

SKILL DEMAND POLARIZATION IN EGYPT

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Abstract

By tracking changes in the employment and wage structure of 9 high, middle and low skilled occupations in 18 economic activities over the period 2000-2009, this paper provides evidence that skill demand polarization is growing in Egypt and wage disparity is widening. The empirical analysis indicates that the demand for middle skilled workers has declined in 2009, compared to 2000, reflecting structural changes where an increase in technological innovation and variation in labor demand appear to be hollowing out the middle across all economic activities over time. Moreover, structural product-demand shifts have increased the relative demand for high and low skilled workers across economic activities, hence reinforcing polarization of the employment and wage structures in Egypt. However, the growth of the private sector has provided room to increase demand for all skills, particularly those of the middle skills, mitigating the effect of polarization. Looking forward, a well-targeted industrial policy is needed to mobilize demand for middle skilled workers, particularly in the manufacturing activities. Also, identifying the skills demanded by the private sector is key to lowering the unemployment rate among the youth and alleviating social and political tensions. Finally, upgrading products and investing in activities with high job content of growth would help stimulate product demand and mobilize employment, thereby narrowing wage disparities across activities, in line with productivity indicators.

ملخص

تناقش الدراسة استقطاب الطلب على المهارات واتساع فجوة الأجور في مصر من خلال تتبع التغيرات التي شهدتها هيكل التشغيل والأجور في تسع مهن مرتفعة ومتوسطة ومنخفضة المهارات في ١٨ نشاطا اقتصاديا خلال الفترة ٢٠٠٠-٢٠٠٩. وتشير نتائج التحليل إلى تراجع الطلب على العمالة متوسطة المهارات في عام ٢٠٠٩ مقارنة بعام ٢٠٠٠، مما يعكس تأثير التغيرات الهيكلية، حيث أدى كل من زيادة الابتكار التكنولوجي والتباين في الطلب على العمالة في الأنشطة الاقتصادية، فضلا عن التحولات الهيكلية في الطلب على المنتجات، إلى زيادة الطلب النسبي على المهارات المرتفعة والمنخفضة وتراجعته على المهارات المتوسطة خلال الفترة الزمنية محل الدراسة. وعلى الرغم من أن ذلك أدى إلى حالة من الاستقطاب الهيكلي للتشغيل والأجور في مصر، إلا أن نمو القطاع الخاص ساعد على زيادة الطلب على كافة المهارات، وخاصة المتوسطة، الأمر الذي خفف من تأثير هذا الاستقطاب. وتشير نتائج التحليل إلى أهمية تطبيق سياسة صناعية جيدة الاستهداف لزيادة الطلب على العمالة متوسطة المهارات، خاصة في أنشطة الصناعة التحويلية. وفي هذا السياق، يعد تحديد المهارات المطلوبة في القطاع الخاص أحد الأمور المهمة اللازمة لخفض معدلات البطالة بين الشباب وتخفيف حدة التوتر الاجتماعي والسياسي. كما سيساعد الارتفاع بالمنتجات والاستثمار في الأنشطة كثيفة العمالة على انتعاش الطلب على المنتجات وزيادة التشغيل ومن ثم الحد من تباين الأجور عبر الأنشطة الاقتصادية بما يتناسب مع مؤشرات الإنتاجية.

JEL Classifications: C21, D63, E24, E26, J23, J24, J31, O15, O33

Keywords: earnings inequality, Egypt, human resources, informality, occupations, polarization, technological change, skill demand, unemployment, wage differentials

1. INTRODUCTION

Despite high economic growth over the past decade, the unemployment rate in Egypt has remained persistently high reaching 9 percent in 2010 and further increasing to 12.4 percent in the fourth quarter of 2011 in the aftermath of the 25th of January Revolution (CAPMAS 2011a). The low job content of growth and the significant mismatch between the types of skills supplied and demanded have resulted in high unemployment among college graduates and the youth. The unemployment rate among those with college degrees reached 18.9 percent in 2010, suggesting that the education system has failed to provide graduates with marketable job skills. Young people, ages 15 to 29, account for almost 70 percent of the unemployed contributing to widespread unrest in the economy (Abdih 2011; CAPMAS 2010a, b; World Economic Forum 2011).¹

Employment and wage distributions in Egypt are becoming more polarized between high skilled occupations (professional and managerial), requiring considerable education and low skilled elementary occupations (personal services). Relative to high and low skilled occupations, the demand for middle skilled manufacturing and routine office jobs is falling. This “clustering around extremes” increases wage disparity, creating political tension and threatening the social fabric of the nation. Rising wage inequality, along with high unemployment, is among the main drivers of the 25th of January 2011 Revolution.

While job polarization in developed countries (the United States and other countries of the Organization for Economic Cooperation and Development “OECD”) and in a broad and diverse set of Asian countries (Sri Lanka, Nepal, China, Hong Kong, Philippines, Singapore, Korea, Bangladesh, Malaysia, New Zealand and Japan) has already been studied in a deep way,² there have been no studies covering Egypt. This gap in the literature has triggered our interest in pursuing this study to verify the presence of polarization trends in the Egyptian labor market and their impact on the observed wage inequality across skills and among economic activities. If so, we further probe the underlying causes of polarization itself in the

¹ Inadequately educated workforce and restrictive labor regulations are among the 15 most problematic factors for doing business in Egypt (World Economic Forum 2011).

² Autor 2010; Goos, Manning and Salomons 2010, 2009a, b; Oesch and Rodriguez 2010; Dustmann, Ludsteck and Schonberg 2009; Michaels, Natraj and Reenen 2009; Autor, Katz and Kearney 2008 and 2006; Lueth 2007; Hur, Seo and Lee 2005; Wright and Dwyer 2003.

Egyptian context. This should guide the process of laying out the relevant policy options going forward.

This paper is structured as follows. Section 2 provides evidence of polarization in Egypt's labor market by tracking changes in the employment and the wage structure of 9 high, middle and low skilled occupations in 18 economic activities over the period 2000-2009, and assesses its impact on wage inequality. Section 3 explores competing explanations of job polarization as advanced by the economic literature then tests them empirically to identify the main determinants of this phenomenon in Egypt. Section 4 concludes by discussing the implications of the main findings of the paper and proposing policy options that would help better match job seekers with vacancies and mitigate the effect of job polarization on the wage gap.

2. SKILL DEMAND IN EGYPT: EVIDENCE OF POLARIZATION

The evolution of employment and wage bill shares of high, middle and low skilled occupations in Egypt's economic activities over the past decade provides information on how the market values of different types of skills and activities have changed over time. Before examining structural changes in employment and wages, the data sources will be presented and the analytical strategy discussed.

2.1. Data Sources and Analytical Strategy

Our analysis of employment and wage changes over the past decade in Egypt is based on the data stemming from the 2000 and 2009 Annual Bulletins for Employment, Wages and Work Hours Statistics published by the Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS 2010c; 2000). This data set lends itself to conducting analysis at two distinct levels: all economic activities in the Egyptian economy (18 in total) and skill level occupations (9 in totals).

Employment and wage statistics are classified by skill level occupation and economic activity covering private sector enterprises employing 10+ workers in addition to public and public business sector enterprises, regardless of the number of workers therein. Wages are measured on a weekly basis. They are paid in compensation for the relevant working period prior to any deductions, including basic wage, overtime, periodic allowances and any other periodic accruals, such as commissions and periodic production bonuses.

To track changes in the employment and wage structure of high, middle and low skilled occupations in Egypt’s economic activities over the past decade, different skill level occupations and economic activities are distinguished.

Occupations are classified using the Egyptian Guide to Occupation Classification (July 2005 edition), published by the Central Agency for Public Mobilization and Statistics (CAPMAS 2010c). Egypt’s occupational classification is consistent with the International Standard Classification of Occupations 1988 (ISCO-88) that was adopted by the International Labour Organization’s Fourteenth International Conference of Labour Statisticians (ICLS) in 1987. The criteria used in this guide to classify occupations are “skill level” and “skill specializations” needed to carry out the tasks and duties undertaken on the job. Hence, this guide could be used towards matching job seekers with job vacancies and the development of vocational training programs. Table 1 classifies occupations and groups them into three categories: high, middle and low skilled occupations. High-skilled occupations are human capital intensive jobs, while middle-skilled occupations typically consist of high school graduates, people with some college education and people with non-academic professional degrees.

