Growing without changing: A tale of Egypt's weak productivity growth

Growing without changing: A tale of Egypt's weak productivity growth

Hanan Morsy[1] and Antoine Levy[23]

Abstract

Despite fast growth during 2000-10, Egypt saw limited productivity gains from sectoral labour reallocation over the past three decades. Using a novel data set and updated measures of productivity growth induced by structural change in employment patterns across a large set of countries, we explain why Egypt failed to significantly reduce unemployment, lower poverty, or raise productivity. We use cross-country comparisons, counterfactual scenarios, and regression analysis to demonstrate that limited openness to trade, weak export diversification, and low access to finance prevented Egypt from tapping the growth potential of a structural shift in labour towards skilled manufacturing and private services, locking Egypt instead into a "low value trap". The paper suggests policy implications on how to overcome impediments to efficient sectoral reallocation of workers.

Keywords: productivity growth; job creation; structural change; structural transformation; sectoral productivity

JEL Classification: D24, O47, O5

Correspondence: Antoine Levy, Economics Department, MIT, 77 Massachusetts Ave., Cambridge, MA 02139, USA. Email: levya@mit.edu

[1] Macroeconomic Policy and Research Department, African Development Bank, Abidjan, Côte d'Ivoire.

[2] Economics Department, Massachusetts Institute of Technology, Cambridge, MA, USA.

[3] The authors thank Clara Sanchez for her support on this paper's initial version.

1. Introduction

Egypt's 2011 revolution highlighted unmet public demands for social justice, poverty alleviation, and improved job quality among Arab countries in transition. Despite improved growth, demands for higher living standards for the middle class – who drove the revolution – erupted just as Egypt's economy appeared to be taking off.

Why? A closer look at Egypt's pre-revolution growth reveals that output per worker increased much more slowly than real GDP. Most of its growth was driven by an increase in the labour force, while labour productivity's contribution was relatively limited and unemployment remained above 8%. The share of wages in GDP declined persistently (Chart 1) and output growth accrued mostly to domestic and foreign capital holders, not the middle class (Fadel, 2011). A lack of good jobs in high-productivity industries explains both the high unemployment, even among educated workers, and the low labour share in GDP, as those workers were concentrated in low-productivity industries, depressing wages.

Chart 1: (a) Unadjusted share of wages in GDP in selected countries

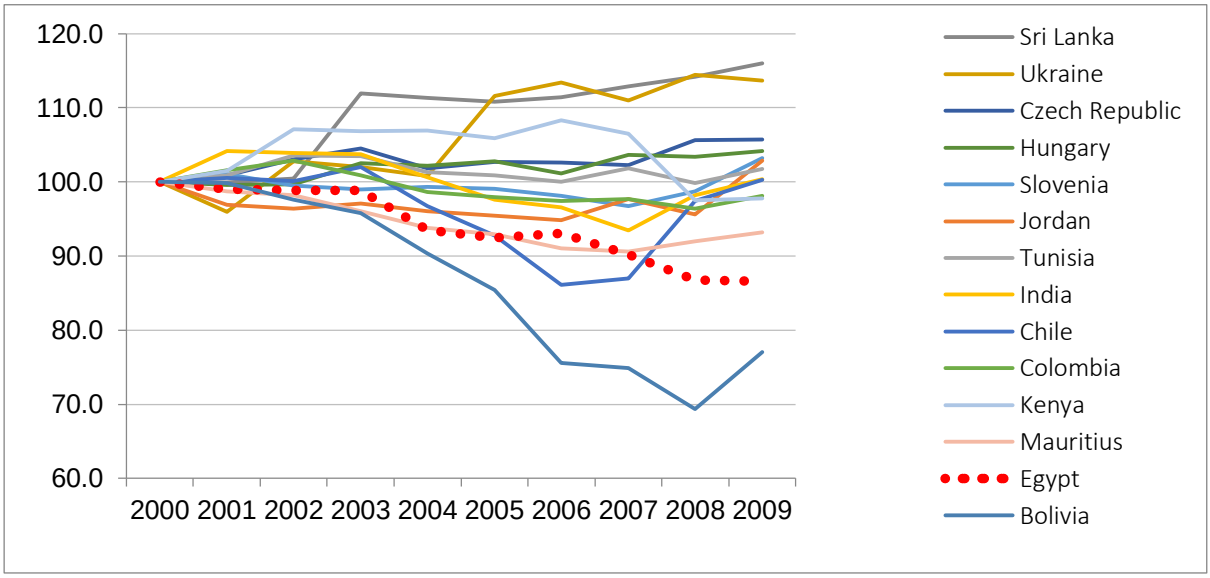
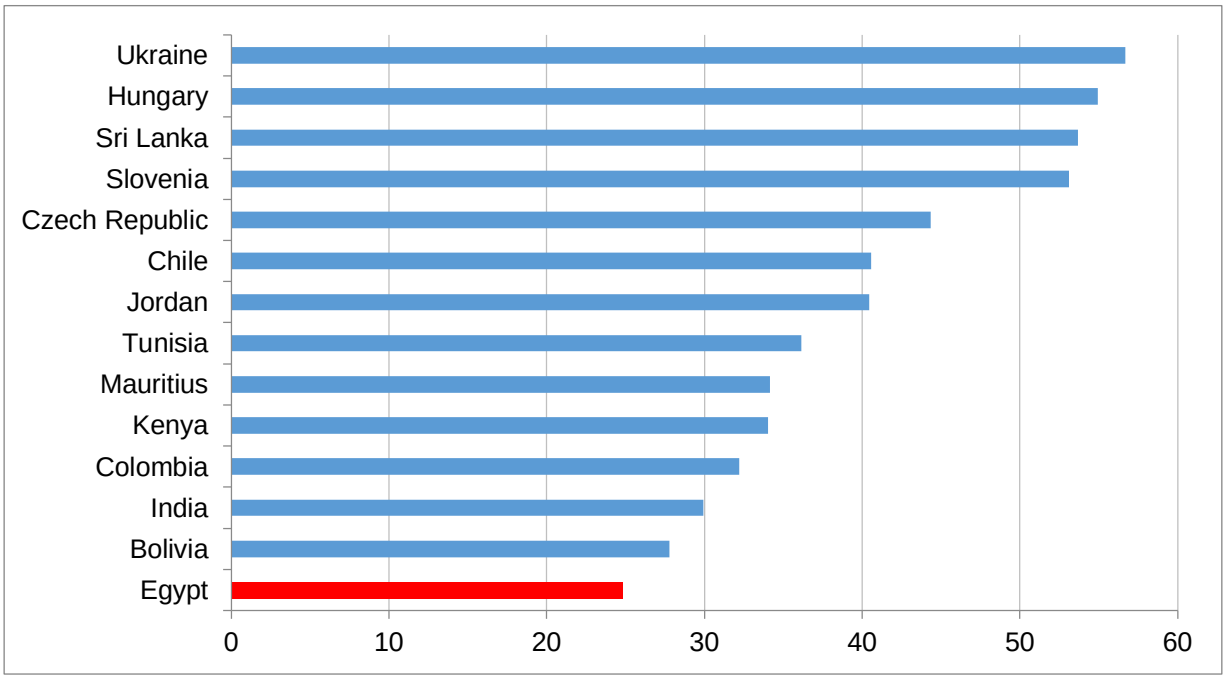


Chart 1: (b) Unadjusted share of wages in GDP in selected countries (%), 2009



Source: ILO, Global Wage Database.

This accords with another striking element of Egypt's pre-revolution economic growth. Growth in emerging markets often sees excess labour reallocated from traditional industries to more productive sectors, but Egypt's GDP composition remained broadly unchanged.

This paper proposes an explanation for Egypt's "lost decade of productivity", using a sectoral approach to show growth was mostly the product of an expanding labour force and within-sector productivity rather than a labour reallocation. Understanding Egypt's constraints on structural change is especially important now, with stagnating income per capita and close to 12% unemployment. Egypt's ability to deliver jobs in high-productivity industries is a matter of economic efficiency, social justice, and socio-political stability.

