IFPRI Discussion Paper 02275

September 2024

The Agricultural Transformation Index

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ABSTRACT

Agricultural transformation, in broad terms, is the process during which the agricultural sector develops from a low-productivity, subsistence-oriented sector to a modern, commercially oriented one. It typically involves adopting advanced technologies and more sustainable and efficient production practices, and results in higher agricultural productivity per worker, agricultural diversification into high-value crops, and rising rural incomes. Importantly, agricultural transformation is also seen as a catalyst for broader economic development and a structural shift in the economy characterized by industrialization and greater integration between the agricultural and nonagricultural sectors. Given the central role of agricultural transformation in driving such change, as well as its contribution to development objectives such as poverty reduction, improvements in diet quality, and environmental sustainability, it is useful to measure and monitor progress on agricultural transformation. This is the purpose of the Agricultural Transformation Index (ATI), a newly developed composite index constructed from four indicators of progress on agricultural transformation: staple crop productivity, diversification, agricultural labor productivity, and food system expansion. Together, these indicators, which are calculated from publicly available, global datasets, can be used to examine progress over time on global, regional, and national scales. In addition to being transparent and easy to interpret, the index can be updated annually as new data is released. As demonstrated in this study, the ATI produces a plausible ranking of countries and is highly correlated with indicators of overall economic wellbeing such as GDP per capita or household welfare measures such as poverty or the prevalence of undernourishment. The ATI is not only useful for identifying countries in need of support from international development partners or tracking their progress on agricultural transformation but can also highlight specific areas of agricultural transformation where technical or investment support might be directed by governments or their partners.

Keywords: agricultural transformation; structural change; economic development

ACKNOWLEDGMENTS

This study was made possible through support provided by the Office of Policy, Analysis and Engagement, Bureau for Resilience and Food Security, USAID, under the Policy, Evidence, Analytics, Research, and Learning (PEARL) Award#720RFS22IO00003. This work is supported by the CGIAR's Foresight and Metrics Initiative, and we thank all funders who contribute to the CGIAR Trust Fund. The study's data and models are supported by the Bill and Melinda Gates Foundation. We particularly thank Christopher Hillbruner and Stanley Wood for their reviews, as well as comments from participants at several seminars. The opinions expressed in this presentation are those of the authors and do not necessarily reflect the views of the BMGF, CGIAR, USAID, or reviewers.

1 INTRODUCTION

The analysis of economic growth and its relation to structural change is an important cornerstone of the field of development economics.

One of the earliest models of structural change is the Lewis (1954) two-sector model, which describes the structural change process as a shift of surplus labor in a subsistence agricultural sector to an expanding modern industrial sector with higher productivity and wages. This intersectoral migration of labor is associated with overall productivity gains and economic growth. More nuanced structural change models acknowledge that it is not only the movement of workers between sectors that contributes to growth. Productivity growth within a sector can also contribute to growth. In this regard, agricultural transformation, which in broad terms is understood as the process of development in the agricultural sector as it develops from a low-productivity, subsistence-oriented sector to a modern, commercially oriented one, is often a catalyst for broader economic growth and development and a subsequent shift towards modernization and industrialization of the economy (de Janvry and Sadoulet 2019).

Economic growth can therefore be decomposed into two parts (McMillan et al. 2014): a within-sector component associated with transformation and productivity growth within sectors, including agricultural and non-agricultural sectors; and a between-sector component associated with the movement of workers between sectors. In the case of agriculture, the within-sector growth component is referred to as agricultural transformation, while the between-sector growth component is referred to as structural change. Of course, the structural change experience has not always been positive for all countries. For instance, McMillan et al. (2014) find that in Africa and Latin America structural change was growth-reducing in the 1990s as labor was pushed out of agriculture and into less productive off-farm activities, such as informal trade, which became the last resort for many rural workers. Compared to the Asian Green Revolution experience in the 1960s and 1970s, countries that started to transition in the later, particularly from the 1990s onwards, faced intense competition in world markets due to rapid globalization, with manufacturing sectors in particular struggling to expand fast enough to absorb labor. Such experiences have led some to question traditional growth models and the notion that agricultural transformation will always contribute to positive structural change. This highlights the importance of not only investing in human capital to facilitate the transition of workers from lower- to higher-skilled jobs, but also supporting the development of globally competitive and productive non-agricultural sectors that can absorb migrating workers.

Agricultural transformation and structural change processes are of course not independent of one another and are, in fact, strongly correlated (World Bank 1982). Input-output linkages between agriculture and non-agriculture become stronger when rising agricultural productivity generates demand for modern inputs such as fertilizer or transportation services, which are supplied by non-agricultural sectors. Similarly, as non-agricultural sectors expand – a process which itself is facilitated by labor migration from agricultural sectors – they demand more inputs from the agricultural sector. With rising rural household incomes and urbanization also comes new demand for non-agricultural products such as processed foods, textiles, or other household items. Therefore, agricultural transformation and structural change processes both reinforce intersectoral linkages between agricultural and non-agricultural sectors and contribute to economywide development.

Agricultural transformation is important also for achieving various socioeconomic and environmental objectives. Numerous studies have shown that agricultural growth is significantly more pro-poor than non-agricultural growth, especially during the earlier stages of development (see Timmer 2007; Christiaensen and Martin 2018). Agricultural growth is also more efficient at addressing malnutrition

(Headey 2013), with increased calorie consumption among the poor associated with higher levels of well-being, human capital accumulation, and increased efficiency (Schultz 1993; Diao et al. 2010).
In recent times, agricultural transformation has also increasingly been discussed in the context of an urgent need to develop agrifood systems that are environmentally and economically sustainable. Environmental sustainability relates to more sustainable use of resources, increased biodiversity, and reduced pollution and emissions in the agrifood system in an era of accelerated climate change. Economic sustainability, on the other hand, relates to access and affordability of healthier, sustainable diets. As Nguyen (2018) writes, a sustainable agrifood system is one that provides food and nutrition security for everyone so that "the economic, social, and environmental bases for doing so also for future generations are not compromised".

Given the central role of agricultural transformation in driving structural change, as well as its contribution to development objectives such as poverty reduction, improvements in diet quality, and environmental sustainability, it is important to be able to measure and monitor progress on agricultural transformation. In this paper, we develop a new Agricultural Transformation Index (ATI), a composite index that provides country estimates of agricultural transformation using global datasets covering the period 2000-2021. As such, it can be used to examine changes in agricultural transformation over time on global, regional, and national scales. Since it is based on publicly available datasets, regular updates are possible, thus allowing regular monitoring of progress. This methods paper is organized as follows: Section 2 presents the theoretical framework that underpins the ATI; Section 3 describes the various components of the composite index; Section 4 presents a synthesis of country results; and Section 4 summarizes.

2 THEORETICAL FRAMEWORK

The Agricultural Transformation Index (ATI) is designed to assess the advancement of countries in agricultural transformation. The theoretical framework for the ATI is influenced by frameworks of agricultural transformation and structural change described by de Janvry and Sadoulet (2019) and Timmer (1988, 2007).

De Janvry and Sadoulet (2019) argue that the most effective strategy for developing countries to achieve sustained growth and poverty reduction is to invest in agricultural transformation and modernization. Their development framework is based on five stages of agriculture modernization. The first stage, which they call "asset building", involves greater access to land and human capital for the landless poor and smallholder farmers. Next is the "Green Revolution" stage, which entails the dissemination and adoption of new agricultural technologies, such as seeds and fertilizers, especially for staple crop production. The third is the "agricultural transformation" stage, which involves investments in infrastructure such as irrigation and rural roads, diversification into high value crops, and the development of agrifood value chains. These developments contribute to a more optimal utilization of labor throughout the year and help minimize periods of food scarcity. This is followed by a "rural transformation" stage, which involves further mechanization and intensification in agriculture, development of land and labor markets, and growth in the rural non-farm economy. Lastly, during the "structural transformation" stage, rural-urban migration accelerates, and urban-based industries and services sectors start to develop.

