SCHOOL OF
ECONOMICS AND
MANAGEMENT

Master's Programme in Economic Growth, Population and Development

Structural Transformation and Productivity Growth in Egypt

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Disentangling Heterogeneous Services and Identifying Drivers of Growth: A Structural Change Approach

by

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Abstract

Premature deindustrialization and a shift to services at early stages of economic development raise concerns about growth prospects of low-income and emerging economies. Within the manufacturing- vs. service-led growth debate, this thesis analyzes the contribution of heterogeneous services vis-à-vis manufacturing to productivity growth, focusing on the role of modern services which are characterized by increased tradability and economies of scale potential arising from the global emergence of ICTs. By testing the validity of *Kaldor's Growth Laws* and conducting a shift-share decomposition analysis for Egypt, within- and cross-sectoral labor productivity dynamics over the period of structural reforms (1990-2018) are identified. Overall, the results point to growth-inhibiting structural transformation processes due to a concentration of economic output and employment in low-tech and informal services and non-manufacturing industrial activities. For the last decade, growth-enhancing roles of manufacturing and (manufacturing-related) business services are found. The findings highlight the importance of promoting the formal private sector to create jobs and the need for industrial policies that strengthen linkages with modern services. By emphasizing the similarity of structural transformation processes and challenges to sustained productivity growth to other developing regions, this thesis argues to include the MENA region in comparative research on structural change.

Keywords: Structural Change, Premature Deindustrialization, Labor Productivity, Services, Egypt

EKHS21
Master's Thesis (15 credits ECTS)
June 2022
Supervisor: Sara Torregrosa Hetland
Examiner: Kristin Ranestad
Word Count: 16'597

Acknowledgments

I would like to thank my supervisor, Sara Torregrosa Hetland, for her valuable support during the thesis writing process.

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Abbreviations & Acronyms

CAPMAS	Central Agency for Public Mobilization and Statistics (Egypt)
DSE	Dynamic shift effect
ETD	Economic Transformation Database
GNP	Gross national product
GDP	Gross domestic product
ICTs	Information and communications technologies
IMF	International Monetary Fund
IRS	Increasing returns to scale
ISE	Intra-sectoral effect
KGLs	Kaldor's Growth Laws
LE	Livre égyptienne (Egyptian Pound)
LP	Labor productivity
MENA	Middle East and North Africa
SC	Structural change
SCE	Structural change effect
SMEs	Small- and medium-sized enterprises
SOEs	State-owned enterprises
SSA	sub-Saharan Africa
SSD	Shift-share decomposition
SSE	Static shift effect
VA	Value-added
WTO	World Trade Organization

1. Introduction

Global development patterns have shown that long-term economic growth requires a fundamental structural change with economic activity and employment shifting from low- to high-productivity economic sectors. Central to structural transformations in past growth paths was the manufacturing sector with the transition from an agrarian to an industrialized economy being at the core of long-term economic growth and poverty reduction (McMillan & Harttgen 2014). Today's low-income and emerging economies, however, reveal an inherently different development trend with a decline of the share of manufacturing in value-added (VA) and employment before reaching high-income levels: This trend of 'premature deindustrialization' (Rodrik 2016) is a turn against the manufacturing-led export growth model of the past. One explanation is the changed global economic environment that today's low-income countries face, with liberalized trade, technological progress affecting modern industrial competition, increasing linkages between manufacturing and services, and relatively increased global demand for services (Rodrik 2014, 2016). The question arises whether this trend is preventing emerging economies from realizing their full economic potential as the focus on lower productivity activities is pushing them into the middle-income trap, or whether these recent structural developments may challenge the assumption that manufacturing is the main engine of growth.

The reason for concerns about the growth prospects of low-income service-based economies are the relatively low productivity rates traditionally assumed for services vis-à-vis manufacturing. Research, however, increasingly questions that service specialization leads to stagnating aggregate productivity and points to efficiency gains in services: Aggregate services are found to be a major source of productivity growth for different countries and time periods in developing Asia, Latin America, and sub-Saharan Africa (SSA) (Felipe et al. 2009, Timmer & de Vries 2009). Productivity gains in the services sector are mainly based on the increasing tradability of services with the revolution in information- and communications-technologies (ICTs), which has eroded the trade and globalization advantages of manufacturing of the past (Dasgupta & Singh 2005). However, the role of services in productivity growth differs substantially across countries and time periods (Timmer et al. 2015). A region largely excluded from comparative studies on structural transformation processes is the transitioning Middle East and North Africa (MENA) region, mainly due to a lack of appropriate comparable data, although data availability at the national level has improved in recent years (Alnashar et al. 2020).

The Arab Republic of Egypt (hereafter Egypt) stands out in the MENA region with more than a quarter of the population and the largest non-oil GDP and is widely regarded as a leading indicator of economic development across the MENA region (Khan & Milbert 2012). Further, Egypt stands out as one of the few emerging economies worldwide that recorded a positive GDP growth rate (3.6%) in 2020 (COVID-19 pandemic), reflecting a sound macroeconomic environment. This is the result of a comprehensive reform agenda linked to a three-year, $12 billion loan of the International Monetary Fund (IMF) in 2016 that focused on three areas: monetary, fiscal, and energy sector reform (World Bank 2021). While the reforms allowed the lower-middle income economy to stabilize and build resilience to external shocks, Egypt is facing persistent structural challenges. Although the economy has experienced strong growth overall, progress in per capita income growth and poverty reduction is limited due a lack of productive employment opportunities in the formal private sector. Structural reforms, with the 2016 IMF reform being the latest, have been an integral part of Egyptian economic policy since the 1990s, addressing structural processes.

This thesis aims to assess the structural transformation processes since the 1990s in Egypt, guided by the main research question:

Were there any effects of structural transformation processes in Egypt on productivity growth and can certain sectors be identified as drivers of growth? If so, which sectors?

Egypt's economy follows the trend of premature deindustrialization. The manufacturing sector has never really taken off, and the economy is mainly oriented toward services. Therefore, the focus of the analysis is on the heterogeneous service sectors in line with recent research on the manufacturing- vs. service-led growth debate - also in light of the information and communications technologies (ICTs) revolution, which has fundamentally changed the characteristics of modern services - leading to the sub research question:

What is the role of modern services in Egypt's structural transformation?

To identify sectoral drivers of growth, this thesis follows the structural change literature and tests the validity of *Kaldor's Growth Laws* (KGLs, Kaldor 1966) for disaggregate economic sectors: first, the law on the relationship between sectoral VA and total VA growth (1. KGL) and second, on the relationship between sectoral VA and sectoral labor productivity growth (2. KGL). Following Di Meglio et al. (2018), the third KGL relationship between sectoral VA growth and total labor productivity growth is replaced by a sectoral shift-share decomposition (SSD) analysis that decomposes overall labor productivity growth in within-sector labor productivity growth and labor reallocation between sectors, with the latter capturing growth-enhancing structural change processes. Sectoral data on VA and employment is used on the most disaggregate sector level available for the period from 1990 to 2018 capturing all waves of structural reform processes in Egypt since its turn to a liberalized market economy.

The relevance of this thesis lies in identifying potential lead sectors of Egypt's structural transformation that should be the focus of future structural policy programs. With a population of around 102 million, Egypt is the most populous country in the MENA region and has one of the fastest growing populations in the world, with half of the people being under the age of 24 (World Bank 2021). Given these population dynamics, broad-based productive employment will be key to inclusive growth by reducing unemployment and poverty. Further, this thesis aims to contribute to the debate on premature deindustrialization and the manufacturing- vs. service-led growth discussion by assessing the ability of heterogeneous service categories to qualify as growth engines in a developing context outside of the previous research scope that has almost exclusively focused on developing Asia, Latin America, and sub-Saharan Africa.

The remainder of this thesis is structured as follows: the next section provides the guiding theoretical framework of Structural Change theory and a review of relevant literature on premature deindustrialization and structural transformation trends in today's developing contexts. Section 3 outlines the contextual framework of history, Status Quo, and challenges of structural processes in Egypt. Section 4 describes the methodological framework to identify sectoral engines of growth, section 5 introduces the data and provides descriptive statistics. In section 6, results are presented. Section 7 discusses results and offers policy implications and a research agenda. Section 8 concludes.

2. Literature & Theory

2.1 Theoretical Framework: Structural Change

Explaining Economic Growth: Neo-classical economic theory vs. structural change theory

Two main strands of theory are dominant in explanations on prospects of long-term economic growth in developing contexts: Structural change theory rooted in development economics and based on the dual-economy model formalized by Lewis (1954), and neoclassical economic theory rooted in macro-economics based on the Solow (1956) model of exogenous growth. Structural change theory differentiates between the traditional (agriculture) and modern (industrial) economic sector with the assumption that growth-enhancing productivity is located in the modern sector. Hence, in the structural change framework sustained growth depends on the shift of resources (mainly labor) from the low productive traditional sectors to the high-productive modern sector, i.e., a shift from low- to high-productive employment. In contrast, neoclassical economic theory applies an aggregate one-sector economic model in which growth depends on economy-wide technological change based on physical and human capital accumulation. The two theoretical traditions offer a complementary perspective on economic growth: While the neoclassical model focuses on within-(modern) sector productivity growth based on technological improvements, the dual-sector model focuses on a growth process determined by cross-sector labor migration to high-productivity economic activity, i.e., growth enhancing cross-sectoral structural change. Further, a complementary view of the two theories captures the main development challenges of today's developing countries: A structural transformation to high-productive economic activities and productivity growth within modern sectors. Thus, while from a theoretical perspective the theories disagree on the fundamental origin of growth, cross-sectoral structural change and within-sector productivity growth are theoretically in line with each other (McMillan et al. 2017).

Origins and development of structural change theory

Structural change theory has its foundations in the "three-sector" economy models of Fisher (1939) and Clark (1940) which introduced the division of economic activity into a primary (agriculture, mining, and extractive industries), secondary (manufacturing) and tertiary (services) sector and emphasized a sequencing of dominant sectors during the process of economic development with resources shifting first from agriculture to manufacturing and then to services. Hence, "structural change" is defined as the shift in relative importance of economic sectors in terms of employment and economic output. The interrelated processes of structural change that accompany economic development (political, social, etc.) are jointly referred to as "structural transformation" (Syrquin 1988).

Clark (1940) offers a first attempt to a theory of structural change and relates the sectoral shift of resources to sectoral differences in productivity growth (supply side) and sectoral differences in income elasticity of demand (Engel's law) thereby adding the demand side to the neoclassical focus of supply side as explanation for growth (Gabardo et al. 2017). In a series of ten articles, Kuznets (1956-1967) provides a quantitative analysis of inter-country variations in economic structures given by the countries' main components of the gross national product (GNP). Based on that, Kuznets (1973) defines structural transformation as one of the six characteristics of Modern Economic Growth and concluded that "*it is impossible to attain high rates of growth of per capita or per worker product without commensurate substantial shift in the shares of various sectors*" (Kuznets 1979: 130). Building on Kuznets' work, Chenery & Syrquin (1975) analyze development patterns of developing and advanced

economies between 1950 and 1970 and find support for the hypothesis that continuous structural change is related to income growth compared to the alternative hypothesis that different structural relations characterize developing and advanced countries.

While these early structural change contributions provided mainly descriptive and empirical analysis of development processes without a theory on underlying processes and mechanisms, Lewis (1954) formalized the mechanism in a dual-sector model: Economic growth in a developing economy is fundamentally explained by the migration of surplus labor from the subsistence (traditional / agricultural) sector to the capitalist (modern / manufacturing) sector. Based on the assumption of a surplus of unproductive labor in the subsistence agricultural sector, labor is pulled by higher wages to the manufacturing sector with productivity growth in the modern sector compared to low productivity in the agricultural sector. By absorbing the economy's surplus labor, the manufacturing sector grows, and the process of industrialization enables sustained economic development.

Kaldor's Growth Laws: What qualifies a sector as an 'engine of growth'?

Based on cross-sectional data for 12 OECD countries from 1953 to 1964, Kaldor (1966, 1967) developed a set of stylized long-term relationships between output, employment, and productivity growth in manufacturing and total output, known as *Kaldor's Growth Laws*. Overall, Kaldor finds a strong (causal) linkage between manufacturing output growth and total economic output growth (1. KGL) based on two underlying sectoral mechanisms: First, productivity growth in the manufacturing sector is positively correlated with growth in manufacturing output resulting from increasing returns to scale (IRS) in this sector (2. KGL). Second, productivity growth in the non-manufacturing sectors is positively correlated with manufacturing output growth and negatively correlated with non-manufacturing employment growth as a result of labor reallocation (3. KGL). The ability of manufacturing to fulfil these laws and hence the sector's qualification as the "engine of growth" in an economy is based on certain characteristics traditionally ascribed to the manufacturing sector.

A first characteristic of a growth-enhancing sector is that sectoral output growth is independent of domestic demand and thus not constrained by limited demand. Through its fundamental trait of tradability and external demand growth, the manufacturing sector experiences cumulative growth (Kaldor 1970). Trade specialization according to comparative advantage allows for high factor productivity in the manufacturing sector. Historically, tradability as a unique characteristic of manufacturing is justified with a low tradability of (unprocessed) agricultural products and a lack of tradability in traditional services such as transport. Further Kaldorian growth-driving characteristics of manufacturing include the high potential for technological upgrading, investment attraction and capital accumulation as well as economies of scale. All these characteristics drive productivity not only in the manufacturing sector but economy-wide based on the strong backward and forward linkages of the manufacturing sector with non-manufacturing sectors (Hirschmann 1958). Another fundamental characteristic of the historic manufacturing sector is the ability to absorb the abundant surplus labor. Economic sectors differ regarding their required skill composition of labor with skill requirements determining the mobility of labor across sectors. Historically, the skill composition required in manufacturing was low which allowed for a high labor mobility from agriculture to manufacturing, and thus productive employment at scale. Given these inherent characteristics of manufacturing, an industrialization process was regarded as the necessary process to stimulate productivity growth, economic development, and poverty reduction (McMillan & Harttgen 2014).

2.2 Literature Review: Premature Deindustrialization & Structural Transformation Trends in Developing Contexts

The role of manufacturing in developing countries & premature deindustrialization trends

While the validity of the KGLs have been tested and confirmed for today's advanced economies, the literature on developing contexts is more limited. However, a few studies confirm a driving role of manufacturing in output growth in the African context (Wells & Thirlwall 2003) and in developing Asia (Felipe et al. 2009). In general, today's advanced economies all followed the stylized path of structural transformation: The share of agriculture in output and employment declined as income per capita raises, followed by inverted U-shape with the positive relationship between the share of manufacturing and income growth at lower levels of development and a negative relationship for higher levels of development when the economy matured and moves to higher productivity economic activities in the service sector (Rodrik 2016). Today's developing countries deviate from this traditional path: Since the 1990s, deindustrialization happens at much lower levels of income, i.e., these countries experience premature deindustrialization (Rodrik 2016). Developing economies shift to a large share of services in output at early stages of development (Szirmai 2012) with the manufacturing sector failing to take off or remaining constant at low-income levels (Dasgupta et al. 2017).

