Identifying Activities for Greater Employment Generation in Egypt: An Input-Output Analysis

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Identifying Activities for Greater Employment Generation in Egypt: An Input-Output Analysis

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List of abbreviations and acronyms

CAPMAS	Central Agency for Public Mobilization and Statistics
GAFI	General Authority for Investment and Free Zones
ILO	International Labour Organization
RCA	Revealed Comparative Advantage
YEI	Youth Employment Inventory

Abstract

Between 2006 and 2017, Egypt's average rate of unemployment was 11.2%, and 23.8% among the youth. Promoting employment-generating industries may mitigate unemployment. The present study, therefore, identifies industries (agricultural, extraction and mining, manufacturing, and services activities) with an employment-generating potential, with special reference to the youth. The study uses input-output analysis to compute employment and output multipliers for Egypt in the year 2016–2017. A spatial analysis is also employed to test for spatial autocorrelation (dependence) in total employment and youth employment. Results show that the highest manufacturing employment multipliers, ranging from 4.30 to 1.90, are: Food products; Basic metals; Motor vehicles; Paper products; Non-metallic mineral products; Beverages; Wearing apparel; Coke and refined petroleum products. Among primary industries, agriculture, extraction of crude petroleum, and mining employment multipliers are 1.45, 1.43, and 1.37, respectively. The employment multipliers of the leading service industries range from 2.66 to 1.44: Real estate; Hotels and restaurants; Administrative & support services; Communication; and Construction. Total and youth employment are found to have positive spatial dependence, with evident clustering of total and youth employment among governorates of the regions of Greater Cairo, the Delta, and Upper Egypt. Many of the high ranking employment multiplier industries and the feeding industries along their value chains are also located in these regions, and in geographically close regions. With the established spatial dependence, a key policy implication is to direct investment to where these industries are located, and possibly to locations of the feeding industries along their value chain. Potentially, there would be stronger inter-firm linkage across regions, and further generation of total and youth employment.

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1. Introduction

Over the period 2006–2017, Egypt's rate of unemployment was 11.2%, on average. Meanwhile, the average the rate of unemployment among the youth (15-29 years of age) was 23.8% (measuring the ratio of unemployed youth labour force in the 15-29 age bracket). Measured as a ratio of the population in the 15-29 age bracket, unemployed youth account for 10.8% (Source: Own calculations from Annual Bulletin of the Labour Force Survey, 2006–2017, and the Annual Statistical Yearbook, 2006–2017, the Central Agency for Public Mobilization and Statistics (CAPMAS), Egypt). Therefore, the ratio of unemployed youth to the youth labour force is twice the ratio of the unemployed to the labour force.

The rate of unemployment among the youth raises an important question that would bear on any policy measure that the Government of Egypt may be undertaking: *why has the economy's limited ability to create youth jobs topped its limited ability to create jobs across all age groups combined?* Among the possible answers to the above question is provided by Egypt's industrial structure. Across governorates, industry (mining and quarrying, and manufacturing) leans heavily toward capital and energy intensive industries. Such a structure developed over time, and was fed by investments which were largely oriented toward capital- and energy-intensive industries, as well as a long history of energy subsidies. For perspective, the "medium-low- and medium-high-technology"[1] manufacturing industries had a 69% share in total manufacturing investment (on average for the period 1982/1983–2011/2011), while its share in manufacturing employment was 38% (Helmy & Al-Ayouty, 2014: 16).

The objective of the present study is to identify industries[2] with a potential to generate employment. This is to be achieved by obtaining employment, as well as output multipliers. Further, the paper aims is to assess if there is spatial dependence in overall and in youth employment. In view of that, the following questions are addressed: where are the high employment-multiplier industries primarily located, and, thereby, where are the upstream industries along their value chain located? Answering the above questions may help promote employment generation, and inter-firm linkage across regions.

Following the introduction, the rest of this study is organized as follows: Section 2 gives the literature review, with emphasis on empirical literature; Section 3 presents stylized facts of total employment, as well as employment and unemployment of the youth by governorate; Section 4 describes the methodology used; Section 5 describes data and data sources; Section 6 presents and discusses the main results of the analysis; Section 7 concludes and gives relevant policy implications.

2. Literature review

A growing body of literature showed increasing use of input-output analysis from 2005 onwards, with noticeable focus on agricultural activity. Input-output models "have the advantage of being transparent, have few assumptions built in, are easily replicable, and are built from current and recent data of national income accounts" (Garrett-Peltier, 2017: 439). They are, thus, used to identify how particular industries may generate employment, and how they may contribute to growth, not only in themselves, but also through their linkage and multiplier effects to all other industries (Bhattacharya & Rajeev, 2014). The multiplier effects comprise the direct increases in employment in a given industry, the indirect increases resulting from the economic relationship between that industry and its suppliers (along its value chain), and the induced effects resulting from an overall increase in the spending by household consumers. As household income increases, spending increases due to the new direct and indirect economic activity, thereby stimulating employment (Lester et al., 2015).

Using input-output models to diagnose the inter-sectoral linkages could provide the answers as to why many nations had not achieved their employment targets, or why their growth was not complemented with the desired employment generation. In fact, in many cases, the output of the high backward-linked sectors depended on capital intensive intermediate products as opposed to labour intensive ones (Tariyal, 2016), thus hindering employment generation. Furthermore, many studies employed input-output models to explore the multiplier effects of new emerging industries, such as renewable energy (see, for example, Garrett-Peltier, 2017, Coon et al., 2015, Ortega et al., 2015, Lester et al., 2015).

Empirical literature further establishes that there are disparities in employment/unemployment among regions within a nation. Such disparities, and indeed the dynamics of employment/unemployment at the regional level are best captured in spatial analysis (Burridge & Gordon, 1981; Johnson & Kneebone, 1991; Murphy, 1985; Partridge & Rickman, 1995; Taylor & Bradly, 1997; Güçlü, 2017). Spatial analysis allows for examining the effect of a region's employment/unemployment on the respective level of its neighbouring region(s), and for testing whether there are clustering and spillover effects (Güçlü, 2017).

With reference to Egypt, most empirical studies were oriented to the macroeconomic problem of unemployment, with emphasis on patterns of unemployment whether by age, gender, or educational attainment (Assad & Krafft, 2016, Nazier & Ramadan,

2016, Barsoum et al., 2014). Other studies focused on unemployment in relation to the informal sector (Wahba, 2009), and to the sectoral reallocation of labour over time (Morsy & Levy, 2020; Hassan & Kandil, 2014). Except for Kamal (2018) where the author obtains employment multipliers by industry for Egypt, empirical studies exploring multiplier effects are, indeed, scarce. Compared to the present paper, Kamal (2018) relies on data from Egypt's 2012–2013 input-output tables, and differs significantly in results found regarding industry employment multiplier.

As for the spatial dimension of employment, Helmy and Al-Ayouty (2014) and World Bank (2014) are among the few studies employing a descriptive analysis of unemployment by governorate. Al-Ayouty and Hassaballa (2020) use spatial analysis of unemployment over the 2006–2016 period, and find unemployment to be spatially-dependent. However, to the best of the author's knowledge, the present paper contributes to empirical literature in obtaining employment and output multipliers for all industries in Egypt, and in assessing whether there is spatial dependence in both total and youth employment. We recognize that it is, not only important to identify which industries will generate output and employment effects, but also where these effects are expected to be generated. If spatial dependence is indeed established, then output and employment spillover effects are to be realized, and must be taken into consideration when assessing multiplier effects.

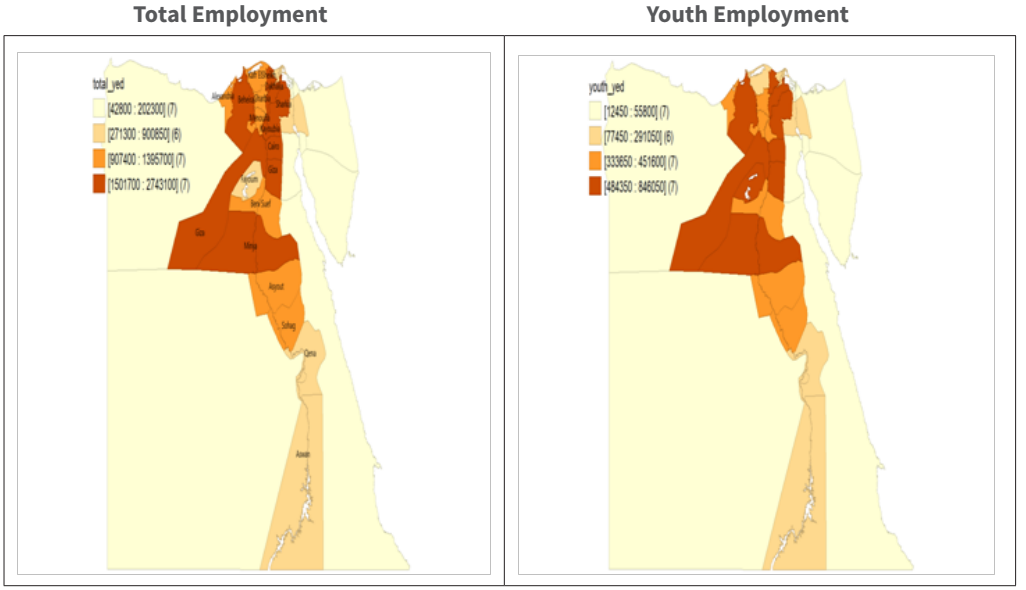
3. Stylized facts of total and youth employment, and youth unemployment

As we probe nationwide outlook and beyond, we examine total and youth employment at the national and regional level, as well as youth unemployment. We hereby present stylized facts of: (1) *the regional outlook of total and youth employment:* levels of governorate total employment and youth employment, governorate share in total employment nationwide (broken into youth and all other age brackets), and the skill composition of the employed nationwide as a reflection of the supply-side characteristics of the employed members of the labour force. (2) *the regional outlook of youth unemployment.*

Regional outlook of total and youth employment

Egypt geographically consists of seven regions, encompassing 27 governorates.[3] Figure 1 presents total and youth employment by governorate.

