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## How global is FDI? Evidence from the analysis of Theil indices

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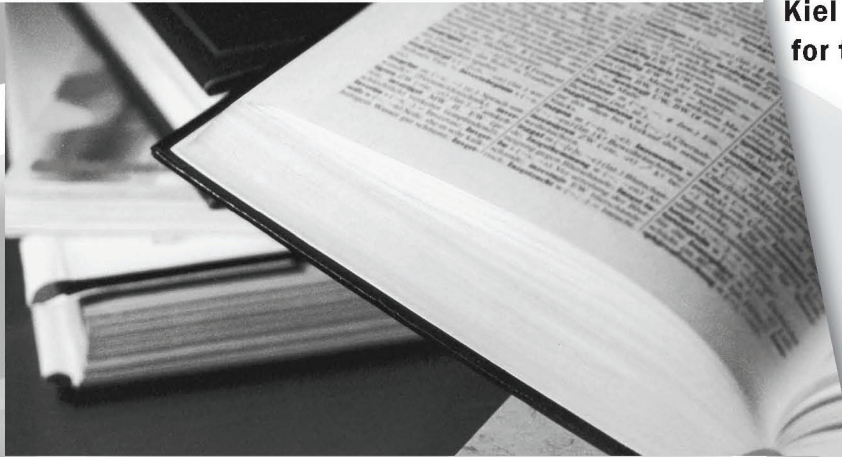
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## **Working Papers**

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### **How Global is FDI? Evidence from the Analysis of Theil Indices**

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## How Global is FDI? Evidence from the Analysis of Theil Indices\*

Frank Bickenbach, Wan-Hsin Liu and Peter Nunnenkamp

### Abstract:

It is open to question whether the intensified worldwide competition for FDI has reduced its traditionally strong concentration in a few large and relatively advanced host countries. We calculate and decompose Theil indices to track changes in absolute and relative concentration of FDI during the period 1970-2013. We find that both absolute and relative concentration decreased when excluding offshore financial centers from the overall sample. In addition to the narrowing gap between OECD and non-OECD countries, the concentration across non-OECD countries declined – for major subgroups and for both the absolute and relative measures. Finally, recent developments indicate that low-income countries are no longer at the losing end of the competition for FDI.

Keywords: Foreign direct investment, concentration, Theil decomposition.

JEL classification: F21

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## 1. Introduction

Not only the usual suspects such as the OECD (2002), but even prominent globalization critics argue that the case for attracting FDI is compelling: “Such investment brings with it not only resources, but technology, access to markets, and (hopefully) valuable training, an improvement in human capital” (Stiglitz 2000: 1076). Hence, it is hardly surprising that UNCTAD has observed since the early 1990s that the vast majority of policy measures relating to the entry and establishment of foreign investors aim at liberalizing and promoting FDI inflows, rather than restricting and regulating them.<sup>1</sup> The UN Summit on Financing for Development in Monterrey in 2002 concluded that creating the necessary conditions to facilitate FDI inflows is a central challenge for developing countries, particularly the poorest among them (United Nations 2003).

It is open to question, however, whether the intensified worldwide competition for FDI has reduced its traditionally strong concentration in highly developed host countries and a small number of large and relatively advanced emerging economies. On the one hand, Kekic (2009) posits a “distinct shift in the pattern of FDI”, implying that “practice may be catching up to theory” according to which FDI should flow from capital-abundant rich countries to capital-scarce poor countries. According to UNCTAD, 2010 was the first year in which developed countries received less than half of global FDI inflows; “developing economies maintain their lead in 2013” (UNCTAD 2014: xiii). On the other hand, skeptical observers point to a persistently strong concentration of FDI stocks (e.g., Nunnenkamp and Thiele 2013). On both sides of the debate, assessments are typically based on just a few simple indicators such as the share of selected country groups in total FDI, while systematic analyses of changes in the concentration of FDI continue to be lacking.

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<sup>1</sup> For details, see UNCTAD’s Investment Policy Monitor, January 2015: <http://investmentpolicyhub.unctad.org/Upload/Documents/IPM%20No%2013.pdf> (accessed: November 2015). See also Nunnenkamp and Thiele (2013: Figure 6).

We attempt to fill this gap by constructing decomposed Theil indices and tracking the changes in these indices during the period 1970-2013. The paper is organized as follows. In Section 2, we introduce our methodical approach and our data. We present our empirical results in Section 3. Section 4 concludes.

## 2. Method and data

### *Theil index: definition and decomposition*

We measure the concentration of FDI inflows across host countries – or, equivalently, the inequality of host countries in terms of FDI inflows – by means of the Theil index.<sup>2</sup> In a generalized form, the Theil index is defined as:

$$T^I = \sum_{i=1}^I w_i \left( \frac{x_i}{w_i} \right) \ln \left( \frac{x_i}{w_i} \right) = \sum_{i=1}^I x_i \ln \left( \frac{x_i}{w_i} \right), \quad (1)$$

where  $I$  is the number of observations, in our case the number of potential host countries of FDI, and  $\mathbf{I}$  is the set of all potential host countries  $i = 1, \dots, I$ ;  $x_i = X_i / (\sum_{i=1}^I X_i)$  is the share of country  $i$  ( $i \in \mathbf{I}$ ) in FDI inflows to all countries (with  $X_i$  the inflow of FDI to country  $i$ ); and  $w_i$  denotes the relative weight of country  $i$  (with  $\sum_{i=1}^I w_i = 1$ ).

The Theil index is equal to zero (no concentration) if each country's share in total FDI inflows  $x_i$  is equal to its weight  $w_i$ ; it takes its maximal value  $T_{\max}^I = \ln(1/w_a)$ , with  $w_a = \min_i w_i$ , if all FDI inflows are concentrated in the country (or one of the countries) with the smallest weight. The relative weights affect the value of the index, i.e., the level of concentration, in two distinguishable ways: on the one hand they define a benchmark for assessing each country's share in global FDI inflows  $x_i$ , and on the other hand they define the

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<sup>2</sup> This section draws on Bickenbach et al. (2015) and Bickenbach and Bode (2008), who provide a detailed discussion of the properties of the Theil index and its decomposition.

relative importance (weight) attributed to individual countries in summing up country-specific observations into a single index.<sup>3</sup>

The Theil index figures most prominently among the so-called general entropy (GE) class of inequality measures. All GE measures satisfy a number of normative criteria, among which the additive decomposability of the measure is particularly important for our empirical analysis. Additive decomposability implies that, for any mutually exclusive (disjoint) and exhaustive set of subgroups of host countries, the total inequality across countries can be meaningfully decomposed into the inequality *within* these subgroups (within-group component) and the inequality *between* these subgroups (between-group component).<sup>4</sup> More specifically, the within-group component corresponds to a weighted sum of the levels of inequality between the countries *within* each group;<sup>5</sup> and the between-group component corresponds to the level of inequality between the different group averages. The decomposition property of the Theil index thus allows us to trace changes over time in the overall concentration of FDI inflows across countries to changes (differences) in the corresponding concentration within and between different subgroups of countries.

More specifically, with **A**, **B**, and **C** being three disjoint and exhaustive subsets of the set of all potential host countries **I**, the decomposition property of the Theil index (2) implies

$$T^I = TW^{ABC} + TB^{ABC} , \quad (2)$$

where  $TW^{ABC}$  is the within-group component, given by:

$$TW^{ABC} = \sum_{S=A,B,C} \left( \left( \frac{\sum_{i \in S} X_i}{\sum_{i \in I} X_i} \right) \sum_{i \in S} \frac{X_i}{\sum_{i \in S} X_i} \ln \left( \frac{X_i}{\sum_{i \in S} X_i} / \frac{w_i}{\sum_{i \in S} w_i} \right) \right) = \omega_A T^A + \omega_B T^B + \omega_C T^C \quad (3)$$

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<sup>3</sup> As discussed in more detail below, we will use two different definitions of weights throughout our analysis.

<sup>4</sup> Other frequently used inequality measures, such as the Gini index or the coefficient of variation (CV) do not have this property.

