A reassessment of UNCTAD's transnationality indices in the digital economy*

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Abstract

This research note reassesses UNCTAD's transnationality indices in light of recent economic trends that are quickly changing the international investment landscape: the digital economy, the new industrial revolution and the resulting asset-light international business models. The recent international "Agreement on a Two-Pillar Solution to Address the Tax Challenges Arising from the Digitalisation of the Economy" through the Base Erosion Profit Shifting project emphasizes the importance of fully understanding and correctly interpreting the implications of digitalization for investment and development policy. The analysis shows that UNCTAD's internationalization indices are still able to capture relevant structural changes but could benefit from several fine-tuning options to allow a clearer interpretation and consequently a better elaboration of policy advice. Relevant policy areas include international taxation, as suggested by the analysis of the FDI lightness index, but also employment and more generally development strategies of host economies.

Keywords: digital economy; technology multinationals; Transnationality Index (TNI), FDI lightness index, Geographical Spread Index (GSI), Base Erosion and Profit Shifting (BEPS)

JEL classification codes: C43, F23, H25, L86

1. Introduction

Since the early 1990s UNCTAD has been analysing the activities of MNEs and their presence abroad using a series of indices. For non-financial companies, UNCTAD computes the Transnationality Index (TNI), a composite of three ratios: foreign assets to total assets, foreign sales to total sales and foreign employment to total employment. Its purpose is to identify and rank the behaviour of those MNEs that have the biggest presence and operations abroad and that, as a consequence, are indicative of trends in international production. They are ranked by the size of their foreign assets, which are taken as a proxy for their transnationalization, or the intensity of foreign activities in relation to domestic activities.

The evolution of this index over the years – together with the sub-indices that compose it – show the impact of major structural changes over time. The servicification of the economy, the adoption of new business models that externalize some of their operations, combined with digitalization and the rise of intangibles, have brought about greater representation of services, tech and pharmaceuticals in the ranking. At the same time, the average TNI of the top 100 – the relative shares of their foreign assets and employees and to a lesser extent also of foreign sales – has stagnated in the last decade, in line with a global loss of momentum for FDI (UNCTAD, 2020).

IIndustry 4.0 is particularly disruptive as it accelerates all these trends, radically transforming established business models and pushing towards a reconfiguration of international production networks. Digitalization allows MNEs to penetrate foreign markets without establishing a large physical presence there, changing the defining characteristic of a transnational/multinational enterprise. UNCTAD's *World Investment Report 2017* developed the FDI lightness index, which captures the light investment footprint of digital MNEs and the impact of digitalization on all industries (UNCTAD, 2017; Casella and Formenti, 2018).

These new asset-light business models have a number of implications for investment and international production networks as well as for development strategies, employment and fiscal outcomes in host economies. In particular, digital companies break the relation between revenues gained abroad and the physical presence in the host economy, facilitating their ability to minimize tax payments and depriving many host economies of important fiscal revenues. In addition, the reliance of these MNEs on intellectual property has made it easier to shift profits to low-tax jurisdictions, further reducing their effective tax rates (called Base Erosion and Profit Shifting – BEPS).

The recent international "Agreement on a Two-Pillar Solution to Address the Tax Challenges Arising from the Digitalisation of the Economy" further emphasizes the importance and relevance for policymakers of these new structural trends.

Pillar One aims to ensure a fairer distribution of profits and taxing rights among countries with respect to the largest MNEs, which are the winners of globalization. Pillar Two puts a floor on competition on corporate income tax through the introduction of a global minimum corporate tax at a rate of 15 per cent, which countries can use to protect their tax bases (OECD, 2021).

This research note reassesses UNCTAD's internationalization indices in this new investment landscape and suggests ways forward to maintain research and policy relevance. Further, it tests the relevance of the FDI lightness index as a tool to assess the impact of BEPS Pillar One for digital MNEs as well as for the broader economy. UNCTAD's FDI lightness index can be interpreted as a proxy for the broken nexus between physical presence and market penetration and could thus be helpful to guide policymakers in assessing the scope of BEPS Pillar One; in particular, it helps find those MNEs that because of the nature of their activities and market presence in host economies are included in the scope of the new taxing rights.

