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# Expanded Real Value-added Data for Manufacturing Sub-sectors and Patterns of Manufacturing Development

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# Expanded Real Value-added Data for Manufacturing Sub-sectors and Patterns of Manufacturing Development

Nobuya Haraguchi
UNIDO

Juergen Amann
OECD

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

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**Abstract**

Benchmarking manufacturing performance has been one of the biggest challenges for policymakers to identify and promote long-run, growth-enhancing policy measures. This observation holds particularly true for developing countries, as economic growth is typically accompanied by a high degree of industrialization. While much research has been devoted to understanding the underlying mechanisms that drive the dynamics of the industrialization-growth nexus, there is a notable lack of real value-added data providing comparable metrics across countries, particularly from countries at the low(er) end of the income distribution. In this paper, we propose a new method for expanding the availability of real value-added data.

To our knowledge, this is the first study that seeks to expand data coverage of the real value-added of a large group of developing countries at the manufacturing sub-sector level. Furthermore, we show how an increase in real value-added data opens up new opportunities for evaluating countries' manufacturing performance.

**Keywords:** value-added; structural change; developing countries; manufacturing; macroeconomic measurement; manufacturing industry development.

*JEL codes:* L60; O14; E01; E30.

# 1 Introduction

Benchmarking the manufacturing sector's performance has been one of the biggest challenges for policymakers to identify and promote long-run, growth-enhancing policy measures. This observation holds particularly true for developing countries, as economic growth is typically accompanied by a high degree of industrialization. While much research has been devoted to understanding the underlying mechanisms that drive the dynamics of the industrialization-growth nexus, there is a notable lack of data providing comparable metrics across countries, particularly from countries at the low(er) end of the income distribution. This presents a substantial barrier to understanding development trajectories in manufacturing, which is of particular concern as it affects a group of countries that would benefit most from industrial development in terms of formal employment opportunities and economic growth.

Given the non-linear development patterns across manufacturing industries over time, it is imperative to consider a country's stage of development over time when assessing its absolute industrial performance. Likewise, it is desirable to have an equally representative and comprehensive set of country comparators to evaluate relative differences in performance for (a) specific industry(ies). For example, it may be common for upper middle-income countries, such as Malaysia, to simultaneously register negative growth in the textile industry and slowed growth in the non-metallic mineral industry while exhibiting steady growth in the electrical machinery and apparatus industry. Therefore, it is difficult to reasonably evaluate a country's manufacturing performance without proper benchmarks for manufacturing development. Conversely, Bangladesh may want to compare the performance of its garment industry with East Asia's success stories, e.g. the Republic of Korea's. However, such a comparison is only meaningful if comparable value-added data for the Republic of Korea are available for the period when the country was at the level of Bangladesh's current development.

In this paper, we propose a new method for expanding the availability of real value-added data. We present manufacturing patterns that reflect the development trajectories of developing countries and use these patterns to benchmark manufacturing performance. To our knowledge, this is the first study that seeks to expand data coverage of the real value-added of a large group of developing countries at the manufacturing sub-sector level. Our approach enables us to comprehensively account for structural change dynamics within the manufacturing sector in unprecedented detail.

Accordingly, we first introduce a new approach to deriving real value-added data for a large group of developing countries at the manufacturing sector level. We then discuss different methodologies to deflate nominal value-added and assess each methodology in terms of quality and its contribution to increasing data availability. Furthermore, we show how an increase in real value-added data opens up new opportunities for evaluating countries' manufacturing performance. Controlling for country- and time-specific effects, we illustrate how development patterns in manufacturing vary across industries and present benchmarks to evaluate a country's performance in relative terms, accounting for differences in the level of value-added and the speed of development.

The remainder of this paper is structured as follows. In the next section, we revisit the discussion on the role of manufacturing in economic development. In section 3, we propose a new way of increasing real value-added data series drawing on UNIDO's INDSTAT database and discuss the advantages of our approach relative to the two readily available manufacturing industry data sources, namely STAN and WIOD. In section 4, we review derivatives of our method to increase the availability of real value-added data further and provide a selection tool based on which to construct the final database. Lastly, we use our novel data set in section 5 to present the patterns of manufacturing development and to demonstrate the use of expanded real value-added to benchmark the performance of manufacturing industries.

# 2 The role of manufacturing and the importance of real value-added data as a performance assessment tool

## 2.1 Manufacturing as the engine of growth...

Manufacturing plays a crucial role as the engine of growth in countries' development. Except for resource-rich and small island countries, a sustained process of industrialisation usually accompanies long-term economic growth, i.e. an increase in the share of manufacturing value-added (MVA) in gross domestic product (GDP), which is attributed to the sector's higher level of productivity, its linkage effects and demand effects (Kaldor, 1967). A higher ability to accumulate capital, exploit economies of scale and achieve technological progress makes manufacturing a highly productive sector relative to the agricultural and service sectors.[1] Consequently, economies that have experienced structural change towards a higher share of manufacturing employment at the expense of agriculture, less productive services and informal activities have typically seen a rise in economy-wide productivity. Such growth-enhancing structural change characterises the experiences made by Asia. At the same time, Latin America and sub-Saharan Africa have primarily witnessed growth-reducing structural change since 1990 (McMillan and Rodrik, 2011), although McMillan

[1] Tradable services and non-manufacturing industries can be more productive than manufacturing, but their value-added and employment shares in GDP and total employment, respectively, are usually much smaller than in manufacturing.

et al. (2014) concludes that sub-Saharan Africa has undergone growth-enhancing structural change since 2000.

The theoretical and applied literature extensively discusses the underlying and fundamental role manufacturing plays in development. It is commonly agreed that growth, particularly in poor(er) countries, can be (at least) partially achieved by transitioning out of agricultural and subsistence farming into a formally integrated economic framework; see, among others, Gollin et al. (2002); Kuznets (1957); Matsuyama (1992). Lewis (1954) shows that developing countries can drive economic development through capital accumulation in a capitalist sector. in large subsistence economies, a capitalist sector can draw surplus labour from the subsistence sector at the wage level prevailing in that sector.[2] This entails a cost advantage for the country's capitalist sector relative to other countries with no surplus labour to absorb. The capitalist sector can expand by reinvesting the profits and accumulating capital until it has fully absorbed the country's surplus labour. Lewis (1954) argues that industrialists typically drive the capitalist sector's expansion because they are more likely than others to invest profits to increase productivity. Thus, by assuming an active role in industrialising activities, low-income countries with a sizeable subsistence sector can drive the process of capital accumulation. As the manufacturing sector accumulates capital, it also reaps the benefits of economies of scale for increases in productivity (Kaldor, 1967; Cornwall, 1977). There are two types of economies of scale. A large production scale leads to labour specialisation and reduced fixed per-unit costs. In contrast to this static effect, the dynamic impact of economies of scale refers to more rapid skills and technological development through learning. The rapid accumulation of production experiences enhances learning in all functional areas, including research and development, production and marketing, thus resulting in higher productivity levels of productivity (Thirlwall, 2002; Arrow, 1962; Dalum et al., 1992). Due to such potential benefits from learning and scale economies, manufacturing is a sector where the advantages of lower levels of development specifically work in favour of productivity increases. Rodrik (2013) highlights the manufacturing sector's unique position of unconditional convergence with the technological frontier. A foothold in the manufacturing sector is likely to lead to continuous productivity increases, regardless of country-specific conditions.

The role of manufacturing as an engine of growth also derives from its strong backward linkages with other sectors (Hirschman, 1958). Manufacturing production generates demand for inputs from all sectors and creates ripple effects for businesses that are only indirectly linked to the

[2] Lewis (1954) shows that in practice, wages paid to employees in the capitalist sector are higher than those in the subsistence sector due to (i) the higher cost of living in the capitalist sector, which is often located in an urban area, (ii) the psychological cost of moving from a simple life in the subsistence sector to a better organised urban environment or (iii) the recognition that workers demand higher wages after having acquired particular tastes and social prestige associated with urban life.

final production stage through supply chains. Manufacturing production's multiplier effect is usually more substantial than that of the agricultural and service sectors and thus drives the entire economy's growth.

Finally, the high-income elasticity of demand for manufactured goods, especially in low and middle-income countries, helps developing countries promote sustained economic growth by focusing on developing manufacturing capabilities to meet the growing demand for the sector's outputs. Following the logic of Engel's Law, once the primary need for food has been met, the share of income people spend on manufactured goods increases. Engle's curve for manufactured goods is usually S-shaped, with the growing income elasticity of demand for manufactured goods rising up to around $10,000. Even though income elasticity may decrease at a very high-income level, it is unlikely to reach a saturation point of zero elasticity, as is the case of demand for agricultural products (Moneta and Stepanova, 2018). In manufacturing, technology-intensive products, such as automobiles, motorcycles and consumer electronics, tend to exhibit high-income elasticity even at a high level of development and income. Thus, acquiring production capabilities to manufacture such products over the long term can promote sustained growth.

## 2.2 ...running out of steam?

Despite the extensive theoretical and empirical evidence supporting the role of manufacturing as an engine of growth, recent studies indicate that the dynamics of the industrial sector, and manufacturing, in particular, are not only subject to changes in income level but seem to have an inter-temporal dimension as well. For example, Haraguchi (2015) find higher variations in the share of manufacturing along the income trajectory between the 1960s and 1980s than during preceding periods. A similar observation is also made by Palma (2014) as well as Rodrik (2016) and, more recently, by Haraguchi and Amann (2020, 2021). These studies find that the hump-shaped relationship between manufacturing-related employment and value-added moved down the income scale over time, leading to projected decreases in employment and value-added generation at earlier stages of economic development than in earlier industrialisers. Palma (2014) also notes that the hump-shaped relationship for employment seems to disintegrate and level out over time. Such time-dependent patterns of premature deindustrialisation have led researchers to argue that manufacturing-led growth has become a more difficult path for currently developing countries to follow. As (Rodrik, 2016, p. 1) puts it, they *'[...] are running out of industrialisation opportunities sooner and at much lower levels of income compared to the experiences of earlier industrialisers'*. Similar observations have been made by Felipe et al. (2018). The authors emphasise that the share of manufacturing employment of late developers reaches its tipping point at a much lower per capita income level than was the case for earlier industrialisers. In the same vein, Tregenna (2009) describes deindustrialisation tendencies as identified by a decline in the manufacturing sector's share of employment and value-added in the total economy and provides a conceptual framework to determine whether a deindustrialisation process is desirable.

Arguments such as those made above are primarily based on the observed downward shift of manufacturing value-added shares in GDP and the share of manufacturing employment in total employment within countries at different income levels. However, these approaches typically resort to country-average shares, which is insufficient to prove any change in the significance of manufacturing for economic development. The share of aggregate manufacturing value-added in GDP, as well as that of aggregate manufacturing employment in total employment across developing countries, is shown to have been constant since 1970, even during the period when the start of deindustrialisation shifted to a lower per capita income level (Haraguchi et al., 2017).[3] The difference between country and aggregate averages can therefore be considered as the difference between unweighted and weighted country averages. This result underscores the fast-paced manufacturing development of very populous developing countries in the global economy, which seems indicative of the concentration of manufacturing-related production in (a) group(s) of larger, more populous countries; see also (Felipe and Mehta, 2016).

Aside from this 'composition effect', which seems indicative of a regional clustering of manufacturing development in recent years, structural change dynamics within manufacturing are strongly heterogeneous across industries and over time. This result paints a much more differentiated picture as far as manufacturing development patterns are concerned. It highlights robust and stable growth trajectories in specific key industries for employment and value-added generation over time, with industrial structure typically changing from a labour-intensive to a capital-intensive and ultimately to a more technology- and knowledge-intensive configuration (Chenery and Taylor, 1968; Taylor, 1969; Haraguchi, 2015).

As countries move from a low to a medium and ultimately to a high level of income, structural change and diversification drive sustained manufacturing growth.[4] A comprehensive analysis of the manufacturing sector level would help shed light on these highly relevant topics and to gain an in-depth understanding of growth performance and the evolution of productivity. This motivates our efforts to elaborate on a derivation of real value-added data for a comprehensive set of countries,

[3] Haraguchi (2015) calculates the average country-level shares of MVA in GDP as the sum of each country's MVA share in GDP divided by the number of countries, while the aggregate share is measured as the developing countries' total MVA divided by their total GDP.

[4] Besides the 'quantity' of manufacturing in developing countries, several recent studies emphasise that the qualitative characteristic of manufacturing as an engine of growth typically represented in Kaldor's Laws has not changed, either; see, among others, Chakravarty and Mitra (2009); Kathuria and Natarajan (2013); Marconi et al. (2016); Su and Yao (2016); Szirmai and Verspagen (2015).

which to date is unprecedented.

### 2.3 Importance of real value-added data as a reliable measure of manufacturing industries' performance

The importance of manufacturing in economic development implies that an adequate measurement of manufacturing performance is indispensable. In an era of global production networks, gross outputs for production or exports are increasingly losing relevance for measuring industrial performance. By contrast, value-added relates directly to a measured entity's value creation and performance. It is the contribution from labour and capital production processes and has notable welfare implications. In addition to displaying an industry's size and growth, value-added data are commonly used to measure productivity and technological and structural change.[5]

To convert nominal into real value-added, the System of National Accounts 2018 favours the double deflation method over the single deflation method on theoretical grounds (SNA, 2017). Real value-added based on the double deflation method is derived as the difference between deflated values of output and intermediate consumption using respective deflators of both series. More precisely, real value-added or value-added quantity at time $t$, $QV_t$, is equal to the residual after subtracting the quantity of intermediate input from the quantity of gross output, that is $QV_t = QG_t - QIN_t$. We introduce simplified notation by expressing nominal value-added as

$$PV_t \times QV_t = PG_t \times QG_t - PIN_t \times QIN_t$$

where $PX_t \times QX_t$ denotes the nominal value of gross output ($X_t = G_t$), intermediate inputs ($X_t = IN_t$) and value-added ($X_t = V_t$) with $P, Q$ denoting the respective prices and quantities at time $t$.[6] The double deflation method then derives real value-added by deflating nominal gross output and nominal intermediate input with their respective prices at period $t$ as

$$\begin{aligned} QV_t &= \frac{PG_t \times QG_t}{PG_t} - \frac{PIN_t \times QIN_t}{PIN_t} \\ &= QG_t - QIN_t. \end{aligned} \tag{1}$$

The deflation method in Equation 1 is the most effective means for deriving real value-added. It is expected to provide a more accurate estimation of real value-added, except during episodes of

[5]The derivation of real value-added entails some conceptual and technical problems as discussed by Meade (2010), and year-to-year change in estimated real value-added may not fully reflect the changes in the contribution of production factors' inputs. However, it is still a valuable variable for exploring industries' development trends and assessing medium- to long-term industrial performance across countries and over time.

[6]We drop time subscripts for price and quantities for the sake of readability.

hyperinflation or rapid changes in product quality (Eurostat, 2014). However, data availability on the intermediate input price, $PIN_t$ at the manufacturing industry level, is often minimal. This shortcoming holds particularly true for developing countries and implies severe feasibility constraints to applying this methodology to many countries. In other words, the lack of real value-added substantially reduces the variable's usefulness as a performance measure.

In the single deflation method, only one deflator - in most cases, the gross output price deflator - is used. Nominal gross output ($PG_t \times QG_t$ - and nominal intermediate inputs ($PIN_t \times QIN_t$) are divided by the gross output prices to deflate nominal value-added into approximate real value-added. Since nominal value-added at time $t$ is defined as $PV_t \times QV_t$, estimated real value-added at $t$ is given as

$$\frac{PV_t \times QV_t}{PG_t} = \frac{PG_t \times QG_t}{PG_t} - \frac{PIN_t \times QIN_t}{PG_t}. \tag{2}$$

The benefits of the above representation are conventional in that it requires one price index less for its construction. Furthermore, it is less sensitive to hyperinflation and production volatility, two problems that may disproportionately affect developing countries. On the other hand, Li and Kuroko (2016) show that the single deflation method overestimates real value-added when the price increase of intermediate goods is small relative to that of output. Given the practical shortcomings of both techniques, it is not surprising that both approaches are often traded against each other, as discussed in the following section.

### 2.4 Limited availability of real value-added data and best practice

While a time series of real value-added data for manufacturing industries is essential for performance measurements, the availability of such data in internationally comparable databases is limited mainly to advanced and a few emerging economies. Therefore, it should not come as a surprise that the single deflation method to estimate real value-added is quite common in practice (SNA, 2017).

Researchers have few data sources available to analyse economic activities at the manufacturing sub-sector level, i.e., the ISIC two-digit level. Most prominently, the OECD's Structural Analysis database, STAN (2021)[7]), and the World Input-Output Database, WIOD by Timmer et al. (2015)[8],

[7] Data retrieved from `http://www.oecd.org/sti/ind/stanstructuralanalysisdatabase.htm` (last accessed April 2021). We use the database *SNA93, ISIC Rev. 3 version of STAN (last update: May 2011)* instead of the more recent ISIC Rev. 4 data sets, as the former provides better data coverage for earlier periods and follows the same industry classification as INDSTAT. Next, we analyse STAN data for 29 countries only, as Australia, Ireland and Poland do not report deflator series for the sectors we are interested in; see coverage file available at `http://www.oecd.org/sti/industryandglobalisation/46671527.XLS` (last accessed April 2021) for further information.

[8] We use the July 2014 issue of the Socio-Economic Accounts (SEA) data which contain, among other variables, value-added at current and constant prices; see `http://www.wiod.org/database/seas13` for more information, which

which cover 32 and 40 economies of mostly OECD and other major economies, respectively.[9] The use of single deflation methods is widespread in these data sets, even in the group of advanced economies. For example, out of 27 European countries included in the WIOD, the single deflation method was used for over half of the countries (Erumban et al., 2012). Moreover, in the OECD.stat country notes for the ISIC Rev.3 data, Australia and the United Kingdom explicitly mention that they used single deflation methods to derive real value-added. Other countries do not indicate which deflation methods were used. Li and Kuroko (2016) states that China mainly uses the single deflation method and partly uses the quantity extrapolation method. In other words, the single deflation method is commonly used in compiling such international databases, even in developed countries. Lastly, national statistics offices in some developing countries that are not included in these databases may also produce real value-added data. Nonetheless, it is neither easy to access such data nor to be confident about their quality and compatibility with existing international databases.

In turn, UNIDO's Industrial Statistics Database at the two-digit level of ISIC, INDSTAT (2021)[10] collects manufacturing production data at the industry level for a large country sample but does not provide an accompanying deflator series to accommodate the need for real value-added series by default.

This situation generates a trade-off: INDSTAT manufacturing data offers the most comprehensive and detailed overview of manufacturing development (past and present) but fails to provide a comprehensive tool to deflate value-added. Researchers in the past have circumvented this issue by employing econometric techniques. For example, Rodrik (2013) estimates convergence in manufacturing conditional on labour productivity dynamics of a frontier economy (the U.S.) and a common global inflation rate.

In what follows, we propose a new way of calculating real value-added based on UNIDO's INDSTAT data and a single deflation method. We illustrate the much-improved data coverage of this approach relative to the WIOD and STAN data sets, particularly for low(er) income economies.

is the most recent version following the ISIC Revision 3 industry classification.

[9]At the time of writing, updated versions for both the STAN and WIOD data set were available. However, this study uses the latest instalments of all Rev. 3 classification data sets to retain consistency across data sets.

[10]Data retrieved from `https://unido.org/researchers/statistical-databases` (last accessed April 2021).

# 3 A new approach to improving the current status of real value-added data for developing countries

To the best of our knowledge, there is no international database with price data for gross output, intermediate input or value-added at the ISIC two-digit level of manufacturing industries for an extensive list of developing countries, which allows the use of the double or single deflation method for the calculation of real value-added. While no such price data is included in INDSTAT, it includes an index of industrial production (IIP) and nominal value-added and gross output data for many developing countries and years. We argue that using INDSTAT's IIP, our procedure allows us to estimate real value-added for countries and years with observations for the IIP series and nominal value-added and gross output in the base year ($QG_b$). These variables are included in INDSTAT as a standard set of variables that UNIDO collects annually.

Theoretically, the IIP indicates the volume changes in production output over time. However, as most countries do not calculate value-added volumes at high frequency, change in output is used for the IIP as a volume index, free of price fluctuations (United Nations, 2008). Based on these metrics, we propose to measure real value-added as follows:

$$rVA_t = \frac{PV_t \times QV_t}{PG_t \times QG_t} \times (QG_b \times IIP_t), \tag{3}$$

which is equivalent to the single deflation method: by noting that the IIP is an inflation-free volume index

$$(QG_t = QG_b \times IIP_t) \tag{4}$$

is real gross output in year $t$. Plugging Equation 4 into Equation 3, this simplifies to

$$rVA_t = \frac{PV_t \times QV_t}{PG_t \times QG_t} \times QG_t \tag{5}$$

$$= \frac{PV_t \times QV_t}{PG_t} \tag{6}$$

that is, the single deflation method described in Equation 2.[11]

[11] It goes without saying that gross output and value-added deflators do not coincide, although they are very likely to be highly correlated, as the latter also consider input prices. We acknowledge that because of this lack of reciprocity, some potential limitations of our proposed approach arise. However, in line with the previous discussion,

### 3.1 Implementation in INDSTAT

Simplifying notation, the single deflation method Equation 3 (which will also be referred to as *Method 1* or *m1* from now on) is calculated using INDSTAT data as

$$rVA_{ist}^{m1} = nVA_{ist} \times Def_{ist} \tag{7}$$

where we define

$$Def_{ist} = \frac{GO_{isb}}{GO_{ist}} \times IIP_{ist} \tag{8}$$

for country $i$, industry $s$ and period $t$, respectively. Subscript $b$ denotes the base year. Finally, $rVA$, $nVA$, $Def$, and $GO$ denote real and nominal value-added, the deflator and (nominal) gross output, respectively.

### 3.2 Measurement error and data revision

When applying the single deflation method, as in the case of using INDSTAT, the quality of the estimation is dependent on, among others, how frequently the weights of the IIPs are updated. Weights reflect the importance of different activities in the industry for which an IIP is constructed. Thus, using outdated weights ignores any structural change within the sub-sector aggregates and introduces bias in the gross output trend. Even though industrial structure changes only gradually, periodical updates of IIP weights are essential for a reliable estimation of changes in an industry's output volume.

In 2008, the United Nations surveyed how countries calculate the IIP (United Nations, 2008). The survey included 62 countries, of which 33 were developing countries, including ten from Africa, ten from Asia, seven from Europe, five from Latin America and one from Oceania. Among the 33 developing countries, 61% of the countries updated their weights annually or at least every five years. 24% of them had periodical updates with an interval of more than five years. The remaining 15% had irregular updates of the weights without any update for the last five years. Even in 2008, many developing countries updated the IIP weights regularly, mainly with an interval of five years or less. This observation gives us confidence in the quality of real value-added estimated by the single deflation method for developing countries.

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it is evident that the availability of real value-added figures based on double deflation techniques constitutes a widely recognised shortcoming of many of the most commonly used data sets in the literature. Despite its recognised limitations, our approach is the first comprehensive attempt to provide a consistent and extensive account of real value-added series for a very extensive data sample. Specifically, the availability of manufacturing data for developing low(er) income and the high level of dis-aggregation of our data source contributes to the novelty of our approach in this paper.

### 3.3 Assessing data coverage across data sets

Using *Method 1* (*m1*) to obtain industry-level deflators, the improved data coverage of INDSTAT data becomes obvious. Table 1 summarises the number of countries and sectors by income group and region of the newly proposed single deflation for value-added in INDSTAT and compares them with the two primary data sources for manufacturing at the industry level, i.e. the STAN and WIOD data set. As can be seen in Table 1, particularly for countries that are not classified as either 'high income: OECD' or 'Europe & Central Asia', INDSTAT offers a considerable improvement over STAN and WIOD as far as data coverage is concerned.

### 3.4 Assessing differences across data sets

Of course, merely increasing data coverage to evaluate the performance of *Method 1* (*m1*) is not worth the effort unless we also consider the quality of the newly derived data set relative to other available data sources. The following discussion will elaborate on this. For illustrative purposes, we compare the nominal value-added series of the G7 countries with their respective real value-added time series between INDSTAT, WIOD and STAN. By choosing the G7 countries, we highlight the similarities and the differences across all three data sets without a lack of generality and for a group of industrialised, high-income countries for which data are readily available in all three data sets. We then follow up the initial visual comparison with a more comprehensive, numerical approach.

**Visual comparison.** Figure 1 illustrates the real and nominal value-added series and the United States deflators. We also provide similar results for all remaining G7 economies in Appendix D and a complete online list of all available countries.[12] The three data sets share several similarities as well as differences. First, it should be noted that the data coverage for INDSTAT (illustrated by the solid red lines) is more comprehensive, both over time and across industries. As regards value-added data, all three data sets report similar results for most sectors and countries but differ in some cases: for example, in the case of Germany, some distinct differences in specific sectors (e.g. 15, 21 or 22) are observed between INDSTAT and STAN/WIOD data. What is more, the latter two data sources, when observed jointly, follow similar patterns; however, there are also some notable exceptions, especially for Japan. At this point, it is worth emphasising that the differences between INDSTAT and the other two data sources used for nominal data may be explained by UNIDO's international mandate to collect nominal value-added data directly from countries following internationally recommended survey procedures. Therefore, differences in

[12] We provide a dynamic online tool which is accessible via `https://amannj.shinyapps.io/rVA_Explorer/` for the interested reader to explore the differences in the data further.