<sup>5</sup> In the case of the Theil index, the sum of these weights is always equal to one so that the within-group component is actually a weighted average of the group-specific inequality measures.

with  $\omega_S = (\sum_{i \in S} X_i / \sum_{i \in I} X_i)$  the share of subset  $S$  in FDI inflows of  $I$  and  $T^S$  the Theil index of concentration of subset  $S$  ( $S = A, B, C$ ); and where  $TB^{ABC}$  is the between-group component given by:

$$TB^{ABC} = \sum_{S=A,B,C} \frac{\sum_{i \in S} X_i}{\sum_{i \in I} X_i} \ln \left( \frac{1}{\sum_{i \in S} w_i} \frac{\sum_{i \in S} X_i}{\sum_{i \in I} X_i} \right). \quad (4)$$

As  $\omega_A + \omega_B + \omega_C = 1$ , the within-group component,  $TW^{ABC}$ , is a weighted average of the Theil indices of the different subgroups with weights equal to the respective subgroup's share in total FDI inflows (in the following,  $\omega_A T^A$  will be referred to as group  $A$ 's *contribution* to the within-group component). The between-group component,  $TB^{ABC}$ , is a Theil index itself, which results from assigning each country of a specific subgroup of countries the average FDI inflows of the countries of that subgroup. It thus measures the inequality between the subgroups in terms of their countries' average FDI inflows.

Importantly, throughout the following analysis, we calculate two distinct variants of the Theil index corresponding to two different choices of relative weights in the definition of the generalised Theil index of equation (1) above. The first variant, the *absolute Theil index*, treats all countries symmetrically, irrespective of their size. It is given by the special case where the weights in equation (1) are the same for all countries ( $w_i = 1/I$  for all  $i$ ). In this case, the country-specific attractiveness for FDI is given by absolute amounts of FDI inflows and the aggregation of country-specific observations into the absolute Theil index gives equal weights to all countries.<sup>6</sup> The second variant, the (population-weighted) *relative Theil index*, is obtained from equation (1) by setting each country's weight equal to its share in total population,  $w_i = POP_i / \sum_{i=1}^I POP_i$ , where  $POP_i$  is the population of country  $i$ . In contrast to the

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<sup>6</sup> The absolute Theil index is thus given by  $T^I = \sum_{i=1}^I x_i \ln(x_i)$ . It is equal to zero (no concentration or perfect equality) if all countries receive the same amount of FDI inflows. It takes its maximal value  $T_{\max}^I = \ln(I)$  if all FDI goes to just one country.

absolute Theil index, the relative Theil index accounts for the countries' population in two respects: (i) by measuring the country-specific attractiveness for FDI in terms of per-capita inflows of FDI, and (ii) by using the countries' population as weights when aggregating country-specific observations into the relative Theil index.<sup>7</sup> Note that the absolute Theil index is conceptually closer than the relative Theil index to the frequently mentioned high shares of a limited set of host countries in worldwide FDI flows, alluded to in the Introduction. However, the relative Theil index appears to be more appropriate to reveal the attractiveness for FDI of various small countries, which are minor hosts of absolute FDI inflows almost by definition.<sup>8</sup> At the same time, the aggregation of country-specific observations with population as weights appears to be better suited to assess the concentration of FDI from a global perspective.

#### *Data source and some aggregate statistics*

We draw on UNCTAD's FDI database for FDI inflows.<sup>9</sup> This source allows us to base the calculation of Theil indices on long time series of FDI inflows during the period 1970-2013. To smooth short-term fluctuations we aggregate annual flows over four-year sub-periods. Hence, our analysis is based on 11 sub-periods from 1970-1973 to 2010-2013.

Our sample covers essentially all host countries of FDI (including those with marginal or at times zero inflows).<sup>10</sup> The sample of 196 hosts of FDI<sup>11</sup> includes 23 OECD countries (as

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<sup>7</sup> The (population-weighted) relative Theil index is zero (no concentration or perfect equality) if each country's share in total FDI inflows is equal to its share in total population. It takes its maximal value  $T_{\max}^I = \ln(\sum_i POP_i / POP_a)$  if all FDI goes to the country (denoted by  $a$ ) with the smallest population.

<sup>8</sup> Conversely, FDI per capita tends to be relatively low for (very) large countries where international transactions generally play a less important role compared with small countries.

<sup>9</sup> The FDI data are available at: <http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx> (accessed: April 2015). Population data used to calculate relative weights are mainly also from UNCTAD. They have been augmented by data from the World Bank's World Development Indicators available at <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed: April 2015) and from the IMF's International Financial Statistics Database (February 2015 Edition).

<sup>10</sup> Note that FDI inflows can be negative, for example, if profit remittances and repayments of loans received from the parent company exceed new equity inflows. Negative values observed after taking four-year aggregates have been set to zero for the calculation of Theil indices. Alternative treatments of negative values, such as the consolidation with inflows from the nearest four-year interval with sufficiently positive inflows, have little



of 1993) and 136 non-OECD countries;<sup>12</sup> 37 offshore financial centers (OFCs) are excluded from non-OECD countries and treated as a distinct subgroup.<sup>13</sup> The broad country coverage mitigates sample selection bias and renders it possible to decompose the Theil indices in several dimensions.

Figure 1 displays long-term trends in FDI inflows. Total inflows soared about 100-fold from about 64.2 billion US\$ in 1970-1973 to almost 6.53 trillion US\$ in 2006-2009. However, the boom of worldwide FDI was associated with considerable volatility, even though we smooth annual fluctuations. In particular, the rising trend was sharply interrupted at the turn of the century when the previous wave of mergers and acquisitions (M&As) collapsed. Another decline in overall FDI inflows occurred after the financial meltdown in 2008. FDI inflows to the OECD countries dropped sharply in both incidents, whereas FDI inflows to OFCs and to non-OECD countries (excluding OFCs) continued to rise.

From Figure 1, we also see that the OECD countries' share in total FDI inflows strongly decreased over time, while that of the other two groups strongly increased over time.<sup>14</sup> While this seems to suggest some convergence in the relative importance of different countries or country groups, a thorough analysis of this issue should go far beyond such aggregate analysis. Not only should it take into account differences in the number of countries and in the population of the different country groups, but it should also take into account changes in the concentration of FDI inflows *within* the different country groups. The following section will do so by looking at the development of absolute and relative Theil

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effects on the results presented below. FDI inflows smaller than 0.0001 million dollars were treated as zero inflows.

<sup>11</sup> During the observation period several countries have split up or unified as in the case of Germany. To get a balanced country panel, the successor states of the Union of Socialist Soviet Republics and of the Socialist Federal Republic of Yugoslavia as well as of Czechoslovakia were treated as if they existed throughout the whole observation period. Eritrea and Ethiopia are treated as one entity (observation) throughout the observation period. The same is true for Belgium and Luxembourg (for which separate FDI data would be available only from 2002 onwards).

<sup>12</sup> Throughout the subsequent analysis, we define OECD countries according to OECD membership by the end of 1993.

<sup>13</sup> The list of OFCs is mainly taken from the International Monetary Fund (for details, see Zoromé 2007). However, we consider Luxembourg and Switzerland as OECD countries.

<sup>14</sup> For details on the development of FDI inflows for the different subgroups see Table A1 in the Appendix.

indices of concentration and their decompositions along different country groups and subgroups.

### 3. Results on FDI concentration

*Overall concentration: measurement matters*

For a start, we assess the concentration of FDI for our overall sample of 196 host countries. For each 4-year interval we differentiate between two subsets of countries:  $\mathbf{Z}=\{i \mid X_i=0\}$ , i.e., the subset of countries that attracted zero FDI inflows over the given time period; and  $\mathbf{P}=\{i \mid X_i > 0\}$ , i.e., the subset of countries with strictly positive (nonzero) FDI inflows over that period. In this specific case the decomposition of the Theil index of overall concentration (equations (2)-(4)) simplifies to:<sup>15</sup>

$$T^I = TW^{ZP} + TB^{ZP}, \quad (5)$$

where the within-group component is now simply the concentration within the subgroup  $\mathbf{P}$  of countries with strictly positive inflows

$$TW^{ZP} = \sum_{i \in \mathbf{P}} \frac{X_i}{\sum_{i \in \mathbf{P}} X_i} \ln \left( \frac{X_i}{\sum_{i \in \mathbf{P}} X_i} / \frac{w_i}{\sum_{i \in \mathbf{P}} w_i} \right) = T^P \quad (6)$$

and the between-group component is simply the logarithm of the inverse of the aggregate weight (in the special case of the absolute Theil index, the share) of countries in the sample that do receive strictly positive FDI inflows

$$TB^{ZP} = \ln \left( \frac{1}{\sum_{i \in \mathbf{P}} w_i} \right). \quad (7)$$

In this case, the within-group component of the overall Theil index represents the “intensive margin” of concentration across country group  $\mathbf{I}$  and the between-group component represents

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<sup>15</sup> In deriving equations (6) and (7) we make use of the fact that for subset  $\mathbf{P}$  the weight  $\omega_P$  from equation (3) is equal to 1. As  $\ln(x)$  is not defined for  $x = 0$  we substitute  $x \ln(x)$  by  $\lim_{x \rightarrow 0} x \ln(x) = 0$ . For a similar decomposition in the context of trade diversification see Cadot et al. (2013).

the “extensive margin” of concentration.<sup>16</sup> It reveals the importance of the changing number (or weight) of zero FDI observations (i.e., countries in subset  $Z$  without FDI inflows in the specific time period) for the development of overall concentration (note that  $\sum_{i \in P} w_i = 1 - \sum_{i \in Z} w_i$ ).