The note is structured as follows: the next section reviews UNCTAD's TNI and Geographical Spread Index (GSI); discusses the main trends, drawbacks and advantages; and suggests how to improve on the analysis. Section 3 applies the FDI lightness index to a set of the top 100 MNEs to assess the spread of digital technologies across sectors and the applicability of BEPS Pillar One beyond the digital and tech group of companies. Section 4 concludes.

2. Indicators of MNE internationalization

The digital economy – the application of internet-based digital technologies to the production and trade of goods and services – is becoming an increasingly pervasive part of the economy. Digitalization is not only important for the tech MNEs at the forefront of the New Industrial Revolution, but is affecting all sectors of the economy, redefining governance modalities in global production networks and disrupting traditional patterns of job creation and of asset structure.

Since 1990 UNCTAD has developed a number of transnationality indices, including the TNI, the Internationalization Index (II), the GSI and recently the FDI lightness index, which measures the intensity of foreign operations in relation to domestic or global activities (UNCTAD, 2001, 2007 and 2017). For non-financial companies the annual *World Investment Report* (WIR) publishes the TNI, an average of the following three ratios: foreign assets to total assets (FA/TA), foreign sales to total sales (FS/TS) and foreign employment to total employment (FE/TE). The index has the advantage of relying on mostly available information of comparable quality across countries and companies – especially for publicly listed ones – and of combining all operative areas of a company. Public companies are obliged to report

in the notes of their financial accounts the business and geographic segmentation of their operations and assets. The only variable that is less often reported – despite growing pressure to improve on environment, social and governance reporting (ESG, for short) – is foreign employment. A reason could be that MNEs wish to avoid scrutiny of the employment created at home versus that created overseas. Given the importance of this information to allowing an evaluation of MNEs' impact on host countries, concerted international action should push for improving the reporting of the workforce's geographical breakdown (UNCTAD, 2019a).

The TNI is computed for the top 100 MNEs ranked by foreign assets. The aggregated average TNI for the top 100 is then analysed. Over the years the TNI has captured some of the structural changes that have affected the global economy, the most relevant being the widespread application of non-equity modes (NEMs) (UNCTAD, 2011) and the digitalization of the economy. These two trends have in common the type of impact they have on international production: by making the direct physical presence of MNEs in host countries less relevant for market penetration both slow the growth of the TNI average, and in particular the pattern of the share of foreign assets and foreign employees. The outsourcing of functions and operations using NEMs are considered the primary factor behind the slowing share of foreign employees. Digitalization is helping and facilitating the use of outsourced contracts, accelerating this trend.[1]

The impact of these two major factors has become evident in two ways: (i) the evolution of the average TNI and its subindexes (figures 1 and 2) and (ii) the changing sectoral and geographical composition of the top 100. The two are clearly interrelated and affected by the selection method of the top 100 MNEs, which in turn affects the average indices.

The ranking composition

Tech and digital companies have gained growing relevance in the top 100 MNEs ranking by foreign assets since 2010. Their number increased from 4 to 15 in 2017 and then fell again to 13 and has remained constant since then. In 2020, during the pandemic, their share of foreign sales in the total ranking jumped 5 percentage points to 22 per cent; this was achieved without a corresponding increase in the share of foreign assets, highlighting their ability to reach foreign markets without the underpinning productive investment. At the same time, the composition of the ranking changed also with respect to the other industries, suggesting a broader impact of digitalization on internationalization patterns of top MNEs.

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[1] See, for example, the legal dispute about the status of drivers (independent contractors versus dependent workers) for ride-hailing companies; *The Financial Times*, "Gig workers should get pension rights now, says regulator", 19 May 2021.

In particular, the share of heavy industry and extractive companies fell by almost a third in the last decade (UNCTAD, 2021).

Figure 1 shows the pattern of average TNI for the top 100 MNEs over time. Most importantly it shows the different components: the share of foreign sales has been consistently higher than the share of foreign assets and employees.[2] After 2010 the TNI stagnated, with the share of foreign assets experiencing a last growth spurt in 2014 and 2015, pushed by a number of tax inversion deals (UNCTAD, 2016) and an exceptional number of megadeals. Following tax inversion deals a number of American MNEs[3] – especially in the pharmaceutical industry – changed their headquarters to Ireland, experiencing a jump in their internationalization rates.[4] In contrast, the share of foreign employees has been decreasing, especially after the 2008 financial crisis.

