\left(\text{income}_{c,t}\right) + \alpha\ WeakLinks_{c,t} + \sum_c \gamma_c D_c + \varepsilon_{c,t}$$

Afterwards, we will explore non-monotonic effects of the proxy on the relationship between income and concentration, , and it considers the impact of two versions of the proxy capturing the presence of *Weak Links*.

2.1 MEASURING DIVERSIFICATION

We measure economic concentration using different indices to check for the robustness of the results. They will be calculated based on sectoral value-added for each country and year using the 28[3]sector disaggregation provided at the 3-digit level of the International Standard Industrial Classification of All Economic Activities (ISIC) rev. 3[4].

An important issue in the calculation of the concentration indices is non-reported data. If data for some small sectors is missing and we instead consider it as a zero, this may increase the value of some indices like the Gini index but this will not affect the Herfindhal index. Thus given that the data is unbalanced within countries over time[5], especially for small sectors, we consider small sectors[6]as inactive if their information is missing and they are not included in the calculation of the concentration indices. The Herfindhal will not be affected by this rule, but the Gini might be downward biased. On the other hand, the Hefindhal is very sensitive to large sectors, whereas the Gini is more sensitive to what

[2] Here we follow most of the literature and use indices of concentration rather than diversification

[3] The number of sectors may vary per country and year due to misreport in the data or inactive sectors in a given economy. On average, we observe 21 active sectors per country and three quarters of countries included in the sample report data for 17 economic sectors. Only one every ten countries reports between 8 to 12 sectors on average.

[4] The source of the data is United Nations Industrial Development Organization (UNIDO) Industrial Statistics Database (INDSTAT). www.unido.org/

[5] Thus, the number of sectors reporting data varies by country and year in our sample. The sample of developing countries used in the regressions covers 98 countries with an average of 18 country-year observations per country and one third of countries has at least 25 of 39 possible observations. Another third of countries in the sample has between 10 and 25 country-year observations and one third of countries have less than 10 observations over the period 1963-2001.

[6] Small sectors are those whose average share in total value-added over the whole period represents less than 2 percent. If the average share in total value-added exceeds 2 percent, the sector is no longer considered as small and we do not consider observations in that year in that country because of incomplete information.

occurs in the middle of the distribution. So, these indices will capture differently changes towards diversification. Thus, to ensure the robustness of our results we also use the Theil index which puts a heavier weight to changes at the bottom of the distribution. The problem with this index is that at the bottom of the distribution we are not sure whether values close to zero are related to active or inactive sectors. Thus, we may be putting too much weight on noisy data by using a Theil index of concentration.

Thus our indices of diversification are the following: Gini, Herfindhal and normalized Theil[7]. After ordering the value-added shares in increasing order, the Gini coefficient is calculated as follows:

(3) $$Gini = 1 - \frac{1}{n_{c,t}} \sum_{n=1}^{n_{c,t}} (S_{i-1}^{c} + S_{i}^{c})$$

where S_i^c is the cumulative share of value-added of sector i in country c , $n_{c,t}$ is the number of active sectors in country c at period t and $S_0 = 0$. The Gini index ranges between 0 and 1. When it takes the value zero in a homogeneously diversified economy where all sectors have an equal share of total value-added. At the other extreme, the economy is fully concentrated and all value-added is generated by a single sector.

The Herfindhal index ranges between $1/n_{c,t}$ and 1 and it also increases with the degree of concentration :

(4) $$Herf = \sum_{n=1}^{n_{c,t}} (S_i)^2$$

where S_i is the share of sector i in total value-added.

Finally, we use the normalized Theil index which is more sensitive to changes at the bottom of the distribution. Furthermore, it has similar range and properties than for the two previous indices :

(5) $$Theil_{trad} = \frac{1}{n_{c,t}} \sum_{n=1}^{n_{c,t}} \left(\frac{S_i}{\bar{S}}\right) * \log\left(\frac{S_i}{\bar{S}}\right) = \frac{1}{n_{c,t}\bar{S}} \left(\sum_{n=1}^{n_{c,t}} S_i * \log S_i\right) - \log(\bar{S})$$

and

(6) $$Theil_{norm} = 1 - \exp(-Theil_{trad}),$$

where $\bar{S}$ is the average share of value-added, namely $1/n_{c,t}$.

[7] The normalization ensures that the range of the new index is $[0,1]$ instead of $[0, \ln n_{c,t}]$ for the traditional version of the Theil index.

2.2 A PROXY FOR *WEAK LINKS*

To estimate the impact of *Weak Links* on economic diversification as suggested in Equation 2, we use the proxy proposed in Ugarte (2013) which aims at capturing the occurrence of low productivity in intermediate goods' production.

Using residuals of labor productivity ($r.q_{c,s,t}$) on country-year and sector-year fixed effects to approximate total factor productivities by sector[8]as shown in Equations 7-8, we run a kernel density estimation for the productivity distribution in intermediates faced by each country in each period[9].

$$(7) \quad \mathrm{q}_{c,s,t} = \frac{\text{Value added}_{c,s,t}}{\text{Labor}_{c,s,t}} = \sum_{c,t} \lambda_{c,t} + \sum_{s,t} \gamma_{s,t} + \varepsilon_{c,s,t}$$

$$(8) \quad \widehat{\varepsilon_{c,s,t}} = \mathrm{r.q}_{c,s,t}$$

The proposed proxy for *Weak Links* measures the probability of observing abnormal low productivities using a relative threshold (λ standard deviation below the mean) by country and year, for example :

$$(9) \quad Weak_{c,t} = \mathrm{Prob}\left[\widehat{\mathrm{r.q}} < mean_{c,t}(\widehat{\mathrm{r.q}}) - \lambda * std_{c,t}(\widehat{\mathrm{r.q}})\right]$$

Here, we present the results for the proxy calculated using $\lambda = 1$ but we also show some results obtained using other values of λ. For further details and characteristics of the proxy used, see the descriptive analysis of this measure in Ugarte (2013).

In a framework where all economic sectors are considered producers of intermediate goods in the production of the final good, *Weak Links* should reflect the fact that relative low productive sectors will reduce the total productivity and implies that resources allocation is not optimal[10]. Less productive sectors will require more resources and this will harm the production of other productive sectors. If less productive sectors are not tradeable and incentives or possibilities of investment beyond these value chains are limited, this situation will lead to a higher concentration of the economy and thus, we expect that $\alpha > 0$ in Equation (2).

[8] The use of residual productivities is a major difference with respect to the results presented by Olarreaga and Ugarte (2012) where authors show that the *Weak Links*' proxy enables to distinguish between countries with an initial tendency to diversification in their patterns of development and countries with an initial tendency to concentration.

[9] The share in intermediate sales as well as an index of tradeability are used to weight the importance of each sector in the kernel density estimation.

[10] See Jones (2011).