As discussed before, we consider two alternative measures of concentration. The absolute Theil index which treats all countries symmetrically ( $w_i = 1/I$  for all  $i$ ), ignoring their different population size, is shown in the left panel of Figure 2. The relative Theil index which considers differences in population size is shown in the right panel of Figure 2.

As can be seen, the development of FDI concentration clearly depends on the choice between absolute and relative Theil indices. The absolute Theil index increases during the 1970s and 1980s before trending downwards in the more recent past. Comparing the last sub-period with the first sub-period, the absolute Theil index points to lower overall concentration of FDI inflows (1.5 versus 2.0). In contrast, the relative Theil index stayed almost constant (at around 1.6) during the first half of the observation period and fluctuated considerably thereafter, before returning almost to its starting level in the last sub-period.

While differences between the absolute and relative Theil indices are mainly due to the within-group component (intensive margin), we observe similar trends for the between-group component (extensive margin) in both panels of Figure 2. The extensive margin fell and was close to zero since the early 1990s implying a very low share (absolute concentration) and population-weight (relative concentration) of countries with zero FDI inflows. The strong decline of zero observations and their negligible role for overall concentration in the more recent past can be attributed to the opening-up to FDI of the transition countries in Eastern Europe and Central Asia (see also below).<sup>17</sup> Consequently, the value of the intensive margin of concentration closely resembled the value of overall concentration since the early 1990s.

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<sup>16</sup> A declining number (or weight) of countries with zero FDI inflows is thus referred to as a lower *extensive margin of concentration*. This should not be confused with a lower *extensive margin of FDI*, which generally refers to a rising number of countries with zero FDI inflows in the literature.

<sup>17</sup> The pronounced decline of the extensive margin in 1978-1981 for the relative measure in the right panel of Figure 2 was associated with China’s opening-up to FDI. Note that the Chinese case illustrates one of the main

*OFCs: minor impact on overall concentration*

In the next step of our analysis, we assess the role of OFCs for the development of overall concentration portrayed above. A priori it is hard to tell whether OFCs should be expected to have an important impact on overall concentration. As for their effect on the absolute Theil index, OFCs, on the one hand, account for almost 20 percent of countries in our sample (37 of the 196) giving them a relatively high weight. On the other hand, FDI inflows *per country* were not much different for the OFCs than for the group of all countries (Table A1) suggesting that their effect on the absolute Theil index for overall concentration may actually be small. For the relative Theil index, by contrast, the aggregate weight of the OFCs is very low (in the last sub-period all OFCs together accounted for only about 0.5 percent of the aggregate population of all countries in the sample), whereas their *per-capita* inflows of FDI were exceptionally high (Table A1). Moreover, increased per-capita inflows resulted in a widening gap compared to other host countries, notably in the last sub-period when FDI flows to OFCs strongly increased while overall FDI flows strongly decreased (Table A1).

Indeed, Figure 3 shows that OFCs have just a marginal effect on the level and development of overall concentration as measured by the absolute Theil index. The curves for the overall sample of 196 countries, including the 37 OFCs, and for the reduced sample after excluding the OFCs closely resemble each other in the left panel of Figure 3. This also holds for the comparison of the relative Theil indices for the full and the reduced country samples from the beginning of our observation period until the early 2000s. However, the two curves in the right panel deviate considerably during the two last sub-periods (2006-2013). Specifically, the relative Theil index appears to be trending downwards at least since its

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differences between the absolute and the relative measures of concentration. For the absolute measure, China counts as just one out of 196 countries. For the relative measure, China represents a heavyweight with almost 20% of total population. In the right panel of Figure 2 China's opening-up to FDI thus led to a strong decrease in the extensive margin (20% of world population now receive FDI), but also to a notable increase in the intensive margin (20% of world population received still quite low per-capita inflows).

temporary peak around the turn of the century (and possibly even since the early 1990s) when excluding the OFCs.<sup>18</sup> Importantly, this implies that the recent development of relative concentration becomes much more similar to the recent development of absolute concentration once the sample is reduced by excluding OFCs. After excluding OFCs, both the absolute and the relative measure of concentration clearly decreased at least since the beginning of the century and were substantially lower at the end of our period of observation than at its beginning.

#### *OECD vs. non-OECD countries: convergence from the top*

The subsequent steps of our analysis are based on the reduced sample after excluding OFCs (the corresponding set of countries is denoted by **IVF**).<sup>19</sup> In this sub-section, we decompose the (absolute and relative) Theil indices for the 159 remaining sample countries according to OECD membership as of 1993.<sup>20</sup> The distinction between traditional OECD countries and the typically less advanced other host countries is clearly relevant to assess whether FDI has increasingly become global. It is well known that traditional OECD countries absorbed large shares of worldwide FDI in the past. It is also widely reported, as mentioned in the Introduction, that FDI flows have shifted toward non-OECD hosts recently (see also Figure 1).<sup>21</sup> The following analysis will show that this shift can indeed explain a substantial part of

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<sup>18</sup> The difference between the relative Theil indices in panel b of Figure 3 can be attributed to two OFC-related developments in the last sub-periods: First, when decomposing the overall index between OFCs and all other countries in our sample, the between-group component increased considerably (not shown). This is due to the above noted widening gap in terms of per-capita FDI inflows in favor of OFCs. Second, concentration strongly increased within the subgroup of OFCs, which together with the OFC's increasing share of total FDI inflows, implies that the OFCs' contribution to the within component of overall concentration increased as well. These two factors are no longer pushing overall relative concentration upwards once OFCs are excluded.

<sup>19</sup> We prefer excluding OFCs from our further analysis since their – limited – effects on overall concentration do not offer relevant insights on whether FDI has become more global in the sense of increasingly involving host countries across the developing world. Mostly, OFCs serve only as stop-over destinations rather than final destinations of FDI and it is generally unknown where FDI flows channeled through OFCs are ultimately used for investment.

<sup>20</sup> The large and heterogeneous group of non-OECD countries will be further decomposed in the next sub-sections.

<sup>21</sup> At the beginning of our observation period, the 23 OECD members accounted for more than 75 percent of FDI inflows to all 159 remaining sample countries. In the last sub-period 2010-2013, the 136 non-OECD countries have increased their share to almost 50% (Table A1).

the decline in overall concentration documented in the preceding sub-section. It will also show, however, that there were other important factors at work as well.

As indicated above, total inequality across countries can be meaningfully decomposed into the inequality *within* subgroups (here: OECD and non-OECD countries, indexed **O** and **N**, respectively) and the inequality *between* these subgroups. Specifically, applying equations (2)-(4), the Theil index for the sample without OFC countries,  $T^{\mathbf{IF}}$ , can be additively decomposed into a within-group component,  $TW^{\mathbf{ON}}$ , and a between-group component,  $TB^{\mathbf{ON}}$  to give:

$$T^{\mathbf{IF}} = TW^{\mathbf{ON}} + TB^{\mathbf{ON}} = \omega_{\mathbf{O}}T^{\mathbf{O}} + \omega_{\mathbf{N}}T^{\mathbf{N}} + TB^{\mathbf{ON}}, \quad (8)$$

where the full set of all countries, **I**, and the number of countries in that set,  $I=\#\mathbf{I}=196$ , have to be replaced by the reduced set of countries **IF** and the corresponding number of countries  $\#\mathbf{IF}=159$ , in equations (1)-(4) as well as in the definition of weights. Note that after these renormalizations, we again have  $\omega_{\mathbf{O}} + \omega_{\mathbf{N}} = 1$ , so that the within-group component  $TW^{\mathbf{ON}}$  is the weighted average of the Theil inequality indices,  $T^{\mathbf{O}}$  and  $T^{\mathbf{N}}$ , for the two subgroups **O** and **N**.