Patterns of structural change in developing regions

Di Meglio & Gallego (2022) analyze sectoral transformation across countries in the three major developing regions between 1950 and 2010: Most alike to traditional structural change patterns is the development path of Asian economies which was characterized by an underlying manufacturing export-led growth model since the 1950s. The inverted U-shape is pronounced picking up to more than 20% of employment share in manufacturing in some Asian economies (China, Korea, Taiwan, Malaysia). In Latin America, the pattern is less pronounced with rather constant employment shares in manufacturing (14% on average), only Argentina and Chile experienced shares above 20%. For a sample of African countries (including Egypt) the employment shares between 1950 and 2005 in manufacturing were low at 8% average, for several SSA countries agriculture still dominates and captures more than 60% of total employment. This is consistent with the lack of a proper industrialization process by which SSA economies are characterized (Aiginger & Rodrik 2020). These findings highlight heterogeneity in structural transformation processes across and within developing regions which contribute differently to economic performance. Depending on productivity levels and growth of sectors where resources are allocated to, structural transformation can promote or constrain growth (McMillan & Rodrik 2011, McMillan & Harttgen 2014). Further, the increasing importance of services in economic patterns since the 1950s becomes clear. This raises concerns about the growth prospects of low-income service-based economies absent a proper industrialization process based on the relatively low productivity rates traditionally assumed for services vis-à-vis manufacturing.

The role of services in developing contexts

Research, however, increasingly questions that service specialization necessarily leads to stagnating aggregate productivity and points to efficiency gains in services. Kaldorian approaches in research on drivers of growth in developing contexts are rather limited. However, a few studies confirm next to the still driving (but small) role of manufacturing in output growth also aggregate services as a major source of productivity growth for different countries and time periods in developing Asia, Latin America, and SSA (Wells & Thirlwall 2003, Felipe et al. 2009, Timmer & de Vries 2009). However, the

role of services in productivity growth differs substantially across countries and time periods analyzed (Timmer et al. 2015). For some Asian economies (India, Malaysia, China, Taiwan, and Hong Kong), Lee & McKibbin (2018) find that the service sector contributed more than the manufacturing sector to aggregate productivity growth between 1990 and 2005 through both within-sector productivity growth and structural change effects. Especially, the service categories of transportation, communications, financial intermediation, and business services exhibited high productivity growth. Differentiating Asian economies, Ghani (2010) finds for the periods 1980-1985 and 2000-2007 that services contributed twice as much to total output growth as industry in South Asian economies (Bangladesh, India, Sri Lanka, Pakistan), while in East Asian economies industry contributed more to total growth than services. Based on these results for the Asian context, it can be concluded that services played a greater role in growth in countries that started their growth path later. The study of Balchin et al. (2016) identifies services as a major source of productivity growth in some SSA countries between 1991 and 2013. In line with McMillan & Rodrik's (2011) finding that structural transformation processes also can constrain growth, Schiffbauer et al (2016) find that structural change in Latin America has served to erode productivity growth rates. Due to the comparatively low productivity of the services sectors (retailing, wholesaling, construction, and government), the labor shift resulted in lower overall value-added per worker in seven of nine sample countries between 1990 and 2005, dragging down the average productivity of the countries.

Heterogeneity in services

The role of services in productivity growth differs not only across and within regions countries, but also across the categories within the heterogeneous services sector (Herrendorf et al. 2014). The structural composition of services determines the relevance and sustainability of their contribution to productivity growth (Felipe et al. 2009). Productivity gains in the services sector are mainly based on the increasing tradability of services and exploitation of scale economies with the ICTs revolution, which has eroded the trade and globalization advantages of manufacturing of the past (Dasgupta & Singh 2005, Eichengreen & Gupta 2013). Thus, the stronger contribution of services in the Asian economies that started the growth path later can be attributed to the different composition of services with the emergence of modern services at the time of the onset of growth. Besides the specific role of high-productive ICTs-related modern services (in contrast to traditional services such as transport), also the differentiation into market vs. non- market services is important. Non-market services (government and personal services) exhibit specific characteristics such as absence of price, direct and indirect consumers, and collective consumption of output (Djellal & Gallouj 2013) which make them hardly comparable to market services and introduce a bias in results that are based on aggregate services. Hence, non-market services need to be separately accounted for when determining the role of services in productivity growth (Di Meglio & Gallego 2022). There are just a few studies that tested the validity of the KGLs in developing contexts by accounting for disaggregate service categories (Di Meglio et al. 2018, Dasgupta et al. 2017, Di Meglio & Gallego 2022). In general, the findings support the key role of manufacturing for growth but also highlight a driving role of modern market-services, particularly business service activities (Di Meglio & Gallego 2022) that sustain productivity growth.

This thesis relates and contributes to the presented literature in two ways: First, it examines the distinct role of heterogeneous market vs. non-market services focusing on modern market services for productivity growth. Second, by analyzing the case of Egypt, this thesis aims to shed light on structural transformation processes in a hitherto understudied region and thus contributes to assessing the differential impact of structural transformation on economic performance across developing regions.

3. Contextual Framework: Egypt's Growth Path

3.1 Status Quo: Economic Structure, Growth & Poverty

As for most emerging economies, the global COVID-19 pandemic shocked the Egyptian economy, particularly the immediate decline in tourism, which accounted for about 12% of the country's GDP and 10% of employment before the pandemic. Lockdowns led to a decline in domestic economic activity (declining demand, disrupted production, interrupted international trade), the economic slowdown reduced tax revenues and thus the national budget. In addition, as most emerging markets, Egypt suffered from the massive capital withdrawal by investors (IMF 2021). Despite these developments, Egypt stands out as one of the few emerging economies that recorded a positive GDP growth rate (3.6%) in 2020, reflecting a sound macroeconomic environment which is the result of a comprehensive reform agenda linked to a three-year, $12 billion IMF loan in 2016 that focused on three key areas: monetary, fiscal, and energy sector reforms. Main characteristics of the reform agenda were fiscal consolidation measures including phasing out of energy subsidies, containment of the wage bill and the introduction of a modern value-added tax replacing a sales tax which led to a surplus primary budget balance and a decline of the overall budget deficit and government debt-to-GDP ratios. A liberalized exchange rate increased foreign reserves, energy sector reforms opened the market for private sector activities, and incentivized investments in renewable energy carriers stimulated a rise in private investments. All these measures led to macroeconomic stabilization in Egypt, improved the country's business environment and credit ranking, and allowed for greater resilience of the economy to the impacts of the pandemic (Alnashar et al. 2020). Nevertheless, structural challenges persist, such as limited non-oil private sector activity and low productivity levels in the formal private sector, which restrict the creation of productive employment opportunities at scale (World Bank 2021). Yet this is precisely what will be key to sustained growth, as it is the basis for addressing the major interrelated challenges Egypt is facing - high population growth and poverty. Egypt is the most populous country in the MENA region, and has one of the fastest growing populations in the world, with half of the country's population under the age of 24 (World Bank 2021). Broad-based productive employment is needed to address the high youth unemployment and the prevailing high national poverty level. More than one quarter of the Egyptian population lives below the national poverty line (World Bank 2021) with a pronounced spatial (rural-urban) poverty divide: Around 57% of the population lives in rural areas with a poverty rate three times higher than in urban areas (IFAD 2021).

Although the Egyptian economy has experienced strong growth overall, this has not translated into any substantial progress in per capita income or improvements in socio-economic conditions. The limited progress in per capita income growth and poverty reduction are related to fundamental challenges of the structure and productivity levels of growth. Several reasons contribute to the missing link between overall growth and poverty reduction: Adjusting for population growth (averaging 2% annually since the 1990s), Egypt's per capita income grew by an average of 2.4% (real terms) during 2004-2018, lower than other middle-income economies. Further, Egypt was not able to capitalize on the potential growth effects of its large working age population but even experienced a decline in the share of employed in the working-age population and particular low youth's employment rates. Lastly, Egypt's job landscape lacks well-paying high-productive job in the formal private sector. For example, the labor-intensive construction sector experienced an employment boom given the infrastructure megaprojects but employment was predominantly informal and productivity levels remain low (World Bank 2021).

3.2 History of Economic Policies & Structural Reforms in Egypt

Paradigm shifts and structural reforms have been an integral part of Egyptian economic policy since independence from the British in 1922 and the 1952 revolution that abolished the monarchy. The political revolution was accompanied by profound socioeconomic restructuring. In the newly established republic, the public sector became the engine of growth under a state-led industrialization model characterized by land reforms, high spending on public infrastructure and social services and a guaranteed employment scheme. The state controlled the economy – the Suez Canal was nationalized, private sector activities were restricted to agriculture, real estate and the informal economy, and state-owned enterprises (SOEs) hold the monopoly in manufacturing and the services sectors of transport, trade, and banking – and protected the economy by import-substitution policies. High public expenditures and military spending slowed growth to 2.8% annually (real terms). In 1973, an 'Open Door Policy' was placed at the core of Egypt's economic policies. This paradigm shift opened the economy to foreign investment and promoted the role of the private sector. A boom decade followed with an average annual growth of 8% (real terms) between 1974 and 1985, also stimulated by a favorable international environment with high oil prices, reopening of the Suez Canal and foreign exchange brought by remittances. Revenues were redistributed through subsidies and continued employment guarantees for lower income levels, and investment opportunities in imports for the upper income class. Imports were stimulated by an overvalued exchange rate coupled with the establishment of the Port Said Free Trade Zone. This, however, reduced demand for domestically produced goods and led to underutilization of domestic industries. Further, soaring imports led to high external debt, which exceeded 100 percent of Egypt's GDP in 1981. The oil price crash in 1985/86 heavily depressed Egypt's sources of revenue, public sector spending on subsidies could no longer be supported. The rising budget deficit was met with an expansionary monetary policy that caused inflation to rise to almost 20 %. Exports declined, Egypt could no longer service its external debt and had to resort to exceptional financing highlighting the necessity of reforms. An economic stabilization program of the IMF and structural adjustment program with the World Bank were initiated in 1991 with the objective of further opening the economy and generating sustained growth (Alissa 2007).

The first wave of reform (1991 to 1998) was characterized by successful stabilization of the economy (currency stability through liberalized interest rate and foreign exchange market), privatization with one third of SOE's assets being privatized and accession to the World Trade Organization (WTO). The second wave (1998 to 2004) focused on trade and institutional policies. Legal economic reform measures promoted Special Economic Zones, export promotion, intellectual property rights, and combated money laundering, in 2003, the exchange rate was liberalized (Alissa 2007). Several trade agreements were signed, which, together with participation in the WTO, led Egypt to reform its trade policies and become more aligned with international standards, especially in the agricultural and industrial sectors. Egypt's economy became more intertwined with the global economy, as evidenced by the fact that the average growth rate of OECD countries was a significant determinant in Egypt's growth during this period (Dobronogov & Iqbal 2007).

An intensification of the market-oriented economic reforms marked the third wave (2004 to 2010), characterized by efforts to align with the Washington Consensus, a set of macroeconomic policies proposed by the World Bank and IMF to support rapid transformation of traditional economies. To remove constraints to growth, the public and financial sectors were restructured, and the pace of privatization accelerated through the privatization of SOEs and joint venture banks with more than half of the baking sector being privately owned at the end of 2006. In addition, business regulations

were streamlined, and trade liberalization increased. The reforms took effect: Growth rose from 4.5% in 2004 to 7.2% in 2008, Egypt was listed as a top performer in the World Bank's 2010 Doing Business Report and grew at an average rate of 5% during the global recession (2008-2010). Also, social indicators improved: The reforms since the 1991 had led to a substantial decline in child mortality, rise in average schooling years and increase in life expectancy. Between 2005 and 2009, the strong growth performance triggered a 14% decline in the share of population living below the national poverty line (Khan & Milbert 2012). However, benefits of growth did not spill over to large parts of the Egyptian population given population dynamics: Job creation was only modest, as employment created by growth has not kept pace with the increase in the labor force. Small and medium-sized enterprises (SMEs) faced challenges in obtaining credit and finding qualified workers due to skill mismatches in the labor market. Thus, macroeconomic progress was counteracted by un- and underemployment and the persistence of a large and even growing informal sector, which according to some estimates accounted for about half of Egypt's GDP (Khan & Milbert 2012).

In 2011, popular uprising against undemocratic governments, corruption and high unemployment swept the Arab world, leading to the overthrow of the regime in Egypt. In the transition period, the economy fell into considerable distress, growth, employment, external current account balance, foreign direct investment, and the fiscal position deteriorated substantially. Under the post-Arab Spring governments, commitment to private sector activities and a liberalized economy was expressed, the major issues of creating jobs and an economic structure able to absorb the labor force and of cutting poorly targeted subsidies (fuel and food) which accounted for 10% of GDP and 25% of government expenditures in 2011 were central. A coherent policy plan was lacking, and given the high budgetary needs resulting from the multiple challenges, it became clear that the required comprehensive reforms would necessitate substantial external funding. The Egyptian authorities developed a program of policy measures and structural reforms supported by the IMF that closed the financing gap, restored investor confidence and competitiveness, and enabled macroeconomic stabilization (IMF 2016). Major obstacles to reforms are the dominance of politically affiliated large corporations in the private sector and the role of the military in Egypt's post-Arab Spring economy of President el-Sisi which is central in the state-led investment strategy and controls most of the economic portfolio, thus crowding-out private activities (Sayigh 2022). Assessing the impact of the different reforms on productivity patterns and identifying sectors that qualify as drivers of sustained growth is essential to inform future policy measures that aim to enable inclusive growth in Egypt.

4. Method

This paper adopts the methodology applied by Di Meglio et al. (2018) in their analysis of the contribution of services to aggregate productivity and output growth within a Kaldorian framework. Their study is the first to tests the validity of Kaldor's Growth Laws at a disaggregated level of services by accounting for four service categories (trade, transport, business, and public services). Moreover, they replace Kaldor's third law with a sectoral shift-share decomposition (SSD) analysis that allows for a decomposition of overall labor productivity growth in differential within-sector labor productivity growth (within effect) and labor reallocation between sectors (reallocation effect).

Kaldor's Growth Laws

As outlined in section 2.1, Kaldor formulated a set of empirical generalizations regarding the relationship between output, employment, and productivity at the sectoral level of an economy to aggregate indicators. While Kaldor focused on the manufacturing sector as a driver growth and formulated the laws in the differentiation of manufacturing vs. non-manufacturing, this thesis tests the laws for different sectors of the economy with focus on heterogeneous service sectors, hence, in the following explanations on the regression specification the index j refers to the sector under consideration.