In Section 2, we relate our study to existing analyses. After describing our data and methodology (Section 3), we decompose the sources of productivity growth, showing that Egypt witnessed less structural change than its peers (Section 4.1). We enumerate stylised facts characterising Egypt's pre-revolution growth and use a cross-country analysis of panel data (Section 4.2) to assess the relative importance of country-level factors in a structural reallocation of labour towards higher-efficiency sectors. We test our findings' robustness (Section 5) and offer policy recommendations (Section 6).

2. Literature review

Unlike advanced economies, whose growth stems from higher productivity *within* industries, in emerging and developing economies growth occurs through the reallocation of labour *across* industries, from low-productivity to higher-productivity sectors (Lewis, 1954).

Moving to higher-value-added activities boosts development and standards of living. For centuries before Europe's industrial revolution, GDP per capita was stagnant as most workers remained in agriculture (Madison, 2001); any technology-driven output growth was cancelled out by population increases – the "Malthusian trap" (Clark, 2005). Egypt witnessed strikingly similar patterns in recent decades. And empirical evidence confirms structural change's key role in long-term income growth, high-productivity job creation, and poverty reduction in emerging countries (Timmer et al., 2015; Timmer and Akkus, 2008; UNIDO, 2012).

Given its fundamental role in development, understanding what drives structural change is essential. Landmark studies, starting with McMillan et al. (2014), identify constraints on the efficient reallocation of labour. Others focus on specific

determinants of structural change: aid (Page, 2012), trade (Uy et al., 2013), land endowments (Barbier and Bugas, 2014), and institutions (Rodrik, 2007).

Our study provides a cross-country perspective, using a consistent database, covering more time – two decades – and more countries – 41, including Egypt and other Arab countries in transition – than existing research. Past cross-country analyses focused on the decomposition of labour productivity growth (Roncolato and Kucera, 2014; Eberhardt and Teal, 2013). Some emphasised drivers of variations in structural change among countries, including McMillan et al. (2014), who examine the role of employment rigidity and exchange rate undervaluation, and Martins (2019), who provides a multivariate analysis using different data sources and a panel approach at yearly frequency, and focuses on development indicators.

Some developing economies have witnessed strong growth but persistent, widespread poverty, stagnant living standards, and high income inequality. Several studies have documented very uneven distribution of rapid growth's benefits in low-income economies, and suggested a country's *pattern* of development may be as important as per capita GDP (Bourguignon, 2003; Loayza and Raddatz, 2010).

Some country-level analyses explain structural change in a particular economy: de Vries et al., 2012, BRICS; Marouani and Mouelhi, 2013, Tunisia; Mouelhi and Ghazali, 2018, Northern Africa; Martins, 2014, Ethiopia; and FEMISE, 2015, three MENA countries including Egypt.

Despite the importance of structural transformation in driving sustainable inclusive growth in Egypt, this has not been examined in the literature. Existing studies have focused on structural reforms in Egypt's labour market (Hassan and Sassanpour,

2008; Yassine, 2013; Ikram, 2019), and the comparative impact of the 2011 revolution across sectors (Hosny et al., 2013).

Our paper documents and explains Egypt's lack of structural change relative to its peers using a shift-share decomposition. We use Egypt to showcase the political and social consequences of failing to attain growth through structural transformation.

3. Data description and stylised facts

3.1. Data

To compare structural change patterns in Egypt during 1990–2010 and 2000–2010 to those in other countries, we derived consistent time-series data from the Groningen Growth and Development Center (GGDC) 10-sector database for eight sectors, merging government and other personal services.

We used GGDC data for employment and value added by sector for most countries. To expand data for 2010–2018 for Egypt, we used UN data on sectoral employment and gross value added at 2015 constant prices.

Using GGDC data for all countries with value added in local currency at constant 2005 prices, we obtained sector-level price indices for each country-sector pair. For European countries where value-added data in constant prices stopped in 2009, we rescaled nominal sectoral growth from 2009 to 2010 to match overall growth in value added from the IMF's WEO database, and applied these rates to 2009 value added to obtain 2010 sectoral value-added and productivity data. Using the WEO's implied PPP conversion rates, we converted the data to constant 2005 international US dollars and computed average labour productivity by sector in this unit for comparability between countries.

We calculated labour productivity in each sector to compare labour flow patterns with changes in sector-level productivity – output in constant 2005 PPP US dollars by economic activity over total employment by economic activity – for each year. For *relative* labour productivity, we computed end-of-period sector labour productivity as a share of overall labour productivity (total value added in 2005 PPP US dollars over total employment).

Explanatory variables and controls came from the following sources:

- IMF WEO database: PPP exchange rates, trade openness, and aggregate GDP growth in 2010. We computed trade openness as half the sum of exports and imports as a percentage of GDP, and used the change in this ratio for each country-decade pair.
- Penn World Tables: capital stocks, capital services, and total factor productivity. To calculate initial and final levels of capital per worker we divided the capital stock by employment figures for each country, before computing growth in capital per worker and in total factor productivity.
- World Bank, World Development Indicators: domestic credit. We computed real growth in domestic private credit over a decade by comparing the initial and final ratios of domestic private credit to GDP.
- UN COMTRADE database: export flows. We analysed the share of primary commodities in a country's exports.
- Cohen-Soto (2007) database: educational attainment data. We obtained the average years of schooling for people aged 15–64 at the beginning and end of both decades for each country, and computed the change in average years of schooling.

- External Wealth of Nations database (Lane and Milesi-Ferretti, 2007): foreign investments and financial openness data. We calculated a canonical ratio of financial openness – half the sum of foreign assets and liabilities of a country divided by its GDP – and estimated this ratio's change over a decade as a proxy for external financial liberalisation.

3.2 Stylised facts

We first document stylised facts that help explain Egypt's low labour productivity. Average labour productivity displays large variations across sectors (Table 1). Some of the least productive sectors – construction and agriculture – employ a large share of the labour force, while sectors with high productivity, including mining and financial services, employ a much smaller share.

Egypt's productivity gaps across sectors are high by international standards (Chart 2). Such large variations characterise lower-income and lower-productivity countries. Egypt's performance therefore highlights the need for a structural transformation to raise productivity growth by redistributing labour across sectors.

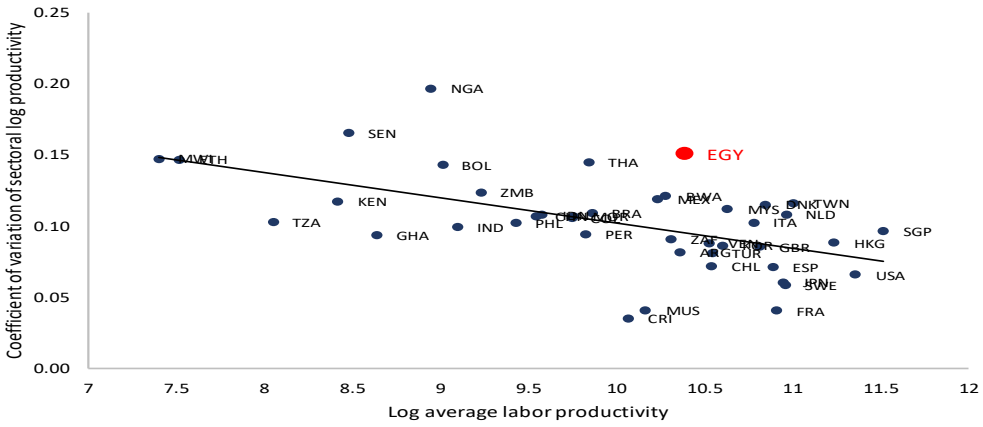
Table 1: Egypt: Sector-level statistics

Sectors	Share of employment 2010	Contribution to GDP 2010	Average labour productivity (2005 International US$)
Mining and Quarrying	0.1%	13.3%	3,283,241
Utulities	1.4%	1.5%	34,817
Finance, Insurance, Real Estate Services	3.6%	7.8%	69,730
Transport, Storage, and Communication	9.0%	14.3%	

			51,259
Manufacturing	11.1%	16.4%	48,190
Construction	12.4%	5.8%	15,300
Wholesale and Retail Trade, Hotels, and Restaurants	13.5%	15.1%	36,285
Agriculture	23.6%	12.8%	17,616
Government and other personal services	25.2%	12.9%	16,636
Overall economy	**100.0%**	**100.00%**	**32,468**

Source: GGDC; authors' calculations.