Table 1. Classification of High, Middle and Low Skilled Occupations

Occupations	Skill classification
High skilled occupations	
Legislators, senior officials and managers	1
Professionals	2
Middle skilled occupations	
Technicians and associate professionals	3
Clerks	4
Service workers and shop and market sales workers	5
Agricultural and fishery workers	6
Craft and related trade workers	7
Low skilled occupations	
Plant and machine operators and assemblers	8
Elementary occupations	9

Source: International Labour Organization (2011).

Based on the United Nations’ International Standard Industrial Classification of All Economic Activities, Rev.4 (ISIC Rev.4), 18 economic activities have been identified in Table 2. For data consistency between the years 2000 and 2009, two economic activities (agriculture, hunting and forestry; and fishing) were combined in 2000.

Table 2. Economic Activities in Egypt

Economic activities
Agriculture, forestry and fishing
Mining and quarrying
Manufacturing
Electricity, gas, steam and air conditioning supply
Water supply, sewerage, waste management and remediation activities
Construction
Wholesale and retail trade, repair of motor vehicles and motorcycles
Transportation and storage
Information and communications
Accommodation and food service activities
Financial and insurance activities
Real estate activities
Professional, scientific and technical activities
Administrative and support service activities
Education
Human health and social work activities
Arts, entertainment and recreation
Other service activities

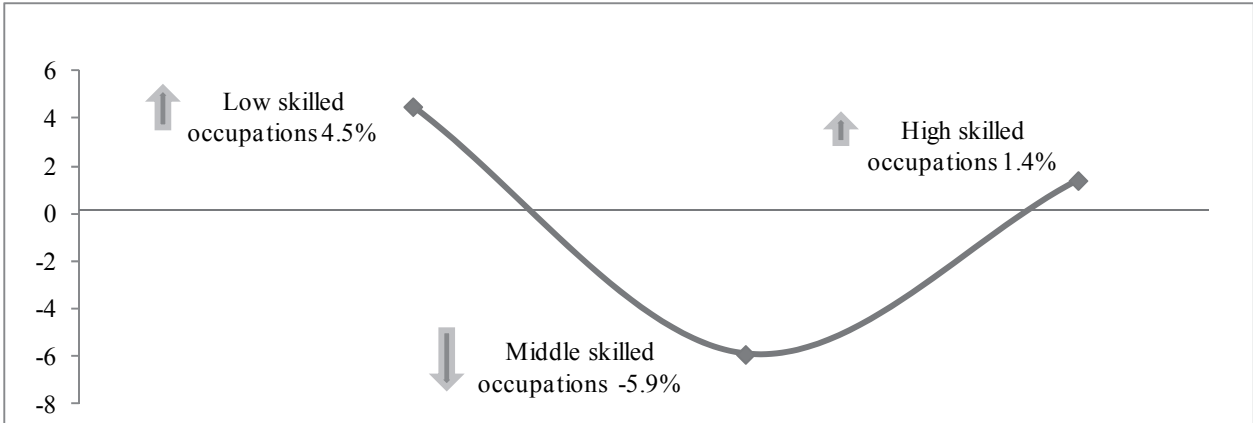
Source: United Nations (2011).

2.2. Skill Polarization: A Disappearing Middle?

Over the period 2000-2009, both employment and wages have shifted towards very high and very low skilled occupations, with the proportion of middle skilled occupations declining. Our analysis provides evidence that polarization is growing among different skill level occupations and economic activities.

Considering changes in employment, the shares of high skilled occupations (legislators, senior officials and managers and professionals) and low skilled occupations (elementary occupations, and plant and machine operators and assemblers) in total employment have increased by 1.4 percent and 4.5 percent, respectively. However, the share of middle skilled occupations (technicians and associate professionals; clerks; service workers and shop and market sales workers; agricultural and fishery workers and craft and related trade workers) has declined by 5.9 percent. Figure 1 shows a distinct pattern of polarization, with high and low skilled occupations expanding their employment shares relative to the middle skilled occupations between 2000 and 2009.

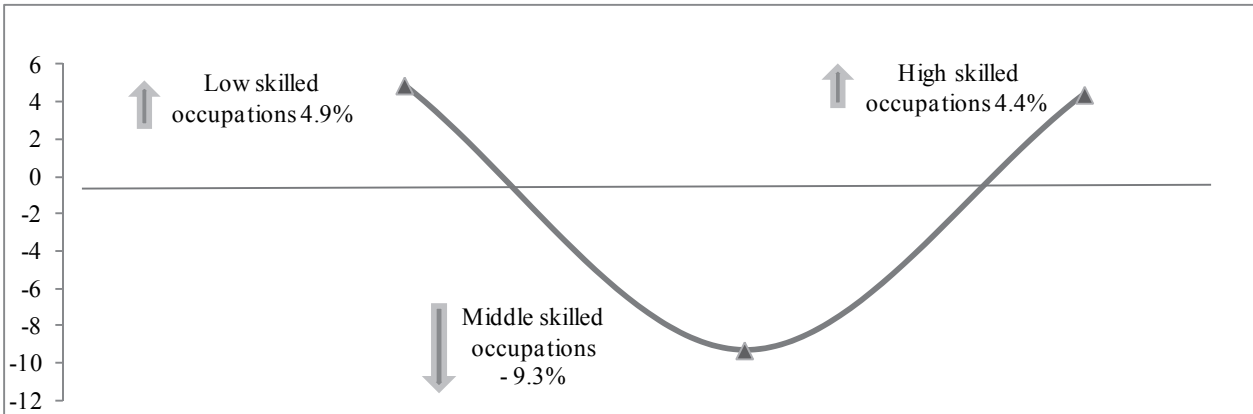
Figure 1. Percentage Change in the Employment Shares of High, Middle and Low Skilled Occupations Between 2000 and 2009 (%)



Source: Author’s calculations based on CAPMAS (2010b, c; 2000).

A standard indicator of skill demand is the share of different skill level occupations in the total wage bill. Wage bill shares are useful summary measures, as each occupation is weighted by its price (the wage). Over the period 2000-2009, the shares of high and low skilled occupations in the total wage bill increased by 4.4 percent and 4.9 percent respectively, while the share of middle skilled occupations declined by 9.3 percent. A decrease in the wage bill of middle skilled occupations relative to high and low skilled occupations indicates that the job structure in Egypt is becoming more polarized (Figure 2).

Figure 2. Percentage Change in the Wage Bill Shares of High, Middle and Low Skilled Occupations Between 2000 and 2009 (%)

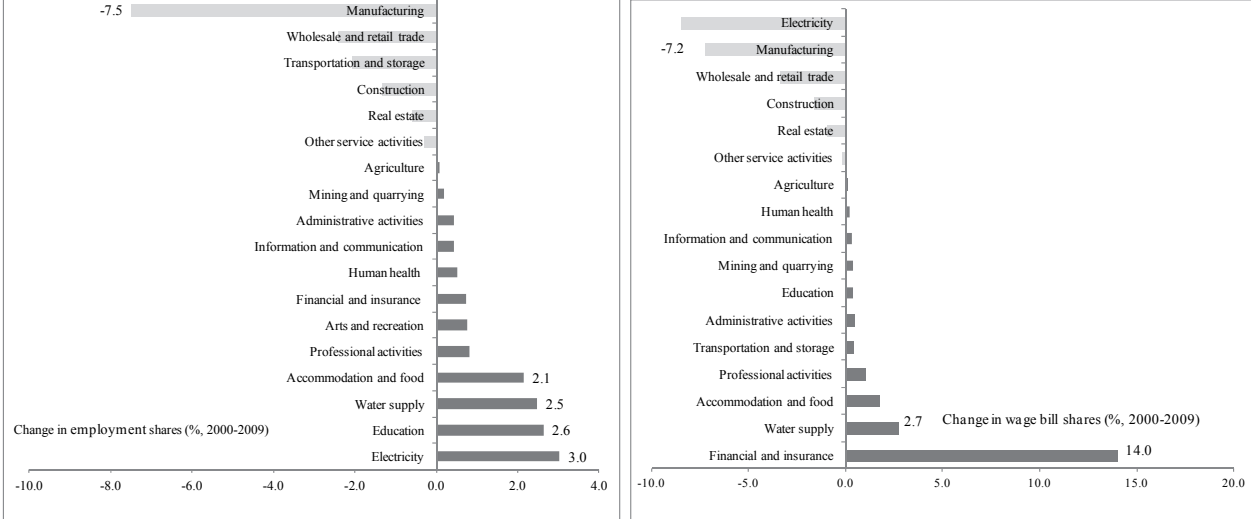


Source: Author’s calculations based on CAPMAS (2010b, c; 2000).