Figure 1. Top 100 MNEs average Transnationality Index (TNI) and relative components: shares of foreign assets, foreign sales and foreign employees
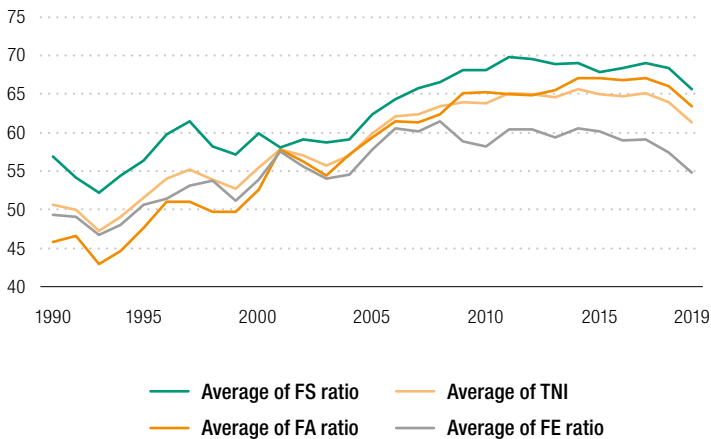
Source: UNCTAD.
Note: Non-weighted averages.

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[2] The average is non-weighted to avoid having large extractive companies drive the TNI, especially the share of foreign assets.

[3] In those years, several companies joined the top 100 ranking after tax inversion deals into Ireland; the biggest of these deals included Allergan and Medtronic from the health industry and Johnson Control, a producer of electric wares (all from the United States).

[4] Bloomberg News, "Tracking tax runaways", Bloomberg Special Reports: Corporate Tax Inversions, 1 March 2017, www.bloomberg.com/graphics/tax-inversion-tracker.

In the last 10 years the trend has changed significantly, flattening out, mostly because of compositional effects induced by the decreasing relevance of extractives and heavy industry MNEs, consolidation trends in key industries (media, telecommunication, pharmaceuticals) and, importantly, the greater internationalization of companies from emerging markets. Since 2015 new MNEs with a particularly low TNI have joined the ranking, including the electricity provider State Grid of China with a TNI of less than 5 per cent, the integrated oil producer Saudi Aramco (Saudi Arabia) with a TNI of 15 per cent and the media company Comcast (United States) with a TNI of 19 per cent, significantly pushing down the aggregate indices (UNCTAD, 2021).

To disentangle the impact of compositional effect from the economic and structural changes in the economy it is worth considering the trends net of the natural churn happening at the bottom of the ranking. Figure 2 shows the sub-indices for the period 2015–2019 for the top 100 MNEs that were in the ranking for at least three years, resulting in a total of 93 companies. It excludes 2020 because of the disruptive impact the COVID-19 crisis had on companies across sectors. Figure 2 shows much stabler indices, with an aggregate TNI growing slightly – in contrast to figure 1, and an increasing divergence between foreign sales and the other components of the TNI.

Figure 2. TNI subcomponents ratios: FA/TA, FS/TS and FE/TE, averages 2015–2019
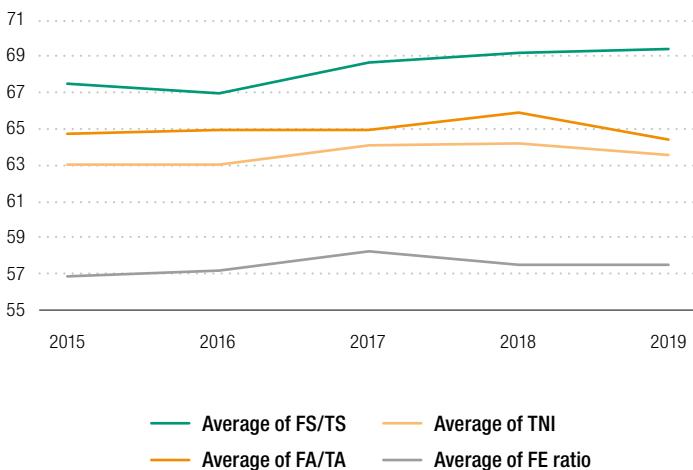
Source: UNCTAD.

Note: Non-weighted averages. The companies were selected on the basis of their presence in the top 100 ranking for three or more years within the period 2015–2019 and for which there were data for other years. The resulting number of companies is 93.

