

Steenkamp, Francois; Nyamela, Yanele; Bryer, Megan; Jonas, Siyanda

Working Paper

Understanding and characterizing the services sector in South Africa: An update

WIDER Working Paper, No. 48/25

Provided in Cooperation with:

United Nations University (UNU), World Institute for Development Economics Research (WIDER)

Suggested Citation: Steenkamp, Francois; Nyamela, Yanele; Bryer, Megan; Jonas, Siyanda (2025) : Understanding and characterizing the services sector in South Africa: An update, WIDER Working Paper, No. 48/25, ISBN 978-92-9256-607-4, The United Nations University World Institute for Development Economics Research (UNU-WIDER), Helsinki, <https://doi.org/10.35188/UNU-WIDER/2025/607-0>

This Version is available at:

<https://hdl.handle.net/10419/322252>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Understanding and characterizing the services sector in South Africa

An update

Francois Steenkamp,¹ Yanele Nyamela,² Megan Bryer,² and Siyanda Jonas²

July 2025

Abstract: This paper examines the services sector's contribution to the South African economy and the extent to which the sector can drive structural transformation. The South African economy has continued along a path of tertiarization and can be classified as a *de facto* services-based economy. Relatively high-productivity modern services activities, including financial, business, and communication services, have become increasingly important. The paper applies subnational economic complexity analysis and shows that at the district level, higher levels of economic complexity are associated with higher levels of economic development. The most complex industries fall within the modern services sector, and the industry space analysis shows that these complex industries are clustered and highly connected. The most complex district economies are those orientated towards these modern services activities. Complex manufacturing activities are also present within these complex district economies, pointing to a degree of interdependence between activities across these two key sectors.

Key words: economic complexity, relatedness, structural transformation, servicification, economic development

JEL classification: O14, O25, O38, R12

Acknowledgements: We thank the National Treasury officials who attended the presentation of this research at the Economic Policy Staff Seminar held on 5 February 2025 for their valuable input and feedback.

¹ Development Policy Research Unit, School of Economics, University of Cape Town, Cape Town, South Africa, corresponding author: francois.steenkamp@uct.ac.za; ² National Treasury, Pretoria, South Africa.

This study has been prepared within the UNU-WIDER project **Southern Africa—Towards Inclusive Economic Development (SA-TIED)**.

Copyright © UNU-WIDER 2025

UNU-WIDER employs a fair use policy for reasonable reproduction of UNU-WIDER copyrighted content—such as the reproduction of a table or a figure, and/or text not exceeding 400 words—with due acknowledgement of the original source, without requiring explicit permission from the copyright holder.

Information and requests: publications@wider.unu.edu

ISSN 1798-7237 ISBN 978-92-9256-607-0

<https://doi.org/10.35188/UNU-WIDER/2025/607-0>

United Nations University World Institute for Development Economics Research provides economic analysis and policy advice with the aim of promoting sustainable and equitable development. The Institute began operations in 1985 in Helsinki, Finland, as the first research and training centre of the United Nations University. Today it is a unique blend of think tank, research institute, and UN agency—providing a range of services from policy advice to governments as well as freely available original research.

The Institute is funded through income from an endowment fund with additional contributions to its work programme from Finland and Sweden, as well as earmarked contributions for specific projects from a variety of donors.

Katajanokanlaituri 6 B, 00160 Helsinki, Finland

The views expressed in this paper are those of the author(s), and do not necessarily reflect the views of the Institute or the United Nations University, nor the programme/project donors.

1 Introduction

The role of manufacturing-led structural transformation as a pathway to higher levels of economic development has recently come into question. Structural transformation, which involves the reallocation of productive resources, such as labour, from low-productivity economic activities towards high-productivity economic activities, drives sustained improvements in living standards, and is thus a key feature of the economic development process (McMillan et al. 2014). The typical structural transformation pathway, followed by successful early industrializers in Europe and North America, and more recently certain East Asian economies such as South Korea and Singapore, involves a sectoral shift in economic activity from agriculture to manufacturing—industrialization—and later services—tertiarization (Herrendorf et al. 2014). However, recent evidence from Rodrik (2016) shows that many developing economies are experiencing premature deindustrialization. He contends that the new cohort of developing economies are running out of industrialization opportunities faster than their predecessors.¹ If current global demand trends in manufacturing persist, there is a strong possibility that manufacturing—particularly manufacturing exports—will no longer serve as a primary engine of growth for developing countries, thereby diminishing its role in shaping their future economic trajectories.

In light of the diminishing potential for manufacturing-led growth, the role of the services sector as an alternative engine of economic growth warrants further consideration. The South Asian experience offers valuable insights in this regard, demonstrating that services can effectively drive economic development. Empirical evidence indicates that the services sector has been a major contributor to economic growth in South Asian countries, in particular India, Pakistan, the Maldives, Nepal, and Sri Lanka. Approximately 60 per cent of total economic growth between 2000 and 2010 in these economies can be attributed to services (Noland et al. 2012). Furthermore, services-led growth is shown to be linked with increases in labour productivity (Bosworth and Maertens 2009), job and wage growth (Ghani 2009), and poverty reduction (Ghani 2009) across the region. Ghani (2009) contends that beyond global technological progress, South Asia's—particularly India's—emergence as a prominent services exporter is the result of effective market integration, a skilled labour force, and enabling institutional and infrastructural environments.

More recently, Newfarmer et al. (2018) argue that activities sharing the characteristics of manufacturing—the so-called 'industries without smokestacks', including tourism, information and communications technology (ICT), telecommunications, logistics, and transport—are beginning to play a role analogous to that played by manufacturing in East Asia. They contend that services industries offer new opportunities for Africa to grow in the coming decades. Bhorat et al. (2018) examine whether these industries without smokestacks can act as an engine for growth in the South African context. They find that South Africa's services sector is large and growing, and South Africa is, thus, a *de facto* services-based economy. Analysing the labour market, they find that the South African services sector exhibits a segmentation that is characterized by high-productivity, high-wage services; low-

¹ For current developing economies, not only is the peak share of manufacturing employment and output lower compared with countries that industrialized earlier, but this peak is occurring at lower levels of income per capita. Rodrik (2016) shows that for countries that industrialized before 1990, the average peak manufacturing employment share was 21.5%, at an average GDP per capita of US\$11,048 (1990 US dollars). For countries that industrialized after 1990, the average peak employment share was 18.9%, which was reached at a much lower aggregate level of GDP per capita of US\$4,273—a decline of over 60%.

productivity, low-wage services; and government services. On the trade side, they show that there has been sustained growth in services exports, but that this has been biased towards traditional services. However, there is evidence of increased entry into sophisticated services markets in developing-country markets. They show that a key driver of export growth is the expansion of foreign direct investment into developed-country markets, and increasingly into developing-country markets.

In this paper we examine the size and shape of South Africa's services sector. The analysis comprises two parts. First, we provide a descriptive overview of the services sector, where we examine trends in the aggregate contribution of the sector to gross domestic product, employment, and productivity. We also analyse the labour market characteristics of workers in the various subsectors that comprise the broader services sector. In exploring the characteristics and contributions of the various subsectors that comprise this broad, heterogeneous sector, we follow Ghani (2009), who makes a distinction between modern impersonal services and traditional personal services.

Second, using economic complexity analysis applied at the subnational level, we examine economic complexity levels across districts in South Africa, with a particular focus on metropolitan district municipalities. Economic complexity is positively correlated with higher levels of economic development and economic growth (Fritz and Manduca 2021; Hausmann et al. 2014), and in this paper we examine whether this relationship holds at the district level in South Africa. We then examine the economic structure of district economies, particularly metros, and explore the sectoral composition of high-complexity industries. In particular, and as found in recent studies,² we aim to identify whether services sector industries feature prominently among the most complex industries, and thus whether these industries are key to economies building economic complexity and in turn shifting to higher levels of economic development. Finally, using 'industry space' network visualisations, we examine the economic structure of metropolitan municipalities and analyse the composition of services sector industries within these economies, and we relate this to district economic complexity levels.

The paper is structured as follows: in section 2, referring to past research, we explore the role of services in driving structural transformation. We also consider the extent to which services feature in South Africa's industrial and growth policy frameworks. In Section 3, we detail the methodological approach applied in the analysis, in particular that relating to the measurement of economic complexity. Section 4 describes the data employed in the two key empirical components of the paper. In section 5, we present our results relating to the services sector's contribution to the South African economy and the characteristics of workers operating within the sector. The results of the subnational economic complexity analysis are presented in Section 6. Section 7 provides a discussion on potential policy recommendations, and Section 8 concludes.

² Recent studies find that services sector industries feature prominently among the most complex industries within countries (Mealy and Coyle 2019; Mealy et al. 2018).

2 Background: the services-sector-led structural transformation

Historically, structural transformation in the twentieth century was characterized by a significant shift of workers from agriculture to manufacturing, a process seen as essential for economic development and growth, and later into the services sector. By expanding into manufacturing, low-income countries could absorb low-skilled workers, raise income per capita, and drive economic growth. However, replicating this path to development today may be less feasible for developing economies. Countries, particularly China, have achieved such a scale in manufacturing that it is difficult for new entrants to compete efficiently on a global playing field. Additionally, technological advances in richer countries have diminished the need to source cheap labour elsewhere, further complicating this development path.

Recent trends indicate that low-income countries are moving into services more quickly than the East Asian countries that developed during the 1970s and 1980s (Baccini et al. 2023: 148). Services have grown faster than manufacturing sectors in many low-income countries over the past three decades. The World Bank reports that, on average, services account for 55 per cent of GDP and 45 per cent of jobs in developing countries (Nayyar et al. 2021). In response to concerns about 'premature deindustrialization', governments have attempted to support manufacturing expansion in developing economies, although the feasibility and effectiveness of these efforts are in question.

Traditionally, the services sector has been considered less productive than manufacturing, with fewer opportunities for positive spillovers from innovation, intersectoral linkages, and economies of scale, and with fewer jobs created for unskilled workers (Baccini et al. 2022: 148). Although services are labour-intensive, they have not matched manufacturing in market access and innovation opportunities (Nayyar et al. 2021: 2). Consequently, the prospects for services-led economic development appear more limited.

All this being said, emerging research suggests that services can provide productivity growth equal to, or above, that of agriculture and manufacturing. Nayyar et al. (2021) find that while labour productivity in services, on average, lags behind manufacturing in low- and middle-income countries, since the 1990s this gap has begun to narrow. Their evidence suggests that services growth can contribute to lower-income countries catching up to advanced economies, known as 'unconditional convergence'. With the rise of digital technology and the increasing tradability of services, the sector now contributes to economies of scale, innovation, spillovers, and job creation for unskilled labour far more than previously observed. However, these productivity gains are not uniform across subsectors. Nayyar et al. find that finance, ICT, and professional services offer the most potential for scale, innovation, and spillovers but are biased towards higher skills. In contrast, wholesale and retail trade, accommodation, food services, and transport, which can absorb low-skilled workers while enhancing productivity, often depend on linkages to manufacturing. This distinction might be thought of as one of modern impersonal services versus traditional personal services: where 'modern services' refers to computer and information services, financial and business services, and communication services; and 'traditional services' refers to trade, hotels and restaurants, education, transport, health, and services that require personal contact (Bhorat et al. 2018). Ghani (2009) shows that in South Asian countries, growth rates of modern services exceed those of traditional services. This is explained by three factors: technology, transportability, and tradability. With technology advances, a radiologist can review a scan from abroad that is uploaded to a remote server; increased access to broadband

internet means a service can be rendered at a distant location; and digital transportation means that modern services do not face government barriers or tariffs.

Also, Kinfemichael and Morshed (2019) highlight that the services sector now faces both domestic and international competition, leading to increased efficiency and productivity improvements in low-income countries. They find evidence of unconditional convergence in labour productivity for the aggregate services sector, with 11 out of 12 subsectors exhibiting this trend, contradicting Rodrik's (2013) earlier findings of unconditional convergence in manufacturing sectors only. This suggests that countries with low initial labour productivity in their services sector experience faster growth than those with high initial productivity. The increasing international mobility of the services sector and the diffusion of modern technology may explain this finding. Domestic services providers, faced with increasing competition, are compelled to improve their efficiency.

While services have historically been seen as less productive than manufacturing, recent evidence indicates that they can drive significant productivity growth and economic transformation in developing countries. With the evolving global economic landscape, services may indeed serve as a viable alternative mechanism for structural transformation and economic growth.

2.1 The services sector in South Africa

In 2018, the Brookings Institution and UNU-WIDER published a book titled *Industries Without Smokestacks*, which provided an investigation into industries, aside from manufacturing, with the potential to promote growth-enhancing structural change. Many of the industries without smokestacks identified in the research share characteristics with manufacturing. In fact, the distinctions between manufacturing and services sectors are no longer as clear-cut as before. Services, once defined by their non-tradability, now comprise three times as many exports as they did ten years ago in developing countries (Newfarmer et al. 2018: 6). Moreover, there are deep linkages between manufacturing and services. A 10 per cent increase in services productivity has been associated with between 0.32 and 0.55 per cent rise in manufacturing productivity in various African countries (Hoekman and Shepherd 2015, in Newfarmer et al. 2018: 7).

In South Africa, where the services sector accounts for over two-thirds of the economy, modern services have led the acceleration in share of GDP since 2000. Bhorat et al. (2018) show that between 2000 and 2014, there has been growth-inducing structural transformation, albeit weak, and that this has been driven by a shift in employment from relatively low-productivity agricultural and catering and accommodation activities, to relatively higher-productivity activities in business, transportation, and government services—i.e. services-led structural transformation. However, while there is evidence of cross-sector productivity growth (i.e. structural transformation), they find that the majority of productivity growth has been driven by resource allocations shifts within industries. The reasons they posit for the growth seen in services employment dim enthusiasm for the view that a highly productive services sector is driving long-term sustainable growth. Rather, services employment is thought to be due to, first, the rise in the use of temporary employment services to avoid regulatory costs; second, the growth in retail employment in response to consumption-driven growth; third, the rise in informal wholesale and retail trade jobs in the absence of formal sector employment rises; and fourth, increasing public sector employment. All of these factors dampen the ambition of sustainable services-led structural transformation.

Visagie and Turok (2021) echo the concern that in African economies, though services like transport and tourism may be more accessible and have greater capacity for labour absorption, they lack the scope for large productivity gains or long-term growth that drives economic development. That said, services provide an opportunity to African countries that have struggled to industrialize—to expand international trade, to enter global value chains, and to improve their competitiveness by increasing their international trade in services. To this end, Visagie and Turok give examples of the successes of South African firms such as MTN, Standard Bank, and Sanlam, all of which generate significant earnings outside of South Africa through the provision of services. This is especially significant given the poor performance of manufacturing firms across the African continent.

2.2 The South African policy stance: growth and industrial policy

Despite its magnitude in share of GDP and employment, the services sector is under-represented in South Africa's industrial policy framework, which has focused on manufacturing, mining, and resource-based industries. However, the importance of the services sector as a vital contributor to economic growth, job creation, and global competitiveness is increasingly recognized. This shift acknowledges the expanding role of services industries, such as ICT, tourism, finance, business process outsourcing, and creative industries, in driving economic growth.

The Industrial Policy Action Plan (IPAP), led by the Department of Trade, Industry, and Competition (DTIC), is a central component of South Africa's industrial strategy. It includes sector-specific strategies and incentives for both traditional industries and high-potential services sectors. Business process outsourcing is recognized as a priority sector due to its potential for export revenue and job creation. The ICT and digital economy is identified as a transformative sector, particularly through the Digital Economy Master Plan (DCDT 2021), which outlines objectives to improve digital infrastructure, foster innovation, and upskill the workforce. Additionally, tourism is considered a high-impact sector that can create jobs and boost regional economies. Incentives within the IPAP for tourism include the Green Tourism Incentive to encourage sustainable practices and the Tourism Equity Fund to support black-owned tourism businesses. But in each of the IPAPs and the master plan development process, the manufacturing sector receives greater attention than the services sector.

In the National Development Plan (NDP; National Planning Commission 2013), the overarching policy document which sets out South Africa's long-term vision to reduce poverty, inequality, and unemployment by 2030, the services sector is essential, especially as it relates to diversification and building a knowledge-driven economy. The NDP emphasizes expanding broadband to foster an inclusive digital economy. It supports financial sector development as part of a broader push for financial inclusion.

In addition, the DTIC provides targeted support for key services sectors, including promoting South Africa as an international film production hub through support to film and television production, and supporting creative industries.

The National Treasury's (2019) paper *A Contribution towards a Growth Agenda for the South African Economy* highlights the potential of services sectors such as ICT, tourism, finance, and professional services as essential components of sustainable economic development. The document prioritizes expanding broadband access and digital infrastructure to improve connectivity across the country; it

outlines the need for regulatory changes to foster a competitive ICT sector, reduce the cost of data, and promote innovation. It emphasizes investment in tourism infrastructure, including transportation, safety, and sustainability measures. It recognizes the importance of financial inclusion and proposes a regulatory environment that supports digital financial services, including mobile banking and digital payments.

In examining the case for including services more substantively in industrial policy, TIPS (2022) notes that industrial policy has typically relied on value chain analyses, a model into which services does not readily fit. They offer three reasons for this: first, though services such as design, engineering, and finance are critical for modern production processes, they do not provide tangible outputs overlooked when conceptualizing value chains; second, the provision of services that develop human and social capital are considered outside of the scope of industrial policy and under the purview of social, often exclusionary, policy; and third, services are not considered as productivity-enhancing.

In this paper, while we examine the size and shape of the services sector, we also investigate, through the use of economic complexity analysis, the extent to which different services sector industries influence levels of regional economic development, and the potential for regional economic growth.

3 Methodology

In this section we detail the methodological approach applied across the two empirical components of the paper.

3.1 Descriptive statistical analysis

The descriptive analysis considers the economic contribution of the services sector on aggregate, but it also examines the characteristics and contributions of the various subsectors that comprise this broad, heterogeneous sector. In this we follow Ghani (2009), who makes a distinction between modern impersonal services and traditional personal services. Traditional services include services, such as trade, hotel and restaurants, education, transport, and health, that often require face-to-face interaction and where ICT use is limited. Modern services include computer and information services, financial and business services, and communication. Ghani (2009) shows that the South Asian services-led growth pattern was driven by expansion of modern services. Thus, we apply this analytical distinction in our analysis. We also examine the nature and characteristics of services sector industries in relation to the manufacturing sector, with the latter providing a baseline reference point for the analysis.

3.2 Subnational economic complexity

We apply the economic complexity approach at the subnational level, or in our case, the district municipal level. Our proposed methodology draws on studies such as Gao et al. (2017), Mealy and Coyle (2022), and Mealy et al. (2018) which have developed the subnational application of the economic complexity approach. As such, we present the formalization of our methodology at the subnational level.

3.2.1 Measuring economic complexity at the district level

Economic complexity indices (ECIs) measure the productive know-how in a society as expressed in the products that it makes and the services that it provides (Hausmann et al. 2014).

Localities, such as districts, that possess a broad array of productive know-how, particularly in the form of complex specialized industrial capabilities, tend to exhibit more diverse and sophisticated industrial structures. Economies characterized by higher levels of economic complexity are typically associated with higher levels of income (Hidalgo and Hausmann 2009). Furthermore, where a locality's economic complexity surpasses what would typically be expected given its current income level, it is likely to experience accelerated economic growth in the future (Hidalgo and Hausmann 2009).