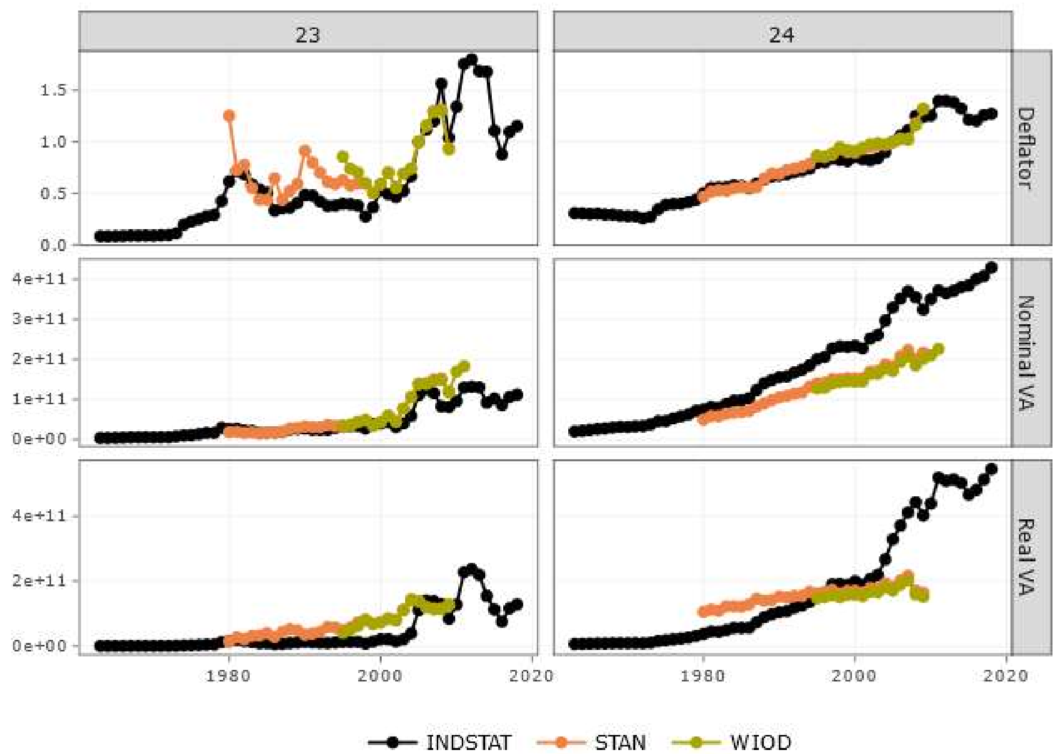
Table 1: Comparison of data coverage, industry and country level

| | No. of observations | | | No. of countries | | |
|---|---|---|---|---|---|---|
| | INDSTAT | STAN | WIOD | INDSTAT | STAN | WIOD |
| **Deflator by income group** | | | | | | |
| High income | 25709 | 10002 | 2700 | 48 | 28 | 30 |
| Low income | 532 | . | . | 9 | . | . |
| Lower middle income | 6639 | . | 180 | 17 | . | 2 |
| Upper middle income | 11911 | 464 | 630 | 28 | 1 | 7 |
| **Deflator by region** | | | | | | |
| East Asia & Pacific | 6566 | 1000 | 450 | 16 | 3 | 5 |
| Europe & Central Asia | 21345 | 8108 | 2520 | 44 | 22 | 28 |
| Latin America & Caribbean | 6765 | 464 | 180 | 12 | 1 | 2 |
| Middle East & North Africa | 4700 | 63 | 90 | 14 | 1 | 1 |
| North America | 1894 | 831 | 180 | 2 | 2 | 2 |
| South Asia | 1067 | . | 90 | 2 | . | 1 |
| Sub-Saharan Africa | 2454 | . | . | 12 | . | . |
| **Nominal Value-added by income group** | | | | | | |
| High income | 36777 | 13485 | 3060 | 53 | 31 | 30 |
| Low income | 4654 | . | . | 18 | . | . |
| Lower middle income | 16051 | . | 204 | 34 | . | 2 |
| Upper middle income | 21491 | 532 | 714 | 47 | 1 | 7 |
| **Nominal Value-added by region** | | | | | | |
| East Asia & Pacific | 12313 | 1586 | 510 | 20 | 4 | 5 |
| Europe & Central Asia | 26975 | 10503 | 2856 | 46 | 24 | 28 |
| Latin America & Caribbean | 13291 | 532 | 204 | 26 | 1 | 2 |
| Middle East & North Africa | 10716 | 266 | 102 | 20 | 1 | 1 |
| North America | 2251 | 1130 | 204 | 3 | 2 | 2 |
| South Asia | 3084 | . | 102 | 6 | . | 1 |
| Sub-Saharan Africa | 10343 | . | . | 31 | . | . |
| **Real Value-added by income group** | | | | | | |
| High income | 25157 | 10002 | 2700 | 48 | 28 | 30 |
| Low income | 328 | . | . | 7 | . | . |
| Lower middle income | 6382 | . | 180 | 17 | . | 2 |
| Upper middle income | 11192 | 464 | 630 | 28 | 1 | 7 |
| **Real Value-added by region** | | | | | | |
| East Asia & Pacific | 6560 | 1000 | 450 | 16 | 3 | 5 |
| Europe & Central Asia | 20025 | 8108 | 2520 | 43 | 22 | 28 |
| Latin America & Caribbean | 6517 | 464 | 180 | 12 | 1 | 2 |
| Middle East & North Africa | 4686 | 63 | 90 | 14 | 1 | 1 |
| North America | 1894 | 831 | 180 | 2 | 2 | 2 |
| South Asia | 956 | . | 90 | 1 | . | 1 |
| Sub-Saharan Africa | 2421 | . | . | 12 | . | . |

*Note:* Numbers of observations/countries contained in each of the three data sets. *Real value-added* for INDSTAT data according to single deflator method in Equation 7. Manufacturing sector classification according to Appendix E. Country classification according to World Bank (2021).
*Data source:* Author's elaboration based on INDSTAT (2021), STAN (2021), Timmer et al. (2015).

the nominal series between UNIDO and the other two data sets do not necessarily mean that value-added data derived from INDSTAT are less quality than others. This observation also follows through for real value-added, confirming that the respective sector series' general direction and characteristics hold across all three data sources. When comparing the differences between INDSTAT and WIOD/STAN data, it should become evident that the discrepancies in the real value-added patterns are typically inherited from the respective nominal series. Consequently, this paper's newly proposed value-added deflator is not the root of the heterogeneities across the series.

Figure 1: United States - Dataset Comparison




*Note:* Deflator (index, 2005 = 100), nominal and real value-added (BUSD), y-axis in log scale.

**Numerical comparison.** We acknowledge that a simple visual analysis of a subset of countries and industries is by no means a sufficient assessment of the discrepancies and similarities of the respective series. In our efforts to compare the different data sets, we introduce a simple numerical comparison mechanism that uses Dynamic Time Warping (DTW); please see Appendix B for more information.

Table 2: Summary table time-series dissimilarity

| | Series | Mean | SD | Percentile 25th | 50th | 75th |
|---|---|---|---|---|---|---|
| STAN vs. WIOD | Deflator | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| | Nominal VA | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| | Real VA | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| M1 vs. STAN | Deflator | 15.51 | 18.00 | 5.28 | 8.85 | 16.48 |
| | Nominal VA | 42.52 | 51.92 | 8.46 | 18.57 | 68.36 |
| | Real VA | 46.63 | 57.77 | 10.52 | 20.77 | 60.47 |
| M1 vs. WIOD | Deflator | 15.94 | 18.15 | 5.40 | 9.62 | 17.05 |
| | Nominal VA | 42.37 | 51.92 | 7.70 | 19.37 | 67.86 |
| | Real VA | 46.50 | 57.71 | 9.71 | 20.43 | 60.97 |
| M1 vs. WN | Deflator | 77.81 | 60.92 | 35.52 | 60.75 | 103.01 |
| | Nominal VA | 32.87 | 44.24 | 1.42 | 11.51 | 54.04 |
| | Real VA | 25.57 | 38.51 | 0.85 | 5.21 | 33.63 |
| STAN vs. WN | Deflator | 79.16 | 59.36 | 38.36 | 61.43 | 105.92 |
| | Nominal VA | 63.57 | 60.96 | 22.04 | 36.52 | 82.32 |
| | Real VA | 53.48 | 54.20 | 20.31 | 33.39 | 65.71 |
| WIOD vs. WN | Deflator | 78.95 | 59.42h | 38.43 | 60.43 | 106.05 |
| | Nominal VA | 63.30 | 61.14 | 20.99 | 36.61 | 81.32 |
| | Real VA | 53.10 | 54.01 | 19.24 | 32.59 | 65.41 |

*Note:* WN: random white noise. See Appendix B for more information. M1 series following the representations in Equation 8.

We summarise these results in Table 2. The results suggest that the normalised dynamic time warping distance (nDTW)s for the m1 deflator is, on average, smaller than the nominal value-added sequences. They also have less variation. Furthermore, they outperform the placebo comparisons with the random white noise (WN) model. Lastly, a more notable variation is reported for the nominal value-added series between INDSTAT, STAN and WIOD. This result, however, is a feature of the raw data generation discussed earlier and not the result of using our proposed deflator method m1.

# 4 Expansion of country- and inter-temporal coverage

In the previous section, we proposed a new way to derive real value-added data based on INDSTAT data (*Method 1*). As illustrated in Table 1, this method allows us to derive real value-added data for a much greater sample of countries than available in the STAN or WIOD database. At the same time, we acknowledge that despite this improvement in data coverage, the availability of real value-added data using (*Method 1*) still varies considerably and is generally much higher for western, high-income countries.

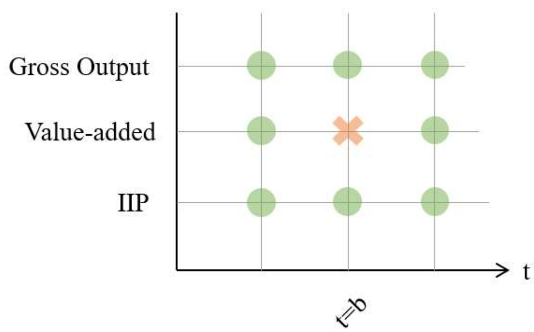
## 4.1 Extensions built on Method 1

### 4.1.1 Alternative methods

As argued earlier, the single deflation method introduced as *Method 1* (*m1*) represents the backbone of our analysis and is the first and best choice for modelling sectoral real value-added series in our data set. This method relies on gross output, nominal value-added and IIP sequences to calculate real value-added. However, data gaps in either of these three series may result in a partial or complete lack of real value-added when applying *m1*. This section addresses this issue by introducing various alternative methods to overcome these challenges.

**Method 2.** *Method 2* (*m2*) addresses a case where gross output measures for the base year are not available. This is a significant problem, as one missing observation alone is enough to make m1 infeasible, even if nominal value-added and gross output data, as well as the IIP sequences are readily available; see Figure 2 for a visual representation of the problem.

Figure 2: Visual representation of *Method 2*



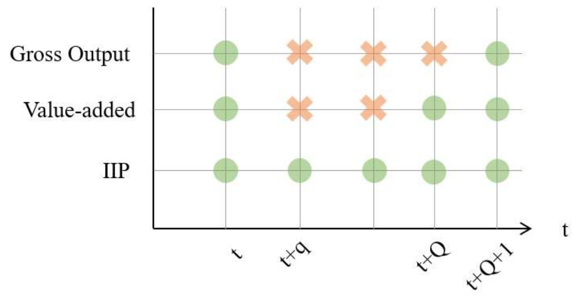

In this scenario, *Method 2* employs spatial interpolation techniques to recover only one observation, i.e. the base-year value for gross output $\tilde{GO}_{bs}$.[13] Then, real value-added can be calculated as:

$$rVA^{m2}_{ist} = nVA_{ist} \times \frac{\tilde{GO}_{isb}}{GO_{ist}} \times IIP_{ist}. \tag{9}$$

**Method 3.** *Method 3* (*m3*) addresses gaps in the data for nominal value-added and gross output; see Figure 3 for a visual representation of the problem.

[13] For the remainder of the paper, any spatially interpolated sequence $x_t$ is designated $\tilde{x_t}$. For any spatially interpolated series, we use three competing measures of economic proximity. These are *gross capital formation*, *trade*, and *natural resources*, i.e., $j = \{cf,\ td,\ nr\}$, respectively. We obtain the data from the World Development Indicator (WDI) database. See Appendix A for a detailed description of the spatial interpolation technique used throughout this paper.

Figure 3: Visual representation of *Method 3*




In this case, we assume that the ratio of nominal value-added and gross output for the gap follows a linear progression between the respective share we observed right before and after the gap. In other words, for a given gap of length $Q$ such that we lack both nominal value-added and gross output data for a particular sector $s$ of country $i$ for the periods $(t+1,...,t+Q)$, we assume that the change of the ratio between nominal value-added and gross output for this period — given by $y_{is(t+q)} = nVA_{is(t+q)}/GO_{is(t+q)}$, $q = 1,...,Q$ — follows a linear interpolation between the last two known points, i.e. $y_{ist}$ and $y_{is(t+Q+1)}$. Then, for a given $q$, the linear interpolation between the two closest points of reference can be expressed as:

$$\frac{y_{is(t+q)} - y_{ist}}{(t+q)-t} = \frac{y_{is(t+Q+1)} - y_{ist}}{(t+Q+1)-t}.$$

Solving for $y_{is(t+q)}$ we obtain:

$$y_{is(t+q)} = \frac{y_{ist}((t+Q+1)-(t+q)) + y_{is(t+Q+1)}((t+q)-t)}{(t+Q+1)-t}$$

which we then use to calculate the real value-added series for industry $s$ of country $i$ for the period $t+q, q = 1,...,Q$ as

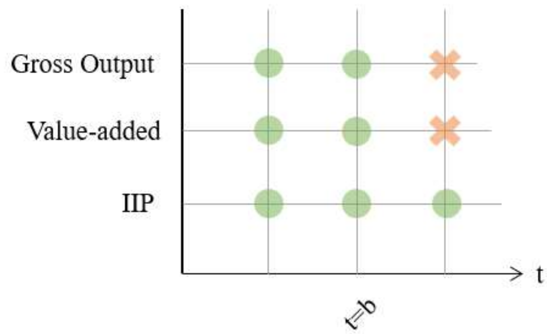
$$rVA^{m3}_{is(t+q)} = y_{is(t+q)} \times GO_{isb} \times IIP_{ist}.$$

#### 4.1.2 Extrapolation methods

While the previous section introduced methods to accommodate the existence of data gaps in existing data series, we now turn to scenario where we want to use existing data to extend the data coverage (also referred to as the 'extrapolation methods').

**Method 4.** *Method 4* (*m4*) imposes a more stringent assumption on the evolution of the growth output ratio, namely that the volume changes in production output can be used to extrapolate real value-added to any point in time $t$; see Figure 4 for a visual representation of the problem.

Figure 4: Visual representation of *Method 4*



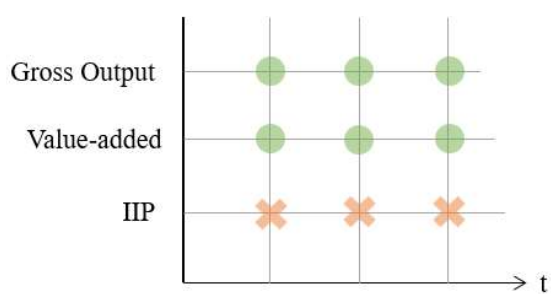

Compared to the previously introduced deflation method, which deflates nominal value(s) of year $t$ to derive real value-added of that respective year, the extrapolation method applies the output volume index to nominal value-added in the base year. It then extrapolates the value-added series for the period. More precisely,

$$QV_{ist} \approx QV_{isb} \times IIP_{ist} = \frac{QV_{isb}}{QG_{isb}} \times (QG_{isb} \times IIP_{ist}),$$

which implies that *Method 4* assumes a constant ratio of value-added to output that is equivalent to the value of the base year $b$ for all time periods, i.e., $y_t = y_b \; \forall \; t$.

**Method 5.** *Method 5 (m5)* is used in the absence of any $IIP$ series; see Figure 5 for a visual representation of the problem.

Figure 5: Visual representation of *Method 5*




In this case, we use a spatially interpolated IIP similar to Method 2 as,

$$\tilde{Def}^{j}_{ts} = \frac{GO_{bs}}{GO_{ts}} \times \tilde{IIP}^{j}_{ts} \tag{10}$$

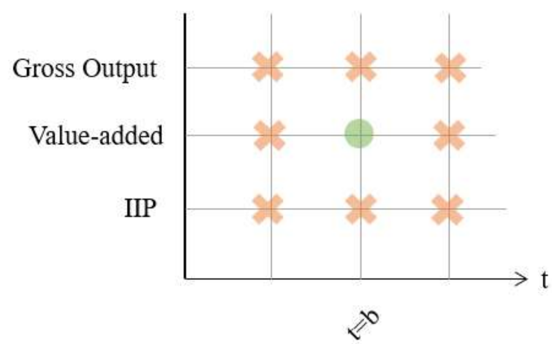
for *gross capital formation*, *trade*, and *natural resources*, i.e., $j = \{cf,\ td,\ nr\}$, and the obtained deflator $\tilde{Def}^{j}_{ts}$ is then plugged into Equation 7.

### 4.1.3 Hybrid forms

We also generate a set of hybrid forms of Method 4 and Method 5, which slightly deviate from each other. The reason behind this is to allow for more flexibility in the way the different competing deflator methods are calculated.

**Method 4.5.** *Method 4.5 (m4.5)* addresses the issue when the only available data sequence for a sector-country combination is nominal value-added for the base year as in *Method 4 (m4)*; see Figure 6 for a visual representation of the problem.

Figure 6: Visual representation of *Method 4.5*



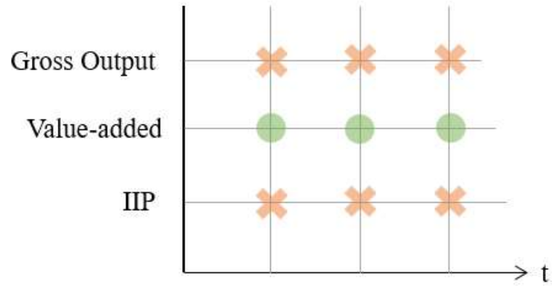

Instead of the actually observed IIP series, *Method 4.5 (m4.5)* uses spatially interpolated IIPs following the same procedure as outlined in *Method 2*. It is hence calculated as:

$$rVA^{m4.5}_{its} = nVA_{isb} \times \tilde{IIP}_{ist},$$

where the IIP series is generated using interpolation. In this setup, we assume a constant gross output ratio similar to *Method 4*.

**Method 4.5.Def.** Lastly, in *Method 4.5.Def (m4.5.Def)*, we resort to an interpolated deflator together with nominal value-added data for the respective country-sector case; see Figure 7 for a visual representation of the problem.

Figure 7: Visual representation of Methods *4.5.Def* and *6*




.

It uses the same spatially interpolated deflator of Method 2 which is then used to calculate real value-added as:

$$rVA_{its}^{m45.Def} = nVA_{ts} \times \tilde{Def}_{ist} \tag{11}$$

It is the most stringent model as it not only assumes a constant value-added-gross-output ratio $y$ but also that gross output in the base year as well as the IIP of country $i$ can be recovered from a spatial interpolation process; please refer to Appendix A for more information on that particular procedure.

#### 4.1.4 Regression methods

Finally, *Method 6 (m6)* uses a regression-type approach to obtain $rVA$ patterns without an $IIP$ series for the corresponding country's sector, similar to Method 5; see Figure 7 for a visual representation of the problem. The regression methods follow these steps:

1. First, the following regressions are run for each sector $s$ and all countries for which we have a sub-sector-specific deflator series as defined in Equation 8. In an alternative setup we run the same model for all countries for which a deflator is available via Equation 8 or Equation 10.

2. The estimates are then taken to calculate a deflator for all countries $r$ that lack this series but have manufacturing value-added deflators applying either Equation 8 or Equation 10 to:

$$\hat{Def}_{rst} = \hat{\beta}_1 \times MVADEF_{rt} + \hat{\beta}_2 \times MVADEF_{rt}^2 + \hat{\beta}_3 \times MVADEF_{rt}^3$$

3. Finally, rVA is calculated in a similar manner as in Method 1.

## 4.2 Selection rule

The various methods differ notably in their assumptions which we summarise in Table 3. The availability of a multitude of competing methods produces a trade-off. On the one hand, methods based on fewer and less stringent assumptions of the underlying model should be favoured for data integrity. On the other hand, it is plausible to assume that the more abstract methodologies, in particular, assume away some of the variability of the respective data components and may be most useful for improving data coverage. While our goal is to build the most comprehensive data set possible, we do not wish to accomplish this by compromising the validity of our data based on an unreliable data mining exercise. We benchmark the data sequences produced with m2 to m6 against m1 using the same tools we employed to assess the similarity between m1 and the STAN and WIOD data sets.

Table 3: Summary methods

| Method | Formula | Remark |
|---|---|---|
| *m1* | $rVA^{m1}_{ts} = nVA_{ts} \times \frac{GO_{bs}}{GO_{ts}} \times IIP_{ts}$ | - |
| *m2* | $rVA^{m2}_{ist} = nVA_{ist} \times \frac{\tilde{GO}_{isb}}{GO_{ist}} \times IIP_{ist}$ | $\tilde{GO}_{bs}$ obtained through spatial interpolation. |
| *m3* | $rVA^{m3}_{s,(t+q)} = y_{t+q} \times GO_{bs} \times IIP_{ts}$ | $y_t$ assumed to follow a linearly interpolated gap of length $Q$ for which both nominal value added and growth outputs is not available. The interpolation is based on the last (first) observation before (after) the gap of the respective ratios of nominal value added and output, i.e. $y_t$ and $y_{t+Q+1}$. |
| *m4* | $rVA^{m4}_{st} = \frac{nVA_b}{QG_b} \times QG_b \times IIP_t$ | Assumes a constant ratio of value added to output that is equivalent to the value of the base year $b$ for all time periods, i.e. $y_t = y_b \; \forall \; t$ |
| *m5* | $rVA^{m5}_{ts} = nVA_{ts} \times \frac{GO_{bs}}{GO_{ts}} \times I\tilde{I}P_{ts}$ | Interpolated IIP series. |
| *m4.5* | $rVA^{m4.5}_{ts} = nVA_{bs} \times I\tilde{I}P_{ts}$. | Same and constant ratio of value added and gross output $y_b$, interpolated IIP series. |
| *m4.5.Def* | $rVA^{m45.nVAiDEF}_{ts} = nVA_{ts} \times \tilde{Def}^{j}_{ts}$ | Interpolated deflator. |
| *m6* | - | Based on regression approach. |

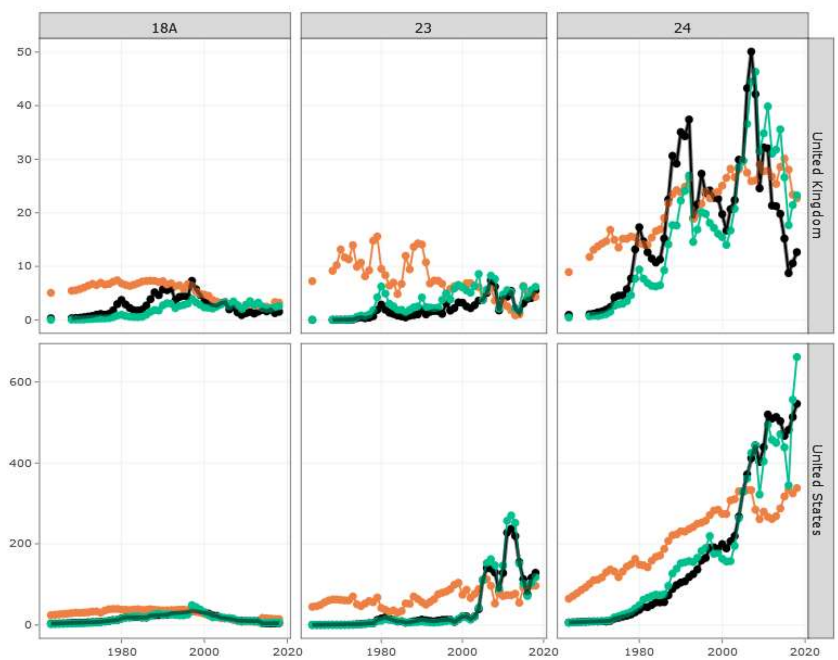
*Note:* Subscripts $i$ surpressed for the sake of clarity. $y_{st} = nVA_{st}/GO_{st}$.

**Visual similarity.** We briefly visualise the differences in predicted value-added patterns for the respective series. Figure 8 visualises real value-added series based on the different methods for a set of selected countries to provide a simple snapshot of the similarities and differences of the various data processes.[14] The results presented in this figure are representative in that the

[14] We cannot offer extensive visual evidence for all possible country-sector combinations in this paper. Therefore, we provide a dynamic online tool accessible at`https://amannj.shinyapps.io/rVA_Explorer/` for the interested

observed patterns seem to follow through for most country-sectors. In most cases, there is a very close relationship between m1 and m2, which is no surprise as these two methods are most closely related. At the same time, some of the less conservative methods allow us to collect significantly more observations over time. They also introduce some more volatility, however. On the other hand, m6 seems to perform relatively poorly compared to all other methods, so we decided to drop this procedure from the pool of potential approaches to increase data coverage before moving on to the numerical analysis. Some initial visual evidence suggests that m2 tends to overestimate historic rVA relative to the m4.5Def family, which seems to follow m1 much more closely.

Figure 8: Real value-added series based on different methods, selected countries.

