

Structural change, productivity and skills dynamics in Tunisia and Turkey

Gunes Asik, Mohamed Ali Marouani, Michelle Marshalian, Ulas Karakoc

Tobb Economics and Technology University, Turkey; IRD, Paris 1 Pantheon-University and ERF; Paris 1 Pantheon-University and DIAL; and Humboldt University Berlin

by Mohamed Ali Marouani

**For the WIDER Development Conference, Bangkok, 11-13
September 2019**

Introduction & Motivation

Literature review

Data, Methodology and Empirical Model

Introduction & Motivation

Literature review

Data, Methodology and Empirical Model

Introduction

- In post-independence countries: education as a modernization tool (social welfare and mobility)
- Debate about "Where has all the education gone" in developing countries (Pritchett, 2001)
- Literature on Structural Change and Productivity (McMillan and Rodrik, 2011)
- Interactions between structural change, education upgrading and productivity
 1. **First:** Does the increase of the share of educated labor increase productivity ?
 2. **Second:** Does this result from an uniform increase or of a structural change favorable to intensive sectors in educated labor?

Methodology

- **Empirical Work**
 1. **First:** Decomposition of productivity growth and skill content of labor force in within and between components
 2. **Second:** Econometric analysis of the impact of education upgrade on productivity
- **Countries:** Tunisia and Turkey
- **Database:** sectoral value added, employment and education level in the past five decades + various explanatory variables

Findings

Summary Findings:

- The reallocation of educated labor to more productive sectors contributed to an increase in productivity in Turkey but not in Tunisia.
 1. Turkey had a relatively developed private sector since the 1930s
 2. In Tunisia, education: consolidation of institutions of the newly independent State
 3. Tunisia: Private sector in the 1970s

Structural change increases productivity

- McMillan and Rodrik (2011) & Diao, McMillan and Rodrik (2017): Difference between countries' productivity due to patterns of structural change.
- Caselli and Coleman (2001): regional productivity convergence in the US is attributable to the structural transformation
- Duarte and Restuccia (2010): cross-country productivity gaps reduced in agriculture and industry, but not as much in services
- The skills are more important in "high-skill" industries
 - the interaction between human capital and structural change in high knowledge-intensive industries impacts significantly on economic growth in advanced economies

Introduction & Motivation

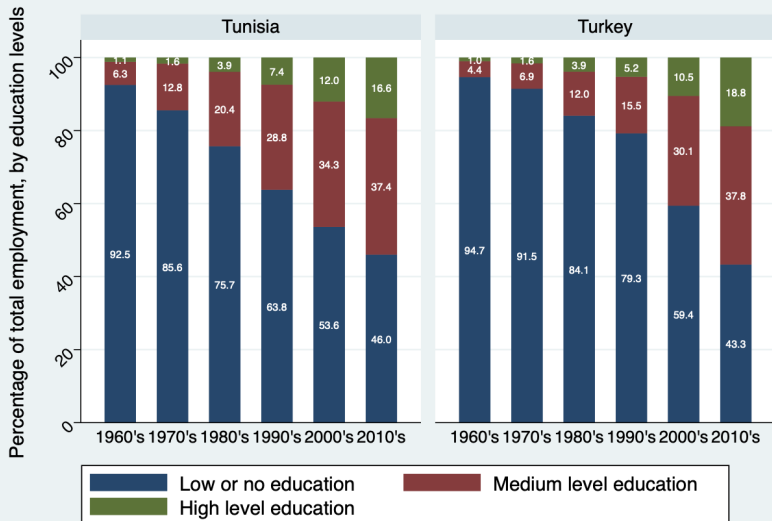
Literature review

Data, Methodology and Empirical Model

Data Sources

- Data sources for Turkey:
 - GDP per sector: Statistical yearbooks by Turkish Statistical Agency
 - Employment by education level and sector: Census data (every 5 years)
- Data sources for Tunisia:
 - Value added per sector: Development Plans and Institute of Statistics for the most recent
 - Employment by education level and sector: Censuses, Labor Force Surveys and ITCEQ
- World Penn Tables for Tunisia and Turkey for additional controls

Employment by Education levels



Tunisia = High: university educated. Medium: high school and secondary school. Low and no: primary, 'khatab' or no education.
 Turkey = High: university educated. Medium: highschool, vocational and secondary. Low and no: primary school and no education.