First Kaldor's Growth Laws

The first KGL refers to Kaldor's overall finding of a causal relationship running from sectoral (manufacturing) to aggregate VA growth. Thus, the first law can be tested by

$$q_{va_t} = \alpha_{1j} + \beta_{1j} q_{jt} + \varepsilon_{jt} \quad \text{with } \beta_1 > 0 \tag{A}$$

with the indices j and t representing sector and time. q_{va_t} reflects overall VA growth, q_{jt} reflets the output growth of the tested sector given by the growth of sectoral VA. The error term ε_{jt} is assumed to be normally distributed. Since total VA growth is given by the weighted sum of sectoral output growth, sectoral output growth is correlated with total VA growth and equation (I) suffers from the problem of spurious correlation. To address this potential bias, Thirlwall (1983) proposed two additional modified regressions:

$$q_{njt} = \alpha_{2j} + \beta_{2j}\, q_{jt} + \varepsilon_{jt} \quad \text{with } \beta_2 > 0 \tag{A-1}$$

Equation (A-1) regresses the VA growth of all non-tested sectors (q_{nj}) on the output growth of the tested sector (q_j). Thus, the estimation tests whether output growth in the sector of interest is correlated with output growth outside its own sector.

$$q_{va_t} = \alpha_{3j} + \beta_{3j}\,(q_{jt} - q_{njt}) + \varepsilon_{jit} \quad \text{with } \beta_3 > 0 \tag{A-2}$$

Equation (A-2) isolates the impact of growth in the tested sector on total VA growth from the impact of growth stimulated through inter-sectoral linkages by regressing overall VA growth on the excess of sectoral output growth (q_j) relative to the output growth of all non-tested sectors (q_{nj}).

Second Kaldor's Growth Laws

The second KGL is based on the increasing returns to scale which are found to be inherent to the engine of the growth sector (manufacturing) and states a positive correlation between the growth of sectoral output and the growth of sectoral labor productivity. Economies of scale based on technological change not only enable faster growth of manufacturing output but disproportionally more increase productivity resulting in slower growth of sectoral employment than sectoral labor productivity growth. Hence, the higher the sectoral economies of scale, the lower is the sectoral elasticity of employment (Di Meglio et al 2018).

Based on Verdoorn's Law on the causal relationship running from output growth to labor productivity growth[1], Kaldor (1966) regressed sectoral labor productivity growth (lp_j) on sectoral output growth:

$$lp_j = \alpha_{4j} + \beta_{4j}\, q_{jt} + \varepsilon_{jt} \quad \text{with } \beta_4 > 0 \tag{B}$$

with β_4 representing the indicator of IRS.

However, given the identify of labor productivity as the ratio of sectoral output to employment, *equation (B)* faces the problem of spurious correlation. To avoid this bias, Thirlwall & Wells (2003) regress sectoral employment growth on sectoral output growth, thereby expressing the relationship in terms of employment elasticity:

$$e_{jt} = -\beta_o + (1 - \beta_5)\, q_{jt} + \varepsilon_{jt} \quad \text{with } 0 < \beta_5 < 1 \tag{B-1}$$

with $(1 - \beta_5)$ capturing the elasticity of employment with regard to output growth. *Equation (B-1)* can be written as:

$$e_{jt} = \alpha_{4j} + \beta_6\, q_{jt} + \varepsilon_{jt} \quad \text{with } \beta_6 > 0 \tag{B-2}$$

with e_{jit} capturing sectoral employment growth and q_{iit} sectoral output growth.

Conceptually, *equation (B)* and *(B-2)* capture the same relationship since sectoral labor productivity growth is measured by sectoral output (value-added) growth in relation to sectoral employment growth. However, the interpretation of the correlation coefficients (β_4 and β_6) differs between the two equations: In *equation (B)*, the correlation coefficient indicates the percentage change in productivity growth given a one percent increase in output growth, thus, the higher the coefficient the more pronounced the effect of increasing returns to scale. In *equation (B-2)*, the correlation coefficient indicates percentage change in employment growth given a one percent increase in output growth, thus, a higher coefficient value indicates a higher elasticity of employment growth and hence the lower the effect of economies of scale. To arrive at this percentage and elasticity interpretation of the coefficients, the output and employment growth variables must be expressed in logarithmic form. These and other data modifications required to obtain consistent interpretations of the test of Kaldorian growth laws are described in the following section on the data.

Third Kaldor's Growth Laws

The third KGL states the positive relationship between manufacturing output growth and the growth of labor productivity outside the manufacturing sector based on labor reallocation. Kaldor assumes for the non-dynamic (non-manufacturing) sectors of an economy diminishing returns to scale for labor. Thus, by reallocating surplus labor, productivity growth increases in the non-manufacturing sectors. To estimate the third law, total labor productivity growth ($lp_{total\ t}$) is regressed on the growth of non-manufacturing employment (e_{nj}) with the expectation of a negative coefficient and controlled for growth in manufacturing output (q_j) or employment in line with the logic of the second KGL (Wells & Thirlwall 2003, Dasgupta & Singh 2005, 2007):

[1] The economic law formulated by Verdoorn in 1949 states that in the long-run productivity grows proportionally to the square root of output and thus establishes a causal relationship running from output growth to productivity growth (Verdoorn 1980).

$$lp_{total\,t} = \alpha_{5t} + \beta_8 q_j - \beta_9 e_{nj} \quad \text{with } \beta_8 \langle 0;\ \beta_9 \rangle 0 \tag{C}$$

Equation (C) however comes like *equation (A)* with the problem of spurious correlation of the variables and an identification problem regarding the drivers of total labor productivity growth. Two main mechanism are underlying the third KGL of increasing economy-wide labor productivity: First, labor productivity within the economic sectors can increase through capital accumulation or technological progress. Second, the cross-sectoral shift of labor from low- to high-productivity sectors (structural change) can increase overall labor productivity. To shed light on the excess and relative importance of these two mechanisms, this thesis follows McMillan & Rodrik (2011), Timmer & de Vries (2009) and Di Meglio et al. (2018) and applies a shift-share decomposition (SSD) analysis instead of testing the third KGL. This growth accounting method allows to decompose aggregated productivity growth into differential labor productivity growth within sectors and labor reallocation between sectors.

Shift-share decomposition analysis

Growth-enhancing structural change requires that the sectoral share patterns in economic output and employment correspond, i.e., if sectoral output grows but the sector's share in employment remains constant, growth is considered "job-less" (Bhalotra 1998). This phenomenon is particularly pronounced in India, where the services sector contributes to nearly 50% of GDP but accounts for only 30% of total employment. In India's growth trajectory, most of overall productivity growth is attributable to within-sector productivity growth, with only a small and even decreasing contribution from structural change, which leads to large wage differentials between sectors due to the high skill requirements in the service sector. This structural development leaves the country without labor absorption potential in non-agricultural sectors, which is a worrying fact for a country with almost half of the labor force still employed in the agricultural sector (McMillan et al. 2017). Hence, the SSD analysis allows determining to what extent overall labor productivity growth can be attributed to a structural change process (labor reallocation) and to what extent labor productivity growth is based on within-sector labor productivity growth. Conceptually, the SSD is a supply-side approach and reflects whether the shift in inputs (labor) matter in quantitative terms for aggregate labor productivity growth (Timmer & Szirmai 2000).

Two-fold vs. three-fold decomposition

The SSD of labor productivity has its origins in the decomposition of a shift in labor per unit of product by Fabricant (1942) but has since mainly emerged as an analytical tool to assess shifts in value-added per unit of labor. Two approaches to the SSD are dominant – a two-fold decomposition of aggregated labor productivity growth into the within-sector effect and between-sector effect (Timmer & de Vries 2009, McMillan & Rodrik 2011, McMillan et al. 2017) where the change in overall labor productivity ($\Delta\pi$) between the beginning (π_0) and the end (π_T) of period under consideration is given by

$$\Delta\boldsymbol{\pi} = \frac{\boldsymbol{\pi_T} - \boldsymbol{\pi_0}}{\boldsymbol{\pi_0}} = \sum_{j=1}^{N} \frac{\left(\pi_{T,j} - \pi_{0,j}\right) * s_{0,j}}{\pi_0} + \sum_{j=1}^{N} \frac{\left(s_{T,j} - s_{0,j}\right) * \pi_{T,j}}{\pi_0} \tag{D}$$

with the subscript j denoting the sector and s_j capturing the share of the sector in total employment at beginning and end of the considered period. The first term captures the within-sector effect and the second term the between sector reallocation effect. Conceptually, the latter will be positive when sectoral employment increases. However, for assessing labor shifts it matters whether the sector

absorbing labor has a (static) higher productivity level or (dynamic) higher productivity growth rates since migration into sector with a higher productivity level but lower growth rates will in the long-term decrease overall output growth. Since the two-fold decomposition does not account for these sectoral characteristics, Timmer & Szirmai (2000) and Timmer et al. (2015) propose the three-fold decomposition:

$$\Delta\boldsymbol{\pi} = \frac{\boldsymbol{\pi_T} - \boldsymbol{\pi_0}}{\boldsymbol{\pi_0}} = \sum_{j=1}^{N} \frac{\left(\pi_{T,j} - \pi_{0,j}\right) * s_{0,j}}{\pi_0} + \sum_{j=1}^{N} \frac{\left(s_{T,j} - s_{0,j}\right) * \pi_{0,j}}{\pi_0} + \sum_{j=1}^{N} \frac{\left(\pi_{T,j} - \pi_{0,j}\right) * \left(s_{T,j} - s_{0,j}\right)}{\pi_0} \quad \text{(E)}$$

$$\Delta\pi = \text{ISE} + \text{SCE} = \text{ISE} + \text{SSE} + \text{DSE} \quad \text{(E-1)}$$

The change in overall labor productivity ($\Delta\pi$) is captured by the effect of within-sector productivity growth (intra-sectoral effect, ISE) [*first term*] and the effect of structural change (SCE) which can be further decomposed into a static shift effect (SSE) [*second term*] and a dynamic shift effect (DSE) [*third term*]. As mentioned, economic sectors differ not only in terms of their productivity levels, but also in terms of their productivity growth rates, therefore resource (labor) reallocation between sectors has both static and dynamic effects: The SSE captures productivity growth caused by a shift of labor towards a sector with a higher productivity level at the beginning of the period and the DSE captures a shift of labor towards more dynamic sectors which are characterized by higher labor productivity growth rates. The differentiation of the SCE into these two effects allows to test two hypotheses that are related to the impact of structural processes – the '*structural bonus*' and '*structural burden*' hypothesis (Timmer & Szirmai 2000, Di Meglio et al. 2018). The *structural bonus* hypothesis assumes a positive relationship between structural change and productivity growth based on labor reallocation from low- to high productivity activities, formally: $SCE > 0\ with\ SCE = SSE + DSE$. The *structural burden* hypothesis postulates that labor reallocates into sectors with lower productivity growth rates, thus, overall productivity growth will decrease, formally: $DSE < 0$. This hypothesis relates to the (non-) existence of increasing returns to scale within the sectors. If the hypothesis does not hold ($DSE > 0$), then increasing returns to scale exist, i.e., these sectors are characterized by increasing productivity levels and have not reached their structural burden in labor absorption. Thus, testing the *structural burden* hypothesis complements to some extent results obtained from testing the second KGL.

Limitations of the SSD Analysis

The SSD analysis is based on several assumptions that may cause the contribution of SCE and its disaggregated SSE and DSE to be over- or underestimated in case of a violation of these assumptions. In the following, based on Timmer & Szirmai (2000: 381), the assumptions and consequences of violation are shortly discussed and will be used to guide the discussion of results in section 7.

First, the more aggregate the level of analysis, i.e., aggregate sectors with few or no sub-sector breakdowns, the more likely there is to be an underestimation of the importance of labor reallocation due to the failure to account for labor shifts between sub-sectors. Research points to the finding of the absence of the *structural bonus* hypothesis in manufacturing due to aggregate output and employment data for the manufacturing sector. Hence, this is primarily a data issue; the level of disaggregation in the analysis conducted in this paper will be discussed in the following data section. Second, the SSD analysis assumes that marginal productivity equals average productivity which precludes a change in average productivity by labor shifts between sectors. However, when surplus labor leaves a

sector, average productivity in this sector will increase. The SSD analysis will account for that labor shift as part of the within effect even though it was a shift due to labor reallocation (*see equation D*). Therefore, this accounting leads to an underestimation of the importance of SCE. Third, the SSD analysis assumes factor input homogeneity. However, input quality and hence input productivity may differ across sectors. If a sector has a higher level of productivity due to higher levels of input quality, the SCE of resource allocation towards that sector includes the effect of higher input quality. This leads to an overestimation of the SCE. Here, considerations on the quality of labor inputs in the different sectors would be needed capturing the higher labor quality in technologically more sophisticated sectors. Lastly, if one sector has high externalities due to stronger for- and backward linkages, productivity growth in that sector triggers output and productivity growth in other sectors in several ways. Therefore, analyzing structural shifts to dynamic sectors with strong linkages and technology and knowledge spillovers is likely to underestimate the SCE, as cross-sector spillovers are not considered. Further, since within-sector externalities are precluded by the assumption of no causal link between productivity and output growth within a sector, the contribution of SCE as measured by the SSD analysis is further underestimated. To conclude, it is likely that the SSD conducted in this thesis underestimates the effect of structural change since, given the generally low level of productivity in Egypt, the overestimation due to the assumed factor input homogeneity is likely to be small.

To answer the research question which economic sectors qualify as engines of growth in Egypt, first, the validity of the first and second KGL is tested separately for Egypt's economic sectors. Replacing the third law, an SSD analysis is conducted for the same sectors to determine the relative extent and relevance of the SCE disaggregated into its static and dynamic effects over the ISE for these sectors. To account for the different economic policies and reforms Egypt has experienced since the 1990s as outlined in section 3.2, a sensitivity analysis for the SSD is conducted by accounting for the distinct time sub-periods 1991-1998 (first wave), 1998-2004 (second wave), 2005-2011 (third wave), 2011-2015 (aftermath Arab Spring), and 2016-2018 (latest IMF reform, fourth wave).

5. Data

5.1 Data Source & Data Description

To minimize potential underestimation of the SCE due to the failure to account for labor shifts between sub-sectors, data on sectoral output (VA) and employment in Egypt is required at the most disaggregate level available. Therefore, data from the 2021 Economic Transformation Database (ETD) from the Groningen Growth and Development Centre (GGDC) and the United Nations University World Institute for Development (UNU WIDER) is used. The ETD is the successor to the GGDC's 10-sector database, which provided the data basis for many relevant studies on structural transformation in developing contexts that this thesis draws on (Timmer et al. 2015, Di Meglio & Gallego 2022).