Figure 4 reveals how the different components contributed to the development of overall concentration across the remaining 159 sample countries of **IF**. Comparing the development of overall concentration,  $T^{\mathbf{IF}}$ , with that of its between- and within-group components,  $TB^{\mathbf{ON}}$  and  $TW^{\mathbf{ON}}$ , we see that at least from the late 1980s onwards, the development of the overall concentration has been driven mainly by its between-group component. This holds for both the absolute (panel a) and the relative (panel b) Theil index: the timing of peaks (and lows) of the overall index and its between-group component coincides and both curves appear to be trending downwards.

The strong peaks in the between-group component,  $TB^{\mathbf{ON}}$ , observed for the 1986-1989 and 1998-2001 sub-periods correspond to particularly strong increases and high shares of FDI

flows to the OECD countries, implying large differences between OECD and non-OECD countries in both per-country inflows (absolute measure) and per-capita inflows (relative measure). Similarly, the drops in the between-group component after the 1998-2001 and 2006-2009 sub-periods can be attributed to declining amounts and shares of FDI flows to the OECD countries in the recessions following the dot-com meltdown and terror attacks of 2001 and the financial crisis of 2008. While these peaks and lows were all largely due to strong changes in the level of FDI inflows to the OECD countries, the strong decline of the between-group component in the early and mid-1990s was largely due to a particularly strong increase (by more than 600 percent) in FDI inflows to the non-OECD countries.

Turning to the within-group component we observe that for the absolute Theil index, the within-group component was the main source of the increase of FDI concentration during the 1970s and early 1980s; but contributed to the decline of overall absolute concentration thereafter. The increase in within-group concentration,  $TW^{ON}$ , over the first four sub-periods was fueled by a temporary increase in the absolute concentration of FDI inflows within both country groups,  $T^O$  and  $T^N$ , which both peaked in the first half of the 1980s (panel c of Figure 4). Overall, the within-group component of the absolute Theil index was slightly higher in the last sub-period than in the first one. This is even though the absolute concentration of FDI inflows decreased slightly within both subgroups.

For the relative Theil index, by contrast, the within-group component was lower at the end of the observation period than at its beginning. That decline was almost exclusively due to a strong decline during the second half of the 1980s, which, in turn, was exclusively due to a very strong decrease in the relative concentration of FDI inflows across the non-OECD countries,  $T^N$ , during that period (panel d of Figure 4). More generally, relative concentration across the non-OECD countries increased until the mid-1980s but very strongly decreased

thereafter, particularly between the mid-1980s and the mid-1990s.<sup>22</sup> By contrast, the relative concentration of FDI inflows across the OECD countries,  $T^O$ , changed comparatively little over time. It decreased from the beginning of the observation period until the mid-1980s and slightly increased thereafter – still staying below its starting level, however.

Taken together, Figure 4 points to a kind of ‘convergence from the top’. For both the absolute and the relative measure the between-group component tended to decrease over time, reflecting a narrowing gap between OECD-countries and non-OECD countries in FDI inflows per country (absolute measure) as well as per-capita (relative measure). At the same time, the concentration across OECD countries remained largely constant (or even decreased slightly) between the beginning and the end of the observation period, suggesting that the narrowing gap between OECD and non-OECD countries was not simply due to an increasing inequality within the group of OECD countries.

Despite this convergence, differences in FDI inflows between OECD countries and non-OECD countries, both per country and per capita, were still pretty large even at the end of our observation period.<sup>23</sup> And even though the OECD’s share,  $\omega_O$ , in total FDI inflows appeared to be trending downwards, it fluctuated heavily. Given the large volatility of  $\omega_O$  it cannot be taken for granted that the decline of that share, and the convergence from the top more generally, will prove to be a longer-term, or even permanent phenomenon. This is even more so as the strong decline of the OECD countries’ share in FDI inflows since the turn of the millennium (from almost 80% in 1998-2001 to slightly more than 50% in 2010-2013) seems to be due mostly to a specific weakness of the OECD countries in the recessions of the early 2000s and after the financial meltdown of 2008, rather than to a particularly strong

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<sup>22</sup> While the relative concentration of inflows across the non-OECD countries,  $T^N$ , continued to strongly decrease throughout most of the 1990s, the effect of that decrease on the within-group component of the overall relative Theil index,  $T^{MF}$ , was overcompensated after the end of the 1990s by the increasing share of inflows to non-OECD countries,  $\omega_N$ . As the concentration of FDI inflows across the non-OECD countries was higher than that across the OECD countries, any increase in  $\omega_N$ , *ceteris paribus*, increased the within-group component of overall concentration.

<sup>23</sup> Both per-country inflows and per-capita inflows to the OECD were still more than six times higher than those to the non-OECD in the last sub-period, 2010-2013 (Table A1).



growth of FDI inflows to the non-OECD countries. It may therefore prove premature to conclude that globalized FDI patterns necessarily allow non-OECD countries to close the traditional gap in attractiveness to FDI.

*Non-OECD subgroups: decreasing concentration at least since the 1980s*

When stressing the “central challenge” to mobilize FDI as a major source of financing sustained economic growth (United Nations 2003), the UN Summit on Financing for Development in Monterrey in 2002 was not only concerned about developing countries as a whole lagging behind OECD countries in terms of attractiveness for FDI. In addition, the Monterrey Consensus explicitly referred to specific subgroups such as low-income countries and economies in transition, for which it might be particularly difficult to lure FDI inflows. Indeed, the reduced concentration across the set of all OECD and non-OECD countries (upper panels of Figure 4) as well as across the non-OECD countries (lower panels of Figure 4) may obscure that specific subgroups of non-OECD countries did not benefit from booming FDI during our period of observation.

Hence, we proceed by assessing changes in concentration for the sub-sample of 136 non-OECD countries. This section distinguishes three subgroups of non-OECD countries: ten G20 members among the non-OECD countries,<sup>24</sup> 28 transition countries in Eastern Europe and Central Asia,<sup>25</sup> and all other non-OECD countries (which are further differentiated by income status in the next section). While non-OECD G20 members stand out with regard to their size and strategic importance (for foreign investors and governments), the transition countries entered the competition for FDI only after the regime change at the beginning of the 1990s. Assessing changes in concentration within and between these subgroups can thus be expected to offer more specific insights.

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<sup>24</sup> Argentina, Brazil, China, India, Indonesia, Mexico, Russia, Saudi Arabia, South Africa, and South Korea.

<sup>25</sup> Albania, Armenia, Azerbaijan, Belarus, Bosnia & Herzegovina, Bulgaria, Croatia, Czech Rep., Estonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Macedonia, Moldova, Mongolia, Montenegro, Poland, Romania, Serbia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

Denoting the subsets of the G20 members, the transition countries and the other non-OECD countries by **G**, **T** and **R**, respectively, we can once again apply equations (2)-(4) to decompose the (absolute and relative) Theil index of concentration of FDI inflows to the non-OECD countries,  $T^N$ , into the corresponding within-group and between-group components:

$$T^N = TW^{GTR} + TB^{GTR} = \omega_G T^G + \omega_T T^T + \omega_R T^R + TB^{GTR}, \quad (9)$$

where **I** and *I* have now to be replaced by **N** and  $N=136$  in equations (1)-(4). The results of this decomposition are displayed in Figure 5.

In the light of the UN's above noted concerns, one might suspect that overall concentration for the remaining non-OECD sample is driven mainly by the between-group components of the Theil indices. However, Figure 5 shows that this conjecture is only partially confirmed for the absolute Theil index (panel a), and is not confirmed at all for the relative Theil index (panel b).

The peak in overall absolute concentration in the first half of the 1980s as well as its increase in the most recent sub-period coincided with corresponding changes in the between-group component, i.e., (temporary) increases in the inequality of FDI inflows per country between the three country groups.<sup>26</sup> Throughout the period of observation, the between-group component of absolute concentration appears to be relatively high, reflecting the fact that (average) FDI inflows *per-country* are very much higher for the G20 countries than for two other country groups.<sup>27</sup> In marked contrast, the between-group component of the relative Theil index was close to zero throughout the observation period (panel b).

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<sup>26</sup> A more detailed look at the development of per-country FDI inflows for the different country groups (Table A1) reveals that the causes for the different peaks in the between-group component were quite different from each other. The strong peak in the mid-1980s was due to a strong increase in inflows to the G20 members that was accompanied by stagnating FDI inflows to the other country groups. By contrast, the increase of the between-group component in the 1990s was mainly caused by weak growth of FDI inflows to the other non-OECD countries; and its increase in the last period was mainly caused by a decrease of FDI inflows to the transition countries.

<sup>27</sup> This is particularly true since the mid-1990s when per-country inflows to the G20 have been between 18 and 23 times higher than those to other non-OECD countries, and between 8 and 15 times higher than those to the transition countries (Table A1).