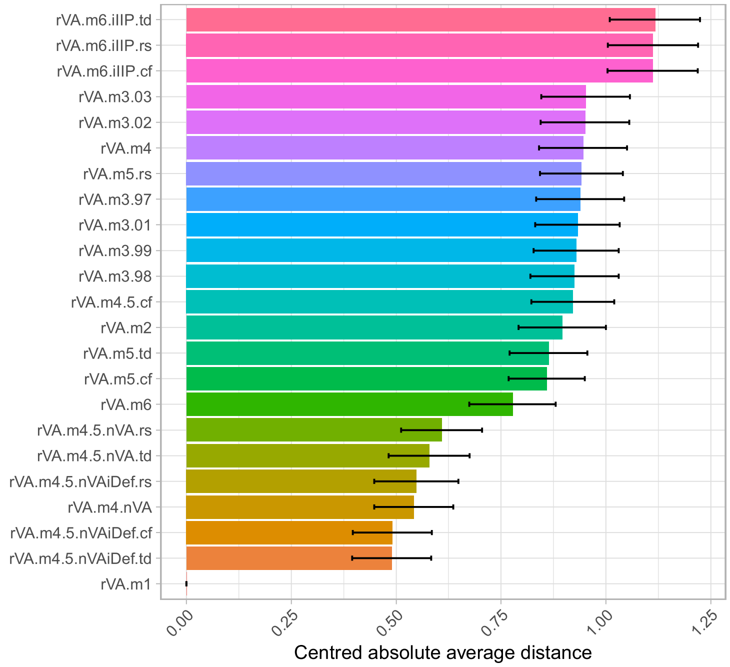



*Note:* Figure extracted from `https://amannj.shinyapps.io/rVA_Explorer/` for methods *m1* (black), *m2* (orange) and *m4.5Def.td* (green).

**Numerical similarity.** To arrive at a quantifiable hierarchical order of the various deflation procedures, we resort to Hierarchical Clustering (HC), which allows us to rank-order real value-added sequences based on their degree of similarity. See Appendix B.2 for a more detailed description of the analysis. Figure 9 indicates that, on average, the most similar real value-added sequences relative to m1 are those that belong to the *m4.5.nVAiDef* family; here, the series with the interpolated deflator using trade openness performs best in that it is most similar to m1 as demonstrated by the smallest centred absolute average distance.

reader to further explore the differences in the data.

Figure 9: Hierarchical clustering by method




*Note:* Central absolute average distance by real value-added sequence following method described in Appendix B.2

**Data coverage across real value-added sequences.** Table 4 summarises the coverage of all competing methods in terms of how many additional data points they add over *m1*, broken down by region and income group. There is a notable difference in how well the different methods perform regarding data coverage. For example, *m2* does not provide additional data on top of *m1*. Given the relatively high average absolute distance to *m1*, this indicates that *m2* is inappropriate for extending real value-added coverage—furthermore, the *m4.5.nVAiDef* family again performs encouragingly. [15]

[15] Note that the conditional data generating capacity as highlighted in Table 4 does *not* correspond to the final real value-added data frequency, which is the result of the final data selection we introduce in the next section. Rather, it counts the number of observations each method may add to *m1*, when applying the final selection criterion (1), without any further selection step. Presenting these capacities in Table 4 is instructive to learn how much additional data each method might add to *m1*. To what extent these potential observations ought to be implemented in the final data set is a different question.

# Table 4: Data generation capacity by method

| | | Additional observations over M1 | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | m1 | m2 | m3.01 | m3.02 | m3.03 | m3.97 | m3.98 | m3.99 | m4 | m4.5.cf | m4.5.nVA.cf | m4.5.nVA.rs | m4.5.nVA.td | m4.5.nVAiDef.cf | m4.5.nVAiDef.rs | m4.5.nVAiDef.td | m4.5.rs | m4.5.td | m4.nVA | m5.cf | m5.rs | m5.td | m6 | m6.iIIP.cf | m6.iIIP.rs | m6.iIIP.td |
| **Region** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| East Asia & Pacific | 7797 | 0 | 1054 | 1101 | 1152 | 1039 | 1010 | 1016 | 851 | 5675 | 3445 | 3226 | 3445 | 3257 | 3092 | 3257 | 4628 | 5675 | 540 | 2605 | 2454 | 2605 | 1162 | 1242 | 1242 | 1242 |
| Europe & Central Asia | 21599 | 0 | 2816 | 2707 | 2709 | 2464 | 2477 | 2473 | 2870 | 14810 | 5376 | 4720 | 5376 | 5376 | 4720 | 5376 | 11813 | 14810 | 1575 | 3005 | 2634 | 3005 | 1478 | 1899 | 1899 | 1899 |
| Latin America & Caribbean | 6955 | 0 | 1525 | 1227 | 1191 | 1229 | 1526 | 1526 | 1123 | 3967 | 5873 | 4991 | 5873 | 5867 | 4985 | 5867 | 3155 | 3967 | 1611 | 1377 | 1350 | 1377 | 270 | 1143 | 1143 | 1143 |
| Middle East & North Africa | 4677 | 0 | 828 | 832 | 507 | 794 | 817 | 828 | 583 | 4718 | 5320 | 4641 | 5320 | 5289 | 4640 | 5289 | 3997 | 4736 | 1227 | 2747 | 2489 | 2747 | 986 | 1457 | 1457 | 1457 |
| North America | 1894 | 0 | 107 | 107 | 107 | 107 | 107 | 107 | 21 | 10 | 68 | 68 | 68 | 68 | 68 | 68 | 10 | 10 | 94 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| South Asia | 993 | 0 | 910 | 11 | 11 | 910 | 910 | 910 | 11 | 15 | 2091 | 1839 | 2091 | 2087 | 1839 | 2087 | 15 | 15 | 948 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Sub-Saharan Africa | 2847 | 0 | 675 | 659 | 422 | 483 | 494 | 649 | 480 | 5912 | 7270 | 6582 | 7279 | 6921 | 6284 | 6961 | 5237 | 5929 | 1067 | 3105 | 2917 | 3109 | 381 | 2013 | 2013 | 2013 |
| **Income group** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| High | 17933 | 0 | 1935 | 1829 | 1834 | 1747 | 1921 | 1928 | 1372 | 5359 | 5009 | 5009 | 5009 | 4895 | 4896 | 4895 | 5359 | 5359 | 1479 | 3075 | 3075 | 3075 | 1682 | 2211 | 2211 | 2211 |
| Upper mid. | 11284 | 0 | 1296 | 1023 | 959 | 1096 | 1153 | 1246 | 949 | 3102 | 4001 | 4001 | 4001 | 3895 | 3895 | 3895 | 3102 | 3102 | 1354 | 1414 | 1414 | 1414 | 440 | 792 | 792 | 792 |
| Lower mid. | 8892 | 0 | 1685 | 1286 | 934 | 1403 | 1471 | 1494 | 1134 | 5505 | 7158 | 7166 | 7158 | 7100 | 7100 | 7100 | 5517 | 5505 | 1727 | 3433 | 3441 | 3433 | 1163 | 2253 | 2253 | 2253 |
| Low | 2480 | 0 | 716 | 404 | 336 | 549 | 513 | 566 | 422 | 4879 | 5733 | 5764 | 5737 | 5687 | 5687 | 5687 | 4932 | 4895 | 866 | 2762 | 2782 | 2766 | 68 | 1323 | 1323 | 1323 |

*Note:* Data generation capacity by method merely counts the numbers of observations each method may add to m1 without any further selection step.

**Final selection.** Based on this information, we compile the final real value-added data set, which is built on the following selection procedure:

1. We select *m1* for a particular country/sector combination if m1 data exist for at least two periods in time for that particular country/sector combination.

2. If only fewer than two periods' worth of data can be obtained using m1, we check whether *m4.5.nVAiDef.dt* data exist for at least two periods for that particular country/sector combination.

Using this procedure, we end up with a final data set that extensively improves the existing data sets. This is demonstrated in Table 5, which summarises the number of observations (by region, income group and sector) for which real value-added data have become available after employing our methodological extensions.[16]

Table 5: Data coverage extended data set

| | *M1* | Final |
|---|---|---|
| **Region** | | |
| East Asia & Pacific | 7797 | 10311 |
| Europe & Central Asia | 21428 | 26251 |
| Latin America & Caribbean | 6937 | 11644 |
| Middle East & North Africa | 4677 | 9547 |
| North America | 1894 | 1958 |
| South Asia | 993 | 2478 |
| Sub-Saharan Africa | 2847 | 8639 |
| **Income group** | | |
| High | 17933 | 19254 |
| Upper-middle | 2480 | 5029 |
| Lower-middle | 8892 | 12039 |
| Low | 11284 | 14372 |
| **ISIC II-digt sector aggregate** | | |
| (15) Food and beverages | 2541 | 3524 |
| (16) Tobacco | 2356 | 3298 |
| (17) Textiles | 3443 | 4786 |
| (18A) Wearing apparel | 3405 | 4769 |
| (20) Wood products | 3672 | 5012 |
| (21) Paper and paper products | 3275 | 4391 |
| (22) Printing and publishing | 3339 | 4521 |
| (23) Coke, petroleum and nuclear | 2485 | 3403 |
| (24) Chemicals | 3277 | 4547 |
| (25) Rubber and plastic | 3319 | 4677 |
| (26) Non-metallic minerals | 3545 | 4714 |
| (27) Basic metals | 3062 | 4102 |
| (28) Fabricated metals | 3410 | 4733 |
| (29C) Machinery | 3061 | 4062 |
| (31A) Computer and electronics | 2985 | 4058 |
| (33) Precision instruments | 2177 | 2972 |
| (34A) Motor vehicles | 3010 | 4091 |
| (36) Furniture and n.e.c. | 3172 | 4315 |

*Note:* *M1*: Data coverage of m1 (see also Table 4). Final: *M1* data plus ' rVA.m4.5.nVAiDef.td' following selection rule in section 4.2.

[16] Note that the numbers of observations for *m1* in Table 4 and Table 5 do not necessarily correspond to the counts in Table 1. The former two condition on the final selection criterion (1), that is, we select m1 for a particular country/sector combination if m1 data exist for at least two periods in time for that particular country/sector combination. In turn, Table 1 merely counts the number of observations produced by applying *m1* to the raw INDSTAT data without imposing any further requirements on the individual series. This is because Table 1 attempts to illustrate the superior data coverage of INDSTAT when employing *m1* alone. In contrast, tables 4 and 5 illustrate the extent to which the methodologies described in this paper can help further extend the coverage of INDSTAT in the most sensible way.

# 5 Patterns of manufacturing development based on the expanded manufacturing value-added data

## 5.1 The structural change literature over time

In this section, we discuss the manufacturing sector's development and structural transformation patterns based on the previously presented, new and comprehensive real value-added data set. Given its extended coverage and scope, this analysis serves the purpose of revisiting earlier studies in the literature and newly uncovered dynamics of structural transformation within manufacturing for country groups that have yet to be well studied in a comparative, cross-sectional setting. We do so by linking our novel data with the traditional empirical practices of the structural change literature, which we briefly summarise in the paragraphs below; see Haraguchi and Amann (2021) for a more detailed discussion and review.

In the first attempts, structural changes in the economy were illustrated by changes in the actual levels and shares of different sectors across countries and over time; see among others Clark (1957); Hoffmann (1959); Kuznets (1966). Chenery (1960) sought to formalise previous empirical studies by identifying regularities of growth of the different sectors through regression estimations. Recognising the effect of country size on the slope and the intercept of development patterns, Chenery and Taylor (1968) expanded their previous work by dividing countries into subgroups of large and small countries and estimating the patterns of the two groups separately. By contrast, Syrquin and Chenery (1975); Chenery et al. (1986); Syrquin and Chenery (1989) delved further into the issues of non-linear development patterns and the importance of country characteristics and their impact on manufacturing development patterns. After Syrquin and Chenery (1989), there is no continuation of similar studies on development patterns.

These earlier studies have contributed significantly to the understanding of the general patterns of industrialisation relative to other sectors. They have shed light on how changes in income levels and differences in given country characteristics, such as country size, influence a country's level of industrialisation. Except for the studies mentioned here, most earlier studies on development patterns focused primarily on broad economic sectors with only a minor treatment of individual manufacturing industries, if at all. Besides the lack of in-depth analyses within the manufacturing sector, previous studies generally shared the following conditions. This underscores the importance of taking a fresh look at manufacturing development patterns.

- Due to the lack of real value-added data, most of the previous studies, including the comprehensive work by Syrquin and Chenery (1989) used the share of value-added in GDP. The development trajectories of individual industries are not very clear in those studies because individual shares are influenced by the ups and downs of the shares of others. Therefore, the results are not suited for analysing how manufacturing industries develop and cannot be used as a benchmark to assess the performance of a country's particular industry, as is the case in this study.

- The periods covered by previous studies focus mainly on the 'heyday' of industrialisation. There was no concern of premature de-industrialisation. There was even little sign of normal de-industrialisation process in the last research carried out by Syrquin and Chenery (1989), which covers the period 1953 to 1983. Thus, it is possible that the patterns of industrialisation were only partially expressed in past studies (Haraguchi and Amann, 2021).

- While having recognised the effect of country size on both the initial level and subsequent growth patterns of industrial development, earlier studies used somewhat arbitrary population thresholds to classify countries into different size groups. We follow up on this by providing an extensive econometric testing procedure of potential threshold effects.

- As the previous analysis highlights, our new data set provides the most inclusive data on this topic, compared with, e.g. Syrquin and Chenery (1989, Table 7). This allows us to analyse structural change dynamics for previously excluded countries.

## 5.2 Empirical approach

**Basic set-up.** The general empirical setup of the industry-level analysis follows earlier methodological approaches in the literature. More specifically, we estimate a panel fixed effects model to analyse the development patterns for $s = 18$ manufacturing industries and focus on ten dominant sub-sectors; see Table 8 for a complete list and description of the manufacturing sub-sectors.[17] In addition to the INDSTAT database, our empirical analysis uses GDP data taken from the Penn Word Data on real GDP from the Penn World Table database (Feenstra et al., 2015). We also use the World Bank's country classification data (World Bank, 2021). These industry classifications follow the OECD's technology intensity definition for ISIC Rev.3 (OECD, 2011a). See Table 8 for more information on the classification. For each sub-sector $s$, we run a separate regression which takes the form:

[17]These are (15) food and beverages; (17) textiles; (18) wearing apparel; (24) chemicals; (26) minerals; (27) basic metals; (28) fabricated metals; (29C) machinery; (31A) electrical machinery and (34A) motor vehicles.

$$y_{it} = \boldsymbol{\beta}\mathbf{X}_{it} + \boldsymbol{\gamma}\mathbf{Z}_{it} + \epsilon_{it}, \tag{12}$$

where $y_{ist}$, the independent variable, is the log of real value-added per capita, which we construct based on the discussion in the previous section. Furthermore, $\mathbf{Z}$ includes a set of controls, including time and country fixed effects for each country and industry. The explanatory variables in $\mathbf{X}_{it}$ contain the logs of real GDP per capita. They are added in their linear, quadratic and cubic representation, i.e. $\{log(rGDP_{it}),\ log(rGDP_{it})^2,\ log(rGDP_{it})^3\}$. Consequently, $\boldsymbol{\beta}_s$ contains the industry-level coefficients for each regression and $\epsilon_{it}$ denotes the idiosyncratic error component. We use a fixed-effects (FE) setup to capture endogeneity arising from variations in time-invariant firm attributes, regional and industry-specific market conditions and technology-related developments (Mundlak, 1978; Wooldridge, 2005). To this end, the error term in Equation 12 has the following structure:

$$\varepsilon_{it} = \alpha_i + D_{st} + e_{it}, \tag{13}$$

where $\alpha_i$ denotes industry-specific intercepts while industry-year interactions ($D_{st}$) capture industry-specific market conditions and technology-related developments.

**Accounting for country-size related differences.** In following the insights from earlier studies in this field, we acknowledge that country size has an overarching influence on economic structural change in terms of its intrinsic endowment and the dynamism of structural transformation along the income trajectory. Thus, instead of including the population in the equation as an additional explanatory variable, we follow the literature by dividing countries into three different country-size groups, which we determine based on a threshold value for the mean population of the country throughout the data cycle. In contrast to earlier studies, which often rely on exogenously determined thresholds, we apply modern econometric techniques to identify the respective threshold values.

We do so by employing two different sets of tests. First, we apply the panel threshold regression model in Hansen (1999), which we base on an artificial aggregate by summing up all available industries per country to obtain an artificial measure of aggregated real manufacturing value-added. Based on this aggregated measure, we identify two significant thresholds at a mean population level of 5 million and 18 million, respectively. Despite its advantages, the panel threshold estimator in Hansen (1999) is not free of pitfalls. Most importantly, it requires the existence of a strongly balanced panel which we try to accommodate by employing aggregation to include as comprehensive a data series as possible. In doing so, we acknowledge that some industry-country aggregates consist of non-homogeneous sub-samples across units. To check the validity of this approach, we also run a country-industry-specific grid-search procedure to identify structural instabilities on the lowest level of aggregation, which we lay out in Appendix C. We identify thresholds at population ratios of 5 million and 18 million, representing the cut-offs to distinguish between small, medium and large countries. Moreover, these cut-offs seem to be relatively persistent across the specification. Consequently, we introduce a dummy identifier matrix for each country-size group $\mathbf{SD}_{isd} = I(\lambda_0 < mean\ population_i < \lambda_1)$, and $\lambda$ is given by the previously determined country-size population threshold values for small ($\lambda_0 = min(mean\ population), \lambda_1 = 5mil$), medium ($\lambda_0 = 5, \lambda_1 = 18mil$) and large ($\lambda_0 = 18, \lambda_1 = max(mean\ population)$) countries. More formally:

$$y_{it} = \left(\boldsymbol{\beta}_i' \mathbf{x}_{it}\right) \times I_{(z_{it} \in Z)} + \varepsilon_{it}, \tag{14}$$

where $I(\cdot)$ is an indicator function which takes the value one if condition $Z$ is met for a particular observation in our data $z_{it}$.

## 5.3 Results

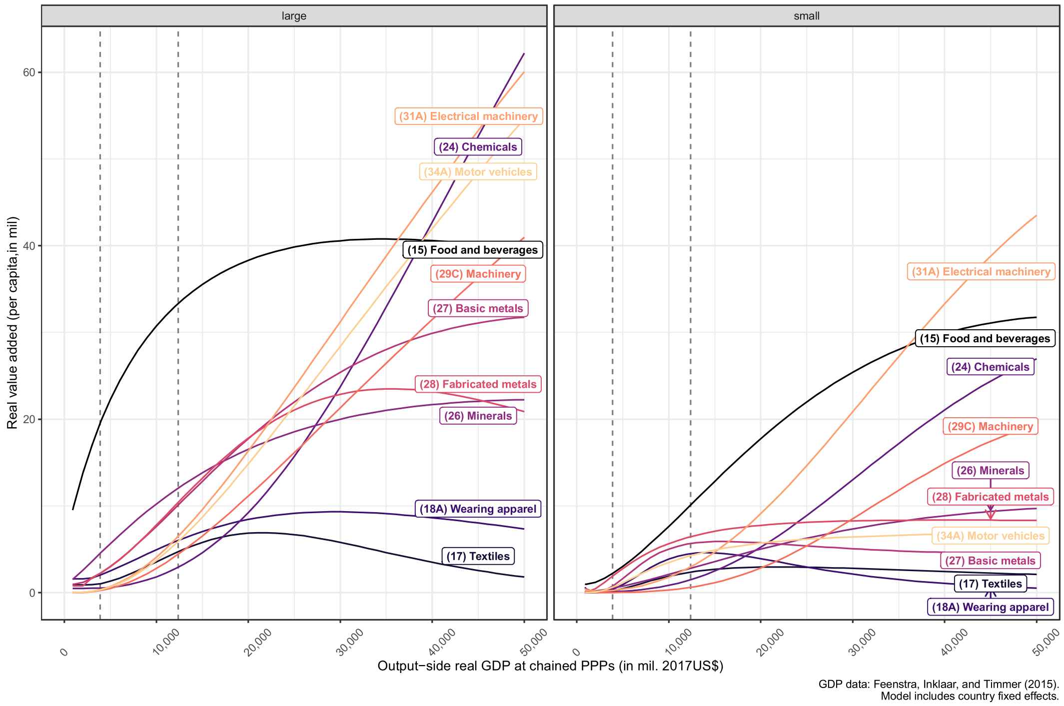
We present the empirical analysis of the industry-level performance of selected industries and countries based on our research on data. We first focus on absolute performance across industries for different income ranges and country-level specifications before suggesting a way to examine relative performance patterns across industry-country pairs more closely.

### 5.3.1 Structural change dynamics across sectors

In Figure 10, we produce the aggregated results using our proposed method for a selection of ten manufacturing sectors by country size and distinguish between large countries (with a mean population of greater than 18 million) and small ones (less than five million), respectively.

Both groups develop low-tech industries, i.e., (15) food and beverages, (17) textiles, and (18A) wearing apparel, and medium-tech or resource-based industries, (26) minerals, (27) basic metals and (28) fabricated metals) at low-income levels. While the food and beverages industry has significant weight in a country's manufacturing value-added across income levels, medium-tech industries grow more than textiles and wearing apparel industries and slow down as countries move to high-income levels. From an upper-middle income stage (around USD 10,000 in 2017 USD), high-

Figure 10: Real value-added patterns of all countries, 10 selected sectors by country size



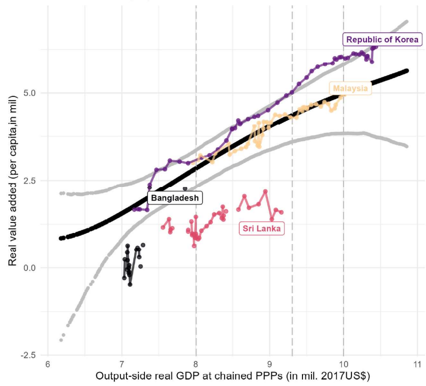

tech industries, i.e., (24) chemicals, (29A) machinery, (31A) electrical machinery and (34A) motor vehicles, proliferate and become dominant manufacturing industries at high-income levels. Unlike other industries, these capital- and technology-intensive industries could sustain growth even at high-income levels. Apart from the similarity in the general pattern of manufacturing development, the two groups exhibit some distinct differences. For example, large countries experience more dynamic structural change and show different growth prospects for each low-tech, medium-tech and high-tech industry group. For small countries, the differences in growth between low-tech and medium-tech industries are not as significant as for large countries. Overall, the manufacturing sector of large countries has a higher development potential than that of small countries. As regards patterns of development across industries, one notable difference between large and small countries is the motor vehicle industry. Without exhausting the scope of the analysis of manufacturing development patterns, which we will leave for future research, our analysis convincingly validates the importance of accounting for a particular country- and industry-specific differences in absolute performance measures of the respective industries. Our expanded real value-added data allowed us to illustrate more accurate and granular patterns of manufacturing development, exhibiting the ebbs and flows of various manufacturing industries at different income levels.

### 5.3.2 Relative and absolute convergence: A country-level analysis

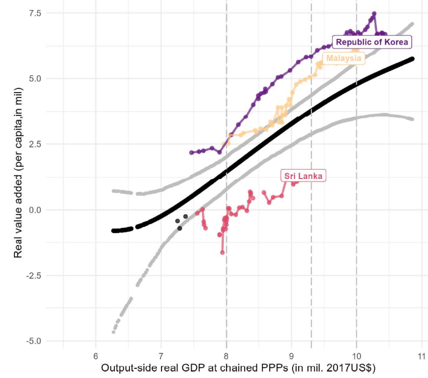
A very different aspect policymakers might be interested in is the relative performance of a given industry compared to the representative world average and/or a set of comparable countries. In our attempts to elaborate an adequate measure of relative performance, we argue that this paper improves the current status quo by providing a comparable data set for many developing countries for whom a cross-country comparison exercise is particularly helpful. While we have illustrated the increased data coverage for this group of countries in Table 1, we explicitly want to validate this case by comparing the performances of three large Asian countries' manufacturing industries. The approach proposed in this study allows us to take a unique glimpse at the developments of this set of countries, which would have otherwise remained hidden if relying on other data sources.

Figure 11 shows the value-added per capita levels in a log scale and their changes across income levels for low-tech, medium-tech and high-tech industries against the estimated patterns of large countries. Overall, the Republic of Korea, Malaysia and Sri Lanka tend to follow the patterns of large countries to which they belong in terms of their population size. The Republic of Korea and Malaysia have reached an income level high enough to exhibit the industries' full development patterns. Both countries show an inverted U-curve for low-tech industries (textiles and wearing apparel) and a gradual slowdown for medium-tech industries (non-metallic and basic metals) in line with the estimated patterns. Also, as expected, they exhibit sustained growth for high-tech industries (chemicals and electrical machinery). While the countries tend to move along the patterns, they do so at different levels. The Republic of Korea consistently maintains the highest value-added among the three countries across income levels, while Malaysia remains in the middle and Sri Lanka at lower levels.