Chart 2: Coefficient of variation of productivity across sectors and average labour productivity



Source: GGDC; authors' calculations.

Note: Country codes = ISO-3.

While the Egyptian economy is diversified across sectors in output terms, employment is highly concentrated in less-productive sectors. Jobs in agriculture and in government, health, and education together account for nearly half of total employment but only one-fourth of output.

There is limited progress towards an efficient reallocation of labour. Construction and agriculture, whose productivity is below half the economy-wide average, saw no

significant decline in employment. Highly productive sectors like mining and financial services employ a small, declining proportion of the labour force. Despite earlier reforms to curb the public sector employment, its prominence has remained largely unchanged.

Egypt's sectoral productivity is below average for most sectors – except mining, where it is high even by international standards (Table 2). But productivity indices in this sector are likely to be affected by high-frequency international price fluctuations, depending on the composition of exports.

Table 2: Egypt: Productivity by sector, 2010 (2005 US$) in international context

Sectors	Egypt	Minimum		Maximum	
Mining and Quarrying	3,283,241	2,195	ETH	3,283,241	EGY
Utulities	34,817	4,912	NGA	488,990	HKG
Finance, Insurance, Real Estate Services	69,730	4,765	ITA	166,269	USA
Transport, Storage, and Communication	51,259	5,105	NGA	127,569	TUR
Manufacturing	48,190	1,527	ETH	154,144	SGP
Construction	15,300	1,923	MWI	85,187	BWA
Wholesale and Retail Trade, Hotels, and Restaurants	36,285	2,388	MWI	86,372	SGP
Agriculture	17,616	751	MWI	68,342	USA
Government and other personal services	16,636	1,719	NGA	86,274	SGP
Overall economy	**32,468**	**1,636**	**MWI**	**100,523**	**SGP**

Source: GGDC and authors' calculations.

Note: Country abbreviations = ISO-3.

Utilities, construction, and finance, insurance, and real estate perform particularly poorly by international standards, reflecting poor efficiency. This only highlights the potential gains of expanding and modernising Egypt's services sectors.

4. Main results

4.1. Structural change in Egypt

Structural change was first modelled through a "dual-economy" approach: as workers move from subsistence agriculture to capital-intensive sectors, a country's living standards improve. Theoretical studies associating "modern" sectors, such as manufacturing and utilities, with increasing returns to scale (Hirschman, 1958; Arthur, 1989) showcase how labour reallocation to more efficient industries improves productive efficiency.

Growth in labour productivity can be separated into the *within-sector* effect, whereby technological improvements increase productivity, and *between-sector* effect, whereby more labour is allocated to more productive economic activities (McMillan et al., 2014; Timmer et al., 2015)

We decompose aggregate labour productivity growth over the period ($t-k$ to t) as follows: $\theta_{i,t}$ represents the sectoral share of employment in sector i at time t for n sectors; Y_t, overall productivity at time t, $y_{i,t}$, productivity in sector i at time t; and Δ, the change in a given variable from $t-k$ to t:

$$\Delta Y_t / Y_{t-k} = \frac{\sum_i^n \theta_{i,t} y_{i,t}}{Y_{t-k}} - \frac{\sum_i^n \theta_{i,t-k} y_{i,t-k}}{Y_{t-k}}$$

$$= \frac{\sum_i^n \theta_{i,t-k} \Delta y_{i,t}}{Y_{t-k}} + \frac{\sum_i^n y_{i,t} \Delta \theta_{i,t}}{Y_{t-k}} \quad (1)$$

The first term of the sum represents productivity growth within sector, weighted by each sector's initial labour share. The second term captures the overall productivity increase from labour reallocation between sectors. This "structural change" term is positive when labour moves to higher relative productivity sectors. Labour-saving innovations leading to higher productivity growth within a sector can have ambiguous effects on overall productivity, depending on whether workers are then reallocated to lower-productivity activities. We perform this decomposition into *within-sector* and *between-sector* components for all sample countries over two decades of productivity growth.

For Egypt, the decomposition shows large disparities across sectors in the within-industry contribution to productivity growth, and an overall negative impact of reallocation mainly attributable to mining, where employment decreased despite high productivity. We discover a negative labour reallocation effect in construction, an unproductive sector whose employment share rose. Agriculture's employment share fell and that of manufacturing rose, but neither change was significant or caused a strong positive reallocation. The drop in mining employment had a strong impact on overall productivity growth given that sector's high worker productivity, but was tempered by mining's low share of employment.

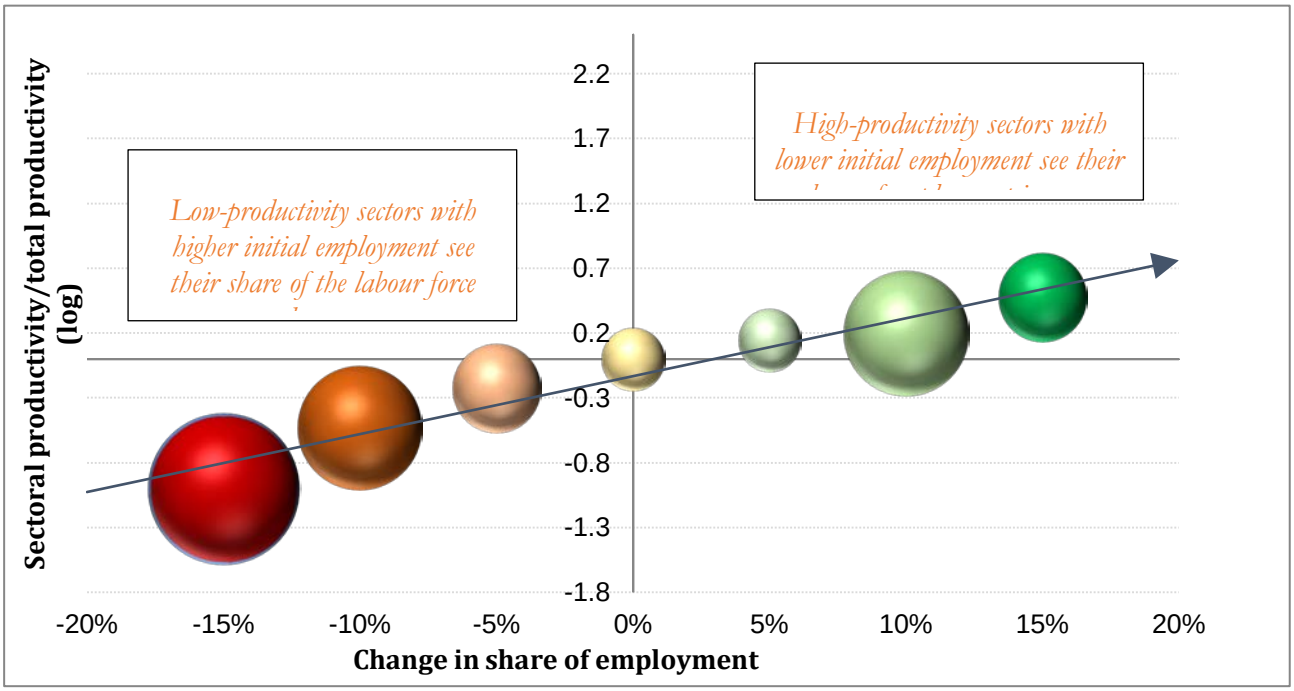
Aggregate labour productivity in Egypt averaged 2.62 percent annually between 2000 and 2010. While within-sector productivity growth contributed close to 3.6 percentage points a year, structural change accounted for *negative* 1.07 percentage points. For labour-abundant Egypt, moving workers from lower-productivity sectors to higher-productivity tradable services and manufacturing jobs is crucial to raise living standards and average wages and offer better jobs in productive sectors during rapid labour force growth. Yet the decline in the employment share of low-productivity

sectors is slow; over half employed Egyptians still worked in agriculture or the public sector in 2010. The largest rise in jobs share was in construction, supported by large energy subsidies despite a lack of modernisation and an abundance of unskilled workers. Meanwhile, the employment share of private sector services and industrial manufacturing almost stagnated, in sharp contrast with other emerging economies.