The strikingly different role of the between-group components for the absolute and relative Theil indices is mainly because the G20 members represent just 10 countries in the large sample of 136 non-OECD countries, whereas they account for almost 60 percent of the population living in all non-OECD countries. As a consequence, FDI inflows per country are very much higher for the group of G20 members than those for the other two groups, while FDI inflows per capita are of a similar level as those of the other groups. Most surprisingly perhaps, the large and heterogeneous group of (98) other non-OECD countries, **R**, were almost as successful as the G20 members in terms of attracting per-capita FDI inflows. And per-capita inflows to the transition countries were even substantially higher than those to the G20 member countries, arguably rebutting the fears expressed by the Monterrey Consensus (see above) at least partially.<sup>28</sup>

Importantly, the decompositions of both the absolute and the relative Theil index reveal the major role of the within-group component for declining overall concentration of FDI flows to non-OECD countries. In panel a, it can be seen that the decreasing trend of the absolute measure of overall concentration of FDI inflows across the non-OECD countries ( $T^N$ ) during most of the 1990s and 2000s was mainly due to the continuous decrease of the within-group component during that time. The development of absolute concentration within the different country groups (panel c) shows that all three subgroups contributed to this decline. For all subgroups the absolute concentration of FDI inflows decreased since the early 1980s at the latest.

While it was only in the early-2000s that the level of overall absolute concentration fell below its level observed in the 1970s, the decline in relative concentration started earlier and was fairly steep from the early 1980s to the mid-1990s (upper panels of Figure 5). The size and the development over time of the relative concentration measure across all non-OECD countries was almost identical to that of its within-group component, which in turn

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<sup>28</sup> In the last sub-period 2010-2013, the transition countries received about 1000 US\$ per capita compared to about 400 US\$ per capita for the G20 member countries and 330 US\$ for other non-OECD countries.

was largely determined by the contribution of G20 members (panel b). Specifically, the strong peak of overall concentration in 1982-1985 corresponds to both a strong increase in the share of G20 members in total FDI inflows and a strong peak in the relative concentration of inflows across the G20 members. And the strong decrease in relative overall concentration since the mid-1980s largely reflects the strong decrease in relative concentration across G20 members.

The lower panels of Figure 5 reveal that the concentration across non-OECD countries declined, for all three subgroups and for both the absolute and relative measures, when comparing the beginning and the end of our period of observation.<sup>29</sup> Yet, there are notable differences across country groups. For the group of G20 members, concentration strongly depends on measurement: inequality across G20 members in terms of per-capita inflows (relative concentration) has been much larger (at the beginning of the observation period) and has declined much stronger than inequality in terms of per-country inflows (absolute concentration). For the transition countries, both absolute and relative concentration declined sharply, notably during the first years after the regime change in 1990.<sup>30</sup> For the other non-OECD countries, which will be analyzed in more detail in the subsequent section, the decline in concentration was less pronounced and of similar magnitude for the absolute and relative measures.

### *Low-income countries: finally converging?*

In this section, we focus on the widespread concern that mainly poor countries could be on the losing end of the worldwide competition for FDI inflows (e.g., United Nations 2003). We therefore exclude the G20 members and transition countries from our further analysis and

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<sup>29</sup> This neglects the zero concentration for transition countries in the first sub-period which is economically meaningless, however, since there were no FDI inflows to any country in this group at that time.

<sup>30</sup> Because of the low but increasing weight,  $\omega_T$ , of transition countries during most of the observation period, the strong decline in concentration across transition countries had little effect on their contribution to the within-group component, however.

restrict our sample to the group of the 98 other non-OECD countries,  $\mathbf{R}$ . Within that group we now distinguish low- and higher-income countries, and calculate the between- and within-group components of the (absolute and relative) Theil index in line with the general equations above. With  $\mathbf{L}$  representing the low-income group and  $\mathbf{H}$  representing the higher-income group<sup>31</sup> we thus get:

$$T^{\mathbf{R}} = TW^{\mathbf{LH}} + TB^{\mathbf{LH}} = \omega_{\mathbf{L}} T^{\mathbf{L}} + \omega_{\mathbf{H}} T^{\mathbf{H}} + TB^{\mathbf{LH}}, \quad (10)$$

where  $\mathbf{I}$  and  $I$  have now to be replaced by  $\mathbf{R}$  and  $R = \#\mathbf{R} = 98$ .

From Figure 6 it can be seen again that both the absolute and the relative concentration across the 98 other non-OECD countries decreased over time. For both measures the development of overall concentration was largely determined by the development of the within-group component,  $TW^{\mathbf{LH}}$ , which, in turn, closely resembles the development of concentration across the higher-income countries,  $T^{\mathbf{H}}$ .<sup>32</sup> However, in line with the main subject of this sub-section, the following analysis focuses on the development over time of the differences in FDI inflows between low- and higher-income countries summarized by the between-group component,  $TB^{\mathbf{LH}}$ , and of the concentration of FDI inflows across the low-income countries,  $T^{\mathbf{L}}$ .

The upper panels of Figure 6 indicate that the level of the between-group component is higher for the relative than for the absolute measure: the gap in FDI inflows between the higher-income countries and the low-income countries is larger for per-capita inflows than for per-country inflows, which simply reflects the fact that the population of low-income countries is larger on average than that of the higher-income countries. More importantly, the development over time of the absolute and the relative between-group components resemble

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<sup>31</sup> More precisely, group  $\mathbf{L}$  comprises 46 countries with low per-capita income according to the World Bank's income classification for the year 2005 (or the closest year for which data are available). Group  $\mathbf{H}$  comprises 52 countries which the World Bank classifies as lower-middle, upper-middle and high income countries. 1.4 billion people were living in  $\mathbf{L}$  countries at the end of our period of observation, while 840 million people were living in  $\mathbf{H}$  countries.

<sup>32</sup> The decline in overall absolute concentration in the 1970s was exclusively due to decreasing concentration across low-income countries, however.

each other quite closely. For both measures, we observe three distinct sub-periods: the between-group components and thus the gap between FDI inflows to the higher-income countries and those to the low-income countries (i) increased during the 1970s, (ii) changed only little during the 1980s and 1990s, and (iii) declined in the new millennium. Concerns that the low-income countries could be on the losing end of the increased competition for FDI inflows might be justified by the fact that the between-group component was still higher in the last sub-period (2010-2013) than in the first sub-period (1970-1973). When considering the more recent past, however, FDI inflows to the low-income countries did not only grow faster (both per-country and per-capita) than those to the higher-income countries (as reflected in the decline of the between-group components in Figure 6); they even grew much faster than the inflows to any other country group analyzed in this paper (see last row of Table A1).

It thus seems that the low-income countries may finally have started to catch up to the other countries in terms of FDI inflows. Moreover, the lower panels of Figure 6 suggest that this recent development involved more than just a few low-income countries. In the longer run, both absolute and relative concentration strongly decreased across the 46 low-income countries (in particular since the mid-1980s). Focusing on the recent past when FDI inflows to the low-income countries have grown faster than those to the other country groups, absolute concentration slightly decreased, whereas relative concentration slightly increased (in the last sub-period). In other words, the recent catch-up of the low-income countries has not been accompanied by an increase, at least not by a strong increase, in the inequality of FDI inflows across the low-income countries. It seems that the catch-up process has not been limited to a few low-income countries only.

This last point is corroborated when decomposing the (absolute and relative) concentration of FDI inflows across the 46 low-income countries,  $T^L$ , into its “intensive

margin” and its “extensive margin” of concentration.<sup>33</sup> For both the absolute and the relative measure, the extensive margin of concentration has been decreasing since the mid-1980s and has been very low in the recent past. This implies that the number of countries that received zero FDI inflows (in a given four-year period) as well as their share in total FDI have been very small in recent years.<sup>34</sup>

Altogether the evidence in this sub-section suggests that concerns about the low-income countries being on the losing end of worldwide competition for FDI may have been justified for the 1970s and possibly for the 1980s and 1990s but probably no longer for the more recent past. Since the turn of the millennium, the growth in FDI inflows to the low-income countries has been much higher both per-country and per-capita than that to the overall sample or to any of the other country groups. In addition, there was no polarization within the group of low-income countries during that period. It remains to be seen, however, whether this positive development will continue into the future.