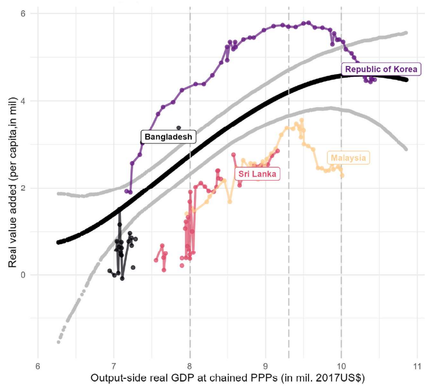
Figure 11: Absolute and relative convergence: a cross-country example



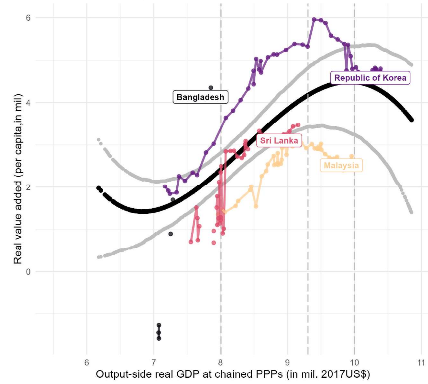

(a) (24) Chemicals



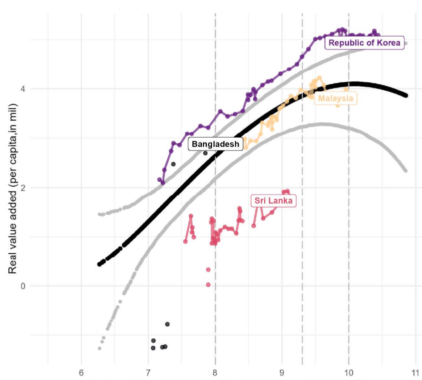

(b) (31A) Computer



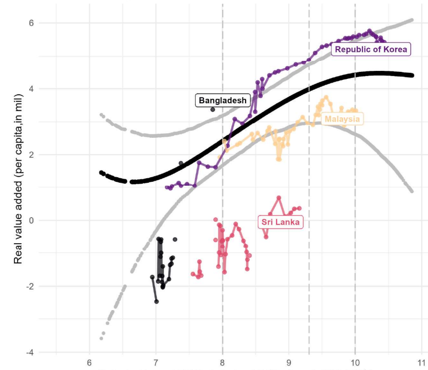

(c) (17) Textiles




(d) (18A) Wearing apparel




(e) (26) Fabricated metals




(f) (27) Basic metals

Estimated patterns and confidence intervals based on a subset of large countries (average population over sample period $\geq$ 18 mil). Residual bootstrap with $R = 1,000$ repetitions. Models include time- and county-fixed effects.

The three countries differ not only in terms of their level of manufacturing development at a given income level but also in the speed of their manufacturing development. Table 6 indicates how fast the three countries' industries developed across income levels of between USD 3,000 and USD 7,500. Since the development prospects of each industry changes at a different income level, we select an income range at which all three countries overlap. The speed of the manufacturing industry's development, expressed by value-added increase per year, was much higher in the Republic of Korea than in the other two countries. In turn, Malaysia's industries grew more quickly than Sri Lanka's, except for food and beverages, textiles and wearing apparel. Countries may have similar development patterns, but their performance differs in terms of the level and speed of manufacturing development at a given income level. As this example demonstrates, the availability of real value-added data for numerous countries and years improves the ability to benchmark manufacturing performance. First, countries can assess whether the development trajectories of their manufacturing industries are following the expected patterns. Secondly, they can evaluate whether their industries' performance is better or worse than the historical patterns or of that of other countries in the same size group, and can measure how much better or worse they are faring. Finally, the speed of manufacturing development across countries can be compared to determine how quickly industries are climbing the development curve relative to others. While not discussed in this paper, the real value-added data set could also expand productivity analyses for developing countries at the sub-sector level. None of these assessments would be possible if only nominal value-added data or real value-added data of a few countries only were available.

Table 6: Speed of Manufacturing Development

| | Speed of Manufacturing Convergence | | |
|---|---|---|---|
| Industry | Republic of Korea | Malaysia | Sri Lanka |
| (15) Food and beverages | 6.88 | 1.26 | 1.82 |
| (17) Textiles | 11.74 | 0.51 | 0.84 |
| (18A) Wearing apparel | 10.19 | 0.77 | 1.50 |
| (24) Chemicals | 4.17 | 2.36 | 0.32 |
| (26) Minerals | 2.54 | 0.77 | 0.21 |
| (27) Basic metals | 6.37 | 0.55 | 0.10 |
| (28) Fabricated metals | 7.72 | 0.31 | 0.11 |
| (29C) Machinery | 10.23 | 0.76 | 0.14 |
| (31A) Electrical machinery | 10.97 | 2.15 | 0.07 |
| (34A) Motor vehicles | 9.11 | 0.75 | 0.14 |

*Note:* The speed is expressed as the the difference of the respective sector level value added per capita figure for a country with a GDP per capita level between USD 3,000 and USD 7,500 divided by the number of years it has taken the respective country to move through this income corridor.

# 6 Conclusion

Despite the significant role industrialisation plays in economic development, especially in developing countries, the limited availability of historically comparable manufacturing value-added data has prevented many developing countries from benchmarking their performance and evaluating their industrial development trajectories. Our study first identifies methodologies that contribute to increasing the availability of real value-added data while maintaining data quality. Our method increases data availability by approximately 5 and 18 times relative to the data currently available in the STAN and WIOD databases, respectively.[18] This significant increase in data availability opens up a new avenue for research on the manufacturing performance of specific countries and on patterns of structural change and manufacturing development. Secondly, we present the analytical use of real value-added data. The patterns of manufacturing development derived from the value-added data help countries benchmark their manufacturing performance against average patterns and against those of other countries. Compared to these patterns, countries' actual industrial development deviates upward and downward in terms of level and speed. Aside from the examples we provide here, future applications of the newly available data could analyse countries' comparative advantages, country-specific and time-specific effects on industrial development, deindustrialisation tendencies, and changes in the development patterns of industries.

[18]Comparison of data coverage of the extended data set (Table 5) with that of STAN and WIOD as broken down in Table 1.

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# Appendix

## A Spatial interpolation

This section describes the spatial interpolation technique used for *Method 2 (m2)*. However, note that for m2, m5, m4.5 and m4.5Def, we spatially interpolate various variations of the IIP/deflator series. Consequently, the estimation technique outlined below remains the same until the second to last step, exclusive to m2.

For an arbitrary series $x_{ist}$, we denote the interpolated version $\tilde{x}_{ist}$, which for country $i$ at time $t$ and sector $s$ is calculated as $\tilde{x}_{ist}$ and denotes a vector of weights of all $j \neq i$ countries for the given sector $s$ and time $t$, and is calculated as follows:

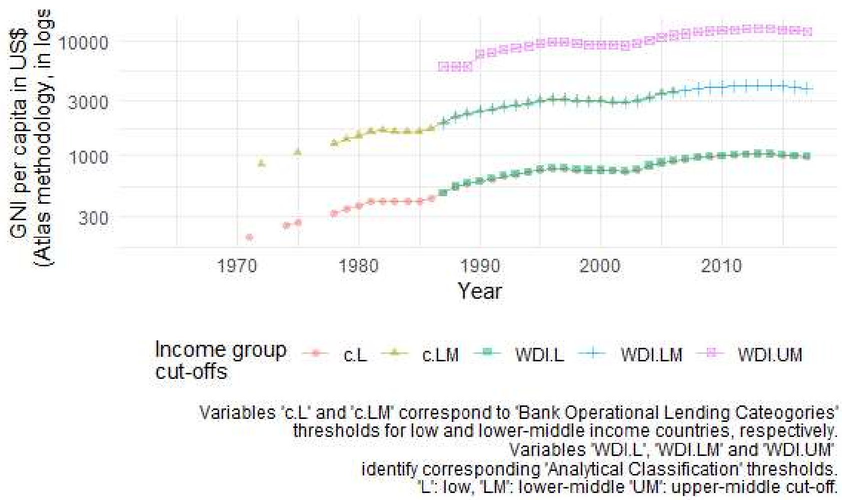
1. For each country $i$, we obtain the spatial distance between its capital and all other capitals of countries in the data set.
2. For each country $i$, we also obtain an income group classification (taken from WDI).
3. We define a possible proxy country based on the following criteria:
   (a) Their capital must lie within a certain radius (of 5,000 km).
   (b) There cannot be more than a maximum of 20 neighbours within that range (in other words, we restrict the analysis to the closest 20 most common economies).
   (c) All potential proxies must share the same income group in the same year.

   The rationale behind (c) is that potential proxy countries should be selected based on the current development pattern of the economy and not on its final stage of development. To ensure this, we rely on the historical World Bank income group classification[19], which provides time series between 1987 and 2019 for the Analytical Classification (as presented in World Development Indicators) as well as more extensive classifications following the Bank Operational Lending Categories, which extend back to 1970. Using both classifications, it is possible to provide sensible income group thresholds up to 1970 as illustrated in Figure 12.

   One problem arising from this practice is that we do not observe high-income country threshold values for the same time horizon. Instead, we are left with data up to the late 1980s only. This is a noteworthy limitation, as it prevents us from correctly mapping the transition from upper-middle- to high-income countries for around half of our data sample. At the same

[19] Available at `http://databank.worldbank.org/data/download/site-content/OGHIST.xls`.

Figure 12: World Bank Historic Income Group Thresholds




time, however, the above figures reveal that the difference between the groups remains very stable. Indeed, when calculating the threshold ratio as:

$$THR = high_t \div (middle_t - low_t)$$

observe that it remains very stable over time and close to a value of 4.14; see Figure 13 below. Consequently, one way to identify previous threshold values for high-income countries would be to set the threshold ratio at $THR = 4.14$ and solve for the cutoff:

$$high_t = (middle_t - low_t) \times 4.14$$

for any period t in which the high-income threshold level is not observed.

We also follow an alternative approach by back-casting the high-income threshold by approximating the series using its ARIMA representation and the values for the two remaining threshold values as additional explanatory variables (also known as ARIMAX). A simple ARIMAX(1,0,0) model can be written as:

$$z_t = \alpha + \phi z_{t-1} + \theta \epsilon_{t-1} + \gamma x_t + \epsilon_t,$$

where, $x_t$ represents the exogenous variable with $\theta$ containing the respective coefficients. The remaining model specification has been identified by employing and testing various autoregressive models, moving average representations of the initial data process, and selecting

Figure 13: World Bank Historic Income Group Thresholds Ratio

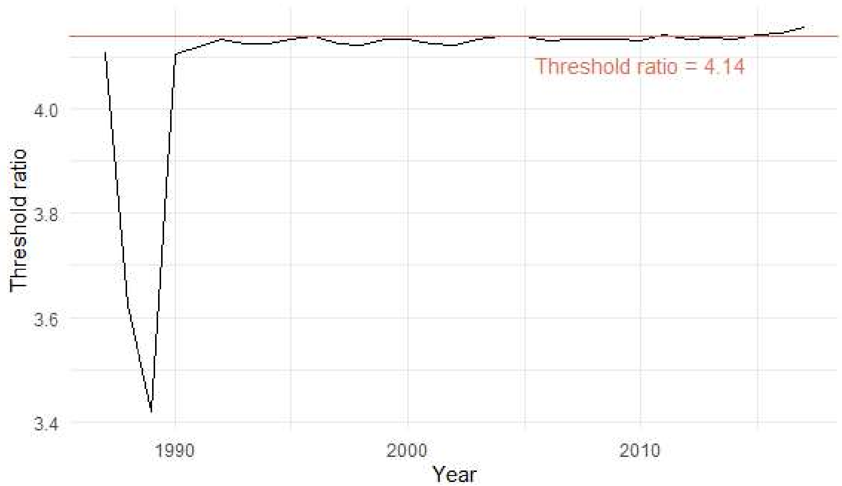
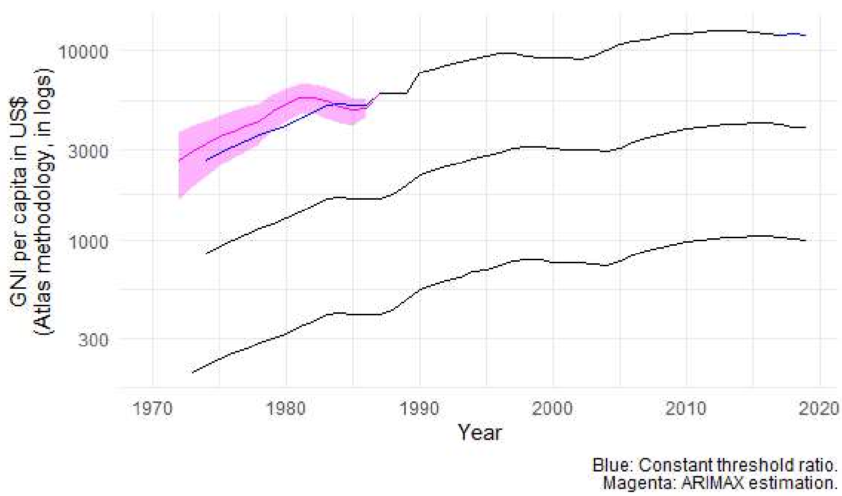



Figure 14: Extended Historic World Bank Income Group Thresholds Ratio

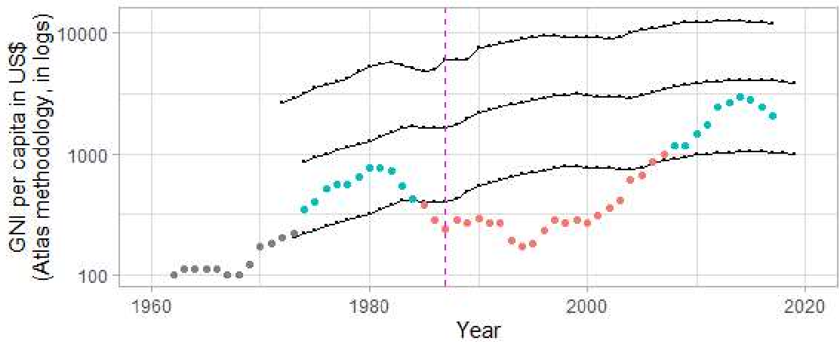



the one with minimal AIC and/or SIC. In this case, an auto-regressive model of order one has been selected.

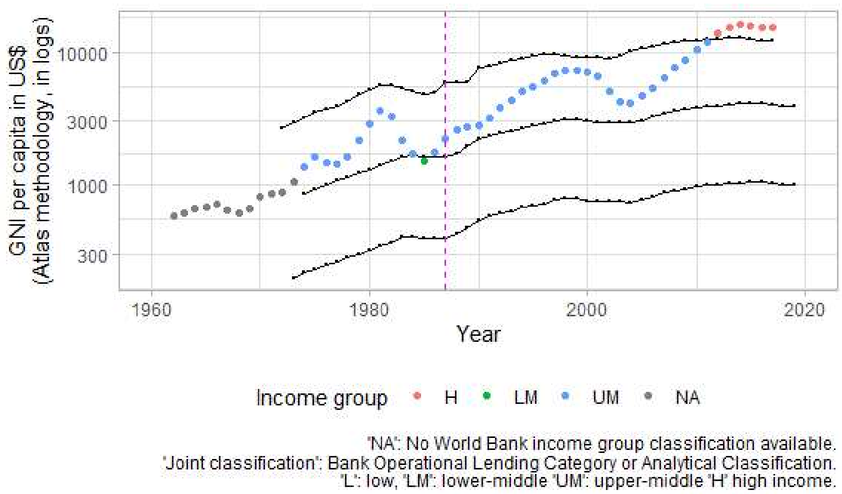
In Figure 14, we compare the differences in the upper middle-income to the high-income threshold for the pre-1987 period obtained by employing the constant threshold ratio and the ARIMAX estimation. The difference between the two measures remains moderate. Therefore, we use the simpler, constant threshold ratio cut-off to determine the upper middle- to high-income threshold for the pre-1987 period. For illustrative purposes, Figure 15 presents a few country examples with their respective time-varying income classifications and the re-constructed pre-1987 upper-middle- to high-income threshold, which we highlight with a vertical, dashed magenta line.

Figure 15: Examples of Interpolated IIP Series, selected economies

(a) Nigeria




(b) Uruguay




4. Given this selection criterion, a list of proxy countries for each country $i$ is obtained. Please note that this still does not take into account whether we are using INDSTAT data or other economic indicators that mark this possible proxy country as a valid one; the only selection criteria at this point are those listed in (a) (b) and (c) above. For a list of all potential proxy countries obtained by the spatial interpolation technique, please see Table 9.

   In other words, we apply a K nearest neighbour selection where K is determined by the selection rule outlined in (a) to (c). We do this to set a reasonable boundary on what constitutes a good proxy country, which we will use in the next step.

5. From the set of possible proxy countries, we evaluate for each sector and year whether any potential proxy countries report its deflator calculated in Equation 2 for the same year and sector. If it does, we estimate a spatially interpolated series. We employ ordinary kriging in each $\tilde{x}_{ist}$, which is modelled as the sum of a set of linear functions in $p$, the known base

function $f_j$ and $p$ unknown constants $\beta$ such that for a particular sector and period

$$\tilde{x}_i = \sum_{j=1}^{p} f_j \beta_j + e_i.$$

The base function is defined as a linear model of independent variables containing spatial data locations (coordinates) as well as a set of economic variables used in the spatial interpolation to account for 'economic similarities' among the proxy economies taken from the WDI and correspond to *gross capital formation*, *trade* and *natural resources* as a percentage of total GDP. We weigh each possible proxy country from the above list by its spatial proximity and 'economic similarity' to the target country. The different deflator projections are then evaluated using visual and numerical analyses.

6. The spatial interpolated series $\tilde{x}_{ist}$ can assume different forms, depending on which method is employed:

   - For method 2, $\tilde{x}_{ist} = \tilde{Def}^{j}_{ts}$ . This leaves us with an interpolated deflator in the form of

     $$\tilde{Def}^{j}_{ts} = \frac{\tilde{GO}^{j}_{bs}}{\tilde{GO}^{j}_{ts}} \times \tilde{IIP}^{j}_{ts}$$

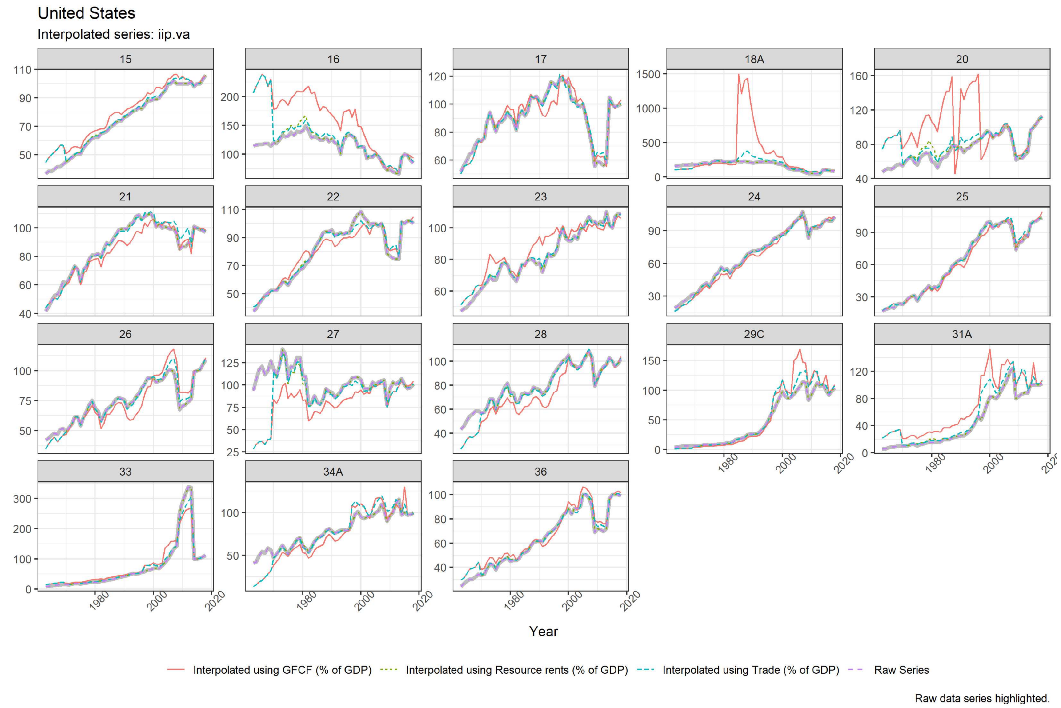
     similar to Equation 2. This allows us to recover real value-added series, as we use $\tilde{Def}^{j}_{ts}$ for m2 to recover $\tilde{GO}_{bs}$ (as $GO_{ts}$ and $IIP_{ts}$ are both known):

     $$rVA^{m2^j}_{ts} = nVA_{ts} \times \frac{\tilde{GO}^{j}_{bs}}{GO_{ts}} \times IIP_{ts}.$$

   - For the extrapolation method and hybrid forms as described in subsubsection 4.1.2 and subsubsection 4.1.3 for which an interpolated IIP series is required, we set $\tilde{x}_{ist} = \tilde{IIP}^{j}_{ts}$. We then apply the spatially interpolated IIP series to the respective methods.

A few comments on the proposed approach to the spatial interpolation technique are warranted: the procedure's sequencing is designed to first select a group of possible proxy countries based on a set of predetermined characteristics. These are intended to serve as good initial exclusion criteria - before we obtain the weights for the remaining countries after the initial selection exercise. In this sense, the pre-selection exercise imposes zero weight on all countries eliminated in this step. A complete set of visualisations is available as supplementary material here: `http://u.pc.cd/9Pm`.

Figure 16: Interpolated IIPs for different economic indicators United States




# B Similarity analysis of derived real value-added sequences

We use Dynamic Time Warping (DTW), a dynamic programming algorithm that allows us to compare two separate time series and aims to identify the optimum warping path between them under certain constraints; see Ratanamahatana and Keogh (2004) and Berndt and Clifford (1994) as well as Sardá-Espinosa (2017) for software implementation.

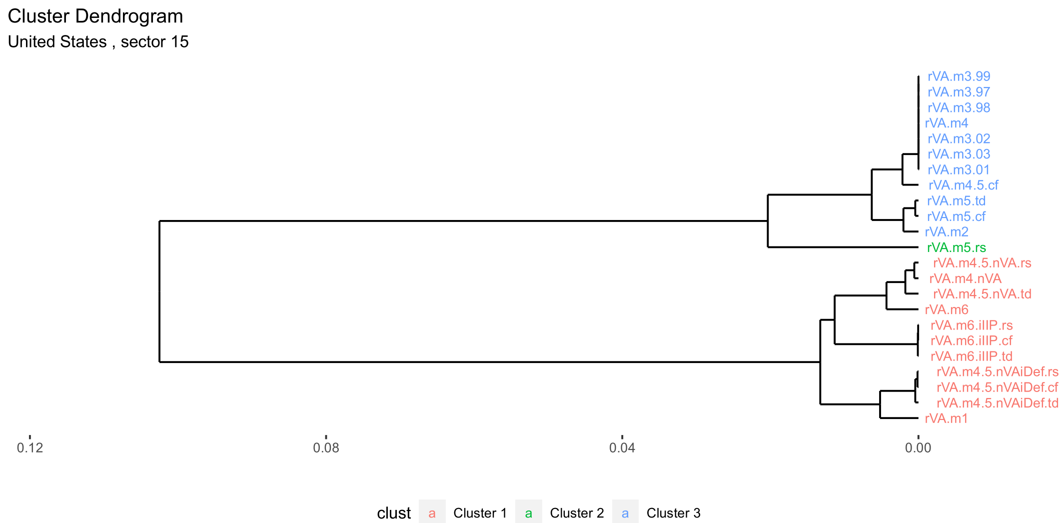
## B.1 M1 vs STAN and WIOD

For the analysis, we resort to a simple DTW algorithm to compare the univariate time series of the m1 deflator and the nominal and real value-added sequences for INDSTAT, STAN and WIOD. In other words, for every pair

$$\{(x^{m,n}, y^{m,n})\} = \{deflator^{m,n}, nVA^{m,n}, rVA^{m,n}\}$$

with $\{m, n\} \in \{INDSTAT, STAN, WIOD\}$. For all trivial cases where $m = n$, $DTW_p(x^{m,n}, y^{m,n}) = 0$, $3 \times 3 = 9$ non-trivial cases are left to be analysed. Next, since we are not interested in the absolute $DTW$s but the performance of m1 vis-a-vis the respective STAN and WIOD series, we calculate the normalized dynamic time warping distance as

Figure 17: Dendrogram USA, sector 15




$$nDTW_p(x^{m,n}, y^{m,n}) := \frac{DTW_p(x^{m,n}, y^{m,n})}{DTW_p(x^{STAN,WIOD}, y^{STAN,WIOD})}$$

where $x$ is as previously defined and $m \neq n$. Finally and to give a sense of the proportions of the calculated $nDTW()$s, we also perform the time series validation on a random white noise (WN) process, which we compare with each of the individual series and data sets. This ultimately leads to a total of $3 \times 3 \times 2 = 18$ cases.

## B.2 Hierarchical clustering of deflators

We employ Hierarchical Clustering (HC) (Hastie et al., 2009) to create a hierarchy of ordered sequences of groupings to obtain clusters of similarity of the various deflator sequences we propose.

Figure 17 is a visual representation of the created hierarchy for sector 31 in the United States. In the visualisation, the height of each node is proportional to the value of the inter-group dissimilarity between its two daughter nodes (Hastie et al., 2009). As the figure reveals, for this particular case, M1 shares the highest degree of similarity with the family of m4.5.VAiDef sequences, as the height that links those two groups together, is very long. In a similar vein, we can identify a second prominent group containing the family of m2, m3 and m5 deflators, and which are notably dissimilar to m1 for this particular country- and sector configuration.

Figure 17 only serves expositional purposes. To rank order the respective real value-added sequences based on their similarity relative to m1, we employ the following aggregation approach:

- If a particular real value-added sequence is contained in the same daughter node as m1, we assume an inter-group dissimilarity of zero.

- If a particular real value-added sequence is contained in a daughter node that differs from m1, we record the average distance of the inter-group dissimilarity based on the HC.
- We then aggregate the inter-group dissimilarities across sectors and countries where a smaller number indicates a higher degree of similarity to m1.