Figure 1: Quartile map of levels of total employment and youth employment in the governorates of Egypt, 2016-2017

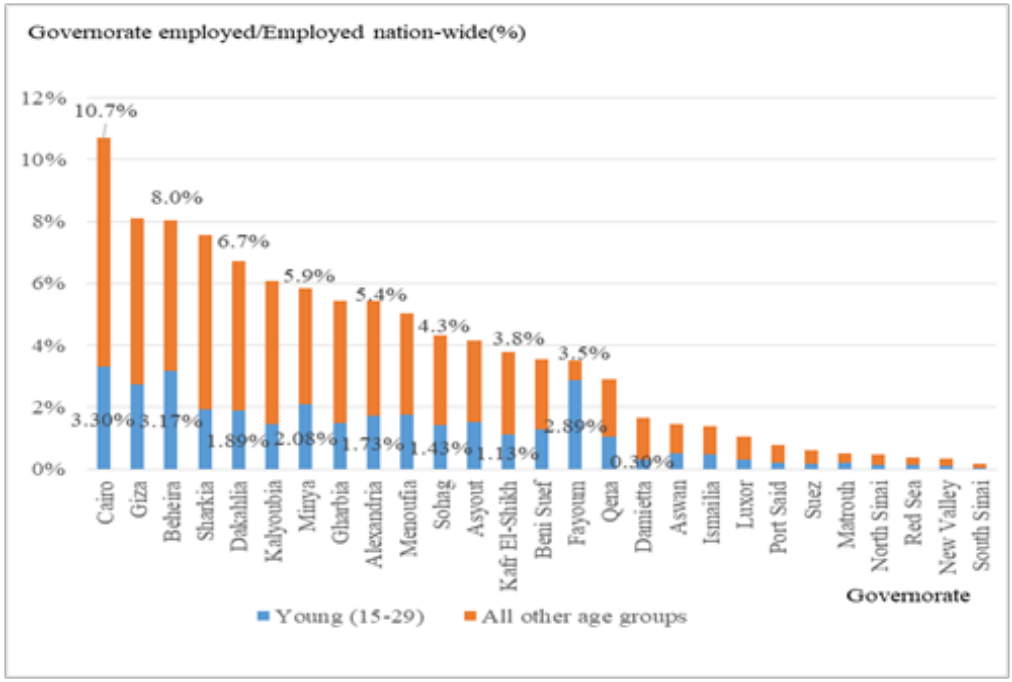


Source: Author's computations and representation.

From Figure 1, we note a pattern of geographical clustering in total employment and youth employment. Governorates with the highest total employment bracket (1,501,700-2,743,100), and those with highest youth employment bracket (484,350-846,050) are geographically close and mostly bordering each other. This is also the case for the governorates with the lowest total employment and youth employment brackets.

In Figure 2, we further present the governorates share in total employment nationwide composed of 'youth' (15-29) and 'all other age brackets' (30-64).

Figure 2: Shares of governorates in total employment nationwide (cumulative youth and all other age brackets), 2016-2017

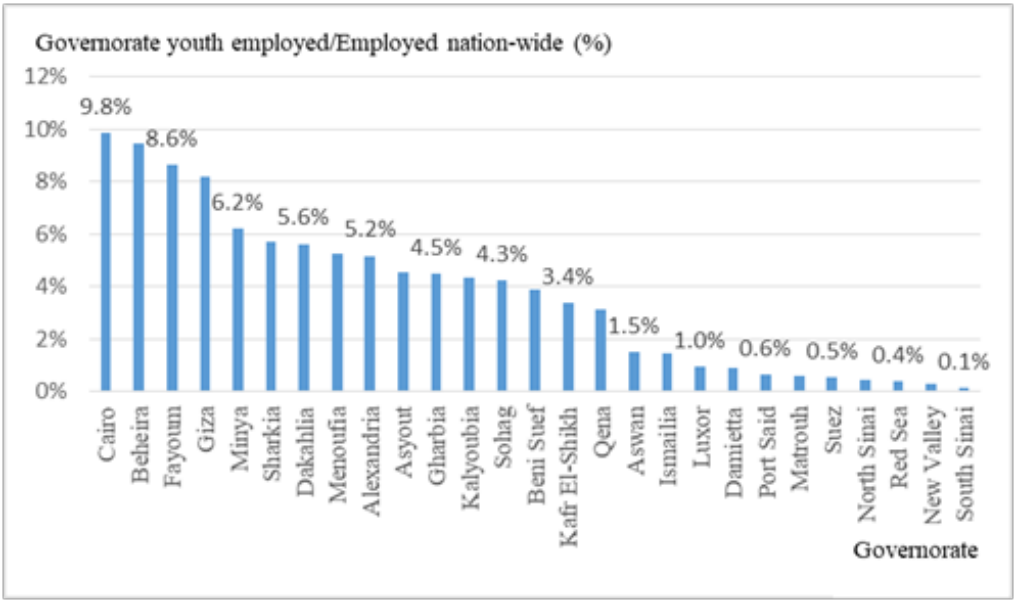


Source: Author's computations based on CAPMAS Statistical Yearbook, 2017.

The region of *Greater Cairo* occupies 25% of total employment, *Delta* 17% (Dakahlia, Gharbia, and Menoufia), *Alexandria* 13.4% (Beheira and Alexandria); *Suez Canal* 7.6% (Sharkia), *Northern Upper Egypt* 6% (Minya). The above ten governorates put together account for approximately 70% of total employment.

Figure 3 provides the detailed outlook for youth employment where the aforementioned ten governorates within the seven regions which dominate total employment similarly dominate youth employment. Together, they account for approximately 64% of youth employment. *Greater Cairo* accounts for 22.3% of youth employment; Delta 15.4% (Dakahlia, Gharbia, and Menoufia); *Alexandria* 14.7% (Beheira and Alexandria); *Suez Canal* 5.7% (Sharkia); *Northern Upper Egypt* 6.2% (Minya).

Figure 3 : Share of governorates in youth employment, 2016-2017

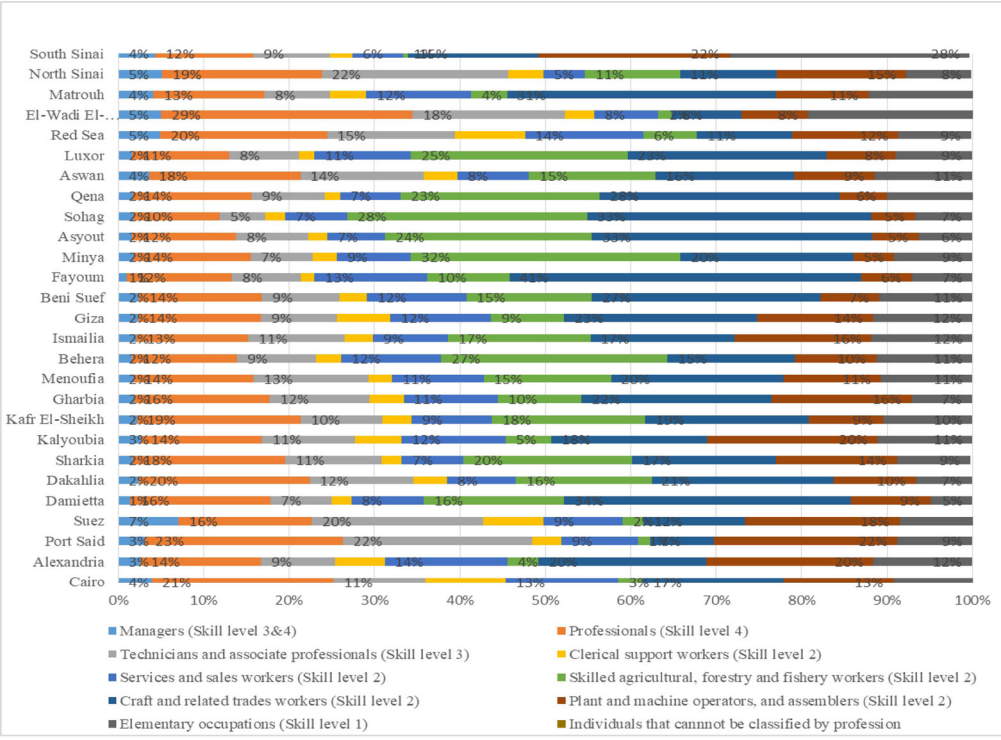


Source: Author''s computations based on CAPMAS Statistical Yearbook, 2017.