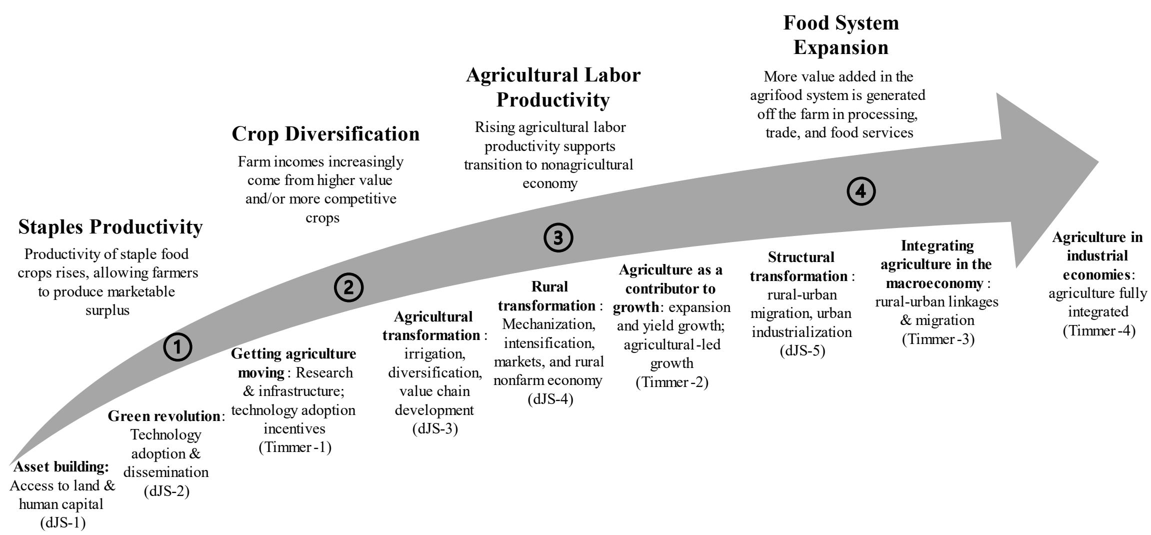
De Janvry and Sadoulet (2019) warn that agricultural modernization has often been hampered by market and government failures. Therefore, complementary initiatives may be required to remove barriers to agricultural modernization, including facilitating smallholder access to credit, insurance, information, and markets. Moreover, by establishing policy environments that encourage vertical coordination within value chains, governments can ensure that the agricultural transformation process is more inclusive. This might include incentives for downstream value chain actors such as traders, marketers, or processors to enter into mutually beneficial contractual agreements with smallholder farmers.

In much the same vein, Timmer (1988, 2007) identifies four phases of agricultural transformation. During the first phase, which he calls "getting agriculture moving", the agricultural sector is still underdeveloped and vulnerable to shocks and stresses. This phase therefore involves directing public investments and resources toward agriculture research and infrastructure to enhance the sector's resilience or offering favorable price incentives to smallholder farmers to encourage the adoption of new technologies (Timmer 1988). The resulting agricultural expansion and yield improvements lead into a second phase called "agriculture as a contributor to growth" where the agricultural sector begins to assume an important role in driving overall economic growth. In the third phase, which Timmer (1998) calls "integrating agriculture into the macroeconomy", improvements in labor and credit markets facilitate the integration of the agricultural sector into the wider economy. Rural-urban linkages are strengthened, and factor market efficiency gains speed the movement of labor and capital from agriculture to industrial or services sectors.

In the final phase, called "agriculture in industrial economies", the agricultural sector is completely transformed and becomes fully integrated into the economy just like any of the other modern non-agricultural sectors. However, at this stage of development the economy requires careful management to avoid certain pitfalls. Timmer (1988) describes a scenario in industrialized economies where resource allocation to the agricultural sector is not aligned with the social profitability of sectors. This may arise, for instance, when governments introduce protective measures to shield farmers from foreign competition, which could slow down or even reverse the process of rural-urban migration or lead to unemployment in the industrial sector.

Drawing on the frameworks by De Janvry and Sadoulet (2019) and Timmer (1988), four components of agricultural transformation are identified to inform the construction of the ATI (Figure 2.1). Even though these are presented as a sequence of stages or phases, countries do not necessarily follow the same linear development pathway, and so we refer to these simply as different components of the agricultural transformation process. The first ATI component is "staples productivity". At the early stages of a country's development agricultural production and (rural) household diets are heavily oriented towards staple crop production. Staple crop productivity growth is important for at least three reasons. First, staple foods satisfy most dietary energy needs and contribute significantly to other essential micronutrients (Su et al. 2017). Rising staples productivity therefore reduces the prevalence of undernourishment among subsistence farmers. The storability of cereals also means increased productivity can help reduce seasonal volatility in household food stocks. Second, increased productivity allows farmers to produce a marketable surplus. This raises farm household incomes, which allows them to diversify their diets and make productivity-enhancing investments, e.g., in farming equipment or education. Increased market supply further helps stabilize staple prices in local markets and creates off-farm employment opportunities, which improves diets and wellbeing also for rural (and urban) households in the nonfarm sector (Lipton 2013). Lastly, staple productivity growth may free up land resources to grow other crops, thus contributing to diversification in the agricultural sector, our second component of agricultural transformation discussed below.

Figure 2.1 Four stylized components of agricultural transformation



Source: Authors' depiction. Note: dJS-1 to 5 refer to the five stages of agriculture modernization identified by de Janvry and Sadoulet (2019), while and Timmer-1 to 4 refer to the four stages of agricultural transformation defined by Timmer (1998).

As highlighted in Figure 2.1, the ATI staples productivity component corresponds to the "asset building" and "green revolution" stages in de Janvry and Sadoulet's (2019) agriculture modernization sequence, as well as to Timmer's (1998) "getting agriculture moving" phase. As highlighted by these authors, investing in and ensuring access to infrastructure and agricultural technologies are important drivers of staples productivity, which in turn kickstarts the agricultural transformation process.

The second ATI component is "crop diversification". Diversification, particularly into higher-value crops, is made possible in part by staples productivity growth, which frees up agricultural land. Crop diversification holds both socioeconomic and environmental benefits (de Janvry and Sadoulet 2019). The socioeconomic benefits stem from the fact that crop diversification boosts household income from the sale of cash and high-value food crops. It also helps improve food security and nutrition by increasing the quantity and variety of household food stocks (Mango et al. 2018). On the environmental front, crop diversification has the potential to address agricultural challenges such as soil degradation, salinity, pest infestations, diseases, and environmental pollution. It also raises the overall resilience of food systems by expanding the geographical and temporal biodiversity within the agricultural sector (Barman et al. 2022). The ATI crop diversification stage relates to Timmer's (1998) "getting agriculture moving" stage, and even more closely to de Janvry and Sadoulet's (2019) "agricultural transformation" stage, which they explicitly describe as a stage involving diversification and value chain development.

The third ATI component is "agricultural labor productivity". Labor-saving technological advancements in agriculture contribute to structural transformation as it facilitates the movement of workers into non-agricultural sectors of the economy where economic returns are comparatively higher (Timmer 1998; Bustos 2016). The existence of a well-functioning, flexible labor market not only facilitates labor productivity growth but is crucial to ensuring that structural change contributes positively to overall economic growth (McMillan et al. 2014). The ATI agricultural labor productivity component relates closely to de Janvry and Sadoulet's (2019) "rural transformation" stage, which describes processes such as mechanization, intensification, more efficient utilization of labor, flexible and robust factor and product markets, and the development of the rural nonfarm economy. Similarly, Timmer's (1998) "agriculture as a contributor to growth" describes how agricultural labor productivity growth contributes to a developmental stage where the agricultural sector starts to assume an important role in driving overall economic growth.

The final ATI component is "food system expansion". An important outcome of rural-urban migration and rising incomes is a change in dietary patterns. Cockx et al. (2018) find that rural-urban migrants shift away from primary foods such as staples towards more processed and prepared foods. Agrifood systems are composed of both a primary or on-farm component (i.e., agriculture) as well as off-farm components such as agroprocessing, food trade and transport, and food services (Diao et al. 2023). Modern agrifood systems adapt to changes in dietary patterns in that productive resources shift from primary agriculture to these off-farm components of the agrifood system to satisfy consumer demands. The ATI food system expansion component therefore defines a development phase where a growing share of total value added in the overall agrifood system is generated off the farm. This corresponds to the "structural transformation" stage described by de Janvry and Sadoulet (2019) or Timmer's (1988) "integrating agriculture into the macroeconomy" phase, both of which describe a development phase characterized by stronger rural-urban linkages, increased factor market efficiencies, rural-urban migration, and growth in industrial and services sectors. It also relates closely to what Barrett et al. (2022) describe as the emergence of "transitional" or "modern" agrifood value chains characterized by rising shares of value addition and employment off the farm and dedicated towards facilitating the flow of products from the farm to final consumers.

Although this final ATI component has implications for structural change of the entire economy, our interest is in the agrifood system. Therefore, the ATI food system expansion indicator focuses specifically on the transition that takes place within the agrifood system of the economy as resources shift from the on-farm to the off-farm components of the system.

3 MEASURING PROGRESS ON AGRICULTURAL TRANSFORMATION

Four Indicators of Progress

Four distinct indicators of progress make up the composite ATI. These indicators correspond directly to the four components of agricultural transformation described in Section 2 and Figure 2.1. All indicators are compiled from publicly available global datasets. This ensures replicability and transparency in the construction of the ATI. At the time of writing the ATI database covers the period 2000–2021, and estimates are available in annual timesteps. Since the underlying datasets are updated annually, it is envisioned that the ATI database will also be updated each year.