#### **4. Conclusion**

This paper addressed the question of whether the intensified worldwide competition for FDI has reduced its traditionally strong concentration in a few large and relatively advanced host countries. We calculated and decomposed Theil indices to track changes in concentration of FDI during the period 1970-2013. We calculated absolute Theil indices where all countries are treated symmetrically, irrespective of their size, as well as population-weighted relative Theil indices. Starting with a large overall sample of 196 host countries, we subsequently considered distinct sub-samples by (i) excluding offshore financial centers (OFCs), (ii)

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<sup>33</sup> This decomposition resembles the procedure described for the overall sample at the beginning of this section (equations (5) to (7)). For the sake of brevity, we provide only a summary of results, here.

<sup>34</sup> In the second last sub-period (2006-09) all countries received strictly positive FDI inflows, and in the last sub-period only two out of 46 low-income countries representing slightly more than 2% of the low-income country group’s total population received zero FDI inflows.

distinguishing OECD and non-OECD countries, (iii) differentiating between major subgroups of non-OECD countries, and (iv) focusing on low-income countries.

The extensive margin of concentration across the overall sample proved to be very low since the early 1990s, implying that very few countries did not receive any FDI inflows. Once OFCs are excluded from the sample, both the absolute and relative measures of concentration clearly decreased in the recent past and were substantially lower at the end of the observation period than at its beginning. A large part of the decline in overall concentration has been due to the narrowing gap between OECD and non-OECD countries (in terms of FDI inflows per-country and per-capita). It may prove premature, however, to conclude that non-OECD countries will be able to further close the traditional gap in attractiveness to FDI. In the past, the observed ‘convergence from the top’ was at least as much the result of temporary external shocks affecting primarily the OECD, such as the financial meltdown in 2008, as it was the result of strong and sustained growth of FDI to non-OECD countries.

Focusing on three subgroups of non-OECD countries, we find that the between-group component of the relative Theil index was close to zero throughout the period of observation. Strikingly, non-OECD G20 members proved to be less attractive in terms of per-capita inflows of FDI than the subgroup of transition countries, and hardly more attractive than the large and heterogeneous subgroup of other non-OECD countries. The absolute and relative measures of concentration both reveal the important role of the within-group component for the declining overall concentration of FDI in non-OECD countries. The concentration across non-OECD countries declined for all three subgroups when comparing the beginning and the end of the observation period.

Finally, recent developments indicate that low-income countries are no longer at the losing end of the competition for FDI inflows. Rather, this group may finally have started to catch up to more advanced host countries in terms of attractiveness. Importantly, the strong growth of FDI inflows to the low-income countries after the turn of the millennium has not



been accompanied by considerably higher inequality of FDI inflows across the low-income countries. Concerns that just a few of them have benefited from recent trends thus appear to be unjustified. If sustained, these trends might reduce fears, as expressed in the Monterrey Consensus of 2002, that globalized FDI hardly involves poor host countries.

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## Appendix

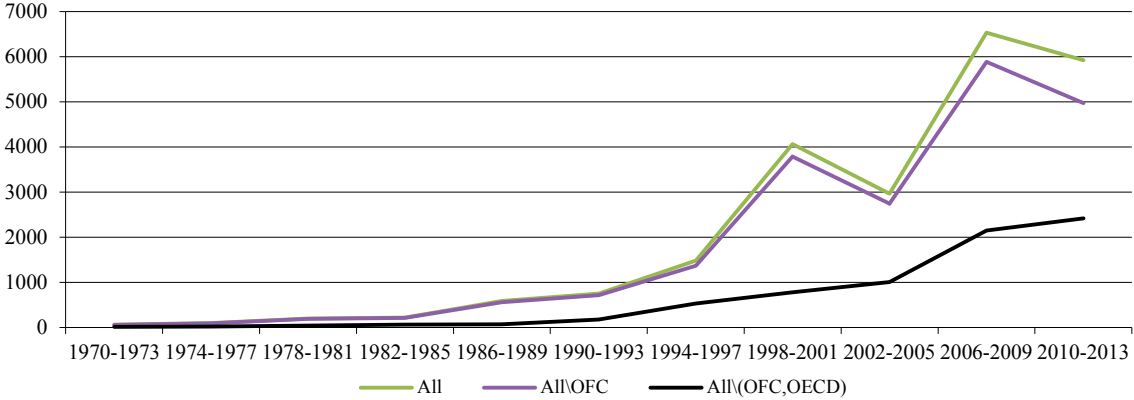
**Table A1: Total FDI inflows (in billion US\$) and FDI inflows per capita (in US\$) for different country groups**

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		(9)	
country group	All		OFC		OECD		Non-OECD		G20 members		Transition		Other		Low-income		Higher-income	
# countries	I		F		O		N		G		T		R		L		H	
	FDI		FDI		FDI		FDI		FDI		FDI		FDI		FDI		FDI	
	Total	p.c.	Total	p.c.	Total	p.c.	Total	p.c.	Total	p.c.	Total	p.c.	Total	p.c.	Total	p.c.	Total	p.c.
1: 1970-1973	64.20	16.92	2.73	161.48	46.82	62.29	14.65	4.84	6.89	3.60	0.00	0.00	7.76	8.72	2.54	4.82	5.22	14.39
2: 1974-1977	102.33	24.97	3.95	217.18	73.95	95.06	24.44	7.40	11.66	5.59	0.01	0.05	12.77	12.98	3.67	6.30	9.10	22.65
3: 1978-1981	204.31	46.44	10.16	517.83	150.81	188.27	43.35	12.11	22.01	9.81	0.12	0.49	21.22	19.45	3.43	5.32	17.78	39.93
4: 1982-1985	223.85	47.39	11.39	540.58	145.42	176.57	67.04	17.28	45.22	18.73	0.10	0.39	21.72	17.92	3.31	4.60	18.41	37.31
5: 1986-1989	591.29	116.41	28.87	1285.54	487.15	575.62	75.27	17.88	37.17	14.27	0.07	0.27	38.03	28.27	7.20	8.99	30.84	56.58
6: 1990-1993	754.30	138.70	38.62	1605.81	531.96	611.17	183.73	40.43	94.78	33.95	15.14	56.89	73.80	49.68	13.99	15.70	59.81	100.61
7: 1994-1997	1480.90	256.77	106.56	4099.82	842.37	940.52	531.97	109.78	316.88	107.39	56.99	214.18	158.10	97.06	28.66	29.00	129.44	202.05
8: 1998-2001	4063.12	668.67	272.43	9715.31	3006.74	3267.32	783.95	152.87	475.68	154.00	105.46	398.81	202.81	114.26	29.57	27.21	173.24	251.73
9: 2002-2005	2967.69	464.93	219.88	7286.25	1739.81	1837.88	1008.01	186.45	545.03	169.27	185.73	705.02	277.24	144.18	50.09	42.18	227.15	308.85
10: 2006-2009	6529.79	974.82	643.53	19942.03	3735.07	3835.84	2151.19	377.90	1146.42	342.37	382.51	1445.79	622.25	299.24	136.46	105.49	485.80	618.22
11: 2010-2013	5923.69	843.70	952.17	27651.17	2550.72	2554.51	2420.81	404.27	1417.41	407.56	266.76	994.74	736.63	328.53	185.02	131.80	551.61	657.95
Sum 1970-2013	229055	3599.7	2290.3	73023	13310.8	14145.15	7304.4	1331.2	4119.2	1266.5	1012.9	3816.6	2172.3	1120.3	463.9	381.4	1708.4	2310.3
	Growth in %																	
period 1 to 11:	9127	4887	34758	17023	5348	4001	16424	8251	20459	11208	n.a.	n.a.	9397	3666	7193	2634	10469	4473
period 6 to 11	685	508	2366	1622	379	318	1218	900	1395	1101	1661	1648	898	561	1223	740	822	554
period 8 to 11 :	45.8	26.2	249.5	184.6	-15.2	-21.8	208.8	164.5	198.0	164.6	152.9	149.4	263.2	187.5	525.7	384.4	218.4	161.4

Note: Total = total FDI inflows in billion US\$; p.c. = FDI inflows per capita in US\$.