The importance of the compositional effects suggests that in a very dynamic economic environment these can hide the true trends, especially in a very small sample like the top 100, and that all efforts should be made to reduce sample attrition across the years. This can be particularly difficult in years when there are many cross-border megadeals like in 2016 and, surprisingly, also in 2020–21, which can easily determine up to 7–10 per cent of the sample. Moreover, experience shows that the megacorporations emerging from these deals could easily fall out of the ranking again after a few years as – typically under the pressure of activist investors – they tend to restructure and split again.[5]

A related point concerning the compositional effects in the top 100 is the importance of the selection method and the shortcomings of selecting on the basis of foreign assets, as it increases the churn in the ranking following large deals. At the same time, it gives too much weight to traditional industries and business models that rely on FDI to serve a market, underrepresenting many companies in the services sector with global brands, such as Facebook (United States) and Netflix (United States), as well as McDonald's (United States) in previous years.[6] This suggests that the size of foreign assets might not fully capture the wider transformation of the economy. In this context it is useful to recall that for almost all MNEs the geographical segmentation of assets refers to tangible long-term assets and usually is limited to property, plant and equipment. Therefore, for digital and tech companies and also pharmaceuticals – which derive much of their value from intangible assets – this measure of foreign assets might be not fully accurate.

A possible solution could be to select companies by foreign sales. The measure, which is readily available for most companies, would include companies that have an international presence while extending the number of digital and tech companies included in the analysis. In table 1 the two selection methods are compared for 2019.

In table 1 the two sets of columns give dimensional indices for the top 100 MNEs selected on the basis of foreign assets and foreign sales for 2019. The breakdown of the 100 MNEs by sector varies (columns 2 and 6). When selecting by foreign sales (compared with selection by foreign assets), the number of MNEs in the following industries increases: tech, trade and – to a lesser extent – extractives. The main industries that record a decline from the foreign sales selection are pharmaceuticals and utilities. With a selection based on foreign sales compared

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[5] See for example DowDuPont, Johnson Controls and Raytheon Technologies (all from United States) (UNCTAD, 2019b).

[6] Despite its nearly global presence, the restaurant chain McDonald's fell out of the top ranking back in 2007 following the extensive use of franchise contracting and the related steep reduction in assets. See also UNCTAD (2011).

Table 1. Transnationality indices, top 100 MNEs selected by foreign assets and by foreign sales, industry breakdown, 2019 (Percentage)

Industry	Selected by foreign assets					Selected by foreign sales				
	MNEs (number)	FA/TA average	FS/TS average	FE/TE average	TNI average	MNEs (number)	FA/TA average	FS/TS average	FE/TE average	TNI average
Extractives	17	63.8	59.9	45.6	56.4	19	49.8	61.6	38.7	49.6
Automotives	12	54.2	69.9	53.5	59.2	13	55.2	80.5	55.6	63.8
Pharmaceuticals	9	73.5	84.2	64.2	73.9	5	68.0	90.5	58.5	72.3
Heavy industry	11	71.4	70.7	59.7	67.3	12	58.3	73.8	55.9	62.8
Light industry	10	80.1	84.3	80.0	81.5	7	76.1	84.9	76.7	79.2
Tech	10	51.0	69.5	49.9	56.8	19	46.0	68.2	50.1	55.0
Tech – digital	3	40.8	29.5	36.6	35.7	4	41.4	61.6	46.9	53.3
Telecom	8	61.6	55.5	56.0	57.7	5	71.3	73.6	68.7	71.2
Trade	4	58.7	50.7	48.1	52.5	8	59.3	50.2	44.1	51.9
Utilities	11	61.9	59.7	48.3	56.6	4	59.4	64.2	50.4	58.0
Other services	3	70.6	46.7	48.0	55.1	2	59.5	84.2	62.5	70.6
Other	2	55.3	49.0	55.0	53.1	2	63.6	75.4	60.5	66.5
Total	**100**	**65.2**	**67.5**	**56.9**	**61.3**	**100**	**56.1**	**70.7**	**52.4**	**59.9**

Source: UNCTAD.