The **staples productivity** indicator is the output value per hectare for staple crops in a country. Staples include cereals, such as rice, wheat, maize, barley, sorghum, and millet, and root crops, such as cassava, potatoes, and sweet potatoes. Estimates of output value and crop area are from the FAOSTAT database (FAO 2024). Output values are in 2015 prices and converted to US dollars to ensure comparability across countries and over time. Rather than using annual estimates, which are highly volatile, three-year moving averages are used in the estimation of the indicator (e.g., the staples productivity indicator for 2021 is an average for 2019 to 2021). Figure 3.1 (panel a) plots the relationship between the staples crop productivity indicator and economic well-being in 2021. Economic well-being is measured by a country's GDP per capita. Each datapoint in the figure represents one of the 182 countries included in the ATI database. Output values and GDP per capita are measured in 2015 US dollars. The fitted logarithmic function shows that a positive correlation exists between staple crop productivity and GDP per capita.

There are different ways of conceiving of **crop diversification**. Most often it is thought of in the context of a production unit, whether defined as a farm, farming district, or country, allocating productive resources across a wider range of activities (see Kankwamba et al. 2018). Another consideration is how equal land or other resources are allocated across the portfolio of activities. The commonly used Simpson's Index of Diversification (SID) (Simpson 1949) incorporates both these dimensions and would measure an increase in diversification if the number of crops cultivated increases and/or land is allocated more equally across those crops. Measures of diversification therefore typically adopt a "more [crops or equality] is better" approach. However, cultivating a wider variety of crops is not always consistent with economic progress. Theories of comparative advantage, for instance, explain a tendency of countries to specialize in the production of those goods in which it has an absolute or comparative advantage and is also competitive in global markets. Those same principles may explain why commercial farmers might choose to specialize rather than grow multiple crops.

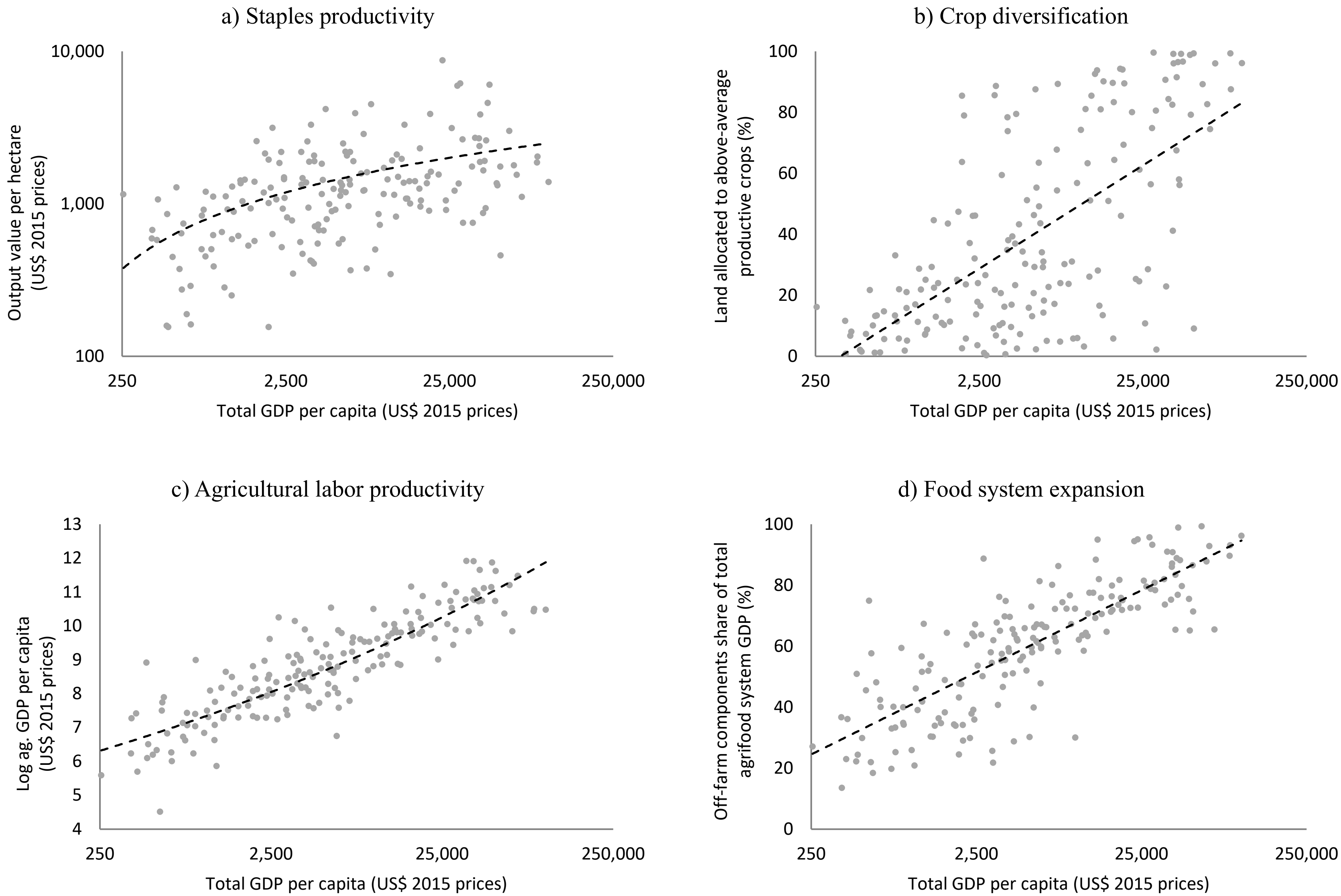
The measure chosen for the ATI is neither a function of the number of crops cultivated nor of how equal resources are allocated across crops. Instead, it measures the extent to which countries diversify away from low-value crops into higher-value crops, particularly those in which a country is (potentially) competitive in global markets. A country is assumed to be competitive in a particular crop subsector if its level of productivity, measured as the three-year moving average of output value per hectare in 2015 US dollars, exceeds the global average productivity for that crop across all countries and years in the ATI database. The crop diversification indicator itself is the total share of cropland allocated to all crops with above-average productivity levels, with a greater share being indicative of a greater orientation towards the cultivation of higher-value or exportable crops. Data for this indicator is from the FAOSTAT database (2024) Figure 3.1 (panel b) shows the relationship between the crop diversification indicator and economic well-being in 2021. The fitted line once again shows a clear positive correlation between the crop diversification indicator and GDP per capita.

The ATI crop diversification measure will likely be positively correlated with traditional crop diversification measures in most countries. However, in at least some countries diversification into high-value crops may result in specialization and a more unequal allocation of land. Another important implication of the definition adopted for this indicator is that a country that surpasses the global average productivity threshold for a crop will be considered as having diversified even if it did not change its land allocation in that year.

The **agricultural labor productivity** indicator is the logarithm of agricultural GDP per worker. This indicator is compiled from agricultural GDP estimates and labor force data published by UNSD (2024) and ILO (2024). As before, GDP is measured in 2015 US dollars. Since agricultural GDP is more stable than crop productivity measures, annual estimates rather than three-year moving averages are used. Figure 3.1 (panel c) shows the relationship between the agriculture labor productivity indicator and GDP per capita. The positive slope confirms the correlation between agricultural labor productivity and structural-change induced growth. This positive relationship remains robust even as the share of agriculture in total GDP declines as economies develop.

The **food system expansion** indicator relies on IFPRI's agrifood system GDP database (IFPRI 2024). As mentioned previously, the agrifood system is composed of a primary agriculture component and several off-farm components, such as agroprocessing, food trade and transport, and food services. Agrifood system GDP is the sum of GDP generated on the farm (i.e., agricultural GDP) and in the off-farm components of the agrifood system (i.e., those portions of manufacturing and services GDP pertaining to food). Expansion of the off-farm components of the agrifood system is central to the process of agricultural transformation and is strongly associated with economic development. The food system expansion indicator is therefore defined as the share of off-farm agrifood system GDP in total agrifood system GDP. Its positive correlation with GDP per capita is confirmed in Figure 3.1 (panel d). As noted, although this indicator is closely related to structural change in an economy, it focuses explicitly on the structural change that takes place within the agrifood system.

Figure 3.1 Correlation between agricultural transformation indicators and economic well-being in 2021



Source: ATI database

Creating a Composite Indicator

Although agricultural transformation is often presented as a "modernization sequence" or stages of development (de Janvry and Sadoulet 2019), it is seldom possible – nor does it make much sense – to pinpoint precisely where a country is on a development pathway such as the one presented in Figure 2.1. The expectation is that most countries, including highly developed ones, will continue to experience progress across all stages of transformation as they develop. This may reflect heterogeneity across agricultural systems within a country, with some systems being more developed than others, perhaps due to their proximity to major markets or trade routes. However, even in countries where lagging regions have caught up with the developed ones and their agrifood systems have been modernized, there may still be opportunities for progress.