4.1.1. Comparison to peer countries

We examine the correlation between productivity levels and changes in labour share across sectors (Chart 3). Each sector's relative employment share is indicated by the circle around its label in the scatter plots. In the "ideal" development of a middle-income economy, high-productivity sectors see an increased share in the labour force while those with lower-than-average productivity shrink rapidly.

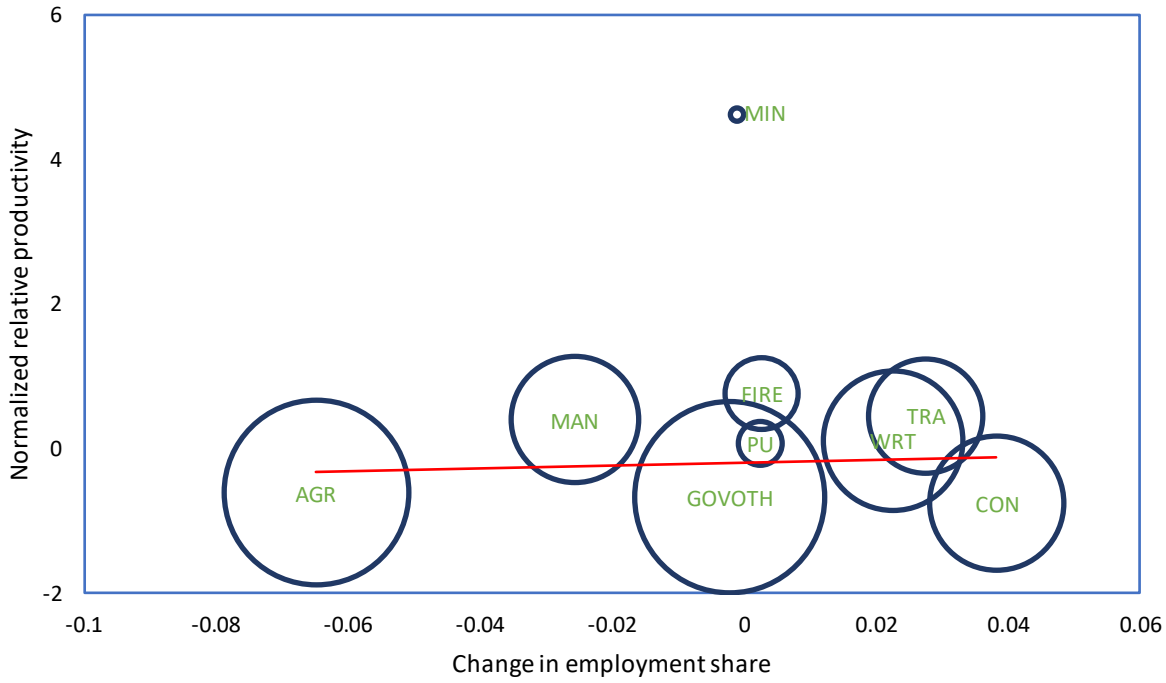
Chart 3: A stylised view of the "ideal" structural change process



Source: Authors' illustration.

But this did not occur in Egypt; structural change was almost flat (Chart 4) in the decade before the 2011 revolution. Not only did labour fail to shift from agriculture towards higher-value-added sectors, but it remained concentrated in low-productivity activities such as construction and the public sector.

Chart 4: Structural change in Egypt, 2000-10



Source: GGDC; authors' calculations.

Note: Y-axis = log of ratio of sectoral 2010 productivity to all-sector 2010 weighted average productivity, all in 2005 PPP USD. Relative labour productivity is end-of-period sector GDP per person employed as a share of the economy-wide GDP per person employed. Size of circle represents share of employment in 2000. Sectors include agriculture (AGR), mining (MIN), public utilities (PU), transport, storage and communication (TRA), finance, insurance and real estate services (FIRE), construction (CON), manufacturing (MAN), wholesale and retail trade and accommodation (WRT), and government and other personal services (GOVOTH).

.

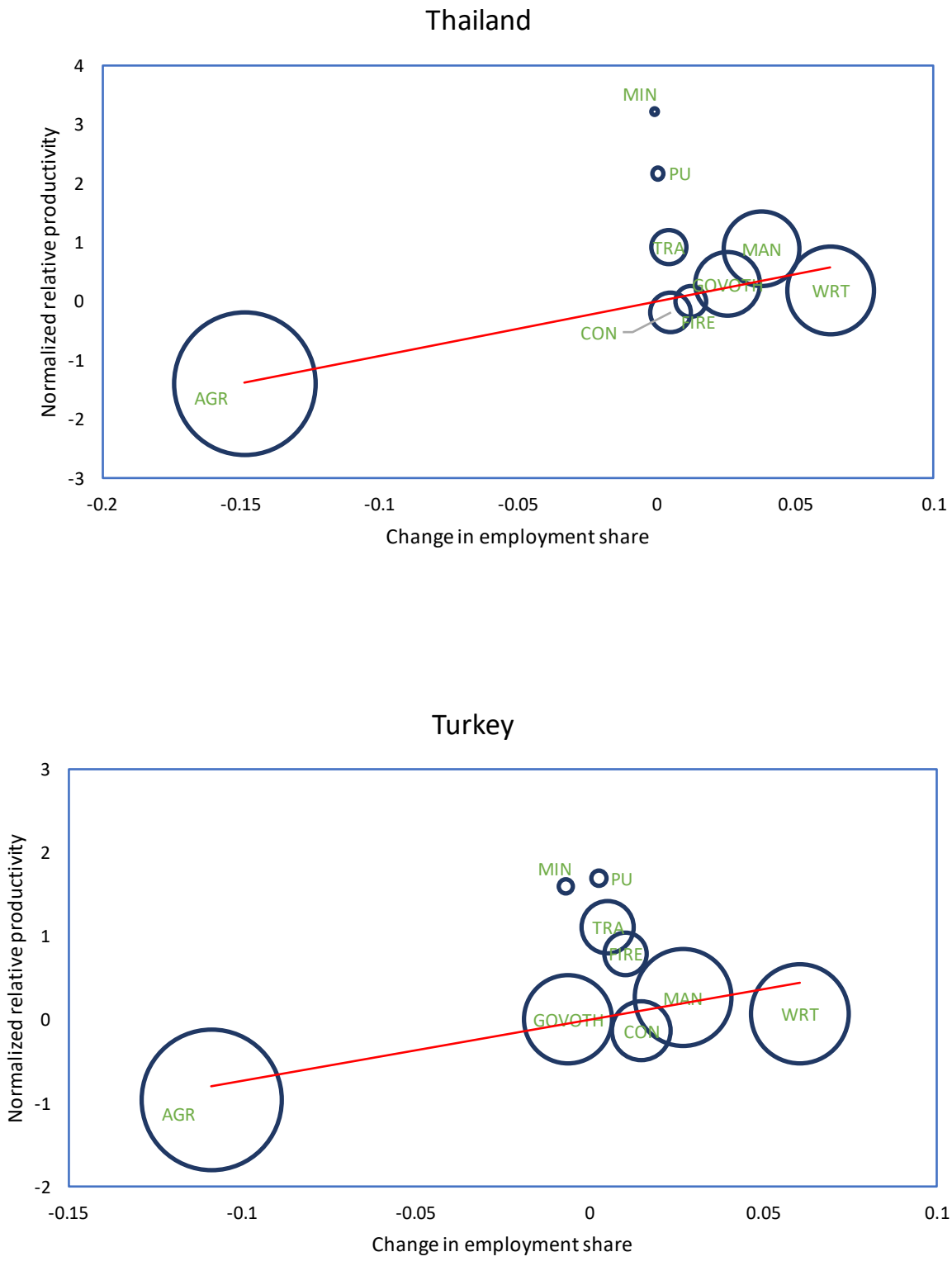
By contrast, many emerging economies have boosted per capita income and high-quality job creation by quickly reallocating labour to more productive sectors (Roncolat and Kucera, 2014). To illustrate this lost opportunity, we compare Egypt's experience with its peers Turkey and Thailand, which in 1990 had similar GDP per capita to that of Egypt in 2000, comparable world population rankings (18th and 20th, respectively, against Egypt's 15th), and similar initial sectoral distribution of

employment. These countries experienced a significant structural shift of labour towards modern industries, allowing them to outpace Egypt's growth and development in a decade.