We follow Mealy and Coyle's (2022) subnational application of the Hausmann et al. (2014) approach for calculating ECIs.³ Using dimensionality reduction methods, we manipulate industry-level employment data from the Spatial Tax Panel dataset and construct ECIs and industry complexity indices (ICIs). We use Standard Industrial Classification (SIC) three-digit industry-level employment data to construct location quotients. We define a binary district–industry matrix M , with elements M_{di} which are equal to 1 if district d has a competitive advantage in industry i with location quotient (LQ) ≥ 1 , and 0 otherwise. The LQ is calculated using Equation 1:

$$LQ_{d,i} = \frac{E_{d,i}/\sum_i E_{d,i}}{\sum_d E_{d,i}/\sum_d \sum_i E_{d,i}} \quad (1)$$

where $E_{d,i}$ is the number of workers in district d employed in industry i . Diversity and ubiquity can be calculated by summing along the rows and columns of the matrix, respectively. Formally, we can define these concepts as:

$$Diversity = d_{d,0} = \sum_i M_{d,i} \quad (2)$$

$$Ubiquity = u_{i,0} = \sum_d M_{d,i} \quad (3)$$

To capture how similar one district's industrial structure is to another's, we calculate a new matrix \tilde{M} , which is given by:

$$\tilde{M} = D^{-1}MU^{-1}M' \quad (4)$$

where D is a diagonal matrix with the entries along the main diagonal being the diversity measures for each district as defined in Equation 2 and U is the diagonal matrix with diagonal entries equal to industry ubiquities, as per Equation 3.

The vector of ECI values for all districts is then defined by the eigenvector corresponding to the second-largest right eigenvalue of the matrix \tilde{M} . It is common practice to standardize this ECI vector

³ The formalization of this approach follows that compiled by Allen et al. (2019).

by subtracting the mean and dividing by the standard deviation of the vector's entries. As a result, one can define the ECI mathematically as:

$$ECI = \frac{\vec{D} - \langle \vec{D} \rangle}{sd(\vec{D})} \quad (5)$$

where \vec{D} is the eigenvector associated with the second-largest right eigenvalue of \tilde{M} , $\langle \cdot \rangle$ represents the mean of the vector, and $sd(\cdot)$ represents the standard deviation. The ICI, which is the equivalent complexity index for industries and analogous to the product complexity index, can be defined as

$$ICI = \frac{\vec{U} - \langle \vec{U} \rangle}{sd(\vec{U})} \quad (6)$$

where \vec{U} is simply the eigenvector associated with the second-largest right eigenvalue of the matrix $\hat{M} = U^{-1}M'D^{-1}M$ (Mealy and Coyle 2019).

Using the above methodology, we obtain ECIs for each district and ICIs for each industry. Given the time dimensions of the Spatial Tax Panel dataset, we are able to calculate these indices for the period 2014–23.

3.2.2 Constructing South Africa's industry space

Relatedness indices are used to construct a network graph that we refer to as the 'industry space'—akin to the product space developed by Hidalgo et al. (2007). The industry space network allows for a visual representation of the economic structure for each district in South Africa. Using the industry space, we are able to visually observe where each district's comparative advantage lies. We are also able to visualize where services sector activities fit within this network structure.

The notion and metrics of industrial relatedness form the basis for the industry space. Two or more industries are related if they require similar productive capabilities and know-how to be produced. However, productive capabilities and know-how are not directly observable, and as a result, the similarity in capabilities between two industries cannot be identified without the use of a proxy. Hidalgo et al. (2007) develop such a proxy, which infers the relatedness, in terms of required productive capabilities, between two industries based on the probability that the two industries are both produced by a given district. The logic behind this measure is as follows: where two industries—e.g., fund management services and insurance services—share similar capabilities, the probability of both of these industries being present within a district is relatively high. However, where two industries—e.g., fund management services and iron ore mining—are dissimilar in the capabilities required in their production, these industries are unlikely to be present in the same district. The probability of two industries being present together in two or more districts thus gives a measure of how proximate the capabilities required for the production of these industries are. This measure is defined as the proximity of one industry to another and is a useful measure in building a visualization of the interconnected network of industries known as the industry space.

Moving to the formal derivation of the relatedness metrics: we estimate how related industries are, in terms of underlying productive capabilities, by drawing on the measure of industry proximity ($\phi_{i,j}$) proposed by Hidalgo et al. (2007). The proximity measure is increasing in the likelihood that two

industries i and j are comparative advantage industries in the same district, where proximity can be defined as follows:⁴

$$\phi_{i,j} = \min \{P(LQ_i \geq 1|LQ_j \geq 1); P(LQ_j \geq 1|LQ_i \geq 1)\} \quad (7)$$

where $P(LQ_i \geq 1|LQ_j \geq 1)$ is the probability that a district has a comparative advantage in industry i (i.e., with $LQ \geq 1$), conditional on the fact that it already has a comparative advantage in industry j , and vice versa for $P(LQ_j \geq 1|LQ_i \geq 1)$. Given that the proximity measure is conceptually related to distance, and that a distance function defined on any metric space must be symmetric (Khamsi and Kirk 2001),⁵ the minimum of these two conditional probabilities is used in order to satisfy this property.

All pairwise proximity values, $\phi_{i,j}$, can then be arranged in a symmetric industry-by-industry proximity matrix, Φ , which will be used in the construction of the industry space visualization. To construct the industry space, we then follow the approach set out in Allen et al. (2019), which is used to construct a fibrous plant product space for South Africa. A network visualization should meet two conditions. First, there should be no isolated nodes (industries) in the network. Put differently, every node (industry) in the network must be connected to the broader network in some way. Second, the visualization needs to be relatively sparse so as to be sensible to examine.

To satisfy the first condition, we generate a maximal spanning tree (MST) for the industry space network. The MST is the set of weighted links that connects all nodes using the minimal number of edges with the maximal weight (Hausmann et al. 2014; Welsh 1968). Put differently, the MST is the network that connects all industry nodes using the smallest number of edges, while simultaneously maximizing the sum of all proximities. This translates to sorting through proximities in descending order and including links if and only if they connect to an isolated industry (Hausmann et al. 2014). The MST forms the backbone of the industry space network.

The MST algorithm creates a network that is visually sparse, where the minimum number of edges, or links, between nodes are included in the network. However, to generate a dense network, we add back those links with the highest proximities. This provides an industry space with its clustered appearance. Practically, this involves choosing a proximity threshold. Our proximity threshold rule follows that applied by Hidalgo et al. (2007) in the generation of the product space. It requires that the number of edges (links) between nodes is double the number of nodes. While this rule is somewhat arbitrary, and one can increase the number of edges by a different factor, the primary objective of the approach is to keep the meaningful edges between nodes. This threshold is chosen to balance visual density with ease of comprehension of the network.

In Section 6.2 we describe the industry space, which provides a visual representation of the economic structures of district economies in South Africa. Using this network, we are able to see how services

⁴ If an industry is designated as a comparative advantage industry in a given district economy, then it is implied that the industry is competitive and well developed in this economy.

⁵ This is the notion that a valid distance function, d , defined between the points x and y should satisfy the property that $d(x, y) = d(y, x)$.

sector activities fit within this economic structure, how these activities cluster, and the complexity of industries within these clusters.

4 Data

To analyse the contribution of the services sector and its constituent components to output in the South African economy, we use data from Statistics South Africa's 'Generation of Income Account' report (Stats SA 2023c). This report provides industry-level gross-value-added data for the period 2010–21. Industries are disaggregated at the two-digit level of the SIC version 5. This disaggregates the services sector into 11 subsectors.⁶ Using this level of disaggregation allows one to assess the relative contribution of each of these distinct and heterogeneous industries. We follow Ghani (2009) and distinguish between modern and traditional services. The former comprises wholesale trade; retail trade and repair of household goods; motor trade and repair of motor vehicles, catering and accommodation; transport; central, provincial, and local government; and personal services. The latter comprises communication; finance and insurance; real estate; and business services. To analyse employment levels across industries, we use household survey data from the Quarterly Labour Force Survey (QLFS; see all Stats SA QLFS publications in the References section). We further use these data to detail the labour market characteristics of workers in services sector industries.

The subnational economic complexity analysis is enabled by using data from the Spatial Tax Panel (STP) developed by Nell and Visagie (2024), version 4. The STP is a publicly available dataset built from administrative tax data compiled by the South African Revenue Services and the National Treasury. In particular, these data come from the IRP5/IT3a tax form, which is a mandatory submission completed by each pay-as-you-earn (PAYE) registered employer for all employees earning more than R2,000 rand (R) per annum. As such, the employment estimates from these data captures the formal sector economy.⁷ Anonymized employer-employee level data with detailed spatial coding from postal codes are then aggregated to generate full-time-equivalent employment estimates across a range of characteristics, including industry, firm size, age group, gender, and firm trade status. Importantly for the purposes of this paper, the data contain employment estimates recorded at both a disaggregated industry level and a disaggregated spatial level. We use full-time-equivalent employment estimates recorded at the three-digit level of the SIC classification (version 7)⁸ at the

⁶ These subsectors include wholesale trade; retail trade and repair of household goods; motor trade and repair of motor catering and accommodation; transport; communication; finance and insurance; real estate; business services; central, provincial, and local government services; personal services.

⁷ While these data do not pick up the informal sector of the economy, this is less of a problem in the South African context since the informal sector in South Africa is relatively small in relation to that in other developing countries. The informal sector comprised 18.8% of employment in South Africa in 2024 (Stats SA 2024) while the average for middle-income countries is 44.68% (Asmal et al. 2024).

⁸ The three-digit classification constitutes 238 industries. We drop two industries beset with the head office problem, namely postal activities; and electric power generation, transmission, and distribution. The head office problem results in all establishment-level employment estimates being allocated to the head office; employment estimates for the industry are then biased towards the spatial location of the head office. The economic complexity estimations require spatial variation across industries, which is negated by the head office effect. Four additional industry categories are removed as these pertain to economic activity that is either subsistence in nature or related to diplomatic employment.

district municipal level.⁹ These data allow us to generate ECIs for each district economy and industry complexity indices (ICI) for each three-digit industry.

5 South Africa's services sector: descriptive statistical analysis

In this section, we provide a descriptive overview of the services sector. We examine trends in the aggregate contribution of the sector to GDP, employment, and productivity. We also consider the relative contribution and trends associated with services subsectors (recorded at the two-digit level of the SIC). We analyse the labour market characteristics of workers in the various subsectors that comprise the broader services sector.

5.1 The services sector's contribution to the South African economy

5.1.1 Gross domestic product

Over recent decades, the services sector has grown faster than other sectors in the South African economy, outpacing traditional sectors such as mining, agriculture, and manufacturing. In Table 1, it is evident that since 2010, the services (tertiary) sector has grown faster (1.43 per cent per annum) than the primary (1.13 per cent) and secondary sectors (−0.47 per cent). This is consistent with the South African economy becoming increasingly services oriented, or as Borat et al. (2018) state, a *de facto* services-based economy. Notably, we observe in Table 1 that the services sector accounted for 73 per cent of GDP in 2021, up from 70 per cent in 2010 and 62 per cent in 2000 (estimate from Borat et al. 2018). This growth has reshaped the South African economy, positioning services as the largest contributor to GDP, a primary source of employment, and a key driver of urbanization and structural transformation.

Notably, in conjunction with the continued tertiarization of the South African economy, it has also been on a deindustrialization pathway. Drawing on Borat et al. (2022), we know that South Africa hit peak industrialization in 1980, with the manufacturing sector accounting for 23 per cent of GDP, and has since undergone a period of deindustrialization. In Table 1 and Figure 2, we see that the manufacturing sector's share of GDP sat at 13 per cent in 2021, down from 15 per cent in 2010 and almost half of what it was four decades previously. This is consistent with the sector stagnating over the period—see the green series in Figure 1.

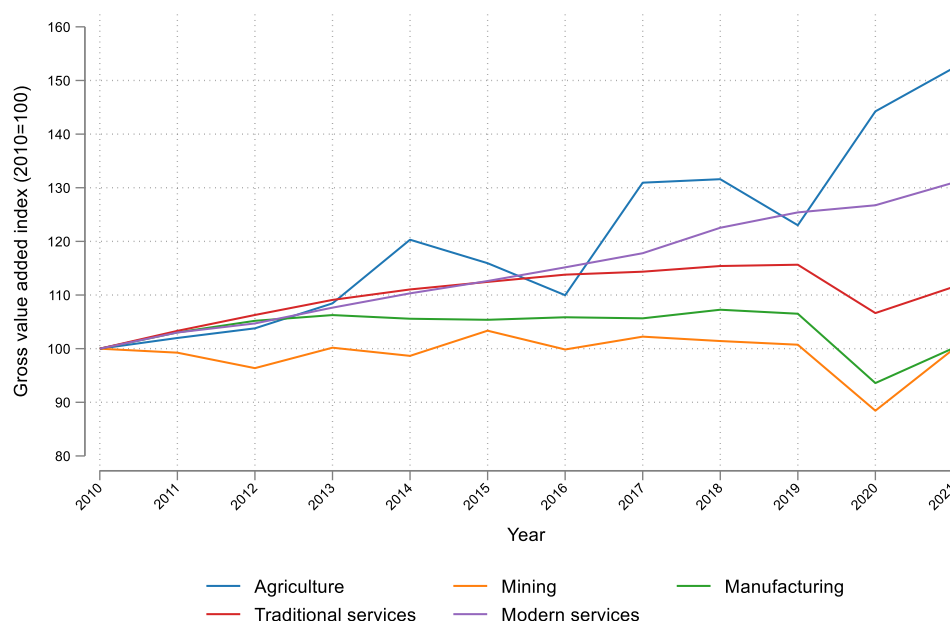
⁹ South Africa is divided into 52 municipal districts, 8 of which are metropolitan municipalities and 18 of which are coded as rural municipalities (Statistics South Africa 2016e).

Table 1: GDP by industry, 2010–21

	GDP shares		Growth (2010–21)			
	2010	2021	Absolute	AAGR (%)	Relative	Share of change
Primary	0.08	0.09	44,180	1.13	1.10	0.09
Agriculture	0.02	0.03	44,527	3.57	3.48	0.09
Mining	0.06	0.05	–347	–0.01	–0.01	–0.00
Secondary	0.22	0.18	–42,991	–0.47	–0.46	–0.09
Manufacturing	0.15	0.13	365	0.01	0.01	0.00
Utilities	0.03	0.03	–16,633	–1.23	–1.20	–0.04
Construction	0.04	0.03	–26,724	–1.76	–1.71	–0.06
Tertiary	0.70	0.73	468,683	1.43	1.40	1.00
Trade	0.12	0.12	48,649	0.88	0.86	0.10
Catering and accommodation	0.02	0.01	–17,353	–3.11	–3.04	–0.04
Transport and storage	0.06	0.04	–36,937	–1.54	–1.50	–0.08
Communication	0.03	0.04	61,438	4.20	4.09	0.13
Finance	0.14	0.16	128,141	1.88	1.84	0.27
Business	0.09	0.10	95,848	2.23	2.18	0.20
Government	0.08	0.09	74,832	1.91	1.87	0.16
Personal services	0.16	0.17	114,065	1.48	1.44	0.24
Total	1.00	1.00	469,872	1.03		

Note: GDP estimates reported in constant 2015 prices; AAGR = average annual growth rate; relative change is calculated as AAGR for the industry (sector) divided by AAGR for the economy as a whole; share of change refers to the absolute change for the industry (sector) divided by the absolute change for the economy as a whole; trade refers to wholesale trade, retail trade and repair of household goods, and motor trade and repair of motor vehicles; finance refers to sum of financial and insurance services and real estate services.

Source: authors' construction based on Stats SA (2023c).

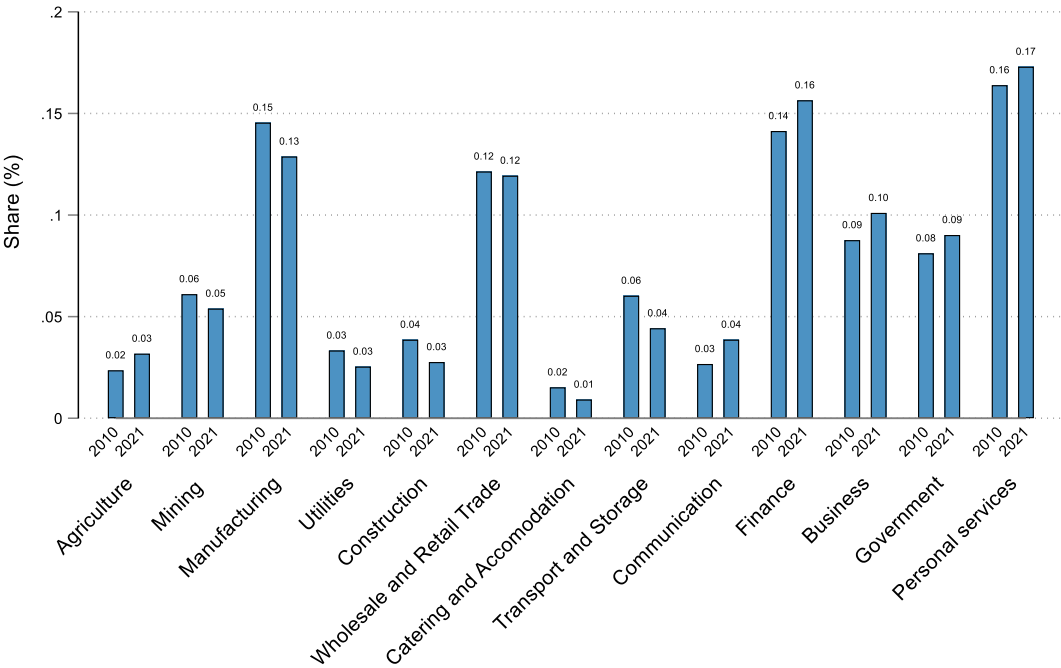
Figure 1: Gross value added by sector, 2010–21

Source: authors' illustration based on Stats SA (2023c).

The services sector's contribution to GDP can be better understood by breaking the sector down into subsectors. Traditional services, such as wholesale and retail trade (12 per cent), catering and accommodation (1 per cent), transport (4 per cent), government (9 per cent), and personal services (17 per cent), accounted for 44 per cent of GDP in 2021. The cumulative share of GDP accounted for by traditional services subsectors has remained constant since 2010, and this is reflected in the relatively marginal growth of the industries that comprise this grouping (see Figure 1). The two large components of traditional services, the wholesale and retail trade (12 per cent) and personal services industries, together account for more than a quarter of aggregate GDP.

Growth has been more evident in the subsectors that comprise the modern services grouping, which not only presents opportunities for economic diversification but also reflects worldwide trends in digital transformation and the need for specialized services. In Figure 1 we see that GDP growth in this grouping (blue series) outstripped that achieved in traditional services (red series), mining (orange series), and manufacturing (green series). Only the agricultural sector grew faster, at a growth rate of 3.57 per cent per annum (see Table 1). The finance, business, and communication services subsectors have experienced robust growth, with each accounting for a larger share of GDP in 2021 than in 2010 (see Figure 2). As such, there has been a structural shift, not only towards services but towards modern services. The growth of modern services in South Africa is likely to continue, driven by the need for digital transformation, increasing internet access, and demand for knowledge-intensive services. This trend positions South Africa as a leader in modern services within Sub-Saharan Africa and could contribute significantly to job creation and improved productivity across the economy.

Figure 2: Gross value added by industry, 2010–21



Source: authors' illustration based on Stats SA (2023c).