The fact that both changes in employment and real wage bill shares of high, middle and low skilled occupations are exhibiting an almost U-shaped pattern provides evidence for labor market polarization in Egypt.

Breaking down the data by economic activity, we find that manufacturing activities have decreased their share in total employment and the total wage bill by 7.5 percent and 7.2 percent respectively over the past decade. This deindustrialization, illustrated in Figure 3, has contributed to the decline in the employment and wage bill shares of the middle skilled occupations that are typically clustered in the manufacturing sector.³

Figure 3. Changes in Employment and Wage Bill Shares across Economic Activities Between 2000 and 2009 (%)



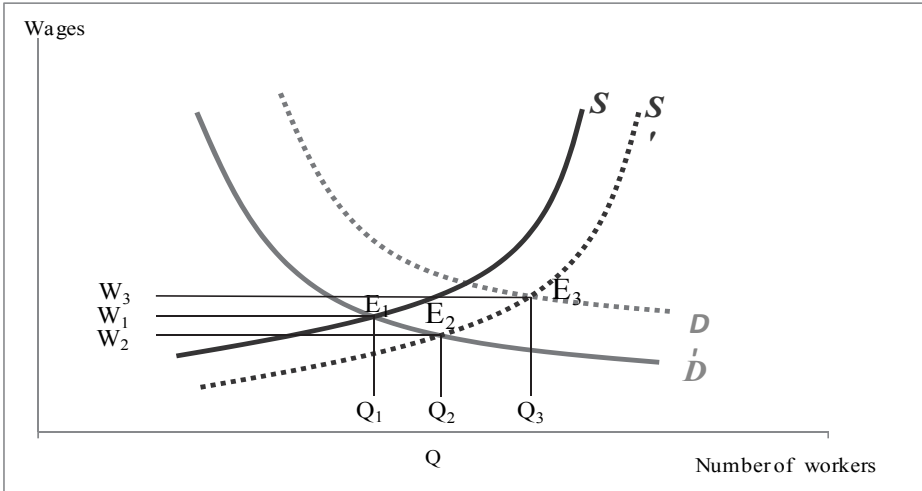
Source: Author’s calculations based on CAPMAS (2010b, c; 2000).

2.3. Skill Polarization: Demand or Supply Shift?

In the absence of any other changes in the labor market, an increase in the number of high and low skilled workers, relative to the middle skilled, would reduce their relative wage unless demand for their skills is sufficiently large to outweigh the impact of the increase in their relative supply. Figure 4 illustrates such a demand shift.

³ Manufacturing activities absorbed 52 and 47 percent of the middle skilled workers in 2000 and 2009, respectively (author’s calculations based on CAPMAS (2010b, c; 2000)).

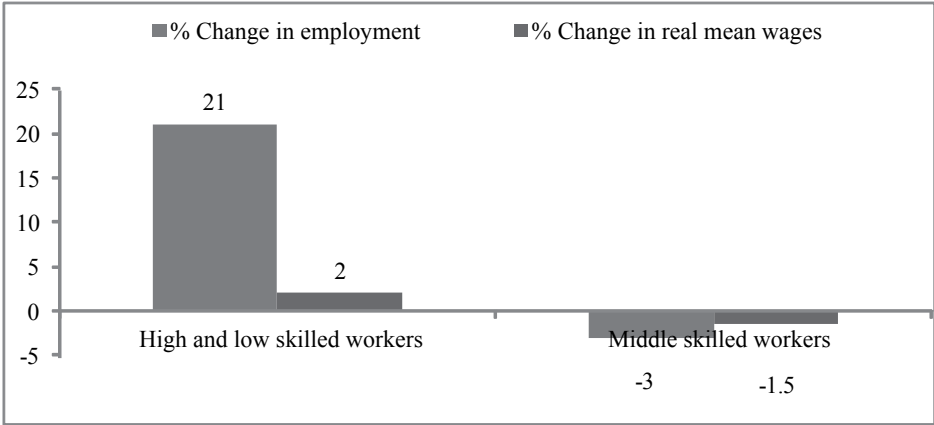
Figure 4. Skill Polarization via a Demand Shift



Source: Borjas (2010).

Over the past decade, the changing patterns of employment and earnings for workers in Egypt were driven, to a substantial extent, by changes in employers’ demand for different skill levels and occupational specialties, rather than by changes in the supply of employees to the labor market. As shown in Figure 5, an increase in employment for the high and the low skilled employees was accompanied by a rise in their real wages. Rising earnings for occupations with increasing employment indicate that a demand shift had occurred towards high and low skilled occupations. A fall in employment for middle skilled employees was accompanied by a decrease in their real wages, signaling a demand shift away from middle skilled occupations.

Figure 5. Skill Polarization: Demand Shift Between 2000 and 2009



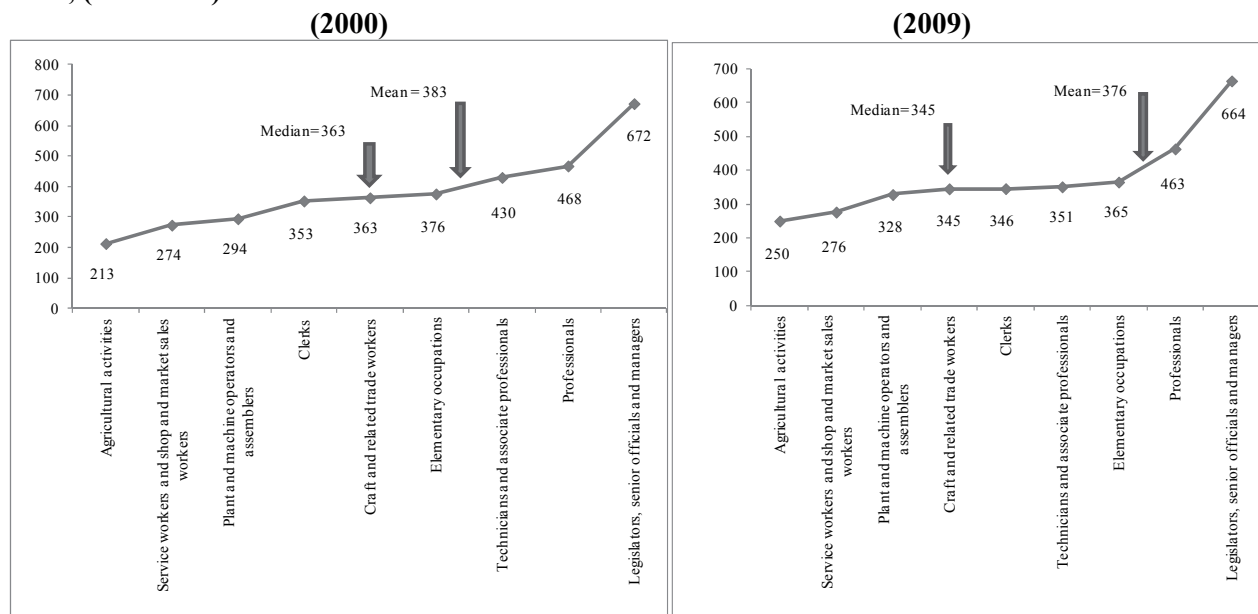
Source: Author’s calculations based on CAPMAS (2010b, c; 2000).

2.4. Skill Polarization: Is it Inequality of Wage Earnings?

Studies that look at both skill demand polarization and wage inequality find that the two move in lockstep most of the time (Lueth 2007; Kanbur and Zhang 2001; Milanovic 2000; Ravallion and Chen 1997; and Wolfson 1994). Several measures of wage earnings inequality between different skill level occupations and among economic activities, over the period 2000-2009, will be checked out such as the mean, median, standard deviation and the Gini coefficient.

Figure 6 ranks skill level occupations by their LE real mean weekly wage in 2000 and 2009 from the lowest paid to the highest paid. In both years, the real mean weekly wage received by Egyptian workers in different skill level occupations was higher than the real median weekly wage, implying that the average real weekly wage is pushed upward by the high earnings of the relatively few occupations whose employees have “high” earnings, namely legislators, senior officials and managers and professionals. Moreover, the distance between the mean and median wage has widened in 2009, signifying a higher disparity compared to “high” earnings occupation.