The overall distribution of sectors by relative productivity (rather than nature of output) shows a similar initial pattern in these countries); the three least productive sectors represent a similar share of employment. However, while the most productive sectors also represent a similar share of the labour force in Egypt and its peers, Egypt's least productive sectors (construction and agriculture) represented a lower share in 2000 than their counterparts in Thailand and Turkey 10 years earlier, leaving less room for reallocation towards more productive sectors.

Chart 5 contrasts Egypt's economic transformation with that of Thailand and Turkey, whose PPP-adjusted per capita GDP in the 1990s was similar to Egypt's in the 2000s. Large increases in these countries' employment share of productive sectors like manufacturing and tourism offset a large contraction in agriculture, facilitating a rapid rise in wages and value added, a stable or rising labour share, and limited unemployment.

Chart 5: Structural change in Thailand and Turkey, 1990-2000



Source: GGDC; authors' calculations

Note. Y axis = log of ratio of sectoral 2000 productivity to all-sector 2000-weighted average productivity, all in 2005 PPP USD. See Chart 4 for sector abbreviations.

4.1.2. Counterfactual scenario

Comparing Egypt with Turkey demonstrates how the transformation of a country's employment structure can boost living standards and labour productivity. A study of the growth elasticity of employment in Turkey and Egypt (Abdel-Khalek, 2010) demonstrates that Egypt's productivity growth arose mainly from the rise of extractive industries, representing limited overall employment opportunities given their high capital intensity, and the informal sector, while Turkey's mostly stemmed from a rise in the tradable manufacturing and export-oriented sectors.

To illustrate the potential of structural change to enhance living standards, we construct a counterfactual scenario whereby Egypt's relative sectoral productivities remain unchanged over 2000–10, but the share of employment in each sector is reallocated to mimic Turkey's 2009 employment structure. (We use 2009 because that is the most recent year in the GGDC data set, and the sectors represented match that we have chosen for our analysis in Egypt.)

We measure this crude version of "lost opportunities" by the additional overall average productivity ($Y_{potential} - Y_{actual}$) Egypt could gain with a similar sector mix $\theta_{Other,t}$ to Turkey, as follows:

$$Y_{potential} - Y_{actual} = \sum_{i}^{n} \theta_i^{Turkey} y_{i,EGP} - \sum_{i}^{n} \theta_i^{EGP} y_{i,EGP} \,. \quad (2)$$

Although Turkey had a higher PPP-adjusted per capita GDP in 2009 than Egypt, it is a reasonable comparator culturally, historically, and in terms of employment and population size. Its labour share in agriculture is about 4% lower and its share in

industry is almost the same. The starkest difference is the employment share of private sector services – almost 33% of Turkey's jobs (versus 25% in Egypt) – and the correspondingly lower share of public sector employment in Turkey.

Applying equation (2), assuming no changes in Egypt's *within-sector* productivity, we find a *between-sector* reallocation of jobs to services alone would translate into a 50% increase in the economy's labour productivity (Table 3). This crude counterfactual is partly driven by the exceptional productivity of Egypt's mining industry (highly dependent on international price fluctuations), and substantial general equilibrium endogenous adjustments would occur under such a redistribution (Duarte and Restuccia, 2010). Nonetheless, it demonstrates the potential for considerable structural-change-driven catchup in average productivity even without substantial within-sector productivity growth.

Table 3: Counterfactual approach using Turkey's sector shares

Sectors	Egypt's actual sectoral labour productivity (2010), 2005 PPP USD	Sectoral employment shares Turkey (2009)	Egypt employment (thousands) in 2010 (with 2009 Turkey sectoral shares)	Contribution to aggregate product (counterfactual), 2005 PPP USD million	Contribution to aggregate product (counterfactual), 2005 PPP USD million
Mining and Quarrying	3,283,241	0.48%	106.60	349,981	93,679
Utilities	34,817	0.37%	80.72	2,811	10,527
Finance, Insurance, Real Estate Services	69,730	6.29%	1,385.75	96,629	54,981
Transport, Storage, and Communication	51,259	5.08%	1,118.74	57,346	100,489
Manufacturing	48,190	18.56%	4,086.88	196,946	115,491
Construction	15,300	5.87%	1,292.61	19,777	41,146

Wholesale and Retail Trade, Hotels, and Restaurants	36,285	21.35%	4,700.58	170,559	106,293
Agriculture	17,616	24.69%	5,437.44	95,788	90,236
Government and other personal services	16,636	17.31%	3,810.56	63,391	90,669
Average labor productivity				**47,831**	**31,949**
Counterfactual impact				49.70%	

Source: GGDC; authors' calculations.

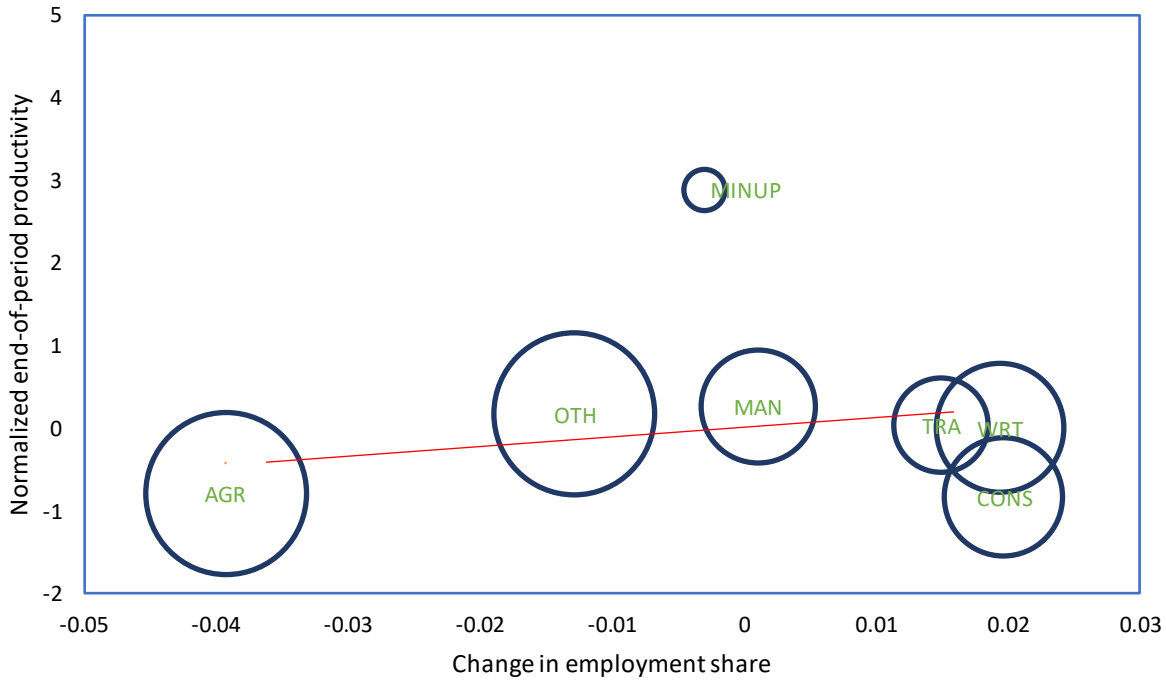
4.1.3. Post-revolution trends

Although it is still early to forecast how Egypt's economy will be transformed long-term in the wake of the revolutions, the data indicate no improvement in patterns of structural change. We expand the GGDC data beyond 2010 for Egypt using UN sectoral value-added data (in 2015 PPP US dollars and sectoral employment data). The UN breakdown contains only seven sectors, combining mining and public utilities.