5.1.2 Employment

In line with the GDP estimates above, the services sector accounts for the bulk share of employment in the South African economy. This is comparable with other middle-income economies: the services sector accounts for approximately 70 per cent of the workforce in Brazil, and approximately 56 per cent in China, Mexico, and Russia (Hyde, et al. 2019). Looking at Table 2, the services sector accounted for 70 per cent of employment in 2010, and this share increased to 75 per cent in 2024. Looking back at Bhorat, Cassim and Yu (2016), the services sector accounted for 65 per cent of employment in 2000, and thus this pattern of tertiarization has continued into the 2020s. For instance, over the period 2010–24, we observe that 85 per cent of employment growth was due to job growth in the services sector. As such, the services sector employs more workers and generates more jobs than any other sector. In level terms, employment in the services sector increased by over three million jobs between 2010 and 2024. This level of job growth is well in excess of that achieved in the secondary sector (123,548 jobs) and the primary sector (408,029).

Table 2: Employment by industry, 2010–24

	Employment shares		Growth (2010–24)	
	2010	2024	Absolute	Share of change
Primary	0.07	0.08	408,029	0.11
Agriculture	0.05	0.05	266,334	0.07
Mining	0.02	0.03	141,695	0.04
Secondary	0.22	0.18	123,548	0.3
Manufacturing	0.13	0.10	–49 902	–0.01
Utilities	0.01	0.01	17,783	0.00
Construction	0.08	0.07	155,667	0.04
Tertiary	0.70	0.75	3,060,154	0.85
Wholesale and retail trade	0.18	0.17	367,443	0.10
Catering and accommodation	0.04	0.04	89,347	0.02
Transport and storage	0.05	0.06	325,421	0.09
Communication	0.01	0.01	–27 391	–0.01
Finance	0.04	0.03	100,826	0.03
Business	0.03	0.04	324,404	0.09
TES	0.06	0.10	756,529	0.21
Government	0.06	0.05	–7,819	–0.00
CSP (excl. govt)	0.13	0.16	965,915	0.27
Private households	0.09	0.07	3,391	0.00
Other services	0.01	0.02	162,088	0.05
Total	0.99	1.01	3,591,731	0.90

Note: TES is temporary employment services, a component of business services that refers to workers employed by labour brokers; CSP is community, social, and personal services; share of change refers to the absolute change for the industry (sector) divided by the absolute change for the economy as a whole.

Source: authors' construction based on Stats SA (2010, 2024).

Employment grew in most subsectors of the tertiary sector. The wholesale and retail trade; transport and storage; business; and CSP subsectors were responsible for the largest contributions to employment growth over the period: 10, 9, 9, and 27 per cent, respectively. The wholesale and retail trade, while growing, did not expand to the same extent that it did over the period 2000–14, for which

Bhorat, Steenkamp, et al. (2016) show an expansion of close to a million jobs. The CSP subsector grew substantially, accounting for a nearly a third of all jobs created in the period.¹⁰

The expansion of employment within business services—a component of the modern services subsector—must be interpreted with caution, given that a substantial proportion of this growth is a function of the increased use of TES firms by employers. TES employment involves third-party service providers supplying workers to formal sector enterprises for occupational roles such as cleaning, accounting, and security services (Bhorat, Cassim, and Yu 2016).¹¹ As such, we divide the business services sector into employment linked to TES employment and employment associated with other business services. As shown in Table 2, the TES subsector showed strong employment growth, accounting for 756,529 jobs over the period. This indicates a rise in the use of employment agencies and labour broking in the South African labour market.

Government services employment registered a decline of 7,819 jobs over the period. This stands in stark contrast to public sector employment trends in the 2000s: Bhorat, Steenkamp, et al. (2016) show that public services accounted for close to a quarter of job growth over the 2000–14 period—in excess of 600,000 jobs. The decline in employment growth over the more recent period largely reflects government efforts to return public finances to a sustainable path through fiscal consolidation. Employment reductions have largely been at the national and provincial government level, with limited decreases at the local government level.

In terms of employment growth in other sectors, consistent with South Africa's current deindustrialization pathway, we observe a decline in employment in the manufacturing sector. Both primary sectors, mining and agriculture, experienced employment growth over the period 2010–24, with the former and latter growing by 266,334 and 141,695 jobs, respectively. Again, this employment growth pales in comparison with the three million jobs created in the services sector over the same period.

5.1.3 Productivity

Structural transformation involves the shift of resources from low-productivity activities towards high-productivity activities (McMillan et al. 2014). The South African economy has historically been dependent mostly on agriculture and industry: mining in particular, but also manufacturing. However, over time, the economy has evolved, with the services sector becoming the main employer and contributor to GDP. This shift towards a service-oriented economy is part of the broader structural transformation process, as the economy diversifies and increasingly relies on knowledge- and skill-intensive activities.

To assess the degree to which services sector activities feature in South Africa's structural transformation trajectory, we apply an analytical technique similar to that of McMillan et al. (2014). Figure 3 compares the relative productivity of different sectors with changes in their employment share. The size of the circle for each sector represents the sector's share of employment in 2021 and

¹⁰ The CSP subsector is a heterogeneous grouping, comprising the education, health, social work, entertainment, and sporting and cultural activity industries.

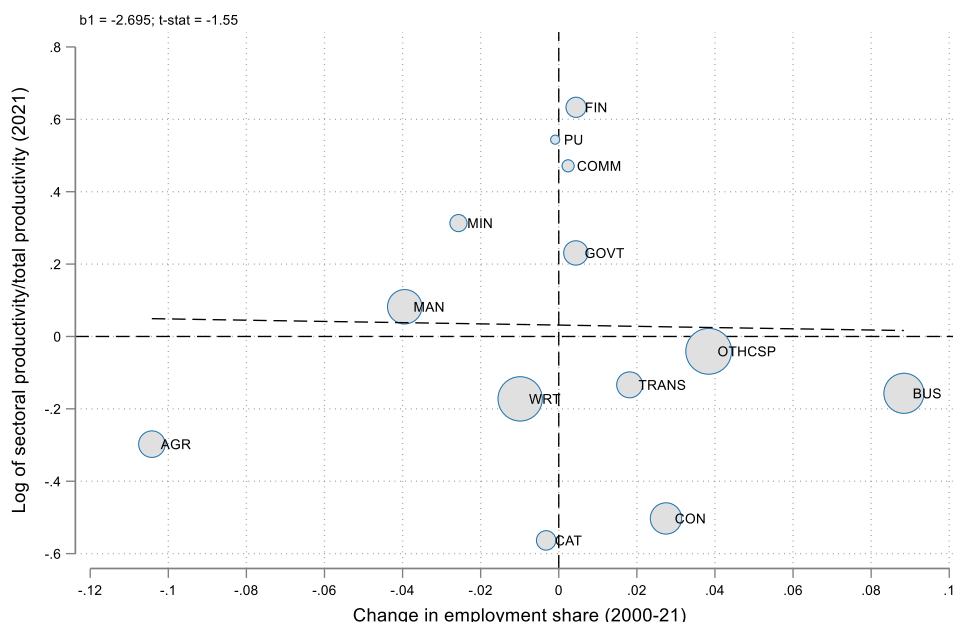
¹¹ In the survey data, TES workers fall under the industry category 'business activities not elsewhere classified'. Bhorat, Cassim, and Yu (2016) find that most of these workers tend to be employed in services-type occupations and not manufacturing sector occupations.

the linear regression line indicates whether the structural transformation has been growth inducing (positively sloped) or not. We focus on a longer period, 2000–21, since structural transformation is better observed over a longer period.

The slight negative slope in Figure 3 suggests that structural transformation since 2000 has had a marginal growth-reducing effect in South Africa. Put differently, the direction of flow of labour resources has been away from high-productivity economic activity and towards low-productivity economic activity. However, this negative correlation is weak, as the estimated coefficient is not significant. Thus we cannot definitively conclude that the structural transformation has had a growth-reducing effect.

Given that structural transformation involves shifting resources from low-productivity to high-productivity activities, the ideal economic development scenario would be to see employment shares in low-productivity industries decrease (bottom-left quadrant), while employment shares in high-productivity industries rise (top-right quadrant) (Bhorat et al. 2018). In South Africa's case, while low-productivity industries, such as agriculture, wholesale and retail trade, and catering and accommodation services, have seen falling employment shares, high-productivity industries, such as manufacturing and mining, have also experienced declining employment shares (Figure 3). Further, we note a substantial movement of labour resources into low-productivity sectors, including business services, transportation services, and construction. In contrast, job growth in high-productivity modern services industries, such as finance and communication services, has been negligible.

Figure 3: Correlation between sectoral productivity and change in employment shares in South Africa, 2000–21



Note: size of circles represents employment shares in 2021; coefficient of fitted is -2.695 (t-stat -1.55); AGR = agriculture, MIN = mining, MAN = manufacturing, PU = public utilities, CON = construction, CAT = catering and accommodation, WRT = wholesale and retail trade, TRANS = transport and storage, COMM = communication, FIN = finance and insurance, BUS = business services, OTHCSP = other CSP services, GOV = government services.

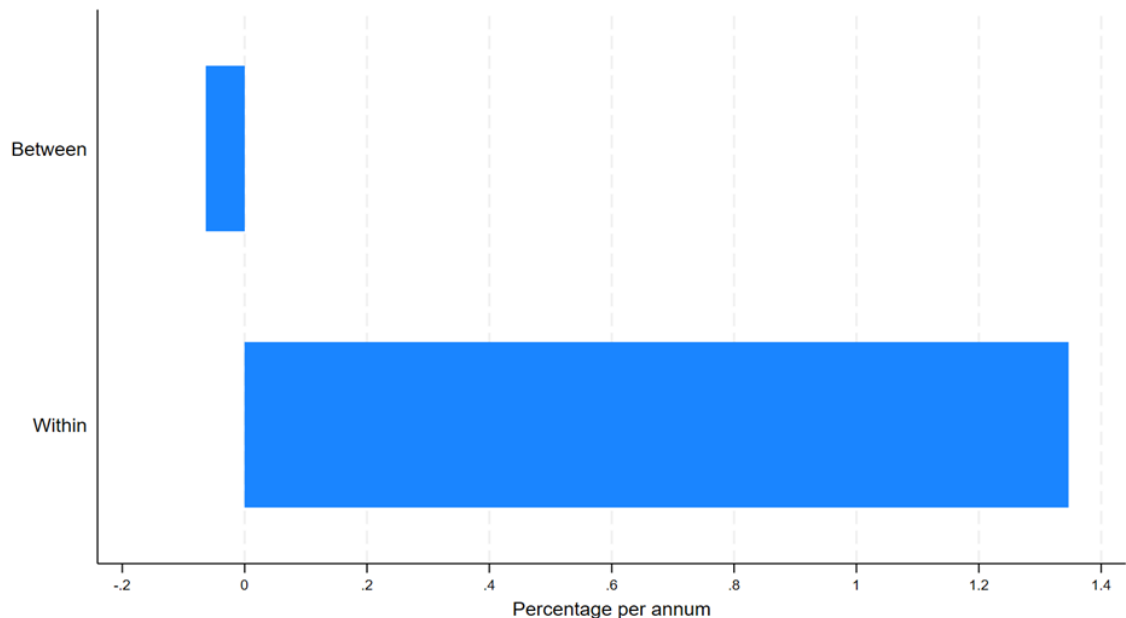
Source: authors' illustration based on Stats SA (2010, 2021b).

Figure 3 also highlights that employment shares have grown in government services. However, despite this being a relatively high-productivity sector, the expansion of government employment presents challenges to the sustainability of South Africa’s fiscus. In order to guarantee sustainable growth in public sector employment, South Africa must strike a balance between the creation of jobs and initiatives to boost efficiency, encouraging the expansion of the private sector, and diversifying the economy to lessen dependency on the government as the primary employer. It is important to note that this growth in public sector employment was driven by strong growth in the first decades of the 2000s and, as shown in Table 2, has been tempered in the second decade of the 2000s.

Drawing on McMillan et al. (2014), we decompose South Africa’s productivity growth into within- and between-sector productivity growth. Within-sector productivity growth refers to productivity growth that occurs across firms within a particular sector or industry. This can be driven by technological developments, labour training, enhanced management techniques, and more effective use of resources within an industry. Between-sector productivity growth refers to productivity growth achieved through the reallocation of labour and resources between sectors, typically from lower-productivity sectors to higher-productivity ones. This is synonymous with structural transformation as it relates to the cross-sectoral transformation of an economy.

The estimates emerging from the decomposition are depicted in Figure 4. This indicates that productivity growth within sectors grew by 1.35 per cent per annum, while productivity growth across sectors declined by 0.06 per cent per annum. Therefore, productivity growth over this period took place within sectors, likely due to more capital- and technology-intensive production processes.

Figure 4: Decomposition of productivity for South Africa, 2000–21



Source: authors’ illustration based on Stats SA (2010, 2021b).

5.2 The labour market characteristics of services sector workers

5.2.1 Employment profile

Understanding the demographic characteristics of the workers employed in the subsectors that comprise the broader services sector is crucial for assessing the importance and role played by the services sector in the South African labour market.

Generally, women face significant barriers to accessing paid work and are under-represented across most industries. Looking at Table 3, several subsectors are male dominated, including, as expected, the manufacturing sector (63.5 per cent male) but also services subsectors such as transport and storage services (84.2 per cent), communication services (66.5 per cent), and business services (61.4 per cent). In contrast, services subsectors such as catering and accommodation services (57.8 per cent) and CSP (68.6 per cent) exhibit a female predominance. We also see a slight over-representation of women in financial services. Wholesale and retail trade services, along with the government services, show a slight predominance of male employees. This suggests that while there is some level of gender diversity, men make up a larger proportion of the workforce in these subsectors. Suffice to say, gender representation varies across the different subsectors that comprise the broader services sector.

The racial composition of the labour market is important in understanding the imperatives of equal opportunity for all racial groups in South Africa. The labour force is predominantly comprised of African workers, indicating a significant representation of this racial group in employment across the services subsectors. Apart from business services (45 per cent) and financial services (55.4 per cent), African workers comprise in excess of 60 per cent of employment across the various services subsectors. The relatively low representation in business and financial services may be due to the specific skills required in these fields and the slow pace of labour market transformation in these industries. Coloured workers are somewhat equally distributed across the various industries, indicating a balanced representation in the labour market. In five of the services subsectors—government (12.5 per cent), CSP (10.4 per cent), communication (15.2 per cent), finance (12.7 per cent), and business (14.1 per cent)—coloured workers comprise in excess of 10 per cent of employment. The Indian population group is mostly represented in the financial services (7.9 per cent) and business services (7.6 per cent) industries, and least represented in government services (2.0 per cent) and CSP (2.8 per cent). As in the case of Indian workers, white workers are strongly represented in business (33.2 per cent) and financial (23.9 per cent) services.

The age distribution of workers is important to examining the labour market participation of different age groups, especially the youth, given the high youth unemployment rates in South Africa. The youth (15–24 years) comprise 12.41 per cent of employment in the catering and accommodation services subsector—the subsector with the highest level of youth representation. They are least represented in financial services (2.3 per cent), reflects the limited skills among the youth in relation to a skill-intensive subsector. Indeed, the low levels of marketable skills among the youth are widely recognized as a significant barrier to youth employment. The 25–34 age group is somewhat equally distributed across the various subsectors.

Table 3: Characteristics of the employed by industry, 2024

	Manufacturing	Wholesale and retail trade	Catering and accommodation	Transport and storage	Government	CSP (excl. govt)	Communication	Finance	Business
Gender									
Male	63.45	54.20	42.18	84.27	52.85	31.36	66.50	45.82	61.36
Female	36.55	45.80	57.82	15.73	47.15	68.64	33.50	54.18	38.64
Race									
African	70.33	76.45	80.26	79.74	79.55	73.23	65.24	55.40	45.08
Coloured	13.33	8.21	9.11	8.17	12.47	10.36	15.22	12.67	14.09
Indian	4.37	6.68	1.99	2.97	2.03	2.75	6.01	7.94	7.60
White	11.97	8.66	8.64	9.13	5.95	13.66	13.53	23.99	33.23
Age									
15–24	6.12	9.23	12.41	4.46	2.97	5.68	5.05	2.33	5.45
25–34	27.89	31.70	34.77	27.95	19.42	24.68	35.58	26.52	31.99
35–44	32.79	27.32	30.78	37.02	33.28	26.52	34.24	35.80	33.20
45–54	24.99	22.62	17.49	21.16	31.63	27.94	15.95	22.60	22.43
55–64	8.21	9.14	4.55	9.42	12.70	15.18	9.18	12.75	6.94
Education level									
No education	0.47	1.23	0.69	0.16	0.08	0.97	0.00	0.23	0.07
Primary	5.31	6.86	3.33	4.65	2.39	3.99	0.00	0.82	0.65
Incomplete secondary	29.92	32.40	30.27	33.00	7.48	17.54	12.83	9.95	8.14
Secondary	42.49	44.91	53.28	44.78	46.44	27.05	45.56	35.97	28.80
Tertiary (diploma/certificate)	12.16	9.02	9.54	9.70	21.25	21.11	22.74	22.64	22.74
Tertiary (degree)	7.92	3.95	2.10	6.13	21.51	28.54	17.70	29.75	38.33

Source: authors' construction based on Stats SA (2024).

Education plays an important role in facilitating entry into the labour market in South Africa. The contribution of education to improving labour market outcomes is well established in the country (Branson and Leibbrandt 2013). Unemployment is lower among those with tertiary education than those with low levels of schooling. Most workers either have incomplete secondary education or have completed secondary education (passed grade 12). Apart from business services, all subsectors comprise more workers with secondary schooling relative to other education levels. In the catering and accommodation services subsector 53.3 per cent of workers have secondary education, followed by wholesale and retail trade services at 44.9 per cent. The subsector with the highest proportion of workers with a tertiary education is business services (38.3 per cent).

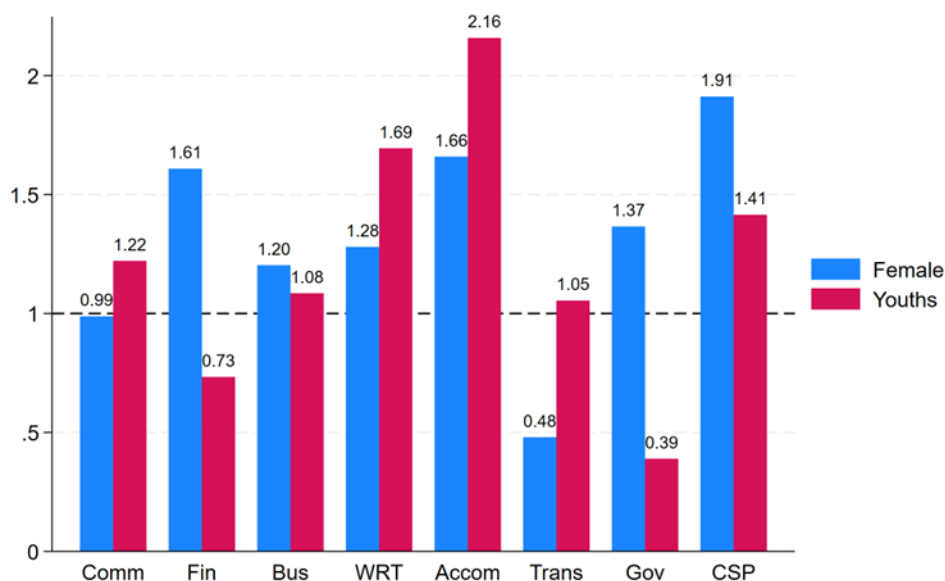
The South African labour market is more advantageous for men than for women and youth, as men are more likely to be in paid employment across most sectors of the economy. In we compare the proportion of women and youth in different services subsectors with the proportion of women and youth in the manufacturing sector in order to obtain a ratio. A ratio of less than unity indicates that there is a greater proportion of women/youths in manufacturing relative to the services subsector. A ratio in excess of unity indicates that there is a greater proportion of women/youths in a services subsector as compared with the manufacturing sector.