3. RESULTS

3.1 DATA AND SAMPLE DESCRIPTION

Table A1 lists the countries in the sample, as well as the number of observations available for the period 1963-2001. The unbalanced nature of our panel suggests that after controlling for country fixed effects our coefficients will mainly capture the within country variability of those countries with a large number of observations. The data on value-added comes from UNIDO's INDSTAT 2 and GDP per capita in constant prices is from the World Development Indicators. We create a correspondence between OECD input-output tables[11] and sectors in INDSTAT in order to establish the importance of each sector s as an intermediate good in each economy.[12]

As a start, we replicate Imbs and Wacziarg (2003) to check that the U-shaped pattern of development is also valid in our sample which contains few more countries and a longer span in time. As our goal is to explore the relationship between economic concentration and development for developing countries, we focus on countries with per capita income below 15 thousands US$ and we exclude high-income countries. In fact, among the excluded countries we find some of the largest exporters of natural resources (oil) with significantly high levels of concentration and considering them in our sample would make our results less relevant for developing countries. In fact, these countries do not necessarily follow the usual pattern of diversification and given important rents of natural resources, they can shift their production structure more easily to specific sectors through investment.

Table 1 and table 2 present summary statistics for the different measures of diversification. The correlation between measures is statistically significant at 1 per cent level and positive in all cases. Table 1 also provides descriptive statistics of the probability of observing *Weak Links* in our sample. On average, the probability of observing low productivity in intermediates is around 7 per cent for the threshold at one standard deviation with respect to the mean and it falls when the threshold is fixed at a lower value. The correlation associated to the measure, calculated using one standard deviation to the mean, is very low but significant and positive with all the concentration indices. The correlations using a second measure ($\lambda = 1.5$) are less significant and show much less correlation between the proxy and the diversification measures.

Table 1
Summary statistics

	Mean	Std. Dev.	Min.	*Max.*	*N*
$Gini_{vadd}$	0.583	0.093	0.293	0.822	1,736
$Theil_{vadd}$	0.466	0.127	0.141	0.807	1,736
$Herf_{vadd}$	0.138	0.077	0.055	0.763	1,736
Year			1963	2001	1,736
GDP_{pc}	2.056	2.640	0.098	14.961	1,736
Weak(-σ)	0.079	0.053	0	0.260	1,736
Weak(-1.5σ)	0.054	0.043	0	0.236	1,736

[11] www.oecd.org/sti/inputoutput/

[12] As only 24 countries report input-output tables, we average values of weights ω_s by region for all remaining countries. The regions defined are Latin America, Europe, Middle East & North Africa, Africa and Asia.

Table 2
Cross-correlation table

	$Gini_{vadd}$	$Theil_{vadd}$	$Herf_{vadd}$	*Weak(-σ)*	*Weak(-1.5σ)*
$Gini_{vadd}$	1.000				
$Theil_{vadd}$	0.712	1.000			
$Herf_{vadd}$	0.990	0.762	1.000		
Weak(-σ)	0.105	0.227	0.109	1.000	
Weak(-1.5σ)	0.003	0.022	0.003	0.718	1.000

Figure 1
Average indices of economic concentration across countries (1963-2001)

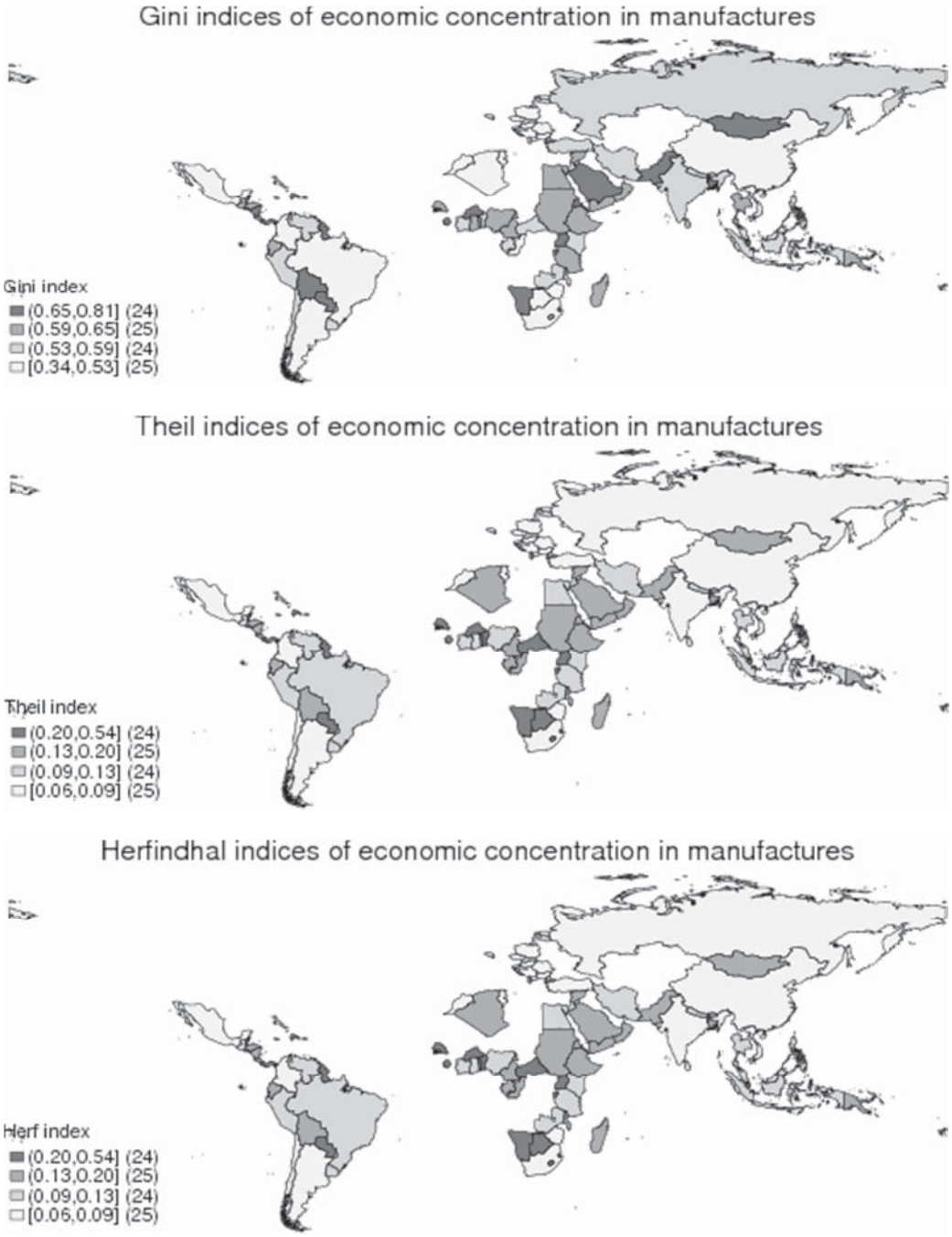
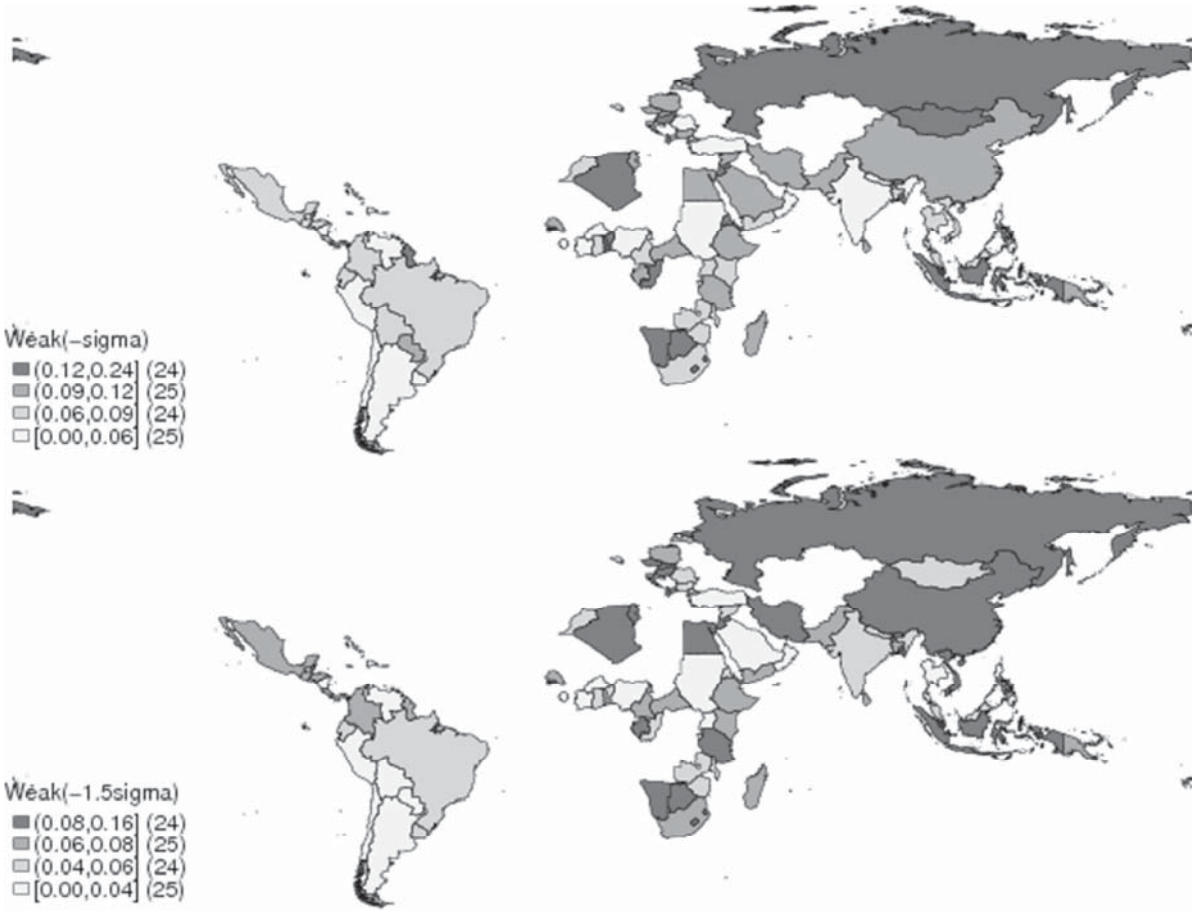