From Figure 2 and Figure 3, we find the average youth employment as a percentage of total employment for all governorates to be approximately 33%, and 67% average for all other age brackets. Although average youth share in total employment in Egypt exceeds their 28% share in the population at large (Source: Author's calculation based on CAPMAS Statistical Yearbook, 2017), there is still room for a greater youth employment. This is further emphasized by the pattern of youth unemployment given in Figure 6.

Another key characteristic is the employment by skill level across governorates. Data for youth employment by skill level across governorates are not available. We thereby use the skill characteristics of the total employed in Egypt under the assumption that the same characteristics would hold for the youth employed across governorates.

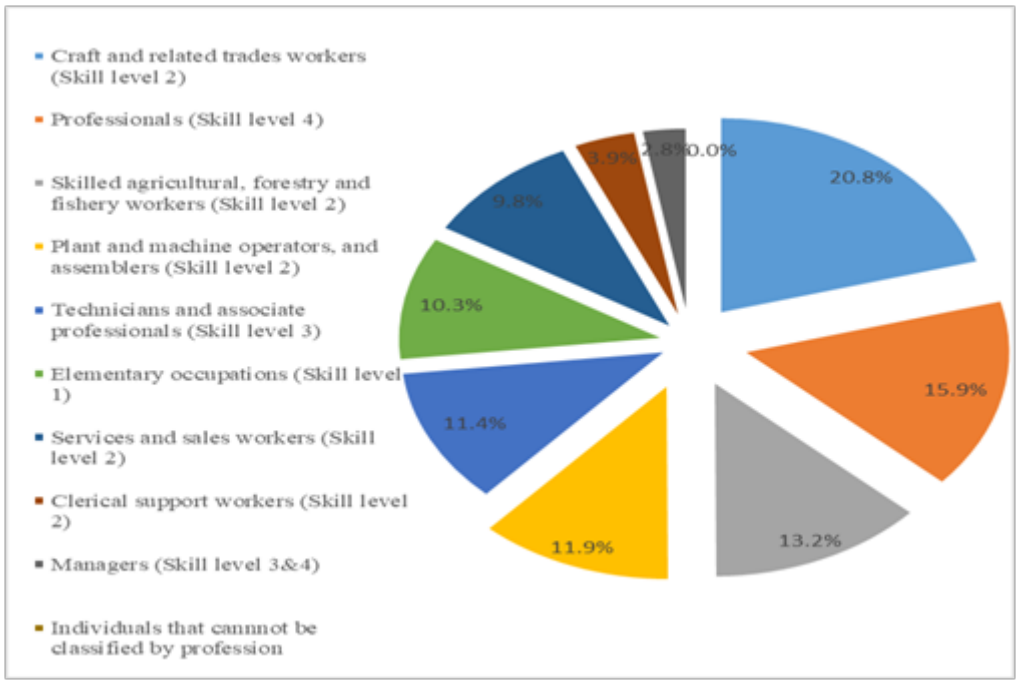
Figure 4: Total employment by skill level occupations in the governorates of Egypt, 2017



Notes: Skill level occupations as per International Labour Organization (ILO) "International Standard Classification of Occupations 2008" (ISCO-08).
Source: Author's computations based on data from the Annual Bulletin of the Labour Force Survey 2017.

Per the ILO ISCO-08, occupations are classified into four skill levels based on the tasks involved in each occupation (Level 4 and Level 1 are high- and low-skill-level-occupations, respectively). Figure 4 shows that there is a high degree of variability among the governorates in the share of the different skill level occupations in employment. However, based on the average for all governorates, Figure 5 shows that almost 62% of employment owes to: craft and related trades workers (Level 2); professionals (Level 4); skilled agricultural forestry and fishery workers (Level 2); plant and machine operators, and assemblers (Level 2), in the respective order. Of the 62%, 46% owe to Level 2 skill level occupations (namely, craft and related trades; skilled agricultural forestry and fishery; plant and machine operators, and assemblers).

Figure 5: Average share of skill level occupations in total employment across governorates, 2017



Source: Author's computations based on data from the Annual Bulletin of the Labour Force Survey 2017.

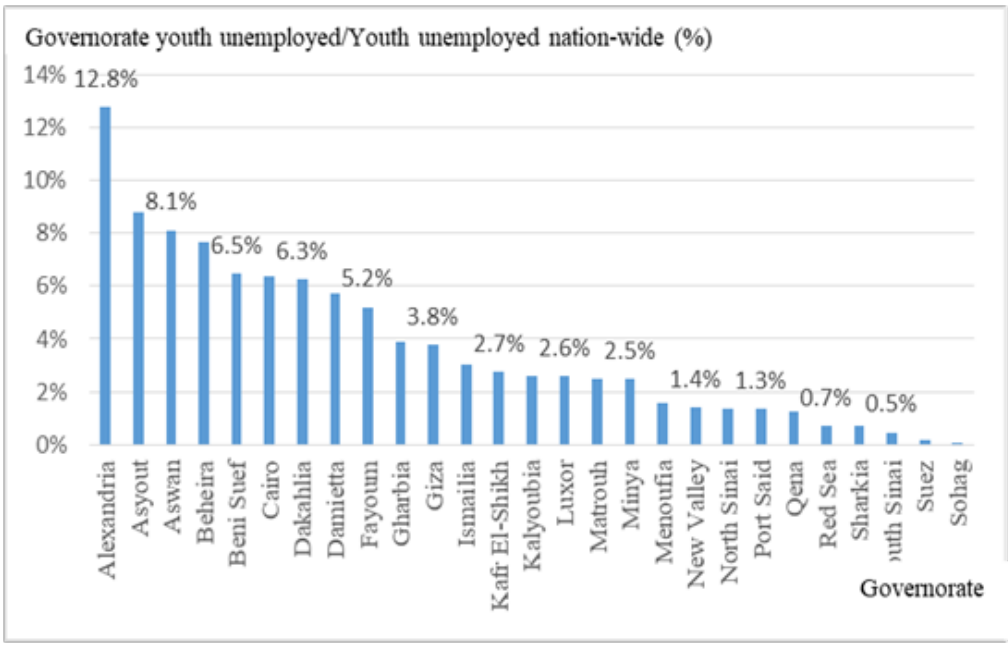
Thereby, the bulk of employment tends towards lower skills, indicating that supply-side labour skills may be acting as a constraint to greater employment. By analogy, supply-side labour skills may also be constraining greater employment of the youth.

We will subsequently link the skill level of employment by governorate to the employment and output multipliers to be identified from input-output analysis.

Regional outlook of youth unemployment:

With respect to youth unemployment, we find that the highest share in *Egypt's youth unemployment* is that of *Alexandria* region, as evident from Figure 6, accounting for 20.4% of youth unemployment (Alexandria, Beheira). The *Delta* (Dakahlia, Damietta, Gharbia) accounts for 15.9%, *Greater Cairo* 12.8% (Cairo, Giza, Kalyoubia), *Northern Upper Egypt* 11.7% (Beni Suef, Fayoum), *Asyout* 8.8% (Asyout), *Southern Upper Egypt* 8.1% (Aswan).

Figure 6: Share of governorate in youth unemployment in Egypt, 2016-2017



Source: Author's computations based on CAPMAS Statistical Yearbook, 2017.

Of further relevance to youth unemployment is the gender characteristic of the unemployed youth. Although data on governorate-specific youth unemployment by gender are not available so as to provide the detailed governorate facts, the gender characteristic of the unemployed youth nation-wide is expected to also hold across governorates. Nation-wide, the unemployed females relative to the females in the 15-29 age bracket of the labour force account for 36.5%. Unemployed males relative to males in the same age bracket account for 20% (Source: Author's computation based on CAPMAS Statistical Yearbook, 2017). By analogy, there would be twice as many unemployed youth females as unemployed youth males at the governorate level.

We will subsequently link the above facts of youth employment and unemployment (with the governorate-specific gender characteristics) to the employment and output multiplier industries to be identified from input-/output analysis. Special reference will be made to the governorates in which these multipliers are located, and in those governorates which are geographically close (if total and youth employment are found to be spatially- dependent).