Using a similar approach to the previous section, we compare the evolution of labour shares and productivity across sectors to assess the structural change between 2010 and 2018. The share of public sector jobs rose at the expense of those in higher-productivity sectors like manufacturing, tourism, and finance (Chart 6). Overall, the aggregate contribution of structural change to aggregate labour productivity growth over the 2010-18 period is small and negative. While agriculture witnessed a reduction in its employment share, other low-productivity industries like construction rose, and manufacturing and mining remained steady. If this continues, within-sector

productivity improvements will be counteracted by productivity-reducing movements between sectors.

Chart 6: Egypt: Labour reallocation, 2010-18



Source: United Nations; authors' calculations.

Note: Y-axis = log ratio of sectoral 2018 productivity in 2015 PPP USD to all-sector 2018 weighted average productivity in 2005 PPP. See Chart 4 for sector abbreviations.

4.2. Panel data analysis

We investigate structural change determinants in a cross-country panel using a novel data set, expanding the McMillan et al. (2014) figures to 2010, for nearly 40 countries from 1990 to 2010 – two decades of sectoral data for value added and employment per country. We use equation (1) to compute country rankings for productivity growth's structural change component and *within-sector* productivity growth for each country, annualized, over 2000-2010 (Table 4).

Table 4: Country rankings by structural change component, 2000–2010

Top 10 countries by structural component		
Country	**Annualized structural change**	**Annualized productivity growth**
CHN	3.38%	10.00%
TZA	3.10%	3.11%
NGA	2.78%	4.25%
MWI	2.57%	1.77%
ETH	2.10%	4.58%
IND	1.45%	6.08%
TUR	0.98%	3.41%
VEN	0.91%	-1.25%
THA	0.70%	2.65%
MOR	0.65%	2.20%
PER	0.63%	3.38%
Bottom 10 countries by structural component		
Country	**Annualized structural change**	**Annualized productivity growth**
BOL	-2.20%	0.59%
BWA	-1.97%	2.41%
EGY	**-1.07%**	**2.62%**
ESP	-0.54%	0.78%
SWE	-0.51%	2.79%
NLD	0.45%	0.95%
ITA	0.39%	-0.85%
DNK	-0.35%	0.34%
USA	-0.29%	1.18%
FRA	0.27%	0.86%

Source: GGDC; authors' calculations.

Note: Structural change = annualized growth rate of productivity explained by labour reallocation across sectors (second term in sum on right-hand side of equation 1). Turkey's decadal value is computed over 2000–2009 (last available year), annualized over nine years. Country codes = ISO-3.

Growth-enhancing structural change was a key determinant of the East Asian countries' strong performance, a result of their growth model orientation towards exports and the tradable, high-productivity sector, notably for China, India or Thailand. Conversely, structural change played a negligible role in high-income

countries, where productivity variation among sectors is lower and gains mainly come from improved *within-sector* productivity. This is consistent with the empirical literature on the geographic variation of structural change, (Roncolato and Kucera, 2014; McMillan et al., 2014). The best performers did so in the second decade. Egypt is an outlier, with structural change flat or negative between 2000 and 2010 despite its lower-middle-income status.

We use multivariate regression analysis to identify the main factors behind the level of structural change across countries. The dependent variable SC_{it} is the structural change term over a decade t in country i, measured as the cumulative annualized labour productivity growth over a decade attributable to the cross-sectoral reallocation of labour. The impact of various explanatory variables on the level of the structural change is examined using the following:

$$SC_{it} = \alpha_t + \alpha_i + \beta_1 {Agri_i^{t-1}}/{L_i^{t-1}} + \beta_2 \times {X_{it}^{raw}}/{X_{it}} + \beta_3 \times \Delta {X_{it} + M_{it}}/{GDP_{it}} + \beta_4 \times \Delta {FA_{it} + FL_{it}}/{GDP_{it}} + \beta_5 \times \Delta {Credit_{it}}/{GDP_{it}} + \beta_6 \times \Delta {K}/{L_{it}} + \beta_7 \times \Delta Educ_{it} + AF(i) + ASI(i) + \varepsilon_{it},$$

where SC_{it} is the structural change term in a given country i and decade t; X_{it}, exports of country i; M_i, imports of country i; X_i^{raw}, raw material exports; ${Agriculture_i^{t-1}}/{L_i}$, share of agriculture in total employment; ${X_i + M_i}/{GDP_i}$, trade openness of country i's economy as the ratio of imports plus exports to GDP; ${FA_{it} + FL_{it}}/{GDP_{it}}$, country's

financial openness (ratio of foreign assets plus liabilities to GDP); $Credit_i/GDP_{i,}$ share of credit to private sector in country i's GDP; $\Delta Educ_{it}$, change in mean years of schooling over the decade; AF and ASI, dummies for Africa and Asia; α_t, a decade-specific fixed effect; α_i (in some specifications), a country fixed effect to account for time-invariant unobservable country-specific factors; and ε_{it}, an uncorrelated idiosyncratic error term.

The choice of specification reflects a number of hypotheses in the literature – notably, that a large untapped workforce in agriculture constitutes a favourable environment for structural change (McMillan et al., 2014), or that export specialisation in commodity and raw materials is likely to slow any such reallocation. We also include important determinants overlooked in some previous studies – in particular, whether factors usually associated with a rise in total factor productivity (capital deepening, increased openness to trade, rising financial integration, improved education of the labour force, or better access to credit) were likely to increase productivity not only through improved capital services and technology within sectors, but specifically by encouraging labour to shift towards more productive industries.

Specifications include two observations for almost all countries in our sample, one for each decade from 1990 to 2010.

We include decade-fixed effects in most specifications to take into account global, country-invariant determinants of structural change such as the global shift towards services in the second decade. We also include country fixed effects in the specification of Table 6 to account for time-invariant country factors.

Tables 5 and 6 summarize our regression analysis.

Table 5: Structural change determinants: OLS regressions

	(5.1)	*(5.2)*	*(5.3)*	*(5.4)*	*(5.5)*	*(5.6)*
Initial share of agriculture in employment	2.821****	3.264****	3.277****	2.812****	3.334****	3.426****
	(0.50)	(0.60)	(0.54)	(0.49)	(0.63)	(0.62)
Share of primary commodities in exports	-0.0478	-0.038	-0.046	-0.0403	-0.0309	-0.0386
	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.04)
Change in trade openness	0.00589	0.00332	0.00956*	0.00722	0.005	0.00995*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Change in financial openness	0.000152***	0.000263***	0.000308***	0.000113*	0.000234**	0.000273**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Africa dummy		-0.444	-0.696**		-0.506	-0.741*
		(0.35)	(0.33)		(0.38)	(0.37)
Asia dummy		0.0975	-0.0464		0.0466	-0.0844
		(0.24)	(0.22)		(0.25)	(0.22)
Change in credit to GDP			0.00115			0.00137
			(0.00)			(0.00)
Change in capital per worker			0.219			0.115
			(0.33)			(0.32)
Change in years of schooling			-0.174			-0.108
			(0.11)			(0.13)
Decade FE	No	No	No	Yes	Yes	Yes
Baseline OLS	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-square	0.372	0.386	0.425	0.393	0.412	0.445

Number of observations	77	77	72	77	77	72
Number of countries	41	41	38	41	41	38

Note: Standard errors in parentheses, clustered at the country level. Most countries have two observations each; four have one only for 2000–2010. * p < 0.10, ** p < 0.05, *** p < 0.01, **** p < 0.001.

Table 6: Panel specification with country fixed effects

	(6.1)	***(6.2)***	***(6.3)***
Initial share of agriculture in employment	4.197	3.649	3.756
	(3.45)	(3.33)	(3.33)
Share of primary commodities in exports	-0.227**	-0.219**	-0.210**
	(0.09)	(0.09)	(0.09)
Change in trade openness	0.0316**	0.0327***	0.0334***
	(0.01)	(0.01)	(0.01)
Change in years of schooling	-0.260*	-0.258*	-0.186
	(0.14)	(0.14)	(0.14)
Change in capital per worker		0.217	0.2
		(0.17)	(0.17)
Change in credit to GDP		-0.00283	-0.0026
		(0.00)	(0.00)
Change in financial openness			-0.000266**
			(0.00)

Decade FE	Yes	Yes	Yes
	Yes	Yes	Yes
Baseline OLS	Yes	Yes	Yes
	0.66	0.65	0.66
Observations	68	68	68
Clusters	34	34	34

Note: Standard errors in parentheses, clustered at the country level. Most countries have two observations each; four have one only for 2000–2010. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.001$.