Methodology

Decomposition Methodology:

- Productivity Decomposition, McMillan and Rodrik (2011)

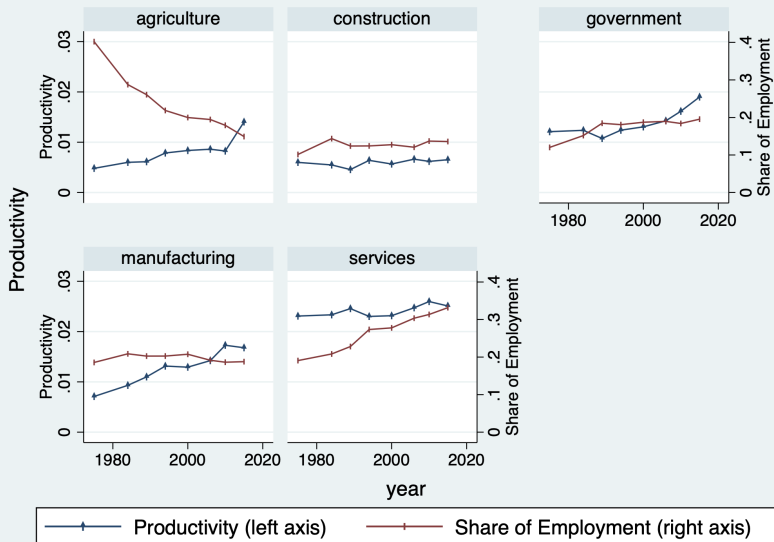
$$\Delta P_t = \sum_{i=1}^n \Theta_{i,t-k} \Delta P_{i,t} + \sum_{i=1}^n P_{i,t} \Delta \Theta_{i,t} \quad (1)$$

- Skill Upgrading Decomposition, Bernard, Bound and Machin (1998)

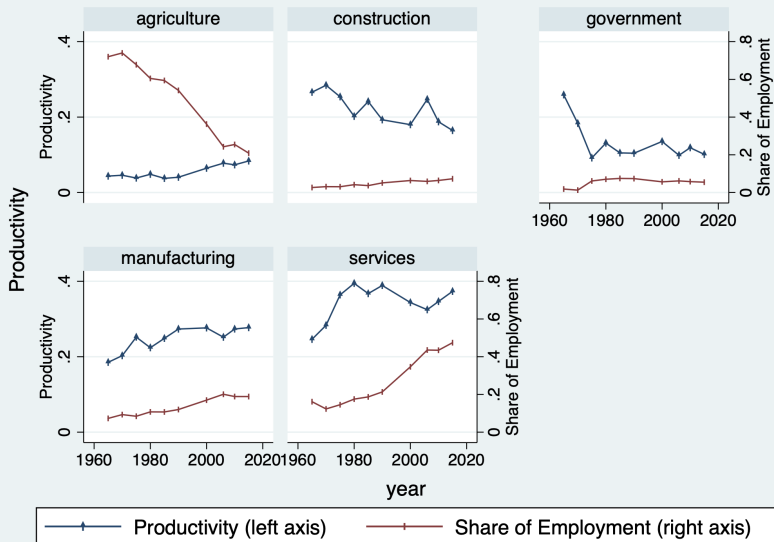
$$\Delta S k_t = \sum_{i=1}^n \Delta s k_{i,t} \Theta_{i,t} + \sum_{i=1}^n \Delta \Theta_{i,t} s k_{i,t} \quad (2)$$

where P_t is aggregate productivity, $P_{i,t}$ is sectoral productivity, $\Theta_{i,t}$ is the share of sector i in total employment, $S k_t$ is the share of highly educated labor in total labor and $s k_{i,t}$ is the share of highly educated labor by sector.

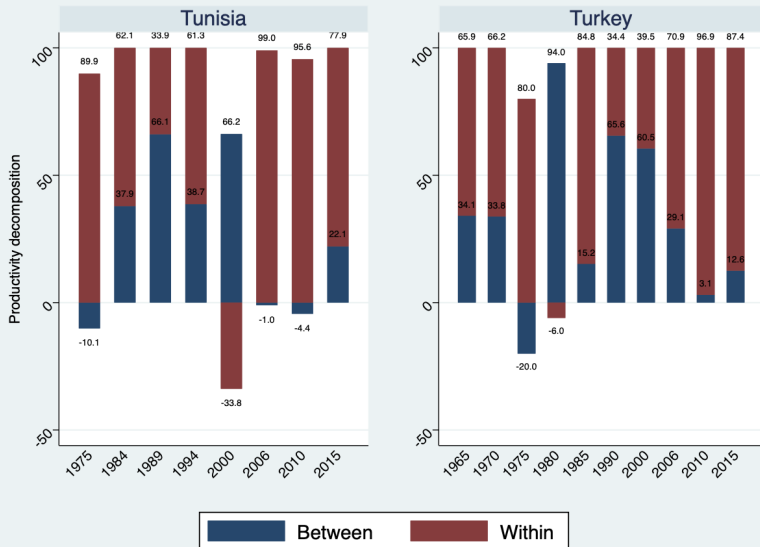
Productivity Growth and changes in employment shares in Tunisia