Figure 6. Real Mean Weekly Wages of High, Middle and Low Skilled Occupations in 2000 and 2009, (LE/Week)



Source: Author’s calculations based on CAPMAS (2010b, c; 2000).

Our calculated Gini coefficient for the 9 skilled level occupations, employing the methodology seminally used by Yitzhaki (1994) and Lerman and Yitzhaki (1984) shown in Appendix 1, has increased from 0.5 in 2000 to 0.55 in 2009. The increase in the coefficient

further provides evidence of increased wage inequality *among* skill level occupations over the past decade.

The real wage differential *among* high, middle and low skilled occupations could be used as a measure of the return to skill (Manning 2004). However, our analysis reveals two worrisome findings. First, the real mean wage is higher in low skilled occupations than in middle skilled occupations by 2.5 percent in 2000 and 9.5 percent in 2009. The second concern is that the real mean wage in low skilled occupations is lower than in high skilled occupations by *only* 41 percent in 2000 and has shrunk to 38.5 percent in 2009. These findings imply a low and decreasing return to skills over the past decade, coupled with an increase in the demand for low skilled workers whose employment mainly consists of providing services (for example, childcare or domestic work) to richer high skilled employees, discouraging investment in human capital (Michaels, Natraj and Reenen 2009; Ngai and Pissarides 2007; Manning 2004).⁴ Hence, it is imperative to develop the education and training systems in a way that matches rewards with the costs incurred.

Besides wage inequality among skill level occupations, real wage differentials exist between employees having the same skill level but working in different economic activities, as indicated by the standard deviation of their real wages from the mean in 2000 and 2009 (Table 3). Over time, *within* each of the skill level occupations, real wage differentials have increased substantially for some occupations, namely: workers in agriculture and fishery related activities, plant and machine operators and assemblers, legislators, senior officials and managers and professionals. Such increase in disparity across activities signals skill demand differential which is driven by product demand.

⁴ It is worth mentioning that 40 percent of the unemployed in Egypt in 2010 are university graduates (CAPMAS 2011a). This mismatch between education and the needs of the labor market casts doubt on the economic returns from investment in education.

Table 3. Real Wage Dispersion for Each Skill Level Occupation over the Period 2000-2009

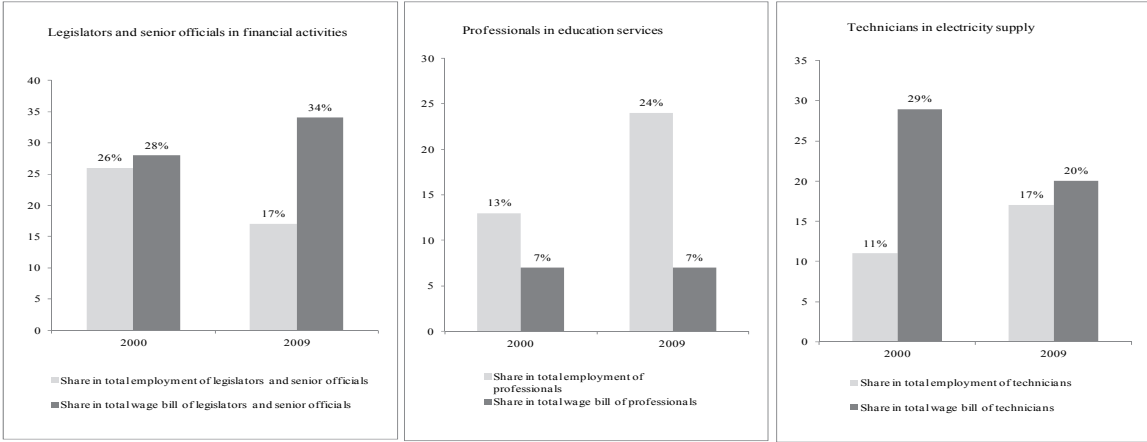
Occupations	Mean		Median		Maximum		Minimum		Standard deviation of real wages for each skill level		
	2000	2009	2000	2009	2000	2009	2000	2009	2000	2009	+/-
Agricultural and fishery workers	214	250	171	230	541	622	114	0	119	196	+
Plant and machine operators and assemblers	294	328	236	230	749	994	141	164	153	234	+
Legislators, senior officials and managers	673	664	628	576	1025	1699	271	245	252	365	+
Professionals	468	463	388	380	1176	1126	217	138	270	272	+
Technicians and associate professionals	430	351	365	316	1128	769	157	156	273	156	-
Clerks	353	346	263	298	1023	962	125	121	280	227	-
Craft and related trade workers	364	345	245	253	1317	1233	154	172	330	271	-
Service workers and market sales workers	274	276	195	233	921	832	112	0	225	204	-
Elementary occupations	377	365	259	303	1019	1122	160	138	273	257	-

Source: Author's calculations based on CAPMAS (2010b, c; 2000).

Figure 7 illustrates three specific examples of real wage differentials between employees having the same skills, but working in different economic activities. In 2000, 26 percent of all legislators and senior officials were engaged in financial activities, while receiving 28 percent of the total wage bill of this specific category of occupational skills. By 2009, *only* 17 percent of all legislators and senior officials were engaged in financial activities, but absorbed 34 percent of the respective wage bill. The same holds true for professionals whereby 13 percent of them provided educational services and received 7 percent of the total wage bill of that category of occupational skills in 2000, while the respective shares in 2009 were 24 percent and 7 percent. In 2000, 11 percent of all technicians were engaged in electricity supply related activities, capturing 29 percent of the total wage bill of this specific category of occupational skills. By 2009, more technicians became engaged in electricity supply related activities (17 percent of total technicians), while their share in the respective wage bill has declined to 20 percent only.

It appears that the wage structures in education and electricity supply have lagged behind other activities in the economy. To illustrate, professionals providing educational services account for a larger share of employment in 2009, but the same share of the wage bill as in 2000. Similarly, technicians engaged in electricity supply related activities account for a larger share of employment in 2009, but a smaller share of the wage bill than in 2000.

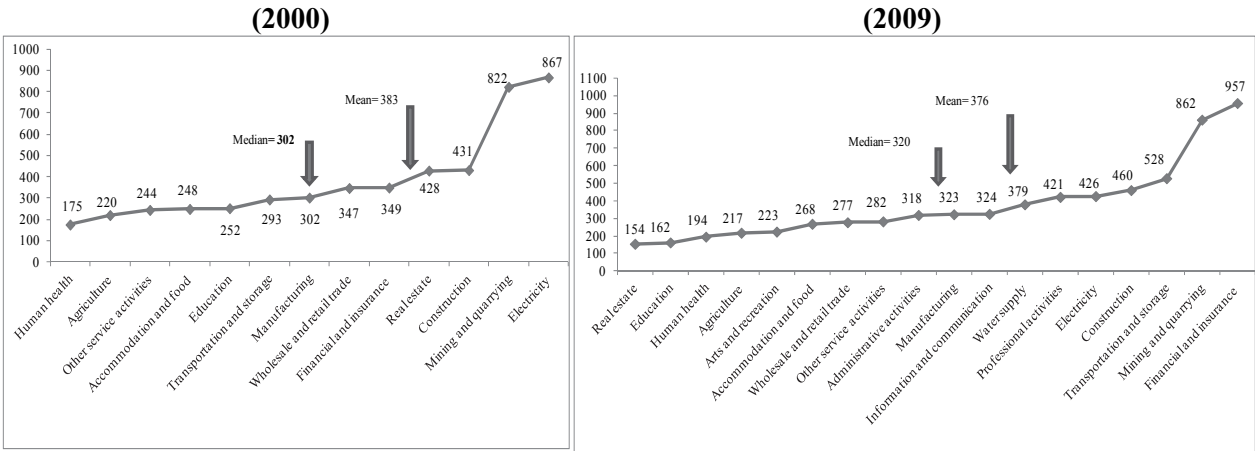
Figure 7. Wage Differentials within Selected Skill Level Occupations (Shares in 2000 and 2009 (%))



Source: Author’s calculations based on CAPMAS (2010b, c; 2000).