4. Methodology

In this section, we describe the three main components of the method used. The first component rests on input-output analysis to obtain employment and output multipliers. As in standard input-output tables, the 2016–-2017 input-output table for Egypt''s economy records the trading of industries with one another, as well as their production for final consumption. The rows in the table give the means by which the output of each industry is distributed throughout the economy. The columns describe what each industry's output is composed of. Transactions from each industry '*i*' to each '*j*' are recorded in monetary terms, and are denoted by "x_{ij}". In addition, the sales to the buyers from all sectors are recorded as final demand. Buying is, namely, the purchases of the household sector, the purchases of the government sector, the purchases of the business sector (for private investment purposes), and the purchases of the foreign sector (i.e., sales abroad). Buying transactions are final demand transactions because they go to final use, and not as inputs in an industrial production process.

The input/output table is used to obtain the technical coefficients (a_{ij})'s, where each is calculated as the input of the buying industry '*j*' from all other industries including itself (*i*=1, 2, …, n) divided by the total output of industry '*j*', (i.e., $a_{ij} = x_{ij}/X_j$). For all industries, matrix **A** defines the technical coefficients matrix (the Leontief matrix), and the $(\mathbf{I}\text{-}\mathbf{A})^{-1}$ is the Leontief inverse or the total requirements matrix giving both the direct and indirect usage of all inputs (each element is denoted by l_{ij}).

Input-output analysis assumes that each industry produces one unique homogeneous product, and no two products are jointly-produced by more than one industry. Prices, consumer demands and factor supplies are assumed to be given, and the input-output relations between the industries are linear. A unit of change in the final demand for industry '*j*', or a unit of change in the output of another industry that uses *j*'s production as an input, will translate into a unit change in production of the industry '*j*.' It also assumes that the relationship between the industry''s inputs and its output is fixed. As such, the technical coefficient (a_{ij}) is fixed and remains unchanged. Thereby, production in the input-output system operates under constant returns to scale, and ignores economies of scale in production and any possible substitution of factors of production. Moreover, as industry '*j*' buys from two industries (1 and 2), it uses the inputs

from 1 and 2 in a fixed proportion. This proportion is equal to the ratio of the two technical coefficients ($p_{12}= a_{1j} /a_{2j}$). a_{1j} and a_{2j} are fixed, and p_{12} is, in turn, fixed. Thus, the technology of production is a fixed proportion technology, which is also not affected by changes in the relative prices of industry 1 to industry 2's inputs. Technological progress is constant. Also, the supply of labour is assumed to be perfectly elastic, whereby adjustments in labour are quantity-based and are unrelated to any change in the wage rate. Finally, there is free mobility of resources between industries.

Using input-output analysis, the output multiplier is computed for all industries in the period 2016–2017, and it measures the total output from all domestic industries required to produce one additional unit of output of industry '*j*'. It is the combined direct and indirect effects of a change in final demand for the industry '*j*'. Since multipliers are assumed to be stable during a typical period of up to six years after the initial calculation of the input-output table (D''Hernoncourt et al., 2011), the computed multipliers would adequately reflect the present output multiplier effects for Egypt's industries. From the total requirements matrix Leontief inverse), it is computed for industry '*j*' as the column sum:

$$(O_{MULT})_j = \sum_{i=1}^{n} l_{ij}$$

Where: l_{ij} is the element of the total requirements matrix, measuring how much of each industry's output is needed in direct and indirect requirements to produce one unit of industry *j*'s output (D'Hernorncourt et al., 2011: 10).

The employment multiplier is obtained as a measure of how employment would directly and indirectly increase throughout the economy as a result of an increase in the final demand for industry '*j*' by one unit, and how that would be enough to produce one additional unit of full time employment in industry '*j*' (D'Hernorncourt et al., 2011: 14). It is computed as:

$$(E_{MULT})_j = \frac{\sum_{i=1}^{n} w_i \; l_{ij}}{w_j}$$

Where: w_j is the share of the total employee compensation in industry *i*'s total output (X_i) (a proxy for the labour coefficient for industry *i*); l_{ij} is the element of the total requirements matrix; and w_j is the share of employee compensation in industry '*j*'s total output (X_j).

Also, the employment effects statistic is further obtained from the denominator of the employment multiplier. It measures the impact on employment throughout the economy arising from a change in final demand for industry '*j*'s output by one unit:

$$(E_{Effect})_j = \sum_{i=1}^{n} w_i \; l_{ij}$$

Further to identifying potential employment generators, the second component of our method is spatial analysis, where we test if there is spatial dependence in total and in youth employment in 2016–2017 using the Moran''s index. If found to exist, it would mean that there are local spillover effects, such that a change in *x* at any location is transmitted to all other locations according to W (the weights matrix) (Vega & Elhorst, 2013). The Moran''s index is computed as:

$$MI = \frac{(n-1)\sum_i^n \sum_j^n w_{ij}\,(y_i - \bar{y})(y_j - \bar{y})}{\sum_i^n \sum_j^n w_{ij}\,(y_i - \bar{y})^2}$$

Where: y_i and y_j is the employment (for total and youth) of the governorates $_i$ and *j*, respectively, and w_{ij} is the element of the spatial weights matrix[4], *i*=1,2,…, 27, *j*=1,2,…,27 where Egypt''s total number of governorates is 27. The significance of the Moran''s index is tested by the Z-score.

With spatial dependence tested for, and with output and employment multipliers obtained, the third component of the method would be to identify *where* the high employment and output multiplier industries are located. Their location is expected to have important implications for total employment and youth employment in the respective governorates. We further consider where industries which fall along the value chains of those high employment multiplier industries are themselves located. The presence of upstream activities in neighbouring locations to those of the output and employment multiplier industries locations is expected to strengthen inter-firm linkage across regions, and to allow for greater employment generation.

5. Data

Data for input-output transactions are obtained from Input-Output Matrix by Economic Activity, 2016–2017 issued by the Institute of National Planning.

Data for youth and total employment by governorates, and employment by gender, and employment in agriculture, industry and services are obtained from Statistical Yearbook 2017 issued by CAPMAS.

Data for employment by skill level occupation are obtained from Annual Bulletin of the Labour Force Survey 2017 issued by CAPMAS.

Data for output of each industry in the governorates of Egypt are obtained from the Industrial Statistics Bulletin issued by CAPMAS. The most recent available complete data are for the years 2015–2016 (public sector) and 2016 (private sector)—both aggregated for the year 2016.[5]

Data for the geographical attributes of governorates (required for computing Egypt's weights matrix) are obtained from the shape file available from CAPMAS. Computations of the Moran's index and maps for total employment and youth employment are obtained using GeoDa open source software.

6. Results

In this section, we present results for the following: (1) the input-output analysis and the computed employment multipliers, output multipliers and employment effects statistics for all industries; (2) the spatial dependence test; (3) the location of the high employment and output multiplier industries; (4) the location of the industries which fall along the value chains of the high employment and output multiplier industries.

Employment and output multipliers

Results for the computed employment and output multipliers, and for the employment effects statistic, are shown in Table 1.

Table 1: Egypt's industries ranked by employment multiplier, and corresponding output multiplier and employment effects statistic, 2016-2017

Industry (ISIC revision 4 code)	Employment multiplier	Output multiplier	Employment effects statistic
Agriculture, forestry and fishing (01-03)			
Crop and animal production, fishing and aquaculture (01 & 03)	1.45	1.56	0.20
Industry (Extraction and Mining) (06-09)			
Extraction of crude petroleum (06)	1.43	1.08	0.04
Mining of metal ores (07-09)	1.37	1.40	0.17
Industry (Manufacturing) (10-33)			
Food products (10)	4.27	2.11	0.18
Basic metals (24)	2.42	1.78	0.10
Motor vehicles and other transport equipment (29 & 30)	2.31	2.17	0.14
Paper products (17)	2.11	2.00	0.18
Non-metallic mineral products (23)	2.03	1.92	0.18
Beverages (11)	2.02	1.70	0.16
Wearing apparel (14)	2.01	1.49	0.15
Coke and refined petroleum (19)	1.91	1.69	0.07
Chemical and chemical products (20)	1.86	1.73	0.15