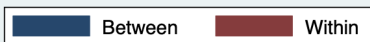
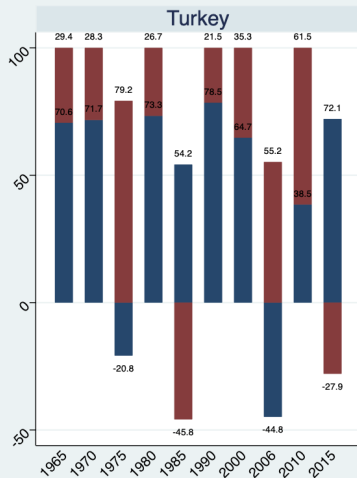
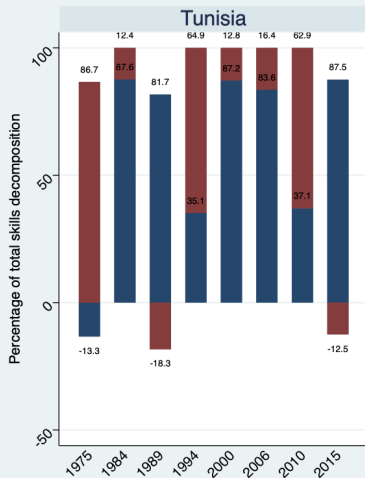
Productivity Growth and changes in employment shares in Turkey



Productivity Decomp à la McMillan and Rodrik (2011)



Skills Decomp à la Bernard, Bound and Machin (1998)



Empirical Approach

Back to Slides

Using OLS and 2SLS, we estimate the following equation for each country:

$$Y_{i,t} = \beta_0 + \beta_1 \Delta Skill_{i,t} + \beta_2 \Delta X_{i,t} + \beta_3 \rho_t + \Delta W_t' \gamma + \lambda_i + \tau_t + \epsilon_{i,t} \quad (3)$$

- $Y_{i,t}$ is the productivity growth in sector i between $t - 1$ and t ;
- $\Delta Skill_{i,t}$ is either *i.*) total skill upgrading, or, *ii.*) between skill upgrading, or *iii.*) within skill upgrading in sector i between $t - 1$ and t ;
- $\Delta X_{i,t}$ denotes the change in relative comparative advantage (RCA) of Turkish or Tunisian exports;
- ρ_t is the average rainfall;
- ΔW_t denotes real capital stock growth (at constant 2011 national prices) and change in human capital index between $t - 1$ and t
- λ_i denotes sector effects and τ_t year effects.

Empirics: The Relationship Between Skill Upgrading and Productivity

- Our starting point is understanding how skill upgrading affects productivity in Turkey and Tunisia.
- Our main variables of interest:
 - **Total skill upgrading:** increase in % of the share of the highest skilled category of labor in total employment,
 - **Skill upgrading within:** increase in % of the share of the highest skilled category of labor in total employment due to the within sector component
 - **Skill upgrading between:** increase in % of the share of the highest skilled category of labor in total employment due to the between sector component
- Skill upgrading between is also known as Skill Biased Structural Change (SBSC)

Empirical Strategy

- Skills and productivity are endogenous and it is notoriously difficult to isolate the independent effects of the two.
- We first document correlations based on OLS estimations and then try to establish causal impact (of skill upgrading) on productivity growth

Instruments

Instruments

1. L5. Share of College Graduates in Total Employment
2. L5. Total, Between or Within Skill Upgrading

Empirical Strategy (Preliminary)

- Control variables (all from World Penn Tables) are:
 - Capital stock at constant 2011 national prices (in logs)
 - Exchange rate, national currency/USD (in logs)
 - Share of merchandise exports at current PPPs
 - Share of merchandise imports at current PPPs
 - Human capital index
 - L5. Capital stock at constant 2011 national prices (in logs)
 - Year effects, sector effects and sector specific linear trends.

2SLS Results for Turkey & Tunisia

	(A) Turkey			(B) Tunisia		
	Total Skill	Between	Within	Total Skill	Between	Within
Skill Upgrading	0.122* [0.074]			-3.731 [23.909]		
Skill Upgrading Between		0.259* [0.144]			-23.826 [55.082]	
Skill Upgrading Within			0.163 [0.169]			58.986 [51.740]
Controls	YES	YES	YES	YES	YES	YES
FIRST STAGE						
Coefficients of Instruments						
L5. Share of College Grad.	-38.420*** [7.606]	-24.410*** [3.760]	-14.145** [6.370]	-0.121** [0.047]	-0.059 [0.044]	-0.080*** [0.026]
L5. Total Skill Upgrading	-0.372 [0.138]			0.009 [0.123]		
L5. Between Skill Upgrading		-0.390*** [0.130]			0.019 [0.150]	
L5. Within Skill Upgrading			-0.342 [0.212]			-0.115 [0.110]
Sanderson-Windmeijer F Statistic	13.04 pval(0.000)	22.92 pval(0.000)	2.74 pval(0.0837)	3.42 pval(0.056)	1.05 pval(0.373)	6.34 pval(0.009)
Hansen J Statistic	0.003 pval(0.955)	0.708 pval(0.400)	0.913 pval(0.339)	5.685 pval(0.017)	3.831 pval(0.050)	3.081 pval(0.079)

(1) Newey West standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

(2) Null hypothesis for S.-Windmeijer weak identification test is that *the particular endogenous regressor in question is unidentified*.

(3) Null for Hansen's J statistic is that the *instruments are uncorrelated with the error term*.

Conclusions

- In Turkey, instrumental analysis suggest that the reallocation of skills between sectors positively impacted productivity.
- No similar effect in Tunisia (weak instrument).

Future Work

- Micro-level analysis focusing on Tunisia or Turkey separately.