In the following, the main content, sources, and methods of the database are summarized based on the ETD technical note (de Vries et al. 2021). The ETD provides harmonized time-series data of employment as well as real and nominal value-added (VA) in local currency by 12 sectors in 51 countries, annually from 1990 to 2018. The database includes 20 Asian, nine Latin American, four Middle East and North African, and 18 sub-Saharan African countries at varying levels of economic development and is constructed based on in-depth investigation of the availability and usability of statistical sources on a country-by-country basis. The 12 sectors are distinguished following the International Standard Industrial Classification, Revision 4 (ISIC Rev. 4), an overview of the sectors and corresponding

description is given in *table 1*. An important feature of ETD is the distinction between financial and business services (categories of modern services), which allows advancing research on the role of services in development, as this thesis seeks to do.

Table 1: ETD Data - Sector disaggregation based on ISIC Rev. 4.

Sector	ISIC Rev. 4 description
Agriculture	Agriculture, forestry, fishing
Mining	Mining and quarrying
Manufacturing	Manufacturing
Utilities	Electricity, gas, steam and air conditioning supply; Water supply; sewerage, waste management and remediation activities
Construction	Construction
Trade services	Wholesale and retail trade; repair of motor vehicles and motor-cycles; accommodation and food service activities
Transport services	Transportation and storage
Business services	Information and communication; professional, scientific and technical activities; administrative and support service activities
Financial services	Financial and insurance activities
Real estate	Real estate activities
Government services	Public administration and defence; compulsory social security; education; human health and social work activities
Other services	Arts, entertainment and recreation; other service activities; activities of households as employers; undifferentiated goods- and services-producing activities of households for own use; activities of extraterritorial organizations and bodies

Source: de Vries et al. (2021).

Data limitations: The issue of informality in measures of output and employment

For sectoral output, sectoral gross value-added in a million Egyptian Pounds (livre égyptienne, LE) at constant 2015 price is used, employment is captured by number of persons engaged in thousands. Employment in the ETD is defined as "all persons engaged", including all paid employees, the self-employed, and family workers. This attempt to include informal workers is especially relevant in developing economies where these categories can account for a large share of total employment. Further, since data on value-added is computed within the systems of national accounts, the coverage of the informal sector in VA differs across countries depending on the quality of the national sources.

Data for Egypt: Employment

For Egypt, the ETD interpolated total employment between the benchmark years 2006 (based on population census) and 2018 (based on statistical yearbook) based on trends from the annual estimates of labor force status from the statistical yearbooks of the Central Agency for Public Mobilization and Statistics (CAPMAS) except agriculture employment, which is interpolated in this period based on trends in the 'economic active population' in agriculture. Sectoral employment in all other reported sectors is interpolated based on productivity-based trends and normalized to the total employment

resulting from the statistical yearbook trends. Data before 2006 is computed by backward extrapolation based on trends from the 10-sector database (de Vries et al. 2021).

In Egypt, informal employment is an important factor in total employment. In 2017, the share of informal employment (the share of workers not participating in social security) in agriculture was estimated at 98.1%, in construction at 90%, in wholesale and retail and accommodation and food services (both part of trade services) at 85% (World Bank 2021). As further orientation: in 2019, the share of employment outside of formal establishments (proxy for informal employment) was at 45%, with the agricultural sector displaying the highest rate of informality with over 90% of employment outside establishments. The sectors of construction, household activities, and transportation and storage had informality rates above 80% (Dcode 2021). Given the source underlying agricultural employment, it can be assumed that informal employment is captured in the data. For the other sectors, employment levels are computed using population census information which tend to have a more complete coverage of informality (McMillan et al. 2014). Thus, regarding employment, informality is assumed to be captured in the data, however, the extent cannot be exactly determined.

Data for Egypt: Value-added

For value-added, annual data on sectoral GDP in current prices from the Egyptian Ministry of Planning and Economic Development national account data is used in the ETD. Sectoral constant price value-added data starting from 2007 comes from the Central Bank of Egypt. Prior to 2007, value-added at constant prices was extrapolated backward based on trends from official UN Country Data for the main aggregates, with subsectors following parent sector trends (de Vries et al. 2021), which precludes the mapping of heterogeneous development in the subsectors before 2007. As mentioned in the general database limitation, since value-added is computed within Egypt's system of National Accounts, the data is assumed to be largely exclusive regarding the VA contribution of the informal sector. The IMF estimates that the size of the shadow economy in Egypt averaged 34% between 1991 and 2015 (Medina & Schneider 2018). The extent of VA undercutting has been illustrated by a recent (published in 2022) comprehensive review of national accounts in Egypt CAPMAS 2022). Since the review refers to the fiscal year of 2017/2018, the latest year covered by the data used in this thesis, the results give an idea of the potential bias underlying the VA data in terms of informality. In 2017 and 2018, CAPMAS conducted an economic census that covered 3.7 million economic establishments, with around 1500 public (business) sector establishments and 3.7 million in the private sector covering both formal and informal establishments. The census covered a total of 13.5 workers in all establishments (CAPMAS 2020). The national accounts review combined the census results with labor force survey data to estimate the level of informal activity outside establishments, using methods recommended by the IMF and OECD. The review resulted in a 7.5% increase in nominal GDP for the fiscal year 2017/2018, with the majority (92%) of the increase coming from construction (37%), manufacturing (18%), education and health (9.4%), other services (8.8 %), real estate activities and business services (8.8 %), transportation and storage (6%), and electricity (4%) (CAPMAS 2022).

In summary, since based on Egypt's system of national accounts, the ETD data show a clear underestimation bias in the contribution of informality in value-added. However, due to the consistent and harmonized measurement of the data in the ETD, it can be assumed that the bias is similar for each data point. Moreover, this thesis uses growth rates and is concerned with the relative importance of the different sectors, so it is assumed that the underlying bias tends to balance out. Consistent with studies on patterns of structural change in developing contexts, a five-year moving average of both

the annual constant price and employment data series is computed based on logarithmic growth rates to smooth out short-term variations and cyclical fluctuations in the annual data series (Pieper 2003, McMillan & Rodrik 2011, Di Meglio et al. 2018).

Sectoral disaggregation

To address the contribution of services vis-à-vis to manufacturing in productivity growth, this paper uses sectoral data on the most sectoral disaggregation level available. However, not all sectors reported in the ETD are suitable to be used for the productivity analysis conducted in this thesis. The VA from real estate activities is composed of the VA from rental activities and imputations of owner-occupied housing, the latter based on an equivalent rent approach. However, as there is no employment equivalent, the ETD recommends excluding real estate activities from productivity analyses (de Vries et al. 2021). In Egypt, real estate activities are pushed by the high population dynamics and the expansion of urban areas of Cairo and Alexandria, with real estate investment accounting for around 16% of Egypt's GDP (FitchSolutions 2020). However, since this thesis is concerned with productivity growth, the focus of the analysis is on the 11 sectors with reported employment dynamics (see *table 2*, with $j = 1, \dots, 11$ in the empirical models), which allows a differentiated statement on the ability of heterogeneous sectors to sustain productivity growth to inform tailored policy measures.

Table 2: (Dis-)aggregation levels of economic sectors.

Primary sector	**Agriculture**

Secondary sector	Industry
	• **Manufacturing**
	• Other industries
	  ○ **Mining**
	  ○ **Construction**
	  ○ **Utilities**

Tertiary sector	Total services
	• Market services
	  ▪ Traditional services
	  ○ **Trade services**
	  ○ **Transport services**
	  ▪ Modern services
	  ○ **Business services**
	  ○ **Financial services**
	• Non-market services
	  ○ **Government services**
	  ○ **Other services**

Note: Bold sectors indicate sectoral focus of the analysis.
Source: **C**lassification following Di Meglio et al. (2018) and Duarte & Restuccia (2020).

Going beyond the traditional three-sector focus of economic growth analysis, the disaggregation of the services sector into seven categories with a clustering in market and non-market services, and the differentiation of traditional and modern services within market services allows to account for the substantial heterogeneity among services that has developed in the last decades (Herrendorf et al. 2014). As today's emerging economies are increasingly dominated by services, it is essential to distin-

guish between the activities within services characterized by different structural compositions that determine the possibility of exploiting economies of scale (Dasgupta & Singh 2007) and thus the relevance and sustainability of their contribution to productivity and economic growth.

The impact of heterogeneity between market vs. non-market services on aggregate productivity is stressed in the study by Duarte & Restuccia (2020). They differentiate between 'traditional' and 'non–traditional services' where traditional services comprise non–market services (government and rents for housing and health services in personal consumption expenditure), while non–traditional services include market services (communication and transport services, financial and related services). The findings highlight heterogeneous income elasticity of relative prices within services: while for non-market services a positive income elasticity is found (i.e., the relative price increases with income), the income elasticity for market services is negative. This finding challenges the notion of a positive income elasticity of prices in the service sectors commonly regarded as support for larger cross-country productivity differences in manufacturing than in services. Hence, it also challenges the interpretation that the process of structural transformation with resources being reallocated to services stimulates divergence of aggregate productivity differences. The substantial differences in the relative price behavior across service categories matter for productivity inferences, i.e., in lower income countries large aggregate productivity losses are due the heterogeneity in services. Productivity differences in the service sectors with negative income elasticity are at least as large as those in manufacturing and much larger than those service sectors with positive income elasticity (Duarte & Restuccia 2020).

Non-market services are characterized by the absence of market-determined prices, direct and indirect consumers, and collective consumption of output which conceptually and methodically poses a challenge to the concept of productivity (definition and measurement) in contrast to the relatively unproblematic productivity measures for market services (Djellal & Gallouj 2013). Since no price data is available, non-market value-added is traditionally approached from input instead of output measures which introduces a notable distortion in the estimations of results when considering aggregate services. The measurement problem applies specifically to government services, where productivity measurement remains inadequate and constrained by data deficiencies (Di Meglio et al. 2015). Since non-market services cannot be left out in the analysis of output and employment, they must be accounted for in a separate category to minimize biased and misleading results in aggregate services. This establishes the non-market vs market services differentiation. To account for differences underlying market services such as economies of scale potential, market services are distinguished in traditional services with lower potential due to low tradability and modern services with higher potential due to higher tradability and stronger inter-sectoral linkages.

The disaggregation level of services provided by the ETD allows to adequately assess the contribution of the heterogeneous services sectors to productivity growth and minimize biased estimation results. In contrast to the disaggregate service sector and 'other industries' (mining, construction, utilities) stands the aggregate manufacturing sector, especially in light of technological progress in the manufacturing sector with the emergence of knowledge-intensive subsectors comparable to modern service sectors characteristics (Dasgupta et al. 2017). Given a lack of suitable data, an analysis of disaggregate manufacturing sector is not possible - this data limitation will guide the analysis and discussion of the results of the comparative contribution of manufacturing vs. services to productivity growth. The data span the period 1990 to 2018, covering the four waves of structural reforms in Egypt which allows to account for different time sub-periods and thus time- and reform-specific trends.

5.2 Descriptive Statistics

Value-added

Between 1990 and 2018, the average annual VA growth rate in Egypt was at 5%. While VA grew at 5.3% annually between 1990 and 2010, the Arab Spring in 2011 and the resulting political and economic instability slowed growth significantly. In 2011, the annual VA growth rate fell to 1.7%, in the following five-year period (2011 - 2016), the average VA growth rate was 2.4%. The 2016 IMF reform enabled economic stabilization, with a first impact in 2018 with a total VA growth rate of 5.4%.

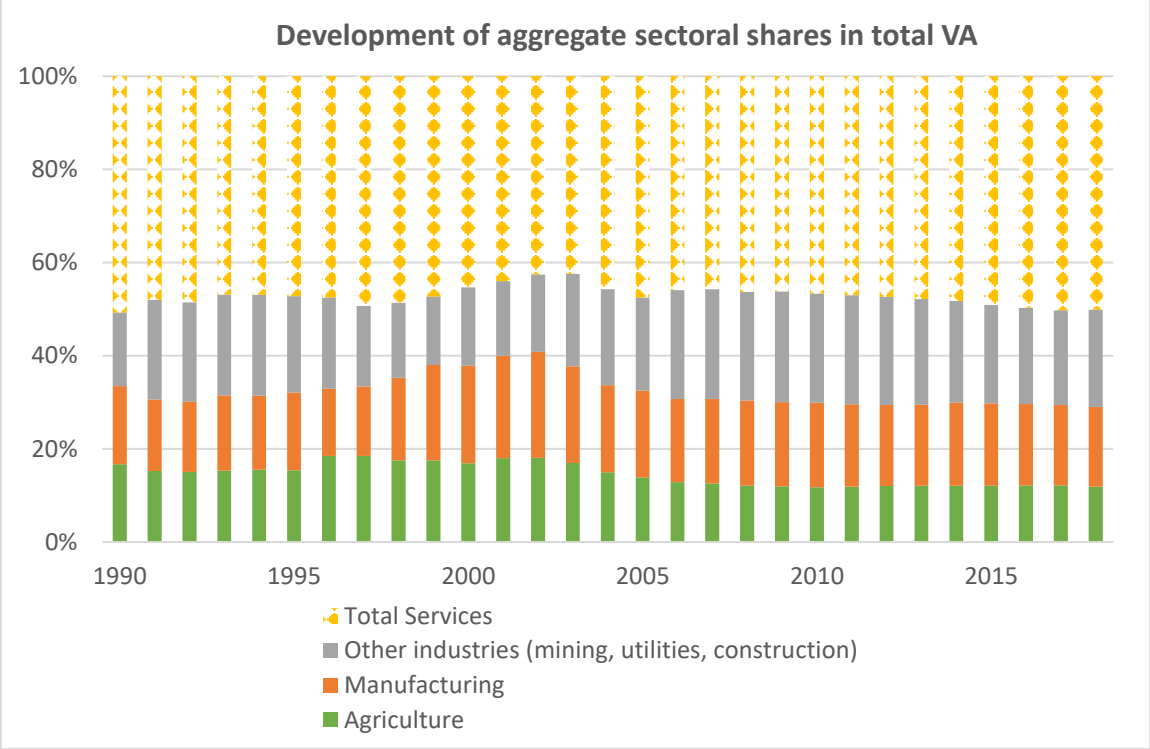


Figure 1: Development of aggregate sectoral shares in total VA in Egypt from 1990 to 2018. *Note*: Order in diagram corresponds to order in the legend.
Source: Author's estimation with data from de Vries et al. (2021).

Looking at the contribution of economic sectors to Egypt's VA trajectory over the past three decades (see *figure 1*), the aggregate service sector dominates economic performance and contributes around 50% to Egypt's output. Agriculture is the smallest contributor overall, with a decreasing share from about 15% in the 1990s to 10% in 2018. The share of manufacturing is constantly below 20% and is almost always lower than the share of other industries, with exceptions in the early 2000s. Disaggregation of other industries (*figure 2)* reveals that the share is mainly driven by mining given Egypt's mineral resource abundance (e.g., gold, copper, coal, tantalite) (USGS 2020). In recent years, the share of construction has increased substantially due to Egypt's national mega-projects such as the new administrative capital or the new Suez Canal and associated economic zones. Given the strong role and dynamics of 'other industries' in Egypt's economic patterns, this thesis considers the three sectors (mining, construction, utilities) separately in the analysis. This contrasts with the guiding paper by Di Meglio et al. (2018) that considered 'other industries' in aggregate.