continued next page

Table 1 Continued

Industry (ISIC revision 4 code)	Employment multiplier	Output multiplier	Employment effects statistic
Industry (Manufacturing) (10-33)			
Textiles (13)	1.83	2.16	0.35
Rubber and plastic products (22)	1.82	1.94	0.16
Fabricated metal products except machinery (25)	1.76	1.68	0.10
Electrical equipment (27)	1.75	2.10	0.18
Computer and electronic and optical products (26)	1.67	2.17	0.19
Machinery and equipment (28)	1.64	2.05	0.24
Pharmaceuticals (21)	1.51	1.88	0.22
Wood and cork except furniture (16)	1.46	1.11	0.03
Tobacco products (12)	1.42	1.57	0.21
Printing and reproduction (18)	1.26	1.09	0.05
Furniture (31)	1.18	1.34	0.23
Other manufacturing and repair of equipment (32 & 33)	1.01	1.03	0.11
Services (35-97)			
Real estate (68)	2.66	1.23	0.43
Hotels And restaurants (55 & 56)	1.66	1.57	0.15
Administrative & support services (77-82)	1.57	1.53	0.14
Communication (58-63)	1.47	1.44	0.25
Construction (41-43)	1.44	1.55	0.17
Membership organization services (94-96)	1.23	1.33	0.19
Wholesale and retail and repair of motor vehicles (45-47)	1.19	1.20	0.11
Electricity and gas (35)	1.16	1.75	0.42
Professional services (69-75)	1.16	1.28	0.17
Water and sewerage (36-38)	1.15	1.62	0.56
Transport and storage (49-53)	1.13	1.38	0.25
Health and social services (86-88)	1.11	1.46	0.50
Public administration and defense (84)	1.10	1.31	0.24
Arts and Entertainment (90-93)	1.08	1.22	0.56
Financial Services (64-66)	1.07	1.14	0.33
Education (85)	1.02	1.10	0.75
Domestic Services (97)	1.00	1.00	0.57

Notes: The computed employment multiplier for Leather is an anomaly, with a value of 14.98. This excessively high value results from the industry having a very low value of employee compensation, hence a very low ratio of employee compensation to output value (the employment multiplier denominator). There was no error in the value reported in the I/O table, and therefore Leather has been omitted from the results.
Source: Author's computations based on Egypt's 2016–2017 input-output tables.

Of primary industries, every unit increase in final demand for agriculture, followed by extraction of crude petroleum, and mining of metal ores, creates 1.45, 1.43 and 1.37 units of employment in all other industries, respectively.

Of manufacturing industries, every unit increase in final demand for Food products creates 4.27 units of employment in all other industries. Other leading manufacturing employment generators in which every unit of increase in final demand creates *more than twice to twice* the employment in all other industries are: Basic metals; Motor vehicles and other transport equipment; Paper products; Non-metallic mineral products; Beverages; and Wearing apparel. Industries in which every unit of increase of final demand creates *almost twice to 1.65* the employment in all other industries are: Coke and refined petroleum; Chemical and chemical products; Textiles; Rubber and plastic products; Fabricated metals products except machinery; Electrical equipment; Computer, electronic and optical equipment; and Machinery and equipment.

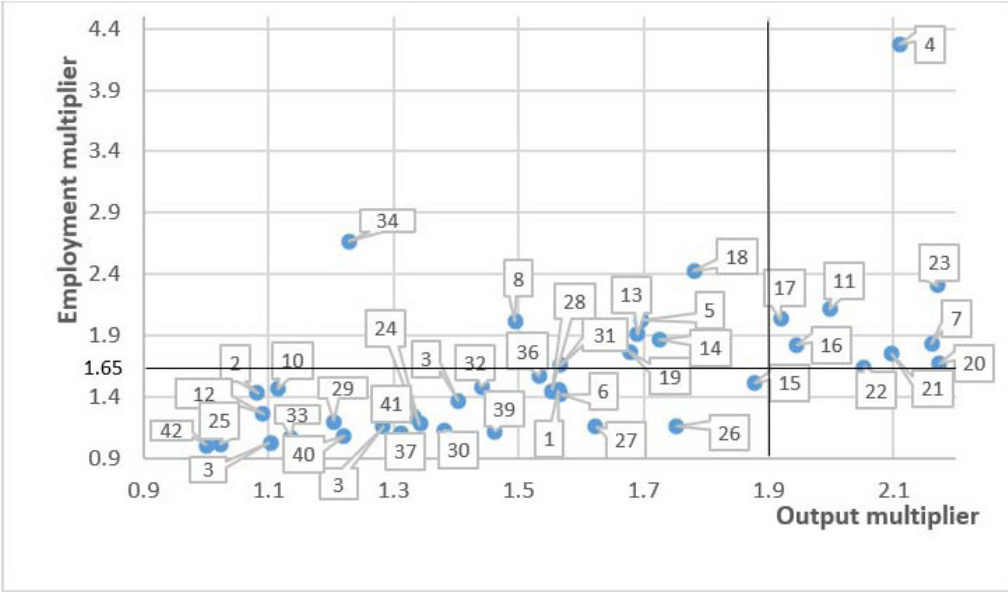
As for services, the leading employment multiplier services are: Real estate; Hotels and restaurants; Administrative & support services; and Communication where every unit increase in final demand in these services creates *more than twice to almost 1.5* the employment in all other industries.

The employment and output multipliers for all industries are jointly presented in Figure 7.

We note from Figure 7 that the following industries possess *both* high employment and high output multipliers (with respective values of 2.0 and more, and 1.70 and more, ranked in descending order): Food products; Motor vehicles and other transport equipment; Basic metals; Paper products; Non-metallic mineral products; Beverages.

With reference to female employment, some of the high employment multiplier industries are also relatively high female employers. Measured by the share of females in total employment, the following industries have a female share in total employed of 10% or more, thus being relatively high female-intensive employers: Wearing apparel (47%); Computer and electronic and optical products (22%); Industrial chemicals and pharmaceuticals (19%); Extraction of crude petroleum and natural gas (15%); Textiles (13%); Food products (10%) (Source: Author's computations based on data from CAPMAS Industrial Statistics Bulletin, 2015–2016 and 2016).

Figure 7: Industry output and employment multipliers, 2016-2017



Notes: (1) Crop and animal production and hunting, and fishing and aquaculture; (2) Extraction of crude petroleum; (3) Mining of metal ores; (4) Food products; (5) Beverages; (6) Tobacco products; (7) Textiles; (8) Wearing apparel ; 10) Wood and cork except furniture; (11) Paper and paper products; (12) Printing and reproduction of recorded media; (13) Coke and refined petroleum; (14) Chemicals and chemical products; (15) Pharmaceuticals; (16) Rubber and plastic products; (17) Non-metallic mineral products; (18) Basic metals; (19) Fabricated metal products except machinery; (20) Computer and electronic and optical products; (21) Electrical equipment ; (22) Machinery and equipment; (23) Motor vehicles, trailers and semitrailers, and other transport equipment; (24) Furniture; (25) Other manufacturing, and repair of machinery and equipment; (26) Electricity and gas; (27) Water and sewerage; (28) Construction; (29) Wholesale and retail and repair of motor vehicles; (30) Transport and storage; (31) Hotels and restaurants; (32) Communication; (33) Financial services and insurance; (34) Real estate; (35) Professional services; (36) Administrative and support services; (37) Public Administration and Defense ; (38) Education; (39) Health and social work; (40) Arts and entertainment; (41) Membership organization services; (42) Domestic services; Leather industry has been omitted.
Source: Author's computations.

Spatial dependence

Testing for spatial dependence in total employment and in youth employment, the results shown in Table 2 are obtained for the Moran''s index.

Table 2: Moran's index (total employment and youth employment) diagnostic test for weights matrix of the governorates of Egypt (row-standardized weights), 2016-2017

	Moran's Index	Z-value	p-value > |Z|
Employment	0.299	2.746	0.01
Youth employment	0.276	2.645	0.02

Source: Author's computations.

For total and youth employment, the approximate values of the Moran's indices of 0.30 and 0.28, and the Z-score values of 2.75 and 2.65, indicate the existence of positive spatial dependence.[6] As such, similar or close values of both total and youth employment would be expected to be geographically clustered, and there would be local spillover effects among the neighbouring regions. Such clustering is, in fact, evident from Figure 1 particularly among: governorates within *Greater Cairo* region (Giza, Cairo, Kalyoubia); *a Greater Cairo governorate* (Giza) and a *Northern Upper Egypt* (Minya); governorates within *Delta* region (Dakahlia, Kafr El-Sheikh, Gharbia, and Menoufia); governorates within *Southern Upper Egypt* (Aswan and Sohag).

Location of the high employment multiplier industries

With the evident geographical clustering shown in Figure 1, and the established positive spatial dependence, an important practical question arises: *where* are the high employment multipliers geographically located, and, in turn, *where* would they yield employment spillover effects in view of the established spatial dependence?

To answer this question, we computed the backward linkage coefficient of the high employment multiplier industries to reflect the magnitude of their respective ties to domestic sources of raw materials and intermediates. We further identified the governorates in which these industries are mainly located. And to reveal the governorate''s relative importance as a location, we obtained the share of the respective governorate''s output in the nation-wide output of the high employment multiplier industries. Results are given in Table 3.