Note: FA/TA = foreign assets/total assets; FS/TS = foreign sales/total sales; FE/TE = foreign employment/total employment, TNI = Transnationality Index. The distinction between light and heavy industries follows traditional demarcations based on the fixed assets necessary for production. Light industries include food and beverages, textiles, instruments, tobacco and electric equipment companies; heavy industries include metal products, aircraft and other transportation vehicles, chemicals and rubber, and building materials companies. Other services includes health care, transport, logistics. Other includes agriculture and construction. In the selection by foreign assets, digital includes Alphabet, Amazon.com and Tencent; in the selection by foreign sales, digital includes Alphabet, Amazon.com, Accenture and Facebook.

with a selection based on foreign assets, the foreign sales index for the total 100 MNEs increases from 67.5 to 70.7 (columns 4 and 8) while the foreign assets index declines from 65.2 to 56.1 (columns 3 and 7).

In the digital industry there are two new companies: Facebook (now Meta – United States) and Accenture (Ireland) but one loss – Tencent (China), which has a foreign sales ratio of about 4 per cent. Most of the new tech MNEs are producers of semiconductors and other components from emerging economies. They include TSCM from Taiwan Province of China and SK Hynix and Samsung from the Republic of Korea, and producers of other electronic components such as displays and other appliances (LG Dysplay and LG Electronics, Republic of Korea)

that serve foreign markets largely through exports. The global value chains associated with tech components secure large amounts of trade.[7] This points to the drawback of using this selection method – the fact that foreign sales often, especially for companies from emerging economies, include home-market exports – and raises the question of how to define transnationality: is physical presence in another economy key to the definition of MNEs? The discussion of this theoretical question is beyond the scope of this note.[8]

One pragmatic solution could be to look at "global players", combining the two selection methods; thus to continue collecting data for MNEs selected by foreign assets for the purpose of maintaining the historical series and to add a selection of the top 100 by foreign sales – producing two rankings. The number of additional companies would be relatively contained, as top corporations tend to engage in both trade and FDI. In 2019 it concerned about 20 companies, most of which were already in UNCTAD's database.

The home-country bias and the GSI

There is another factor related to compositional effects that influences the trends of the aggregated TNI and its sub-indices over time: the home-country bias. Companies from small home economies are more likely to have high internationalization rates, as they are forced to penetrate foreign markets to reach significant scale. In contrast, MNEs from the United States rarely have TNIs above 65 per cent. The composition of the ranking among countries clearly affects the trend over time, with a heavier representation of larger economies leading to a slowing aggregate TNI.

This is due to the design of the TNI, which "does not take into account the size of the home country, nor does it distinguish between companies whose activities are concentrated in a few foreign countries and companies whose activities are spread across numerous host countries"[9] (UNCTAD, 2007, p. 13). As a consequence, a high TNI value can reflect a home country's locational advantages (a small market, for example) rather than indicate strong international competitiveness on the part of the home country firms.

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[7] TSMC, the world's largest contract chipmaker, has almost all of its capacity in its home economy, Taiwan Province of China. That scale has made the company highly profitable; this in turn allowed it to invest in the most advanced facilities and become the world leader in nano chips. Only recent political pressures are convincing the company to invest more abroad. See *The Financial Times*, "Spreading chip plants around the world will add to costs", 27 July 2021.

[8] For a more theoretical discussion of transnationality indices, see Ietto-Gillies (2021).

[9] This is only the case for two or three MNEs in the ranking: some North American companies have operations only in the neighboring country, thus having a presence in only two markets. Similarly, there are some United Kingdom–United States companies that divide their operations almost equally across the Atlantic.

One solution to the home-country bias is the use of the GSI, which is the square root of the share of foreign affiliates times the number of host economies. UNCTAD computes and ranks financial companies by this index because the nature of financial companies' assets – highly liquid and thus easily transferred across borders – differs from that of non-financial MNEs, making the interpretation of the foreign assets index less meaningful. This relates to the issue of the appropriateness of the foreign asset index for digital companies, which typically report only a very limited amount of fixed tangible assets, and could provide a valid alternative for measuring their internationalization. The attachment of weights to the locations of different affiliates – in particular offshore centres – could probably also help assess the risk of BEPS practices and thus help in the economic assessment of Pillar Two.

The availability of new databases could facilitate the collection of the necessary information. Unfortunately, the index cannot be computed back in time, as UNCTAD has access only to the most recent ownership information, and thus the index cannot be used in a trends analysis. It can nevertheless provide some useful insights in the cross-sectoral analysis. Table 2 shows an example of the GSI and its subcomponents for the top MNEs in 2018.