A reasonable expectation is that a large initial share of employment in agriculture increases the potential for structural change, since more room is available for growth-augmenting labour reallocation, consistent with McMillan et al. We find a positive and statistically significant coefficient on agriculture's share in employment at the beginning of the decade in explaining the variation in the annualized structural change component of a country's productivity growth. The coefficient is also large and positive in the panel specification, albeit more noisily estimated.

But specialisation in primary commodities can trigger a form of Dutch disease, whereby labour concentrates in sectors with a comparative advantage at the expense of sectors with higher potential for economies of scale and learning externalities, such as manufacturing. We test for the importance of a revealed comparative advantage in agriculture or primary commodities, using the share of primary commodities in exports as a proxy, averaged over the decade. The degree of structural change is negatively correlated with a higher share of primary commodities in a country's exports, suggesting that a specialisation in commodities is likely to slow structural

change (Table 6). This is in line with the insights of Barbier and Bugas (2014) for Latin America that if much arable land is available, it absorbs displaced unskilled labour from elsewhere in the economy, limiting productivity gains and generating Dutch disease.

Greater openness to trade can increase foreign competition for domestically produced goods and spur countries to improve efficiency through better use of surplus labour. More openness to trade is also associated with an increase in total factor productivity (Edwards, 1998). We obtain a strong, positive, and statistically significant effect of increased openness to trade on the structural change term, even when controlling for initial conditions (share of agriculture in employment) and comparative advantage in primary commodities, especially in the specification that includes country fixed effects.

Higher external capital can substitute for or complement domestic capital and help finance the adoption of new technologies or increased production by the best-performing firms. It can also serve as a channel to "import" frontier technologies and organisations, and could therefore be expected to enhance structural change. To proxy for financial openness, we estimate the change over a decade in a country's foreign assets and liabilities divided by its GDP over a decade. We find financial openness has a positive impact on the structural change term, similar in magnitude to the change in trade openness. However, the coefficient associated with the change in financial openness is quite sensitive to specifications, as its sign is reversed and its magnitude reduced substantially in the panel specification. Similarly, a higher-level credit to the private sector appears to be associated with positive structural change in

the pooled OLS regression, but the coefficient changes sign when using a panel data specification.

Interestingly, our specifications all yield a negative predicted value of structural change for Egypt, matching reality. This is mainly due to the low growth in credit to the private sector and the large share of primary commodities in Egypt's exports. However, the actual magnitude of the growth-reducing structural change (–1% annualized contribution to productivity growth over the decade) was much greater than predicted by all regression models. Egypt's increased trade openness failed to trigger the expected increase in structural change, suggesting other constraints to an efficient reallocation of labour were at play in Egypt's disappointing performance.

We examine a number of additional variables. We add the change in the level of capital per worker from the Penn World Tables to control for the change in the capital intensity of production and its development and depth. Conditional on other controls, capital deepening has a small, positive but statistically insignificant effect on our measure of structural change. We also test for the impact of the change in average years of schooling of the working-age population. We expect it to be positive but small; however, we find a negative impact, albeit noisily estimated and generally not statistically significant.

5. Robustness checks

Table 7 reports the results of a random-effects specification, which are similar to the fixed-effects model. There is a robust positive and statistically significant effect of agriculture's initial share in employment on annualized structural change; a positive impact of trade openness counteracted by a large negative impact of a substantially

higher share of raw material exports; and mostly statistically insignificant impacts of additional variables.

Table 7: Panel specification with random effects

	(7.1)	*(7.2)*	*(7.3)*
Initial share of agriculture in employment	3.053****	2.826****	2.814****
	(0.63)	(0.62)	(0.62)
Share of primary commodities in exports	-0.0748*	-0.0924**	-0.0924**
	(0.04)	(0.04)	(0.05)
Change in trade openness	0.0195**	0.0199***	0.0203***
	(0.01)	(0.01)	(0.01)
Change in years of schooling	-0.162	-0.168	-0.14
	(0.10)	(0.10)	(0.11)
Change in capital per worker		0.235	0.228
		(0.24)	(0.23)
Change in credit to GDP		-0.0015	-0.0014
		(0.00)	(0.00)
Change in financial openness			-0.000137
			(0.00)
No. of observations	73	72	72
No. of countries	39	38	38

Note: Standard errors in parentheses, clustered at the country level. Most countries in the sample have two observations each; four have one only for 2000–2010. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.001$.

All standard errors are clustered at the country level to account for serial correlation of the residuals and country-specific heteroskedasticity. We conduct several additional robustness checks, including dropping one country at a time (testing for outliers) and one variable at time; the findings are broadly unchanged. To check for multicollinearity, we regress each predictor on the others and compute the variance inflation factor: all in model (1) are below 6, well below the commonly accepted threshold of 10, suggesting no significant issue of multicollinearity.

Additional variables, such as real effective exchange rate dynamics, are included in unreported specifications but have no statistically significant or economically large effect on estimated structural change dynamics.

6. Discussion and policy implications

Despite its apparent success in liberalising key segments of the economy between 2000 and 2010, with increased openness to trade, foreign investments, and financial flows, Egypt's economic policies over that decade failed to ignite significant structural change. No large-scale reallocation of labour from low- to high-productivity industries occurred, and some low-value-added sectors even expanded at the expense of more efficient ones, slowing aggregate productivity growth. If such a trend continues, Egypt's inability to provide quality jobs to its growing middle class and multitude of new entrants to the labour market every year is likely to endanger socio-political stability and increase the likelihood of reform reversals.

It is therefore essential that Egypt identify reforms to more efficiently allocate the country's major asset: its young and large labour force. These should include sector-level policies to rationalise low-value-added industries and enable the expansion of firms in higher-productivity sectors. In parallel, broader cross-cutting macroeconomic

and business climate reforms are necessary, to further open up some key sectors to domestic and foreign competition and facilitate the efficient allocation of labour.

6.1. Sector-level policies

The share of labour employed in ***agriculture*** failed to decrease significantly over 2000–2010. This is partly due to archaic regulations that led to high land fragmentation, leaving many individual farmers to work on small plots of land, with low productivity by international standards. Land consolidation and modernisation of farming practices would allow farmers to benefit from economies of scale and higher efficiency through improvements in both within-sector and across-sector productivity. Better management of urbanisation to preserve high-quality arable land for agriculture is also important.

In the ***manufacturing*** sector, the removal of distortive energy subsidies, which over-incentivised the use of capital relative to labour, could increase employment. Egypt's recent energy subsidy reforms should help. And more energy-efficient technologies could expand such areas as food processing, biotechnology, and labour-intensive consumer electronics.

The role of ***private services*** must be expanded. Development of the tourism sector in new areas could spur job creation in hotels, transportation, and retail services. Another services sector with expansion potential is ICT.

The expansion of the ***retail trade*** sector has been particularly notable in other dynamic emerging markets, as distribution channels expanded geographically and socially and consumption of tradable goods became more widespread. In Egypt, the development of such retail trade services in remote areas would increase employment opportunities far from the main industrial centres of Cairo and Alexandria.

6.2. Cross-cutting reforms

We can draw several implications for broader economic and business climate reforms from our analysis.

For the development of a healthy private sector, a number of reforms are needed to enhance ***access to finance.*** One critical step is to remedy the public sector's crowding out of private sector lending. In addition, the financial infrastructure must be strengthened to enhance credit information, strengthen creditor rights, improve collateral regimes, and expand asset registries. Macro-prudential policies to reduce credit concentration could boost competition and access to credit. And diversification of the heavily bank-based financial system would help expand the range of financial services, deepen financial intermediation, and promote competition among banks and non-bank financial actors.

Industrial and trade policy can promote allocation of labour towards higher-value-added and more productive sectors, including by reducing non-tariff barriers to trade and removing subsidies and other support of less-efficient industries.