Looking at economic activities, Figure 8 ranks them by their LE real mean weekly wage in 2000 and 2009 from the lowest paid to the highest paid activity. Figure 8 reveals that, in both years, the average real weekly wage for all economic activities is pushed upward by the high wages offered within the relatively few activities whose employees have “high” earnings. In 2000, four activities were offering wages that are higher than the mean, namely: electricity supply, mining and quarrying, construction and real estate. By 2009, seven activities were providing wages that are higher than the mean, namely: financial and insurance activities, mining and quarrying, transportation and storage, construction, electricity supply, professional activities and water supply activities. Further, the gap between high-paying jobs and the mean is much wider in 2009.

Figure 8. Real Mean Weekly Wage by Economic Activity in 2000 and 2009 (LE/Week)



Source: Author’s calculations based on CAPMAS (2010b, c; 2000).

Real wage differentials among employees engaged in different economic activities have slightly increased, as evident by the standard deviation of their real wages from the mean in 2000 and 2009 (Table 4). Furthermore, over the past decade, the maximum real wage has increased while the minimum real wage has declined, widening wage disparity (Table 4).

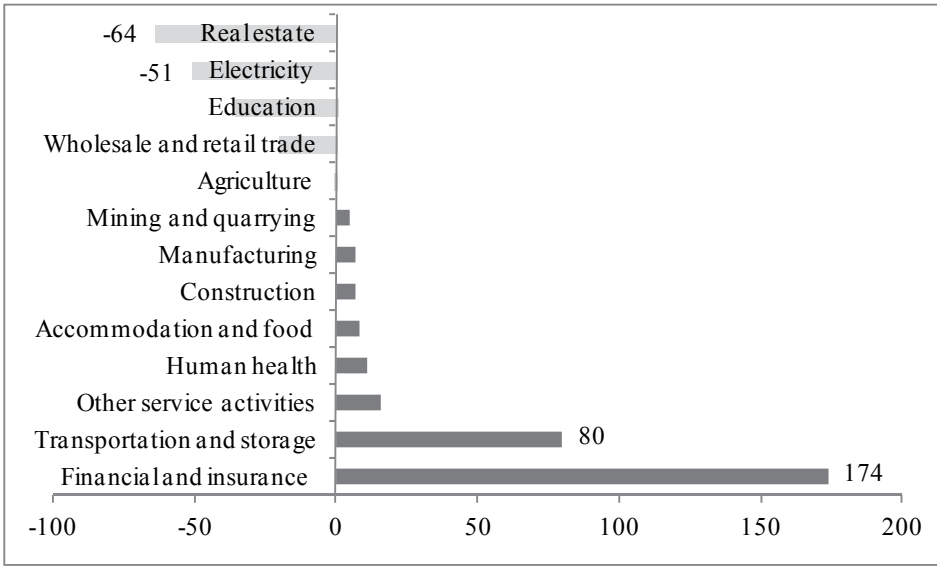
Table 4. Real Wage Dispersion across Economic Activities over the Period 2000-2009

Economic activities	Mean		Median		Maximum		Minimum		Standard deviation of real wages within each activity in the year		+/-
	2000	2009	2000	2009	2000	2009	2000	2009	2000	2009	
Among all economic activities	383	376	302	320	867	957	175	154	219	220	+

Source: Author’s calculations based on CAPMAS (2010b, c; 2000).

Over the period 2000-2009, the real mean wage substantially increased in the financial and insurance activities (174 percent) and transportation and storage activities (80 percent), but declined in real estate activities (64 percent) and in electricity (51 percent), widening the real wage gap between workers in different economic activities (Figure 9).

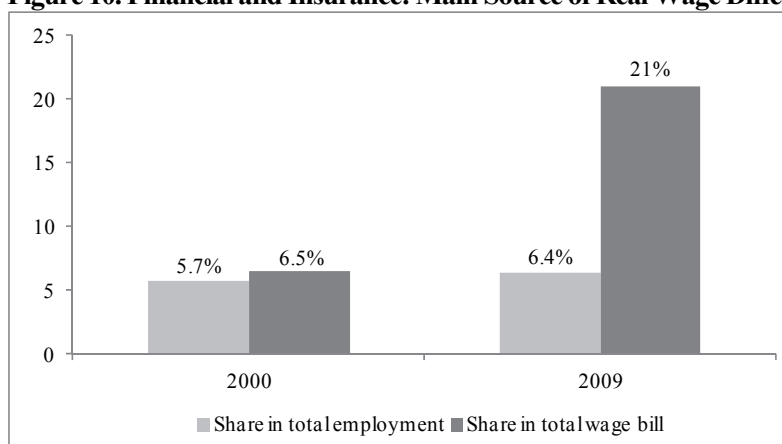
Figure 9. Percentage Change in the Real Mean Wage by Economic Activity Between 2000 and 2009 (%)



Source: Author’s calculations based on CAPMAS (2010b, c; 2000).

The share of financial and insurance activities in the total wage bill has increased from 6.5 percent in 2000 to 21 percent in 2009, although their share in total employment has remained relatively stable at around 6 percent (Figure 10).

Figure 10. Financial and Insurance: Main Source of Real Wage Differentials (Shares in 2000 and 2009 (%))



Source: Author's calculations based on CAPMAS (2010b, c; 2000).

Over the period 2000-2009, real wage dispersion has increased substantially *within* several economic activities, namely, financial and insurance activities, transportation and storage, health care services, manufacturing, mining and quarrying and agriculture (Table 5), reflecting increasing wage inequality within these specific activities.

Table 5. Real Wage Dispersion within Economic Activities over the Period 2000-2009

Economic activities	Mean		Median		Maximum		Minimum		Standard deviation of real wages within each activity in the year		+/-
	2000	2009	2000	2009	2000	2009	2000	2009	2000	2009	
Financial and insurance activities	349	957	297	962	774	1699	202	497	175	359	+
Transportation and storage	293	528	241	448	518	996	145	248	136	254	+
Human health	175	194	157	163	271	350	112	120	54	73	+
Manufacturing	302	323	259	279	575	674	196	214	117	141	+
Mining and quarrying	822	862	811	854	1176	1233	541	453	200	239	+
Agriculture	220	217	193	182	439	449	114	113	93	97	+
Real estate	428	154	328	172	894	263	171	0	246	83	-
Education	252	162	201	146	539	289	127	96	144	56	-
Electricity	867	426	1019	381	1317	873	286	272	355	176	-
Other service activities	244	282	213	270	481	447	143	231	106	65	-
Accommodation and food	248	268	200	228	628	571	128	153	150	126	-
Wholesale and retail trade	347	277	327	237	649	580	130	179	148	128	-
Construction	431	460	365	386	1025	1016	254	326	229	216	-

Source: Author's calculations based on CAPMAS (2010b, c; 2000).

3. SOURCES OF SKILL DEMAND POLARIZATION

The previous section showed that job polarization is growing in Egypt. Several explanations of skill demand polarization have been advanced by the economic literature. This section explores these competing explanations then proceeds to empirically identify the potential importance of each of them as a source of change in the demand for skills in Egypt.

3.1. Sources of Skill Demand Polarization: Economic Literature

No single factor seems to be able to explain all—or even most—of the changes in the demand for skills. Besides product-demand shifts *across activities*, most of the literature has focused on the pace of skill biased technological change *within activities* and on the increasing role of the private sector in economic activity as possible explanations of skill demand polarization (Autor 2010; Kolev and Saget 2010; Goos, Manning and Salomons 2010; Oesch and Rodriguez 2010; OECD 2004).

Within activities, the idea of skill biased technological change (SBTC) was used in the 1990s to understand the shift in employment towards more educated workers (Autor, Katz and Krueger 1998). SBTC explanation of job polarization expects the spread of computer based technology to increase the productivity of skilled workers and, therefore, their demand relative to low skilled workers. Hence, clear-cut employment upgrading is expected as a result of computerization.

The SBTC explanation has been challenged by the “routinization” hypothesis (first put forward by Autor, Levy and Murnane 2003), which argues that computers complement both high skilled analytical and low skilled interpersonal tasks, but substitute for middle skilled manual and clerical tasks. While machines cannot easily substitute for abstract analysis occupations that demand sophisticated and creative skills (for example, engineers and lawyers), nor for manual jobs which require interaction and flexibility in different situations (such as janitors and construction workers), they readily take over the routine production and clerical tasks typically done in middle range jobs. Thus, the “routinization” hypothesis expects technical change to hollow out the middle and hence to polarize the employment and wage structures (Goos, Manning and Salomons 2010; Jung and Mercenier 2010; Dustmann, Ludsteck and Schonberg 2009; Michaels, Natraj and Reenen 2009; Goldin and Katz 2008; Hur, Seo and Lee 2005; Manning 2004; Berman, Bound and Machin 1998).