Table 2. The Geographical Spread Index and its components, top 100 MNEs, 2020

Industry	MNEs (number)	TNI average	Affiliates (number)	Foreign affiliates (number)	I.I.	Host countries (number)	GSI average
Extractives	17	57.9	712.4	470.0	63.2	46.4	53.2
Automotives	11	60.8	746.1	560.5	74.2	51.5	60.8
Pharmaceuticals	11	68.1	705.1	579.1	85.0	71.1	77.0
Heavy industry	13	69.3	920.5	653.7	72.5	69.8	65.0
Light industry	9	85.8	661.1	587.8	77.6	69.8	72.1
Tech	10	58.2	592.3	464.0	73.7	58.5	64.4
Tech – digital	3	35.5	453.3	171.0	52.7	33.3	38.1
Telecommunication	7	67.0	804.0	682.4	84.2	48.4	61.8
Trade	5	55.2	856.8	719.8	84.2	49.8	64.7
Utilities	9	63.4	798.9	537.1	65.1	31.0	42.4
Other services	4	57.2	678.5	480.0	67.0	29.8	43.7
Other	1	47.8	260.0	188.0	72.3	19.0	37.1
Total	**100**	**63.6**	**731.6**	**546.8**	**73.0**	**53.5**	**60.2**

Source: UNCTAD, on the basis of BvD Orbis data.

Note: Only majority-owned affiliates. I.I.= Internationalization Index (the number of foreign affiliates divided by the total number of affiliates), GSI = Geographical Spread Index (square root of the share of foreign affiliates times the share of host economies). The data on the subsidiaries were collected in 2020 and refer to the end of fiscal year 2019. The sample of top 100 parents was the ranking of 2018 MNEs.

The correspondence between the TNI and the GSI is striking. Pharmaceuticals, light and heavy industry, and tech hardware industries are the most internationalized and geographically spread. The biggest difference between the TNI and the GSI is for utilities and other services, as the number of host countries seem indeed quite low. Digital companies – in the sample, these are Amazon, Alphabet and Tencent – have low internationalization, using both indices.

3. The FDI lightness index and relevance for BEPS

The ratio between two components of the TNI indicator, the share of sales generated by foreign affiliates and the corresponding share of foreign assets, is the FDI lightness index. This indicator was developed in UNCTAD's *WIR17* for the analysis of the international footprint of digital MNEs. It reveals the extent to which a company is able to generate sales abroad given its stock of foreign assets. As a ratio of two sub-indexes it also has the advantage of mitigating the effect of the home-market bias.

A very light investment footprint is typical of digital and tech companies and indicates that the operational nexus between foreign sales and foreign assets is weakening, undermining taxing rights in host economies. In particular, BEPS Pillar One "recognizes that in an increasingly digital age, taxing rights can no longer be exclusively determined by reference to physical presence" (OECD, 2020a) and provides new nexus rules based on indicators of a significant and sustained engagement with market jurisdictions. Pillar One aims to ensure a fairer distribution of profits and taxing rights among countries with respect to the largest MNEs, which are the winners of globalization.

To identify the in-scope MNEs (those subject to new taxing rules) there are three requirements:

- A profitability threshold. This corresponds to a global turnover above €20 billion and profitability above 10 per cent (i.e. profit before tax divided by revenue) (OECD/G20 (2021)).

- The activity allows for an extended foreign market presence without a corresponding investment and consequently is in the automated digital services (ADS) or consumer-facing business (CFB) industries.

- The market presence: the entity should derive at least €1 million in revenue from host jurisdictions (this is lower for smaller jurisdictions).

The FDI lightness index and its sub-indices can help assess the scope of BEPS Pillar One; in particular, provided most top MNEs satisfy the profitability threshold, it helps find those MNEs or entities in a group that because of the nature of their activities and their market presence in host economies are included in the scope of the new taxing right.

The FS/TS index can provide only a first approximation of the foreign market presence of a company. Detailed information on revenues by market would be required to fully assess BEPS Pillar One. However, few companies report that information, typically grouping foreign markets under the single heading "International". Still, this is a good – and readily computable – approximation of the relevance of BEPS Pillar One to MNEs.[10] For example, many digital MNEs from China tend to serve primarily national customers, making BEPS less relevant to them.