Figure 2
Average value of *Weak Links*' proxy across countries



Note: The *Weak Links'* proxy used in the first panel of this Figure is the probability of observing productivities lower than the mean productivity minus the standard deviation averaged over all observations for each country in the period 1963-2001. The second panel uses the probability of observing productivities lower than the mean productivity minus 1.5 times the standard deviation as proxy.

Figure 1 provides a graphical representation of our sample and shows the substantial heterogeneity that exists across countries while measuring economic concentration. Concentration seems to be particularly relevant for African and Latin American countries, but even within each of these regions the variability of indices is significant. Figure 2 plots the average value of the proxy for *Weak Links* for each country in our sample. In this sense, Latin American economies seem to be less subject to observe relatively low productivities than other developing countries in other regions of the world. However, it can be observed that the higher probabilities of observing *Weak Links* are mainly associated with higher economic concentration[13] [14].

3.2 RESULTS

First, we replicate Imbs and Wacziarg (2003) with our sample and found similar results to theirs. The u-shaped pattern between concentration and level of development is verified for all our measures of concentration and is robust to the inclusion of country and year fixed effects. These results are presented in the first 6 columns of table 3. The last two columns of this table show the

[13] The Russian Federation and China are two clear exceptions to this behavior.

[14] Further details and characteristics of the proxy used here can be found in Ugarte (2013).

results by Imbs and Wacziarg that are based on the same data source. Results obtained by Imbs and Wacziarg are very close to those observed in columns 1 and 3 of this table, with a slightly increased sample size.

Table 3
Replicating Imbs & Wacziarg

				Enlarged sample			Imbs & Wacziarg	
	(1) Gini	(2) Theil	(3) Herf	(4) Gini	(5) Theil	(6) Herf	(7) Gini	(8) Herf
GDP_{pc}	-0.023774***	-0.029124***	-0.006364**	-0.022884***	-0.026904***	-0.011401***	-0.0161***	-0.0073***
	(0.004721)	(0.006276)	(0.002953)	(0.004934)	(0.006758)	(0.003369)		
GDP_{pc}^2	0.001356***	0.001763***	0.000859***	0.001295***	0.001640***	0.001047***	0.0009***	0.0003***
	(0.000221)	(0.000304)	(0.000198)	(0.000218)	(0.000302)	(0.000189)		
Constant	0.616489***	0.506256***	0.141643***	0.641447***	0.537970***	0.168157***	0.6126***	0.1308***
	(0.007619)	(0.010053)	(0.004466)	(0.012270)	(0.016639)	(0.007612)		
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE				Yes	Yes	Yes		
Observations	1,736	1,736	1,736	1,736	1,736	1,736	1,493	1,493
R-squared	0.737	0.743	0.787	0.746	0.752	0.799	0.388	0.210

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Columns 7 and 8 report estimates from Table 4 of Imbs and Wacziarg (2003). Standard errors for columns 7 and 8 are not available in the original table.

Our first attempt is to include the proxy for *Weak Links* as a control variable in the regression as suggested by the specification in Equation 2. Table 4 shows the results obtained in this exercise. At this point, it seems that the proxy included does not capture any particular effect on concentration and estimates are rarely significant. This result could be partially explained by the low correlation observed in table 2. However, we believe that these results are driven by a non-monotonic impact of *Weak Links* on concentration and table 5 addresses this question by interacting the proxy with the income per capita and the square of it. All interactions and the proxy itself are highly significant in all regressions. The proxy has a positive impact on concentration and jointly with the effect of interactions we can argue that the presence of relatively less productive sectors in a country tend to be associated with higher levels of concentration at the sectoral level. Indeed, the coefficients of interactions of GDP and the proxy are significantly larger than those of GDP and its quadratic term. This points out a steeper u-shaped pattern for countries with higher propensity to observe *Weak Links*.