Although the South African labour market favours men, the service industries in South Africa rely relatively more on female workers than male workers, particularly when compared with the manufacturing sector. Six industries—financial services, business services, wholesale and retail trade, catering and accommodation services, government services, and CSP—have a higher proportion of women relative to the manufacturing sector. As such, all things being equal, growth in these industries would see more female employment. However, female representation in relation to manufacturing is lower in the transport and storage services subsector (0.48).

With respect to age, financial services (0.73) and government services (0.39) have a lower proportion of youth compared with the manufacturing sector. The lower proportion of youth in government services suggests a bias towards older workers. The catering and accommodation (2.16), wholesale and retail trade (1.69), and CSP (1.41) services subsectors have the highest proportion of youth relative to manufacturing. The catering and accommodation subsector has more than double the proportion of youth compared with manufacturing. This may be reflective of lower barriers and experience requirements to enter this subsector.

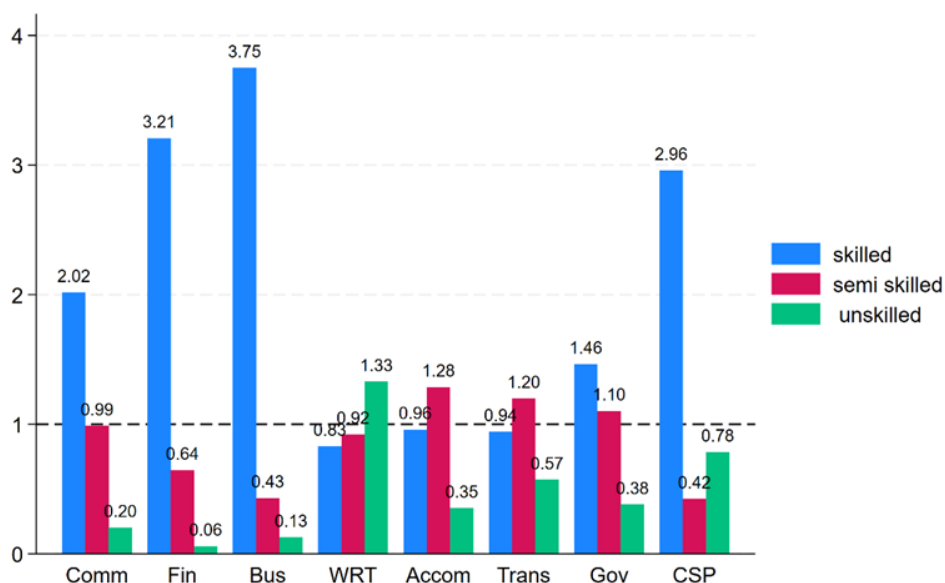
The reallocation of economic activity and employment away from the primary and secondary sectors and towards the tertiary sector is a notable feature of South Africa's long-term structural transformation path. Figure 6 shows the proportion of unskilled, semi-skilled, and highly skilled workers relative to manufacturing. Apart from the wholesale and retail trade subsector, the ratio of unskilled workers is below unity across all services subsectors. This suggests that most of the workers in the services subsectors are skilled compared with workers in the manufacturing sector. The financial services (0.06) and business services (0.13) subsectors have low ratios of unskilled workers compared with manufacturing, indicating that these subsectors are relatively skill-intensive.

Figure 5: Services industry women and youth employment relative to manufacturing



Source: authors' illustration based on Stats SA (2024).

Figure 6: Unskilled, semi-skilled, and highly skilled ratio relative to manufacturing



Source: authors' illustration based on Stats SA (2024).

The proportion of semi-skilled workers relative to manufacturing is higher in catering and accommodation services (1.28), followed by transport and storage services (1.20) and government services (1.10). The communication services (0.99), wholesale and retail trade (0.92), and financial services (0.64) subsectors have a relatively higher proportion of semi-skilled workers compared with manufacturing. Meanwhile, the CSP and business services subsectors have relatively low ratios of semi-skilled workers.

In terms of skilled workers, five industries—communication services, financial services, business services, government services, and CSP—have a higher proportion than manufacturing. This demonstrates a high demand for skilled workers in these subsectors, which may be attributed to skill-biased technological change. Although less than unity, catering and accommodation services (0.96), transport and storage services (0.94), and wholesale and retail trade (0.83) have relatively higher ratios of skilled workers than manufacturing.

5.3 Main findings

The South African economy has continued along a pathway of tertiarization. Employment (75 per cent) and GDP (73 per cent) shares show that the economy can *de facto* be classified as a services-based economy. Some key sectoral trends have emerged.

First, relatively high-productivity modern services have become increasingly important in the South African economy. Financial, business, and communication services accounted for 60 per cent of GDP growth over the period 2010–21 and now represent 30 per cent of GDP—nearly a third of the economy. We observe that these modern services subsectors are relatively skill-intensive, which may explain why their share of aggregate employment (18 per cent) is less than the corresponding GDP share. This does suggest that future growth of this grouping of services subsectors may face skills constraints. Employment growth within this grouping has been concentrated in the business services subsector—approximately a million jobs between 2010 and 2024—but the bulk of this job growth—in excess of 700,000 jobs—has been concentrated in the TES component of the business services subsector. This labour market dynamic points to the increased use of labour brokers.

Second, we observe that a set of relatively more skill-intensive traditional services subsectors accounts for a large part of the economy. Government services experienced a decline in employment over the period. As noted by Bhorat et al. (2018), the public sector cannot act as a driver of growth, given that a bloated public sector is not fiscally sustainable, and the decline in public sector employment over the period seems to reflect government efforts to return public finances to a sustainable path through fiscal consolidation. Nevertheless, the subsector accounts for 6 and 9 per cent of employment and GDP, respectively. CSP accounts for 17 per cent of GDP and 16 per cent of employment. Almost a third of employment growth over the period originated from this subsector.

Third, we observe a set of relatively less skill-intensive, low-productivity traditional services subsectors—wholesale and retail trade, transport and storage, catering and accommodation—that experienced mixed performance over the period. All three subsectors experienced employment growth, with strong growth in the wholesale and retail trade and transport and storage subsectors. However, only the wholesale and retail trade subsector experienced GDP growth over the period.

6 Subnational economic complexity analysis

In this section we use economic complexity analysis to examine the role of services sector industries in shaping the level and growth of per capita income across districts in South Africa. The analysis proceeds as follows. First, we show how district level per capita income levels are positively correlated with economic complexity. Second, we show how services sector industries are, on average, more complex than industries in other sectors, and how the most complex, and richest, districts tend to have well-developed services sectors. Finally, we use network analytics to examine the economic structure of district economies. We relate the economic structure of these district economies to their level of economic complexity, and in so doing, we assess whether services-oriented productive structures present economic growth potential.

6.1 Economic complexity and the services sector

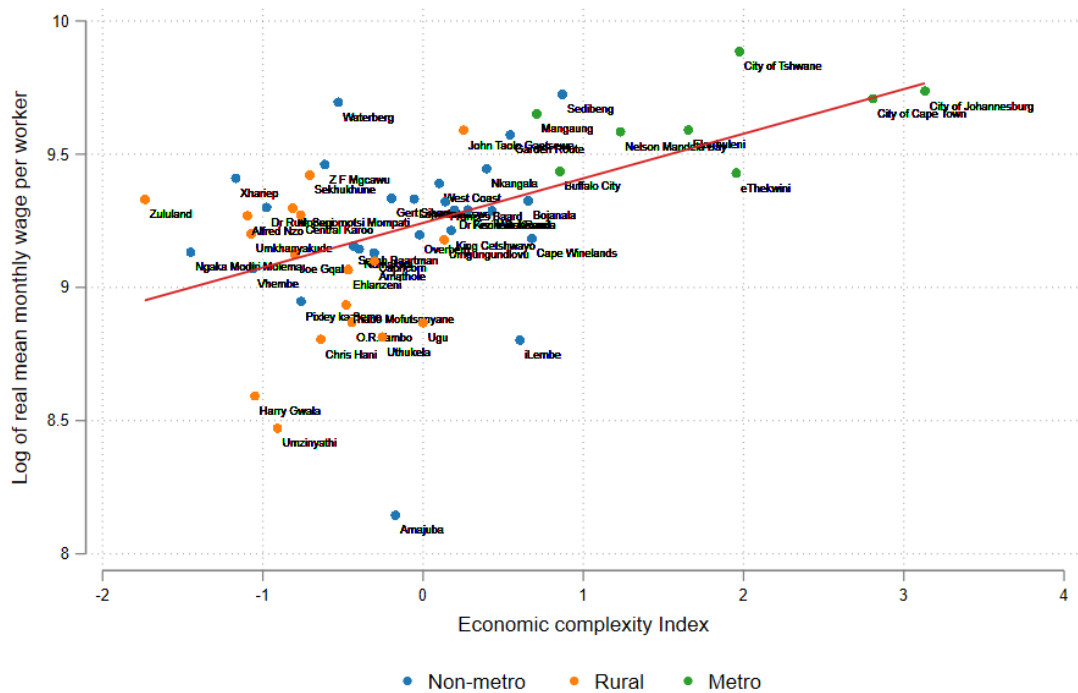
As detailed in Section 3.2, we use the economic complexity methodology developed by Hausmann et al. (2014) to estimate ECIs for district economies in South Africa. Similarly, we estimate ICIs for the industries that comprise these economies. Following Hidalgo and Hausmann (2009), we examine how economic complexity relates to measures of economic performance, such as levels of income per capita and growth in income per capita.

We observe that districts with more complex economic structures have, on average, higher per capita income levels. This is shown in Figure 7, where we plot the ECIs for district economies in South Africa in relation to the natural logarithm of mean real monthly wages per worker.¹² Figure 7 shows a strong statistically significant correlation between district economic complexity levels and district per capita income levels for 2023. This positive correlation is further evident in all years within the period 2014–23.¹³ This finding is consistent with similar findings at the country level (Hausmann et al. 2014; Hidalgo and Hausmann 2009) and the subnational level (Fritz and Manduca 2021; Gao and Zhou 2018; Mealy and Coyle 2019).

¹² Hidalgo and Hausmann (2009) examine the relationship between economic complexity and per capita GDP at the country level. At that level, GDP data is readily available. However, in South Africa, district-level GDP estimates are not available. Following Mealy et al. (2018), we develop a district per capita income measure using data from Stats SA's QLFS. We use these data to estimate real (2023 prices) mean monthly wages for workers in the formal sector. We use formal sector wage levels so as to align with the Spatial Tax Panel data used to construct the complexity indices—the administrative tax data used to develop the Spatial Tax Panel data by definition captures the formal sector of the economy.

¹³ This is depicted in appendix Figure AA 1.

Figure 7: Economic complexity index and mean real wage per worker by district, 2023



Note: earnings estimates revised based on imputation method applied by Kohler and Bhorat (2023); regression line is statistically significant ($\beta = 0.167$ and $t - stat = 84.3$)

Source: authors’ illustration based on Nell and Visagie (2024) and Stats SA (2014–23: QLFS datasets).

Metros have the most complex economic structures, while rural districts tend to have the least complex economic structures. The markers in Figure 7 are shaded so as to distinguish between metropolitan (green), rural (orange), and non-metro (blue). We observe that the green metro markers are clustered in the high ECI/high per capita income north-east quadrant of the figure. In Table 4 we list the top ten districts ranked according to ECI. All eight metros are listed in the top ten most complex district economies. Notably, Gauteng province is South Africa’s economic hub, with its three metro districts—City of Johannesburg (ranked 1), City of Tshwane (ranked 3) and Ekurhuleni (ranked 5)—as well as the Sedibeng district (ranked 7), being ranked in the top ten. The orange rural district markers are clustered in the low ECI/low income per capita south-west quadrant. We also list the ten least complex district economies in Table 4, and here we observe that six of these districts are classified as rural districts.¹⁴ These are districts characterized by little or inadequate infrastructure, poor means of communication, poor access to services, poor living conditions, and high levels of unemployment (Stats SA 2016e).

¹⁴ Statistics South Africa (2016e) identifies rural nodes within South Africa, and we use this mapping to identify rural districts.

Table 4: Top ten and bottom ten district municipalities by economic complexity ranking

District municipality	Province	Type	ECI	Diversity	ECOI	Share of employment
Top ten districts						
City of Johannesburg	GT	Metro	3.13	114	-1.13	0.192
City of Cape Town	WC	Metro	2.80	103	0.32	0.137
City of Tshwane	GT	Metro	1.97	84	1.91	0.102
eThekweni	KZN	Metro	1.95	84	1.81	0.087
Ekurhuleni	GT	Metro	1.65	113	1.86	0.078
Nelson Mandela Bay	EC	Metro	1.23	90	1.90	0.020
Sedibeng	GT	Non-metro	0.87	88	2.04	0.015
Buffalo City	EC	Metro	0.85	50	0.77	0.015
Mangaung	FS	Metro	0.71	61	1.36	0.015
Cape Winelands	WC	Non-metro	0.68	49	0.83	0.026
Bottom ten districts						
Mopani	LIM	Rural	-0.81	31	-0.62	0.010
Umzinyathi	KZN	Rural	-0.91	25	-0.90	0.004
Dr Ruth Segomotsi Mompati	NW	Non-metro	-0.98	25	-0.89	0.003
Harry Gwala	KZN	Rural	-1.05	22	-1.10	0.004
Vhembe	LIM	Non-metro	-1.06	27	-0.85	0.007
Umkhanyakude	KZN	Rural	-1.07	24	-0.92	0.002
Alfred Nzo	EC	Rural	-1.10	11	-1.39	0.003
Xhariep	FS	Non-metro	-1.17	19	-1.26	0.001
Ngaka Modiri Molema	NW	Non-metro	-1.45	13	-1.44	0.009
Zululand	KZN	Rural	-1.74	14	-1.43	0.007

Note: EC = Eastern Cape, FS = Free State, GT = Gauteng, KZN = KwaZulu Natal, LIM = Limpopo, NW = North West, WC = Western Cape; ECOI = economic complexity outlook index; ranking of all districts provided in appendix Table A 1.

Source: authors' construction based on Nell and Visagie (2024).

Economic complexity measures the productive capabilities or know-how present within a society as expressed in the products and services that it produces and provides. The diversity of an economy's economic structure provides a view into the complexity of the economy. Economies that are capable of sustaining a broad base of productive know-how—including sophisticated and specialized forms—tend to exhibit a greater capacity to produce and deliver a wide array of increasingly complex goods and services. We observe this pattern in Table 4, where the diversity measure shows that the most complex districts are able to produce in a diverse range of industries while the least complex districts are able to produce in relatively few industries.

The relevance of economic complexity to how economic structures shape the levels and patterns of economic development is evident in how it is correlated with district economic performance. We show the link between district economic performance and district economic complexity using regression analysis. In Table 5 we report regression estimates. First, we estimate the relationship between economic complexity and the level of income per capita across districts for a pooled cross-section of years from 2014 to 2023. We estimate the following equation using ordinary least squares:

$$\ln Y_{jt} = \beta_0 + \beta_1 ECI_{jt} + \varepsilon_{jt} \quad (8)$$

where $\ln Y_{jt}$ is the natural logarithm of the mean real wage per worker in district j in time period t and ECI_{jt} is the economic complexity index for district j in time period t . Second, we estimate the

relationship between economic complexity and growth in income per capita across districts for the period 2014–23. Here, we estimate the following equation:

$$\Delta \ln Y_j = \beta_0 + \beta_1 ECI_{jt-1} + \varepsilon_j \quad (9)$$

where $\Delta \ln Y_j$ is the change in the natural logarithm of the mean real wage per worker in district j in time period t between the initial period (2014) and the end period (2023). The coefficient of interest relates to ECI_{jt-1} , which is the economic complexity index for district j in the initial period $t - 1$ (2014). Estimates for Equations 8 and 9 are reported in columns 1 and 2, respectively.

Table 5: Regression analysis showing relationships between ECI, income per capita levels, and income per capita growth

	(1)	(2)
	Log of mean wage per worker	Growth in log of mean wage per worker
	Pooled	2014–23
ECI	0.147*** [0.009]	
Initial-period ECI		0.074** [0.030]
Initial-period log of mean wage per worker		-0.458*** [0.105]
Constant	9.269*** [0.012]	4.218*** [0.984]
Observations	519	51
R-squared	0.229	0.352

Note: robust standard errors in brackets; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: authors' construction based on Nell and Visagie (2024).

Economic complexity is positively related to district economic performance. Consistent with the regression line depicted in Figure 7, the estimates in column 1 show a statistically significant positive relationship between income per capita and economic complexity. Districts with higher levels of economic complexity, and hence with more sophisticated productive capabilities and know-how, tend to be richer. Similarly, the estimates in column 2 show a statistically significant positive relationship between a district's initial level of economic complexity in 2014 and its income per capita growth over the period 2014–23. This suggests that district economies with more productive capabilities and know-how experience, on average, higher levels of per capita income growth. These findings are consistent with the stylized facts that have emerged in the literature regarding the link between economic complexity and income levels and income growth (Hausmann et al. 2014; Hidalgo and Hausmann 2009). This implies that the accumulation of productive capabilities and know-how is key to developing an economic structure that allows an economy to experience income growth, and that in turn shifts the economy towards higher levels of income and economic development.

We now focus on how the sectoral and industrial composition of economic structures relate to economic complexity in terms of distinguishing between economic structures that are more complex and those that are less complex. As discussed in Section 3.2.1, we are able to measure the ICIs of the

industries that comprise the economic structures of the various district economies in South Africa.¹⁵ In Table 6, we report the mean ICI for the industries (measured at the three-digit level of the SIC) that fall within various sectoral groupings (measured at the one-digit level of the SIC).

Table 6: Summary statistics of ICIs by sector, 2023

	Mean	Std dev.	Min.	Max.
Agriculture	-1.400	0.339	-1.752	-0.381
Mining	-0.681	0.882	-1.417	0.961
Manufacturing	0.065	0.808	-1.817	2.582
Utilities	-0.408	0.259	-0.744	-0.024
Construction	-0.560	0.332	-0.983	0.107
Modern services	0.699	0.954	-1.165	2.786
Communication	1.393	1.013	-0.481	2.786
Financial services	0.924	0.729	-0.094	2.167
Business services	0.343	0.817	-1.165	2.582
Traditional services	-0.193	0.946	-1.629	2.034
Wholesale and retail trade	-0.286	0.942	-1.517	1.853
Transport and storage	0.506	0.912	-0.658	2.034
Community, social, and personal services	0.498	0.835	-1.165	2.582

Source: authors' construction based on Nell and Visagie (2024).

Industries within the agriculture and mining sectors are, on average, low-complexity industries, and as a result, economies concentrated in such industries are likely to be characterized by lower ECIs. In Table 6 we observe that the mean ICIs for the agriculture and mining industries are -1.4 and -0.681, respectively. This is further evident in Figure 8, where we present the kernel density function showing the distribution of ICIs within sectoral aggregates. The density functions for the agriculture (blue series) and mining (orange series) sectors show that industries within these sector aggregates are oriented towards lower ICI levels. However, we observe that there are some relatively complex industries within the mining sector, as evidenced by a relatively high standard deviation for ICIs in this sector and as depicted by the spread of the mining sector density function.¹⁶ In Table 7 we present the 20 industries with the lowest ICI levels, and we further observe that four of these industries fall within the mining sector, including mining of hard coal, mining of non-ferrous metals, and mining of iron ore. A further seven of these industries fall within the agriculture sector, including support services to forestry, logging, growing of perennial crops, and silviculture and other forestry activities.