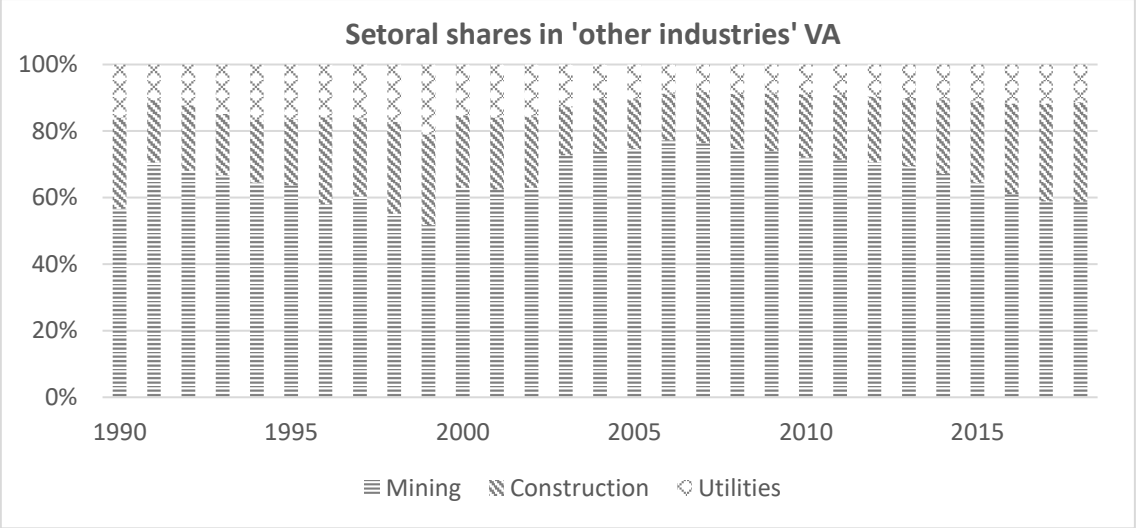


Figure 2: Development of sectoral shares in 'other industries' VA in Egypt from 1990 to 2018.
Source: Author's estimation with data from de Vries et al. (2021).

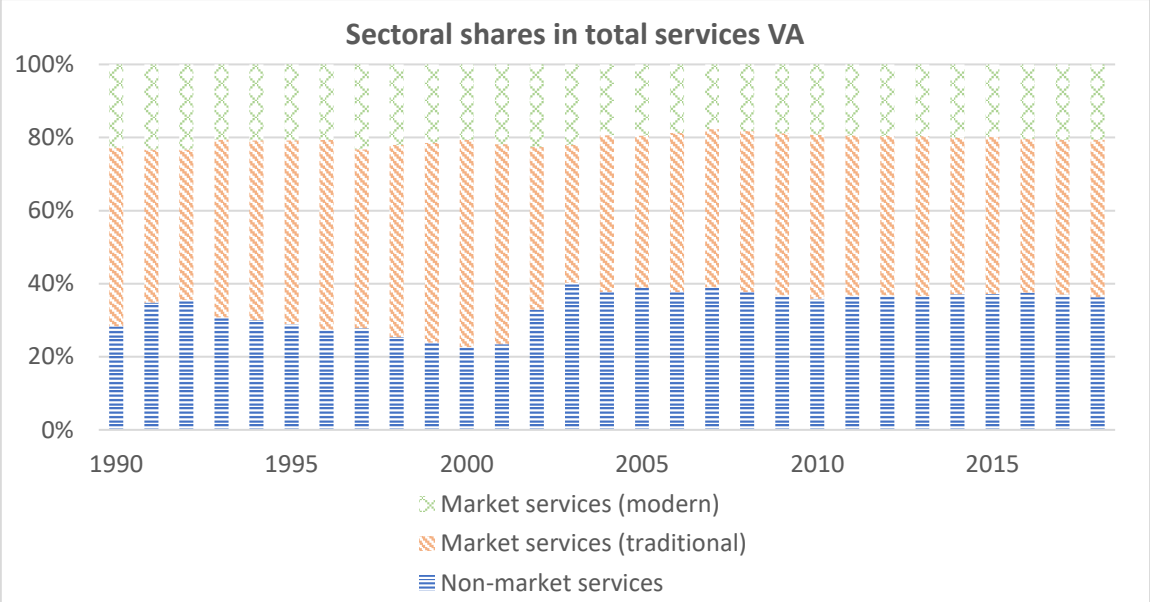
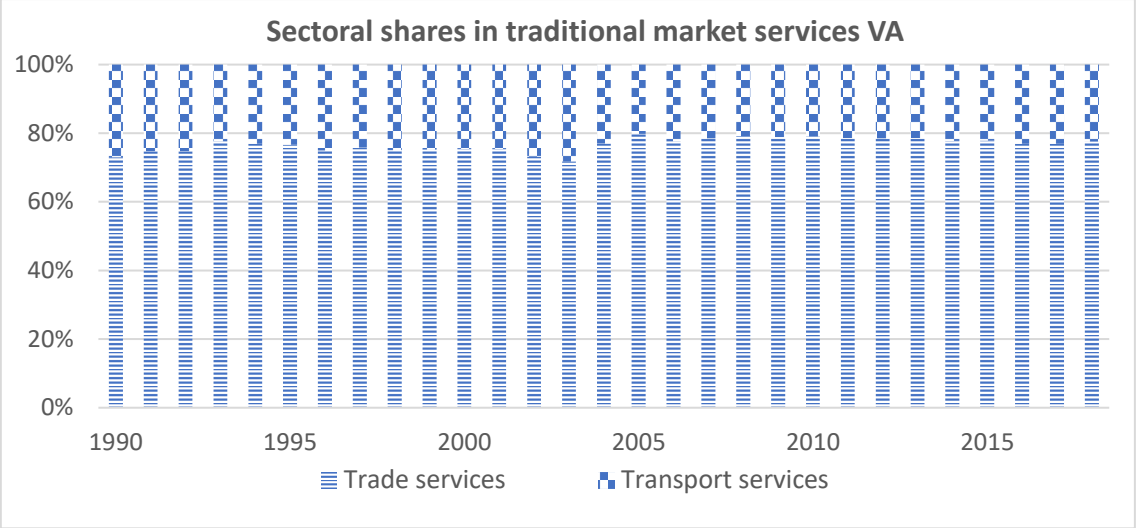
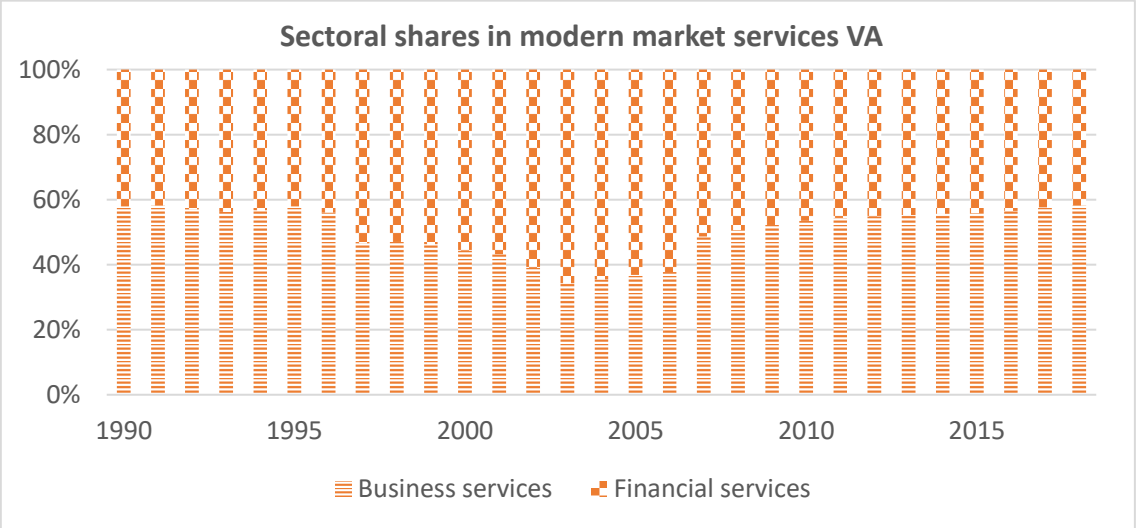


Figure 3: Development of sectoral shares in total services VA in Egypt from 1990 to 2018.
Source: Author's estimation with data from de Vries et al. (2021).

The service dominance in Egypt's economic output gives rise to the question of the development of sectoral shares within total service VA. A first disaggregation into non-market and market (traditional and modern) services (see *figure 3*) reveals a persistent but decreasing dominance of traditional market services. In the first wave of structural reforms (1991-1998), traditional market services expanded significantly (over 50% of total service VA) paralleled by decrease in non-market services and stable (around 20%) share of modern market services. Around 2002, the trend reversed, with the share of non-market services increasing by up to 20%, while the share of traditional market services declined significantly. Since 2006, shares have levelled off with non-market services making up around 35%, traditional market services around 45% and modern market services around 20%. Thus, the VA share of modern services did not significantly change during the period under review.





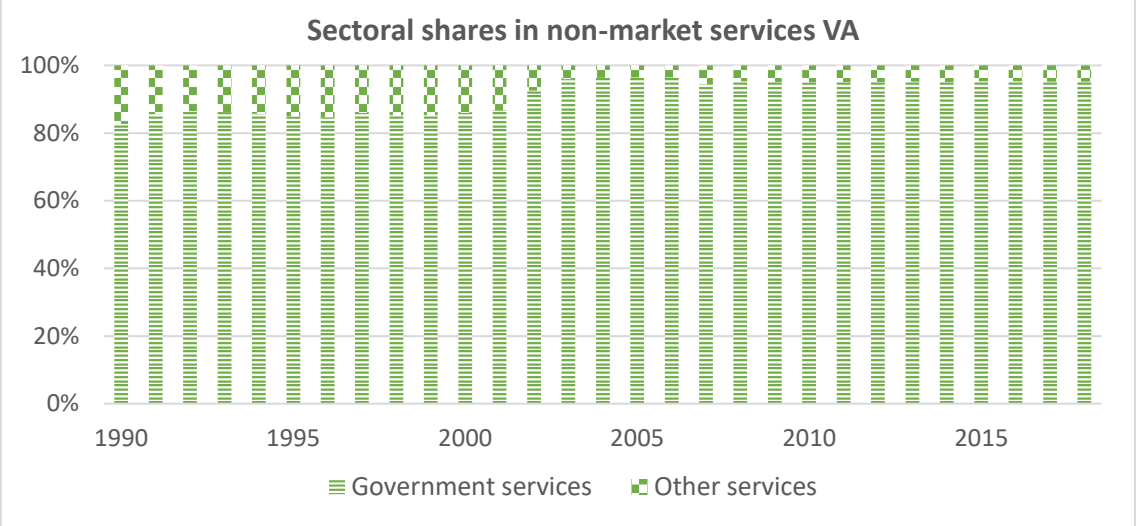


Figure 4: Development of sectoral shares in market and non-market services VA in Egypt from 1990 to 2018.
Source: Author's estimation with data from de Vries et al. (2021).

To determine drivers within the three service categories, a further disaggregation into the single services is essential (*see figure 4*). Within traditional market services, trade services dominate with a share of around 80%. In the early 2000s, the trade services share increased slightly – this trend matches with the observation of a short-term increase in the share of manufacturing in total VA at the same time. However, the strong role of trade services is rather driven by the tourism sector which is partly captured in the trade services component of 'accommodation and food service activities'. Tourism plays an important role in the Egyptian economy - in 2018, total tourism revenues accounted for 15% of the country's GDP, the tourism sector is one of the largest employers in the country, providing around 3 million jobs (9.5% of the total workforce) (OECD 2020). While in the 1990s, business services dominated over financial services within modern market services, the share of business services decreased between the late 1990s to 2006 (second wave). Since 2006 shares again took a turn, with business services (55%) contributing more to modern service VA compared to financial services (45%). Within non-market services, government services dominate. The rise in non-market services in the early 2000s is based on the expansion of government services. To summarize, while there was some variance within traditional and modern market services over the period under review, since around 2006 the relative importance of the three services categories is constant as is the share of the sectors within traditional and modern market services and non-market services.

Employment & Labor Productivity

Structural change that enhances long-term growth is not only characterized by a shift in economic output but requires a corresponding development in employment patterns with labor shifting to higher-productivity activities. Therefore, a complementary look at employment patterns to the VA share development is essential (*see table 3)*. In 1990 (before the start of structural reform processes), agriculture only accounted for 15% of VA but employed around one third of Egypt's labor force. While until 2018 the share of agriculture dropped by 4%, the share of agricultural employment declined by 12% indicating that the agricultural sector became more productive. Two main statements can be concluded: First, the discrepancy in contribution of agriculture to VA and employment indicates that the sector - which is dominated by small family holdings - holds continued potential to improve productivity and expand jobs in higher value-added off-farm activities (Alnashar et al. 2020). Second, the essential question arises as to where the surplus labor has migrated to.

There were no significant developments of the share of manufacturing in VA and employment with the persistent trend of manufacturing contributing less to employment than to output. Within other industries, output generated by mining increased substantially, however, the employment effects of the sector are low. To note are the developments in the construction sector: Employment increased more than the output of the sector which increased labor productivity. Besides into construction, surplus labor migrated to traditional market services, the increase in the share of employment (+ 10%) however was paralleled by a decrease in the share of traditional market services in total VA, indicating a decline in labor productivity. This development was mainly driven by the transport sector where a decline in VA was offset by an increase in employment share, indicating a significant decline in labor productivity. Trade services (including tourism) remained constant in VA share, but the employment share increased by 7%, indicating that labor productivity in that sector decreased to a lesser extent.

Table 3: Development of sectoral shares in VA and employment and sectoral labor productivity in Egypt from 1990 to 2018.