This is particularly true for the staple crop productivity and agricultural labor productivity components of the ATI. In principle, investments in research and development may continue to push out crop productivity frontiers indefinitely, thus creating room for continued development. Put simply, we may never reach a point where we can say with certainty that productivity has reached its upper limit. For the crop diversification and food system expansion indicators, however, 100 percent is a technical upper limit, albeit one that very few countries would ever reach. For instance, only Denmark, Germany, and Ireland allocate more than 99 percent of their land to crops with above-average productivity, while 99 percent of agrifood system GDP is generated off the farm in countries like Hong Kong or Singapore, but only because primary agriculture is non-existent in those countries.

The implication is that, even though each of the indicators of agricultural transformation are meaningful on their own, it would be hard tell from examining them separately where a country is in its agricultural transformation trajectory unless the country has reached some notional or technical ceiling in a stage. Even then it is not guaranteed that countries will reach those ceilings in a linear, prescribed order, although we might normally expect staple crop productivity to be a precursor to crop diversification or agricultural labor productivity to be a precursor to agrifood system expansion. This is a justification for developing composite indicator of agricultural transformation that examines joint progress across all stages of transformation. The composite ATI can thus also be used to uniquely rank countries in terms of their overall progress on agricultural transformation.

When forming a composite indicator from a set of individual indicators with different units of measurement or widely divergent ranges, it is standard practice to normalize the individual indicators first. This involves transforming each individual indicator to a standardized range of [0, 1]. In the normalized indicator, the highest value is assigned a value of one, while the smallest is assigned a value of zero. All other values are expressed relative to the maximum value. Further details about the process are provided below, suffice to say that normalization ensures that the shape of the original indicator is preserved and makes different indicators comparable with one another. Once indicators have been normalized, a composite indicator can be formed by computing a simple or weighted average of the individual indicators.

Since all values in the normalized indicator are expressed relative to the highest value, that value is very significant. For instance, if the highest value is a statistical outlier, all other values in the transformed indicator will be very small, which will undermine their economic meaning. In the context of an agricultural transformation indicator, the highest value should also serve as a plausible development target for developing countries to aim for. For instance, setting the food system expansion target equal to level achieved in Hong Kong or Singapore (99 percent) is illogical for any country with large quantities of arable land and water resources that can sustain a vibrant agricultural sector. Or setting an agricultural labor productivity target equal to what is being achieved in developed countries with highly productive agricultural production systems is not realistic for many developing countries. While acknowledging that productivity boundaries may continue to expand, or that a technical limit for some indicators is 100 percent, we identify a maximum threshold for each beyond which we deem further improvements no longer contribute to agricultural transformation in an economic development sense. Put differently, we would consider a country that has reached the maximum threshold we have identified to be fully transformed from the perspective of developing countries.

For transparency and consistency, the maximum threshold for each indicator is set at the 50th percentile (or median) of the indicator values across all years within the subset of high and upper-middle income countries. These countries tend to be well-developed in most of the components of agricultural transformation and therefore serve as a sensible development target for other countries. Once maximum thresholds have been set, the indicators are truncated, which entails replacing values that exceed the maximum threshold with the threshold value. Therefore, if x_{ijt} is the indicator value for country $i = (1, \ldots, n)$ in agricultural transformation component $j = (1, \ldots, d)$ and time *t*, the truncated indicator values, x^*_{ijt}, take on the threshold value, P_j, if x_{ijt} exceeds the threshold, but is otherwise unchanged.

$$x^*_{ijt} = \begin{cases} x_{ijt} \ if \ x_{ijt} \leq P_j \\ P_j \ if \ x_{ijt} > P_j \end{cases} \qquad [1]$$

Since the truncated indicators have different units of measurement, they must be normalized before a composite index can be created. Truncation has the effect of compacting the distribution at the upper end. Therefore, whereas normalization of the original (non-truncated) indicator would have entailed setting the maximum value, $\max_j (x_{ijt})$, equal to one, multiple values in the truncated indicator are capped at $P_j = \max_j\left(x^*_{ijt}\right)$, and will all be assigned a value of one in the normalized indicator, z_{ijt}. All other normalized values will be expressed relative to the maximum threshold. We consider this an important feature rather than a flaw, as the normalized indicators provide an indication of how far a country is from a plausible development target rather than an unattainable one. The following standard normalization formula is used to transform the truncated scores.

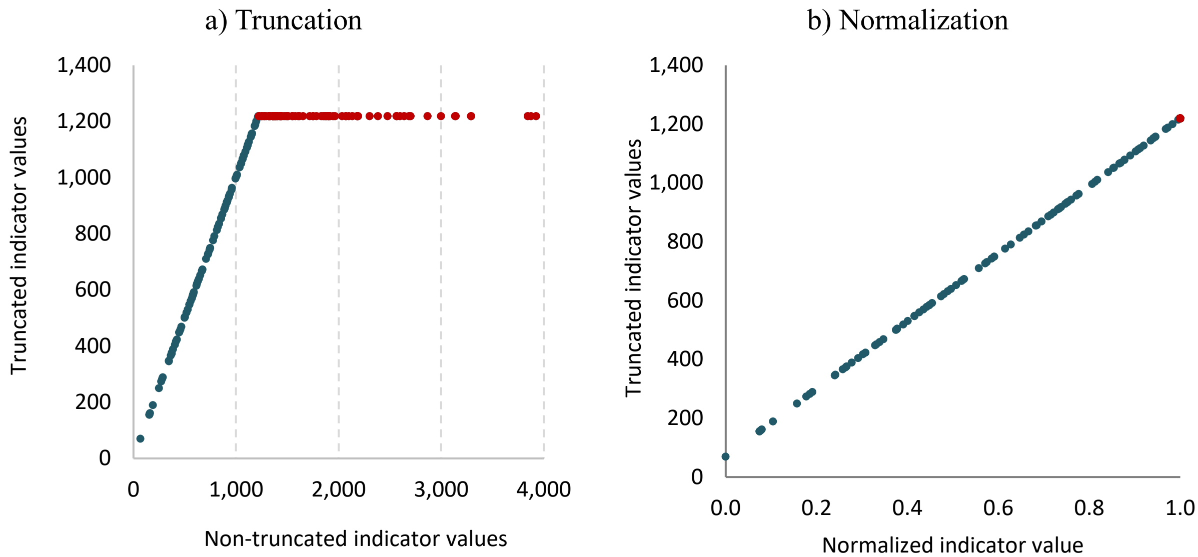
$$z_{ijt} = \frac{x^*_{ijt} - \min_j (x^*_{ijt})}{\max_j\left(x^*_{ijt}\right) - \min_i (x^*_{ijt})} = \frac{x^*_{ijt} - \min_j (x^*_{ijt})}{P_j - \min_i (x^*_{ijt})} \qquad [2]$$

A composite score c_{it} is now calculated as the weighted average of the normalized scores, where ρ_j is the weight assigned to each indicator dimensions $j = 1, \ldots, d$ and $\sum_j \rho_j = 1$. For equal weights, the default for the ATI, $\rho_j = 1/d$ for each dimension j.

$$c_{it} = \sum_j \rho_j z_{ijt} \qquad [3]$$

Figure 3.2 illustrates the effect of truncation (panel a) in the case of the staple crop productivity indicator. The maximum threshold for this indicator is US$1,219 per hectare, which is the median crop staple crop productivity value among all upper-middle and high-income countries across all years. The truncated indicator is therefore capped at that threshold (see array of red datapoints). When the indicator is normalized (panel b), all the truncated datapoints are assigned a value of one (see single red data point), while the remaining scores range from zero to one. Their values are all expressed relative to the maximum threshold.

Figure 3.2 Truncation and normalization of staples productivity indicator for 2021



Source: ATI database.

4 A SYNTHESIS OF COUNTRY RESULTS

The synthesis presented in this section is based on ATI estimates for *n* = 182 countries. Using this comprehensive ATI database, we examine correlations between ATI and country income status and household welfare and analyze changes in the ATI over time. We also take a closer look at agricultural transformation within a subset of priority countries of the United States government's Feed the Future initiative. The complete set of country results is provided in an Appendix.

Agricultural Transformation and Country Income Status

Table 4.1 reports averages of the original (non-truncated) outcome indicator values by country income group, the maximum thresholds defined for each indicator, and the averages of the normalized scores, also by country income group. The country income groups follow the World Bank classification of low, lower-middle, upper-middle, and high-income groups based on their Gross National Income (GNI) per capita. Prior to normalization, the staples crop productivity indicator is truncated at US$ 1,219, the crop diversification indicator at 50.2 percent, the agricultural labor productivity indicator at US$ 9.5 (logged value), and the food system expansion indicator at 72.1 percent. Since these thresholds are the median indicator values for upper-middle and high-income countries across all years, they tend to lie between the 2021 averages for these two country groups, except for staples crop productivity.