Industries within the manufacturing sector are, on average, complex, but they exhibit a degree of variation, with some manufacturing industries having very high ICI levels and others having very low ICI levels. As shown in Table 6, the mean ICI for industries in the manufacturing sector is 0.065 and thus just above average.¹⁷ This is consistent with the bulk share of the density function for manufacturing (green series) being centred over 0 (see Figure 8). Looking at Table 8, we further

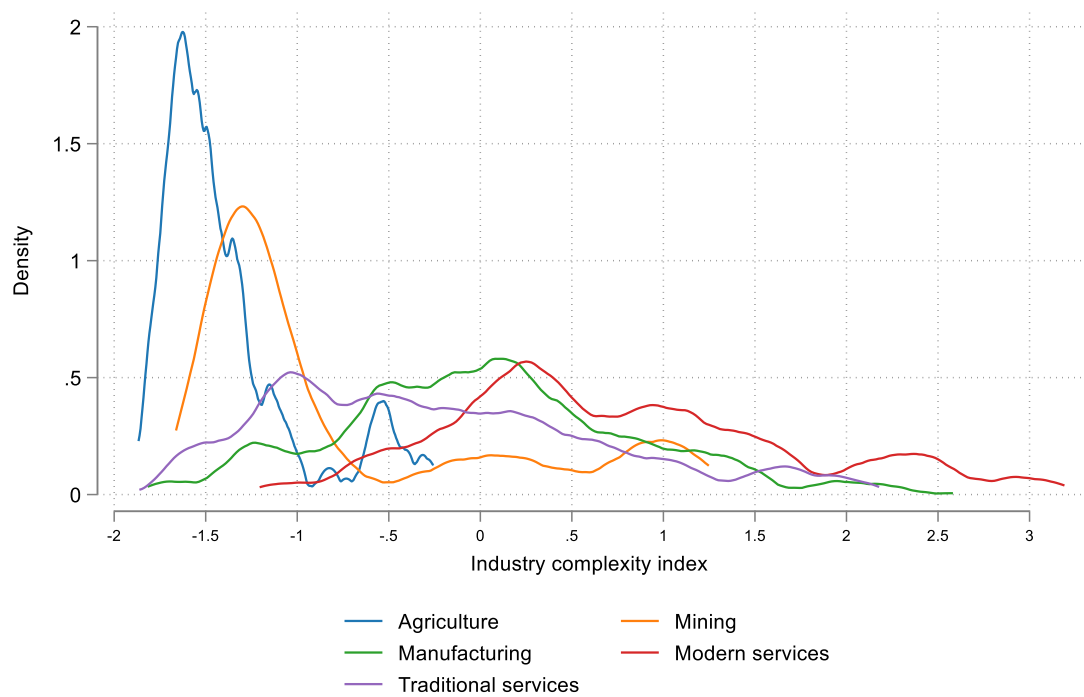
¹⁵ It is important to note that a district's ECI is equal to the mean of the ICIs for the industries that are relatively important in the district. An industry is determined as relatively important in a district if its LQ is greater than or equal to unity (see Section 3.2.1).

¹⁶ These mining industries with relatively high ICIs are mining of lignite, extraction of crude petroleum, and extraction of natural gas.

¹⁷ The ICI measure is normalized to have a mean of 0 and a standard deviation of 1. This implies that positive ICIs are above average and negative ICIs are below average.

observe that the manufacturing sector comprises very complex industries, with five of the top 20 most complex industries being manufacturing sector industries, including reproduction of recorded media, manufacture of computers and peripheral equipment, and manufacture of consumer electronics. However, and consistent with the spread of manufacturing density function in Figure 8, we also note that the manufacturing sector includes a few low-complexity industries (see Table 7), such as manufacture of prepared animal feeds, processing and preserving of meat, and sawmilling and planing of wood. These low-complexity manufacturing industries are clustered in activities linked to agriculture.

Figure 8: Distribution of ICIs by sector



Source: authors' illustration based on Nell and Visagie (2024).

Modern services industries are characterized by high levels of complexity. The most complex industries fall within the communications sector, where the average ICI (1.393) is the highest of all sectors listed in Table 6. The next most complex sector is financial services, where the average ICI is 0.924. Industries within the business services sector also exhibit above average ICI levels. Together these three sectors represent modern service industries, which are, on average, the most complex. The high relative complexity levels in these modern services industries is evident in Figure 8, where the density function for modern services (red series) is skewed to the right. We also observe that within the top 20 most complex industries (see Table 8) 11 industries are modern services industries—

including television programming and broadcasting activities; satellite telecommunications activities; computer programming, consultancy, and related activities; insurance; and advertising.¹⁸

Table 7: Bottom 20 industries ranked by ICI, 2023

SIC three-digit industry name	Sector	ICI	ICI rank	Ubiquity	Employment share
Mining of hard coal	Mining	-1.362	213	8	0.387
Mining and quarrying n.e.c.	Mining	-1.380	214	16	0.431
Manufacture of prepared animal feeds	Manufacturing	-1.386	215	21	0.086
Mining of non-ferrous metal ores	Mining	-1.387	216	11	2.545
Mining of iron ores	Mining	-1.417	217	4	0.156
Retail of automotive fuel in specialized stores	Wholesale and retail trade	-1.467	218	33	0.684
Provision of services to the community as a whole	Community, social, and personal services	-1.471	219	23	2.678
Support services to forestry	Agriculture	-1.478	220	11	0.032
Processing and preserving of meat	Manufacturing	-1.482	221	22	0.490
Short-term accommodation activities	Wholesale and retail trade	-1.517	222	24	0.780
Hunting, trapping, and related service activities	Agriculture	-1.548	223	17	0.025
Educational support activities	Community, social, and personal services	-1.550	224	8	1.018
Mixed farming	Agriculture	-1.600	225	34	1.308
Administration of the state and the economic and social policy of the community	Community, social, and personal services	-1.610	226	34	16.182
Logging	Agriculture	-1.622	227	14	0.061
Compulsory social security activities	Community, social, and personal services	-1.629	228	25	0.149
Growing of perennial crops	Agriculture	-1.631	229	16	2.069
Support activities to agriculture and post-harvest crop activities	Agriculture	-1.697	230	25	0.468
Silviculture and other forestry activities	Agriculture	-1.752	231	13	0.217
Sawmilling and planing of wood	Manufacturing	-1.817	232	15	0.137

Note: n.e.c = not elsewhere classified.

Source: authors' construction based on Nell and Visagie (2024).

Traditional services industries represent less-complex services sector activities. The mean ICI for these industries is -0.193 and thus below average. This is further evident in Figure 8, where the density function for traditional services (purple series) is positioned to the left of the density function for

¹⁸ Finding modern services industries within the most complex grouping of industries is consistent with findings in similar such studies. In the case of the US, Fritz and Manduca (2021) find financial services industries within the top ten most complex industries in the US—e.g., securities and commodity exchanges; monetary authorities—Central Bank; depository credit intermediation; and reinsurance carriers. In the case of the UK, Mealy and Coyle (2022) find modern services industries within the most complex industries—e.g., reinsurance; fund management activities; television programming and broadcasting activities; advertising; market research and public opinion polling; management consultancy activities; and computer programming, consultancy, and related activities.

modern services (red series), and to a lesser degree manufacturing (green series). However, there is a degree of variation across industries that constitute traditional services activities. Industries in the wholesale and retail trade sector are characterized by lower average ICIs (-0.286), with two of these industries being within the 20 least complex industries: retail of automotive fuel in specialized stores, and short-term accommodation activities. Average ICIs are higher for industries in the transport and storage (0.506) and CSP (0.498) sectors. Nevertheless, as evident in Figure 8, there is a fair degree of variation in ICI across these sectors. For example, we observe industries within the CSP services sector being in the bottom 20 industries, while industries within the transport services sector are in the top 20.

Table 8: Top 20 industries ranked according to ICI, 2023

SIC three-digit industry name	Sector	ICI	ICI rank	Ubiquity	Employment share
Television programming and broadcasting activities	Information and communication	2.786	2	1	0.09
Satellite telecommunications activities	Information and communication	2.786	2	1	0.06
Reproduction of recorded media	Manufacturing	2.582	4	2	0.004
Advertising	Business services	2.582	4	2	0.28
Computer programming, consultancy, and related activities	Information and communication	2.167	7	3	1.09
Insurance	Finance services	2.167	7	3	1.20
Other telecommunications activities	Information and communication	2.167	7	3	0.48
Manufacture of computers and peripheral equipment	Manufacturing	2.167	7	3	0.01
Activities of call centres	Business services	2.158	10	3	0.44
Other financial service activities, except insurance and pension funding activities	Finance services	2.158	10	3	1.73
Passenger air transport	Transport services	2.034	11	3	0.10
Sound recording and music publishing activities	Information and communication	1.856	12	3	0.01
Retail sale of cultural and recreation goods in specialized stores	Wholesale and retail trade	1.853	14	4	0.15
Printing and service activities related to printing	Manufacturing	1.853	14	4	0.36
Transport via railways	Transport services	1.811	15	3	0.55
Event catering and other food service activities	Wholesale and retail trade	1.749	16	5	0.83
Wired telecommunications activities	Information and communication	1.720	17	4	0.07
Manufacture of musical instruments	Manufacturing	1.657	18	2	0.003
Market research and public opinion polling	Finance services	1.638	19	3	0.10
Manufacture of consumer electronics	Manufacturing	1.569	20	3	0.01

Source: authors' construction based on Nell and Visagie (2024).

The relative magnitude of the ICIs suggests that the most complex district economies are those with economic structures that are oriented towards modern services activities. This has economic development implications at the district level, as we have shown that higher levels of economic complexity are associated with higher and growing per capita income levels. In the next section,

through the use of the industry space network, we examine the economic structure of the high-ECI metros, detail the industry composition of these districts, and relate this to ECI levels across districts.

Of course, it is simplistic to state that an economic structure characterized by the presence of modern services activities should be the sole desired industrial policy objective. First, we know that there are complex economic activities present in other sectors, such as manufacturing and transport services, and the dynamic growth-oriented industries within these sectors should not be ignored. Second, economic structures represent networks of economic activity that are linked, and in order for various complex industries to exist, the existence of less complex industries is necessary. The industry space analysis in the next section provides insights into the network structure of these district economies.

6.2 Industrial relatedness and the industry space

In this section, using industrial relatedness metrics, we present the industry space for South Africa. We start by presenting the aggregate industry space, which represents the industrial structure of the South African economy and provides insight into how the various industries that comprise the economy are related and clustered. We then examine how industry complexity levels vary across the industry space, and thus get a sense of how complex economic activities are clustered and related to one another. Finally, we generate industry space visualizations for metro municipalities, which allows us to gain insight into how different economic structures relate to regional economic complexity and, in turn, how this relates to economic development outcomes.

6.2.1 The South African industry space

The South African industry space is presented in Figure 9. Each circular node represents one of the 232 SIC three-digit industries present in the South African economy. The size of each node is proportional to a given industry's share of total employment in South Africa. For example, the large yellow node to the right of the space refers to administration of the state and the economic and social policy of the community (SIC841), which accounts for 16.2 per cent of total employment.¹⁹ As per the legend, the nodes are shaded according to one-digit SIC divisions. This allows for the identification of clusters of similar industries. Each node is connected by an edge. The edge between nodes signifies that the connected industries are related, which implies that there is a strong overlap in requisite productive capabilities and know-how between the industries.

The industry space exhibits a bimodal structure which correlates closely with industry complexity levels. First, to the left of the space we observe a highly connected clustering of complex economic activities in both the services and the manufacturing sectors. Figure 10 shows the industry space with the industry nodes shaded according to industry complexity—more complex industries shaded towards magenta and less complex industries shaded towards cyan. The left of the space has a highly connected clustering of high-complexity industries. Referring to Figure 9, these industries include high-

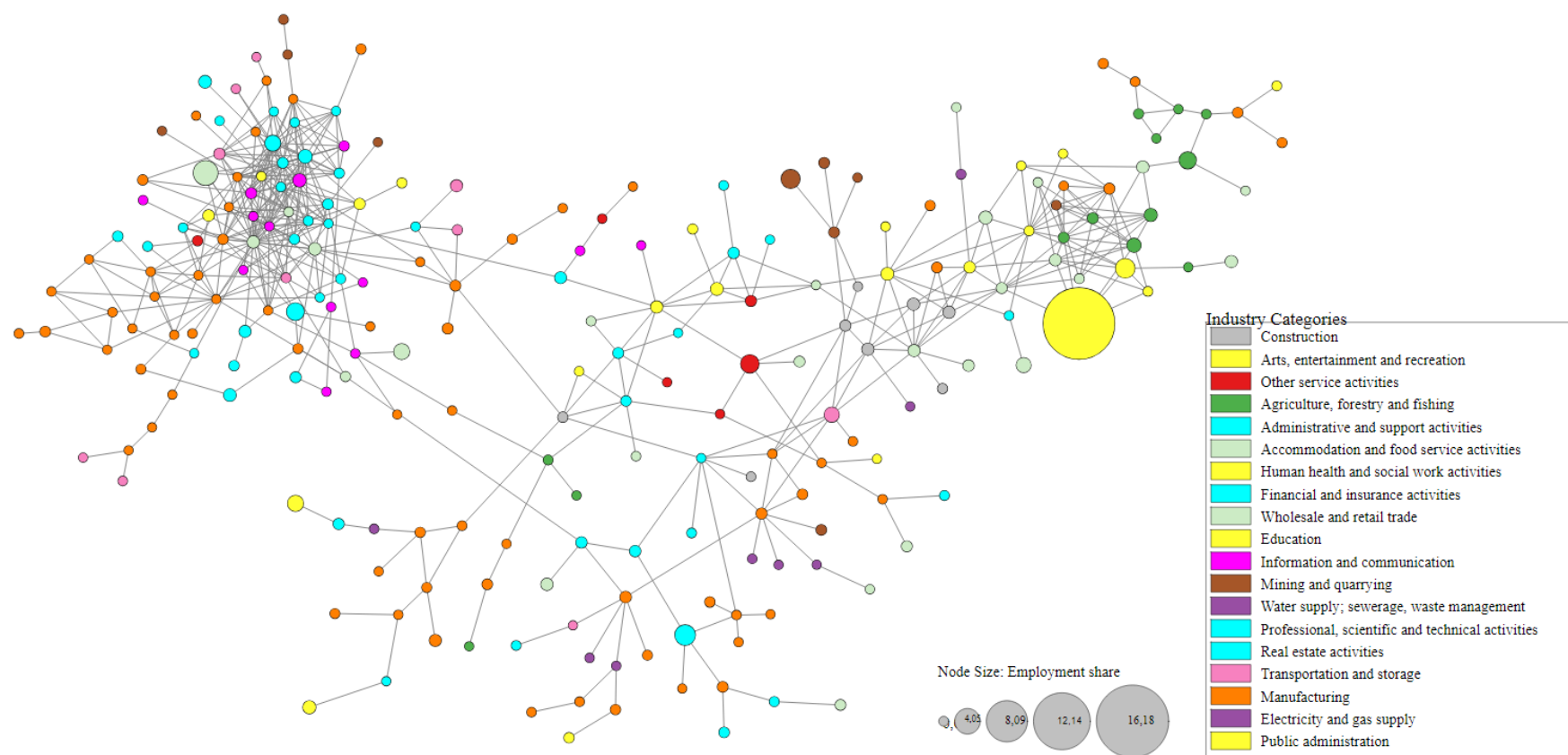
¹⁹ It is worth noting that the SIC classification does not provide a great deal of disaggregation of public administration activities. At the three-digit level, there are three categories: administration of the state and the economic and social policy of the community; provision of services to the community as a whole; and compulsory social security activities. The first of these accounts for employment linked to national, provincial, and local governance. This may explain why the public sector node accounts for such a large share of employment. Further, there is evidence of a growing public sector in South Africa (Bhorat, Naidoo, et al. 2016).

complexity modern services industries in the financial and business services subsectors (turquoise nodes)—for example, insurance; reinsurance; pension funding; monetary intermediation; management consultancy activities; advertising; and activities of call centres—and the information and communication subsector (magenta nodes)—for example, software publishing; television programming and broadcasting activities; wired telecommunications activities; and computer programming, consultancy, and related activities; data processing, hosting, and related activities. We also observe several transport subsector industries fitting within this cluster (light pink nodes)—for example, courier activities; sea and coastal water transport; and transport via railways. There are also several high-complexity manufacturing sector industries located within the core of this cluster of high-complexity industries (orange nodes), including manufacture of consumer electronics; manufacture of communication equipment; manufacture of computers and peripheral equipment; reproduction of recorded media; and manufacture of medical and dental instruments. Further, there is a clustering of relatively complex manufacturing industries linked to this larger cluster—including manufacture of motor vehicles; manufacture of general-purpose machinery; manufacture of batteries and accumulators; manufacture of magnetic and optical media; manufacture of electric components and boards; and manufacture of basic iron and steel.

Second, to the far right of the industry space is a cluster of relatively less connected low-complexity industries, which primarily fall within the agriculture (dark green nodes), wholesale and retail trade (light green nodes), CSP services (yellow nodes), and manufacturing sectors (orange nodes). Figure 10 shows that the low-complexity industries are clustered in this part of the industry space. This cluster of industries comprises industries associated with agricultural value chains. It includes groupings of primary agricultural activities (e.g., mixed farming; animal production; plant propagation; growing of perennial crops; growing of non-perennial crops; logging) and associated downstream manufacturing activities (e.g., manufacture of prepared animal feeds; manufacture of dairy products; processing and preserving of meat; processing and preserving of fruit and vegetables), and wholesale and retail trade activities (e.g., retail sale of food, beverages, and tobacco in specialised stores; wholesale of agricultural raw materials and live animals). There is a clustering of low-complexity catering and accommodation sector industries, which are likely linked to tourism, including short-term accommodation activities; and camping grounds, recreational vehicle parks, and trailer parks. Finally, the three public sector industries fall within this cluster of low-complexity industries.

The middle part of the industry space is relatively sparse and disconnected and comprises a range of sectors. We observe mini-clusters of industries in the construction, manufacturing, and mining sectors, although the levels of connectedness between these industries is relatively low. To the south we see a number of low- to moderate-complexity manufacturing industries (orange nodes in Figure 9, cyan nodes in Figure 10), including labour-intensive manufacturing in the textiles (e.g., spinning, weaving, and finishing of textiles), clothing (e.g., manufacture of knitted and crocheted apparel), agri-processing (e.g., manufacture of beverages; manufacture of vegetables and animal oils and fats), and furniture industries. To the north-east of the middle part of the space there is a low-complexity construction sector cluster (light grey nodes in Figure 9, cyan nodes in Figure 10) and a low-complexity mining sector cluster (brown nodes in Figure 9, cyan nodes in Figure 10).

Figure 9: South Africa's industry space with industry categories



Note: nodes represent three-digit SIC industry categories; industry nodes shaded according to one-digit SIC sectors; size of nodes proportional to industry's share of employment in the national economy in 2023.

Source: authors' illustration based on Nell and Visagie (2024).

Figure 10: South Africa's industry space with nodes shaded, by ICI



Note: nodes represent three-digit SIC industry categories; industry nodes shaded according to ICIs; size of nodes proportional to industry's share of employment in the national economy in 2023.