	Share in VA (%)			Share in Employment (%)			Labor productivity		
	1990	**2018**	**Trend**	**1990**	**2018**	**Trend**	**1990**	**2018**	**Trend**
Agriculture	17	12	↓	34	22	↓	28	54	↑
Manufacturing	17	17	-	13	13	-	73	135	↑
Other industries	16	21	↑	9	14	↑	97	144	↑
Mining	9	12	↑	0.4	0.1	↓	1437	8913	↑
Construction	4	6	↑	8	12	↑	31	49	↑
Utilities	3	2	↓	1	2	↑	132	139	↑
Market services	37	32	↓	18	29	↑	114	110	↓
Traditional services	25	22	↓	15	25	↑	95	87	↓
Trade	18	17	↓	10	17	↑	105	100	↓
Transport	7	5	↓	5	8	↑	74	60	↓
Modern services	12	10	↓	3.2	4	↑	209	258	↑
Business	7	6	↓	2.5	3.3	↑	152	179	↑
Financial	5	4	↓	0.7	0.7	-	429	654	↑
Non-market services	14	18	↑	25	23	↓	33	79	↑
Government	12	17	↑	21	18	↓	33	94	↑
Other services	2	1	↓	4	5	↑	37	19	↓

Note: Sectoral labor productivity is measured as VA in million LE per 1000 persons engaged; deviations due to rounding.
Source: Author's estimation with data from de Vries et al. (2021).

For total modern market services, labor productivity increased, as it did for the two included service categories (business and financial services). However, the underlying dynamics within the sectors were different. For business services, the employment share increased while the output share declined, indicating an increase in labor productivity related to positive employment effects. For financial services, the rise in labor productivity is due a decline in VA while employment remained constant. Thus, within modern services only business services experienced employment-generating dynamics.

In non-market services, labor productivity increased substantially, owing to a rise in VA and decline in employment in government services. However, this development muss be evaluated with caution since as outlined productivity measures within non-market services are different from the measures for market which introduces difficulties in comparing labor productivity measures for these two categories of services. To conclude, Egypt has experienced a more pronounced shift in sectoral employment shares than in VA shares. Employment shifts from agriculture to construction and traditional market services, however, most jobs are still provided by non-tradable service industries (almost 50%). Most sectors experienced an increase in labor productivity (except traditional market services), but this is not necessarily associated with employment-generating dynamics.

6. Results

6.1 Testing the First Kaldorian Growth Law

The first KGL tests the relationship between sectoral output growth and total output growth, suggesting that a sector drives growth if it exhibits faster sectoral output growth than total output growth. *Table 4* presents the results for the first KGL (original test and the two additional side tests). For the original test, it is generally expected that sectoral output growth and total output growth are positively correlated given their endogeneity based on inter-sectoral linkages, overarching economic policies and economic conditions. The results indicate positive correlations between sectoral and total output growth for most sectors. Significant positive correlations on the disaggregate sectoral level, however, are only found for manufacturing, mining, financial services, and government with the smallest coefficient found for mining. The smaller (yet positive) the coefficient, the higher the growth of total output given little growth in sectoral output. Striking is the finding of the statistically highly significant but negative correlation of output growth in utilities with total output growth (also the only finding consistent over the side tests) indicating that expansion of utilities is associated with a growth decline. Given the marginal relevance of utilities in total VA and employment (around 2%), however, this result is not necessarily relevant for this study.

Given the endogenous nature of the dependent and independent variable, an alternative indicator to identify drivers of growth is the relevance of sectoral output growth for the variation in total output growth, i.e., R^2. The results for R^2 in the original test vary significantly for the aggregation level of sectors. While aggregate total services explain 47%, which is reasonable given service dominance in both output and employment shares, a breakdown by service sector shows that only financial services (20%), and government services (34%) are explaining growth variation, with the latter sector not yielding comparable results, as mentioned before. Comparatively, also manufacturing emerges as one of the total growth variation-explaining sector (26%).

To minimize the endogeneity bias in results of the original test, two side tests (Thirlwall 1983) are conducted. The first side test (*equation A-1*) is a methodological correction and aims to remove endogeneity of the dependent and independent variable by regressing output growth of all sectors unequal to the sector of interest on the output growth in the sector of interest, i.e., a test for intra-sectoral linkages. The results of the first side test are less supportive of the original test than expected with more sectors displaying negative (although not all statically significant) coefficients, indicating a lack of intra-sectoral linkages overall. Linkages are confirmed for financial services, significant negative relationships are found for trade services and mining. The second test (*equation A-2*) aims to identify sectors that drive growth through productivity gains in distinction to the growth stimulated through inter-sectoral linkages. All significant results indicate negative relationships (except a slight positive result for mining and for government services which, as explained, is not considered as a comparable result). Interestingly, growth in agriculture seems not to translate into productivity growth in other sectors which is contradictory to the theorized mechanisms of structural change that migration of surplus labor from agriculture increases productivity in the overall economy. This indicates that not (enough) higher productive employment opportunities outside agriculture are available to absorb surplus labor. Thus, no sector can be confirmed as engine of growth based on the link between sectoral and total VA.

Table 4: Regression Results First Kaldorian Growth Law.

Sectors (*j*)		**First KGL** *(Equation A)*	**Side Test 1** *(Equation A-1)*	**Side Test 2** *(Equation A-2)*
Agriculture		0.09	-0.07	**-0.22****
		(0.13)	(0.15)	(0.09)
	R^2	0.02	0.01	0.21
Manufacturing		**0.24*****	0.07	0.03
		(0.08)	(0.09)	(0.09)
	R^2	0.26	0.02	0.00
Other industries		**0.11****	**-0.10***	**0.07***
		(0.04)	(0.05)	(0.03)
	R^2	0.22	0.14	0.13
Mining		**0.07****	**-0.06****	**0.05***
		(0.02)	(0.03)	(0.02)
	R^2	0.22	0.17	0.12
Construction		0.03	-0.01	**-0.17****
		(0.10)	(0.10)	(0.08)
	R^2	0.00	0.00	0.16
Utilities		**-0.43*****	**-0.47*****	**-0.35*****
		(0.09)	(0.09)	(0.04)
	R^2	0.48	0.51	0.77
Total services		0.61***	0.25	-0.09
		(0.13)	(0.25)	(0.08)
	R^2	0.47	0.04	0.04
Market services		0.06	**-0.41****	**-0.15****
		(0.10)	(0.16)	(0.06)
	R^2	0.01	0.21	0.20
Traditional services		-0.02	**-0.31*****	**-0.12****
		(0.08)	(0.10)	(0.05)
	R^2	0.00	0.26	0.16
Trade services		-0.01	**-0.21****	**-0.14****
		(0.08)	(0.10)	(0.06)
	R^2	0.00	0.14	0.18
Transport services		-0.02	-0.08	**-0.09***
		(0.06)	(0.06)	(0.05)
	R^2	0.01	0.07	0.12
Modern services		**0.40*****	**0.33****	0.01
		(0.11)	(0.12)	(0.10)
	R^2	0.33	0.22	0.00
Business services		0.10	0.06	-0.04
		(0.07)	(0.07)	(0.07)
	R^2	0.07	0.02	0.01
Financial services		**0.21****	**0.17***	-0.01
		(0.08)	(0.09)	(0.10)
	R^2	0.20	0.13	0.00
Non-market services		0.19***	0.05	**0.11***
		(0.05)	(0.06)	(0.06)
	R^2	0.36	0.03	0.12
Government services		**0.16*****	0.04	**0.10***
		(0.04)	(0.05)	(0.05)
	R^2	0.34	0.02	0.13
Other services		0.02	0.01	-0.07
		(0.06)	(0.06)	(0.06)
	R^2	0.01	0.00	0.05

Notes: OLS estimation, standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Source: Author's estimation with data from de Vries et al. (2021).

Table 5: Regression Results Second Kaldorian Growth Law.

Sectors (*j*)		**Labor productivity** *(Equation B)*	**Employment** *(Equation B-2)*	**Sectors (*j*)**		**Labor productivity** *(Equation B)*	**Employment** *(Equation B-2)*
Agriculture		1.26***	**-0.26****	*Modern services*		1.34***	-0.34***
		(0.10)	(0.10)			(0.12)	(0.12)
	R^2	0.85	0.20		R^2	0.83	0.24
Manufacturing		0.91***	**0.09***	Business services		1.16***	**-0.16****
		(0.05)	(0.05)			(0.07)	(0.07)
	R^2	0.92	0.12		R^2	0.91	0.16
Other industries		0.97***	0.03	Financial services		0.89***	0.11
		(0.05)	(0.05)			(0.14)	(0.14)
	R^2	0.93	0.01		R^2	0.62	0.03
Mining		0.86***	**0.14****	**Non-market services**		0.96***	**0.04***
		(0.06)	(0.06)			(0.02)	(0.02)
	R^2	0.90	0.19		R^2	0.99	0.14
Construction		0.52***	**0.48*****	Government services		0.97***	0.03
		(0.08)	(0.08)			(0.02)	(0.02)
	R^2	0.61	0.57		R^2	0.99	0.08
Utilities		1.08***	-0.08	Other services		0.95***	0.05
		(0.08)	(0.08)			(0.07)	(0.07)
	R^2	0.89	0.04		R^2	0.87	0.02
Total services		0.96***	0.04				
		(0.07)	(0.07)				
	R^2	0.89	0.02				
Market services		1.02***	-0.02				
		(0.05)	(0.05)				
	R^2	0.93	0.00				
Traditional services		0.98***	0.02				
		(0.04)	(0.04)				
	R^2	0.96	0.01				
Trade services		0.98***	0.02				
		(0.07)	(0.07)				
	R^2	0.89	0.00				
Transport services		0.98***	0.02				
		(0.05)	(0.05)				
	R^2	0.93	0.01				

Notes: OLS estimation, standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Source: Author's estimation with data from de Vries et al. (2021).

6.2 Testing the Second Kaldorian Growth Law

Table 5 reports the results for the test of the second KGL on the relationship between sectoral output growth and sectoral labor productivity growth. For an engine of growth labor productivity growth needs to grow with the sectoral output, i.e., the sector displays increasing returns to scale with a more efficient use of inputs the larger the sector is. The first column reports the result of Kaldor's original test, however, the endogeneity underlying the variables of sectoral labor productivity growth and sectoral output growth biases results into significant relationships. As a correcting regression, sectoral employment elasticities (*column 2*) are tested with a higher coefficient indicating a higher elasticity of sectoral employment growth and hence a lower effect of economies of scale.

For the original test, all coefficients are as expected positive and significant. For agriculture, utilities and business services, labor productivity growth increases faster than output growth, indicating diminishing returns to scale. This is confirmed by the results of the employment elasticities. A positive and statistically significant (though on different significance levels) correlation is found for manufacturing, mining and construction, all industrial sectors. When output growth increases by one percent in each of these sectors, employment in manufacturing increases by 0.09%, in mining by 0.14% and in construction by 0.48%, thus, output growth faster than labor input. Hence, according to results of the second law, these three industrial sectors qualify as engine for growth. For agriculture and business services, employment growth is significantly negatively correlated with output growth. Thus, the diminishing returns to scale in agriculture complementary to the increasing returns to scale in manufacturing Kaldor found in its original work are confirmed for Egypt. The result of diminishing returns to scale in business services is striking and against the hypothesis of modern services exhibiting similar characteristics to the manufacturing sector, such as increasing returns to scale. Hence, the test of the second KGL does not confirm any market service sector as an engine of growth.

6.3 Shift-Share Decomposition Analysis

The results of the productivity growth shift-share decomposition analysis as the substitute for the third KGL to analyze the mechanisms underlying labor productivity growth are reported in *table 6* broken down by sectoral contributions. As given in *equation E*, the sum of the intra-sectoral productivity growth effect (ISE) and the static and dynamic structural effects (SSE + DSE = SCE) equals the average growth rate of aggregate labor productivity (horizontal summation of the first row). Vertically, for each of the three labor productivity growth components, the contribution of each sector is reported. Following Di Meglio et al. (2018), the average labor productivity growth rate in each sector is reported in parentheses as additional information that allows to determine whether there are regular patterns of differential productivity growth across sectors (*note*: these do not add up horizontally or vertically).

Between 1990 and 2018, Egypt experienced rather moderate labor productivity growth of 0.72%, which is slightly above the labor productivity growth rate (0.68%) of 29 developing economies in Asia, Latin America, and sub-Saharan Africa between 1975 and 2005 found by Di Meglio et al. (2018). Further consistent with a common literature finding (McMillan & Rodrik 2011, Di Meglio et al. 2018), labor productivity growth in Egypt is largely explained by the intra-sectoral effect. However, while other relevant literature finds some contribution of the SCE to labor productivity growth in developing and emerging countries, for Egypt the contribution of structural change is negative, driven by a large negative dynamic structural effect indicating that labor reallocation between sectors in Egypt significantly reduced the overall labor productivity.

Table 6: Results Shift-Share Decomposition Analysis.

	Intra-sectoral Effect ISE	**Static Structural Effect SSE**	**Dynamic Structural Effect DSE**	**Structural Effect SCE**	**Labor Productivity Growth**
TOTAL	1.017	0.082	-0.379	-0.297	0.720
	141%	11%	-53%	-41%	100%
Agriculture	0.157	-0.062	-0.058	-0.120	*(0.939)*
Manufacturing	0.141	-0.008	-0.007	-0.014	*(0.849)*
Other industries	0.492	-0.017	-0.274	-0.292	*(0.485)*
Mining	0.466	-0.056	-0.289	-0.345	*(5.202)*
Construction	0.024	0.025	0.014	0.039	*(0.581)*
Utilities	0.001	0.013	0.001	0.014	*(0.810)*
Total services	0.227	0.169	-0.040	0.129	*(0.433)*
Market services	0.016	0.179	-0.009	0.170	*(-0.035)*
Traditional services	-0.022	0.158	-0.013	0.145	*(-0.084)*
Trade services	-0.009	0.122	-0.006	0.116	*(-0.048)*
Transport services	-0.013	0.036	-0.007	0.029	*(-0.189)*
Modern services	0.038	0.021	0.004	0.025	*(0.234)*
Business services	0.012	0.021	0.004	0.024	*(0.177)*
Financial services	0.025	0.000	0.000	0.000	*(0.524)*
Non-market services	0.211	-0.010	-0.031	-0.041	*(1.394)*
Government services	0.223	-0.015	-0.028	-0.044	*(1.848)*
Other services	-0.012	0.005	-0.002	0.003	*(-0.486)*
Sectoral contribution to each effect *(adding the TOTAL by columns)*					
Agriculture	15%	-75%	15%	40%	
Manufacturing	14%	-10%	2%	5%	
Other industries	48%	-21%	72%	98%	
Total services	22%	206%	11%	-43%	
	(100%)	*(100%)*	*(100%)*	*(100%)*	
Sectoral contribution to each effect *(adding the TOTAL services by columns)*					
Market services (traditional)	-10%	94%	32%	113%	
Market services (modern)	17%	12%	-10%	19%	
Non-market services	93%	-6%	78%	-32%	
	(100%)	*(100%)*	*(100%)*	*(100%)*	
Sub-sectoral contribution to each effect *(adding the Total services by columns)*					
Trade services	-4%	72%	15%	90%	
Transport services	-6%	21%	17%	23%	
Business services	5%	12%	-9%	19%	
Financial services	11%	0%	0%	0%	
Government services	98%	-9%	71%	-34%	
Other services	-5%	3%	6%	2%	
	(100%)	*(100%)*	*(100%)*	*(100%)*	

Source: Author's estimation with data from de Vries et al. (2021).