Table 3: Industries ranked by employment multiplier, with geographical location and share of the governorate in industry output, main upstream industries along the value chain, backward linkage, geographical proximity of location to upstream industries' location, and industry average revealed comparative advantage (RCA), 2016-N2017

	(1)	(2)	(3)	(4)	(5)
	Industry	**Main locations of the industry, and the governorate share in the industry's output nationwide (%)**	**Main upstream industries along the industry's value chain (arranged in descending importance), and geographical proximity of the industry's location to upstream industries' locations ((£) if satisfied)**	**Backward linkage coefficient**	**Industry average RCA**
	Agriculture, forestry and fishing (01-03)				
(1)	Crop and animal production, fishing and aquaculture	Dakahlia (96.0) ; Fayoum (1.0) ; Beheira (1.0) ; Gharbia (1.0) ; Sharkia (1.0)	Crop and animal production; Food products; Mining of metal ores; Extraction of crude petroleum and natural gas (£)	0.363	2.8

continued next page

Table 3 Continued

	(1)	(2)	(3)	(4)	(5)
	Industry	**Main locations of the industry, and the governorate share in the industry's output nationwide (%)**	**Main upstream industries along the industry's value chain (arranged in descending importance), and geographical proximity of the industry's location to upstream industries' locations ((£) if satisfied)**	**Backward linkage coefficient**	**Industry average RCA**
(2)	Extraction of crude petroleum and natural gas	Cairo (31.0); North Sinai (31.0); Red Sea (21.0)	Extraction of crude petroleum; Crop and animal production (£)	0.058	--
(3)	Mining of metal ores) ferrous and non-ferrous) and quarrying of stone, sand and clay and extraction of salt	Alexandria (57.0); Red Sea (36.0)	Mining of metal ores; Crop and animal production; Extraction of crude petroleum and natural gas (£)	0.274	15.7 (a)
	Industry (Manufacturing) (10-33)				
(4)	Food products	Giza (19.5); Cairo (12.5); Alexandria (11.5); Kayoubia (9.0); Suez (7.5)	Crop and animal production; Other manufacturing and repair; Food products; Coke and refined petroleum; Machinery and equipment (£)	0.746	4.5
(5)	Basic metals	Alexandria (25.5) ; Menoufia (21.0); Sharkia (16.0); Suez (11.5) ; Qena (9.0)	Basic metals; Mining of metal ores; Food products; Fabricated metals except machinery (£)	0.469	2.3
(6)	Motor vehicles and other transport equipment	Giza (48.0); Cairo (29.0); Kalyoubia (19.0)	Basic metals; Fabricated metals except machinery; Motor vehicles, trailers and semitrailers and other transport equipment; Coke and refined petroleum; Other manufacturing and repair; Textiles; Chemical and chemical products (£)	0.689	1.1(b)
(7)	Paper products	Giza (36.5) ; Alexandria (15.5); Cairo (14.5) ; Sharkia (10.5); Kalyoubia (10.0)	Coke and refined petroleum products; Printing and reproduction of recorded media; Chemical and chemical products; Paper products; Fabricate metals except machinery; Basic metals; Crop and animal production; Other manufacturing and repair (£)	0.660	4.4

continued next page

Table 3 Continued

	(1)	(2)	(3)	(4)	(5)
	Industry	**Main locations of the industry, and the governorate share in the industry's output nationwide (%)**	**Main upstream industries along the industry's value chain (arranged in descending importance), and geographical proximity of the industry's location to upstream industries' locations ((£) if satisfied)**	**Backward linkage coefficient**	**Industry average RCA**
(8)	Non-metallic mineral products	Cairo (30.0); Suez (19.0); Beni Suef (10); Sharkia (7.5); Giza (7.0)	Coke and refined petroleum products; Other manufacturing and repair; Non-metallic mineral products; Basic metals; Mining of metal ores; Chemicals and chemical products; Printing and reproduction of recorded media; Rubber and plastic products (£)	0.596	4.1
(9)	Beverages	Cairo (86.5); Kalyoubia (11.5)	Crop and animal production; Other manufacturing and repair; Chemical and chemical products; Rubber and plastic products; Basic metals (£)	0.480	1.2
(10)	Wearing apparel	Port Said (18); Alexandria (16); Ismailia (16); Sharkia (15); Cairo (14); Kalyoubia (6)	Textiles (£)	0.269	2.8
(11)	Coke and refined petroleum	Alexandria (55.0); Asyout (12.5); Cairo (12.5); Kalyoubia (10.0); Suez (8.0)	Extracting of crude petroleum and natural gas; Coke and refined petroleum; Chemicals and chemical products; Basic metals (£)	0.605	3.8
(12)	Chemicals and chemical products and pharmaceuticals	Alexandria (24.0); Giza (23.0); Cairo (19.0); Kalyoubia (10.5); Sharkia (8.0)	Mining of metal ores; Coke and refined petroleum products; Chemicals and chemical products; Pharmaceuticals; Basic metals; Other manufacturing and repair; Rubber and plastics (£)	0.521 (c)	3.9
(13)	Textiles	Sharkia (57.0); Alexandria (12.0); Menoufia (10.5); Gharbia (10.0)	Textiles; Crop and animal production; Coke and refined petroleum; Chemicals and chemical products (£)	0.677	4.1
(14)	Rubber and plastic products	Alexandria (32.5); Giza (17); Cairo (16.5); Beni Suef (11.5); Sharkia (9)	Coke and refined petroleum; Chemicals and chemical products; Basic metals (£)	0.587	1.5

continued next page

Table 3 Continued

	(1)	(2)	(3)	(4)	(5)
	Industry	**Main locations of the industry, and the governorate share in the industry's output nationwide (%)**	**Main upstream industries along the industry's value chain (arranged in descending importance), and geographical proximity of the industry's location to upstream industries' locations ((£) if satisfied)**	**Backward linkage coefficient**	**Industry average RCA**
(15)	Fabricated metal products except machinery	Cairo (36.0) ; Giza (20.5) ; Kalyoubia (18.5) ; Sharkia (12.5); Alexandria (11.0)	Basic metals; Food products (£)	0.404	2.8
(16)	Electrical equipment	Kalyoubia (30.0) ; Menoufia (22.5); Beni Suef (19.5) ; Sharkia (16.5)	Basic metals; Coke and refined petroleum products; Fabricated metals except machinery; Electrical equipment; Chemicals and chemical products; Other manufacturing and repair (£)	0.658	3.5
(17)	Computer and electronic and optical products	Giza (37.0) ; Cairo (35.0) ; Menoufia (17.0); Kalyoubia (8.5)	Basic metals; Coke and refined petroleum products; Fabricated metal products except machinery; Chemical and chemical products; Computer and electronic and optical equipment; Other manufacturing and repair (£)	0.694	3.0
(18)	Machinery and equipment	Giza (62.5) ; Menoufia (15.5); Cairo (8.5) ; Kalyoubia (8.5)	Basic metals; Other manufacturing and repair; Food products; Coke and refined petroleum products; Fabricated metal products except machinery (£)	0.671	--

Notes:

industries with high employment and output multipliers;

industries with high female employment intensity;

governorates with high youth unemployment.

(a) Under the two-digit "Other mining and quarrying (07)", the highest RCA is for the three-digit "mining and quarrying n.e.c. (089)," under which is the "mining of chemicals and fertilizer minerals (0891)."

(b) Motor vehicles and transport equipment was not available in RCA industries in 2017, but appears in 2020 for which the value is given.

(c) Average backward linkage coefficient of "chemicals and chemical products", and "pharmaceuticals."

Source: Author's computations for columns (1), (2), and (3) based on data by governorate from CAPMAS Industrial Statistics Bulletin, 2015–2016 and 2016, column (4) based on 2016–2017 input-output table, and column (5) values are computed based on UNCTADStat – RCA Radar, RCA Egypt data for the year 2017 (with concordance of SITC rev. 3 with ISIC rev. 4), available at: https://unctadstat.unctad.org/en/RcaRadar.html).

From Table 3, the following conclusions are distilled with reference to industry in Egypt's seven regions:

- *Greater Cairo* (comprising Cairo, Giza, and Kalyoubia) homes twelve high employment multipliers: Extraction of crude petroleum; Food products; Motor vehicles; Paper products; Non-metallic mineral products; Beverages; Wearing apparel; Rubber and plastics; Fabricated metals except machinery; Electrical equipment; Computer and electronic and optical equipment; Machinery and equipment.

- The *Delta* and *Suez* regions (specifically, Menoufia, Gharbia in the *Delta* and Sharkia in *Suez*) home nine high employment multipliers: Basic metals; Paper products; Non-metallic mineral products; Wearing apparel; Industrial chemicals and pharmaceuticals; Textiles; Rubber; Fabricated metals except machinery; Electrical equipment.

- *Alexandria* homes ten high employment multipliers: Mining, Food products, Basic metals, Paper products, Wearing apparel, Coke and refined petroleum, Industrial chemicals and pharmaceuticals, Textiles, Rubber, and Fabricated metal products.