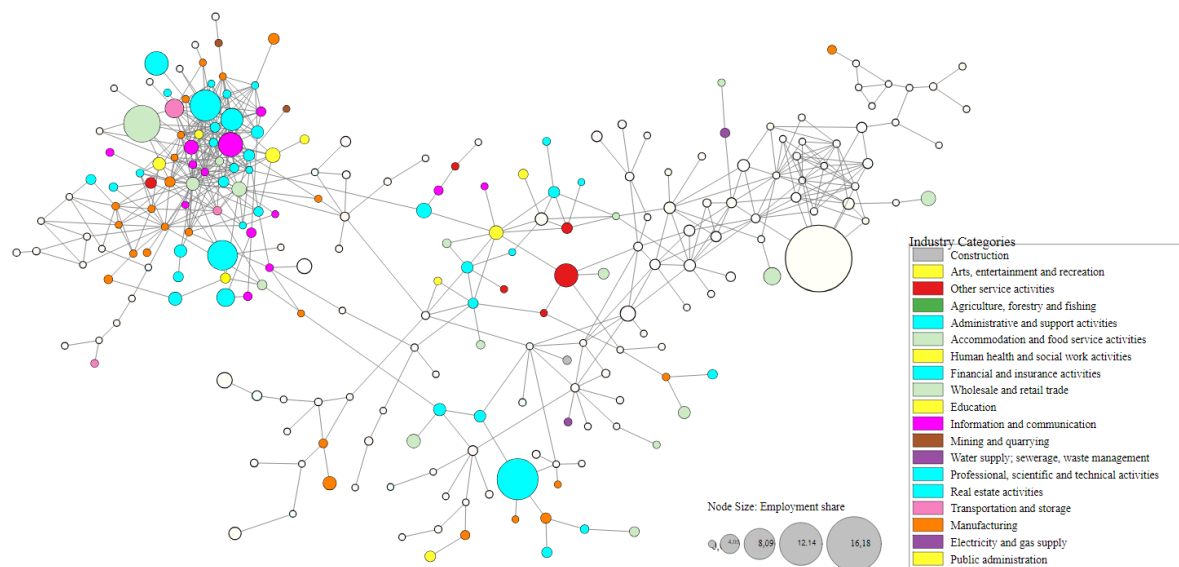
Source: authors' illustration based on Nell and Visagie (2024).

6.2.2 Regional economic structures

We now use the industry space to examine the economic structures of key metropolitan municipalities, to get a sense of how services sector industries are positioned within the regional economic structures and how this relates to the economic complexity of these economies. In this section we use the industry space to depict two key structural differentials: first, between high-complexity metropolitan municipalities and low-complexity rural municipalities, and second, between a group of the most complex metros and a group of the next most complex metros.

The economic structures of complex metro district economies are oriented towards high-complexity industries in the modern services sector and high-complexity industries in the manufacturing sector. This is particularly evident when looking at the industry spaces for City of Johannesburg (Figure 11), City of Cape Town (Figure 12), City of Tshwane (Figure 13), eThekweni (Figure 14), and Ekurhuleni (Figure 15), in which we find that many of the occupied industry nodes are located in the complex right-hand cluster of the bimodal industry space. In the case of City of Johannesburg, City of Cape Town, City of Tshwane, and eThekweni, a number of financial and business services industry nodes (turquoise), information and communication industry nodes (magenta), and manufacturing industry nodes (orange) are occupied in the high-industry complexity cluster to the left of the industry space. We also observe that as one moves down the complexity rankings for the metros—see Table 4—the diversity, or number of occupied nodes, of industries within this complex cluster of industries declines. Put differently, the most complex economies are well positioned within the industry space.

Figure 11: Industry space for City of Johannesburg, 2023



Note: nodes represent three-digit SIC industry categories; industry nodes shaded according to one-digit SIC sectors; size of nodes proportional to industry's share of employment in the district economy in 2023.

Source: authors' illustration based on Nell and Visagie (2024).

In contrast, the economic structures of less complex rural district economies are oriented towards low-complexity industries in the agricultural, mining, manufacturing, and traditional services sectors. Rural district economies are characterized by low levels of economic complexity (see Figure 7) and tend to exhibit similar economic structures oriented around primary economic activities in mining and agriculture, and a relatively large public sector. By way of example, the industry space for the Umkhanyakude and Mopani districts are depicted in Figure 17 and Figure 18, respectively.²⁰ In both instances, the industrial structure of these economies is located towards the low-complexity right-hand cluster of the industry space. In the case of Umkhanyakude district (fifth least complex district) we see occupied nodes in the agriculture sector (green)—particularly in forestry activities²¹—and a large public sector (yellow). As is the case with many of the low-complexity district economies, the public sector is a major employer.²² For Umkhanyakude, the large yellow industry node, for

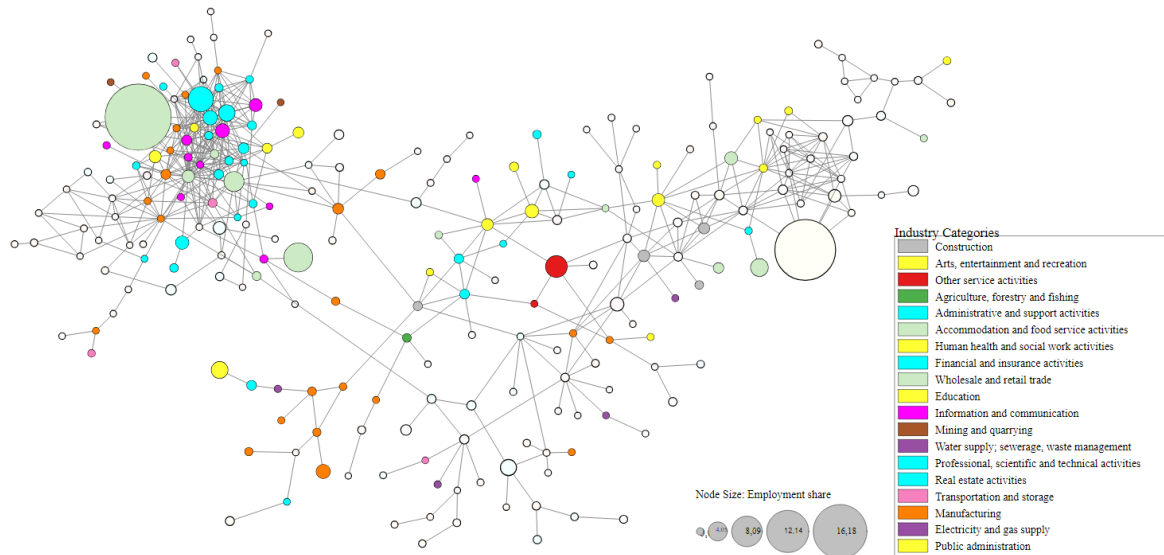
²⁰ For the purposes of brevity we do not present the industry space for every district. Rather, in this instance, we present these two examples which provide representations of the typical low-complexity rural district economy. Similar economic structures are evident across other low-complexity economies.

²¹ These industries include silviculture and other forestry activities; growing of perennial crops; growing of non-perennial crops; support services to agriculture and post-harvest crop activities; logging; and support services to forestry.

²² These public sector industries include provision of services to the community as a whole; compulsory social security activities; and administration of the state and the economic and social policy of the community.

administration of the state and the economic and social policy of the community, accounts for just over half of all employment in the district.

Figure 12: Industry space for City of Cape Town, 2023



Note: nodes represent three-digit SIC industry categories; industry nodes shaded according to one-digit SIC sectors; size of nodes proportional to industry's share of employment in the district economy in 2023.

Source: authors' illustration based on Nell and Visagie (2024).

A similar industry pattern is evident in Mopani district (tenth least complex district), where we see occupied nodes in primary sector activities in agriculture (green)²³ and mining (brown),²⁴ and low-complexity agri-processing activities in manufacturing (orange).²⁵ The large public sector node, for administration of the state and the economic and social policy of the community, again speaks to the public sector being a large employer in this rural district.²⁶ While the public sector is the main traditional services sector in these low-complexity districts, the other traditional services sector present is the wholesale and retail trade sector. Industries within this sector often relate to retail

²³ These agricultural industries include growing of perennial crops (large green node); mixed farming; animal production; logging; and plan propagation.

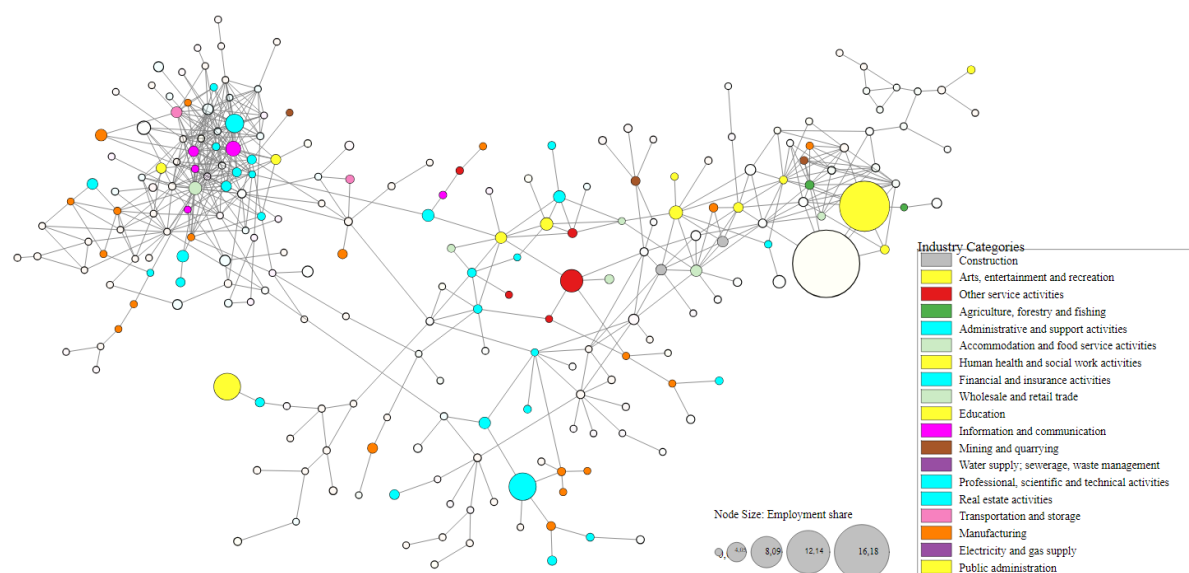
²⁴ These mining industries include quarrying of stone, sand, and clay; and mining of non-ferrous metal ores.

²⁵ These manufacturing industries include sawmilling and planning of wood; processing and preserving of fruit and vegetables; and manufacture of products of wood, cork, straw, and plaiting materials.

²⁶ The revealed comparative advantage (RCA) index, which takes the quotient of the industry's share of employment in a district against the industry's share of employment nationally, determines whether a node is shaded or not. The threshold for shading is an RCA index of greater than or equal to 1. In this instance, the industry accounts for 15.02% of employment in Mopani and 16.18% of employment nationally (RCA = 0.93).

activities,²⁷ and accommodation activities in instances where there is a presence of the tourism industry.²⁸

Figure 13: Industry space for City of Tshwane, 2023



Note: nodes represent three-digit SIC industry categories; industry nodes shaded according to one-digit SIC sectors; size of nodes proportional to industry's share of employment in the district economy in 2023.

Source: authors' illustration based on Nell and Visagie (2024).

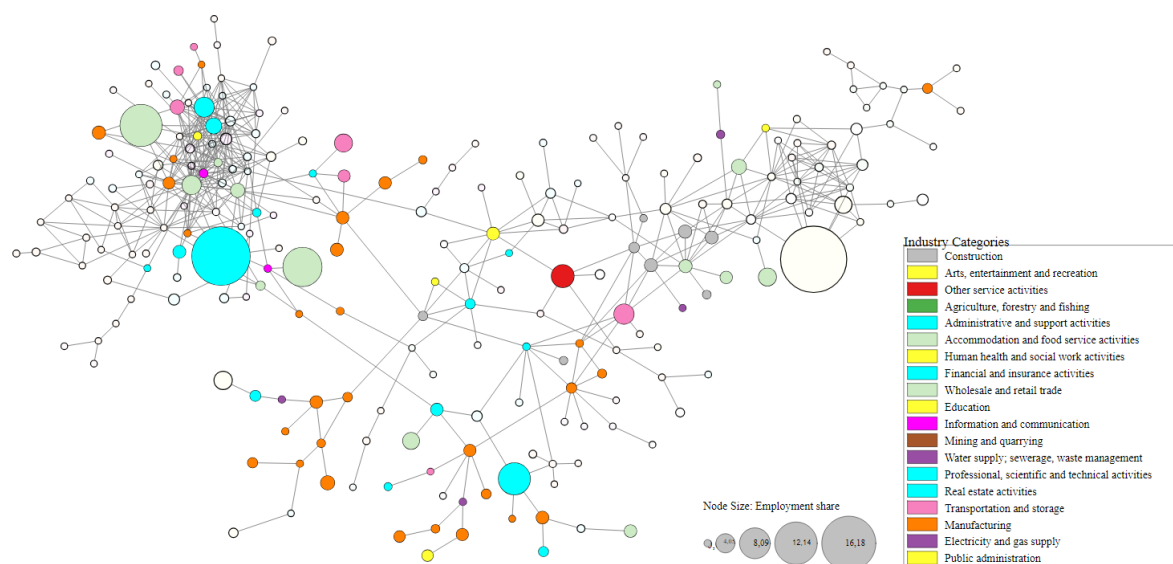
Within the grouping of metros, the most complex economic structures comprise complex industries in the modern services sector, and the most complex manufacturing industries. This pattern is most clearly evident in the four most complex districts: City of Johannesburg (Figure 11), City of Cape Town (Figure 12), City of Tshwane (Figure 13), and eThekweni (Figure 14). In each of these metros there is a strong orientation towards the complex cluster of industries to the left of the industry space, where there is a diversity of finance and business services industries (turquoise nodes), information and communications industries (magenta nodes), and manufacturing industries (orange nodes). City of Johannesburg—the most complex district economy—provides a good example of this complex economic structure. There is a strong presence of financial and business services industries (large turquoise nodes representing e.g. temporary employment agency activities; insurance; other financial service activities except insurance and pension funding; and monetary intermediation) information and communication industries (magenta nodes representing e.g. computer programming, consultancy, and related activities; satellite telecommunications activities; television programming, and broadcasting activities; data processing, hosting, and related activities; web portals; wired

²⁷ In Mopani these industries include retail of automotive fuel in specialized stores; and retail sale of other household equipment in specialized store.

²⁸ In Mopani these industries include short-term accommodation activities; and other accommodation.

telecommunications activities; and software publishing), and complex manufacturing industries (e.g., manufacture of communication equipment; manufacture of computers and peripheral equipment; manufacture of consumer electronics; manufacture of irradiation, electromedical, and electrotherapeutic equipment; manufacture of pharmaceuticals, medicinal chemical, and botanical products; and reproduction of recorded media.

Figure 14: Industry space for eThekweni, 2023



Note: nodes represent three-digit SIC industry categories; industry nodes shaded according to one-digit SIC sectors; size of nodes proportional to industry's share of employment in the district economy in 2023.

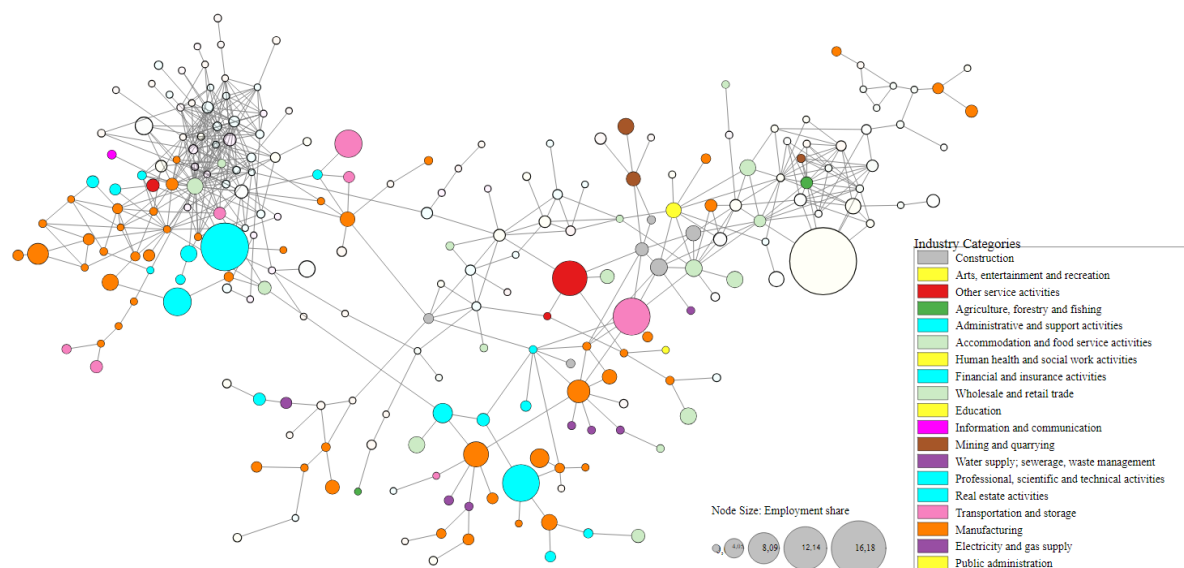
Source: authors' illustration based on Nell and Visagie (2024).

The next most complex grouping of metros exhibit economic structures that lean more towards industries in the manufacturing sector. We observe this pattern when we look the eThekweni (Figure 14), Ekurhuleni (Figure 15), and Nelson Mandela Bay (Figure 16) metros.²⁹ The orientation of the metros shifts increasingly towards manufacturing industries both in the complex cluster of industries to the left of the industry space and in manufacturing industries in the middle of the space. Ekurhuleni

²⁹ This pattern is not apparent in the two least complex metros, Buffalo City (see appendix Figure A 2) and Mangaung (see appendix Figure A 3).

in particular is the industrial hub for the South African economy, comprising a number of industries in metal and machinery industry.³⁰ Nelson Mandela Bay is a hub for the automotive industry.³¹

Figure 15: Industry space for Ekurhuleni, 2023



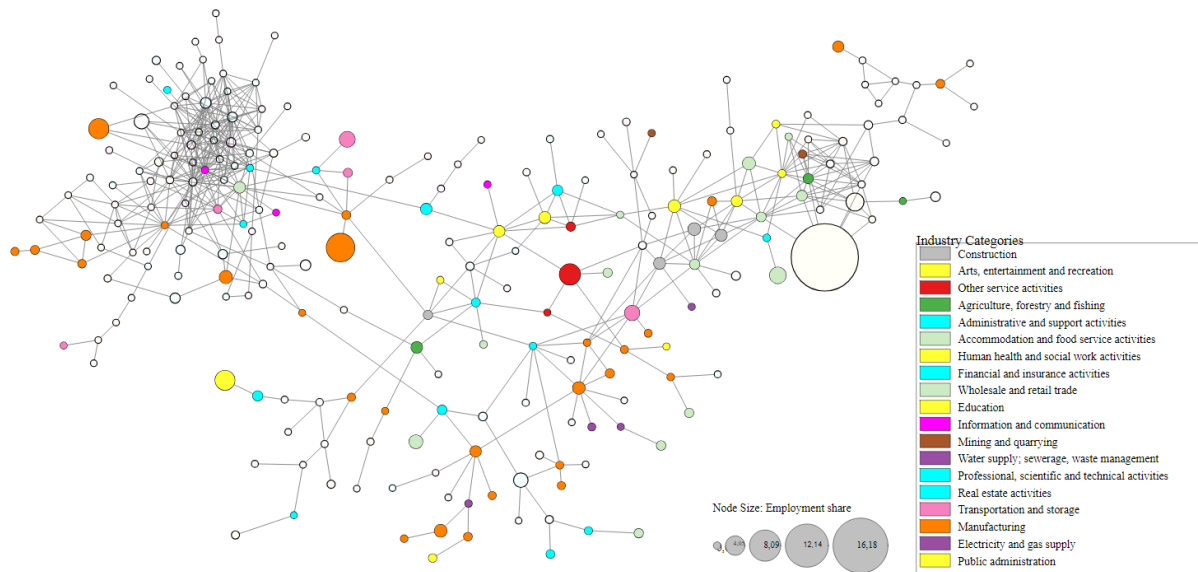
Note: nodes represent three-digit SIC industry categories; industry nodes shaded according to one-digit SIC sectors; size of nodes proportional to industry's share of employment in the district economy in 2023.