Intra-sectoral effect

Since the ISE captures within sector productivity advancements, it is not surprising that the within component is the strongest effect for labor productivity growth in agriculture, manufacturing, and mining, as these sectors are highly receptive to technological advances in production structures. The contribution of services to overall ISE is driven by government services. Further, both business and financial services contribute to the ISE, for financial services the ISE is the only effect found, i.e., in financial services sector labor productivity growth is exclusively driven by the ISE. In contrast to other literature, negative contributions of the within components are identified for traditional market services (trade, transport) which indicate inefficient processes that curb growth potential. When analyzing the within-effect, it should be noted that the component methodologically captures both a pure within-effect and intra-sectoral reallocation, which especially might not account for productivity developments within aggregate manufacturing.

Structural change effect

Looking at the reallocation effect, the structural bonus hypothesis (SCE > 0) is rejected for agriculture, manufacturing, and mining, but plays a role for construction and utilities, traditional market services, especially trade, and the modern market services of business services. This suggests that labor has efficiently reallocated from agriculture, manufacturing and mining activities into other industries and the listed services. Of note is the (albeit small) static productivity loss in manufacturing, which points to inefficient labor shifts in this sector given a lower productivity level. Further, most of the sectors absorbing labor have lost productivity growth dynamics since the structural burden (DSE < 0) emerges in mining, trade, and transport. Only for construction and slightly for business services, the structural burden hypothesis can be rejected (DSE > 0), suggesting that these are sectors to which labor has migrated that had positive productivity growth rates, i.e., that these sectors have increasing returns to scale.

This finding is just partly in line with the results from the test of the second KGL, which also indicated IRS in construction, but also in manufacturing and mining and contrary to the SSD results, diminishing returns for business services. The results of the SSD analysis, however, are just to some extent complementary to the results of the second law, also in Di Meglio et al. (2018) the results of the second law are not matched by the DSEs results of the SSD. The discrepancy is due to two factors: First, estimations of the second law hold between-sector interactions that influence productivity growth constant which are explicitly accounted for in the SSD. Second, different data modifications are underlying the law regressions and the SSD. While the regression results are based on smoothed five-year averages, the SSD considers the full length of the period without any correcting measures for within-period fluctuations. Further, the SSD considers productivity levels and growth rates at the beginning of the period under review. Therefore, to capture productivity developments within sectors and changing sectoral capacities over time in terms of structural bonus and burden characteristics, a time-disaggregated SSD is required. Therefore, as a sensitivity analysis (*reported in the annex, A-1 to A-5*) an SSD analysis is conducted for the different periods of structural reforms in Egypt to capture potential reform specific effects on structural characteristics and changing sectoral productivity level and growth rates.[2]

[2] Testing KGLs for these subperiods is not feasible given the small number of data points and the inadequacy of smoothing over short periods.

Sensitivity Analysis

While the pattern of the ISE being the main contributor to labor productivity growth is constant over the time periods under review as is the negative DSE, there is variance in the direction and relative strength of the static component of the SCE. In the first reform wave (1991-1998), a positive and strong SSE (mainly driven by trade services) dominated negative DSE, leading to a positive SCE indicating a productive labor reallocation in this period (structural bonus). However, the following structural reforms have not been effective in sustaining this trend. In the second wave, the overall SSE and thus the SCE turned negative, a trend driven by negative SSEs in manufacturing and other industries while for services the structural bonus trend (SCE > 0) continued driven by trade services. In the third wave, all service categories experienced static productive losses and the SCE was rejected. In the last decade (aftermath Arab Spring and IMF reform), both traditional market services exhibited the structural bonus, while for modern services only business services had a positive SCE in the last period. Looking at the other sectors, in contrast to the overall result, the structural bonus hypothesis holds for manufacturing over the last decade; for the 2016-2018 period, even the structural burden hypothesis can be rejected. However, worrying is the negative ISE for manufacturing in the same time periods since ISE is needed to uphold positive SCEs over time. ISE is the strongest for agriculture in those time periods which highlights continuous potential of productivity improvements in this sector. Lastly, the construction sector is confirmed as the sector with most pronounced positive structural change effects in all categories for the last decade.

To conclude, based on the results, the research questions are answered:

Were there any effects of structural transformation processes in Egypt on productivity growth and can certain sectors be identified as drivers of growth? If so, which sectors?

In the 1990s, Egypt began to take policy measures to structurally transform its economy. Since then, Egypt has experienced moderate labor productivity growth of 0.72%. However, labor productivity growth is solely driven by intra-sectoral effects. The contribution of structural change is negative, driven by a largely negative dynamic structural effect, indicating that labor reallocation significantly reduced the overall labor productivity, i.e., structural change had an eroding impact on productivity growth in Egypt. Overall, economic sectors are still characterized by rather low productivity levels and a shift of labor to informal and low-skilled activities and services (trade, construction, and government) with a lack of manufacturing core which drags on average productivity. Over the three parts of the analysis, no sector qualifies consistently as an engine of growth. However, the second KGL and the sensitivity analysis of the SSD point to manufacturing as an engine of growth emerging in the last decade.

What is the role of modern services in Egypt's structural transformation?

Regarding modern services, no results that confirm a specific role of modern services overall are found. There is some indication in the SSD that business services are starting to play a growth-supporting role, no supporting results are found for financial services. These findings, their linkage to the literature, and the resulting policy implications are discussed in the following section.

7. Discussion

7.1 Analysis & Literature Contextualization

The results for Egypt are in line with the research of McMillan & Rodrik (2011), McMillan et al. (2014), Rodrik (2016a, 2016b), Gallego et al. (2018) pointing to growth-inhibiting structural change in developing contexts due to a shift in VA and employment to low-tech, personal, and informal services and activities (construction) as a result of an underdevelopment of the manufacturing base which leads to productivity and growth slowdown. Thus, Egypt is following the path of SSA and especially Latin America, for which between 1950 and 2010 also static productivity losses in manufacturing were found and negative or zero DSEs in all sectors (Gallego et al. 2018). Further, results for Egypt are similar to the eroding impact of structural change on productivity growth rates in Latin America (Schiffbauer et al (2016). There, labor shift to comparatively low productive services sectors such as retailing, wholesaling, construction, and government resulted in lower overall value-added per worker which dragged down the average productivity.

In contrast to the manufacturing-led export growth model of many Asian economies, SSA and Latin America followed a different path of structural transformation and growth characterized by a 'pathological' mode of deindustrialization during the 1980s and 1990s (Dasgupta & Singh 2007). This growth-inhibiting structural change is related to various reasons: Economies specialized according to their static comparative advantages, either in resource-based industries in countries with large endowments of natural resources, in low-tech processes, or in labor-intensive products with little potential for scaling or upgrading. These specialization patterns reduce incentives to diversify to modern manufacturing and thus, the scope of productivity-enhancing structural change since they do not generate much employment and offer few potentials for productivity improvements compared to manufacturing and related business services. Further, overvalued currencies hamper the tradable modern sector, and a reduced flexibility of labor markets due to informality and skill mismatches restricts labor migration across sectors (McMillan & Rodrik 2011, Rodrik 2016).

All these reasons apply to some extent to Egypt: The contribution of mining to VA increased over time given Egypt's mineral resource abundance, however, without any employment effects. Currency overvaluation and devaluation policies are a recurring measure in Egypt: In the 1970s/80s, overvaluation stimulated imports but depressed demand for domestically produced goods which led to underutilization of domestic manufacturing. In the 2016 reform, the devaluation of the Egyptian currency was key to the attempt to restore trade competitiveness. Main obstacles to productivity-enhancing structural change in Egypt, however, is the inflexibility of the labor market. The flexibility of labor markets determines how quickly and sustainably an economy can respond to changing market conditions by adjusting its workforce. First, labor in Egypt moves in the "wrong" direction of less productive activities, most notable into informality since Egypt lacks decent work opportunities. Between 2008 and 2015, informal employment outside the agricultural sector increased from 38% to 47% (World Bank 2021). Second, high (youth) unemployment results from a skills mismatch and a lack of demand-oriented inclusive skills strategies and education policies (ILO 2021). All these factors prevent the key dynamism of structural transformation processes: Economic diversification through the emergence of new industries and the movement of labor from traditional low-productive sectors to the new ones.

Structural change literature on Egypt to compare the results with is limited, especially the testing of the KGLs. However, this paper's results are in line with some reports and studies decomposing productivity growth in Egypt for different time periods. For the period 1993 to 2010, Morsy et al. (2015) find

that structural change was negative during the 2000s and was characterized by labor shifting from agriculture to less productive service activities (trade and the informal sector). Ayed Mouelhi & Ghazali (2021) find that between 1960 and 2010 the shift to modern services has been slow and the main driver of productivity growth is the within component while structural change has been delayed, leading to adverse effects, i.e., labor shift to less productivity activities. Alnashar et al. (2020) decompose productivity growth in Egypt between 2004 and 2018 and find that employment shares increased either in low value-added sectors, or in sectors that have experienced a decline in productivity. Further, they show that the private sector has been gradually assuming a larger role in economic activity and employment but has witnessed very limited growth in its productivity.

Thus, the results of this thesis are in line with literature findings on structural change in in developing contexts and on the country case of Egypt. Moreover, the findings confirm the necessity of disaggregating sector categories and accounting for the heterogeneous dynamics within all economic sectors within comparative research debate on premature deindustrialization and the manufacturing- vs. service-led growth discussion. The results for aggregate other industries and services are consistently offset when disaggregating the sectors into diverse categories with heterogeneous within- and across-sector productivity performance.

7.2 Policy Implications

Three priority areas can be identified for future structural policies in Egypt: First, measures on improving productivity and innovation capacities in the agricultural sector are essential for Egypt's long-term economic development. Agriculture remains the largest employer outside urban areas and holds potential to increase employment and income opportunities in small-scale agriculture activities as well as to expand jobs in higher value-added off-farm activities. Thus, a more productive and innovative agricultural sector and expansion of agri-businesses in value chains is key to large-scale poverty reduction. Second, industrial policies that are targeted to establishing a core manufacturing sector as well as to promoting manufacturing-related business services will be essential for productivity growth. Increased tradability within global value chains has made manufacturing-related service activities major players in current globalization processes (Gallego et al. 2013). The SSD for the last decade confirmed the structural bonus hypothesis for manufacturing in Egypt, for the 2016-2018 period, even the structural burden hypothesis could be rejected. Recent efforts by the Egyptian government to promote manufacturing match this trend: in July 2021, Egypt announced an export promotion program for manufacturers in automotive, ceramics, pharma, electronics, and chemicals industries (MTI 2021). Key for manufacturing development in Egypt's economic structure is private engagement to stimulate employment. Using Egyptian data on manufacturing sub-sectors, Alnashar et al. (2020) show that while public sector manufacturing has realized productivity growth, it experienced a decline in its share of employment. In contrast, productivity in private sector manufacturing has declined, while the sector's share in total employment increased. This trade-off between labor productivity growth and job creation in both the manufacturing sector and the economy overall requires measures to strengthen the environment for private sector activity and employment. Thus, improving human capital and business capacity, and reducing the mismatch between supply and demand side in the Egyptian labor market are key.

The third policy priority is therefore to address challenges that depress the skill levels of the Egyptian labor force through better and targeted education and training programs on the supply side.

Capacities on the demand side should be strengthened through adoption of product and production quality standards that enable economic opportunities to be seized through competition in global markets and participation in global value chains. Further, promotion of innovation capacity in both processes and products is needed to stimulate employment-generating dynamics. Especially digitalization on both the supply side (technologies) and the demand side (skills) can be identified as an important contributor to promoting innovation and employment. All these policy priorities are acknowledged in Egypt's latest *National Structural Reform Program* (2021-2024) with the main objective of diversifying the productivity structure of the Egyptian economy, especially increasing the relative importance of agriculture, manufacturing and ICT as well as improving labor market efficiency and technical and vocational education and training through developing the technical education and vocational training system (IDSC 2021). Further, creating a regulatory framework that supports the establishment of a formal private sector and reduces the displacement of workers into unregulated informal activities can be identified as the main challenge for Egypt's growth prospects.

7.3 Limitations & Research Agenda

The main limitations of data inaccuracy due to the extensive informal economic activities in Egypt, the measurement problems, and the resulting difficulties in the comparative interpretation of the productivity of public services vs. market services, and the limitations of the SSD analysis have been discussed. Several other caveats need to be highlighted that apply to the analysis and set the research agenda in the field of comparative research on structural change in developing contexts as well as the debate on the contribution of manufacturing vs. services to productivity growth.

First, given the increasing trend of interdependence between production and service activities, the distinction between manufacturing and services is not as clear-cut as the analysis suggests. Related to this point is the importance of accounting for heterogeneous sub-sectors, both, in services but also in manufacturing since also the different industries within manufacturing differ regarding their productivity and economies scale potential as well as interlinkage with the modern business services. As mentioned, the report by Alnashar et al. (2020) uses disaggregate data for manufacturing sub-sectors based on data from the Egyptian statistical agency and stresses differential employment and productivity performances of sub-sector also regarding public or private sector activities. These data were not available to the author of this thesis due to language barriers. In general, comparative structural change research on manufacturing vs. service-led growth in today's developing and emerging economies needs to be based on harmonized and comparable data covering also manufacturing sub-sectors, as provided by the ETD database for services categories. The data necessity also arises from the fact that the manufacturing sector is confirmed as an engine of growth in the literature, while within services those categories associated with manufacturing are confirmed. Related to data availability, comparative structural change studies need to incorporate the transitioning MENA region to inform tailored policy measures. Lastly, testing the existence of increasing returns to scale, i.e., the second KGL on the relationship between sectoral VA growth and labor productivity growth, lacks important informative value and requires methodological refinement. The estimation does not account for other factors influencing productivity growth as the contribution of the capital stock or technological spillovers. Moreover, the origin of domestic productivity improvement leading to increasing returns to scale cannot be distinguished into improvements based on 'leapfrogging'" strategies (technology import) or indigenous (domestic) innovations (Di Meglio et al. 2018).

8. Conclusion

The aim of this thesis was two-fold: By assessing the structural transformations processes in Egypt, first, potential growth-enhancing sectors have been identified. Second, by assessing the ability of heterogeneous service categories to qualify as engines of growth in a developing context outside the dominant research on developing Asia, Latin America, and sub-Saharan Africa, this thesis contributes to the debate on premature deindustrialization and manufacturing- vs. service-led growth.