- *Northern Upper Egypt*, in which Beni Suef is central for embracing: Non-metallic mineral products; Rubber; and Electrical equipment. Meanwhile *Southern Upper Egypt* (Qena) and *Asyout* (Asyout) embrace Basic metals and Coke and refined petroleum, respectively.

For the service industries, it was not possible to obtain the share of the governorate in the total service output (or value added) nation-wide since data are not available, hence not possible to determine key service locations. We, therefore, used the share of service industries in the total employment by governorate as a proxy measure for the contribution of services in total output by governorate.

Services were found to tip the scale in output share across all governorates, such that they account for more than 50% of economic activity in the majority of governorates. By region, we find that services in the governorates of *Greater Cairo* have a 74% average share in output. In the *Alexandria* and the *Delta* regions, services account for close to 75% and 60% of output, respectively. In *Southern Upper Egypt* (Qena, Sohag), and in *Asyout* (Asyout), their average share in output is approximately 60% (Source: Author's computations).[7]

Value chain perspective

From a value chain perspective, the use of input-output analysis allows for tracking linkages between industries, hence identifying the upstream industries feeding production of a given industry. Also, the existence of spatial dependence means that neighbouring regions would simultaneously affect each other's employment, and would attain greater vertical integration.

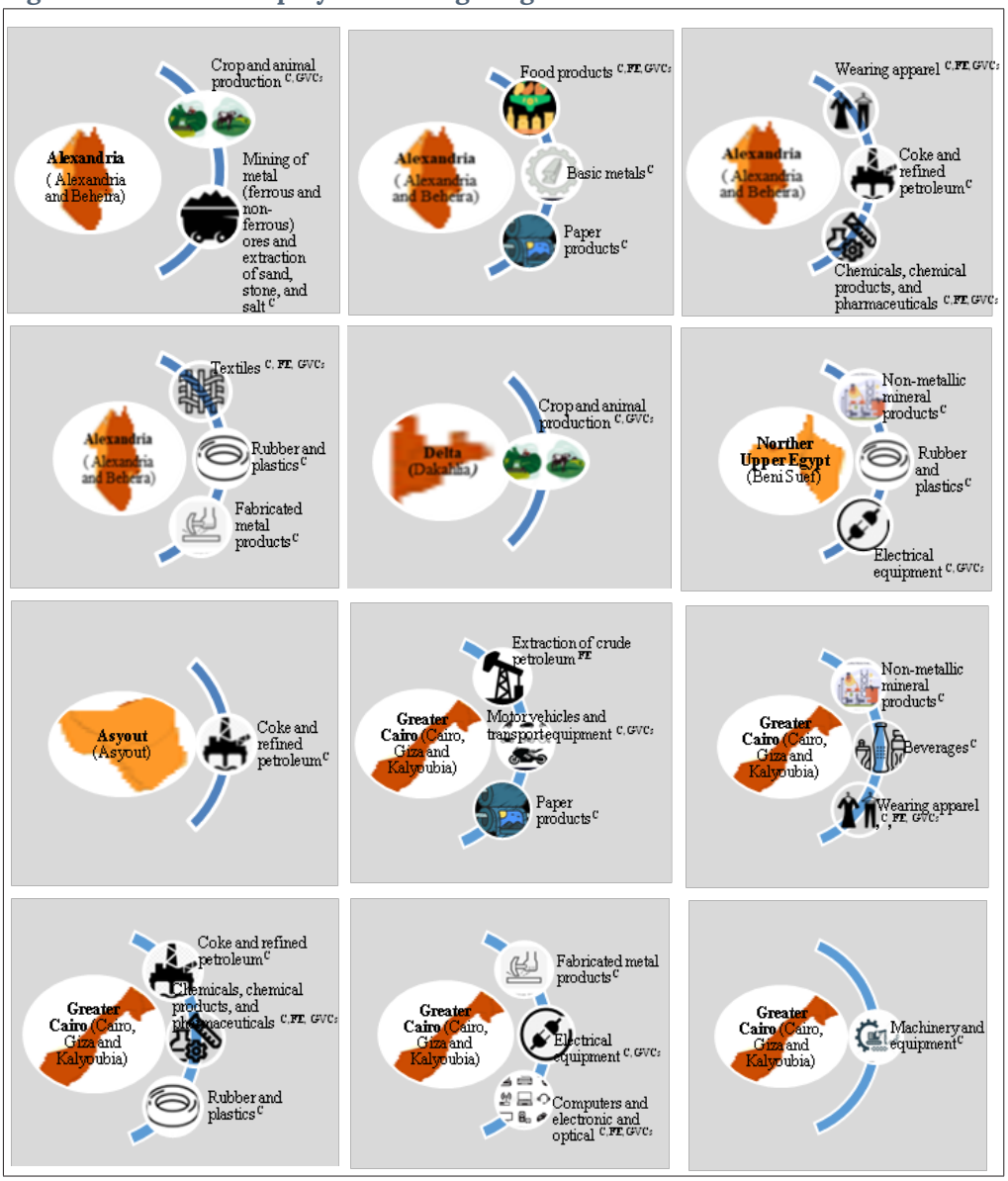
In Table 3, we show the main upstream industries along the value chains of the high employment multiplier industries, whether proximity of the industry location to upstream industries' locations is satisfied,[8] and the revealed comparative advantage of the high employment multiplier industries as an indicator of competitiveness.[9] We find that, to a large extent, the high multiplier industries and the upstream industries along their value chains *are located* in neighbouring governorates, or in geographically close ones. They may, thereby, become interlinked with their upstream industries across regions, with prospects for strengthening domestic supply chains, and for integrating into global value chains. To cite one example, Food products is mainly located in Giza, Cairo, Alexandria, Kalyoubia, and Suez, while its main upstream industries (located in) are: Crop and animal production (Dakahlia, Beheira, Gharbia, and Suez); Food products (same locations); Coke and refined petroleum (Alexandria, Asyout, Cairo, Kalyoubia, and Suez); Machinery and equipment (Giza, Menoufia, Cairo, and Kalyoubia).

The above findings emphasize what was identified by the "Strategy for Industrial Development and Foreign Trade, 2016–2020" as industries with potential for stronger inter-firm linkage along their domestic supply chains, and for integration in global value chains: Food products (4.5); Textiles (4.1); Chemicals and chemical products and pharmaceuticals (3.9); Electrical equipment (3.5); Computer and electronic and optical products (3.0); Wearing apparel (2.8); Crop and animal production (2.8); Basic metals (2.3); Motor vehicles and other transport equipment (1.1) (Source: Ministry of Industry and Trade, Egypt, and author's computations of the average industry RCA, and industry ranking by competitiveness). We note that, to date, only textiles and apparel, motor vehicles and other transport equipment, and crop and animal production (fresh and processed fruits and vegetables) have attained some integration in global value chains.

Linking to youth unemployment

We had identified the following regions as those with the highest share in youth unemployment nationwide: *Alexandria* (Alexandria, Beheira), *Delta* (Dakahlia, Damietta, Gharbia), *Greater Cairo* (Cairo, Giza, Kalyoubia), *Northern Upper Egypt* (Beni Suef, Fayoum), *Asyout* (Asyout), *Southern Upper Egypt* (Aswan). With reference to Table 3, we note that, except for Aswan, all of the above governorates appear in column (2), thus making them key locations of the employment multiplier industries. From column (3) of Table 3, we note that these governorates are also key locations of upstream industries along the value chains of the employment multiplier industries. In conclusion, we summarize in Figure 8 the industries in the high youth unemployment governorates whose promotion would be a positive step in the direction of mitigating youth unemployment. Some of these industries would further mitigate unemployment among the female youth, would be candidates for deeper integration in global value chains, as well as being competitive.

Figure 8: Youth unemployment mitigating industries



Notes: C : competitive as assessed by RCA;
FE : with potential for mitigating female youth unemployment;
GVCs : with potential for deeper integration in global value chains.
Source: Author's computations and representation.

7. Conclusion and policy implications:

While the 33% average youth share in total employment exceeds the 28% average youth share in the population, there is much room for greater youth employment in view of: 1) an average youth unemployment rate of 23.8%, nation-wide; and 2) regionally, *Alexandria* accounting for 20.4% of youth unemployment, followed by *Delta* (15.9%), *Greater Cairo* (12.8%), *Northern Upper Egypt* (11.7%), *Asyout* (8.8%), and *Southern Upper Egypt* (8.1%). Nation-wide, the rate of female youth unemployment is 36.5%, compared to 20% among males. By analogy, there would be twice as many unemployed youth females as unemployed youth males at the regional level. Furthermore, with the bulk of employment tending towards lower skill level occupations, there is evidence that supply-side labour skills may be constraining greater employment at the national, and the regional levels.