Table 4.1 Agricultural transformation indicators by country grouping in 2021

	Staples productivity (US $)	Crop diversificatio n (%)	Agric. labor productivity (log US $)	Food system expansion (%)	Composite ATI (0-1)
Original indicator values		x_{ijt}			
All countries	1,445	39.4	8.8	59.9	
Low-income	576	9.9	6.9	34.0	
Lower-middle income	1,133	27.6	8.1	48.5	
Upper-middle income	1,495	34.7	8.8	62.6	
High income	2,134	70.0	10.5	81.4	
Maximum thresholds	1,219	50.2	9.5	72.1	
Normalized indicator values		z_{ijt}			c_{it}
All countries	0.78	0.58	0.76	0.73	0.72
Low-income	0.44	0.20	0.38	0.34	0.34
Lower-middle income	0.73	0.47	0.65	0.59	0.61
Upper-middle income	0.84	0.59	0.82	0.82	0.76
High income	0.93	0.87	1.00	0.99	0.95

Source: ATI database. Note: The composite ATI (final column) is an unweighted average of the normalized scores.

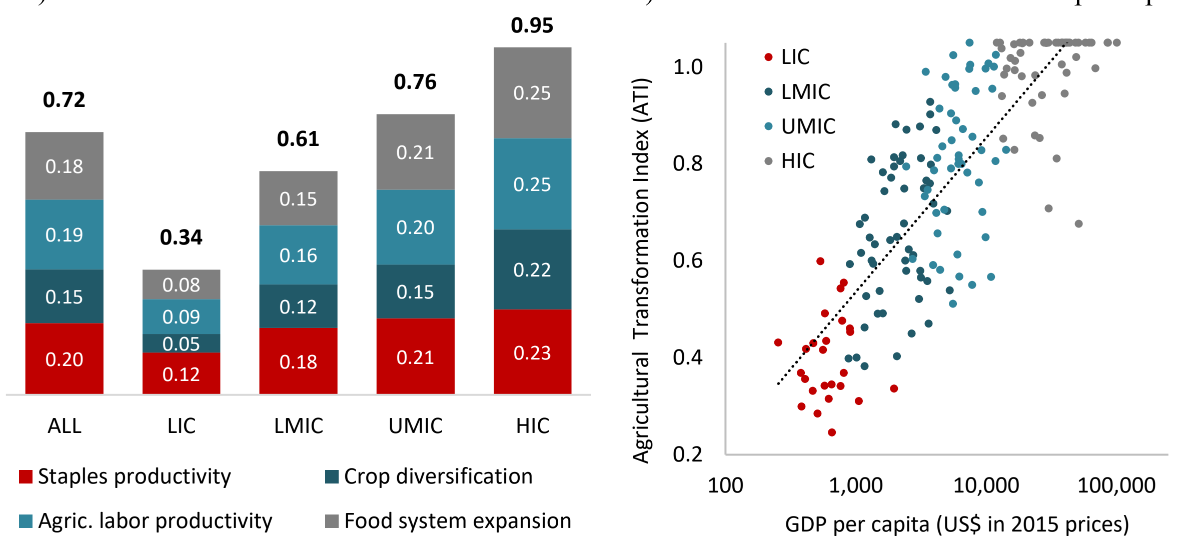
A comparison of either the original or normalized scores shows that agricultural transformation indicator values increase as we move from low- to high-income countries. Indicator values jump especially sharply between the low- and lower-middle income groups; for instance, the staples productivity indicator almost doubles, from US$ 576 to US$ 1,133 per hectare, while the crop diversification indicator increase by a factor of almost three, from 9.9 to 27.6 percent. Another large increase in the crop diversification indicator is observed between the upper-middle and high-income groups.

The lower part of Table 4.1 shows the normalized indicator values. The final column presents ATI averages by country income group. As discussed, the ATI is an equal-weighted or simple average of the normalized indicator values. As is the case with the individual indicators, the composite ATI also increases sharply as we move from low- to lower-middle income countries, i.e., from 0.34 to 0.61. High-income countries have an ATI of 0.95, which in terms of the definitions and maximum thresholds selected suggests that the agricultural sectors of many of the high-income countries are nearing a state of being fully transformed.

Figure 4.1 (panel a) shows the absolute contributions of each agricultural transformation indicator to the composite ATI by country group. The labels of the components are the weighted indicator values, $\rho_j z_{ijt}$, for $\rho_j = 0.25$ (see equation 2 and Table 4.1). For high-income countries the four indicators contribute roughly similar amounts to the overall score, with absolute contributions ranging between 0.22 and 0.25 out of 0.95. Among low-income countries, however, the relative contribution of the crop diversification indicator is disproportionately small (i.e., 0.05 out of 0.32). This indicates that low-income countries lag in the crop diversification indicator relative to the maximum threshold. This may either indicate that few crops grown in these countries have above-average productivity, or when do, very little land is allocated to these crops.

Figure 4.1 Agricultural transformation indicators by country grouping in 2021

a) Absolute contribution of indicators to ATI b) Correlation between ATI and GDP per capita



Source: ATI database. Notes: LIC = low-income countries; LMIC = lower-middle income countries; UMIC = upper-middle income countries; HIC = high-income countries.

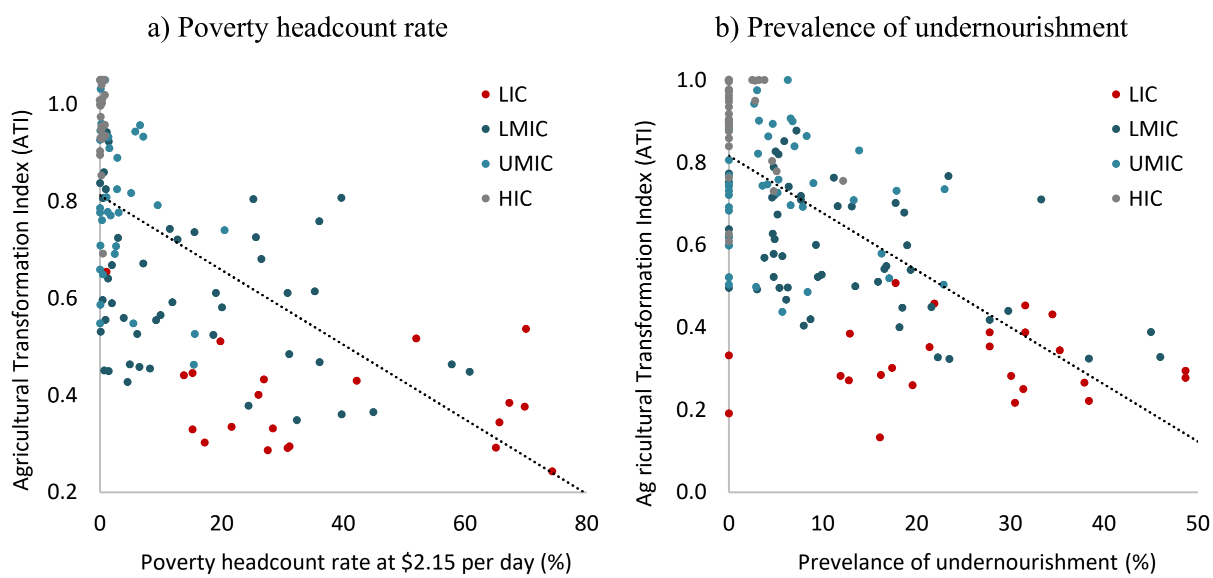
Figure 4.1 (panel b) plots the ATI against GDP per capita for the full sample of 182 countries, with different colored dots indicating the country income classification. The figure confirms the strong positive correlation between the ATI and countries' level of well-being, with a high degree of clustering of ATI values also within each country income group.

Agricultural Transformation and Household Welfare

A country's poverty rate measures the share of the population that lacks the resources required to maintain a minimum standard of living, while the prevalence of undernourishment is the share of the population that consumes fewer calories than is deemed adequate to sustain a healthy, active life. Estimates published in the World Development Indicators (WDI) database (World Bank 2024) shows that, globally, almost one-in-ten people are either poor (as measured against a global poverty line of US$2.15 per capita per day) or undernourished (as measured against a minimum daily energy requirement). Country-specific poverty and undernourishment rates deviate significantly from this global average; for instance, among low-income countries the average poverty rate is 44.5 percent, while the prevalence of undernourishment is 28.3 percent (World Bank 2024).

Figure 4.2 shows the correlation between the ATI and the poverty headcount rate (panel a) and the prevalence of undernourishment (panel b). The fitted lines indicate a strong negative correlation between the ATI and the two household welfare measures. This reflects the fact that the agricultural sector is an important source of livelihood for rural poor households, who benefit directly from agricultural productivity gains and diversification. Agricultural productivity gains also lead to food price declines, which benefit nonfarm households in rural or urban areas.