Table 4
Including *Weak Links*' proxy

	(1) Gini	(2) Theil	(3) Herf	(4) Gini	(5) Theil	(6) Herf
GDP_{pc}	-0.023732***	-0.029081***	-0.006200**	-0.022911***	-0.026952***	-0.011299***
	(0.004719)	(0.006276)	(0.002978)	(0.004934)	(0.006759)	(0.003397)
GDP_{pc}^2	0.001360***	0.001767***	0.000872***	0.001294***	0.001637***	0.001054***
	(0.000222)	(0.000305)	(0.000201)	(0.000218)	(0.000302)	(0.000191)
$Weak$	0.013869	0.013960	0.054088**	-0.008758	-0.015172	0.032689
	(0.034312)	(0.046054)	(0.025593)	(0.035379)	(0.047296)	(0.024955)
Constant	0.615271***	0.505030***	0.136893***	0.642313***	0.539470***	0.164925***
	(0.008027)	(0.010701)	(0.005090)	(0.012765)	(0.017371)	(0.008074)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE				Yes	Yes	Yes
Observations	1,736	1,736	1,736	1,736	1,736	1,736
R-squared	0.737	0.743	0.787	0.746	0.752	0.799

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5

Including *Weak Links* and interactions with $GDPpc$

	(1) Gini	(2) Theil	(3) Herf	(4) Gini	(5) Theil	(6) Herf
GDP_{pc}	-0.015990***	-0.017793***	-0.000621	-0.015573***	-0.015984**	-0.006460
	(0.005008)	(0.006646)	(0.003491)	(0.005266)	(0.007154)	(0.003972)
GDP_{pc}^2	0.000821***	0.000975***	0.000511**	0.000805***	0.000901**	0.000760***
	(0.000259)	(0.000354)	(0.000251)	(0.000258)	(0.000355)	(0.000243)
$GDP_{pc} \times Weak$	-0.101873***	-0.148850***	-0.071714***	-0.088172***	-0.132191***	-0.056092**
	(0.030354)	(0.040328)	(0.026050)	(0.030461)	(0.040571)	(0.024513)
$GDP_{pc}^2 \times Weak$	0.005776**	0.008590***	0.003217	0.004921**	0.007541**	0.002309
	(0.002465)	(0.003246)	(0.002369)	(0.002482)	(0.003258)	(0.002128)
$Weak$	0.175708***	0.248625***	0.178151***	0.133425**	0.196065**	0.132913***
	(0.062508)	(0.083412)	(0.043202)	(0.064640)	(0.086409)	(0.043612)
Constant	0.603155***	0.487431***	0.127777***	0.630479***	0.521860***	0.156730***
	(0.008797)	(0.011698)	(0.005709)	(0.013442)	(0.018221)	(0.008541)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE				Yes	Yes	Yes
Observations	1,736	1,736	1,736	1,736	1,736	1,736
R-squared	0.739	0.746	0.790	0.748	0.754	0.801

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6 goes further in this exercise and splits the sample with respect to the mean probability of observing relatively low productive sectors[15]. We define a dummy variable taking the value 1 if the probability of observing low productivities is higher than the average probability in the sample. Using interactions terms with the dummy variable, we verify that the u-pattern exists for the two sub-samples. Except for the Herfindhal indices in countries with a high propensity to relatively low productivity in intermediates, all u-shaped patterns are confirmed by the in-sample test proposed by Lind and Mehlun (2010)[16]. Furthermore, we test the estimates between sub-samples and we find that the shapes of the u-shaped relationships are different for each group. In fact, countries with *Weak Links* show a steeper pattern which implies higher levels of concentration at earlier and later stages of development. Moreover, these countries with high probability of *Weak Links* remain more concentrated than other countries during their development as the estimate for the dummy variable is statistically significant in all regressions.

Figures 3-5 plot these patterns for the three indices of concentration in table 6. The intersection of the two patterns drawn in these Figures is a potential explanation to the low statistical significance of the proxy in table 4. These graphs show that poor countries with *Weak Links* show a lower correlation between diversification and income level. In fact, these countries face important productivity bottlenecks that impede them of attaining higher levels of development. On the other hand, rich countries with *Weak Links* show a lower correlation between concentration and income level than rich countries with low probability of observing relatively low productive sectors.

[15] This distinction leads to two subsamples of almost similar sizes: 840 and 896 observations. Considering a splitting around the median value of the proxy would imply similar samples to those considered here.

[16] This test goes beyond the check of two necessary conditions, i.e. statistical significance of the coefficient of the quadratic term and the existence of an extremum point within the data, used to verify U-shaped relationships. Authors show that these two necessary conditions are not sufficient and they propose a test that checks the exact and necessary condition for the existence of a U-shaped relationship in a finite sample.

Table 6
Splitting the sample between countries with high and low propensity to observe *Weak Links*

	(1) Gini	(2) Theil	(3) Herf	(4) Gini	(5) Theil	(6) Herf
$GDP_{pc} \times (1 - dummy)$	-0.018469***	-0.021724***	-0.004476	-0.016923***	-0.018416***	-0.009737***
	(0.004821)	(0.006302)	(0.003073)	(0.005109)	(0.006848)	(0.003552)
$GDP_{pc}^2 \times (1 - dummy)$	0.001023***	0.001295***	0.000770***	0.000947***	0.001141***	0.000981***
	(0.000236)	(0.000317)	(0.000220)	(0.000237)	(0.000320)	(0.000211)
$GDP_{pc} \times dummy$	-0.030449***	-0.038428***	-0.008930***	-0.027863***	-0.034007***	-0.012751***
	(0.004906)	(0.006606)	(0.003262)	(0.005050)	(0.006944)	(0.003506)
$GDP_{pc}^2 \times dummy$	0.001709***	0.002258***	0.000929***	0.001573***	0.002040***	0.001058***
	(0.000253)	(0.000346)	(0.000221)	(0.000250)	(0.000341)	(0.000205)
$dummy$	0.019412***	0.026403***	0.010850***	0.015778***	0.022197***	0.006479*
	(0.005468)	(0.007204)	(0.003612)	(0.005678)	(0.007471)	(0.003615)
Constant	0.607213***	0.493640***	0.136656***	0.632732***	0.525711***	0.164696***
	(0.007776)	(0.010206)	(0.004757)	(0.012793)	(0.017204)	(0.007873)
Tests						
(1) $GDP_{pc} \times (1 - dummy) = GDP_{pc} \times dummy$	Reject	Reject	Reject	Reject	Reject	Accept
(2) $GDP_{pc}^2 \times (1 - dummy) = GDP_{pc}^2 \times dummy$	Reject	Reject	Reject	Reject	Reject	Accept
(1) + (2) Joint	Reject	Reject	Reject	Reject	Reject	Reject
Joint + dummy	Reject	Reject	Reject	Reject	Reject	Accept
p-value if dummy = 1	0.000	0.000	0.130	0.022	0.064	0.325
p-value if dummy = 0	0.013	0.040	0.046	0.000	0.002	0.000
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE				Yes	Yes	Yes
Observations	1,736	1,736	1,736	1,736	1,736	1,736
R-squared	0.740	0.746	0.788	0.749	0.755	0.800

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure 3
Diversification and *Weak Links* using Gini indices