An increasing role of the private sector in economic activity and job creation with a notable retreat of the government as employer of first choice is expected to change employers' demand for skills toward aligning wages with productivity. The government as an employer, in contrast to the private sector, offers greater job security, good wages, more generous benefits, and less demanding qualifications compared to the private sector (Dhillon and Yousef 2009; Assaad 1997).

3.2. Sources of Skill Demand Polarization in Egypt: Econometric Analysis

Over the period 2000-2009, the evolution of the shares of high, middle and low skilled workers in the total wage bill provides information on how the demand for skills in Egypt has changed over time. We employ the shift-share analysis to decompose the change in these shares into three components. The first component is the “*across activity*” component that depends only on product-demand shifts. The second is the “*within activity*” component that depends only on the pace of skill biased technological change. The third is the “*private employment*” component that depends on the increasing role of the private sector in employment, which may work to increase demand for skills and offer competitive wages. This decomposition helps us to proceed with the econometric identification of the potential importance of each component in explaining skill demand polarization in Egypt over the past decade (Hur, Seo and Lee 2005).

3.2.1. Estimation procedures

To capture the potential importance of each of the three components outlined above as sources of skill demand polarization in Egypt, the share of each skill in the total wage bill economy-wide (STWB) is used as the dependent variable. STWB is to be explained by three variables: (i) the share of each skill employed in a specific economic activity in the total wage bill within this activity (SWWB); (ii) the share of each skill in the total wage bill received by the respective skill across various activities (SAWB); and (iii) the share of each skill in the private sector economy-wide, i.e., within and across activities (STPE).

It is useful to highlight that the decomposition of the dependent variable (STWB) into its three components (SWWB), (SAWB) and (STPE), as per the “shift-share analysis” implies that STWB is positively correlated with each of its components. Given that, identifying the potential importance of each of the three components as a source of skill demand polarization in Egypt will depend on the “size” of the regression coefficient on each explanatory variable.

Our regression analysis is conducted for changes in skill demand over the period 2000-2009 to identify the importance of each component in driving the process of skill demand polarization over the past decade. Moreover, by zooming in on the years 2000 and 2009 and carrying out the regression analysis for each of these two years separately, we can identify which component is the most important determinant of demand for different skills at each point in time.

As a result of some data limitations in the year 2000, 5 out of the 18 economic activities were excluded before delving into the regression analysis, namely, professional, scientific and technical activities; arts, entertainment and recreation; water supply, sewerage, waste management and remediation activities; administrative and support service activities and transportation and storage.

3.2.2. Determinants of skill demand polarization in Egypt

Now, we turn to econometrically identify the main determinants of skill demand polarization in Egypt. Using the ordinary least squares (OLS) method, three cross-sectional regression analysis models are estimated once for the period 2000-2009; then for each of the years 2000 and 2009 separately. Model (1) encompasses workers of all the (9) skill levels, as illustrated in Table 1, Section 2.1. Model (2) includes middle skilled workers only (that is, skills from 3 to 7). Model (3) focuses on high and low skilled workers (that is, skills 1, 2, 8 and 9). The following equation (1) is estimated for each of our three models.

$$(STWB_{ij}) = \alpha + \beta (SWWB_{ij}) + \gamma (SAWB_{ij}) + \delta (STPE_{ij}) + \mu_{ij} \quad (1)$$

where,

$i = 1, \dots, 9$ skill level occupations;

$j = 1, \dots, 18$ economic activities;

$(STWB_{ij})$ = the share of each skill in the total wage bill economy-wide, calculated by the

following formula $(\frac{\sum_{j=1}^{18} WB_{ij}}{\sum_{j=1}^{18} \sum_{i=1}^9 WB_{ij}})$;

$(SWWB_{ij})$ = the share of each skill employed in a specific economic activity in the total wage bill within this activity, calculated by the following formula $(\frac{WB_{ij}}{\sum_{i=1}^9 WB_{ij}})$;

$$\sum_{i=1}^9 WB_{ij}$$

(SAWB_{ij}) = the share of each skill in the total wage bill received by the respective skill across activities, calculated by the following formula ($\frac{WB_{ij}}{\sum_{j=1}^{18} WB_{ij}}$);

(STPE_{ij}) = the share of each skill in total private employment economy-wide, calculated by the following formula ($\frac{\sum_{j=1}^{18} PE_{ij}}{\sum_{j=1}^{18} \sum_{i=1}^9 TPE_{ij}}$);

and μ_{ij} is the random error.

Our regression results are reported hereafter in Table 6 for the period 2000-2009 and in Table 7 for the years 2000 and 2009. Over the period 2000-2009 (Table 6), the results obtained from all our three models confirm that increasing employment in the private sector was the main source of change in the demand for skills in Egypt over the past decade. The large significant coefficient on the explanatory variable (STPE) reflects the increasing role of the private sector in economic activity. Also, the “size” of this coefficient is greater than that of the “across activity” component (SAWB) and of the “within activity” component (SWWB), in all the three models. Moreover, the coefficient on STPE for the demand for middle skilled workers (model 2) is larger than the coefficient on STPE for the demand for high and low skilled workers (model 3). The difference in the coefficient size signifies that growth of the private sector has provided room to increase demand for all skills and particularly for middle skills, mitigating the rate of polarization over time.

Table 6. Determinants of Skill Demand Polarization in Egypt: Cross Sectional Analysis (Change in Shares over the Period 2000-2009)

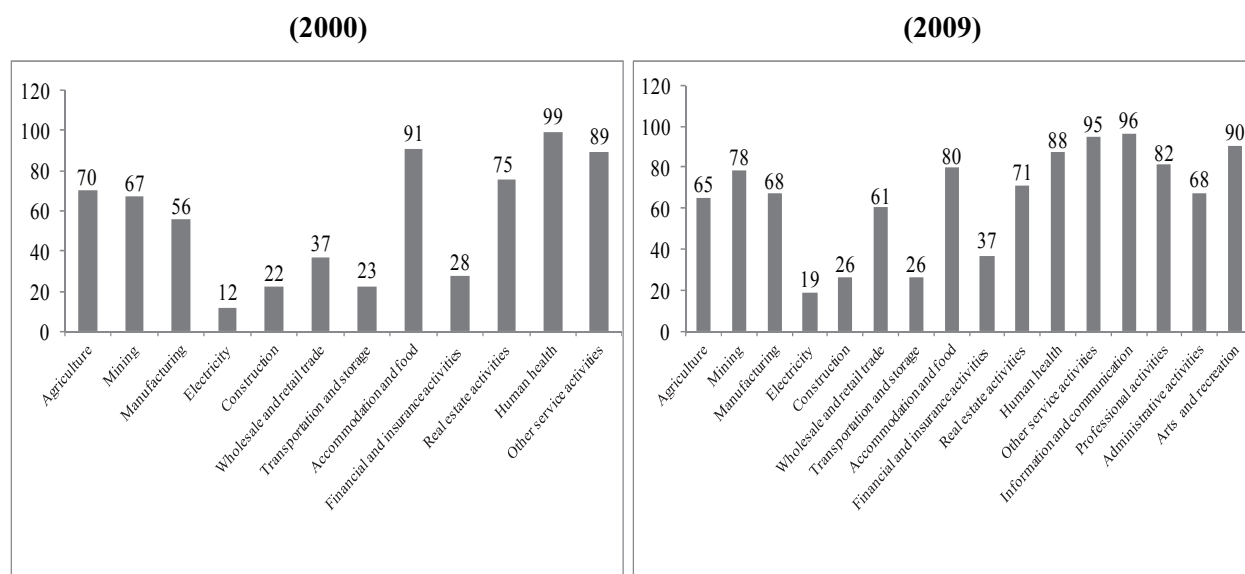
Independent variables	Change in the wage-bill shares (STWB) over the period 2000-2009		
	Model (1)	Model (2)	Model (3)
	All skill levels	Middle skill levels	High and low skill levels
C	-0.04 (0.05)	-0.04 (0.02)	+0.04 (0.10)
Δ SWWB (within activity)	+0.02*** (0.01)	+0.03*** (0.01)	+0.01* (0.01)
Δ SAWB (across activity)	+0.08*** (0.03)	+0.02* (0.01)	+0.23*** (0.08)
Δ STPE (in private activity)	+0.70*** (0.25)	+0.65*** (0.15)	+0.37** (0.17)
No. of observations	162	90	72
Adjusted R-squared	0.48	0.64	0.66
F-statistic	49.57	52.87	47.65
Prob (F-statistic)	0.00	0.00	0.00

Source: Author's calculations.