Figure 4.2 Agricultural transformation and household welfare

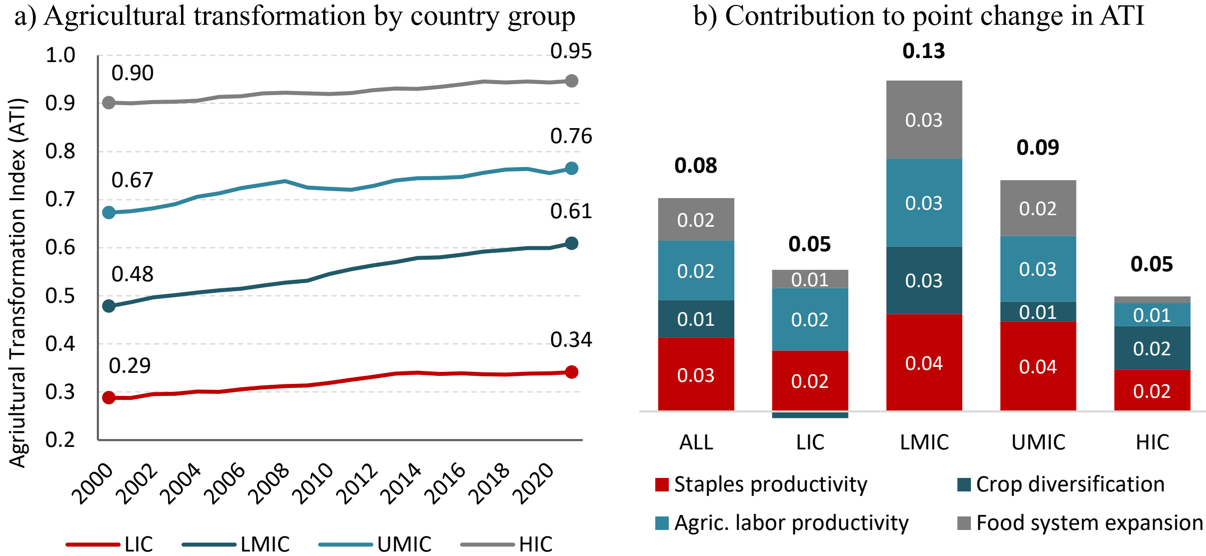


Source: ATI database and World Development Indicators. Notes: LIC = low-income countries; LMIC = lower-middle income countries; UMIC = upper-middle income countries; HIC = high-income countries. Poverty estimates are available for only 137 countries and are for the most recent for which data is available.

Changes in Agricultural Transformation

The ATI Dataset spans the period 2000–2021. Whereas until now we have looked at results for 2021, we now look at changes over a period of just over two decades. Figure 4.3 (panel a) presents changes in the ATI by country income group. The income classification reflects countries' status as of 2021 (i.e., each group likely contains countries that may have started out in a different income group two decades earlier). On average, all country groups experienced an increase in their ATIs. The largest gains in absolute terms occurred in the lower- and upper-middle income groups, with gains of 0.13 and 0.09 points, respectively. Low- and high-income groups gained 0.05 points.

Figure 4.3 Changes in agricultural transformation



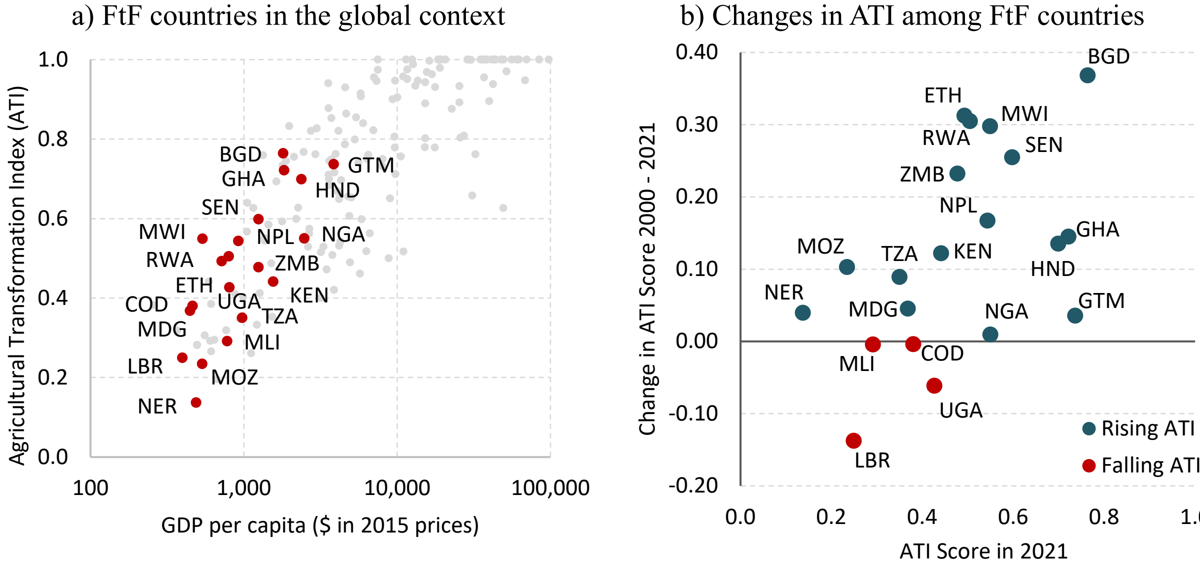
Source: ATI database. Notes: LIC = low-income countries; LMIC = lower-middle income countries; UMIC = upper-middle income countries; HIC = high-income countries.

Figure 4.3 (panel b) shows the contribution of changes in the different agricultural transformation indicators to the overall change in the ATI. Agricultural labor productivity growth was the most important contributor to the change in ATI among low-income countries, albeit only marginally more than staples productivity. Staples productivity contributed most to the change in the remaining income groups, including in high-income countries, even though staples productivity is considered one of the earlier stages of agricultural transformation. Whereas increased crop diversification had some impact on the ATI in the middle- and high-income countries, it contributed negatively to the change in low-income countries. This likely reflects the growing challenge low-income countries face to maintain crop productivity levels at globally competitive levels and to diversify away from lower-productivity staples production.

Agricultural Transformation in the Feed the Future Countries

We finally explore levels and changes in ATI in the subset of Feed the Future countries. Figure 4.4 (panel a) shows that although there is a wide variation in ATI scores among the Feed the Future countries – from 0.76 in Bangladesh to 0.14 in Niger – the average ATI score was only 0.48 in 2021. The global average, by comparison, is 0.71 (see Table A 1). Therefore, at least in terms of ATI scores, the selection of Feed the Future countries seems appropriate, as many of them represent some of the least transformed countries in the world. Most Feed the Future countries have also experienced increases in their ATIs over the last two decades, with gains in Bangladesh, Ethiopia, Malawi, and Rwanda all exceeding 0.30 points. However, four countries, namely DRC, Liberia, Mali, and Uganda, are backsliding. Consistent with the finding in Figure 4.3 (panel b), declining crop diversification explains most of the decline in ATI in DRC, Liberia and Mali. In Uganda, however, declining staples productivity was the main contributing factor.

Figure 4.4 Feed the Future countries' ATI scores



Source: ATI database.

5 SUMMARY

The Agricultural Transformation Index (ATI) presented in this paper combines key dimensions of agricultural transformation into a composite score of progress. The stylized components of transformation that underpin the ATI include staples productivity, crop diversification, agricultural labor productivity, and food system expansion. An important feature of the ATI database, which includes agricultural transformation indicators for 182 countries and covers the period 2000–2021, is that it is easy to update. Indicators are also intuitive and simple to interpret, and they are calculated in a transparent manner. The ATI produces a plausible ranking of countries, with ATI scores shown to be highly correlated with indicators of economic wellbeing such as GDP per capita or household measures of welfare such as poverty or the prevalence of undernourishment.

Although agricultural transformation is often conceived of as a modernization sequence where countries move from one stage into the next, the ATI does not prescribe a single, linear pathway for development. Our analysis of the ATI shows that improvements can occur simultaneously in all components of transformation irrespective of a country's level of development. For instance, staple crop productivity, often thought of as the first development stage that kickstarts agricultural transformation, continued to make an important contribution to the increase in the ATI in middle- and high-income countries over the last two decades, while it was agricultural labor productivity growth emerged as the biggest contributor to the growth in the ATI in low-income countries.

Our analysis has shown that the selection of Feed the Future countries is appropriate, with most remaining among the least transformed countries in the world. Most have also experienced increases in their ATIs over the last decade. However, four countries, including DRC, Liberia, Mali, and Uganda, have experienced a decline in their ATIs. As in many other low-income countries, declining crop diversification explains much of the decline. This calls for more targeted interventions, both geographically and programmatically. With respect to the latter, programs that facilitate a transition towards more commercially oriented, high-value agricultural production systems should be prioritized.

In conclusion, the ATI is not only useful for identifying countries in need of support from international development partners or tracking their progress on agricultural transformation but can highlight specific areas of agricultural transformation where technical or investment support might be directed by governments to address shortcomings.