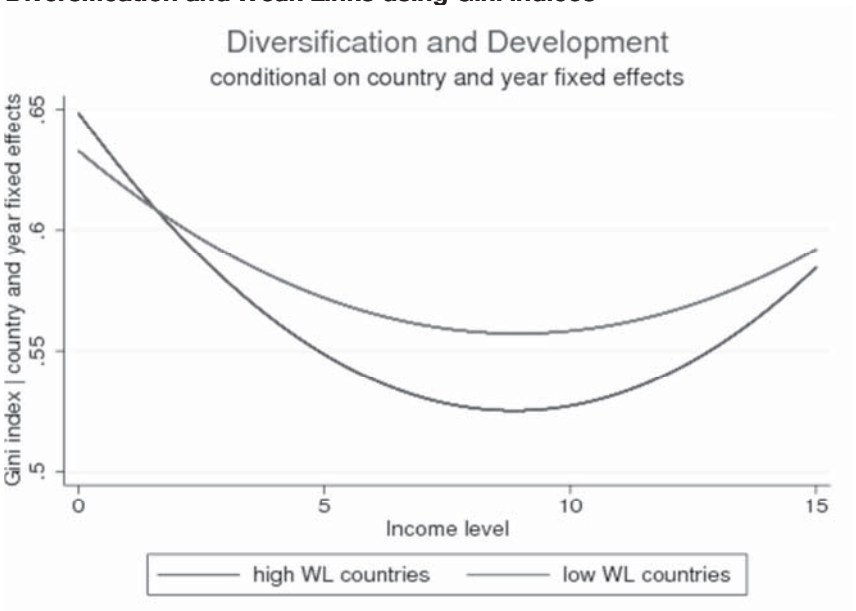


Figure 4
Diversification and *Weak Links* using Theil indices

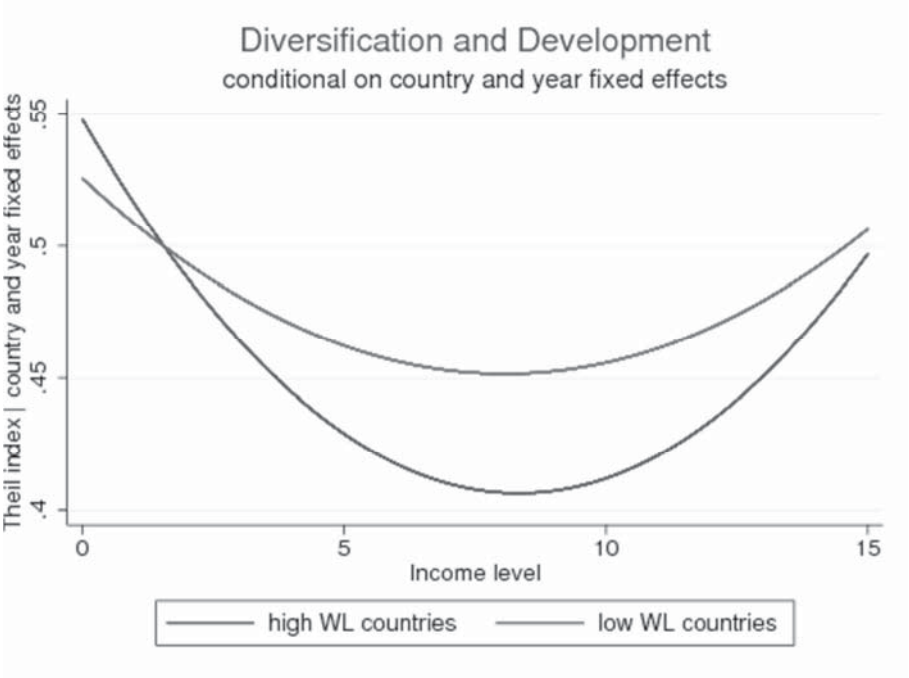
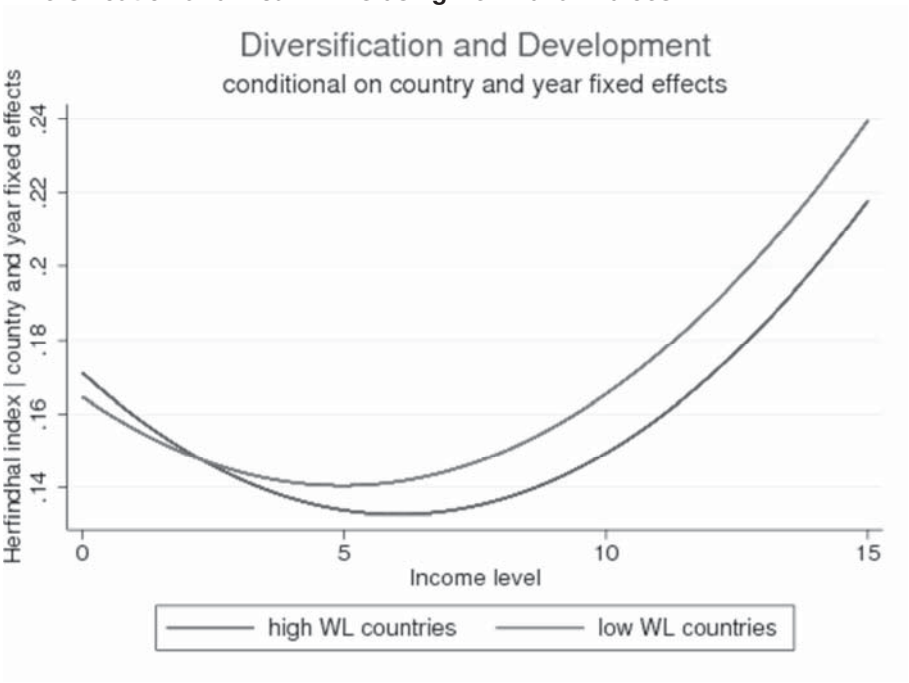


Figure 5
Diversification and *Weak Links* using Herfindhal indices



3.3 ROBUSTNESS CHECKS

A recurrent concern on previous results is related to the restricted sample used in the analysis as we focus exclusively on current developing countries and the relevance of *Weak Links* on economic concentration might be particular to this reduced sample of countries. Table 7 and table 8 extend the sample to all countries below the threshold of 15 thousands US$ of GDP per capita irrespectively of their current level of development and they show similar results to those observed in table 5 and table 6 for the restricted sample. Thus, we conclude that *Weak Links* do not only influence the pattern of development of (current) developing countries but they have also played a role in the development of more advanced economies.

Table 7
***Weak Links* and interactions with $GDPpc$ including observations for high-income countries**

	(1) Gini	(2) Theil	(3) Herf	(4) Gini	(5) Theil	(6) Herf
GDP_{pc}	-0.007416***	-0.008499**	-0.000257	-0.003891	-0.002973	-0.001662
	(0.002580)	(0.003493)	(0.001793)	(0.002878)	(0.003897)	(0.002018)
GDP_{pc}^2	0.000607***	0.000771***	0.000291**	0.000562***	0.000673***	0.000404***
	(0.000149)	(0.000202)	(0.000128)	(0.000160)	(0.000215)	(0.000132)
$GDP_{pc} \times Weak$	-0.083019***	-0.104209***	-0.039855**	-0.073100***	-0.092886***	-0.026193
	(0.021387)	(0.028249)	(0.018334)	(0.022312)	(0.029638)	(0.018222)
$GDP_{pc}^2 \times Weak$	0.005447***	0.006138***	0.000163	0.004779***	0.005400**	-0.000695
	(0.001652)	(0.002214)	(0.001684)	(0.001716)	(0.002302)	(0.001647)
$Weak$	0.153158***	0.200883***	0.144991***	0.116673**	0.155487**	0.102403***
	(0.056794)	(0.075607)	(0.038584)	(0.058797)	(0.078517)	(0.039400)
Constant	0.568676***	0.444214***	0.116626***	0.591863***	0.472799***	0.136222***
	(0.006918)	(0.009366)	(0.004304)	(0.009690)	(0.013086)	(0.005981)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE				Yes	Yes	Yes
Observations	2,315	2,315	2,315	2,315	2,315	2,315
R-squared	0.774	0.778	0.792	0.781	0.785	0.801

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Moreover, the choice of $\lambda = 1$ is arbitrary as we lack from a clear criterion establishing the most suitable value for this parameter and a sensitivity analysis of our results using different values of λ is therefore appropriate. Table 9 and table 10 show the results obtained while running similar regressions to those in table 5 but for values of λ equal to 0.84 and 1.5, respectively[17]. Table 9 and table 10 confirm that *Weak Links* are positively correlated with economic concentration and that countries with higher propensity to observe such effects tend to have a steeper pattern of development as the estimates for interaction terms between the proxies and GDP per capita increase the absolute value of the slope at both extremes of the relationship. It is also particularly important to notice that the magnitude of estimates increases for higher values of λ. Undoubtedly, this fact is related to kind of productivities that is captured by the proxy which has a higher sensitivity to extremely low productivities when $\lambda = 1.5$. Indeed, extremely low productivities are those whose effects on economic concentration are the strongest.