# C Accounting for country size effects

Only few papers on the analysis of threshold effects in panel data models are available. Hansen (1999) explores the problem of estimation and testing for threshold effects in the case of static panels with fixed effects and homogeneous slopes and deals with panels where the time dimension $T$ is short and the cross-section dimension $N$ is large. It also requires a strongly balanced panel which, in our case, will lead to a significant reduction in included panel members, particularly in the low(er) income range, which is likely to introduce a bias in the estimated thresholds. The test for up to two thresholds following Hansen (1999) is based on Equation 12 and presented in Table 7, indicating the existence of two significant thresholds at the five and 18 million mark of mean population.

Table 7: Population threshold regression

| Model | Threshold | Lower | Upper | Fstat | Probability |
|---|---|---|---|---|---|
| *Single threshold model* | | | | | |
| Threshold 1 | 18.2 | 12.89 | 28.37 | 600 | 0.000 |
| *Double threshold model* | | | | | |
| Threshold 1 | 18.2 | 12.89 | 28.34 | 207 | 0.046 |
| Threshold 2 | 5.48 | 4.8 | 8.23 | | |

*Note:*
Statistic based on the threshold regression model, up to two thresholds are based on 500 bootstrap repetitions. The number of grid points for the threshold search is set to 300 with a trimming proportion set to .015 for both thresholds.

Given the threshold regression approach's limitations due to our data structure, we apply a second approach that employs a grid of values for the threshold (and delay). The selected threshold is one that minimizes the sum of squared residuals $S(r)$ over the interval $[r_l, r_u]$ where $S(r) = T \times trace(\hat{\Sigma}(r))$, where $T$ is the number of observations and $\hat{\Sigma}(r)$ is the estimated covariance matrix of the residuals for a given threshold value. This means that conditional on each possible population threshold, a model is estimated by least squares and the trace of the covariance matrix is computed. The estimated threshold is that which minimizes the objective function. The limits of the grid for the threshold are defined based on the rule that at least $100\pi\%$ of the observations must be present in each regime, where $0 < \pi < 1$. Values of $\pi$ commonly found in the literature are 0.10 (Clements and Galvão, 2004) and 0.15 (Andrews, 1993). The maximum likelihood estimator employed here assumes that the covariance matrices are the same for each regime. When applied to macroeconomic data with time-varying variances, this assumption may not hold, but the estimator can be modified to allow regime-switching variances. Our set-up allows for $k = 3$ regimes (for small, medium and large countries) so that the conditional variance matrix $\hat{\Sigma}(r_1, r_2)$ is computed with $T_j$ observations of $\hat{u}_t$ of regime $j$. The maximum likelihood estimator that allows for changes in the regime-dependent variances (HML) is written as:

$$\hat{r}_1, \hat{r}_2 = \min_{\substack{r_l \leq r1 \leq r_u \\ r_l \leq r2 \leq r_u \\ \tau_l \leq \tau \leq \tau_u}} \left( \sum_{j=1}^{k} \frac{T_j}{2} log(det(\hat{\Sigma}_j(r_1, r_2))) \right)$$

As regards the industry-country level threshold grid search, we do not want to test for the possibility of one vs two or more thresholds or for the significance of each specific threshold. What we want to do instead is to determined whether the averages of the identified thresholds for each industry lie within a reasonable distance to the threshold ranges estimated by the Hansen (1999) test. In other words, we employ the maximum likelihood approach as a robustness check to identify potential industry-specific heterogeneity patterns.

Figure 18: Population Threshold Grid Search results


Our objective is to compare the grid-search result with the results of the joint model where each country-sector combination is treated as a separate panel member to accommodate the dimensional constraints of the Hansen (1999) approach on a balanced sub-sample of the data. To this end, we visualize the results of the threshold tests in Figure 18.

Despite some variation across sectors, the results obtained from the analysis generally support two thresholds around the 5 and 15 million mark and mostly lie within the band of what the sub-sample analysis based on the Hansen (1999) approach would predict (identified by the two solid lines). We would be able to identify more variation across sectors and potentially more noise if we used sector data and a slightly different approach. Indeed, there is quite some notable variation across industries; however, when we estimate one joint panel across all industrial sectors, the identified thresholds (see row $JOINT$) are quite close to the previously fixed threshold value. Also, it seems to make intuitive sense that they do not lie at the very extreme compared to some of the sector threshold values. Moreover, when plotting the distribution of the mean country population across countries (lower panel of the above graph), the location of the thresholds seems reasonable.

# D Visual Value-added comparison G7

Figure 19: Database comparison Canada

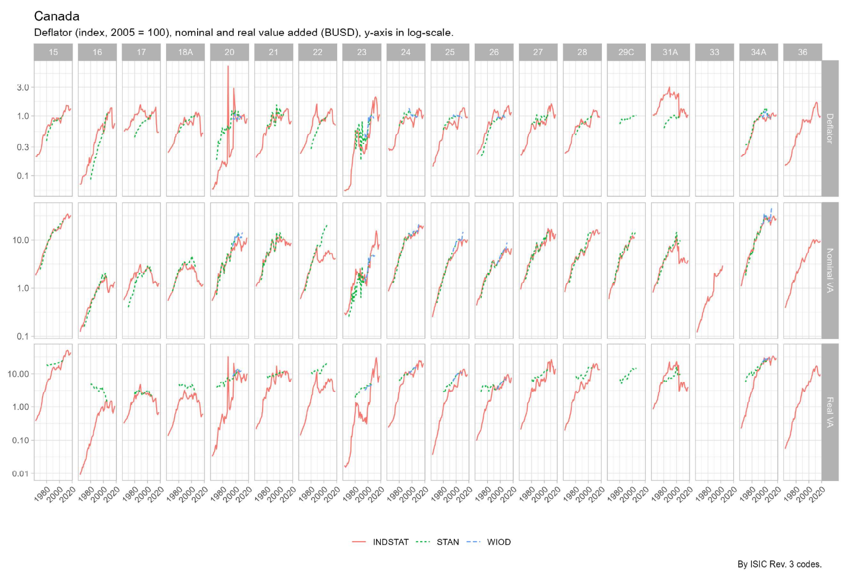



Figure 20: Database comparison France

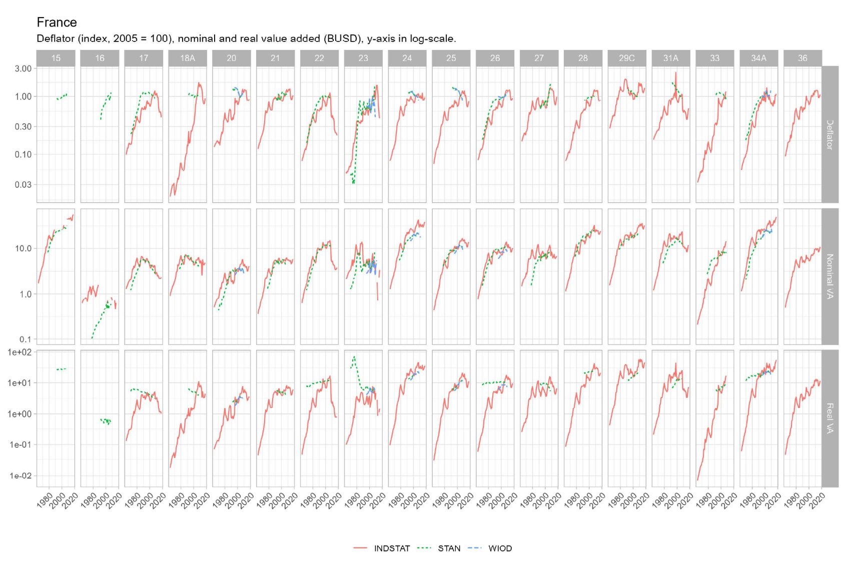


Figure 21: Data base comparison Germany


Figure 22: Data base comparison Japan

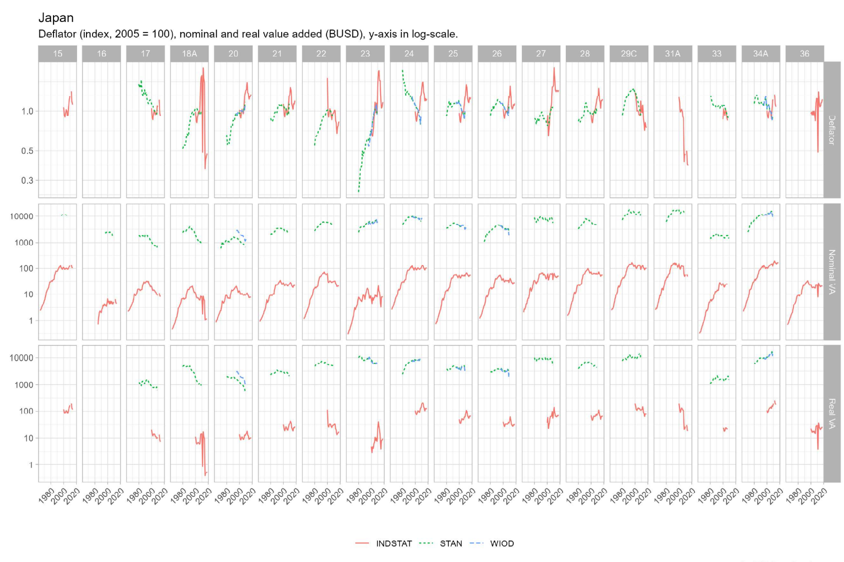
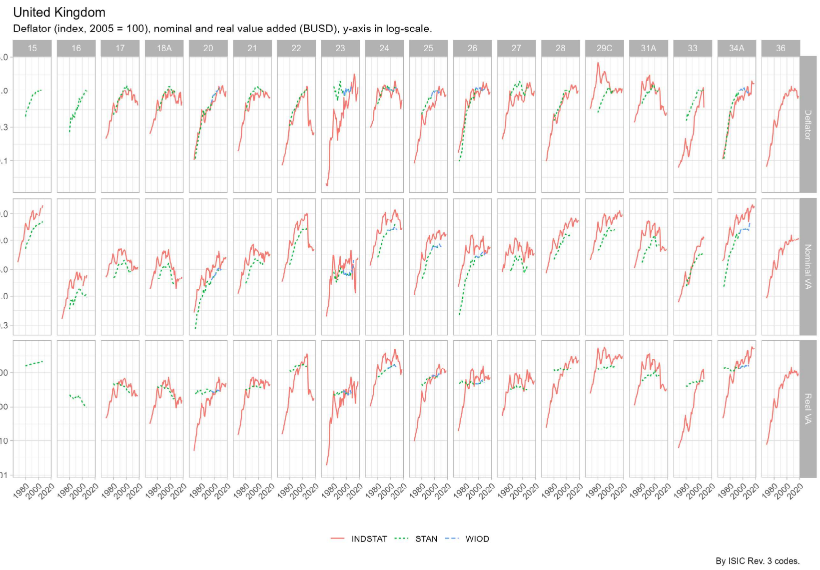


Figure 23: Data base comparison United Kingdom




# E Data set coverage and classification

The industry sector level classification used in this section follows the *International Standard Industrial Classification* (ISIC), Revision 3 database by the United Nations Statistics Division (INDSTAT, 2021). The ISIC combinations chosen for this report are presented in Table 8. As regards the technology classification of industries, all manufacturing industries are further classified by their technology intensity following the technology classification of the *Organization for Economic Co-operation and Development* (OECD), which is based on Research and Development (R&D) intensity relative to value-added and gross production statistics (OECD, 2011b). The OECD classifies manufacturing industries into the four categories of high technology, medium-high technology, medium-low technology and low technology industries.

**Aggregation to ISIC Rev. 3 combinations** While many countries report manufacturing data according to the ISIC industry aggregation in Table 8, the majority of countries report manufacturing data in INDSTAT at the level of individual industries. A simple summation across industries can obtain data to arrive at a consistent ISIC industry aggregate nominal value-added and output. For example, for industry (18A) wearing apparel, this implies a summation of value-added and output for sectors (18) Manufacture of wearing apparel; dressing and dyeing and (19) Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear, respectively. To obtain the corresponding IIP series, for a particular country $i$ where ISIC industry $j$ is one of the $N_{iJ}$ industries belonging to an ISIC aggregate $J$, $j \in J$, we calculate the weighted

IIP for each $J$ as

$$IIP_{iJ} = \frac{1}{N_{iJ}} \sum_{j \in J} w_{ij} \times IIP_{ij}, \quad w_{ij} = \frac{X_{ij}}{\sum_{j \in J} X_{ij}}$$

where $X_{ij}$ corresponds to the manufacturing sector-level value-added of each industry. We use the same weighting approach to aggregate ISIC industry aggregates for the STAN data.

Table 8: Manufacturing Industry Classification

| ISIC Industry Aggregation | | ISIC Industry Classification | | | Data Set Coverage | | |
|---|---|---|---|---|---|---|---|
| (Code) Abbreviation | Rev. 3 Combination | Rev. 3 Code | Rev. 3 Industry Description | Technology Group | INDSTAT | STAN | WIOT |
| (15) Food and beverages | 15 | 15 | Manufacture of food products and beverages | Low | 15 | 15 | 15t16** |
| (16) Tobacco | 16 | 16 | Manufacture of tobacco products | Low | 16 | 16 | 15t16** |
| (17) Textiles | 17 | 17 | Manufacture of textiles | Low | 17 | 17 | 17t18** |
| (18A) Wearing apparel | 18 + 19 | 18 | Manufacture of wearing apparel; dressing and dyeing of fur | Low | 18A | 18* | 17t18** |
| (18A) Wearing apparel | 18 + 19 | 19 | Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear | Low | 18A | 19* | 19 |
| (20) Wood products | 20 | 20 | Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials | Low | 20 | 20 | 20 |
| (21) Paper and paper products | 21 | 21 | Manufacture of paper and paper products | Low | 21 | 21 | 21t22** |
| (22) Printing and publishing | 22 | 22 | Publishing, printing and reproduction of recorded media | Low | 22 | 22 | 21t22** |
| (23) Coke, petroleum and nuclear | 23 | 23 | Manufacture of coke, refined petroleum products and nuclear fuel | Medium | 23 | 23 | 23 |
| (24) Chemicals | 24 | 24 | Manufacture of chemicals and chemical products | High | 24 | 24 | 24 |
| (25) Rubber and plastic | 25 | 25 | Manufacture of rubber and plastics products | Medium | 25 | 25 | 25 |
| (26) Non-metallic minerals | 26 | 26 | Manufacture of other non-metallic mineral products | Medium | 26 | 26 | 26 |
| (27) Basic metals | 27 | 27 | Manufacture of basic metals | Medium | 27 | 27 | 27t28** |
| (28) Fabricated metals | 28 | 28 | Manufacture of fabricated metal products, except machinery and equipment | Medium | 28 | 28 | 27t28** |
| (29C) Machinery | 29 + 30 | 29 | Manufacture of machinery and equipment n.e.c. | High | 29C | 29* | 29 |
| (29C) Machinery | 29 + 30 | 30 | Manufacture of office, accounting and computing machinery | High | 29C | 30* | 30t33** |
| (31A) Computer and electronics | 31 + 32 | 31 | Manufacture of electrical machinery and apparatus n.e.c. | High | 31A | 31* | 30t33** |
| (31A) Computer and electronics | 31 + 32 | 32 | Manufacture of radio, television and communication equipment and apparatus | High | 31A | 32* | 30t33** |
| (33) Precision instruments | 33 | 33 | Manufacture of medical, precision and optical instruments, watches and clocks | High | 33 | 33 | 30t33** |
| (34A) Motor vehicles | 34 + 35 | 34 | Manufacture of motor vehicles, trailers and semi-trailers | High | 34A | 34* | 34A |
| (34A) Motor vehicles | 34 + 35 | 35 | Manufacture of other transport equipment | High | 34A | 35* | 34A |
| (36) Furniture and n.e.c. | 36 | 36 | Manufacture of furniture; manufacturing n.e.c. | Low | 36 | 36 | 36t37** |

* ISIC Rev. Industry aggregated to designated Rev. 3 combination.
** Higher level of aggregation not mapped onto respective ISIC Rev. 3 combinations. ISIC Rev. industry (37) Recycling not considered. Technology classification based on OECD (2011).
*Note:* ISIC Rev. 3 technology group classification according to OECD (2011b).
*Data coverage:* INDSTAT (2021) (1963-2018), STAN (2021) (1970-2009), Timmer et al. (2015) (1995-2011)

## F List of proxy countries

Table 9: List of proxy countries

| Country | List of proxy countries |
|---|---|
| Afghanistan | Pakistan, Tajikistan, Uzbekistan, India, Kyrgyzstan, Turkmenistan, Nepal, Azerbaijan, Bhutan, Armenia, Georgia, Bangladesh, Syria, Myanmar (Burma), Sri Lanka, Yemen, Maldives, Mongolia, Ukraine, Egypt, Moldova, Eritrea, Laos, Vietnam, China, Ethiopia, Sudan, Albania, Somalia |
| Albania | Montenegro, North Macedonia, Bosnia & Herzegovina, Bulgaria, Croatia, Romania, Hungary, Slovakia, Moldova, Tunisia, Czechia, Libya, Turkey, Poland, Ukraine, Belarus, Algeria, Lithuania, Lebanon, Egypt, Syria, Latvia, Jordan, Estonia, Russia, Georgia, Armenia, Iraq, Morocco, Azerbaijan, Iran |
| Algeria | Tunisia, Spain, Morocco, Libya, Malta, Portugal, Croatia, Bosnia & Herzegovina, Montenegro, Albania, North Macedonia, Slovakia, Czechia, Hungary, Greece, Bulgaria, Ireland, Romania, Poland, Moldova, Lithuania, Turkey, Ukraine, Belarus, Egypt, Cyprus, Latvia, Mauritania, Lebanon, Estonia, Syria, Jordan, Nigeria, Senegal, Gambia |
| Andorra | Spain, Monaco, Switzerland, France, Liechtenstein, Luxembourg, San Marino, Italy, Belgium, Portugal, United Kingdom, Slovenia, Netherlands, Croatia, Czechia, Austria, Ireland, Malta, Slovakia, Germany, Hungary, Denmark, Poland, Greece, Romania, Norway, Sweden, Lithuania, Latvia, Estonia, Finland, Iceland, Cyprus, Russia, Israel |
| Angola | Congo - Kinshasa, Congo - Brazzaville, Gabon, São Tomé & Príncipe, Cameroon, Equatorial Guinea, Namibia, Central African Republic, Zambia, Burundi, Rwanda, Benin, Nigeria, Togo, Zimbabwe, Ghana, Botswana, Chad, Malawi, Uganda, South Africa, Tanzania, Côte d'Ivoire, Eswatini, Lesotho, Kenya, Niger, Mozambique, Burkina Faso, Liberia, Comoros, Mali, Sudan, Ethiopia, Sierra Leone, Guinea, Somalia, Madagascar, Eritrea, Guinea-Bissau, Djibouti, Gambia, Senegal, Yemen, Mauritania, Libya, Seychelles, Egypt, Cape Verde, Mauritius |
| Antigua & Barbuda | St. Kitts & Nevis, Dominica, St. Lucia, St. Vincent & Grenadines, Barbados, Grenada, Trinidad & Tobago, Dominican Republic, Venezuela, Suriname, Jamaica, Bahamas, Colombia, Cuba, Costa Rica, Ecuador, United States, Belize, Canada, Peru, Mexico, Brazil |
| Argentina | Uruguay, Paraguay, Chile, Bolivia, Brazil, Peru, Ecuador, Suriname, Guyana, Colombia |
| Armenia | Georgia, Azerbaijan, Iraq, Iran, Turkey, Syria, Lebanon, Jordan, Turkmenistan, Moldova, Ukraine, Romania, Egypt, Bulgaria, Russia, North Macedonia, Belarus, Albania, Uzbekistan, Tajikistan, Montenegro, Lithuania, Bosnia & Herzegovina, Poland, Afghanistan, Slovakia, Latvia, Croatia, Kazakhstan, Kyrgyzstan, Czechia, Pakistan, Yemen, Eritrea, Libya, Sudan, Tunisia |
| Australia | New Zealand, Nauru, Palau |
| Austria | Slovakia, Hungary, Czechia, Croatia, Slovenia, Germany, Liechtenstein, Poland, San Marino, Switzerland, Italy, Luxembourg, Monaco, Romania, Denmark, Belgium, Netherlands, Lithuania, France, Latvia, United Kingdom, Sweden, Greece, Andorra, Norway, Estonia, Malta, Finland, Russia, Ireland, Spain, Cyprus, Portugal, Israel, Iceland, Kuwait |
| Azerbaijan | Georgia, Armenia, Iran, Turkmenistan, Iraq, Syria, Turkey, Lebanon, Jordan, Uzbekistan, Tajikistan, Afghanistan, Moldova, Ukraine, Russia, Romania, Egypt, Kazakhstan, Kyrgyzstan, Pakistan, Bulgaria, Belarus, North Macedonia, Lithuania, Albania, Montenegro, Poland, Hungary, Latvia, Bosnia & Herzegovina, Slovakia, Croatia, India, Yemen, Czechia, Eritrea, Sudan, Djibouti |
| Bahamas | Cuba, Jamaica, United States, St. Kitts & Nevis, Costa Rica, Antigua & Barbuda, Venezuela, Canada, Barbados, Trinidad & Tobago, Mexico, Ecuador, Suriname, Peru |

Table 9: List of proxy countries *(continued)*

| Country | List of proxy countries |
|---|---|
| Bahrain | Qatar, Saudi Arabia, United Arab Emirates, Kuwait, Oman, Iraq, Israel, Lebanon, Cyprus, Turkey, Greece, Romania, Russia, Seychelles, Malta, Belarus, Hungary, Libya, Croatia, Lithuania, Slovakia, Poland, Austria |
| Bangladesh | Bhutan, Nepal, Myanmar (Burma), Laos, India, Vietnam, Pakistan, Cambodia, Sri Lanka, Afghanistan, Kyrgyzstan, Tajikistan, Uzbekistan, Maldives, China, Mongolia, Philippines, Turkmenistan, North Korea, Indonesia, Azerbaijan, Armenia, Georgia, Yemen |
| Barbados | St. Vincent & Grenadines, St. Lucia, Grenada, Dominica, Trinidad & Tobago, Antigua & Barbuda, St. Kitts & Nevis, Venezuela, Suriname, Bahamas, Cuba, Costa Rica, Belize, United States, Brazil, Canada, Mexico |
| Belarus | Lithuania, Latvia, Ukraine, Poland, Estonia, Russia, Moldova, Hungary, Slovakia, Romania, Croatia, Slovenia, Bulgaria, Bosnia & Herzegovina, North Macedonia, Montenegro, Albania, Turkey, Greece, Georgia, Armenia, Malta, Azerbaijan, Lebanon, Tunisia, Syria, Jordan, Libya, Iraq, Egypt, Algeria, Iran, Turkmenistan, Kazakhstan |
| Belgium | Netherlands, Luxembourg, France, United Kingdom, Switzerland, Liechtenstein, Germany, Czechia, Denmark, Ireland, Monaco, Austria, Slovenia, Andorra, Slovakia, San Marino, Croatia, Norway, Hungary, Poland, Italy, Sweden, Spain, Latvia, Lithuania, Estonia, Finland, Portugal, Romania, Malta, Greece, Iceland, Russia, Cyprus, Israel |
| Belize | Guatemala, Honduras, El Salvador, Nicaragua, Cuba, Costa Rica, Mexico, Jamaica, Dominican Republic, Colombia, Ecuador, Venezuela, St. Kitts & Nevis, Antigua & Barbuda, Dominica, Grenada, St. Vincent & Grenadines, St. Lucia, Trinidad & Tobago, Barbados, Peru, Guyana, Suriname, Bolivia |
| Benin | Togo, Ghana, Nigeria, Equatorial Guinea, Niger, Burkina Faso, São Tomé & Príncipe, Côte d'Ivoire, Cameroon, Mali, Liberia, Chad, Sierra Leone, Central African Republic, Guinea, Congo - Brazzaville, Congo - Kinshasa, Angola, Guinea-Bissau, Gambia, Senegal, Mauritania, Cape Verde, Burundi, Rwanda, Morocco, South Sudan, Algeria, Uganda, Sudan, Tunisia, Zambia, Kenya, Tanzania, Egypt, Ethiopia, Eritrea, Malawi, Zimbabwe, Albania, Botswana, Bosnia & Herzegovina, Djibouti |
| Bhutan | Nepal, Bangladesh, Myanmar (Burma), India, Laos, Pakistan, Vietnam, Thailand, Afghanistan, Kyrgyzstan, Tajikistan, Cambodia, Uzbekistan, Sri Lanka, Mongolia, China, Maldives, Turkmenistan, Philippines, North Korea, Iran, Azerbaijan, Indonesia, Georgia, Armenia, Iraq, Yemen |
| Bolivia | Peru, Paraguay, Chile, Ecuador, Brazil, Argentina, Uruguay, Colombia, Guyana, Suriname, Venezuela, Grenada, St. Vincent & Grenadines, Costa Rica, St. Lucia, Dominica, Nicaragua, Dominican Republic, Jamaica, Honduras, El Salvador, Guatemala, Belize, Cuba |
| Bosnia & Herzegovina | Montenegro, Croatia, Albania, North Macedonia, Hungary, Bulgaria, Slovakia, Romania, Czechia, Moldova, Poland, Tunisia, Ukraine, Turkey, Libya, Belarus, Lithuania, Latvia, Algeria, Lebanon, Russia, Egypt, Syria, Jordan, Georgia, Armenia, Morocco, Iraq, Azerbaijan, Iran |
| Botswana | South Africa, Lesotho, Eswatini, Zimbabwe, Namibia, Zambia, Angola, Madagascar, Comoros, Congo - Kinshasa, Congo - Brazzaville, Kenya, Mauritius, Gabon, Central African Republic, Cameroon, Equatorial Guinea, Seychelles, Nigeria, Benin, Togo, Ghana, Djibouti, Sudan, Yemen, Côte d'Ivoire, Niger |
| Brazil | Paraguay, Bolivia, Uruguay, Argentina, Suriname, Guyana, Chile, Peru, Trinidad & Tobago, Grenada, Barbados, St. Vincent & Grenadines, Venezuela, St. Lucia, Colombia, Dominica, Ecuador, Antigua & Barbuda, St. Kitts & Nevis, Cape Verde, Dominican Republic, Senegal, Costa Rica, Jamaica |
| Brunei | Singapore, Palau, Taiwan, South Korea, Japan |