Source: authors' illustration based on Nell and Visagie (2024).

³⁰ These include manufacture of basic iron and steel; manufacture of general-purpose machinery; manufacture of other fabricated metal products; metalworking service activities; manufacture of special-purpose machinery; and manufacture of structural metal products, tanks, reservoirs, and steam generators.

³¹ The automotive industry includes manufacture of motor vehicles; manufacture of parts and accessories for motor vehicles; manufacture of other fabricated metal products; metalworking service activities; and manufacture of rubber products.

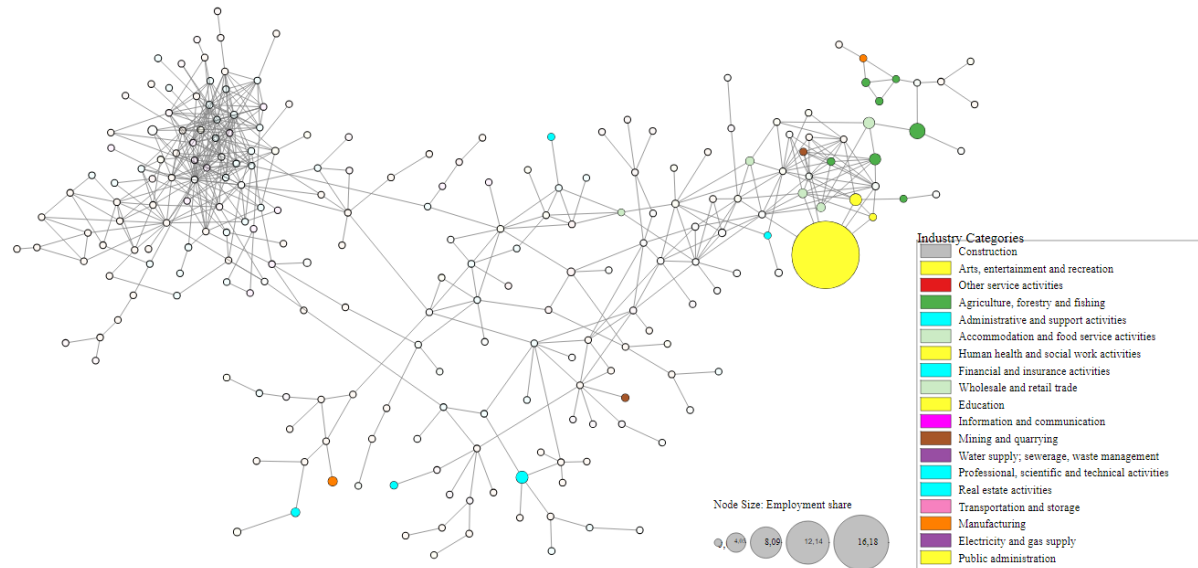
Figure 16: Industry space for Nelson Mandela Bay, 2023



Note: nodes represent three-digit SIC industry categories; industry nodes shaded according to one-digit SIC sectors; size of nodes proportional to industry's share of employment in the district economy in 2023.

Source: authors' illustration based on Nell and Visagie (2024).

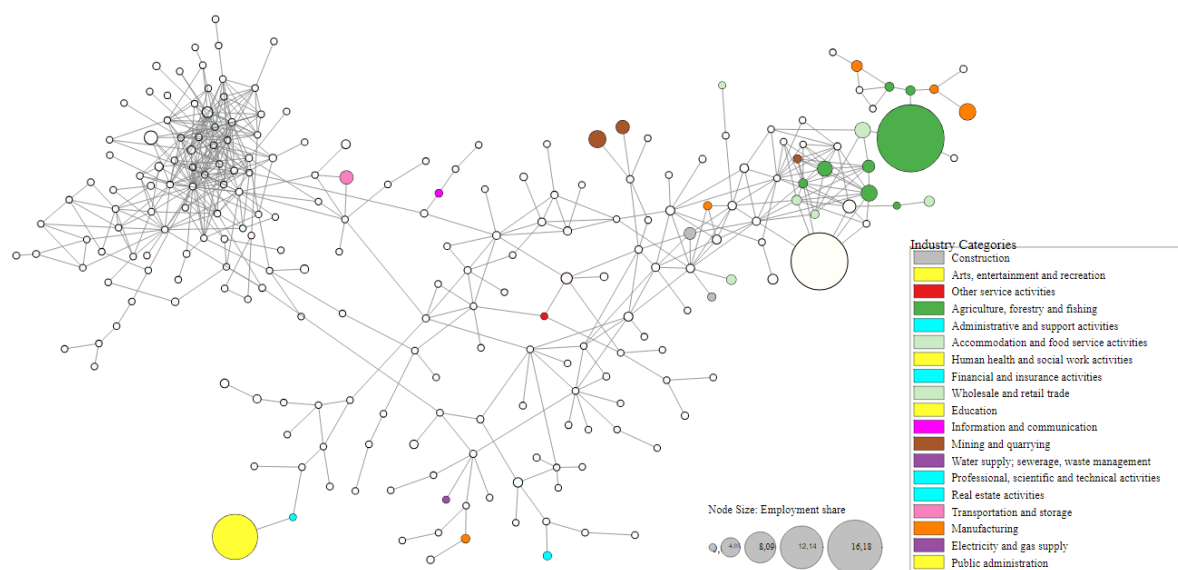
Figure 17: Industry space for a rural district—Umkhanyakude, 2023



Note: nodes represent three-digit SIC industry categories; industry nodes shaded according to one-digit SIC sectors; size of nodes proportional to industry's share of employment in the district economy in 2023.

Source: authors' illustration based on Nell and Visagie (2024).

Figure 18: Industry space for a rural district—Mopani, 2023



Note: nodes represent three-digit SIC industry categories; industry nodes shaded according to one-digit SIC sectors; size of nodes proportional to industry's share of employment in the district economy in 2023.

Source: authors' illustration based on Nell and Visagie (2024).

6.3 Economic complexity analysis: main findings and implications

From the economic complexity analysis emerge several key findings and accompanying implications.

First, at the district level in South Africa, higher levels of economic complexity are associated with higher levels of economic development and growth. More complex economies possess more productive capabilities and know-how, which enables actors within these economies to operate across a diverse and increasingly complex set of industrial activities. This is associated with higher income per capita levels and higher growth rates of income per capita, which in turn corresponds to better welfare outcomes for those within these complex economies. Thus, to promote economic development, district economies should aim to build and accumulate productive capabilities and know-how—i.e., to build economic complexity.

Second, we find that, on average, the most complex industries fall within the modern services sector, and that several of the most complex industries in South Africa are modern services industries. Further, we know that the most complex district economies have industrial structures oriented towards modern services sector activities. Given that these are the most complex industries, and that building economic complexity is key to driving economic development and growth, there is a strong case for driving economic diversification efforts towards financial and business services, and information and communications industries.

Third, the industry space shows that complex modern services industries are clustered and highly connected. This indicates that these related economic activities tend to agglomerate in spatial localities where the critical threshold of productive capabilities and know-how is met. The connectedness, and hence overlap in capabilities, between these related industries suggests that industrial diversification into related *nearby* modern services activities within the cluster is a feasible industrial diversification pathway once a regional economy has a foothold in the cluster of industries.³²

Fourth, we find that the various district economies have economic structures that occupy different parts of the industry space. We observe that complex metros typically occupy the high-complexity cluster to the left of the industry space, while rural districts tend to occupy the low-complexity cluster to the right of the industry space. Given that economies tend to diversify towards economic activities that are related to their economic structure, industrial policy needs to be tailored along the regional dimension, and district economies should target industries that are *nearby* to their current economic structure. Put simply, not every district economy can feasibly shift to high-complexity modern services industries.

Fifth, a number of industries within the manufacturing sector are among the most complex industrial activities and are located within the highly connected and complex cluster of industries to the left of the industry space. These manufacturing industries are present within the most complex district economies and are connected, and hence related, to a number of modern services activities. This connectedness between complex manufacturing industries and complex modern services industries seems to suggest, at least tentatively, that these activities agglomerate within complex economies.³³ The linkages between manufacturing and services is beyond the scope of this analysis. However, these linkages suggest, from an industrial policy standpoint, that the choice between services and manufacturing should be not an *either/or* but rather a *both/and* decision.

7 Policy recommendations

Several policy recommendations emerge from the analysis.

- First, promote the building of economic complexity at the district level. Given the strong relationship between economic complexity and economic growth, industrial policy should focus on building and accumulating productive capabilities across district economies. This could involve targeted investments in skills development, knowledge transfer initiatives, and

³² A key stylized fact in the industrial relatedness literature states that the probability of an economy entering into a new economic activity is higher the more related that activity is to the current set of economic activities in the locality (Hidalgo et al. 2007).

³³ For example, manufacture of communication equipment may require the presence of the telecommunication activities industry, since productive capabilities and know-how present in telecommunication activities may be key to informing the corresponding manufacturing activity.

infrastructure improvements that enhance the ability of local firms to participate in more complex, and importantly, related economic activities.

- Second, prioritize diversification into modern services industries. As modern services industries—such as financial and business services and information and communications—are among the most complex and are concentrated in the most complex district economies, industrial policy should support their expansion. This can be achieved through tailored incentives, R&D funding, and regulatory reforms that create a conducive environment for innovation and competitiveness in these industries.
- Third, support industry clustering and regional specialization. The clustering and connectedness of complex modern services industries suggest that industrial policy should facilitate agglomeration effects by reinforcing existing industrial hubs. This could include policies that promote collaboration between firms, universities, and research institutions within clusters, as well as targeted infrastructure investments to enhance connectivity and resource-sharing within these specialized regions.
- Fourth, leverage linkages between manufacturing and services. The analysis indicates that highly complex manufacturing industries are closely linked to modern services industries, implying that industrial policy should not treat these sectors in isolation. Instead, policy efforts should foster linkages between manufacturing and services by encouraging co-location strategies, integrated supply chain development, and cross-sectoral innovation initiatives that enhance the productivity of both sectors.
- Fifth, expand digital and knowledge-based services. To fully exploit the economic potential of modern services, South Africa should continue to invest in digital infrastructure, high-speed internet connectivity, and ICT-related education and training. This will enable non-metro municipalities to tap into the tradability of services, reducing the geographic constraints associated with service provision and enhancing economic inclusivity.
- Finally, develop tailored support for non-metro municipalities. While economic complexity is concentrated in metropolitan areas, targeted interventions can enable non-metro municipalities to participate in modern services growth. This could include decentralized business support programmes, digital upskilling initiatives, and policies that attract investment in knowledge-intensive industries beyond urban centres.

8 Conclusion

The services sector in South Africa already contributes significantly to the country's economy. Evidence from South Asia suggests that the sector can drive structural transformation, making it an important factor in South Africa's economic trajectory. However, the heterogeneity of the sector necessitates a nuanced policy approach, as modern, high-productivity services contrast substantively with traditional, lower-productivity segments. While industrial policy has begun to acknowledge the strategic importance of services, this recognition has yet to translate to adequate policy support or targeted incentives, despite the sector accounting for approximately two-thirds of national GDP. Furthermore, the strong interdependencies between services and manufacturing underscore the sector's broader economic significance. It is thus critical to gain a detailed understanding of the size and shape of South Africa's services sector. While policy efforts promoting manufacturing-led industrialization and economic diversification are key to driving economic growth and shifting an

economy to higher income levels, a multi-pronged industrial policy approach that features services is an essential additional element to the policy toolkit. This multifaceted approach is necessary given how the global economy has evolved, and how services have become increasingly tradable as new technologies have emerged.

Spatially, the concentration of productive capabilities within metropolitan areas raises concerns about the capacity of non-metro municipalities to leverage these dynamics effectively, to compete with or catch up to the levels of development in metropolitan municipalities. But the increasing tradability of services presents an untapped avenue for economic diversification, with potential benefits not only for the national economy but also for less urbanized regions. Addressing these disparities through more deliberate policy interventions could enhance the sector's contribution to inclusive and sustainable economic development.

References

- Allen, C.S., H. Bhorat, R. Hill, C. Rooney, and F. Steenkamp (2019). 'Building Economic Complexity in the South African Fibrous Plant Economy'. DPRU Working Paper DSI-NRF CoP/WP201904. Cape Town: DPRU (Development Policy Research Unit), University of Cape Town.
- Asmal, Z., H. Bhorat, A. Lochmann, L. Martin, and K. Shah (2024). 'Supply-Side Economics of a Good Type: Supporting and Expanding South Africa's Informal Economy'. CID Working Paper 158. Cambridge, MA: Centre for International Development (CID): Harvard University.
- Baccini, L., M. Fiorini, B. Hoekman, and M. Sanfilippo (2023). 'Services, Jobs, and Economic Development in Africa'. *The World Bank Research Observer*, 38(1): 147–78. <https://doi.org/10.1093/wbro/lkac006>
- Bhorat, H., A. Cassim, and D. Yu. (2016). 'Temporary Employment Services in South Africa: Assessing the Industry's Economic Contribution'. Labour Market Intelligence Partnership (LMIP) Report 28. Available at: www.lmip.org.za/sites/default/files/documentfiles//Temporary%20employment%20services%20in%20South%20Africa.pdf (accessed 23 November 2017).
- Bhorat, H., K. Naidoo, M. Oosthuizen, and K. Pillay (2016). *Demographic, Employment, and Wage Trends in South Africa*. Cape Town: Brookings Africa Growth Initiative. <https://doi.org/10.35188/UNU-WIDER/2015/030-0>
- Bhorat, H., K. Lilenstein, M. Oosthuizen, F. Steenkamp, and A. Thornton (2022). 'Economic Growth, Rising Inequality and Deindustrialization: South Africa's Kuznetsian Tension'. In A.S. Alisjahbana, K. Sen, A. Sumner, and A.A. Yusuf (eds), *The Developer's Dilemma: Structural Transformation, Inequality, and Inclusive Growth*. Oxford: Oxford University Press. <https://doi.org/10.1093/oso/9780192855299.003.0009>
- Bhorat, H., F. Steenkamp, C. Rooney, N. Kachingwe, and A. Lees. (2016). 'Understanding and Characterising the Services Sector in South Africa: An Overview'. WIDER Working Paper 2016/57. Helsinki: UNU-WIDER. <https://doi.org/10.35188/UNU-WIDER/2016/201-4>
- Bhorat, H., C. Rooney, and F. Steenkamp (2018). 'Understanding and Characterising the Services Sector in South Africa: An Overview'. In R. Newfarmer, J. Page, and F. Tarp (eds), *Industries without Smokestacks: Industrialization in Africa Reconsidered*. Oxford: Oxford University Press. <https://doi.org/10.1093/oso/9780198821885.003.0014>
- Bosworth, B., and A. Maertens (2009). 'The Role of the Service Sector in Economic Growth and Employment Generation in South Asia'. In E. Ghani and H. Kharas (eds), *The Service Revolution in South Asia*. Washington, DC: World Bank.
- Branson, N., and M. Leibbrandt (2013). 'Education Quality and Labour Market Outcomes in South Africa'. Economics Department Working Paper 1021. Paris: OECD (Organisation for Economic Co-operation and Development) Publishing.

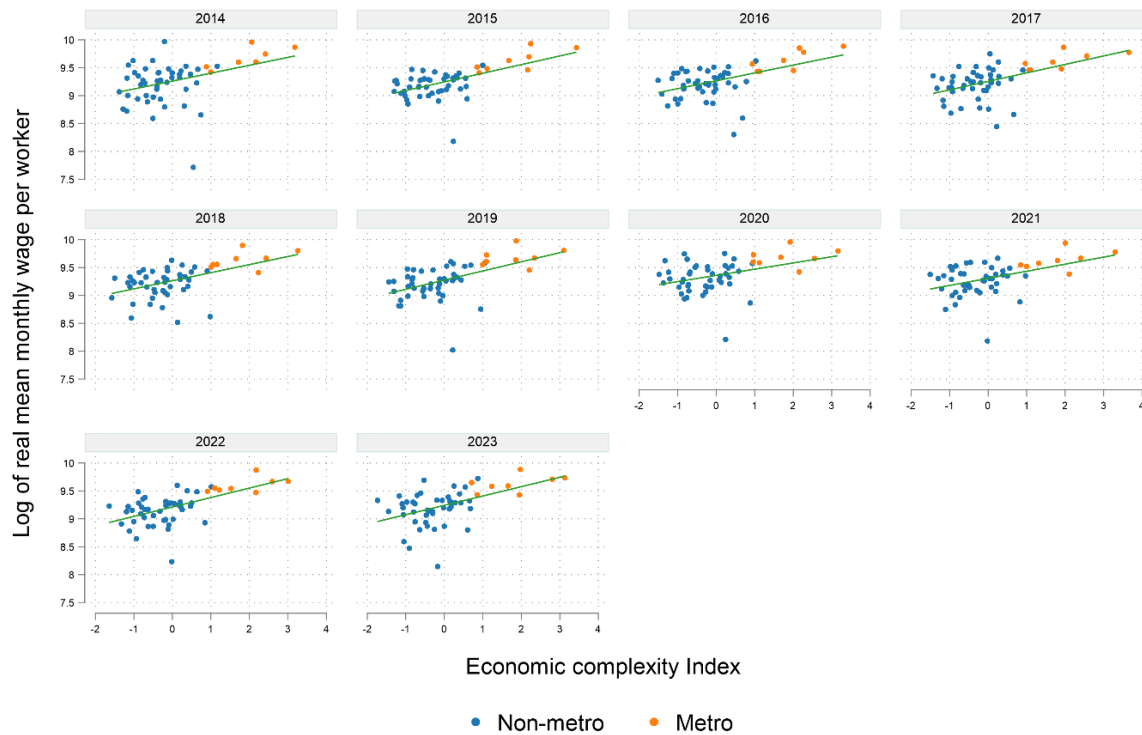
- DCCDT (Department of Communications and Digital Technologies) (2021). *ICT and Digital Economy Masterplan for South Africa*. Available at www.ellipsis.co.za/wp-content/uploads/2021/08/Digital-Economy-Masterplan-22-Feb-2021v1_updated.pdf (accessed 10 February 2025).
- Fritz, B.S., and R.A. Manduca (2021). 'The Economic Complexity of US Metropolitan Areas'. *Regional Studies*, 55(7): 1299–310. <https://doi.org/10.1080/00343404.2021.1884215>
- Gao, J., and T. Zhou (2018). 'Quantifying China's Regional Economic Complexity'. *Physica A: Statistical Mechanics and Its Applications*, 492: 1591–603. <https://doi.org/10.1016/j.physa.2017.11.084>
- Gao, J., B. Jun, A. Pentland, T. Zhou, and C.A. Hidalgo (2017). 'Collective Learning in China's Regional Economic Development'. arXiv paper 1703.01369. <https://doi.org/10.48550/arXiv.1703.01369>
- Ghani, E. (2009). 'Is Service-Led Growth a Miracle for South Asia?' In E. Ghani and H. Kharas (eds), *The Service Revolution in South Asia*. Washington, DC: World Bank.
- Hausmann, R., C.A. Hidalgo, S. Bustos, M. Coscia, A. Simoes, and M.A. Yildirim (2014). *The Atlas of Economic Complexity: Mapping Paths to Prosperity*. Cambridge, MA: The MIT Press. <https://doi.org/10.7551/mitpress/9647.001.0001>
- Herrendorf, B., R. Rogerson, and A. Valentinyi (2014). 'Growth and Structural Transformation'. In P. Aghion and S.N. Durlauf (eds), *Handbook of Economic Growth*, Volume 2. Amsterdam: Elsevier. <https://doi.org/10.1016/B978-0-444-53540-5.00006-9>
- Hidalgo, C.A., B. Klinger, A.L. Barabási, and R. Hausmann (2007). 'The Product Space Conditions the Development of Nations'. *Science*, 317(5837): 482–87. <https://doi.org/10.1126/science.1144581>
- Hidalgo, C.A., and R. Hausmann (2009). 'The Building Blocks of Economic Complexity'. *Proceedings of the National Academy of Sciences*, 106(26): 10570–575. <https://doi.org/10.1073/pnas.0900943106>
- Hyde, M., S. George, and V. Kumar (2019). 'Trends in Work and Employment in Rapidly Developing Countries'. In: U. Bültmann and J. Siegrist (eds), *Handbook of Disability, Work and Health*, Volume 1. Cham: Springer. https://doi.org/10.1007/978-3-319-75381-2_2-1
- Khamsi, M.A. and Kirk, W.A. (2001). *An Introduction to Metric Spaces and Fixed Point Theory*. Toronto: John Wiley & Sons. <https://doi.org/10.1002/9781118033074>
- Kinfemichael, B., and A.M. Morshed (2019). 'Unconditional Convergence of Labor Productivity in the Service Sector'. *Journal of Macroeconomics*, 59: 217–29. <https://doi.org/10.1016/j.jmacro.2018.12.005>
- Köhler, T., and H. Bhorat (2023). 'Wages and Wage Inequality during the COVID-19 Pandemic in South Africa'. DPRU Working Paper 202308. Cape Town: DPRU, University of Cape Town.
- Mealy, P., J.D. Farmer, and R. Hausmann (2018). 'Determining the Differences That Matter: Development and Divergence in US States over 1850–2010'. HKS Working Paper RWP18-030. Cambridge, MA: Harvard Kennedy School (HKS). <https://doi.org/10.2139/ssrn.3235193>
- Mealy, P., and D. Coyle (2022). 'To Them That Hath: Economic Complexity and Local Industrial Strategy in the UK'. *International Tax and Public Finance*, 29(2): 358–77. <https://doi.org/10.1007/s10797-021-09667-0>
- McMillan, M., D. Rodrik, and I. Verduzco-Gallo (2014). 'Globalization, Structural Change, and Productivity Growth, with an Update on Africa'. *World Development*, 63: 11–32. <https://doi.org/10.1016/j.worlddev.2013.10.012>
- National Planning Commission (2013). *National Development Plan 2030: Our Future, Make it Work*. Pretoria: National Planning Commission, Government of South Africa.
- National Treasury (2019). *A Contribution towards a Growth Agenda for the South African Economy*. Pretoria: National Treasury. Available at: www.treasury.gov.za/comm_media/press/2019/towards%20a%20growth%20agenda%20for%20sa.pdf (accessed 10 February 2025).
- Nayyar, G., M. Hallward-Driemeier, and E. Davies (2021). *At Your Service? The Promise of Services-Led Development*. Washington, DC: World Bank. <https://doi.org/10.1596/978-1-4648-1671-0>
- Nell, A., and J. Visagie (2004). 'Spatial Tax Panel 2014–2023' Dataset, Version 4. Pretoria: National Treasury—Cities Support Programme and Human Sciences Research Council.
- Newfarmer, R., J. Page, and F. Tarp (eds) (2018). *Industries Without Smokestacks: Industrialization in Africa reconsidered*. Oxford: Oxford University Press. <https://doi.org/10.1093/oso/9780198821885.001.0001>