The FS/TS index thus addresses the third requirement of market presence in terms of revenues. The FA/TA index, which relies on information on property, plant and equipment, refers to the physical presence of an MNE in an economy. The FDI lightness indicator (the ratio of the first index to the second) gives an indication of the Internet intensity or of the ability of certain MNEs to serve customers remotely. It is thus a very helpful indicator to define in-scope MNEs.

The divergence between foreign sales and foreign assets in figure 2 implies increasing FDI lightness, from 1.03 to 1.08 on average, and a lighter footprint for these core MNEs. It might seem a small change, but it could be a first signal of a trend, as it is measured across 93 MNEs over a very short time span, net of compositional effects. The process is driven not only by tech and digital MNEs, but also by companies in other sectors that have become lighter; this is in contrast to the findings in the *WIR17*, where there was no evidence on the digitalization of the rest of the economy as the FDI lightness indicator of the top 100 non-tech companies remained constant at about 1 over the period 2010–2015.

Table 3 decomposes the FDI lightness index across the sub-indices and across industries to assess the scope of BEPS Pillar One across the economy. It shows that other industries are also becoming asset light, including pharmaceuticals, manufacturing in general (both light and heavy), trade (although starting from a lower base) and even extractives.

The counterintuitive pattern for digital companies is driven by Tencent and Amazon. The first is fully concentrated on the domestic market in terms of sales while increasing investments in foreign Asian start-ups are growing its stock of foreign assets. The second is fast transforming into a diversified conglomerate; its investments in many disparate sectors are consistently gaining weight in its balance sheet.

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[10] Once the group or MNE is included in the scope, OECD (2020a) has developed a number of rules to determine the correct revenues source, including using the geolocation of the customer's device, his IP address and his billing address. That clearly requires company by company, customer by customer data collection.

This suggests several methodological points: (i) the selection by foreign sales could trim from the onset companies that, like Tencent, are transforming into tech venture capitalists, leaving the initial activity (digital gaming) as a stronghold only in the home market; (ii) the selection of "pure digital" MNEs is more and more difficult, not only because there is no such industry in standard statistical classifications and each MNE needs to be checked on its activity and the characteristics of its production process, but also because this classification is still changing. An update of the top 100 digital MNEs developed in *WIR17* could be required, to create a wider sample from which to select the set of digital MNEs.

Many digital start-ups diversify into contiguous industries as soon as they reach a certain scale. In fact, Asian tech start-ups are typically born offering multiple services on their platforms, from ride-hailing to video-sharing, e-commerce and e-payments. At the same time, hardware producers and old-industry champions are also becoming more hybrid, adding digital services to their offerings.[11] COVID-19 only accelerated this trend, pushing most retailers to open e-commerce services.

Table 3. Shares of foreign assets and sales and FDI lightness index by industry, top 100 MNEs (constant sample of 93 companies), 2015 and 2019

Industry	MNEs (number)	FA/TA 2015	FS/TS 2015	FA/TA 2019	FS/TS 2019	Lightness 2015	Lightness 2019
Extractives	16	66.5	63.8	65.1	67.3	0.96	1.03
Automotives	12	54.0	73.5	53.6	69.3	1.36	1.29
Pharmaceuticals	10	66.7	74.1	64.8	77.2	1.11	1.19
Heavy industry	9	73.7	73.7	73.2	78.1	1.00	1.07
Light industry	11	79.6	77.9	78.8	85.2	0.98	1.08
Tech	9	50.9	71.8	50.1	69.8	1.41	1.39
Tech – digital	3	27.4	31.4	40.8	29.5	1.14	0.72
Telecommunication	7	69.6	62.8	67.9	60.5	0.90	0.89
Trade	5	70.3	48.4	59.9	52.7	0.69	0.88
Utilities	8	58.9	59.8	65.7	64.5	1.02	0.98
Other services	3	79.8	71.3	77.8	65.7	0.89	0.84
Total	**93**	**65.2**	**67.5**	**56.9**	**61.3**	**1.03**	**1.08**

Source: UNCTAD.
Note: FDI lightness index = FS/TS divided by FA/TA.

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[11] See *The Economist*, "The new rules of competition in the technology industry", 27 February 2021, and "The IT establishment is dressing in new clothes", 4 November 2021.