Table 9: List of proxy countries *(continued)*

| Country | List of proxy countries |
|---|---|
| Bulgaria | North Macedonia, Romania, Albania, Montenegro, Bosnia & Herzegovina, Greece, Hungary, Moldova, Croatia, Slovakia, Turkey, Ukraine, Czechia, Malta, Poland, Cyprus, Belarus, Tunisia, Lithuania, Libya, Lebanon, Syria, Egypt, Latvia, Jordan, Georgia, Russia, Armenia, Algeria, Estonia, Iraq, Azerbaijan, Spain, Iran, Portugal, Morocco |
| Burkina Faso | Niger, Mali, Côte d'Ivoire, Togo, Ghana, Benin, Nigeria, Liberia, Sierra Leone, Guinea, Equatorial Guinea, Guinea-Bissau, São Tomé & Príncipe, Gambia, Mauritania, Cameroon, Senegal, Chad, Central African Republic, Congo - Brazzaville, Congo - Kinshasa, Angola, Sudan, South Sudan, Albania, Rwanda, Burundi, Egypt, Bosnia & Herzegovina, Uganda |
| Burundi | Rwanda, Uganda, Tanzania, Kenya, South Sudan, Malawi, Zambia, Central African Republic, Congo - Kinshasa, Congo - Brazzaville, Zimbabwe, Ethiopia, Comoros, Somalia, Angola, Sudan, Cameroon, Chad, Eritrea, Equatorial Guinea, Mozambique, São Tomé & Príncipe, Madagascar, Yemen, Nigeria, Lesotho, Benin, Togo, Ghana, Niger, Egypt, Burkina Faso, Côte d'Ivoire, Syria, Mali, Liberia |
| Cambodia | Laos, Vietnam, Myanmar (Burma), Philippines, Indonesia, Bangladesh, Bhutan, Nepal, Sri Lanka, Timor-Leste, China, India, Maldives, North Korea, Mongolia, Pakistan, Afghanistan, Kyrgyzstan, Tajikistan, Uzbekistan |
| Cameroon | Equatorial Guinea, São Tomé & Príncipe, Nigeria, Central African Republic, Chad, Congo - Brazzaville, Congo - Kinshasa, Benin, Togo, Ghana, Angola, Niger, Burkina Faso, Côte d'Ivoire, Burundi, Rwanda, South Sudan, Mali, Uganda, Liberia, Sudan, Sierra Leone, Zambia, Guinea, Kenya, Tanzania, Namibia, Ethiopia, Guinea-Bissau, Malawi, Zimbabwe, Eritrea, Gambia, Mauritania, Senegal, Botswana, Egypt, Djibouti, Tunisia, South Africa, Algeria, Somalia, Yemen, Morocco, Comoros, Eswatini, Mozambique, Jordan, Cape Verde, Lesotho, Lebanon, Syria, Albania |
| Canada | United States, Bahamas, St. Kitts & Nevis, Antigua & Barbuda, Iceland, Barbados, Venezuela, Trinidad & Tobago, Ireland |
| Cape Verde | Senegal, Mauritania, Liberia, Côte d'Ivoire, Morocco, Ghana, Benin, Nigeria, Algeria, Suriname, São Tomé & Príncipe, Equatorial Guinea, Guyana, Cameroon, St. Lucia, Dominica, St. Vincent & Grenadines, Tunisia, Grenada, Brazil, Venezuela, Congo - Brazzaville, Congo - Kinshasa, Angola, Dominican Republic |
| Central African Republic | Cameroon, Chad, Congo - Brazzaville, Congo - Kinshasa, Equatorial Guinea, Nigeria, São Tomé & Príncipe, South Sudan, Rwanda, Burundi, Angola, Uganda, Benin, Togo, Sudan, Niger, Ghana, Kenya, Tanzania, Ethiopia, Burkina Faso, Zambia, Eritrea, Malawi, Côte d'Ivoire, Zimbabwe, Somalia, Yemen, Mali, Egypt, Comoros, Liberia, Botswana, Sierra Leone, Guinea, Mozambique, Syria, Lesotho, Guinea-Bissau, Gambia, Mauritania, Madagascar, Albania, Senegal |
| Chad | Nigeria, Central African Republic, Cameroon, Equatorial Guinea, Niger, Benin, São Tomé & Príncipe, Togo, Congo - Brazzaville, Congo - Kinshasa, Burkina Faso, Ghana, Sudan, South Sudan, Rwanda, Angola, Burundi, Uganda, Côte d'Ivoire, Mali, Ethiopia, Eritrea, Egypt, Kenya, Liberia, Tanzania, Sierra Leone, Yemen, Guinea, Syria, Albania, Zambia, Guinea-Bissau, Mauritania, Gambia, Somalia, Malawi, Senegal, Bosnia & Herzegovina |
| Chile | Argentina, Uruguay, Paraguay, Bolivia, Peru, Brazil, Ecuador, Colombia, Suriname, Guyana, Venezuela, Trinidad & Tobago |

Table 9: List of proxy countries *(continued)*

| Country | List of proxy countries |
|---|---|
| China | North Korea, Mongolia, Vietnam, Laos, Bhutan, Philippines, Myanmar (Burma), Bangladesh, Nepal, Thailand, Cambodia, Kyrgyzstan, Kazakhstan, India, Pakistan, Uzbekistan, Palau, Tajikistan, Afghanistan, Malaysia, Turkmenistan |
| Colombia | Ecuador, Venezuela, Costa Rica, Jamaica, Nicaragua, Grenada, Dominican Republic, St. Vincent & Grenadines, St. Lucia, Guyana, Honduras, Dominica, Peru, St. Kitts & Nevis, Antigua & Barbuda, El Salvador, Suriname, Guatemala, Belize, Cuba, Bolivia, Mexico, Brazil, Paraguay, Chile, Argentina, Uruguay |
| Comoros | Madagascar, Tanzania, Malawi, Kenya, Zimbabwe, Somalia, Zambia, Uganda, Burundi, Mauritius, Rwanda, Mozambique, Eswatini, South Sudan, Botswana, Ethiopia, Lesotho, Djibouti, Yemen, Eritrea, Congo - Kinshasa, Congo - Brazzaville, Sudan, Central African Republic, Angola, Maldives, Cameroon, Chad, Equatorial Guinea, São Tomé & Príncipe, Sri Lanka, Nigeria, Egypt, Benin |
| Congo - Brazzaville | Congo - Kinshasa, Angola, Cameroon, Central African Republic, São Tomé & Príncipe, Equatorial Guinea, Burundi, Rwanda, Nigeria, Chad, Benin, Zambia, Togo, Uganda, Namibia, Ghana, South Sudan, Tanzania, Zimbabwe, Malawi, Kenya, Niger, Botswana, Côte d'Ivoire, Burkina Faso, South Africa, Sudan, Eswatini, Ethiopia, Mozambique, Lesotho, Liberia, Mali, Comoros, Eritrea, Somalia, Sierra Leone, Djibouti, Guinea, Yemen, Guinea-Bissau, Madagascar, Gambia, Egypt, Senegal, Mauritania, Seychelles, Jordan, Tunisia, Algeria, Lebanon, Syria, Cape Verde |
| Congo - Kinshasa | Congo - Brazzaville, Angola, Cameroon, Central African Republic, São Tomé & Príncipe, Equatorial Guinea, Burundi, Rwanda, Nigeria, Chad, Benin, Zambia, Togo, Uganda, Ghana, South Sudan, Zimbabwe, Tanzania, Malawi, Kenya, Niger, Botswana, Côte d'Ivoire, Burkina Faso, Sudan, Ethiopia, Mozambique, Lesotho, Liberia, Comoros, Mali, Eritrea, Somalia, Sierra Leone, Guinea, Yemen, Madagascar, Guinea-Bissau, Gambia, Egypt, Senegal, Mauritania, Tunisia, Syria, Cape Verde |
| Costa Rica | Nicaragua, Honduras, El Salvador, Guatemala, Belize, Jamaica, Colombia, Ecuador, Cuba, Dominican Republic, Bahamas, Venezuela, Mexico, St. Kitts & Nevis, Grenada, Trinidad & Tobago, St. Vincent & Grenadines, Antigua & Barbuda, Dominica, Peru, St. Lucia, Barbados, Guyana, Suriname, Bolivia, Paraguay, Brazil |
| Côte d'Ivoire | Ghana, Liberia, Mali, Togo, Burkina Faso, Benin, Sierra Leone, Guinea, Niger, Guinea-Bissau, Nigeria, Gambia, São Tomé & Príncipe, Equatorial Guinea, Senegal, Mauritania, Cameroon, Cape Verde, Chad, Congo - Brazzaville, Congo - Kinshasa, Central African Republic, Angola, Morocco, Algeria, Tunisia, Burundi, Rwanda, Namibia, South Sudan, Sudan, Uganda, Zambia, Albania, Egypt, North Macedonia, Bosnia & Herzegovina, Kenya, Tanzania, Croatia, Zimbabwe, Botswana, Ethiopia |
| Croatia | Slovenia, Austria, Slovakia, Bosnia & Herzegovina, Hungary, San Marino, Montenegro, Czechia, Liechtenstein, Italy, Albania, North Macedonia, Switzerland, Bulgaria, Monaco, Germany, Poland, Romania, Luxembourg, Moldova, Belgium, Greece, France, Netherlands, Malta, Tunisia, Denmark, Lithuania, Ukraine, Andorra, Belarus, United Kingdom, Latvia, Libya, Algeria, Sweden, Turkey, Norway, Estonia, Finland, Spain, Ireland, Russia, Cyprus, Lebanon, Syria, Portugal, Israel, Jordan, Morocco, Georgia, Armenia, Iraq, Azerbaijan, Iceland, Iran, Kuwait |
| Cuba | Bahamas, Jamaica, Belize, Honduras, El Salvador, Guatemala, Nicaragua, Dominican Republic, Costa Rica, Mexico, St. Kitts & Nevis, Venezuela, Colombia, Antigua & Barbuda, Dominica, St. Lucia, St. Vincent & Grenadines, Grenada, Trinidad & Tobago, Ecuador, Barbados, Guyana, Suriname, Peru, Bolivia |

Table 9: List of proxy countries *(continued)*

| Country | List of proxy countries |
|---|---|
| Cyprus | Syria, Israel, Jordan, Turkey, Greece, Iraq, Romania, Bulgaria, Kuwait, Iran, Malta, Saudi Arabia, Hungary, Libya, Croatia, Bahrain, Italy, Slovakia, Slovenia, Austria, San Marino, Qatar, Tunisia, Poland, Czechia, Lithuania, Russia, United Arab Emirates, Liechtenstein, Monaco, Germany, Latvia, Switzerland, Algeria, Luxembourg, Oman, Estonia, Denmark, Finland, Andorra, Belgium |
| Czechia | Austria, Germany, Slovakia, Hungary, Slovenia, Croatia, Liechtenstein, Poland, Luxembourg, Switzerland, Denmark, San Marino, Netherlands, Belgium, Bosnia & Herzegovina, Monaco, France, Lithuania, Italy, Montenegro, Latvia, United Kingdom, North Macedonia, Sweden, Albania, Bulgaria, Romania, Moldova, Norway, Ukraine, Estonia, Andorra, Finland, Ireland, Tunisia, Greece, Malta, Russia, Algeria, Spain, Turkey, Libya, Portugal, Cyprus, Lebanon, Morocco, Georgia, Syria, Armenia, Iceland, Israel, Jordan, Azerbaijan, Iraq, Iran, Kuwait |
| Denmark | Germany, Norway, Sweden, Netherlands, Czechia, Poland, Latvia, Belgium, Luxembourg, Lithuania, Estonia, Austria, Finland, Slovakia, United Kingdom, Liechtenstein, Hungary, France, Switzerland, Slovenia, Croatia, Ireland, San Marino, Monaco, Italy, Russia, Romania, Andorra, Spain, Iceland, Greece, Malta, Portugal, Cyprus, Israel |
| Djibouti | Yemen, Sudan, South Sudan, Kenya, Tanzania, Jordan, Egypt, Iraq, Syria, Comoros, Lebanon, Iran, Armenia, Azerbaijan, Turkmenistan, Turkey, Georgia, Zambia, Maldives, Zimbabwe, Congo - Brazzaville, Cameroon, Mauritius, Equatorial Guinea, Nigeria, Pakistan, Tajikistan, Bulgaria, North Macedonia, Romania, Albania, India, Angola, Sri Lanka |
| Dominica | St. Lucia, Antigua & Barbuda, St. Vincent & Grenadines, St. Kitts & Nevis, Barbados, Grenada, Trinidad & Tobago, Venezuela, Dominican Republic, Guyana, Suriname, Jamaica, Colombia, Cuba, Costa Rica, Ecuador, Nicaragua, Honduras, Belize, El Salvador, Guatemala, Peru, Bolivia, Brazil, Mexico, Cape Verde, Paraguay, Senegal, Gambia, Mauritania |
| Dominican Republic | Jamaica, St. Kitts & Nevis, Antigua & Barbuda, Venezuela, Dominica, St. Lucia, St. Vincent & Grenadines, Grenada, Cuba, Colombia, Costa Rica, Guyana, Nicaragua, Honduras, Belize, Suriname, El Salvador, Guatemala, Ecuador, Mexico, Peru, Bolivia, Brazil, Cape Verde |
| Ecuador | Colombia, Costa Rica, Peru, Nicaragua, Venezuela, Honduras, El Salvador, Jamaica, Guatemala, Bolivia, Trinidad & Tobago, Belize, Dominican Republic, Grenada, Guyana, St. Vincent & Grenadines, St. Lucia, Dominica, St. Kitts & Nevis, Cuba, Antigua & Barbuda, Suriname, Bahamas, Mexico, Paraguay, Chile, Brazil, Argentina, Uruguay |
| Egypt | Jordan, Lebanon, Syria, Turkey, Iraq, Bulgaria, North Macedonia, Sudan, Albania, Armenia, Romania, Montenegro, Georgia, Eritrea, Moldova, Bosnia & Herzegovina, Iran, Azerbaijan, Tunisia, Yemen, Ukraine, Slovakia, Djibouti, Ethiopia, Poland, Chad, Turkmenistan, Belarus, Algeria, Lithuania, South Sudan, Oman, Russia, Latvia, Central African Republic |
| El Salvador | Guatemala, Honduras, Nicaragua, Belize, Costa Rica, Mexico, Cuba, Jamaica, Ecuador, Colombia, Dominican Republic, Venezuela, Grenada, Dominica, St. Vincent & Grenadines, St. Lucia, Peru, Guyana, Suriname, Bolivia |

Table 9: List of proxy countries *(continued)*

| Country | List of proxy countries |
|---|---|
| Equatorial Guinea | Cameroon, Gabon, São Tomé & Príncipe, Nigeria, Benin, Togo, Ghana, Central African Republic, Chad, Congo - Brazzaville, Congo - Kinshasa, Niger, Burkina Faso, Angola, Côte d'Ivoire, Mali, Liberia, Burundi, Rwanda, Sierra Leone, Guinea, Uganda, Guinea-Bissau, Sudan, Gambia, Zambia, Namibia, Senegal, Mauritania, Kenya, Tanzania, Libya, Ethiopia, Malawi, Zimbabwe, Eritrea, Malta, Botswana, Tunisia, Algeria, Morocco, Cape Verde, Egypt, South Africa, Djibouti, Somalia, Greece, Yemen, Eswatini, Israel, Lesotho, Mozambique, Comoros, Jordan, Italy, Spain, Portugal, Cyprus, Albania |
| Eritrea | Yemen, Sudan, Ethiopia, South Sudan, Somalia, Uganda, Egypt, Kenya, Syria, Rwanda, Burundi, Tanzania, Central African Republic, Chad, Armenia, Azerbaijan, Georgia, Comoros, Turkmenistan, Cameroon, Malawi, Congo - Brazzaville, Congo - Kinshasa, Albania, Nigeria, Equatorial Guinea, Zambia, Moldova, Afghanistan, Bosnia & Herzegovina, Zimbabwe, Tajikistan, Angola |
| Estonia | Finland, Latvia, Sweden, Lithuania, Belarus, Norway, Poland, Denmark, Russia, Germany, Ukraine, Czechia, Slovakia, Austria, Hungary, Moldova, Netherlands, Belgium, Luxembourg, Croatia, Slovenia, Romania, Liechtenstein, United Kingdom, Switzerland, France, Bulgaria, San Marino, Montenegro, North Macedonia, Ireland, Albania, Monaco, Italy, Turkey, Greece, Georgia, Iceland, Andorra, Malta, Tunisia, Cyprus, Spain, Lebanon, Algeria, Syria, Kazakhstan, Libya, Jordan, Israel, Iraq, Iran, Egypt, Portugal, Turkmenistan |
| Eswatini | South Africa, Lesotho, Botswana, Zimbabwe, Zambia, Namibia, Madagascar, Comoros, Tanzania, Angola, Mauritius, Kenya, Congo - Brazzaville, South Sudan, Seychelles, São Tomé & Príncipe, Cameroon, Equatorial Guinea, Djibouti, Sudan, Nigeria, Benin, Yemen, Togo, Ghana |
| Ethiopia | Eritrea, Yemen, South Sudan, Sudan, Somalia, Kenya, Uganda, Rwanda, Tanzania, Burundi, Central African Republic, Comoros, Egypt, Chad, Malawi, Syria, Zambia, Congo - Brazzaville, Congo - Kinshasa, Cameroon, Zimbabwe, Madagascar, Equatorial Guinea, Nigeria, Angola, Armenia, Azerbaijan, Georgia, São Tomé & Príncipe, Turkmenistan, Maldives, Mozambique, Benin, Niger, Albania |
| Fiji | Tonga, Tuvalu, Vanuatu, Samoa, Solomon Islands, Nauru, Marshall Islands, Kiribati, Papua New Guinea, Micronesia (Federated States of) |
| Finland | Estonia, Latvia, Sweden, Lithuania, Norway, Denmark, Russia, Poland, Germany, Czechia, Slovakia, Austria, Hungary, Netherlands, Belgium, Luxembourg, Croatia, Slovenia, Romania, Liechtenstein, United Kingdom, Switzerland, France, San Marino, Ireland, Monaco, Italy, Iceland, Greece, Andorra, Malta, Cyprus, Spain, Israel, Portugal |
| France | Belgium, Luxembourg, United Kingdom, Netherlands, Switzerland, Liechtenstein, Monaco, Andorra, Ireland, Germany, Czechia, San Marino, Slovenia, Denmark, Austria, Spain, Croatia, Slovakia, Italy, Hungary, Norway, Poland, Portugal, Sweden, Lithuania, Latvia, Malta, Estonia, Romania, Finland, Greece, Iceland, Russia, Cyprus, Israel |
| Gabon | Equatorial Guinea, Angola, Namibia, Botswana, South Africa, Libya, Malta, Tunisia, Algeria, Israel, Greece, Jordan, Cyprus, Lebanon, Italy, Syria, Spain |
| Gambia | Senegal, Guinea-Bissau, Mauritania, Guinea, Sierra Leone, Mali, Liberia, Côte d'Ivoire, Burkina Faso, Ghana, Niger, Togo, Benin, Morocco, Nigeria, São Tomé & Príncipe, Equatorial Guinea, Algeria, Cameroon, Chad, Tunisia, Central African Republic, Congo - Brazzaville, Congo - Kinshasa, Angola, Guyana, Albania, Bosnia & Herzegovina, St. Lucia, St. Vincent & Grenadines, Dominica |

Table 9: List of proxy countries *(continued)*

| Country | List of proxy countries |
|---|---|
| Georgia | Armenia, Azerbaijan, Iran, Iraq, Turkey, Syria, Lebanon, Turkmenistan, Jordan, Moldova, Ukraine, Romania, Russia, Bulgaria, Egypt, Belarus, North Macedonia, Lithuania, Uzbekistan, Tajikistan, Albania, Montenegro, Poland, Bosnia & Herzegovina, Latvia, Afghanistan, Kazakhstan, Slovakia, Croatia, Estonia, Kyrgyzstan, Czechia, Pakistan, Yemen, Libya, Eritrea, Tunisia |
| Germany | Czechia, Denmark, Poland, Austria, Slovakia, Netherlands, Luxembourg, Belgium, Liechtenstein, Hungary, Slovenia, Switzerland, Croatia, Sweden, Lithuania, Norway, Latvia, France, United Kingdom, San Marino, Estonia, Monaco, Finland, Italy, Romania, Ireland, Andorra, Russia, Greece, Malta, Spain, Portugal, Iceland, Cyprus, Israel |
| Ghana | Togo, Benin, Côte d'Ivoire, Burkina Faso, Niger, Nigeria, São Tomé & Príncipe, Equatorial Guinea, Mali, Liberia, Cameroon, Sierra Leone, Guinea, Guinea-Bissau, Chad, Gambia, Congo - Brazzaville, Congo - Kinshasa, Central African Republic, Senegal, Angola, Mauritania, Cape Verde, Morocco, Burundi, Rwanda, Algeria, South Sudan, Tunisia, Namibia, Uganda, Sudan, Zambia, Kenya, Tanzania, Egypt, Zimbabwe, Ethiopia, Malawi, Botswana, Eritrea, Albania, Bosnia & Herzegovina |
| Greece | Bulgaria, Romania, Turkey, Malta, Cyprus, Italy, Croatia, Libya, Hungary, San Marino, Slovenia, Syria, Slovakia, Israel, Austria, Jordan, Monaco, Czechia, Liechtenstein, Poland, Switzerland, Belarus, Germany, Algeria, Lithuania, Luxembourg, Iraq, Andorra, Belgium, France, Latvia, Denmark, Netherlands, Russia, Spain, Estonia, United Kingdom, Sweden, Kuwait, Finland, Iran, Norway, Saudi Arabia, Bahrain |
| Grenada | St. Vincent & Grenadines, Trinidad & Tobago, St. Lucia, Barbados, Dominica, Antigua & Barbuda, St. Kitts & Nevis, Venezuela, Guyana, Suriname, Dominican Republic, Colombia, Jamaica, Ecuador, Costa Rica, Cuba, Nicaragua, Honduras, Belize, El Salvador, Guatemala, Peru, Bolivia, Brazil, Mexico, Cape Verde, Paraguay, Senegal, Gambia, Mauritania |
| Guatemala | El Salvador, Belize, Honduras, Nicaragua, Costa Rica, Mexico, Cuba, Jamaica, Ecuador, Colombia, Dominican Republic, Venezuela, Grenada, Dominica, St. Vincent & Grenadines, St. Lucia, Peru, Guyana, Suriname, Bolivia |
| Guinea | Sierra Leone, Guinea-Bissau, Liberia, Gambia, Senegal, Mali, Côte d'Ivoire, Mauritania, Burkina Faso, Ghana, Togo, Niger, Benin, Nigeria, São Tomé & Príncipe, Equatorial Guinea, Cameroon, Chad, Congo - Brazzaville, Congo - Kinshasa, Central African Republic, Angola, Albania, Bosnia & Herzegovina, Guyana, Burundi |
| Guinea-Bissau | Gambia, Guinea, Senegal, Sierra Leone, Mauritania, Liberia, Mali, Côte d'Ivoire, Burkina Faso, Ghana, Niger, Togo, Benin, Nigeria, São Tomé & Príncipe, Equatorial Guinea, Cameroon, Chad, Central African Republic, Congo - Brazzaville, Congo - Kinshasa, Angola, Guyana, Albania, Bosnia & Herzegovina |
| Guyana | Suriname, Grenada, St. Vincent & Grenadines, St. Lucia, Dominica, Venezuela, Colombia, Dominican Republic, Haiti, Jamaica, Ecuador, Brazil, Bolivia, Costa Rica, Peru, Nicaragua, Cuba, Honduras, El Salvador, Belize, Paraguay, Guatemala, Cape Verde, Senegal, Argentina, Gambia, Uruguay, Mexico, Chile, Guinea-Bissau, Mauritania, Guinea, Sierra Leone |
| Haiti | Nicaragua, Honduras, Guyana |
| Honduras | El Salvador, Nicaragua, Guatemala, Belize, Costa Rica, Cuba, Jamaica, Mexico, Haiti, Colombia, Ecuador, Dominican Republic, Grenada, Dominica, St. Vincent & Grenadines, St. Lucia, Peru, Guyana, Suriname, Bolivia |