[17] Several values for the parameter λ were evaluated but we believe that these two examples illustrate results obtained with a larger number of values.

Table 8

Splitting the sample between countries with high and low propensity to observe *Weak Links* (including high-income countries' observations)

	(1) Gini	(2) Theil	(3) Herf	(4) Gini	(5) Theil	(6) Herf
$GDP_{pc} \times (1 - dummy)$	-0.009664***	-0.011655***	-0.002679*	-0.005490**	-0.005296	-0.003789**
	(0.002343)	(0.003144)	(0.001471)	(0.002641)	(0.003552)	(0.001700)
$GDP_{pc}^2 \times (1 - dummy)$	0.000777***	0.000981***	0.000359***	0.000694***	0.000836***	0.000450***
	(0.000126)	(0.000168)	(0.000093)	(0.000134)	(0.000177)	(0.000096)
$GDP_{pc} \times dummy$	-0.017640***	-0.021117***	-0.004699***	-0.012826***	-0.014193***	-0.004386**
	(0.002706)	(0.003643)	(0.001750)	(0.002856)	(0.003892)	(0.001876)
$GDP_{pc}^2 \times dummy$	0.001259***	0.001511***	0.000353***	0.001140***	0.001336***	0.000361***
	(0.000159)	(0.000212)	(0.000123)	(0.000158)	(0.000211)	(0.000120)
$dummy$	0.013372***	0.017300***	0.008596***	0.010822**	0.014529**	0.004286
	(0.004955)	(0.006553)	(0.003181)	(0.005127)	(0.006775)	(0.003246)
Constant	0.573397***	0.450471***	0.123696***	0.594857***	0.476547***	0.142150***
	(0.005810)	(0.007855)	(0.003384)	(0.008995)	(0.012087)	(0.005298)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE				Yes	Yes	Yes
Observations	2,315	2,315	2,315	2,315	2,315	2,315
R-squared	0.774	0.778	0.789	0.781	0.785	0.798

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 9

Including *Weak Links* and interactions with $GDPpc$ for $\lambda = 0.84$

	(1) Gini	(2) Theil	(3) Herf	(4) Gini	(5) Theil	(6) Herf
GDP_{pc}	-0.018351***	-0.021141***	-0.001474	-0.018077***	-0.019493**	-0.007167
	(0.005190)	(0.006961)	(0.003855)	(0.006038)	(0.008104)	(0.004445)
GDP_{pc}^2	0.001029***	0.001273***	0.000620**	0.001016***	0.001198**	0.000857***
	(0.000335)	(0.000450)	(0.000249)	(0.000357)	(0.000480)	(0.000263)
$GDP_{pc} \times Weak$	-0.063439**	-0.093293***	-0.053812***	-0.052825**	-0.080796**	-0.042621**
	(0.024971)	(0.033490)	(0.018546)	(0.025156)	(0.033766)	(0.018521)
$GDP_{pc}^2 \times Weak$	0.002932	0.004419	0.002039	0.002332	0.003731	0.001423
	(0.002142)	(0.002872)	(0.001591)	(0.002155)	(0.002893)	(0.001587)
$Weak$	0.095980**	0.137174**	0.150587***	0.052908	0.083485	0.109064***
	(0.044694)	(0.059942)	(0.033194)	(0.045430)	(0.060977)	(0.033446)
Constant	0.608670***	0.495105***	0.127970***	0.637672***	0.531729***	0.156888***
	(0.008428)	(0.011304)	(0.006260)	(0.013068)	(0.017540)	(0.009621)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE				Yes	Yes	Yes
Observations	1,736	1,736	1,736	1,736	1,736	1,736
R-squared	0.739	0.745	0.790	0.748	0.754	0.801

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 10

Including *Weak Links* and interactions with $GDPpc$ for $\lambda = 1.5$

	(1) Gini	(2) Theil	(3) Herf	(4) Gini	(5) Theil	(6) Herf
GDP_{pc}	-0.015075***	-0.016526**	-0.002622	-0.015560***	-0.016061**	-0.008858**
	(0.004995)	(0.006696)	(0.003741)	(0.005799)	(0.007782)	(0.004292)
GDP_{pc}^2	0.000798***	0.000953**	0.000627***	0.000821***	0.000937**	0.000898***
	(0.000288)	(0.000386)	(0.000216)	(0.000309)	(0.000415)	(0.000229)
$GDP_{pc} \times Weak$	-0.210539***	-0.305330***	-0.076316**	-0.181713***	-0.268041***	-0.044031
	(0.051328)	(0.068813)	(0.038447)	(0.051575)	(0.069207)	(0.038175)
$GDP_{pc}^2 \times Weak$	0.015732***	0.022790***	0.002598	0.013949***	0.020398***	0.000461
	(0.004969)	(0.006661)	(0.003722)	(0.004993)	(0.006700)	(0.003696)
$Weak$	0.351342***	0.504059***	0.093699*	0.308598***	0.448795***	0.048294
	(0.071587)	(0.095972)	(0.053622)	(0.071978)	(0.096586)	(0.053277)
Constant	0.598700***	0.480806***	0.137369***	0.625509***	0.514804***	0.165480***
	(0.008087)	(0.010841)	(0.006057)	(0.012540)	(0.016827)	(0.009282)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE				Yes	Yes	Yes
Observations	1,736	1,736	1,736	1,736	1,736	1,736
R-squared	0.740	0.747	0.788	0.749	0.755	0.800

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Given that the proxy for the presence of *Weak Links* is derived from a kernel density estimation which relies on labour productivities and their corresponding weights as explained in previous section, measurement error on the estimation of the proxy is likely to arise. To address a potential measurement bias, we implement a correction suggested by Fuller (1986) and already used by Gawande et al. (2012) among others. This correction identifies values of the proxy for *Weak Links* that are estimated with low accuracy and in order to reduce their influence in the regression, the correction brings those values closer to the average value for the proxy in the sample.