The boundaries of the digital industry are thus changing quickly, as more and more sectors of the economy digitalize. As an example, in November 2021, the S&P Dow Jones Indices and MSCI launched a consultation on a potential revamp of the widely followed Global Industry Classification Standards, proposing that transaction and payment processing companies be switched from the information technology industry to the financial one.[12] Ietto-Gillies and Trentini (2021) contend that the allocation of firms and products to the digital industry needs to take into consideration different developments in the economy such as digitalization, specialization, diversification and innovations in organization (i.e. externalization versus internalization of operations).

For these reasons, it is useful to extend the analysis to the whole economy and not to limit it a priori to digital services and consumer-facing businesses as defined in BEPS Pillar One. For example, light industries display a high (and increasing) FDI lightness index. Light industries broadly match the definition of consumer-facing businesses as included in the in-scope activities for BEPS Pillar One. In this case, an increasing FDI lightness index not only reflects a growing intensity of Internet use but also a possible greater resort to licensing, franchising and contract manufacturing for more asset- and labor-intensive operations.

The FDI lightness index can be a useful approximation tool to identify potential in-scope MNEs for BEPS Pillar One, beyond digital and tech companies, especially in a highly dynamic environment where most MNEs are adopting digital solutions and new business models. Starting from the sample of top 100 digital MNEs compiled by UNCTAD (2017), the OECD estimated that Pillar One could in fact affect fewer than 100 MNEs, mostly in digitalized and intangible-intensive sectors, with, consequently, only limited impact on their investment abroad. Even considering the joint impact of Pillars One and Two (minimum taxation), the change would lead to a relatively small increase in the average (post-tax) investment costs of MNEs, possibly offset by the expected increased efficiency of capital allocation that would give more importance to non-tax factors (e.g. infrastructure, education levels or labour costs) rather than to taxing motivations in investment decisions (OECD, 2020b).

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[12] *The Financial Times*, "Major sector ETFs face risk of large tech companies being reclassified", 16 November 2021.

4. Conclusions

This research note has provided a brief reassessment of UNCTAD's transnationality indices in light of recent economic trends: the digital economy and the new industrial revolution, and the resulting asset-light business models. The most recent index – specifically designed to capture the increased digitalization of the economy – the FDI lightness index, has been tested for relevance to the assessment of the impact of BEPS tax reforms, showing its validity to select and detect potentially in-scope MNEs beyond the digital industry.

Overall, the analysis revealed that the TNI, GSI and FDI lightness index are still able to capture relevant structural changes but could benefit from some fine-tuning to allow a clearer interpretation and consequently a better elaboration of policy advice. This is relevant for several areas of policy, including international taxation as well as employment policies and, more in general, development strategies of host economies.

First, UNCTAD may need to adapt the sample of companies on which the indices are computed to the new business models. The sample selection could be adjusted to add more relevance to the dimension of foreign sales. Because new business models tend to have a very low share of foreign assets in relation to their foreign sales, the top 100 MNEs ranking is missing some of the most dynamic MNEs. Adding a second ranking by foreign sales could mitigate the risk of focusing too much on a 20th-century group of MNEs and ensure a more forward-looking approach. Enlarging the sample of companies under study could also help alleviate the compositional effects on the aggregated TNI, which over the last decade have occasionally led to potentially misleading internationalization trend lines. It would also allow for a better analysis of trends by industry. Partly related to this, the ranking of the top digital MNEs created for UNCTAD (2017) could be updated every two to three years to detect emerging trends in this highly dynamic group of companies.[13]

Second, as the analysis of the FDI lightness index (a ratio of the TNI's two sub-indexes) showed, it is important to detail the analysis to the different sub-indices as these can provide insights on the business and organizational models adopted by MNEs. Tracking diverging trends between the shares of foreign sales and foreign assets and employees – as pointed out in several editions of the *WIR* – can enable policymakers to address the economic impact of FDI in host economies.

Third, the GSI could be reintroduced for non-financial MNEs (jointly with the TNI) to provide a more complete picture of MNE groups and to address the home-market bias and the inadequacy of the foreign assets measure for companies relying on intangibles. The attachment of weights to the different affiliates' locations could also strengthen the economic assessment of Pillar Two.

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[13] Probably a focus on the top 50 digital companies would suffice.

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