Table 9: List of proxy countries *(continued)*

| Country | List of proxy countries |
|---|---|
| Hungary | Slovakia, Austria, Croatia, Slovenia, Bosnia & Herzegovina, Czechia, Poland, Montenegro, Bulgaria, North Macedonia, Romania, San Marino, Albania, Germany, Liechtenstein, Italy, Switzerland, Lithuania, Belarus, Luxembourg, Monaco, Denmark, Latvia, Greece, Belgium, Netherlands, France, Sweden, Malta, Estonia, Turkey, Tunisia, United Kingdom, Finland, Norway, Andorra, Russia, Libya, Algeria, Cyprus, Ireland, Spain, Lebanon, Israel, Jordan, Portugal, Azerbaijan, Iraq, Iran, Iceland, Kuwait |
| Iceland | Ireland, Norway, United Kingdom, Netherlands, Denmark, Belgium, Sweden, France, Luxembourg, Germany, Finland, Estonia, Latvia, Switzerland, Czechia, Liechtenstein, Poland, Lithuania, Andorra, Austria, Spain, Monaco, Slovakia, Portugal, Slovenia, Hungary, Croatia, San Marino, Italy, Russia, Romania, Canada, Malta, Greece, United States, Cyprus |
| India | Pakistan, Nepal, Afghanistan, Bhutan, Tajikistan, Bangladesh, Uzbekistan, Kyrgyzstan, Turkmenistan, Myanmar (Burma), Sri Lanka, Iran, Maldives, Azerbaijan, Laos, Thailand, Vietnam, Iraq, Armenia, Georgia, Mongolia, Cambodia, Yemen, China, Syria, Jordan, Djibouti, Eritrea, Egypt, Somalia, Ethiopia, Ukraine, North Korea, Moldova, Philippines, Sudan, Indonesia |
| Indonesia | Malaysia, Cambodia, Timor-Leste, Thailand, Laos, Philippines, Vietnam, Myanmar (Burma), Sri Lanka, Bangladesh, Maldives, Bhutan, Nepal, Papua New Guinea, India |
| Iran | Azerbaijan, Turkmenistan, Iraq, Armenia, Georgia, Saudi Arabia, Syria, Lebanon, Jordan, Oman, Tajikistan, Cyprus, Uzbekistan, Turkey, Egypt, Pakistan, Kyrgyzstan, Moldova, Ukraine, Kazakhstan, Romania, Yemen, Russia, Greece, Bulgaria, India, North Macedonia, Belarus, Djibouti, Albania, Montenegro, Sudan, Lithuania, Bosnia & Herzegovina, Hungary, Poland, Latvia, Slovakia, Croatia, Estonia, Malta, Czechia, Libya |
| Iraq | Iran, Syria, Armenia, Jordan, Lebanon, Azerbaijan, Georgia, Bahrain, Saudi Arabia, Cyprus, Turkey, Egypt, Turkmenistan, Oman, Greece, Yemen, Romania, Moldova, Bulgaria, Ukraine, North Macedonia, Tajikistan, Sudan, Albania, Uzbekistan, Djibouti, Montenegro, Bosnia & Herzegovina, Russia, Hungary, Belarus, Pakistan, Malta, Croatia, Lithuania, Slovakia, Poland, Kyrgyzstan, Libya, Kazakhstan, Latvia, Czechia, Tunisia, India, Estonia |
| Ireland | United Kingdom, Netherlands, Belgium, France, Luxembourg, Switzerland, Denmark, Norway, Liechtenstein, Germany, Andorra, Spain, Monaco, Czechia, Iceland, Sweden, Portugal, Austria, Slovenia, San Marino, Slovakia, Croatia, Poland, Italy, Hungary, Latvia, Algeria, Estonia, Finland, Lithuania, Malta, Romania, Russia, Greece, Turkey, Cyprus, Syria, Israel, Jordan |
| Israel | Cyprus, Greece, Kuwait, Saudi Arabia, Romania, Bahrain, Qatar, Malta, United Arab Emirates, Hungary, Croatia, Italy, Slovakia, Slovenia, San Marino, Austria, Oman, Poland, Czechia, Lithuania, Russia, Monaco, Liechtenstein, Switzerland, Germany, Latvia, Luxembourg |
| Italy | San Marino, Monaco, Slovenia, Croatia, Liechtenstein, Switzerland, Malta, Austria, Slovakia, Hungary, Andorra, Czechia, Luxembourg, Greece, France, Romania, Belgium, Germany, Netherlands, Poland, Spain, United Kingdom, Denmark, Lithuania, Portugal, Latvia, Ireland, Cyprus, Sweden, Norway, Estonia, Finland, Israel, Russia, Iceland |
| Jamaica | Dominican Republic, Bahamas, Cuba, Costa Rica, Honduras, Nicaragua, Belize, Venezuela, El Salvador, St. Kitts & Nevis, Colombia, Guatemala, Antigua & Barbuda, Dominica, St. Lucia, Grenada, St. Vincent & Grenadines, Trinidad & Tobago, Ecuador, Mexico, Guyana, Suriname, Peru, Bolivia, Brazil |
| Japan | South Korea, Taiwan, Palau, Brunei, Nauru |

Table 9: List of proxy countries *(continued)*

| Country | List of proxy countries |
|---|---|
| Jordan | Syria, Lebanon, Cyprus, Egypt, Iraq, Turkey, Armenia, Greece, Georgia, Iran, Azerbaijan, Romania, Bulgaria, North Macedonia, Albania, Moldova, Sudan, Montenegro, Bosnia & Herzegovina, Malta, Yemen, Ukraine, Libya, Turkmenistan, Hungary, Croatia, Djibouti, Slovakia, Oman, Tunisia, Belarus, Poland, Russia, Lithuania, Czechia, Latvia, Algeria, Tajikistan, Uzbekistan |
| Kazakhstan | Kyrgyzstan, Uzbekistan, Tajikistan, Turkmenistan, Azerbaijan, Russia, Georgia, Iran, Armenia, Mongolia, Ukraine, Belarus, Iraq, Estonia, Lithuania, Latvia, Moldova, Turkey, Oman, Poland, Romania, Syria, Lebanon, Jordan, China, Bulgaria, Hungary, Slovakia, North Macedonia, Czechia, Bosnia & Herzegovina, Montenegro, Albania, Croatia, Egypt, North Korea |
| Kenya | Uganda, Tanzania, Rwanda, Burundi, South Sudan, Somalia, Ethiopia, Comoros, Malawi, Djibouti, Zambia, Eritrea, Sudan, Zimbabwe, Yemen, Seychelles, Central African Republic, Madagascar, Congo - Kinshasa, Congo - Brazzaville, Angola, Mozambique, Chad, Eswatini, Botswana, Cameroon, Mauritius, Equatorial Guinea, Lesotho, São Tomé & Príncipe, Nigeria, Egypt, Oman, Jordan, Syria, Benin, Togo, Maldives, Niger, Ghana, Burkina Faso, Armenia, Côte d'Ivoire |
| Kiribati | Samoa, Tuvalu, Tonga, Fiji, Marshall Islands, Vanuatu, Solomon Islands, Micronesia (Federated States of) |
| Kuwait | Bahrain, Saudi Arabia, Qatar, United Arab Emirates, Oman, Israel, Cyprus, Greece, Romania, Russia, Hungary, Malta, Croatia, Lithuania, Slovakia, Poland, Austria, Slovenia, Italy, San Marino, Latvia |
| Kyrgyzstan | Uzbekistan, Tajikistan, Kazakhstan, Pakistan, Afghanistan, Turkmenistan, India, Nepal, Azerbaijan, Iran, Bhutan, Georgia, Armenia, Mongolia, Bangladesh, Iraq, Russia, Myanmar (Burma), Ukraine, Turkey, China, Syria, Lebanon, Moldova, Jordan, Lithuania, Vietnam, Laos, Latvia, Romania, Sri Lanka, Poland, Thailand, Egypt, Bulgaria, Yemen, North Korea, Maldives, North Macedonia, Slovakia, Albania, Bosnia & Herzegovina |
| Laos | Vietnam, Thailand, Myanmar (Burma), Cambodia, Bangladesh, Bhutan, Philippines, Nepal, Indonesia, Sri Lanka, China, India, North Korea, Mongolia, Pakistan, Maldives, Afghanistan, Kyrgyzstan, Timor-Leste, Tajikistan, Uzbekistan, Turkmenistan |
| Latvia | Lithuania, Estonia, Finland, Belarus, Sweden, Poland, Denmark, Ukraine, Russia, Norway, Germany, Czechia, Slovakia, Austria, Hungary, Moldova, Netherlands, Croatia, Slovenia, Romania, Luxembourg, Belgium, Liechtenstein, Bosnia & Herzegovina, Bulgaria, Switzerland, Montenegro, San Marino, North Macedonia, United Kingdom, France, Albania, Italy, Monaco, Ireland, Turkey, Greece, Georgia, Andorra, Armenia, Malta, Tunisia, Cyprus, Iceland, Azerbaijan, Lebanon, Spain, Algeria, Syria, Libya, Jordan, Israel, Egypt, Iraq, Kazakhstan, Iran, Portugal, Turkmenistan |
| Lebanon | Syria, Jordan, Egypt, Turkey, Iraq, Armenia, Georgia, Romania, Bulgaria, Azerbaijan, Iran, Saudi Arabia, North Macedonia, Moldova, Albania, Bahrain, Montenegro, Bosnia & Herzegovina, Ukraine, Malta, Hungary, Libya, Turkmenistan, Croatia, Slovakia, Yemen, Belarus, Tunisia, Poland, Russia, Lithuania, Czechia, Oman, Djibouti, Latvia, Estonia, Algeria, Tajikistan |
| Lesotho | Eswatini, Botswana, Mozambique, Namibia, Zimbabwe, Zambia, Malawi, Madagascar, Comoros, Tanzania, Angola, Burundi, Rwanda, Congo - Kinshasa, Congo - Brazzaville, Mauritius, Kenya, Uganda, South Sudan, Central African Republic, São Tomé & Príncipe, Somalia, Seychelles, Cameroon, Equatorial Guinea, Ethiopia, Chad, Nigeria, Benin, Djibouti, Togo, Ghana, Sudan |

Table 9: List of proxy countries *(continued)*

| Country | List of proxy countries |
|---|---|
| Liberia | Sierra Leone, Guinea, Côte d'Ivoire, Mali, Guinea-Bissau, Gambia, Ghana, Senegal, Burkina Faso, Togo, Mauritania, Benin, Niger, Cape Verde, Nigeria, São Tomé & Príncipe, Equatorial Guinea, Cameroon, Chad, Morocco, Congo - Brazzaville, Congo - Kinshasa, Angola, Central African Republic, Algeria, Tunisia, Burundi, Rwanda, South Sudan, Sudan, Uganda, Albania, Zambia |
| Libya | Malta, Tunisia, Algeria, Albania, Greece, Montenegro, North Macedonia, Bosnia & Herzegovina, Bulgaria, Croatia, Slovenia, Hungary, Romania, Slovakia, Cyprus, Czechia, Turkey, Lebanon, Portugal, Jordan, Poland, Belarus, Lithuania, Latvia, Iraq, Armenia, Georgia, Estonia |
| Liechtenstein | Switzerland, Luxembourg, Slovenia, Monaco, San Marino, Czechia, Croatia, Austria, Belgium, France, Slovakia, Italy, Germany, Netherlands, Hungary, Andorra, United Kingdom, Denmark, Poland, Spain, Malta, Ireland, Romania, Lithuania, Norway, Sweden, Latvia, Greece, Estonia, Finland, Portugal, Russia, Cyprus, Iceland, Israel |
| Lithuania | Belarus, Latvia, Poland, Estonia, Ukraine, Finland, Sweden, Russia, Denmark, Germany, Moldova, Czechia, Hungary, Slovakia, Austria, Norway, Romania, Croatia, Slovenia, Bosnia & Herzegovina, Bulgaria, Netherlands, Liechtenstein, Luxembourg, Montenegro, North Macedonia, Belgium, San Marino, Switzerland, Albania, France, Italy, United Kingdom, Turkey, Monaco, Greece, Georgia, Ireland, Armenia, Andorra, Malta, Cyprus, Tunisia, Azerbaijan, Lebanon, Syria, Libya, Algeria, Jordan, Israel, Spain, Egypt, Iraq, Iceland, Iran, Kazakhstan, Turkmenistan, Portugal |
| Luxembourg | Belgium, France, Switzerland, Netherlands, Liechtenstein, United Kingdom, Czechia, Germany, Monaco, Slovenia, Austria, San Marino, Denmark, Slovakia, Croatia, Andorra, Ireland, Hungary, Italy, Poland, Norway, Spain, Sweden, Lithuania, Latvia, Estonia, Romania, Malta, Finland, Portugal, Greece, Russia, Iceland, Cyprus, Israel |
| Madagascar | Comoros, Mauritius, Malawi, Mozambique, Zimbabwe, Seychelles, Eswatini, Tanzania, Zambia, Kenya, Botswana, Somalia, Lesotho, Burundi, Rwanda, Uganda, South Sudan, Ethiopia, Yemen, Maldives, Congo - Kinshasa, Congo - Brazzaville, Angola, Eritrea, Central African Republic, Sudan, Sri Lanka, Cameroon, Oman, Chad, Equatorial Guinea, São Tomé & Príncipe |
| Malawi | Zimbabwe, Zambia, Tanzania, Comoros, Burundi, Mozambique, Rwanda, Kenya, Madagascar, Uganda, Lesotho, South Sudan, Somalia, Congo - Kinshasa, Congo - Brazzaville, Angola, Ethiopia, Central African Republic, Cameroon, Sudan, Eritrea, São Tomé & Príncipe, Equatorial Guinea, Yemen, Chad, Nigeria, Benin, Togo, Ghana, Niger, Maldives, Burkina Faso, Egypt, Côte d'Ivoire |
| Malaysia | Singapore, Thailand, Indonesia, Sri Lanka, Philippines, Maldives, Palau, China, South Korea, North Korea, Mongolia |
| Maldives | Sri Lanka, Seychelles, India, Bangladesh, Nepal, Myanmar (Burma), Bhutan, Malaysia, Somalia, Thailand, Mauritius, Pakistan, Afghanistan, Yemen, Djibouti, Laos, Cambodia, Comoros, Madagascar, Tajikistan, Ethiopia, Indonesia, Vietnam, Eritrea, Turkmenistan, Kenya, Uzbekistan, Iran, Kyrgyzstan, Tanzania, Iraq, Uganda, Sudan, Azerbaijan, Malawi, Rwanda, Armenia, Burundi, Jordan |
| Mali | Burkina Faso, Côte d'Ivoire, Guinea, Sierra Leone, Liberia, Guinea-Bissau, Gambia, Senegal, Mauritania, Niger, Ghana, Togo, Benin, Nigeria, Equatorial Guinea, São Tomé & Príncipe, Cameroon, Chad, Central African Republic, Congo - Brazzaville, Congo - Kinshasa, Angola, Albania, Bosnia & Herzegovina, Sudan, South Sudan, Egypt, Burundi, Rwanda |

Table 9: List of proxy countries *(continued)*

| Country | List of proxy countries |
|---|---|
| Malta | Libya, Tunisia, Italy, Greece, San Marino, Algeria, Monaco, Bulgaria, Croatia, Slovenia, Liechtenstein, Andorra, Hungary, Switzerland, Romania, Austria, Slovakia, Czechia, Spain, Luxembourg, Turkey, Cyprus, France, Germany, Belgium, Poland, Lebanon, Israel, Netherlands, Syria, Jordan, United Kingdom, Portugal, Denmark, Belarus, Lithuania, Latvia, Ireland, Sweden, Norway, Estonia, Iraq, Finland, Russia |
| Marshall Islands | Nauru, Micronesia (Federated States of), Tuvalu, Solomon Islands, Vanuatu, Fiji, Samoa, Papua New Guinea, Tonga, Kiribati, Palau |
| Mauritania | Senegal, Gambia, Guinea-Bissau, Cape Verde, Guinea, Mali, Sierra Leone, Liberia, Burkina Faso, Côte d'Ivoire, Morocco, Niger, Ghana, Togo, Benin, Nigeria, Algeria, Equatorial Guinea, São Tomé & Príncipe, Tunisia, Cameroon, Chad, Central African Republic, Congo - Brazzaville, Congo - Kinshasa, Albania, Bosnia & Herzegovina, Angola |
| Mauritius | Madagascar, Seychelles, Comoros, Eswatini, Zimbabwe, South Africa, Kenya, Zambia, Lesotho, Maldives, Botswana, Djibouti, Sri Lanka, Yemen, Namibia, Sudan, Oman, Congo - Kinshasa, Congo - Brazzaville, Angola, United Arab Emirates |
| Mexico | Guatemala, Belize, El Salvador, Honduras, Nicaragua, Cuba, Costa Rica, Bahamas, Jamaica, Dominican Republic, Ecuador, Colombia, Venezuela, St. Kitts & Nevis, Antigua & Barbuda, Dominica, Grenada, St. Lucia, St. Vincent & Grenadines, Trinidad & Tobago, Peru, Barbados, Guyana, Suriname |
| Micronesia (Federated States of) | Marshall Islands, Solomon Islands, Papua New Guinea, Tuvalu, Vanuatu, Fiji, Timor-Leste, Samoa, Philippines, Tonga, North Korea, Kiribati |
| Moldova | Romania, Ukraine, Bulgaria, Belarus, North Macedonia, Poland, Turkey, Lithuania, Bosnia & Herzegovina, Slovakia, Albania, Croatia, Czechia, Russia, Latvia, Georgia, Estonia, Armenia, Lebanon, Syria, Jordan, Azerbaijan, Egypt, Tunisia, Iraq, Iran, Algeria, Turkmenistan |
| Monaco | Switzerland, San Marino, Liechtenstein, Italy, Andorra, Slovenia, Luxembourg, France, Croatia, Belgium, Austria, Czechia, Slovakia, Netherlands, Spain, Hungary, United Kingdom, Malta, Germany, Denmark, Poland, Ireland, Portugal, Romania, Greece, Lithuania, Norway, Sweden, Latvia, Estonia, Finland, Cyprus, Russia, Israel, Iceland |
| Mongolia | China, North Korea, Kazakhstan, Kyrgyzstan, Bhutan, Nepal, Vietnam, Uzbekistan, Bangladesh, Pakistan, Tajikistan, Myanmar (Burma), India, Laos, Afghanistan, Thailand, Philippines, Cambodia, Turkmenistan, Azerbaijan, Russia, Iran, Georgia, Armenia, Malaysia |
| Montenegro | Albania, Bosnia & Herzegovina, North Macedonia, Bulgaria, Croatia, Hungary, Romania, Slovakia, Czechia, Tunisia, Poland, Turkey, Libya, Ukraine, Belarus, Lithuania, Algeria, Latvia, Lebanon, Egypt, Syria, Jordan, Estonia, Russia, Georgia, Armenia, Iraq, Morocco, Azerbaijan, Iran |
| Morocco | Algeria, Tunisia, Mauritania, Croatia, Senegal, Bosnia & Herzegovina, Niger, Montenegro, Albania, Gambia, Czechia, Slovakia, North Macedonia, Cape Verde, Bulgaria, Sierra Leone, Poland, Côte d'Ivoire, Romania, Liberia, Nigeria, Togo, Benin, Ghana, Moldova, Lithuania, Latvia, Belarus |
| Mozambique | Lesotho, Zimbabwe, Zambia, Malawi, Madagascar, Comoros, Tanzania, Burundi, Rwanda, Kenya, Angola, Uganda, Congo - Kinshasa, Congo - Brazzaville, Somalia, South Sudan, Central African Republic, Ethiopia, Cameroon, São Tomé & Príncipe, Equatorial Guinea, Chad, Sudan, Eritrea, Nigeria, Yemen, Benin, Togo, Ghana |

Table 9: List of proxy countries *(continued)*

| Country | List of proxy countries |
|---|---|
| Myanmar (Burma) | Laos, Bangladesh, Vietnam, Bhutan, Cambodia, Nepal, India, Sri Lanka, Philippines, Pakistan, China, Maldives, Indonesia, Afghanistan, Kyrgyzstan, Mongolia, Tajikistan, Uzbekistan, North Korea, Turkmenistan, Timor-Leste, Azerbaijan |
| Namibia | Botswana, South Africa, Lesotho, Eswatini, Zimbabwe, Angola, Congo - Brazzaville, Gabon, Cameroon, Equatorial Guinea, Ghana, Côte d'Ivoire, Mauritius, Sudan, Seychelles, Djibouti |
| Nauru | Marshall Islands, Tuvalu, Fiji, Samoa, Tonga, Palau, Australia, New Zealand, Japan |
| Nepal | Bhutan, Bangladesh, India, Pakistan, Myanmar (Burma), Afghanistan, Kyrgyzstan, Tajikistan, Laos, Uzbekistan, Vietnam, Sri Lanka, Cambodia, Turkmenistan, Maldives, Mongolia, China, Azerbaijan, North Korea, Philippines, Armenia, Georgia, Indonesia, Yemen, Syria, Djibouti, Eritrea |
| Netherlands | Belgium, Luxembourg, United Kingdom, France, Germany, Denmark, Switzerland, Liechtenstein, Czechia, Ireland, Norway, Austria, Monaco, Slovakia, Slovenia, Croatia, San Marino, Poland, Andorra, Sweden, Hungary, Italy, Latvia, Lithuania, Estonia, Spain, Finland, Romania, Portugal, Malta, Iceland, Russia, Greece, Cyprus, Israel |
| New Zealand | Australia, Nauru |
| Nicaragua | Honduras, Costa Rica, El Salvador, Guatemala, Belize, Jamaica, Cuba, Colombia, Mexico, Ecuador, Haiti, Dominican Republic, Grenada, Dominica, St. Vincent & Grenadines, St. Lucia, Peru, Guyana, Suriname, Bolivia |
| Niger | Burkina Faso, Nigeria, Benin, Togo, Ghana, Côte d'Ivoire, Mali, Equatorial Guinea, Chad, Cameroon, São Tomé & Príncipe, Liberia, Sierra Leone, Guinea, Guinea-Bissau, Mauritania, Gambia, Central African Republic, Senegal, Morocco, Congo - Brazzaville, Congo - Kinshasa, Tunisia, Angola, Sudan, South Sudan, Egypt, Rwanda, Albania, Burundi, Uganda, Bosnia & Herzegovina, Eritrea, Ethiopia |
| Nigeria | Equatorial Guinea, Benin, Cameroon, Togo, Niger, Chad, Ghana, São Tomé & Príncipe, Burkina Faso, Central African Republic, Côte d'Ivoire, Congo - Brazzaville, Congo - Kinshasa, Mali, Liberia, Angola, Sierra Leone, Guinea, Guinea-Bissau, Gambia, South Sudan, Mauritania, Rwanda, Burundi, Senegal, Sudan, Uganda, Tunisia, Algeria, Morocco, Egypt, Ethiopia, Cape Verde, Kenya, Eritrea, Zambia, Tanzania, Albania, Malawi, Jordan, Djibouti, Zimbabwe, Bosnia & Herzegovina |
| North Korea | China, Mongolia, Philippines, Vietnam, Laos, Myanmar (Burma), Bhutan, Cambodia, Bangladesh, Thailand, Nepal, Kyrgyzstan, Kazakhstan, India, Malaysia, Pakistan, Uzbekistan, Micronesia (Federated States of), Tajikistan, Afghanistan |
| North Macedonia | Albania, Bulgaria, Montenegro, Bosnia & Herzegovina, Romania, Croatia, Hungary, Slovakia, Moldova, Turkey, Czechia, Tunisia, Poland, Ukraine, Libya, Belarus, Lithuania, Lebanon, Egypt, Syria, Latvia, Algeria, Jordan, Russia, Georgia, Armenia, Estonia, Iraq, Azerbaijan, Morocco, Iran |
| Norway | Sweden, Denmark, Estonia, Finland, Germany, Latvia, Netherlands, Lithuania, Poland, Belgium, Czechia, United Kingdom, Luxembourg, Ireland, France, Austria, Slovakia, Liechtenstein, Switzerland, Hungary, Slovenia, Croatia, Russia, Iceland, San Marino, Monaco, Romania, Italy, Andorra, Spain, Greece, Malta, Portugal, Cyprus, Israel |
| Oman | United Arab Emirates, Qatar, Bahrain, Saudi Arabia, Kuwait, Iran, Iraq, Jordan, Syria, Israel, Lebanon, Cyprus, Egypt, Sudan, Sri Lanka, Turkey, Seychelles, Kazakhstan, Kenya, Greece, Romania, Bulgaria, Russia, Montenegro, Belarus, Hungary, Lithuania |