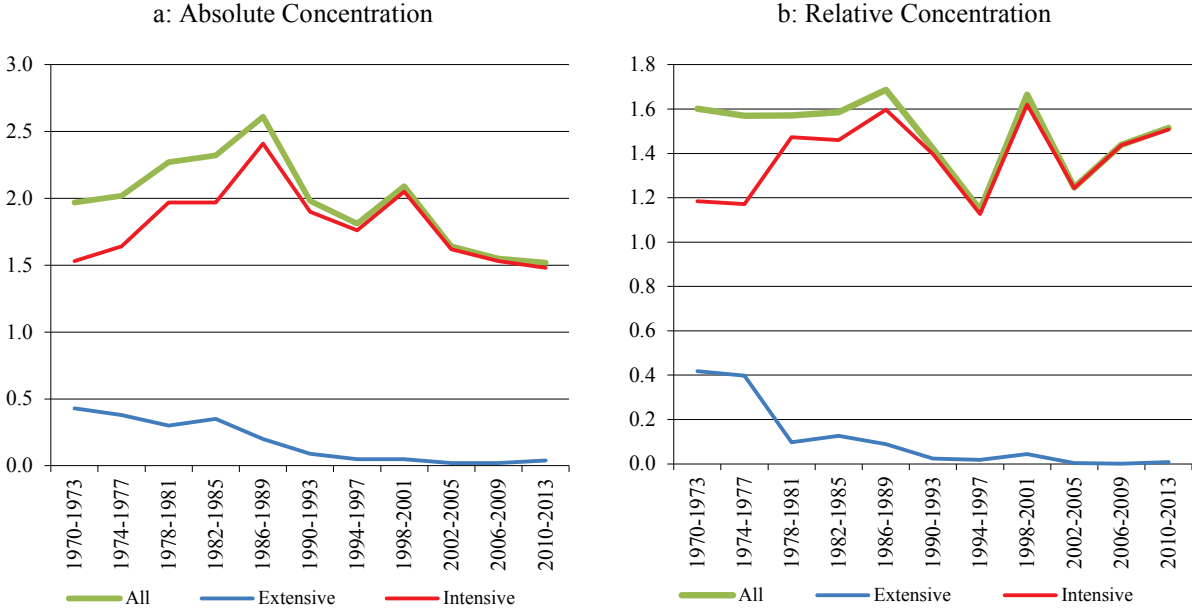
I = F U O N; N = G U T R; R = L U H

**Figure 1: Total FDI inflows by country groups OFC, OECD, and non-OECD (in billion US\$)**

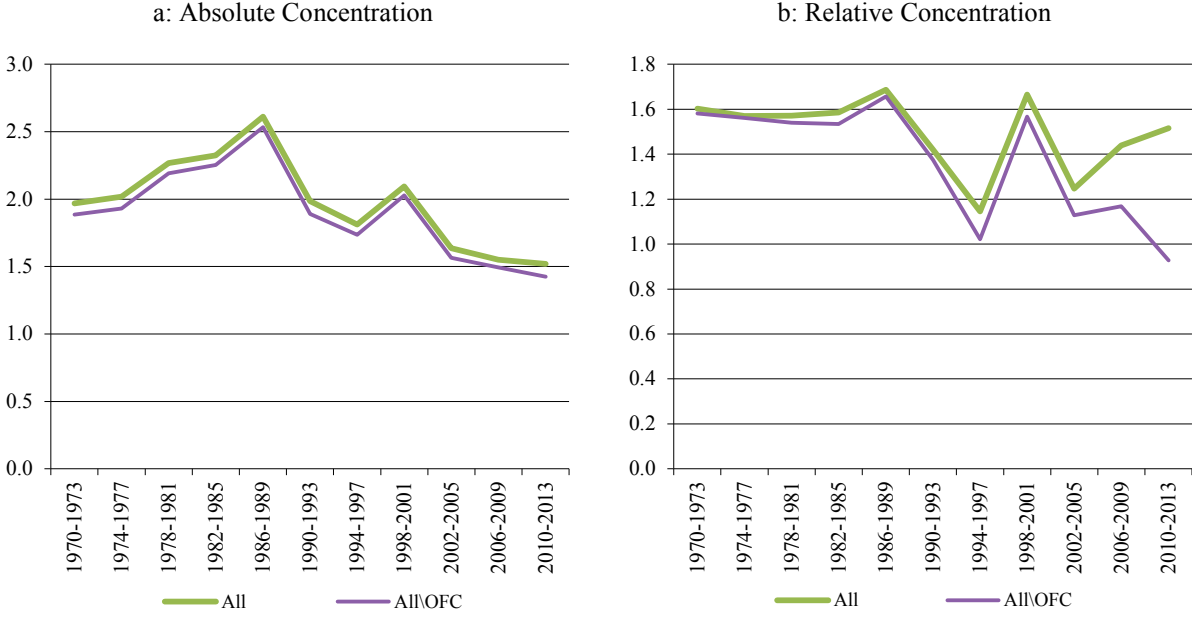


Note: FDI inflows to OFC = All – All\OFC; FDI inflows to OECD = All\OFC – All(OFC, OECD); FDI inflows to non-OECD = All(OFC, OECD)

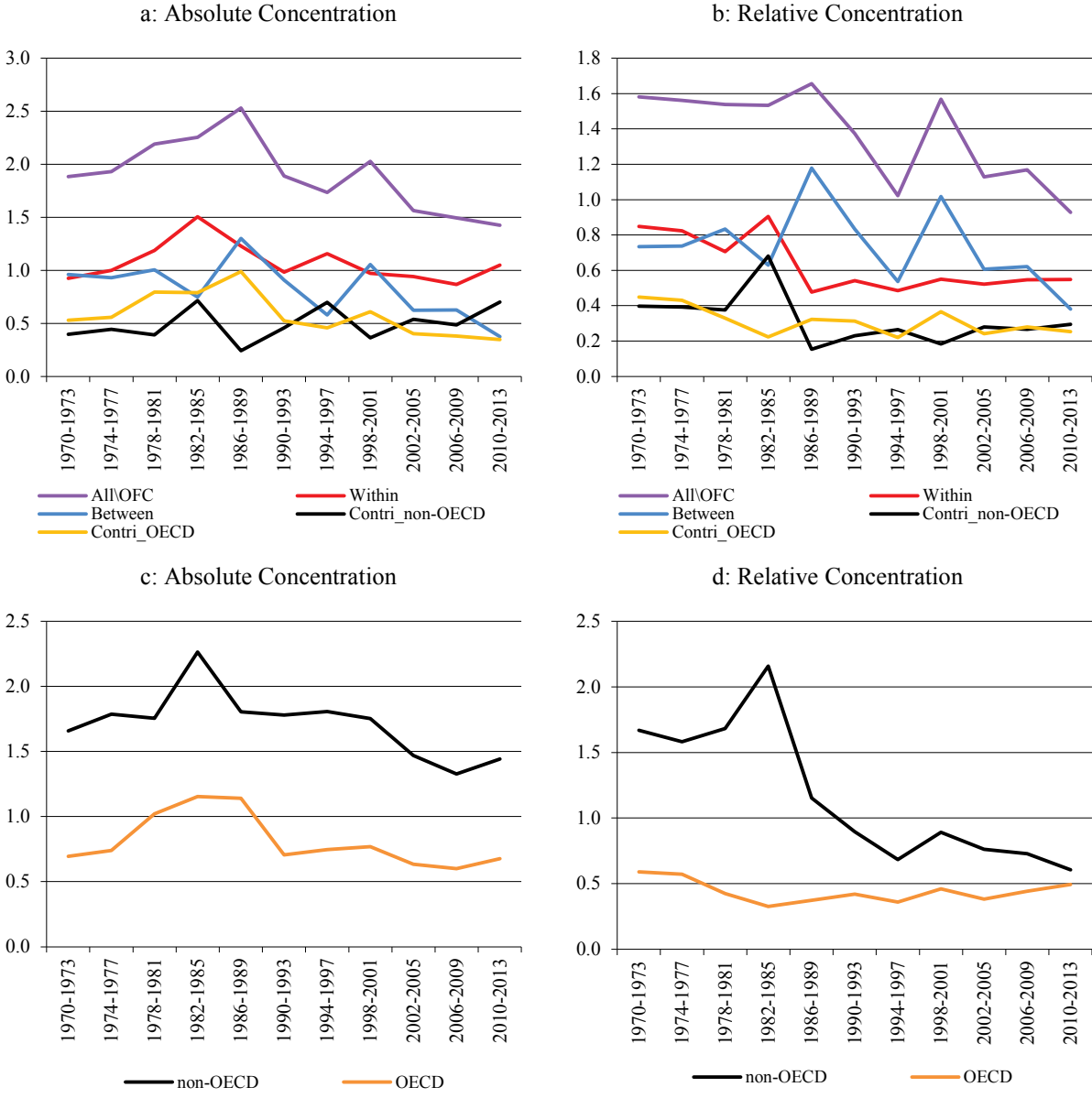
**Figure 2: Absolute and relative concentration of FDI inflows across all countries decomposed into intensive and extensive margin of concentration**