By testing the validity of *Kaldor's Growth Laws* and conducting an SSD analysis to decompose aggregate labor productivity into within-sector labor productivity growth and cross-sectoral labor reallocation, economy-wide and sectoral productivity dynamics are identified. Overall, the findings suggest that economic reforms in Egypt lack a policy and regulatory framework that supports the transition to a sound market economy, as evidenced by a suppressed formal private sector and the push of workers into unregulated informal low-productivity sectors. Economic policy dominated by national mega infrastructure projects, dominance of politically affiliated corporations in the private sector, the military as the dominant economic actor and the focus on Egypt's static comparative advantage in the resource industry distort the market, depress competitiveness, and inhibit employment, innovation, and productivity dynamics. This is highlighted by the persistent low productivity levels missing inter-economic linkages and lack of dynamics structural effects found over the period of structural reforms (1991-2018), with no sector consistently qualifying as an engine of growth and overall growth-inhibiting structural transformation processes. Thus, essential to addressing unemployment, national poverty and to promote inclusive growth in Egypt is stimulating formal job creation and productive employment dynamics. This requires policy measures to strengthening innovation and productivity capacities on both sides of the labor market with the promotion of technological capacities in business on the one side and skill development of the labor force on the other side which enables competitive participation in global markets. This thesis finds that manufacturing and (manufacturing-related) business services can be identified as those sector that have potential to be the core of growth-enhancing structural transformation processes.

These findings on Egypt are consistent with comparative research on premature deindustrialization and structural change in developing contexts, especially on Latin America, that points to growth-inhibiting structural change due to a concentration of economic output and employment in low-tech, personal, and informal services and activities due to an underdeveloped manufacturing base. Further, the results are consistent with research on the manufacturing vs. service-led growth debate that stress a key role of manufacturing for employment and productivity growth, but also the rise of a growth-driving role of modern market-services, and (manufacturing-related) business service activities. The classification of low-productivity services vis-à-vis higher-productivity manufacturing is increasingly being revoked in light of the fundamentally changed characteristics of modern services with increased tradability and the potential for economies of scale arising from the global emergence of ICT. Thus, this thesis highlights the necessity of disaggregating service categories in productivity growth analyses to account for heterogeneous within- and cross-sectoral dynamics.

Moreover, this thesis emphasizes several aspects that need to be included in the research agenda on premature deindustrialization and the manufacturing vs- service-led growth debate in developing contexts. First, the validity and informative value of productivity analyses are highly dependent on the data underlying regarding the sectoral disaggregation of output and employment figures. In addition to the recent trend of disaggregating service sectors, disaggregate data on manufacturing categories

capturing varying levels of knowledge- and technology-intensity and linkages with ICT services. While those data are sometimes available on the nation level, harmonized and comparable disaggregate manufacturing data, as provided by the ETD database for services categories, is needed. Second, the issue of capturing informal economic activities in the data, especially the contribution to output, needs to be addressed by supporting countries in taking corrective measures in national accounts and employment figures accounting methods. Lastly, the analysis of the case of Egypt highlights the similarity of structural transformation processes and productivity growth challenges with other developing regions. Including the transitioning MENA region in comparative studies of structural change will increase the external validity of the research, and the comparative assessment of challenges and policy impact could inform policy measures better tailored to the context.

9. References

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10. Appendix

Sensitivity Analysis: Shift Share Decomposition for the periods of structural reforms

A-1: First wave of structural reforms (1991 – 1998)

	Intra-sectoral Effect ISE	Static Structural Effect SSE	Dynamic Structural Effect DSE	Structural Effect SCE	Labor Productivity Growth
TOTAL	0.069	0.037	-0.020	0.017	**0.086**
	80%	43%	-23%	20%	100%
Agriculture	0.047	-0.019	-0.005	-0.024	
Manufacturing	0.021	0.004	0.000	0.004	
Other industries	0.038	-0.013	-0.007	-0.021	
Mining	0.035	-0.020	-0.008	-0.028	
Construction	0.001	0.004	0.000	0.005	
Utilities	0.003	0.002	0.000	0.003	
Total services	-0.037	0.065	-0.007	0.058	
Market services	-0.028	0.066	-0.007	0.058	
Traditional services	-0.008	0.042	-0.004	0.038	
Trade services	-0.015	0.046	-0.004	0.042	
Transport services	0.007	-0.004	0.000	-0.004	
Modern services	-0.020	0.024	-0.003	0.020	
Business services	-0.020	0.011	-0.003	0.008	
Financial services	0.000	0.013	0.000	0.013	
Non-market services	-0.010	-0.001	0.000	0.000	
Government services	-0.004	0.000	0.000	0.000	
Other services	-0.005	0.000	0.000	0.000	
Sectoral contribution to each effect *(adding the TOTAL by columns)*					
Agriculture	68%	-50%	26%	-136%	
Manufacturing	31%	10%	-2%	23%	
Other industries	55%	-35%	38%	-118%	
Total services	-54%	176%	38%	331%	
	(100%)	*(100%)*	*(100%)*	*(100%)*	
Sectoral contribution to each effect *(adding the TOTAL services by columns)*					
Market services (traditional)	21%	64%	57%	65%	
Market services (modern)	53%	36%	44%	35%	
Non-market services	26%	-1%	0%	-1%	
	(100%)	*(100%)*	*(100%)*	*(100%)*	
Sub-sectoral contribution to each effect *(adding the Total services by columns)*					
Trade services	40%	71%	51%	73%	
Transport services	-19%	-6%	6%	-8%	
Business services	54%	17%	45%	13%	
Financial services	-1%	20%	-1%	22%	
Government services	12%	-1%	0%	-1%	
Other services	14%	0%	0%	0%	
	(100%)	*(100%)*	*(100%)*	*(100%)*	

A-2: Second wave of structural reforms (1999 – 2004)

	Intra-sectoral Effect ISE	Static Structural Effect SSE	Dynamic Structural Effect DSE	Structural Effect SCE	Labor Productivity Growth
TOTAL	0.337	-0.007	-0.107	-0.113	**0.223**
	151%	-3%	-48%	-51%	100%
Agriculture	0.020	-0.010	-0.001	-0.012	
Manufacturing	0.073	-0.016	-0.006	-0.022	
Other industries	0.217	-0.036	-0.091	-0.126	
Mining	0.223	-0.036	-0.090	-0.126	
Construction	0.000	-0.004	0.000	-0.004	
Utilities	-0.005	0.004	-0.001	0.003	
Total services	0.026	0.055	-0.008	0.047	
Market services	-0.058	0.054	-0.010	0.044	
Traditional services	-0.049	0.041	-0.008	0.033	
Trade services	-0.031	0.028	-0.005	0.024	
Transport services	-0.018	0.013	-0.004	0.009	
Modern services	-0.009	0.012	-0.001	0.011	
Business services	-0.016	0.006	-0.002	0.004	
Financial services	0.007	0.006	0.001	0.006	
Non-market services	0.085	0.002	0.001	0.003	
Government services	0.095	0.002	0.002	0.003	
Other services	-0.010	0.000	0.000	0.000	
Sectoral contribution to each effect *(adding the TOTAL by columns)*					
Agriculture	6%	160%	1%	10%	
Manufacturing	22%	243%	6%	20%	
Other industries	65%	549%	85%	112%	
Total services	8%	-853%	8%	-42%	
	(100%)	*(100%)*	*(100%)*	*(100%)*	
Sectoral contribution to each effect *(adding the TOTAL services by columns)*					
Market services (traditional)	-188%	74%	100%	70%	
Market services (modern)	-35%	22%	16%	23%	
Non-market services	324%	4%	-16%	7%	
	(100%)	*(100%)*	*(100%)*	*(100%)*	
Sub-sectoral contribution to each effect *(adding the Total services by columns)*					
Trade services	-118%	51%	54%	50%	
Transport services	-70%	24%	46%	20%	
Business services	-61%	12%	25%	9%	
Financial services	26%	10%	-8%	14%	
Government services	364%	3%	-18%	7%	
Other services	-40%	1%	2%	0%	
	(100%)	(100%)	(100%)	(100%)	

A-3: Third wave of structural reforms (2005 – 2011)

	Intra-sectoral Effect ISE	Static Structural Effect SSE	Dynamic Structural Effect DSE	Structural Effect SCE	Labor Productivity Growth
TOTAL	0.213	-0.027	-0.010	-0.037	**0.176**
	121%	-15%	-6%	-21%	100%
Agriculture	-0.008	-0.002	0.000	-0.002	
Manufacturing	0.043	-0.018	-0.004	-0.022	
Other industries	0.047	0.020	0.002	0.022	
Mining	0.043	0.001	0.000	0.002	
Construction	0.004	0.015	0.002	0.016	
Utilities	0.000	0.004	0.000	0.004	
Total services	0.131	-0.027	-0.008	-0.035	
Market services	0.084	-0.014	-0.005	-0.019	
Traditional services	0.056	-0.005	-0.004	-0.009	
Trade services	0.055	-0.011	-0.004	-0.015	
Transport services	0.001	0.006	0.000	0.006	
Modern services	0.028	-0.009	-0.001	-0.010	
Business services	0.029	-0.001	-0.001	-0.002	
Financial services	-0.001	-0.008	0.000	-0.008	
Non-market services	0.047	-0.012	-0.003	-0.016	
Government services	0.043	-0.012	-0.003	-0.015	
Other services	0.004	0.000	0.000	0.000	
Sectoral contribution to each effect *(adding the TOTAL by columns)*					
Agriculture	-4%	8%	-1%	6%	
Manufacturing	20%	68%	42%	61%	
Other industries	22%	-76%	-21%	-61%	
Total services	62%	100%	81%	94%	
	(100%)	*(100%)*	*(100%)*	*(100%)*	
Sectoral contribution to each effect *(adding the TOTAL services by columns)*					
Market services (traditional)	43%	20%	49%	27%	
Market services (modern)	22%	33%	10%	27%	
Non-market services	36%	47%	40%	45%	
	(100%)	*(100%)*	*(100%)*	*(100%)*	
Sub-sectoral contribution to each effect *(adding the Total services by columns)*					
Trade services	42%	42%	51%	44%	
Transport services	1%	-22%	-1%	-17%	
Business services	22%	4%	11%	6%	
Financial services	0%	29%	-1%	22%	
Government services	33%	46%	39%	44%	
Other services	3%	1%	2%	1%	
	(100%)	*(100%)*	*(100%)*	*(100%)*	

A-4: Aftermath Arab Spring (2012– 2015)

	Intra-sectoral Effect ISE	Static Structural Effect SSE	Dynamic Structural Effect DSE	Structural Effect SCE	Labor Productivity Growth
TOTAL	0.035	0.008	-0.007	0.001	**0.036**
	97%	23%	-19%	3%	100%
Agriculture	0.031	-0.020	-0.005	-0.025	
Manufacturing	-0.010	0.018	-0.001	0.017	
Other industries	0.001	-0.018	0.001	-0.017	
Mining	-0.006	-0.020	0.001	-0.020	
Construction	0.007	0.001	0.000	0.001	
Utilities	0.001	0.002	0.000	0.002	
Total services	0.013	0.027	-0.002	0.025	
Market services	0.000	0.024	-0.002	0.022	
Traditional services	-0.013	0.027	-0.002	0.025	
Trade services	-0.011	0.021	-0.001	0.019	
Transport services	-0.002	0.006	0.000	0.006	
Modern services	0.012	-0.002	0.000	-0.003	
Business services	0.007	-0.001	0.000	-0.001	
Financial services	0.005	-0.002	0.000	-0.002	
Non-market services	0.013	0.003	0.000	0.003	
Government services	0.014	0.002	0.000	0.002	
Other services	0.000	0.001	0.000	0.001	
Sectoral contribution to each effect *(adding the TOTAL by columns)*					
Agriculture	89%	-239%	73%	-2078%	
Manufacturing	-29%	223%	15%	1448%	
Other industries	4%	-214%	-14%	-1391%	
Total services	36%	330%	26%	2120%	
	(100%)	*(100%)*	*(100%)*	*(100%)*	
Sectoral contribution to each effect *(adding the TOTAL services by columns)*					
Market services (traditional)	-100%	98%	90%	99%	
Market services (modern)	97%	-9%	17%	-11%	
Non-market services	103%	11%	-8%	12%	
	(100%)	*(100%)*	*(100%)*	*(100%)*	
Sub-sectoral contribution to each effect *(adding the Total services by columns)*					
Trade services	-87%	76%	77%	76%	
Transport services	-13%	22%	13%	23%	
Business services	58%	-2%	6%	-3%	
Financial services	38%	-7%	12%	-8%	
Government services	106%	8%	-9%	9%	
Other services	-2%	3%	2%	4%	
	(100%)	*(100%)*	*(100%)*	*(100%)*	

A-5: Fourth wave of structural reforms (2016 - 2018)

	Intra-sectoral Effect ISE	Static Structural Effect SSE	Dynamic Structural Effect DSE	Structural Effect SCE	Labor Productivity Growth
TOTAL	0.075	-0.008	-0.005	-0.013	**0.062**
	121%	-14%	-8%	-21%	100%
Agriculture	0.017	-0.010	-0.001	-0.011	
Manufacturing	0.000	0.005	0.000	0.005	
Other industries	0.019	-0.009	0.000	-0.009	
Mining	0.005	-0.011	0.000	-0.011	
Construction	0.011	0.003	0.001	0.003	
Utilities	0.003	-0.001	0.000	-0.001	
Total services	0.040	0.005	-0.004	0.002	
Market services	0.014	0.018	-0.001	0.017	
Traditional services	-0.003	0.021	0.000	0.021	
Trade services	-0.005	0.019	-0.001	0.018	
Transport services	0.002	0.003	0.000	0.003	
Modern services	0.016	-0.003	-0.001	-0.004	
Business services	0.007	0.002	0.000	0.003	
Financial services	0.010	-0.006	-0.001	-0.007	
Non-market services	0.026	-0.013	-0.002	-0.015	
Government services	0.027	-0.014	-0.002	-0.016	
Other services	0.000	0.001	0.000	0.001	
Sectoral contribution to each effect *(adding the TOTAL by columns)*					
Agriculture	22%	117%	28%	85%	
Manufacturing	0%	-59%	0%	-37%	
Other industries	25%	104%	-2%	65%	
Total services	53%	-62%	74%	-12%	
	(100%)	*(100%)*	*(100%)*	*(100%)*	
Sectoral contribution to each effect *(adding the TOTAL services by columns)*					
Market services (traditional)	-7%	411%	12%	1284%	
Market services (modern)	41%	-59%	26%	-245%	
Non-market services	66%	-252%	61%	-939%	
	(100%)	*(100%)*	*(100%)*	*(100%)*	
Sub-sectoral contribution to each effect *(adding the Total services by columns)*					
Trade services	-12%	363%	16%	1124%	
Transport services	5%	48%	-3%	160%	
Business services	17%	47%	-8%	169%	
Financial services	24%	-106%	35%	-414%	
Government services	66%	-271%	60%	-998%	
Other services	-1%	19%	1%	59%	
	(100%)	*(100%)*	*(100%)*	*(100%)*	

Source: Author's estimation with data from de Vries et al. (2021).