Table 9: List of proxy countries *(continued)*

| Country | List of proxy countries |
|---|---|
| Pakistan | Afghanistan, Tajikistan, India, Uzbekistan, Kyrgyzstan, Nepal, Turkmenistan, Bhutan, Iran, Bangladesh, Azerbaijan, Armenia, Georgia, Iraq, Myanmar (Burma), Sri Lanka, Mongolia, Maldives, Syria, Laos, Jordan, Vietnam, Thailand, Yemen, China, Djibouti, Ukraine, Egypt, Moldova, Eritrea, Cambodia, Ethiopia, Sudan, Somalia |
| Palau | Brunei, Taiwan, Japan, South Korea, Singapore, Malaysia, Nauru, Thailand, China, Marshall Islands, Australia |
| Papua New Guinea | Solomon Islands, Micronesia (Federated States of), Timor-Leste, Vanuatu, Marshall Islands, Fiji, Tuvalu, Philippines, Tonga, Indonesia, Samoa |
| Paraguay | Argentina, Bolivia, Brazil, Chile, Peru, Suriname, Guyana, Ecuador, Colombia, Venezuela, Grenada, St. Vincent & Grenadines, St. Lucia, Dominica, Costa Rica |
| Peru | Bolivia, Ecuador, Colombia, Chile, Paraguay, Costa Rica, Venezuela, Nicaragua, Guyana, Trinidad & Tobago, Honduras, Argentina, Suriname, El Salvador, Grenada, Brazil, Uruguay, St. Vincent & Grenadines, Guatemala, Jamaica, St. Lucia, Dominican Republic, Dominica, Belize, St. Kitts & Nevis, Antigua & Barbuda, Cuba, Bahamas, Mexico |
| Philippines | Vietnam, Cambodia, Laos, Thailand, Malaysia, Timor-Leste, South Korea, Myanmar (Burma), North Korea, Indonesia, China, Bangladesh, Bhutan, Mongolia, Papua New Guinea, Nepal, Micronesia (Federated States of), Sri Lanka, India |
| Poland | Lithuania, Belarus, Czechia, Germany, Slovakia, Hungary, Austria, Latvia, Denmark, Ukraine, Croatia, Sweden, Moldova, Estonia, Slovenia, Finland, Romania, Bosnia & Herzegovina, Liechtenstein, Norway, Bulgaria, Luxembourg, Netherlands, Montenegro, San Marino, North Macedonia, Switzerland, Russia, Belgium, Albania, Italy, France, Monaco, United Kingdom, Greece, Turkey, Andorra, Ireland, Malta, Tunisia, Cyprus, Georgia, Algeria, Armenia, Libya, Spain, Lebanon, Syria, Israel, Jordan, Azerbaijan, Egypt, Portugal, Iceland, Iraq, Morocco, Iran, Turkmenistan |
| Portugal | Spain, Andorra, Algeria, France, Monaco, United Kingdom, Switzerland, Ireland, Belgium, Tunisia, Luxembourg, Liechtenstein, Netherlands, Italy, San Marino, Slovenia, Libya, Malta, Croatia, Czechia, Austria, Germany, Slovakia, Hungary, Denmark, Norway, Bulgaria, Poland, Greece, Iceland, Romania, Sweden, Lithuania, Latvia, Belarus, Estonia, Finland, Turkey |
| Qatar | Bahrain, United Arab Emirates, Saudi Arabia, Kuwait, Oman, Israel, Cyprus, Greece, Romania, Seychelles, Russia, Malta, Hungary, Croatia, Lithuania |
| Romania | Bulgaria, Moldova, North Macedonia, Montenegro, Albania, Bosnia & Herzegovina, Hungary, Greece, Ukraine, Turkey, Slovakia, Croatia, Austria, Slovenia, Poland, Belarus, Czechia, San Marino, Italy, Lithuania, Cyprus, Germany, Liechtenstein, Malta, Latvia, Lebanon, Switzerland, Monaco, Syria, Russia, Georgia, Denmark, Armenia, Tunisia, Israel, Luxembourg, Jordan, Egypt, Estonia, Libya, Sweden, Finland, Belgium, Netherlands, France, Andorra, Azerbaijan, Iraq, Norway, United Kingdom, Algeria, Iran, Spain, Ireland, Kuwait, Turkmenistan, Saudi Arabia, Portugal |
| Russia | Belarus, Ukraine, Lithuania, Latvia, Estonia, Finland, Moldova, Poland, Sweden, Romania, Denmark, Hungary, Germany, Slovakia, Georgia, Norway, Czechia, Austria, Bulgaria, Turkey, Armenia, Croatia, Bosnia & Herzegovina, North Macedonia, Azerbaijan, Slovenia, Montenegro, Albania, Netherlands, Liechtenstein, Luxembourg, San Marino, Greece, Belgium, Kazakhstan, Switzerland, Cyprus, Italy, Lebanon, Iran, Syria, France, United Kingdom, Turkmenistan, Monaco, Iraq, Jordan, Israel, Uzbekistan, Ireland, Malta, Egypt, Tunisia, Andorra, Kyrgyzstan, Kuwait, Libya |

Table 9: List of proxy countries *(continued)*

| Country | List of proxy countries |
| --- | --- |
| Rwanda | Burundi, Uganda, Kenya, South Sudan, Tanzania, Malawi, Central African Republic, Zambia, Ethiopia, Congo - Kinshasa, Congo - Brazzaville, Zimbabwe, Somalia, Comoros, Sudan, Angola, Eritrea, Cameroon, Chad, Equatorial Guinea, Yemen, São Tomé & Príncipe, Mozambique, Madagascar, Nigeria, Lesotho, Benin, Togo, Ghana, Niger, Egypt, Burkina Faso, Syria, Côte d'Ivoire, Mali, Liberia |
| Samoa | Tonga, Fiji, Tuvalu, Vanuatu, Kiribati, Nauru, Marshall Islands, Solomon Islands, Micronesia (Federated States of), Papua New Guinea |
| San Marino | Italy, Slovenia, Croatia, Monaco, Liechtenstein, Switzerland, Austria, Slovakia, Hungary, Czechia, Luxembourg, Andorra, Malta, France, Germany, Belgium, Netherlands, Romania, Poland, Greece, United Kingdom, Denmark, Spain, Lithuania, Latvia, Ireland, Sweden, Norway, Portugal, Estonia, Finland, Cyprus, Russia, Israel, Iceland |
| São Tomé & Príncipe | Equatorial Guinea, Cameroon, Benin, Togo, Ghana, Nigeria, Congo - Brazzaville, Congo - Kinshasa, Angola, Central African Republic, Côte d'Ivoire, Niger, Chad, Burkina Faso, Liberia, Mali, Sierra Leone, Guinea, Burundi, Rwanda, Guinea-Bissau, South Sudan, Uganda, Zambia, Gambia, Senegal, Mauritania, Sudan, Tanzania, Zimbabwe, Kenya, Malawi, Ethiopia, Cape Verde, Eritrea, Eswatini, Lesotho, Morocco, Mozambique, Algeria, Tunisia, Egypt, Djibouti, Comoros, Somalia, Yemen, Jordan, Albania |
| Saudi Arabia | Bahrain, Qatar, Kuwait, United Arab Emirates, Iraq, Oman, Iran, Israel, Lebanon, Cyprus, Turkey, Greece, Romania, Malta, Seychelles, Libya, Hungary, Russia, Croatia, Belarus, Slovakia, Italy |
| Senegal | Gambia, Guinea-Bissau, Mauritania, Cape Verde, Guinea, Sierra Leone, Mali, Liberia, Côte d'Ivoire, Burkina Faso, Niger, Ghana, Togo, Benin, Morocco, Nigeria, São Tomé & Príncipe, Equatorial Guinea, Algeria, Cameroon, Chad, Tunisia, Central African Republic, Congo - Brazzaville, Congo - Kinshasa, Suriname, Angola, Guyana, Albania, Croatia, Bosnia & Herzegovina, St. Lucia, Dominica, St. Vincent & Grenadines, Brazil, Grenada, North Macedonia |
| Seychelles | Mauritius, Madagascar, Kenya, Maldives, Sri Lanka, Zimbabwe, Oman, Zambia, United Arab Emirates, Qatar, Saudi Arabia, Sudan, Bahrain, Eswatini, South Africa, Kuwait, Botswana, Lesotho, Iraq, Congo - Brazzaville, Iran, Jordan, Israel, Namibia, Egypt, Syria, Angola, Turkmenistan, Lebanon, Cyprus, Cameroon |
| Sierra Leone | Guinea, Liberia, Guinea-Bissau, Gambia, Mali, Senegal, Côte d'Ivoire, Mauritania, Burkina Faso, Ghana, Togo, Benin, Niger, Nigeria, São Tomé & Príncipe, Equatorial Guinea, Cameroon, Morocco, Chad, Congo - Brazzaville, Congo - Kinshasa, Angola, Algeria, Central African Republic, Tunisia, Albania, Burundi, Rwanda, Guyana, South Sudan, Bosnia & Herzegovina |
| Singapore | Malaysia, Brunei, Taiwan, Palau, South Korea |
| Slovakia | Austria, Hungary, Croatia, Czechia, Slovenia, Bosnia & Herzegovina, Poland, Germany, Liechtenstein, San Marino, Montenegro, Switzerland, North Macedonia, Bulgaria, Italy, Albania, Romania, Luxembourg, Moldova, Denmark, Monaco, Lithuania, Belarus, Belgium, Netherlands, Ukraine, Latvia, France, Sweden, Greece, United Kingdom, Estonia, Andorra, Norway, Malta, Tunisia, Finland, Turkey, Russia, Algeria, Libya, Ireland, Spain, Cyprus, Lebanon, Syria, Georgia, Egypt, Armenia, Portugal, Israel, Jordan, Morocco, Azerbaijan, Iraq, Iceland, Iran, Kuwait |
| Slovenia | Croatia, Austria, San Marino, Slovakia, Hungary, Liechtenstein, Czechia, Italy, Switzerland, Monaco, Germany, Luxembourg, Poland, Belgium, Romania, France, Netherlands, Denmark, Andorra, Malta, Greece, Lithuania, United Kingdom, Belarus, Latvia, Libya, Sweden, Norway, Spain, Estonia, Ireland, Finland, Russia, Cyprus, Portugal, Israel, Iceland, Kuwait |

Table 9: List of proxy countries *(continued)*

| Country | List of proxy countries |
|---|---|
| Solomon Islands | Vanuatu, Papua New Guinea, Micronesia (Federated States of), Tuvalu, Fiji, Marshall Islands, Tonga, Samoa, Timor-Leste, Kiribati |
| Somalia | Kenya, Ethiopia, Tanzania, Uganda, Yemen, Comoros, South Sudan, Eritrea, Rwanda, Burundi, Sudan, Malawi, Madagascar, Zambia, Zimbabwe, Central African Republic, Maldives, Mozambique, Congo - Kinshasa, Congo - Brazzaville, Egypt, Chad, Syria, Angola, Cameroon, Sri Lanka, Lesotho, Equatorial Guinea, Turkmenistan, Armenia, Nigeria, Azerbaijan, São Tomé & Príncipe, Afghanistan, Georgia, India, Pakistan, Tajikistan |
| South Africa | Botswana, Eswatini, Zimbabwe, Namibia, Angola, Congo - Brazzaville, Mauritius, Gabon, Seychelles, Cameroon, Equatorial Guinea, Djibouti |
| South Korea | Japan, Taiwan, Philippines, Palau, Thailand, Brunei, Malaysia, Singapore |
| South Sudan | Uganda, Rwanda, Kenya, Ethiopia, Burundi, Sudan, Tanzania, Eritrea, Central African Republic, Djibouti, Somalia, Yemen, Chad, Congo - Brazzaville, Congo - Kinshasa, Malawi, Cameroon, Comoros, Zambia, Zimbabwe, Nigeria, Egypt, São Tomé & Príncipe, Madagascar, Syria, Benin, Togo, Niger, Mozambique, Iraq, Eswatini, Ghana, Burkina Faso, Lesotho, Côte d'Ivoire, Armenia |
| Spain | Andorra, Portugal, Algeria, Monaco, France, Switzerland, United Kingdom, Luxembourg, Liechtenstein, Belgium, Italy, San Marino, Ireland, Netherlands, Slovenia, Malta, Croatia, Czechia, Austria, Slovakia, Germany, Hungary, Denmark, Bulgaria, Poland, Greece, Norway, Romania, Sweden, Lithuania, Latvia, Estonia, Iceland, Finland, Turkey, Cyprus, Russia |
| Sri Lanka | Maldives, Bangladesh, Myanmar (Burma), Nepal, Thailand, India, Malaysia, Bhutan, Laos, Cambodia, Oman, Seychelles, Pakistan, Vietnam, Afghanistan, Indonesia, Tajikistan, Somalia, Mauritius, Uzbekistan, Yemen, Kyrgyzstan, Turkmenistan, Djibouti, Iran, Ethiopia, Comoros, Madagascar, Eritrea, Philippines, Iraq, Azerbaijan, Kenya, Kazakhstan |
| St. Kitts & Nevis | Antigua & Barbuda, Dominica, St. Lucia, St. Vincent & Grenadines, Barbados, Grenada, Trinidad & Tobago, Dominican Republic, Venezuela, Jamaica, Suriname, Bahamas, Colombia, Cuba, Costa Rica, Ecuador, United States, Belize, Canada, Peru, Mexico, Brazil |
| St. Lucia | St. Vincent & Grenadines, Dominica, Barbados, Grenada, Antigua & Barbuda, Trinidad & Tobago, St. Kitts & Nevis, Venezuela, Guyana, Dominican Republic, Suriname, Jamaica, Colombia, Cuba, Ecuador, Costa Rica, Nicaragua, Honduras, Belize, El Salvador, Guatemala, Peru, Bolivia, Brazil, Cape Verde, Mexico, Paraguay, Senegal, Gambia, Mauritania |
| St. Vincent & Grenadines | St. Lucia, Grenada, Barbados, Dominica, Trinidad & Tobago, Antigua & Barbuda, St. Kitts & Nevis, Venezuela, Guyana, Suriname, Dominican Republic, Colombia, Jamaica, Ecuador, Cuba, Costa Rica, Nicaragua, Honduras, Belize, El Salvador, Guatemala, Peru, Bolivia, Brazil, Cape Verde, Mexico, Paraguay, Senegal, Gambia, Mauritania |
| Sudan | Eritrea, Ethiopia, South Sudan, Djibouti, Yemen, Egypt, Uganda, Jordan, Chad, Kenya, Rwanda, Central African Republic, Syria, Somalia, Burundi, Iraq, Tanzania, Cameroon, Turkey, Nigeria, Oman, Congo - Brazzaville, Congo - Kinshasa, Iran, Equatorial Guinea, Armenia, Albania, North Macedonia, Georgia, Azerbaijan, Tunisia, Comoros, Malawi, Niger, São Tomé & Príncipe, Seychelles, Bosnia & Herzegovina, Benin, Angola, Zambia, Moldova, Turkmenistan |

Table 9: List of proxy countries *(continued)*

| Country | List of proxy countries |
|---|---|
| Suriname | Guyana, Trinidad & Tobago, Barbados, Grenada, St. Vincent & Grenadines, St. Lucia, Dominica, Venezuela, Antigua & Barbuda, St. Kitts & Nevis, Colombia, Dominican Republic, Brazil, Ecuador, Jamaica, Bolivia, Peru, Bahamas, Costa Rica, Paraguay, Nicaragua, Cuba, Cape Verde, Honduras, El Salvador, Belize, Guatemala, Senegal, Argentina, Uruguay, Chile, Mexico |
| Sweden | Estonia, Finland, Norway, Latvia, Denmark, Lithuania, Poland, Germany, Czechia, Netherlands, Russia, Austria, Slovakia, Belgium, Hungary, Luxembourg, United Kingdom, Liechtenstein, Slovenia, Croatia, France, Switzerland, Ireland, Romania, San Marino, Monaco, Italy, Iceland, Andorra, Greece, Spain, Malta, Cyprus, Portugal, Israel |
| Switzerland | Liechtenstein, Luxembourg, Monaco, France, Belgium, San Marino, Slovenia, Czechia, Netherlands, Croatia, Andorra, Austria, Italy, Slovakia, United Kingdom, Germany, Hungary, Denmark, Poland, Spain, Ireland, Malta, Norway, Romania, Lithuania, Sweden, Latvia, Portugal, Greece, Estonia, Finland, Russia, Cyprus, Iceland, Israel |
| Syria | Lebanon, Jordan, Cyprus, Egypt, Iraq, Turkey, Armenia, Georgia, Greece, Iran, Azerbaijan, Romania, Bulgaria, North Macedonia, Moldova, Albania, Montenegro, Bosnia & Herzegovina, Ukraine, Malta, Sudan, Eritrea, Turkmenistan, Yemen, Croatia, Slovakia, Belarus, Tunisia, Poland, Oman, Russia, Lithuania, Djibouti, Czechia, Ethiopia, Latvia, Tajikistan, Estonia, Uzbekistan, Afghanistan, Algeria |
| Taiwan | South Korea, Japan, Brunei, Palau, Singapore |
| Tajikistan | Uzbekistan, Afghanistan, Pakistan, Kyrgyzstan, Turkmenistan, India, Kazakhstan, Iran, Azerbaijan, Nepal, Georgia, Armenia, Iraq, Bhutan, Bangladesh, Syria, Lebanon, Jordan, Turkey, Mongolia, Ukraine, Myanmar (Burma), Moldova, Yemen, Egypt, Romania, Sri Lanka, Bulgaria, Maldives, Eritrea, Djibouti, Poland, Laos, Vietnam, China, Albania, Thailand, Bosnia & Herzegovina |
| Tanzania | Kenya, Burundi, Rwanda, Uganda, Malawi, Comoros, South Sudan, Zambia, Zimbabwe, Somalia, Ethiopia, Madagascar, Djibouti, Mozambique, Central African Republic, Congo - Kinshasa, Congo - Brazzaville, Eswatini, Eritrea, Sudan, Angola, Yemen, Lesotho, Cameroon, Chad, Equatorial Guinea, São Tomé & Príncipe, Nigeria, Benin, Egypt, Togo, Ghana, Niger, Maldives, Syria, Burkina Faso, Côte d'Ivoire |
| Thailand | Laos, Vietnam, Malaysia, Bhutan, Philippines, Indonesia, Sri Lanka, India, Maldives, China, Pakistan, Timor-Leste, South Korea, North Korea, Palau, Mongolia, Kyrgyzstan, Tajikistan, Uzbekistan, Oman, Kazakhstan, Turkmenistan |
| Timor-Leste | Indonesia, Papua New Guinea, Philippines, Cambodia, Thailand, Solomon Islands, Laos, Vietnam, Micronesia (Federated States of), Myanmar (Burma), Vanuatu |
| Togo | Benin, Ghana, Côte d'Ivoire, Burkina Faso, Nigeria, Niger, Equatorial Guinea, São Tomé & Príncipe, Cameroon, Mali, Liberia, Sierra Leone, Chad, Guinea, Central African Republic, Congo - Brazzaville, Congo - Kinshasa, Guinea-Bissau, Gambia, Angola, Senegal, Mauritania, Morocco, Burundi, Rwanda, South Sudan, Algeria, Tunisia, Uganda, Sudan, Zambia, Kenya, Tanzania, Egypt, Ethiopia, Zimbabwe, Malawi, Eritrea, Albania, Botswana, Bosnia & Herzegovina |
| Tonga | Fiji, Samoa, Tuvalu, Vanuatu, Solomon Islands, Nauru, Kiribati, Marshall Islands, Papua New Guinea, Micronesia (Federated States of) |
| Trinidad & Tobago | Grenada, St. Vincent & Grenadines, Barbados, St. Lucia, Dominica, Venezuela, Antigua & Barbuda, St. Kitts & Nevis, Suriname, Jamaica, Ecuador, Bahamas, Costa Rica, Cuba, Belize, Peru, Brazil, United States, Canada, Mexico, Chile |

Table 9: List of proxy countries *(continued)*

| Country | List of proxy countries |
|---|---|
| Tunisia | Malta, Libya, Algeria, Albania, Montenegro, Bosnia & Herzegovina, Croatia, North Macedonia, Bulgaria, Slovakia, Hungary, Czechia, Morocco, Romania, Portugal, Moldova, Poland, Turkey, Egypt, Cyprus, Ukraine, Lithuania, Lebanon, Belarus, Syria, Jordan, Latvia, Niger, Estonia, Russia, Armenia, Georgia, Nigeria, Iraq |
| Turkey | Cyprus, Lebanon, Romania, Syria, Greece, Moldova, Bulgaria, Jordan, North Macedonia, Armenia, Georgia, Egypt, Albania, Montenegro, Ukraine, Iraq, Bosnia & Herzegovina, Hungary, Azerbaijan, Croatia, Slovakia, Belarus, Poland, Malta, Iran, Lithuania, Russia, Czechia, Libya, Latvia, Tunisia, Saudi Arabia, Turkmenistan, Bahrain, Estonia, Algeria, Sudan |
| Turkmenistan | Iran, Azerbaijan, Tajikistan, Uzbekistan, Afghanistan, Armenia, Georgia, Iraq, Pakistan, Kyrgyzstan, Kazakhstan, India, Syria, Lebanon, Jordan, Turkey, Russia, Ukraine, Moldova, Egypt, Nepal, Romania, Yemen, Belarus, Bulgaria, Lithuania, Bhutan, Eritrea, North Macedonia, Latvia, Djibouti, Poland, Albania, Montenegro, Hungary, Estonia, Bosnia & Herzegovina, Bangladesh, Slovakia, Sudan, Croatia, Czechia, Ethiopia |
| Tuvalu | Fiji, Samoa, Tonga, Vanuatu, Nauru, Marshall Islands, Solomon Islands, Kiribati, Micronesia (Federated States of), Papua New Guinea |
| Uganda | Rwanda, Kenya, South Sudan, Burundi, Tanzania, Ethiopia, Somalia, Malawi, Central African Republic, Sudan, Comoros, Eritrea, Zambia, Congo - Kinshasa, Congo - Brazzaville, Zimbabwe, Yemen, Chad, Angola, Cameroon, Equatorial Guinea, Madagascar, São Tomé & Príncipe, Mozambique, Nigeria, Egypt, Lesotho, Benin, Togo, Niger, Ghana, Syria, Burkina Faso, Côte d'Ivoire, Maldives, Armenia |
| Ukraine | Moldova, Belarus, Lithuania, Poland, Romania, Russia, Latvia, Slovakia, Bulgaria, Estonia, Czechia, North Macedonia, Bosnia & Herzegovina, Turkey, Croatia, Montenegro, Albania, Georgia, Armenia, Azerbaijan, Lebanon, Syria, Jordan, Iraq, Tunisia, Egypt, Iran, Turkmenistan, Algeria, Kazakhstan, Uzbekistan |
| United Arab Emirates | Qatar, Bahrain, Oman, Saudi Arabia, Kuwait, Israel, Cyprus, Seychelles, Greece, Romania, Russia, Malta, Hungary, Lithuania |
| United Kingdom | Belgium, France, Netherlands, Ireland, Luxembourg, Switzerland, Liechtenstein, Germany, Denmark, Andorra, Monaco, Czechia, Norway, Slovenia, Austria, San Marino, Spain, Slovakia, Croatia, Italy, Sweden, Poland, Hungary, Portugal, Latvia, Lithuania, Estonia, Finland, Iceland, Malta, Romania, Greece, Russia, Cyprus, Israel |
| United States | Canada, Bahamas, St. Kitts & Nevis, Antigua & Barbuda, Venezuela, Barbados, Trinidad & Tobago, Iceland |
| Uruguay | Argentina, Chile, Brazil, Bolivia, Peru, Ecuador, Suriname, Guyana, Colombia |
| Uzbekistan | Tajikistan, Kyrgyzstan, Afghanistan, Pakistan, Turkmenistan, Kazakhstan, India, Azerbaijan, Iran, Georgia, Armenia, Nepal, Iraq, Bhutan, Bangladesh, Russia, Syria, Mongolia, Turkey, Lebanon, Ukraine, Jordan, Moldova, Belarus, Myanmar (Burma), Romania, Lithuania, Egypt, Latvia, Estonia, Bulgaria, Yemen, Poland, North Macedonia, China, Sri Lanka, Albania, Laos, Eritrea, Vietnam, Slovakia, Bosnia & Herzegovina, Maldives, Djibouti |
| Vanuatu | Fiji, Solomon Islands, Tuvalu, Tonga, Samoa, Papua New Guinea, Marshall Islands, Micronesia (Federated States of), Kiribati, Timor-Leste |

Table 9: List of proxy countries *(continued)*

| Country | List of proxy countries |
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| Venezuela | Trinidad & Tobago, Grenada, St. Vincent & Grenadines, St. Lucia, Dominica, Barbados, St. Kitts & Nevis, Antigua & Barbuda, Dominican Republic, Colombia, Guyana, Jamaica, Suriname, Ecuador, Costa Rica, Bahamas, Cuba, El Salvador, Belize, Guatemala, Peru, Bolivia, United States, Brazil, Mexico, Canada, Paraguay, Cape Verde, Chile |
| Vietnam | Laos, Thailand, Myanmar (Burma), Cambodia, Bangladesh, Philippines, Bhutan, Nepal, China, North Korea, Mongolia, India, Indonesia, Sri Lanka, Pakistan, Kyrgyzstan, Afghanistan, Timor-Leste, Maldives, Tajikistan, Uzbekistan, Turkmenistan |
| Yemen | Djibouti, Eritrea, Ethiopia, Sudan, Somalia, South Sudan, Iraq, Kenya, Jordan, Uganda, Egypt, Syria, Lebanon, Iran, Rwanda, Tanzania, Burundi, Armenia, Azerbaijan, Turkmenistan, Georgia, Turkey, Comoros, Central African Republic, Chad, Afghanistan, Malawi, Maldives, Tajikistan, Pakistan, Bulgaria, Romania, India, Albania, Uzbekistan, Moldova, Cameroon, Madagascar, Zambia, Congo - Brazzaville, Congo - Kinshasa, Zimbabwe, Sri Lanka, Bosnia & Herzegovina |
| Zambia | Zimbabwe, Malawi, Botswana, Eswatini, Mozambique, Tanzania, Burundi, Rwanda, Lesotho, Comoros, Angola, Uganda, Kenya, Congo - Kinshasa, Congo - Brazzaville, Madagascar, South Sudan, Central African Republic, Somalia, Cameroon, Ethiopia, São Tomé & Príncipe, Equatorial Guinea, Mauritius, Seychelles, Chad, Djibouti, Sudan, Nigeria, Eritrea, Benin, Yemen, Togo, Ghana, Niger, Côte d'Ivoire, Burkina Faso, Liberia |
| Zimbabwe | Zambia, Malawi, Mozambique, South Africa, Botswana, Eswatini, Lesotho, Tanzania, Comoros, Namibia, Burundi, Madagascar, Rwanda, Kenya, Uganda, Angola, Congo - Kinshasa, Congo - Brazzaville, South Sudan, Somalia, Mauritius, Central African Republic, Seychelles, Ethiopia, Cameroon, São Tomé & Príncipe, Equatorial Guinea, Djibouti, Sudan, Chad, Eritrea, Yemen, Nigeria, Benin, Togo, Ghana, Niger, Côte d'Ivoire, Burkina Faso |

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INDUSTRIAL DEVELOPMENT ORGANIZATION

Vienna International Centre · P.O. Box 300 9 · 1400 Vienna · Austria
Tel.: (+43-1) 26026-0 · E-mail: info@unido.org
www.unido.org