Improvements in the ***business climate*** to help efficiently allocate resources are critical to successful structural change. Egypt is ranked 114th of 190 countries on the 2020 *Doing Business* ranking. The country's insolvency laws and regulations make it costly and time-consuming to close down plants and companies, slowing the movement of workers towards higher-productivity industries. The creation and growth of productive firms can be facilitated by better defining property rights, easing regulations, removing barriers to entry, fostering fair competition, and reducing discretionary enforcement of laws and regulations.

On ***labour markets,*** the ILO (2013) study emphasises the links between unemployment or under-employment and no structural change. Low capital investment is one of the main reasons for the lack of structural reallocation of labour in North Africa compared with Southeast Asia or even sub-Saharan Africa. Investment encourages workers to transfer to higher-productivity industries as wages in these sectors increase; improved infrastructure can also indirectly favour labour reallocation by helping workers physically move to clusters of high-value-added industries. Labour mobility can also be boosted by making it easier to hire and fire workers and by ensuring workers have the skills needed in high-value-added, productive industries (Morsy and Mukasa, 2019).

Addressing Egypt's well-documented skills mismatch and investing effectively in education to better equip graduates to enter the marketplace is a critical policy priority.

References

Abdel-Khalek, G. (2011), 'Growth, Economic Policies and Employment Linkages in Mediterranean countries: The Cases of Egypt, Israel, Morocco and Turkey', ILO Employment Working Paper No. 63, International Labour Organization, Geneva, Switzerland.

Arthur, W.B. (1989), 'Competing Technologies, Increasing Returns, and Lock-in by Historical Events', *Economic Journal*, Vol. 99, No. 394, 116-131.

Barbier, E.B. and Bugas, J.S. (2014), 'Structural Change, Marginal Land and Economic Development in Latin America and the Caribbean', *Latin American Economic Review*, Vol. 23, No. 1, 3.

Bourguignon, F. (2003), 'The Growth Elasticity of Poverty Reduction: Explaining Heterogeneity across Countries and Time Periods', in *Inequality and Growth: Theory and Policy Implications*, T.S. Eicher and S.J. Turnovsky (eds), MIT Press, Cambridge, Massachusetts, USA.

Clark, G. (2005), 'The Condition of the Working Class in England, 1209–2004', *Journal of Political Economy*, Vol. 113, No. 6, 1307-1340.

Cohen, D. and Soto, M. (2007), 'Growth and Human Capital: Good Data, Good Results', *Journal of Economic Growth*, Vol. 12, No. 1, 51-76.

de Vries, G.J. et al. (2012), 'Deconstructing the BRICs: Structural Transformation and Aggregate Productivity Growth', *Journal of Comparative Economics*, Vol. 40, No. 2, 211-227.

Duarte, M. and Restuccia, D. (2010), 'The Role of the Structural Transformation in Aggregate Productivity', *Quarterly Journal of Economics*, Vol. 125, No. 1, 129-173.

Eberhardt, M. and Teal, F. (2013), 'Structural Change and Cross-country Growth Empirics', *World Bank Economic Review*, Vol. 27, No. 2, 229-271.

Edwards, S. (1998), 'Openness, Productivity and Growth: What Do We Really Know?', *Economic Journal*, Vol. 108, No. 447, 383-398.

Fadel, M. (2011), 'Labor and the Future of the Egyptian Revolution', *Foreign Policy*, February 28. Available at: https://foreignpolicy.com/2011/02/28/labor-and-the-future-of-the-egyptian-revolution/

FEMISE (2015), *Structural Transformation and Industrial Policy: A Comparative Analysis of Egypt, Morocco, Tunisia and Turkey and Case Studies*, FEMISE, Marseille, France.

Hassan, M. and Sassanpour, C. (2008), 'Labor Market Pressures in Egypt: Why Is the Unemployment Rate Stubbornly High?', *Journal of Development and Economic Policies*, Vol. 10, No. 2, 79-115.

Hirschman, A.O. (1958), *The Strategy of Economic Development*, Yale University Press, New Haven, Connecticut, USA.

Hosny, A., Kandil, M. and Mohtadi, H. (2013), 'The Egyptian Economy Post-Revolution: Sectoral Diagnosis of Potential Strengths and Binding Constraints,' Economic Research Forum Working Paper No. 767, Giza, Egypt.

Ikram, K. (2019), 'Structural Transformation in Egypt, 1965–2015,' in *The Oxford Handbook*

of Structural Transformation, C. Monga and J.Y. Lin (eds), Oxford University Press, Oxford, UK.

International Labour Organization (2013), *Global Employment Trends 2013: Recovering from a Second Jobs Dip*, International Labour Office-ILO, Geneva, Switzerland.

Lane, P.R. and Milesi-Ferretti, G.M. (2007), 'The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970–2004', *Journal of International Economics*, Vol. 73, No. 2, 223-250.

Lewis, W.A. (1954), 'Economic Development with Unlimited Supplies of Labour', *Manchester School*, Vol. 22, No. 2, 139-191.

Loayza, N.V. and Raddatz, C. (2010), 'The Composition of Growth Matters for Poverty Alleviation', *Journal of Development Economics*, Vol. 93, No. 1, 137-151.

Maddison, A. (2001), *The World Economy*, OECD, Development Centre Studies, Paris, France.

Marouani, M.A. and Mouelhi, R. (2016), 'Contribution of Structural Change to Productivity Growth: Evidence from Tunisia', *Journal of African Economies*, Vol. 25, No. 1, 110-132.

Martins, P.M.G. (2014), *Structural Change in Ethiopia: An Employment Perspective*, World Bank Policy Research Working Paper No. 6749, World Bank, Washington, DC, USA.

Martins, P.M.G. (2019), 'Structural Change: Pace, Patterns and Determinants,' *Review of Development Economics*, Vol. 23, No. 1, 1-32.

McMillan, M., Rodrik, D. and Verduzco-Gallo, Í. (2014), 'Globalization, Structural Change,

and Productivity Growth, with an Update on Africa', *World Development*, Vol. 63, 11-32.

Morsy, H. and Mukasa, A.N. (2019), *Youth Jobs, Skill and Educational Mismatches in Africa*, Working Paper No. 326, African Development Bank, Abidjan, Côte d'Ivoire

Mouelhi, R. and Ghazali, M. (2018), *Structural Transformation in Egypt, Morocco and Tunisia: Patterns, Drivers and Constraints*, Economic Research Forum Working Paper No. 1231, Economic Research Forum, Giza, Egypt.

Page, J. (2012), *Aid, Structural Change and the Private Sector in Africa*, WIDER Working Paper No. 2012/021, United Nations World Institute for Development Economic Research (UNU-WIDER), Helsinki, Finland.

Rodrik, D. (2007), *One Economics, Many Recipes: Globalizations, Institutions and Economic Growth*, Princeton University Press, Princeton, New Jersey, USA.

Roncolato, L. and Kucera, D. (2014), 'Structural Drivers of Productivity and Employment Growth: A Decomposition Analysis for 81 Countries', *Cambridge Journal of Economics*, Vol. 38, No. 2, 399-424.

Timmer, C.P. and Akkus, S. (2008), *The Structural Transformation as a Pathway out of Poverty: Analytics, Empirics and Politics*, Center for Global Development Working Paper No. 150, Center for Global Development, Washington, DC, USA.

Timmer, M., de Vries, G.J. and de Vries, K. (2015), 'Patterns of Structural Change in Developing Countries', in *Routledge Handbook of Industry and Development*, J. Weiss and M. Tribe (eds), Routledge, Abingdon-on-Thames, England, UK.

Uy, T., Yi, K.M. and Zhang, J. (2013), 'Structural Change in an Open Economy', *Journal of Monetary Economics*, Vol. 60, No. 6, 667-682.

UNIDO (2012), *Annual Report 2011*, United Nations Office, Vienna, Austria.

Yassin, S. (2013), *Structural Labor Market Transitions and Wage Dispersion in Egypt and Jordan*, Economic Research Forum Working Paper No. 753, Giza, Egypt.