Notes: *** designates significance level of 1 percent; ** designates significance level of 5 percent; * designates significance level of 10 percent. White heteroskedasticity-consistent standard errors in parentheses.

Figure 11 further illustrates the increasing importance of private sector employment in the *majority* of economic activities in Egypt over the past decade.

Figure 11. Private Employment as a Share of Total Employment per Activity (% , 2000 and 2009)



Source: Author's calculations based on CAPMAS (2010b, c; 2000).

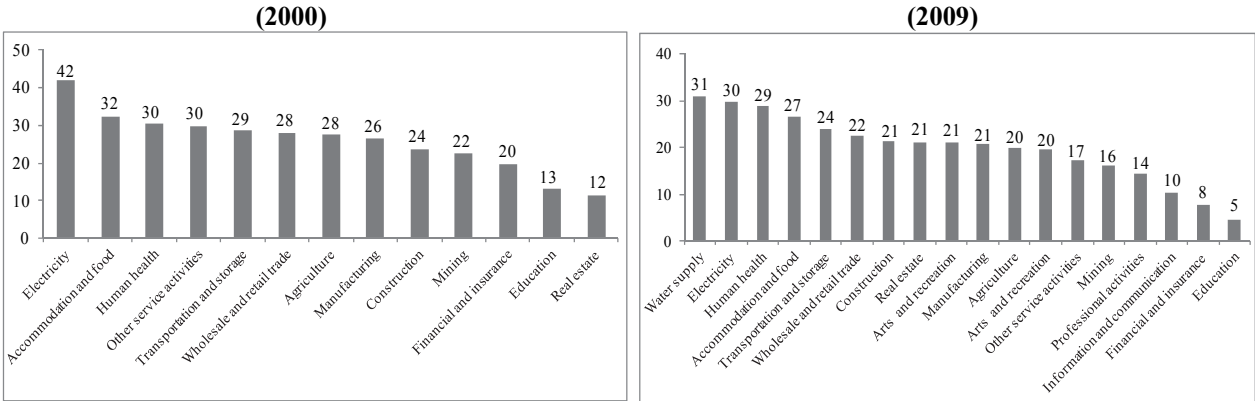
The results of model (2) further indicate that the change in the demand for middle skilled workers over the past decade is supported by the demand for their skills within activity

and across activity. The coefficients on SWWB and SAWB are significant, although the former is larger in size and significant at the one percent level.

The results of model (3), in contrast to model (2), indicate that product-demand shifts across activities were more important than skill biased technological changes as a source of job polarization in Egypt over the period 2000-2009. The coefficient on SAWB, signifying the demand for high and low skilled workers (model 3), is significant at the one percent level and significantly larger than the coefficient on SWWB for the demand on middle skilled workers (model 2), which is also significant at the one percent level. The difference signifies larger demand based on skills within activity compared to variations in demand for middle skills across economic activities.

Over the period 2000-2009, the total wage bill share of middle skilled workers declined from 28.4 percent to 19.1 percent. Figure 12 illustrates that most of this decline is attributed to the decrease in the “within activity” component (the decrease in the share of middle skilled workers employed in a specific economic activity in the total wage bill within this economic activity). Such a pervasive decline signifies a structural change where technological innovations have displaced job opportunities for the middle skills over time in support of “the routinization” hypothesis.

Figure 12. Decline in Demand for Middle Skilled Workers Attributed to Skill Biased Technological Change (the “Within Activity” Component) - (% , 2000 and 2009)

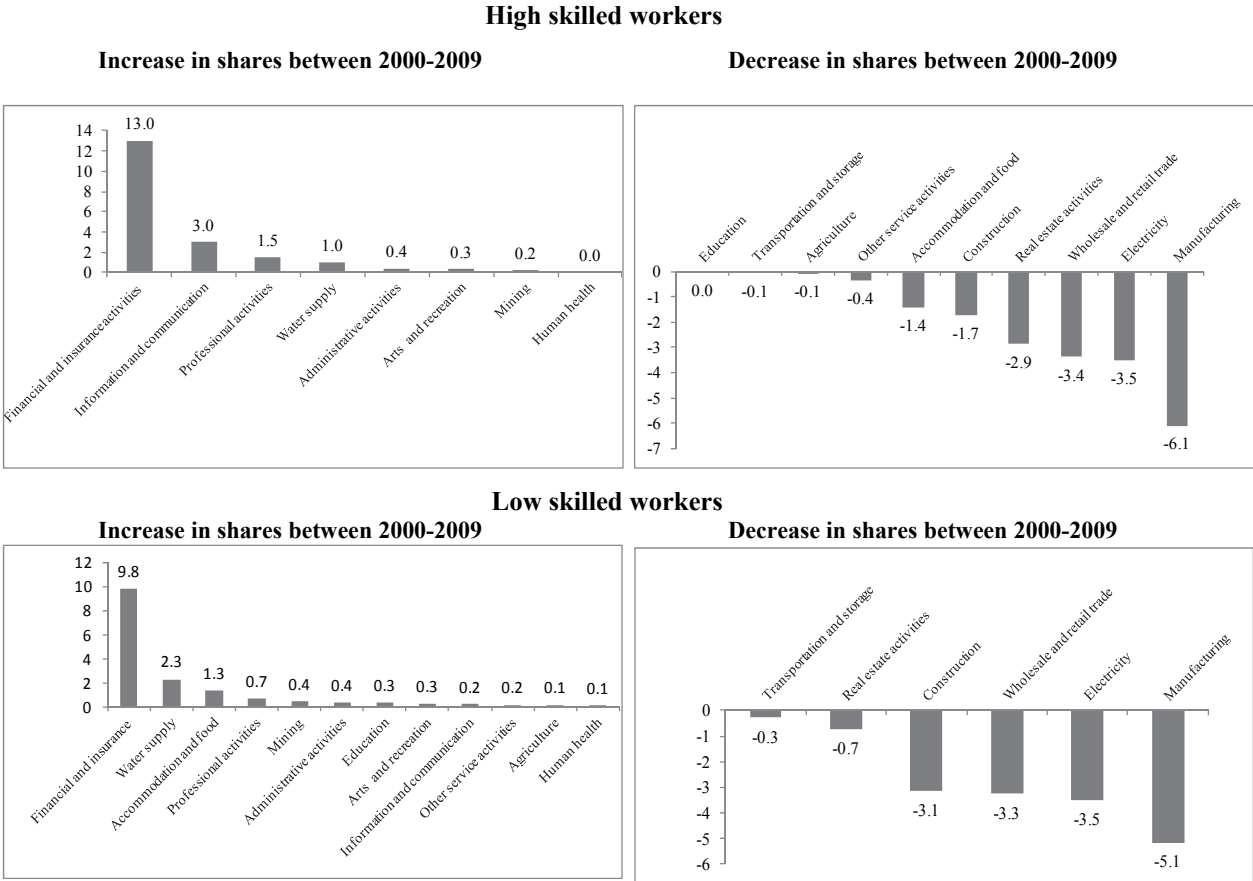


Source: Author’s calculations based on CAPMAS (2010b, c; 2000).

Model (3) reflects that the evolution of the demand for the high and low skilled workers was mainly driven by product-demand shifts across activities. The coefficient on SAWB is significant at the one percent level and its size is larger than that on the SWWB, which is significant at the 10 percent level (Table 6).

Over the period 2000-2009, the share of high and low skilled workers in the total wage bill increased from 71.6 percent to 80.9 percent. Figure 13 illustrates that most of this increase is attributed to the rise in the share of both high and low skilled workers employed in the financial and insurance activities in the total wage bill received by the respective workers across activities.