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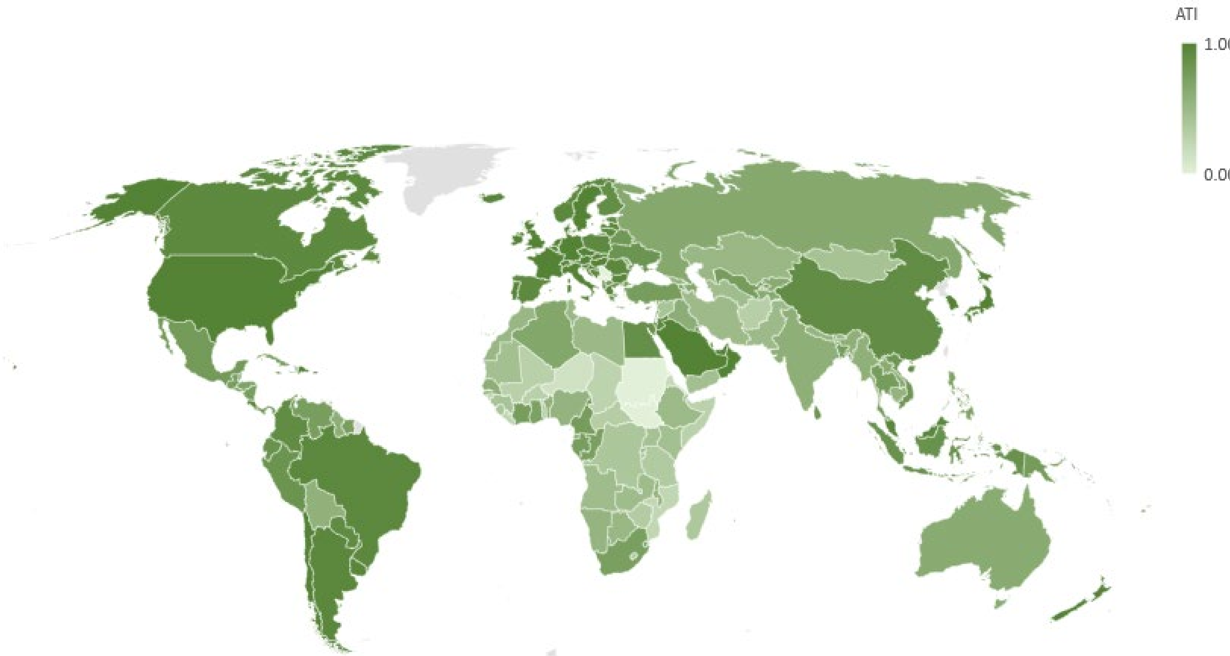
APPENDIX

Figure A 1 Global map of ATI scores



Source: ATI database

Table A 1 Ranked list of countries and ATI scores

#	Name	Feed the Future	Class.	Staples prod.	Crop divers.	Agric. labor prod.	Food system exp.	ATI
1	Austria		HIC	1.000	1.000	1.000	1.000	1.000
1	Belgium		HIC	1.000	1.000	1.000	1.000	1.000
1	Chile		HIC	1.000	1.000	1.000	1.000	1.000
1	Croatia		HIC	1.000	1.000	1.000	1.000	1.000
1	Czech Republic		HIC	1.000	1.000	1.000	1.000	1.000
1	Denmark		HIC	1.000	1.000	1.000	1.000	1.000
1	Dominican Republic		UMIC	1.000	1.000	1.000	1.000	1.000
1	France		HIC	1.000	1.000	1.000	1.000	1.000
1	Germany		HIC	1.000	1.000	1.000	1.000	1.000
1	Hong Kong SAR, China		HIC	1.000	1.000	1.000	1.000	1.000
1	Ireland		HIC	1.000	1.000	1.000	1.000	1.000
1	Italy		HIC	1.000	1.000	1.000	1.000	1.000
1	Japan		HIC	1.000	1.000	1.000	1.000	1.000
1	Korea, Rep.		HIC	1.000	1.000	1.000	1.000	1.000
1	Luxembourg		HIC	1.000	1.000	1.000	1.000	1.000
1	Netherlands		HIC	1.000	1.000	1.000	1.000	1.000
1	New Zealand		HIC	1.000	1.000	1.000	1.000	1.000

#	Name	Feed the Future	Class.	Staples prod.	Crop divers.	Agric. labor prod.	Food system exp.	ATI
1	Puerto Rico		HIC	1.000	1.000	1.000	1.000	1.000
1	Qatar		HIC	1.000	1.000	1.000	1.000	1.000
1	Saudi Arabia		HIC	1.000	1.000	1.000	1.000	1.000
1	Singapore		HIC	1.000	1.000	1.000	1.000	1.000
1	Slovenia		HIC	1.000	1.000	1.000	1.000	1.000
1	Sweden		HIC	1.000	1.000	1.000	1.000	1.000
1	Switzerland		HIC	1.000	1.000	1.000	1.000	1.000
1	United Arab Emirates		HIC	1.000	1.000	1.000	1.000	1.000
1	United Kingdom		HIC	1.000	1.000	1.000	1.000	1.000
1	United States		HIC	1.000	1.000	1.000	1.000	1.000
28	Kuwait		HIC	1.000	1.000	0.997	1.000	0.999
29	Oman		HIC	1.000	1.000	1.000	0.996	0.999
30	Slovak Republic		HIC	1.000	1.000	1.000	0.987	0.997
31	Hungary		HIC	1.000	1.000	1.000	0.952	0.988
32	Portugal		HIC	1.000	0.917	1.000	1.000	0.979
33	Costa Rica		UMIC	1.000	1.000	0.924	0.977	0.975
34	Lebanon		UMIC	1.000	1.000	1.000	0.898	0.974
35	Iceland		HIC	1.000	1.000	1.000	0.881	0.970
36	Uruguay		HIC	1.000	1.000	1.000	0.873	0.968
37	Greece		HIC	0.853	1.000	1.000	0.997	0.962
38	Malaysia		UMIC	1.000	1.000	1.000	0.828	0.957
39	Israel		HIC	1.000	0.820	1.000	1.000	0.955
40	Bulgaria		UMIC	1.000	1.000	1.000	0.818	0.954
41	Argentina		UMIC	0.935	1.000	1.000	0.867	0.951
42	Norway		HIC	0.902	1.000	1.000	0.886	0.947
43	Latvia		HIC	0.813	1.000	1.000	0.973	0.946
44	Romania		UMIC	0.946	1.000	0.840	1.000	0.946
45	Brazil		UMIC	0.996	1.000	0.945	0.843	0.946
46	Lithuania		HIC	0.772	1.000	1.000	1.000	0.943
47	Jordan		UMIC	0.760	1.000	1.000	1.000	0.940
48	Canada		HIC	0.753	1.000	1.000	1.000	0.938
49	Poland		HIC	0.877	1.000	0.858	1.000	0.934
50	Spain		HIC	0.731	1.000	1.000	1.000	0.933
51	Estonia		HIC	0.722	1.000	1.000	1.000	0.930
52	Bosnia and Herzegovina		UMIC	1.000	1.000	0.825	0.893	0.929
53	Paraguay		UMIC	0.973	0.979	0.791	0.914	0.914
54	Serbia		UMIC	1.000	1.000	0.815	0.838	0.913
55	Colombia		UMIC	1.000	1.000	0.808	0.820	0.907
56	China		UMIC	1.000	1.000	0.853	0.766	0.905
57	Mauritius		UMIC	1.000	0.601	1.000	1.000	0.900

#	Name	Feed the Future	Class.	Staples prod.	Crop divers.	Agric. labor prod.	Food system exp.	ATI
58	Finland		HIC	0.695	1.000	1.000	0.885	0.895
59	Cyprus		HIC	1.000	0.568	1.000	1.000	0.892
60	Barbados		HIC	1.000	0.559	1.000	1.000	0.890
61	Egypt, Arab Rep.		LMIC	1.000	1.000	0.882	0.629	0.878
62	Bahrain		HIC	1.000	0.503	1.000	1.000	0.876
63	Jamaica		UMIC	1.000	0.861	0.761	0.834	0.864
64	Ecuador		UMIC	1.000	0.921	0.710	0.785	0.854
65	Indonesia		LMIC	1.000	1.000	0.694	0.714	0.852
66	Peru		UMIC	1.000	0.868	0.680	0.811	0.840
67	Ukraine		LMIC	1.000	1.000	0.750	0.578	0.832
68	Vietnam		LMIC	1.000	1.000	0.610	0.698	0.827
69	St. Vincent and the Grenadines		UMIC	1.000	0.451	0.936	0.899	0.822
70	West Bank and Gaza		LMIC	0.890	0.476	1.000	0.915	0.820
71	Sri Lanka		LMIC	1.000	0.735	0.658	0.888	0.820
72	Bahamas, The		HIC	0.854	0.489	0.890	1.000	0.808
73	St. Lucia		UMIC	1.000	0.477	0.747	1.000	0.806
74	Malta		HIC	1.000	0.214	1.000	1.000	0.804
75	Trinidad and Tobago		HIC	0.878	0.329	1.000	1.000	0.802
76	Belarus		UMIC	1.000	0.583	0.855	0.757	0.799
77	North Macedonia		UMIC	0.806	0.684	0.942	0.712	0.786
78	Panama		UMIC	1.000	0.267	0.850	1.000	0.779
79	French Polynesia		HIC	1.000	0.114	1.000	1.000	0.779
80	Mexico		UMIC	0.684	0.618	0.810	1.000	0.778
81	Montenegro		UMIC	1.000	0.283	1.000	0.789	0.768
82	Papua New Guinea		LMIC	1.000	0.916	0.880	0.274	0.767
83	Bangladesh	X	LMIC	1.000	1.000	0.474	0.581	0.764
84	Albania		UMIC	1.000	1.000	0.795	0.254	0.762
85	Uzbekistan		LMIC	1.000	1.000	0.912	0.133	0.761
86	New Caledonia		HIC	0.591	0.454	1.000	1.000	0.761
87	Thailand		UMIC	1.000	0.617	0.642	0.780	0.760
88	Cameroon		LMIC	1.000	0.888	0.458	0.691	0.759
89	Turkey		UMIC	0.656	0.518	1.000	0.849	0.756
90	Cote d'Ivoire		LMIC	0.869	0.738	0.614	0.801	0.755
91	Gabon		UMIC	1.000	0.581	0.837	0.582	0.750
92	Suriname		UMIC	1.000	0.098	1.000	0.901	0.750
93	El Salvador		LMIC	0.557	0.756	0.680	1.000	0.748
94	Venezuela, RB		UMIC	1.000	0.354	0.777	0.848	0.745
95	Nicaragua		LMIC	0.818	1.000	0.658	0.502	0.745
96	South Africa		UMIC	0.920	0.410	0.633	1.000	0.741
97	Guatemala	X	UMIC	0.522	0.782	0.685	0.957	0.736