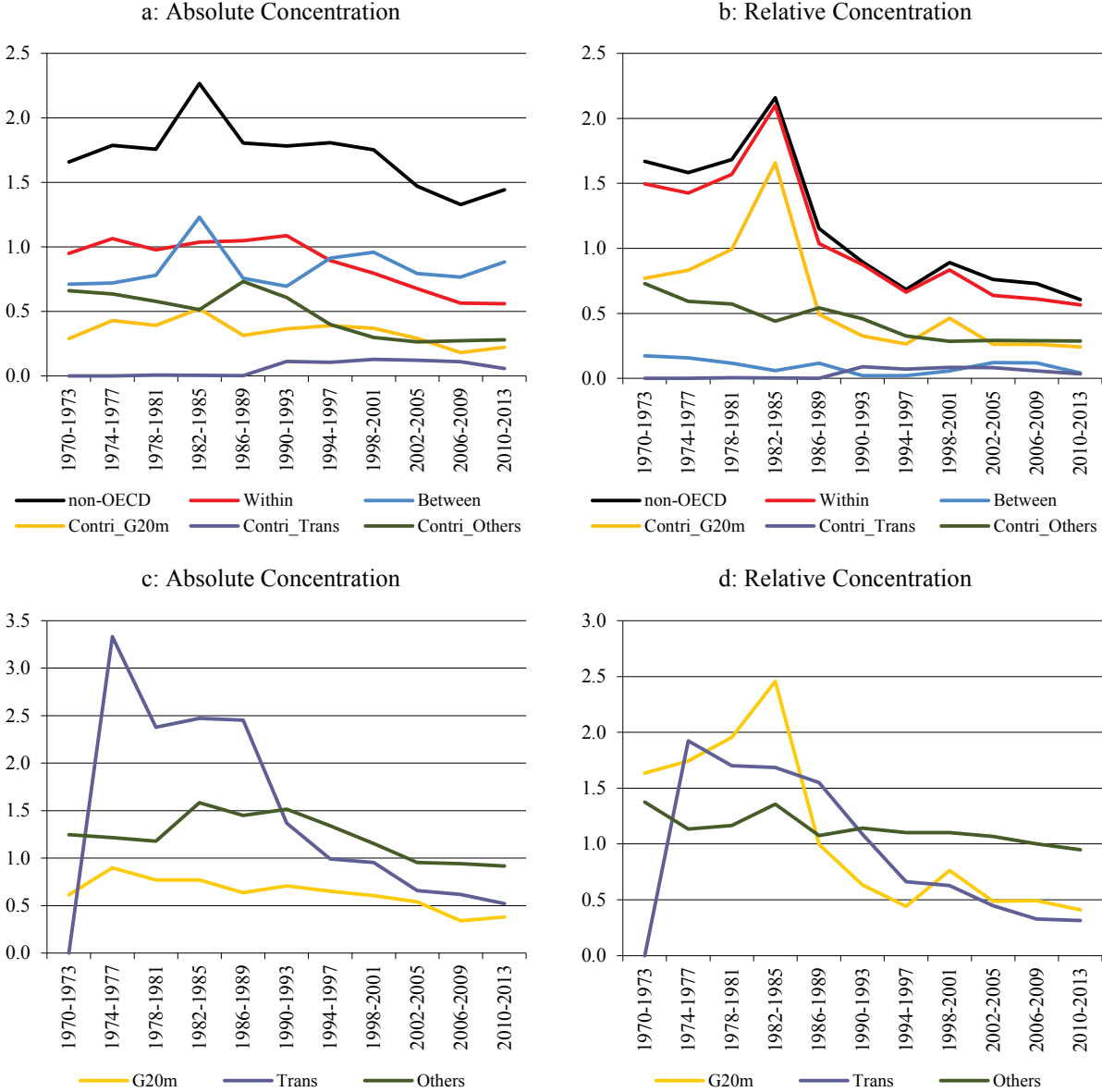
**Figure 3: Absolute and relative concentration of FDI inflows – All countries and all countries excluding OFCs**



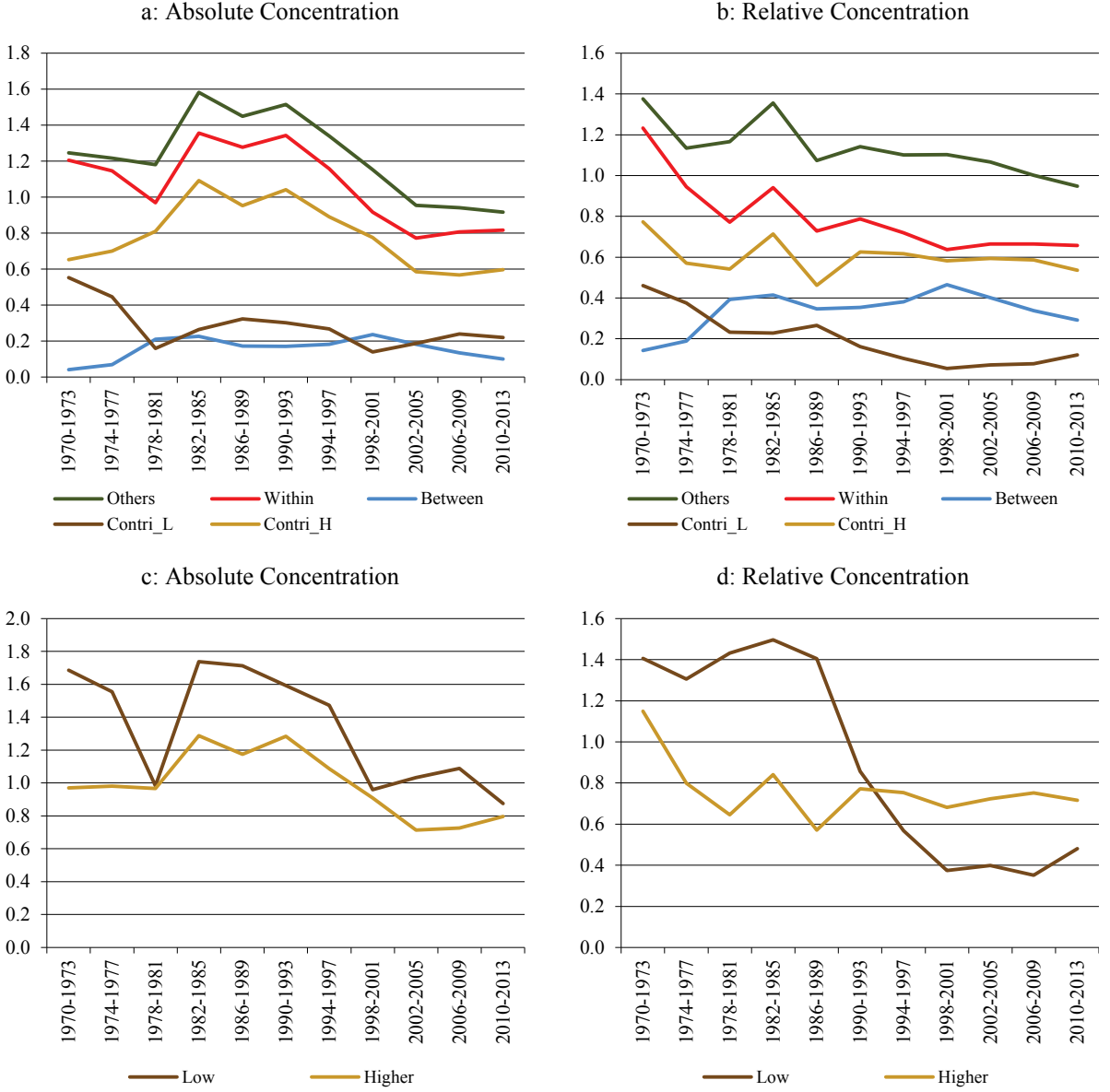
**Figure 4: Absolute (left panels) and relative (right panels) concentration of FDI inflows across countries (excluding OFCs) decomposed between OECD and non-OECD countries (upper panels) and concentration of FDI inflows within the two country groups (lower panels)**



**Figure 5: Absolute (left panels) and relative (right panels) concentration of FDI inflows to non-OECD countries decomposed between G20 member countries, Transition countries and Others (upper panels) and concentration within the three country groups (lower panels)**



**Figure 6: Absolute (left panels) and relative (right panels) concentration of FDI inflows to Other non-OECD countries decomposed between low-income countries and higher-income countries (upper panels) and concentration within the two country groups (lower panels)**





**Figure 7: Absolute and relative concentration of FDI inflows across low-income countries – intensive and extensive margin of concentration.**