Against this backdrop, the computed employment multipliers for primary, manufacturing and services, nominate the following industries as high employment multiplier generators. *Primary industries:* Agriculture, Extraction of crude petroleum, and Mining of metal ores. *Manufacturing industries:* Food products; Basic metals; Motor vehicles and other transport equipment; Paper products; Non-metallic mineral products; Beverages; Wearing apparel; Coke and refined petroleum; Chemical and chemical products; Textiles; Rubber and plastic products; Fabricated metals products except machinery; Electrical equipment; Computer, electronic and optical equipment; and Machinery and equipment. Over-and-above, the following industries also have high output multipliers: Food products; Motor vehicles and other transport equipment; Basic metals; Paper products; Non-metallic mineral products; Beverages. *Service industries include:* Real estate; Hotels and restaurants; Administrative & support services; and Communication.

Total and youth employment are found to be spatially-dependent, implying that similar or close values of both total and youth employment would be expected to be geographically clustered, with local spillover effects among the neighbouring regions. In recognition of this, we found that the high multiplier industries and the upstream industries along their value chains are, to a large extent, located in neighbouring governorates, or in geographically close ones. This would imply that they could be interlinked across regions, thereby strengthening domestic supply chains. This is in keeping with Egypt's "Strategy for Industrial Development, 2016–2020" which has identified the following as potential industries for stronger inter-firm linkage, and

prospects for global value chain engagement: Food products (4.5); Textiles (4.1); Chemicals and chemical products and pharmaceuticals (3.9); Electrical equipment (3.5); Computer and electronic and optical products (3.0); Wearing apparel (2.8); Crop and animal production (2.8); Basic metals (2.3); Motor vehicles and other transport equipment (1.1) (Source: Ministry of Industry and Trade, Egypt, and author's computations of the average industry RCA, and industry ranking by competitiveness). We note that, to date, only Textiles and apparel, Motor vehicles and other transport equipment, and Crop and animal production (fresh and processed fruits and vegetables) have attained some integration in global value chains. Thus, the following industries have heightened potential for integration: Food Products, Chemicals and chemical products and pharmaceuticals, Electrical equipment, Computer and electronic and optical products, and Basic metals.

Spatial dependence further implies that investments in Greater Cairo will affect neighbouring regions to the eastwards (namely, Suez, Ismailia, and Port Said), northwards to Sharkia, Menoufia and Gharbia, and southwards to Fayoum, Beni Suef, and Minya. Investments in the Delta may have spillovers eastwards in the neighbouring governorates of Suez, Ismailia, and Port Said, and southwards in Greater Cairo. And investments in Alexandria will impact its eastward and westward neighbours of Beheira and Matrouh, respectively. Accordingly, we propose that Egypt's investment map, launched as part of the Investment Law No. 72 of 2017 to attract investments to specific industries in named governorates, be complemented with the findings of the present research regarding employment multipliers and youth employment spillovers (see Egypt General Authority for Investment and Free Zones).

Finally, new investments and/or capital expansion may be guided by the potential of the following industries to mitigate youth unemployment, especially in the regions with the highest youth unemployment. Crop and animal production (Alexandria, Delta); Mining of metal ores (Alexandria); Extraction of crude petroleum (Greater Cairo); Food products (Alexandria); Basic metals (Alexandria); Paper products (Alexandria, Greater Cairo); Wearing apparel (Alexandria, Greater Cairo); Textiles (Alexandria); Coke and refined petroleum (Alexandria, Asyout, Greater Cairo); Chemicals and chemical products and pharmaceuticals (Alexandria, Greater Cairo); Rubber and plastics (Alexandria, Northern Upper Egypt, Greater Cairo); Fabricated metal products (Alexandria, Greater Cairo); Non-metallic mineral products (Northern Upper Egypt, Greater Cairo); Electrical equipment (Northern Upper Egypt, Greater Cairo); Motor Vehicles (Greater Cairo); Beverages (Greater Cairo); Computers and electronic and optical products (Greater Cairo); Machinery and equipment (Greater Cairo).

Of further importance is that the research findings be linked with the “Youth Employment Inventory (YEI): Egypt” of the International Labour Organization (ILO). This inventory is part of youth interventions worldwide comprising more than 400 youth employment programmes from around 90 countries. For Egypt, the interventions range from “skills training” (counselling and job search skills) to “entrepreneurship promotion” (providing financial, technical, and training assistance) to “employment services” to “subsidized employment” (wage subsidies and public

works). It complements information about the geographical coverage, scale and targeting characteristics of each intervention by information about their design, costs, and implementation mechanisms. The database of interventions is periodically updated (see ILO Youth Employment Inventory: Egypt (2014)).

To cite one example of possible linking with YEI: Egypt, we refer to the database citing 17 out of 182 interventions (9%) as specifically targeting young women. We have identified industries with potential for mitigating female youth unemployment in the regions of Alexandria and Beheira, and Greater Cairo. Moreover, the database indicates that Northern Upper and Southern Upper Egypt, and Asyout (part of Asyout region) account for 45-74 of 182 interventions (approximately 33%). Our findings nominate Coke and refined petroleum in Asyout, Rubber and plastics, Non-metallic mineral products, and Electrical equipment in Northern Upper Egypt. Linking of these findings may contribute to raising the share of the Upper Egypt regions beyond 33%.

For future research, we would recommend that the locations of the employment multipliers identified in be linked to/compared with the different categories of the unemployed in each governorate (by educational attainment). This would mean matching the location of the high employment multipliers industries and the location of their upstream industries, with regions of high unemployment among holders of different levels of education. It may be a step towards eliminating labour demand-supply mismatch at the regional level, and pre-empting migration to urban centres in search of jobs.

Notes

1. Per Eurostat classification of industries by type of technology, the medium-low, medium-high and high–technology are associated with high capital intensity (source: Eurostat Statistics Explained).

2. In input-output analysis, the term “industry” and “sector” are used interchangeably (Miller & Blair, 2013: 10). We use the term industry to refer to all economic activities/ sectors within the input-output table.

3. The seven regions (and governorates within): Greater Cairo (Cairo, Giza, Kalyoubia); Delta (Menoufia, Gharbia, Dakahlia, Damietta, Kafr El-Sheikh); Alexandria (Alexandria, Beheira, Matrouh); Northern Upper Egypt (Fayoum, Minya, Beni Suef); Southern Upper Egypt (Qena, Luxor, Aswan, Sohag, Red Sea); Asyout (Asyout; El-Wadi El-Gedeed); Suez Canal (Sharkia, Port Said, North Sinai, South Sinai, Ismailia, Suez) (source: General Organization for Physical Planning, available at: http://gopp.gov.eg/eg-map/delta-map/).

4. To account for spatial dependence, a binary ‘contiguity weight matrix’ (W) uses the geographical attributes of regions to identify if they are neighbours to one another in location. The diagonal element the matrix are zero as each region is its own self, while the off diagonal elements are 1's if neighbourhood is established based on any one of the following criteria: (1) regions ‘i’ and ‘j’ sharing (part of) a common eastern or western border (linear contiguity); (2) regions ‘i’ and ‘j’ sharing part of a common border on any side for a small “snapshot distance” (Rook contiguity); (3) regions ‘i’ and ‘j’ meeting at a point (even less than the snapshot distance) (Bishop contiguity); (4) regions ‘i’ and ‘j’ sharing any part of common border (Queen contiguity, which is a union of Rook and Bishop). The weight matrix is then row-standardized by dividing each element in the row by the sum of its elements.

5. Data for the year 2016–2017 public sector are available, but data for 2017 private sector have not been issued to date.

6. Al-Ayouty and Hassaballa (2020) find unemployment in 2016–-2017 to also have a statistically significant positive Moran's index, indicating positive spatial dependence.

7. Detailed shares: South Sinai and Matrouh (90% each); Red Sea (86%); North Sinai and Port Said (82% each); Cairo (80%); Alexandria (75%). Following in order of service importance are: Suez and Giza (74% each); Luxor (69%); Aswan and Kalyoubia (67% each); El-Wadi El-Gedeed, Gharbia, and Dakahlia (64% each); Ismailia (61%); Fayoum (59%); Qena, Sohag, and Asyout (58% each); Menoufia (57%); Sharkia (56%); Damietta (54%); Kafr El-Sheikh (52%) (Source: Author's computations based on CAPMAS Statistical Yearbook, 2017).

8. The location of the upstream industries is also identified in Table 3.

9. With a value exceeding one, the RCA indicates competitiveness since the country exporting that product is producing and exporting it at or below the world average. Higher RCA values indicate higher degrees of competitiveness.

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Mission

To strengthen local capacity for conducting independent, rigorous inquiry into the problems facing the management of economies in sub-Saharan Africa.

The mission rests on two basic premises: that development is more likely to occur where there is sustained sound management of the economy, and that such management is more likely to happen where there is an active, well-informed group of locally based professional economists to conduct policy-relevant research.

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