We consider an additive measurement error for $Weak = P_i = \widehat{P}_i + e_i$ where $\widehat{P}_i$ is the true value of the probability and e_i is the error in its estimation. The variance of the error in each estimation (σ_i^2) is known since we estimated P_i using a kernel density of 1'000 points and its expression is given by :

$$(10)\quad \sigma_i^2 = var[P_i] = var[\textstyle\sum_k \mathbb{D}(k) * p(k)] = P_i(1 - P_i) \sum_k [p(k)]^2$$

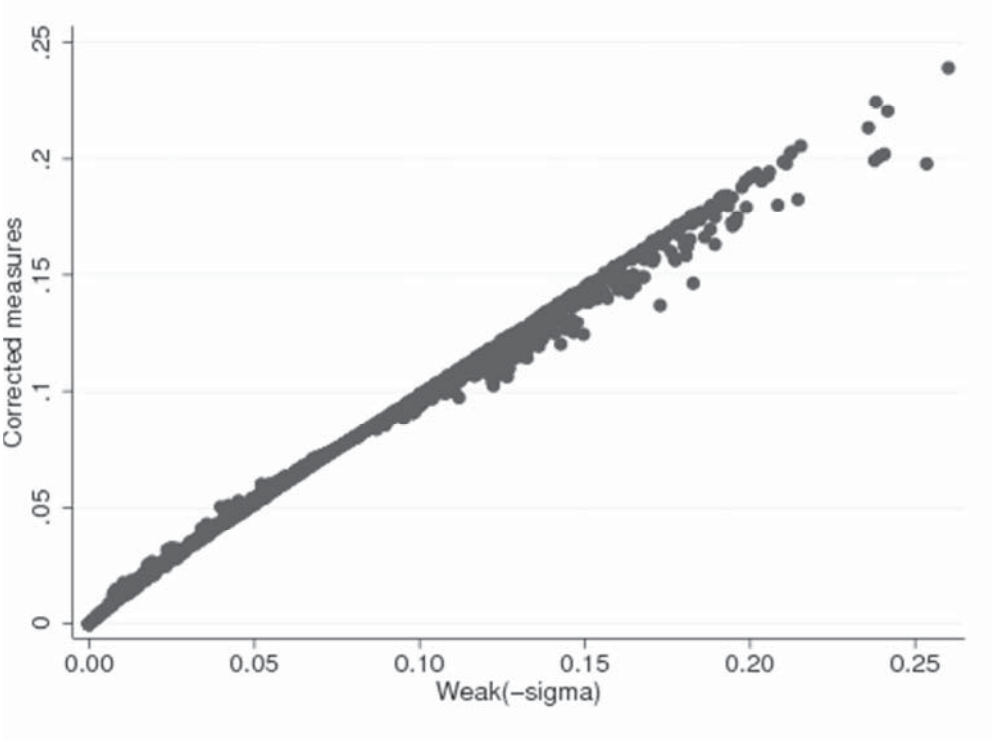
where $p(k)$ is the probability of each point k in the kernel density estimation and $\mathbb{D}(k)$ is a dichotomous variable coding the probability of each point k of being a *weak link*.

Using the mean probability of observing *Weak Links* in the sample ($\bar{P}$), the sample variance of P_i (σ_E^2) and the mean variance of P_i ($\bar{\sigma}_u^2$), we apply the following transformation to the estimated probabilities :

$$(11)\quad \tilde{P}_i = \frac{\sigma_i^2}{\sigma_E^2 - \bar{\sigma}_u^2} \bar{P} + \left(1 - \frac{\sigma_i^2}{\sigma_E^2 - \bar{\sigma}_u^2}\right)(P_i - \bar{P})$$

All values of the proxy which are estimated with low accuracy (high uncertainty) will be brought closer to the mean probability of observing *Weak Links* in the sample while values of the proxy which are accurately estimated will not be affected by the transformation. Changes of the proxy due to this correction might be observed in figure 6. Points out of the diagonal are those that were not precisely estimated and the correction narrows them from the mean value of our proxy.

Figure 6
Correction of the *Weak Links*' proxy for measurement error



Finally, table 11 reports the estimates obtained once this transformation has been applied to our proxy $Weak$. Results are in line with those previously presented in table 5 and so, the measurement error correction has not changed estimates significantly.

The proxy used here is meant to capture the underlying productivity distribution that is faced by each country in terms of intermediate inputs. Therefore, it is worth evaluating whether the double weights considered in this exercise are determinant to understand the impact on economic concentration. Table 12 uses an alternative proxy for *Weak Links* which ignores the share of each sector in intermediates' sales and their level of tradeability. In fact, this alternative measure considers that all sectors have an equal importance as an input for other sectors in the economy and the interactions of the proxy with the GDP per capita as well as the proxy itself are no longer statistically significant as in previous versions of these regressions. We conclude that weights used in the kernel density estimation of productivity residuals are relevant and they play an important role in the explanation of the pattern of development followed by countries. These results are in line with recent findings in Acemoglu et al. (2012) which show that the structure and interactions between sectors of the economy affect the performance observed at the country level[18].

[18] A similar conclusion has been raised in Ugarte (2013).

Table 11
Applying an error correction in the estimation of the proxy for *Weak Links*

	(1) Gini	(2) Theil	(3) Herf	(4) Gini	(5) Theil	(6) Herf
GDP_{pc}	-0.015696***	-0.017369**	-0.000321	-0.015406**	-0.015739*	-0.006220
	(0.005142)	(0.006896)	(0.003824)	(0.005979)	(0.008024)	(0.004403)
GDP_{pc}^2	0.000820***	0.000973**	0.000509**	0.000809**	0.000906**	0.000757***
	(0.000315)	(0.000422)	(0.000234)	(0.000337)	(0.000452)	(0.000248)
$GDP_{pc} \times Weak_{error}$	-0.110682***	-0.161661***	-0.078405***	-0.095991***	-0.143756***	-0.062568***
	(0.032335)	(0.043363)	(0.024045)	(0.032563)	(0.043704)	(0.023982)
$GDP_{pc}^2 \times Weak_{error}$	0.006064**	0.009061**	0.003489*	0.005151*	0.007934**	0.002572
	(0.002751)	(0.003689)	(0.002046)	(0.002769)	(0.003717)	(0.002040)
$Weak_{error}$	0.187676***	0.266326***	0.199460***	0.140645**	0.207806***	0.151238***
	(0.056840)	(0.076226)	(0.042268)	(0.057679)	(0.077414)	(0.042480)
Constant	0.602783***	0.486838***	0.126480***	0.630532***	0.521815***	0.155583***
	(0.008478)	(0.011370)	(0.006305)	(0.012998)	(0.017446)	(0.009573)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE				Yes	Yes	Yes
Observations	1,736	1,736	1,736	1,736	1,736	1,736
R-squared	0.739	0.746	0.790	0.748	0.754	0.801

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 12
Calculating *Weak Links*' proxy without specific weights ω for sectors

	(1) Gini	(2) Theil	(3) Herf	(4) Gini	(5) Theil	(6) Herf
GDP_{pc}	-0.020387***	-0.023990***	-0.002807	-0.020554***	-0.023033***	-0.008667**
	(0.004798)	(0.006371)	(0.003286)	(0.005003)	(0.006811)	(0.003702)
GDP_{pc}^2	0.001117***	0.001396***	0.000667***	0.001138***	0.001373***	0.000912***
	(0.000242)	(0.000333)	(0.000236)	(0.000240)	(0.000331)	(0.000227)
$GDP_{pc} \times Weak_{noweight}$	-0.043023*	-0.065432**	-0.035040*	-0.028957	-0.04786	-0.024757
	(0.022022)	(0.029276)	(0.020767)	(0.022253)	(0.029495)	(0.019821)
$GDP_{pc}^2 \times Weak_{noweight}$	0.001795	0.002911	0.000394	0.000887	0.001760	-0.000139
	(0.001986)	(0.002646)	(0.002122)	(0.002004)	(0.002641)	(0.001931)
$Weak_{noweight}$	0.038984	0.061607	0.186108***	-0.028007	-0.022997	0.134481***
	(0.05364)	(0.071850)	(0.043940)	(0.056178)	(0.075119)	(0.045605)
Constant	0.614415***	0.502866***	0.128468***	0.644936***	0.541461***	0.156554***
	(0.008032)	(0.010720)	(0.005373)	(0.013125)	(0.017920)	(0.008684)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE				Yes	Yes	Yes
Observations	1,736	1,736	1,736	1,736	1,736	1,736
R-squared	0.738	0.744	0.791	0.748	0.753	0.802