#	Name	Feed the Future	Class.	Staples prod.	Crop divers.	Agric. labor prod.	Food system exp.	ATI
98	Congo, Rep.		LMIC	1.000	0.867	0.464	0.601	0.733
99	Cuba		UMIC	1.000	0.341	0.586	1.000	0.732
100	Ghana	X	LMIC	1.000	0.943	0.600	0.342	0.721
101	Samoa		LMIC	1.000	0.214	0.769	0.879	0.715
102	Maldives		UMIC	0.375	0.471	1.000	1.000	0.711
103	Eswatini		LMIC	0.291	0.693	0.895	0.959	0.710
104	Philippines		LMIC	1.000	0.202	0.670	0.925	0.699
105	Honduras	X	LMIC	0.391	0.918	0.623	0.863	0.699
106	Fiji		UMIC	1.000	0.323	0.714	0.748	0.696
107	Sao Tome and Principe		LMIC	1.000	0.224	0.682	0.867	0.693
108	Tonga		UMIC	1.000	0.411	0.862	0.460	0.683
109	Algeria		LMIC	0.575	0.336	1.000	0.762	0.668
110	Brunei Darussalam		HIC	0.591	0.041	1.000	1.000	0.658
111	Azerbaijan		UMIC	0.715	0.603	0.571	0.732	0.655
112	Belize		LMIC	0.734	0.316	0.906	0.654	0.652
113	Russian Federation		UMIC	0.571	0.114	1.000	0.916	0.650
114	Armenia		UMIC	0.945	0.463	0.548	0.639	0.649
115	Tajikistan		LMIC	1.000	0.498	0.579	0.479	0.639
116	Lao PDR		LMIC	1.000	0.637	0.461	0.410	0.627
117	Australia		HIC	0.339	0.180	1.000	0.987	0.626
118	Kyrgyz Republic		LMIC	0.912	0.571	0.467	0.553	0.626
119	Iraq		UMIC	0.519	0.048	1.000	0.859	0.606
120	Solomon Islands		LMIC	1.000	0.468	0.670	0.258	0.599
121	Guyana		UMIC	1.000	0.117	1.000	0.276	0.598
122	Senegal	X	LMIC	0.474	0.583	0.681	0.653	0.598
123	India		LMIC	0.968	0.499	0.551	0.351	0.592
124	Myanmar		LMIC	1.000	0.476	0.518	0.342	0.584
125	Bolivia		LMIC	0.647	0.327	0.639	0.682	0.574
126	Benin		LMIC	0.738	0.435	0.662	0.431	0.566
127	Equatorial Guinea		UMIC	0.777	0.146	0.328	1.000	0.563
128	Djibouti		LMIC	0.242	0.005	1.000	1.000	0.562
129	Moldova		UMIC	0.615	0.528	0.450	0.622	0.554
130	Cambodia		LMIC	1.000	0.446	0.474	0.282	0.550
131	Nigeria	X	LMIC	0.748	0.271	0.749	0.433	0.550
132	Malawi	X	LIC	1.000	0.431	0.224	0.542	0.549
133	Comoros		LMIC	0.841	0.256	0.798	0.280	0.544
134	Nepal	X	LMIC	0.908	0.417	0.490	0.358	0.543
135	Namibia		UMIC	0.416	0.188	0.781	0.780	0.541
136	Georgia		UMIC	0.628	0.142	0.531	0.823	0.531
137	Vanuatu		LMIC	1.000	0.069	0.669	0.378	0.529

#	Name	Feed the Future	Class.	Staples prod.	Crop divers.	Agric. labor prod.	Food system exp.	ATI
138	Bhutan		LMIC	1.000	0.432	0.482	0.201	0.529
139	Botswana		UMIC	0.258	0.363	0.535	0.914	0.518
140	Kazakhstan		UMIC	0.240	0.061	0.912	0.852	0.517
141	Morocco		LMIC	0.347	0.134	0.754	0.825	0.515
142	Tunisia		LMIC	0.308	0.092	0.923	0.710	0.508
143	Rwanda	X	LIC	0.983	0.436	0.408	0.193	0.505
144	Libya		UMIC	0.266	0.094	0.879	0.761	0.500
145	Ethiopia	X	LIC	0.666	0.657	0.321	0.327	0.493
146	Iran, Islamic Rep.		LMIC	0.416	0.260	1.000	0.280	0.489
147	Pakistan		LMIC	0.751	0.202	0.638	0.357	0.487
148	Zambia	X	LMIC	0.710	0.172	0.108	0.917	0.477
149	Angola		LMIC	0.426	0.180	0.521	0.758	0.471
150	Turkmenistan		UMIC	0.448	0.042	0.909	0.446	0.461
151	Kenya	X	LMIC	0.435	0.366	0.546	0.418	0.441
152	Yemen, Rep.		LIC	0.177	0.261	0.574	0.752	0.441
153	Mauritania		LMIC	0.401	0.216	0.761	0.385	0.441
154	Uganda	X	LIC	0.733	0.227	0.295	0.450	0.426
155	Mongolia		LMIC	0.302	0.012	0.807	0.561	0.420
156	Haiti		LMIC	0.448	0.144	0.409	0.648	0.412
157	Guinea		LIC	0.481	0.313	0.400	0.447	0.410
158	Syrian Arab Republic		LIC	0.277	0.100	0.885	0.348	0.403
159	Cabo Verde		LMIC	0.000	0.020	0.723	0.857	0.400
160	Sierra Leone		LIC	0.585	0.264	0.613	0.077	0.385
161	Burundi		LIC	0.941	0.320	0.039	0.226	0.382
162	Congo, Dem. Rep.		LIC	0.683	0.035	0.167	0.636	0.380
163	Madagascar	X	LIC	0.866	0.160	0.067	0.380	0.368
164	South Sudan		LIC	0.264	0.199	0.000	1.000	0.366
165	Timor-Leste		LMIC	0.489	0.113	0.462	0.347	0.353
166	Tanzania	X	LMIC	0.507	0.337	0.351	0.205	0.350
167	Lesotho		LMIC	0.376	0.034	0.200	0.782	0.348
168	Zimbabwe		LMIC	0.157	0.139	0.298	0.735	0.332
169	Togo		LIC	0.331	0.113	0.498	0.332	0.319
170	Central African Republic		LIC	0.454	0.229	0.200	0.390	0.318
171	Afghanistan		LIC	0.442	0.133	0.493	0.154	0.306
172	Burkina Faso		LIC	0.191	0.292	0.207	0.489	0.295
173	Guinea-Bissau		LIC	0.496	0.021	0.515	0.136	0.292
174	Mali	X	LIC	0.378	0.266	0.423	0.099	0.291
175	Sudan		LIC	0.075	0.049	0.841	0.181	0.286
176	Somalia		LIC	0.077	0.040	0.867	0.141	0.282
177	Gambia, The		LIC	0.104	0.024	0.346	0.588	0.265

#	Name	Feed the Future	Class.	Staples prod.	Crop divers.	Agric. labor prod.	Food system exp.	ATI
178	Chad		LIC	0.185	0.223	0.515	0.118	0.260
179	Liberia	X	LIC	0.525	0.014	0.459	0.000	0.249
180	Mozambique	X	LIC	0.329	0.145	0.191	0.273	0.234
181	Eritrea		LIC	0.080	0.111	0.143	0.449	0.196
182	Niger	X	LIC	0.075	0.028	0.267	0.179	0.137

Source: ATI database

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