Figure 13. Change in Demand for High and Low Skilled Workers Attributed to Product-Demand Shifts (the “Across Activity” Component) - (% , 2000-2009)

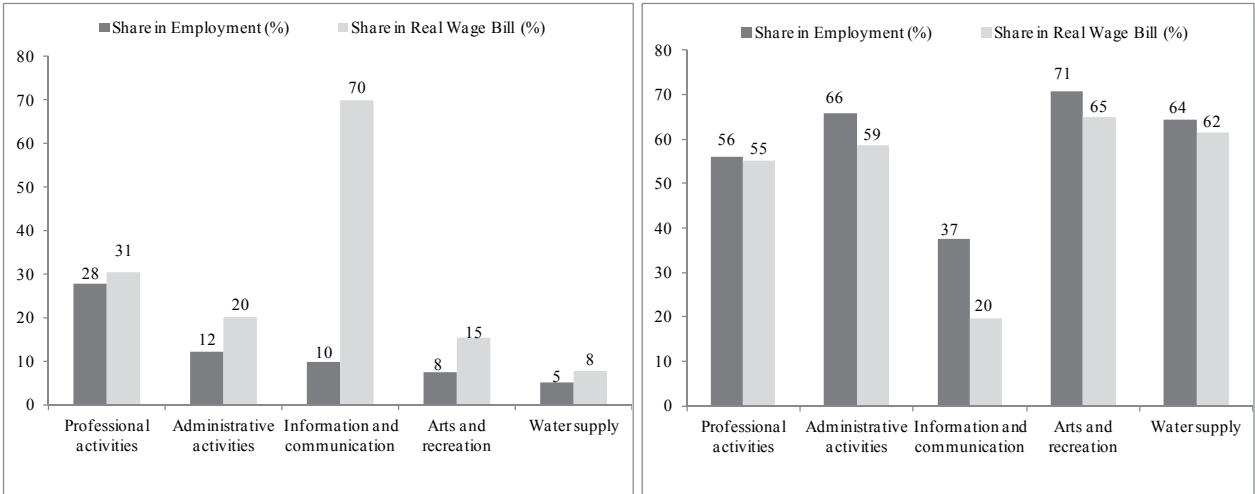


Source: Author’s calculations based on CAPMAS (2010b, c; 2000).

In addition, Figure 14 demonstrates that five new activities have emerged over the past decade employing high and low skilled workers. These activities are: professional, scientific and technical activities; arts, entertainment and recreation; water supply, sewerage, waste management and remediation activities; administrative and support service activities and information and communications activities. Hence, the share of high and low skilled workers employed in these emerging activities has increased in the total wage bill received by the respective workers across activities.

Although it is expected that high skilled workers should be adequately rewarded, it is evident from Figure 14 that such compensation is disproportionate to their share in employment, particularly in the information and communications activities. Moreover, dominant high earning for high paying activities has eroded the share of low skilled workers in the total wage bill for the respective activities. The share of low skilled workers in employment outweighs their share in the real wage bill, which is all the more striking in the case of information and communications activities. From the above, we infer that middle skilled workers have a 53 percent share in employment in information and communications activities with a mere 10 percent share in the real wage bill of the respective activities, further emphasizing that skill biased technologies hollow out the middle.

Figure 14. The Share of High and Low Skilled Workers in Newly Emerging Activities (% , 2000-2009)



Source: Author’s calculations based on CAPMAS (2010b, c; 2000).

Zooming in on the years 2000 and 2009, our results confirm that in both years and for all our three models, private employment (STPE) was the main determinant of skill demand in Egypt (Table 7). The coefficient on the STPE is always significant at the one percent level and its “size” is greater than that of the “across activity” component (SAWB), and of the “within-activity” component (SWWB).

Table 7. Determinants of Skill Demand Polarization in Egypt: Cross Sectional Analysis (Shares in 2000 and 2009)

Dependent variable (Δ share of each skill in total wage bill - Δ STWB)	Wage bill shares (STWB) in 2000			Wage bill shares (STWB) in 2009		
	Model (1)	Model (2)	Model (3)	Model (1)	Model (2)	Model (3)
Independent variables	All Skill Levels	Middle skill levels	High and low skill levels	All skill levels	Middle skill levels	High and low skill levels
C	-0.14 (0.11)	-0.14 (0.08)	-0.16 (0.22)	+2.69E-05 (0.12)	+0.03 (0.03)	+0.1 (0.24)
SWWB (within activity)	+0.03** (0.01)	+0.03* (0.02)	+0.03* (0.02)	+0.01 (0.39)	-0.01 (0.01)	+0.01 (0.01)
SAWB (across activity)	+0.03** (0.01)	+0.03*** (0.01)	+0.03 (0.04)	+0.03** (0.02)	+0.02*** (0.01)	+0.06* (0.04)
STPE (in private activity)	+0.56*** (0.05)	+0.36*** (0.12)	+0.56*** (0.07)	+0.54*** (0.05)	+0.42*** (0.10)	+0.50*** (0.06)
No. of observations	117	65	52	162	90	72
Adjusted R-squared	0.86	0.80	0.86	0.75	0.83	0.75
F-statistic	238.85	88.93	103.55	163.12	144.23	73.18
Prob (F-statistic)	0.00	0.00	0.00	0.00	0.00	0.00

Source: Author's calculations.

Notes: *** designates significance level of 1 percent; ** designates significance level of 5 percent; * designates significance level of 10 percent. White heteroskedasticity consistent standard errors in parentheses.

Moreover, the coefficient on STPE for the demand on middle skilled workers is larger in 2009 than in 2000 (model 2), while the coefficient on STPE for the demand on high and low skilled workers is smaller in 2009 than in 2000 (model 3). The evidence further reinforces that the growth of the private sector has provided room to increase demand for middle skilled workers, mitigating the rate of polarization over time.

An interesting result merits highlighting. Workers' shares in the total wage bill were mainly determined by the demand for their specific skills in 2000 (the coefficients on the SWWB are significant at the 5 percent level in model (1) and at the 10 percent level in the other two models). In contrast, in 2009, the shares in the total wage bill of various skills were primarily dependent on the demand for the products of the activities in which they were engaged (the coefficients on the SWWB are insignificant in all our three models in 2009, while the coefficients on the SAWB are significant at the 5 percent level in model (1), at the one percent level in model (2) and at the 10 percent level in model (3)). Thus, workers were rewarded more for their skills in 2000, but more for being engaged in some booming activities in 2009. Moreover, product demand has progressed in favor of higher polarization in 2009, as evident by the larger coefficient for the share of high and low skilled workers (model 3), compared to the coefficient for the share of middle skilled workers (model 2). These findings imply a low and decreasing return to skill over the past decade, particularly for middle skilled

workers, emphasizing the need to develop the education and training systems in a way that matches rewards with the costs incurred and provide a level playing field for all participants in the labor market.

4. CONCLUSION AND POLICY IMPLICATIONS

By tracking changes in the employment and wage structure of 9 high, middle and low skilled occupations in 18 economic activities over the period 2000-2009, this paper provides evidence that skill demand polarization is growing in Egypt and wage disparity is widening.

Our analysis indicates that the demand for middle skilled workers has declined in 2009, compared to 2000, reflecting structural changes where an increase in technological innovation and variation in labor demand across economic activity appear to be hollowing out the middle across all economic activities over time. Moreover, product-demand shifts have increased the relative demand for high and low skilled workers across economic activities, hence reinforcing polarization of the employment and wage structures in Egypt. However, our analysis provides evidence that growth of the private sector has provided room to increase demand for all skills, particularly those of the middle skills, mitigating the effect of polarization.

Demand-driven polarization in Egypt has three policy implications. First, a well-targeted industrial policy is needed to mobilize demand for middle skilled workers, particularly in the manufacturing activities that have shrunk over the past decade relative to other economic activities, both in its shares of employment and wages. Second, identifying the skills demanded by the private sector is imperative to guide the education and training systems towards providing graduates with marketable job skills, thereby lowering the unemployment rate among the youth and alleviating social and political tensions. Finally, upgrading products in underdeveloped activities and investing in activities with high job content of growth would help stimulate the demand for their products and mobilize employment, thereby narrowing wage disparities across activities.

APPENDIX 1

The GINI coefficient calculation

The GINI coefficient was calculated using the following method (Yitzhaki 1994; Lerman and Yitzhaki 1984):

$$Gini\ Coefficient = \frac{2\text{cov}(s,r)}{N\bar{Y}}$$

where:

s = the share of each skill level occupation in the total real wage bill (arranged ascendingly);

r = the rank of each skill level occupation (arranged ascendingly);

$n= 9$ (the total number of skill level occupations);

\bar{Y} = the mean of the share of each skill level occupation in the total real wage bill.

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