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

4. CONCLUSIONS

This paper aims at measuring the impact of low productivity in intermediates' sectors on the u-shaped pattern of development described in Imbs and Wacziarg (2003). To quantify these effects, we use data on value-added and employment for manufacturing sectors in almost 100 developing countries for the period 1963-2001 available from UNIDO's INDSTAT 2. We combine this information with information coming from input-output tables in order to take into account the importance of each sector as an input for each economy and also its degree of substitutability by imported goods. The measure proposed gives a propensity to observe relatively low productivities in intermediate goods based on the distribution of productivities observed in each country and each year.

Our results show that *Weak Links* have a non-monotonic relation with economic concentration as *Weak Links* not only shift the u-shaped pattern of development toward more concentrated production bundles but they also affect the shape of the pattern. The different versions of the proxy proposed here have a significant and positive impact on indices of economic concentration. The magnitude of the effect increases as the proxy becomes more sensitive to extremely low productivities which unveils the severity of the costs related to these extreme values in terms of development[19]. Regarding the slope of the u-shaped relationship, it becomes steeper for low and high levels of development for countries with higher propensity to observe *Weak Links* and this points out that the benefits of diversification into new areas are lower for poor countries with high probability of observing *Weak Links*.

The previous conclusions are consistent to a number of robustness checks which include the definition of the proxy variable, the enlargement of the sample to developed countries and the treatment of potential measurement bias in the estimation of the proxy. We also provide evidence showing that the structure and sector linkages of each economy play a relevant role as the forementioned effects are only significant when inputs' need and tradeability indices are considered in the calculation of the proxy.

Finally, the evidence provided in this paper is highly relevant in the formulation of industrial and economic policies in developing countries. The benefits of production innovation are well known and the discovery and launch of new products has become a goal in the search of prosperity in most of countries. However, our study suggests that the correlation between diversification and income level is lower in the presence of *Weak Links* and that the benefits expected of diversification can be mitigated if countries do not address in a coherent and comprehensive way the production bottlenecks that lower their competitiveness.

[19] Jones (2011) shows that in case of low substituability, resources need to be deviated from other sectors to the low productive sector which increases the capital per worker in the *Weak Link* sector generating more concentration. In case of severe deviations of productivity, the displacement is larger than proportional which generates larger effect of this kind of deviations on economic concentration.

APPENDIX

Table A1. Sample coverage

Albania (3), Algeria (28), Argentina (14), Bahamas (4), Bangladesh (28), Belgium (17), Belize (2), Benin (7), Bhutan (1), Bolivia, Plurinational State of (31), Botswana (12), Brazil (5), Bulgaria (11), Burkina Faso (10), Burundi (17), Cameroon (25), Central African Republic (16), Chile (38), China (22), Colombia (38), Congo, Republic of the (14), Costa Rica (21), Côte d'Ivoire (21), Croatia (3), Czech Republic (2), Dominican Republic (23), Ecuador (37), Egypt (35), El Salvador (29), Eritrea (10), Estonia (2), Ethiopia (21), Fiji (25), Gabon (8), Gambia (8), Ghana (28), Guatemala (19), Guyana (1), Honduras (26), Hong Kong, China (13), Hungary (8), India (39), Indonesia (32), Iran, Islamic Rep. (36), Jamaica (28), Jordan (27), Kenya (39), Latvia (9), Lesotho (4), Luxembourg (1), Macao, China (19), Madagascar (22), Malawi (32), Malaysia (33), Malta (8), Mauritius (19), Mexico (31), Mongolia (6), Morocco (24), Namibia (1), Nepal (9), Nicaragua (21), Nigeria (28), Oman (9), Pakistan (30), Panama (37), Papua New Guinea (27), Paraguay (6), Peru (14), Philippines (34), Poland (11), Puerto Rico (14), Romania (12), Russian Federation (9), Saudi Arabia (1), Senegal (24), Sierra Leone (1), Slovak Republic (5), Slovenia (12), South Africa (30), Sri Lanka (28), Sudan (1), Swaziland (16), Syrian Arab Republic (35), The Former Yugoslav Republic of Macedonia (7), United Republic of Tanzania (9), Thailand (18), Togo (10), Tonga (1), Tunisia (28), Turkey (33), Uganda (1), Uruguay (31), Venezuela, Bolivarian Republic of (34), Viet Nam (1), Yemen, Rep. (4), Zambia (18), Zimbabwe (34).

Note: In parenthesis, the number of observations per country.

REFERENCES

Acemoglu D and Zilibotti F (1997). Was Prometheus Unbound by Chance ? Risk, Diversification, and Growth. Journal of Political Economy 105(4), pp. 709-51.

Acemoglu D, Carvalho V M, Ozdaglar A and Tahbaz-Salehi A (2012). The Network Origins of Aggregate Fluctuations. Econometrica 80(5), pp. 1977-2016, 09

Cadot O, Carrere C and Strauss-Khan V(2011). Export Diversification: what's behind the hump ? The Review of Economics and Statistics 93(2), pp. 590-605.

Corden M and Neary P(1982). Booming Sector and De-industrialisation in a Small Open Economy. The Economic Journal 92 (December), pp. 825-48.

Faini R (2004). Trade Liberalization in a Globalizing World. CEPR Discussion Paper #4665.

Fuller WA (1986). Measurement Error Models. John Wiley, New York.

Gawande K, Krishna P and Olarreaga M(2012). Lobbying Competition Over Trade Policy. International Economic Review, 53(1), pp. 115-132.

Hirschman A (1958). The strategy of economic development. Yale University Press, New Haven.

Imbs J and Wacziarg R(2003). Stages of diversification. American Economic Review 93(1), pp. 63-86.

Jones C I (2011). Intermediate Goods and Weak Links in the Theory of Economic Development. American Economic Journal: Macroeconomics, 3(2), pp. 1-28.

Koren M and Tenreyro S(2007). Volatility and development. Quarterly Journal of Economics 122(1), pp. 243-87.

Kremer M (1993). The o-ring theory of economic development. Quarterly Journal of Economics 108(3), pp. 551-75.

Lind J Tand Mehlum H(2010). With or Without U ? The Appropriate Test for a U-Shaped Relationship. Oxford Bulletin of Economics and Statistics 72(1), pp. 109-18.

Olarreaga Mand Ugarte C(2012). Stages of development in Middle East and North Africa, Chp. 4 in Diop, Ndiame, Daniela Marotta, and Jaime de Melo eds., Natural Resource Abundance, Growth and Diversification in MENA, World Bank.

Saint-Paul G (1992). Technological Choice, Financial Markets and Economic Development. European Economic Review 36(4), pp. 763-81.

Ugarte C (2013). Inclusive Growth and the Impact of Intermediate Goods' Productivity on Economic Development, PhD thesis, University of Geneva, Switzerland.

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