- Noland, M., D. Park, and G. Estrada. (2012). 'Developing the Service Sector as Engine of Growth for Asia: An Overview'. ADB Economics Working Paper 320. Metro Manila: Asian Development Bank (ADB). Available at: www.adb.org/sites/default/files/publication/30080/economics-wp320.pdf (accessed on 15 September 2016).
- Rodrik, D. (2013). 'Unconditional Convergence in Manufacturing'. *The Quarterly Journal of Economics*, 128(1): 165–204. <https://doi.org/10.1093/qje/qjs047>
- Rodrik, D. (2016). 'Premature Industrialisation'. *Journal of Economic Growth*, 21(1): 1–33. <https://doi.org/10.1007/s10887-015-9122-3>
- Stats SA (Statistics South Africa) (2010). 'Quarterly Labour Force Survey (2010Q2)'. Dataset. Pretoria: Stats SA.
- Stats SA (2014a). 'Quarterly Labour Force Survey (2014Q1)'. Dataset. Pretoria: Stats SA.
- Stats SA (2014b). 'Quarterly Labour Force Survey (2014Q2)'. Dataset. Pretoria: Stats SA.
- Stats SA (2014c). 'Quarterly Labour Force Survey (2014Q3)'. Dataset. Pretoria: Stats SA.
- Stats SA (2014d). 'Quarterly Labour Force Survey (2014Q4)'. Dataset. Pretoria: Stats SA.
- Stats SA (2015a). 'Quarterly Labour Force Survey (2015Q1)'. Dataset. Pretoria: Stats SA.
- Stats SA (2015b). 'Quarterly Labour Force Survey (2015Q2)'. Dataset. Pretoria: Stats SA.
- Stats SA (2015c). 'Quarterly Labour Force Survey (2015Q3)'. Dataset. Pretoria: Stats SA.
- Stats SA (2015d). 'Quarterly Labour Force Survey (2015Q4)'. Dataset. Pretoria: Stats SA.
- Stats SA (2016a). 'Quarterly Labour Force Survey (2016Q1)'. Dataset. Pretoria: Stats SA.
- Stats SA (2016b). 'Quarterly Labour Force Survey (2016Q2)'. Dataset. Pretoria: Stats SA.
- Stats SA (2016c). 'Quarterly Labour Force Survey (2016Q3)'. Dataset. Pretoria: Stats SA.
- Stats SA (2016d). 'Quarterly Labour Force Survey (2016Q4)'. Dataset. Pretoria: Stats SA.
- Stats SA. 2016e. 'Monitoring Rural Development: Using Census Data to Measure Change in the Rural Nodes'. Report 03-10-09. Stats SA: Pretoria.
- Stats SA (2017a). 'Quarterly Labour Force Survey (2017Q1)'. Dataset. Pretoria: Stats SA.
- Stats SA (2017b). 'Quarterly Labour Force Survey (2017Q2)'. Dataset. Pretoria: Stats SA.
- Stats SA (2017c). 'Quarterly Labour Force Survey (2017Q3)'. Dataset. Pretoria: Stats SA.
- Stats SA (2017d). 'Quarterly Labour Force Survey (2017Q4)'. Dataset. Pretoria: Stats SA.
- Stats SA (2018a). 'Quarterly Labour Force Survey (2018Q1)'. Dataset. Pretoria: Stats SA.
- Stats SA (2018b). 'Quarterly Labour Force Survey (2018Q2)'. Dataset. Pretoria: Stats SA.
- Stats SA (2018c). 'Quarterly Labour Force Survey (2018Q3)'. Dataset. Pretoria: Stats SA.
- Stats SA (2018d). 'Quarterly Labour Force Survey (2018Q4)'. Dataset. Pretoria: Stats SA.
- Stats SA (2019a). 'Quarterly Labour Force Survey (2019Q1)'. Dataset. Pretoria: Stats SA.
- Stats SA (2019b). 'Quarterly Labour Force Survey (2019Q2)'. Dataset. Pretoria: Stats SA.
- Stats SA (2019c). 'Quarterly Labour Force Survey (2019Q3)'. Dataset. Pretoria: Stats SA.
- Stats SA (2019d). 'Quarterly Labour Force Survey (2019Q4)'. Dataset. Pretoria: Stats SA.
- Stats SA (2020a). 'Quarterly Labour Force Survey (2020Q1)'. Dataset. Pretoria: Stats SA.
- Stats SA (2020b). 'Quarterly Labour Force Survey (2020Q2)'. Dataset. Pretoria: Stats SA.
- Stats SA (2020c). 'Quarterly Labour Force Survey (2020Q3)'. Dataset. Pretoria: Stats SA.
- Stats SA (2020d). 'Quarterly Labour Force Survey (2020Q4)'. Dataset. Pretoria: Stats SA.
- Stats SA (2021a). 'Quarterly Labour Force Survey (2021Q1)'. Dataset. Pretoria: Stats SA.
- Stats SA (2021b). 'Quarterly Labour Force Survey (2021Q2)'. Dataset. Pretoria: Stats SA.

- Stats SA (2021c). 'Quarterly Labour Force Survey (2021Q3)'. Dataset. Pretoria: Stats SA.
- Stats SA (2021d). 'Quarterly Labour Force Survey (2021Q4)'. Dataset. Pretoria: Stats SA.
- Stats SA (2022a). 'Quarterly Labour Force Survey (2022Q1)'. Dataset. Pretoria: Stats SA.
- Stats SA (2022b). 'Quarterly Labour Force Survey (2022Q2)'. Dataset. Pretoria: Stats SA.
- Stats SA (2022c). 'Quarterly Labour Force Survey (2022Q3)'. Dataset. Pretoria: Stats SA.
- Stats SA (2022d). 'Quarterly Labour Force Survey (2022Q4)'. Dataset. Pretoria: Stats SA.
- Stats SA (2023a). 'Quarterly Labour Force Survey (2023Q1)'. Dataset. Pretoria: Stats SA.
- Stats SA (2023b). 'Quarterly Labour Force Survey (2023Q2)'. Dataset. Pretoria: Stats SA.
- Stats SA. (2023c). 'P0441—Gross Domestic Product (GDP), 1st Quarter 2023. GDP P0441—Generation of Income Account'. Stats SA: Pretoria.
- Stats SA (2024). 'Quarterly Labour Force Survey (2024Q2)'. Dataset. Pretoria: Stats SA.
- TIPS (Trade and Industry Policy Strategies (2022). *Services and Inclusive Industrialisation*. Pretoria: TIPS.
- Visagie, J., and I. Turok (2021). 'The Contribution of Services to International Trade in Southern Africa'. *Development Southern Africa*, 38(1): 21–38. <https://doi.org/10.1080/0376835X.2020.1834351>
- Welsh, D.J.A. (1968). 'Kruskal's Theorem for Matroids'. *Mathematical Proceedings of the Cambridge Philosophical Society*, 64(1): 3–4. <https://doi.org/10.1017/S030500410004247X>

Appendix

Figure A1: Economic complexity and mean real wage per worker by district, 2014–23



Note: mean real wage per formal sector worker (2023 prices) estimated using wage data from the QLFS; earnings estimates revised based on imputation method applied by Kohler and Bhorat (2023)

Source: authors' illustration based on Nell and Visagie (2024) and Stats SA (2014–23).

Table A1: Ranking of district municipalities by economic complexity index, 2023

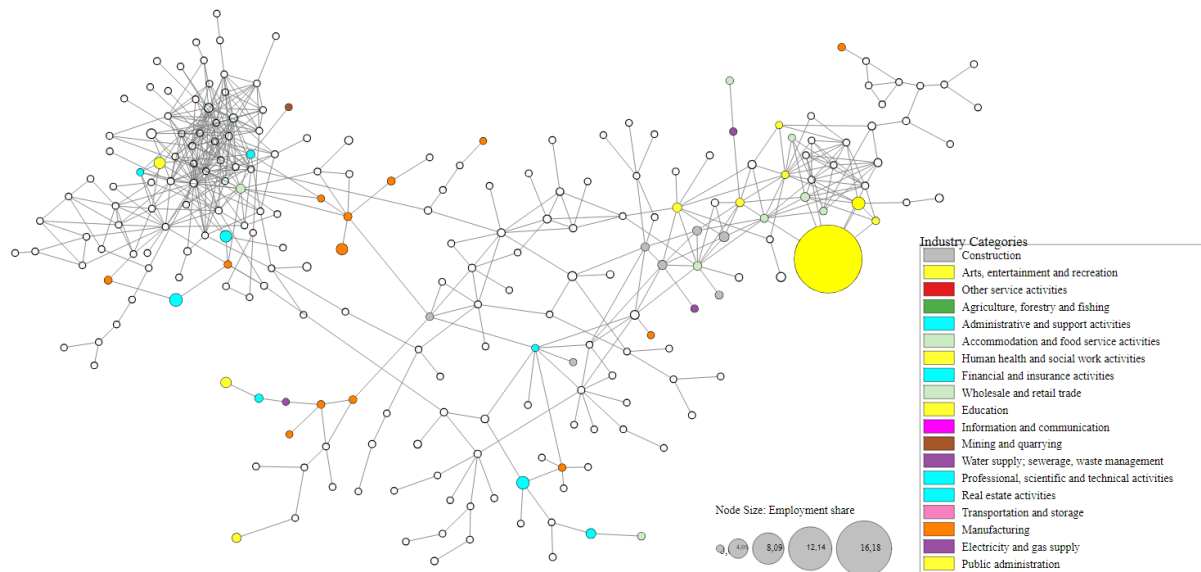
District municipality	Province	ECI	Diversity	Opportunity outlook index	Share of employment
City of Johannesburg	GT	3.13	114	-1.13	0.192
City of Cape Town	WC	2.80	103	0.32	0.137
City of Tshwane	GT	1.97	84	1.91	0.102
eThekweni	KZN	1.95	84	1.81	0.087
Ekurhuleni	GT	1.65	113	1.86	0.078
Nelson Mandela Bay	EC	1.23	90	1.90	0.020
Sedibeng	GT	0.87	88	2.04	0.015
Buffalo City	EC	0.85	50	0.77	0.015
Mangaung	FS	0.71	61	1.36	0.015
Cape Winelands	WC	0.68	49	0.83	0.026
Bojanala	NW	0.65	37	0.04	0.026
iLembe	KZN	0.60	42	0.35	0.007

Garden Route	WC	0.54	83	2.32	0.010
West Rand	GT	0.43	56	0.83	0.017
Nkangala	MP	0.39	54	0.67	0.017
Fezile Dabi	FS	0.28	52	0.58	0.005
John Taolo Gaetsewe	NC	0.25	30	-0.45	0.003
Dr Kenneth Kaunda	NW	0.19	58	0.86	0.009
King Cetshwayo	KZN	0.17	41	-0.13	0.009
Frances Baard	NC	0.14	41	0.25	0.005
Umgungundlovu	KZN	0.13	56	0.88	0.016
West Coast	WC	0.10	51	0.51	0.009
Ugu	KZN	0.00	47	0.36	0.007
Overberg	WC	-0.02	51	0.62	0.006
Lejweleputswa	FS	-0.06	45	0.27	0.006
Amajuba	KZN	-0.17	31	-0.54	0.005
Gert Sibande	MP	-0.20	39	-0.20	0.012
Uthukela	KZN	-0.26	24	-0.81	0.005
Amathole	EC	-0.31	34	-0.18	0.005
Capricorn	LIM	-0.31	39	-0.11	0.011
Namakwa	NC	-0.40	37	-0.31	0.001
Sarah Baartman	EC	-0.44	39	-0.01	0.008
O.R.Tambo	EC	-0.45	17	-0.99	0.005
Ehlanzeni	MP	-0.47	49	0.30	0.021
Thabo Mofutsanyane	FS	-0.48	37	-0.35	0.006
Waterberg	LIM	-0.53	35	-0.37	0.009
Z F Mgcawu	NC	-0.62	29	-0.82	0.005
Chris Hani	EC	-0.64	32	-0.46	0.004
Sekhukhune	LIM	-0.71	23	-0.94	0.006
Pixley ka Seme	NC	-0.76	23	-0.96	0.002
Central Karoo	WC	-0.77	25	-0.88	0.001
Joe Gqabi	EC	-0.80	19	-1.17	0.002
Mopani	LIM	-0.81	31	-0.62	0.010
Umzinyathi	KZN	-0.91	25	-0.90	0.004
Dr Ruth Segomotsi Mompoti	NW	-0.98	25	-0.89	0.003
Harry Gwala	KZN	-1.05	22	-1.10	0.004
Vhembe	LIM	-1.06	27	-0.85	0.007
Umkhanyakude	KZN	-1.07	24	-0.92	0.002
Alfred Nzo	EC	-1.10	11	-1.39	0.003
Xhariep	FS	-1.17	19	-1.26	0.001
Ngaka Modiri Molema	NW	-1.45	13	-1.44	0.009
Zululand	KZN	-1.74	14	-1.43	0.007

Note: EC = Eastern Cape, FS = Free State, GT = Gauteng, KZN = KwaZulu Natal, LIM = Limpopo, NW = North West, WC = Western Cape..

Source: authors' construction based on Nell and Visagie (2024).

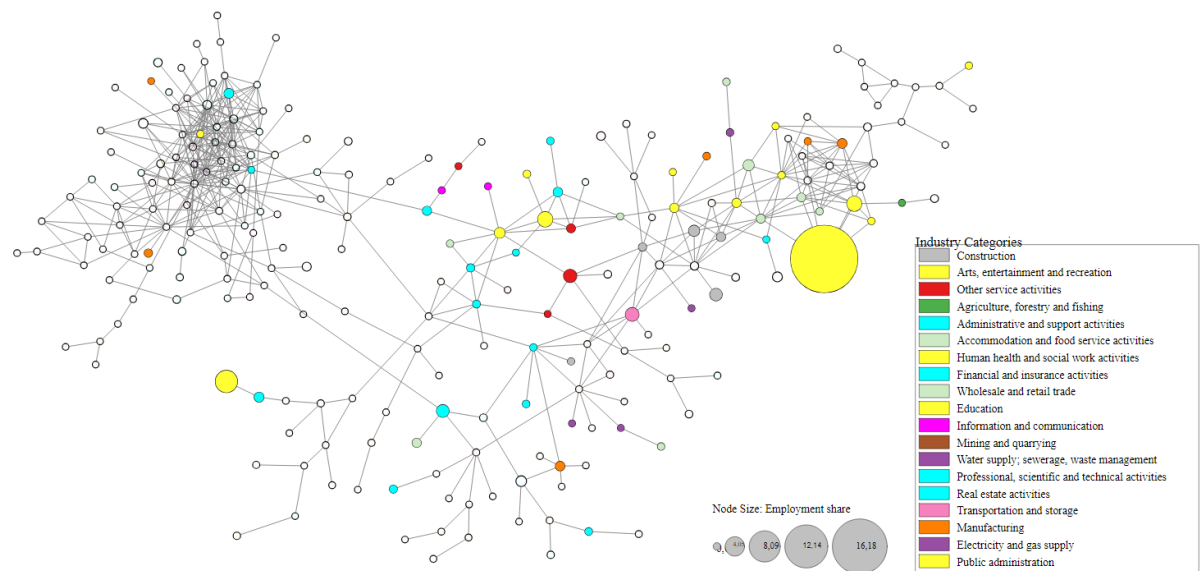
Figure A2: Industry space for Buffalo City, 2023



Note: nodes represent three-digit SIC industry categories; industry nodes shaded according to one-digit SIC sectors; size of nodes proportional to industry's share of employment in the district economy in 2023.

Source: authors' illustration based on Nell and Visagie (2024).

Figure A3: Industry space for Mangaung, 2023



Note: nodes represent three-digit SIC industry categories; industry nodes shaded according to one-digit SIC sectors; size of nodes proportional to industry's share of employment in the district economy in 2023.

Source: authors' illustration based on Nell and Visagie (2024).