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PRODUCTIVITY, STRUCTURAL CHANGE AND SKILLS DYNAMICS IN TUNISIA AND TURKEY

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Abstract

This article explores the contribution of the structural change and the skill upgrading of the labor force to productivity growth in Tunisia and Turkey in the post-WorldWar II period. Our growth decomposition shows that productivity growth is explained by intra-industry changes for both countries during the import substitution period. Structural change played an important role in Turkey for a longer period of time than in Tunisia. Based on a regression analysis, we find evidence that skill upgrading had a causal impact on productivity growth in Turkey, as productivity has mainly been driven by the increasing share of highly educated workers within sectors rather than the reallocation of skilled labor between sectors. In addition, skill upgrading has been as important as physical capital accumulation. On the other hand, OLS and IV evidence do not support similar mechanisms for Tunisia.

Keywords: Productivity, Skills, Structural change, Tunisia, Turkey, MENA

JEL Classifications: J24, L16, 047, 053, 055, 057, N15, N17

ملخص

تستكشف هذه المقالة مساهمة التغيير الهيكلي ومهارة رفع مستوى القوى العاملة في نمو الإنتاجية في تونس وتركيا في فترة ما بعد مؤتمر الحرب العالمية الثانية. يوضح تحليلنا للنمو أن نمو الإنتاجية يمكن إرجاعه إلى التغيرات في الصناعة في كلا البلدين خلال فترة إحلال الواردات. لعب التغيير الهيكلي دورا هاما في تركيا لفترة أطول من الوقت مقارنة بتونس. وبناءً على تحليل الانحدار ، نجد دليلاً على أن الارتقاء بالمهارات كان له أثر سببي على نمو الإنتاجية في تركيا ، حيث أن الإنتاجية كانت مدفوعة بشكل أساسي بالحصة المتزايدة للعاملين المتعلمين تعليماً عالياً في القطاعات المختلفة بدلاً من إعادة توزيع العمالة الماهرة بين القطاعات. بالإضافة إلى ذلك ، حظى تحديث المهارات بنفس أهمية تراكم رأس المال المادي. ومن ناحية أخرى ، لا تدعم أدلة من ناحية أخرى ، لا تدعم المربعات الصغرى العادية وأدلة المتغيرات الآلية آليات مشابهة لتونس.

1 Introduction

In most developing countries, educational attainment has increased spectacularly in the recent decades. Education had been often reserved to foreigners and the elite until the first half of the twentieth century. When it became widely accepted as a vector for modernization. In his seminal contribution ”Where has all the education gone?”, Pritchett (2001), nevertheless shows that education does not always foster growth. The low quality of education has received a lot of attention as a possible reason, but the role of stagnation demand for skills is yet to be understood. Indeed, the high unemployment rate of the well-educated youth and its role in the mismatch between skills supplied and demanded in the labor market is a fact that becoming one of the most serious concerns in development debates in recent years.

The weak absorption of college graduate job seekers is a particularly acute problem for the MENA region. For instance, there is evidence that the frustration of thousands of unemployed educated youth was a motive in the beginning of the Tunisian uprisings in 2011 (Gatti et al. 2013, Rijkers et al. 2014, Angel-Urdinola et al. 2015). The main argument for the weak demand of educated labor suggested by labor economists is typically the existence of skill mismatch. This explanation is however insufficient to explain the large gap between unemployment rates of graduates in the MENA and other regions. There are also arguments along the line of the insufficient sectoral specialization in labor-abundant countries in the MENA, referring to low level of structural change, particularly, from basic manufacturing to high valued added industries and services. But, why did such economies fail to take sectoral specialization further? We believe that the weakness of skilled biased technological change may provide an alternative or complementary explanation to the low absorption of educated labor. This connection calls for analyzing the links between skills upgrading, structural change and productivity growth.

This article thus first explores the contribution of structural change to productivity growth and the skill upgrading of the labor force by looking into the post-World War II data in Tunisia and Turkey, following McMillan and Rodrik (2011). We decompose the overall productivity into within and between components to see if labor productivity resulted from workers moving out of lower productivity sectors like agriculture to higher productivity sectors like manufacturing or, if productivity increased mainly because of changes within each sector. Using the same method citepberman1998, we likewise decompose the overall contributions to skills upgrading to movement of high skilled workers between sectors and increased concentration of high-skilled employment within sectors. Because of the endogenous nature of the relationship between skills and productivity growth, our most convincing methodology relies on instrumental variables.

We find that the skill upgrading has a causal impact on productivity growth in Turkey and its main driver is the skill upgrading within sectors and not the reallocation of skilled labor between sectors. More specifically we show that a percentage point increase in total skill upgrading increases sectoral productivity growth by 0.6-0.7 percentage points whereas a percentage point increase in the share of highest skill category within a sector increases productivity growth by the order of 1-2 percentage points. Our results suggest that skill upgrading is as important as physical capital accumulation in Turkey. On the other hand, we do not find a similar effect for Tunisia. In fact, there does not seem to be a statistically meaningful association between skill upgrading and productivity growth in Tunisia. However, skills reallocation between sectors, has been a larger contributer to productivity growth in Tunisia than up-skilling within sectors.

2 Historical background

2.1 Turkey

Turkey's macro policies since 1960 can simply be considered in two rather distinct periods: Import substitution before 1980 and the comprehensive liberalization after. Evidently, labor continued to shift from agriculture to industry and services while the human capital composition changed between and within sectors over the course of policy shifts.[1]

Turkey was a part of the global trend of booming economies after the end of World War II: GDP per capita consistently grew and manufacturing growth was even more impressive. The import substitution period had already started in the 1930s via protectionism, so that by the 1950s most of the textiles and processed food consumption was met by the domestic production. During the 1960-1970s, the second phase of the import substitution industrialization (ISI) was achieved, as consumer durables came also to be produced domestically. The basic logic of the ISI prevailed: Domestic market remained highly protected (via tariff and non-tariff barriers), currency was overvalued, and wages were high. In this relatively closed and command-led market, state enterprises invested in intermediate goods, while private enterprises focused on the consumer good markets.[2] Coincidentally, the 1960s was also the time when land-labor ratio stopped to increase in agriculture, i.e. land frontier was no more open. That is, increasing per capita agricultural output required technical change, the scale of which eventually remained limited. This resulted in mass scale rural-urban migration.

A sharp policy reversal took place in 1980 at the height of the political turmoil and the crisis of the ISI. The policy focus shifted towards market liberalization, reduction of state intervention and export promotion. The 1980 *coup d'etat* simply made such a reorientation politically viable. The swing was severe, requiring a comprehensive readjustment of prices and wages. The 1980s would be the decade of dwindling real wages; the prices significantly moved in favor of manufacturing and the agricultural subsidies were reduced. The combined result was the reinforced the rural-urban migration. Opening up of the economy also led to the increasing importance of foreign trade. The share of export and imports remarkably increased. In this period, the symbiotic relationship between the large scale public enterprises and private sector also changed structurally. Small and medium scale manufacturing enterprises revived in the Anatolian cities, which had not been industrial centers previously, thus changing notably the spatial distribution of industry.[3].

Market liberalization and decline of the role of state continued after the turn of century under AKP rule with further privatization under the guidance of the IMF and World Bank. What characterized the AKP period was the expansion of the share of services and construction at

[1] See Karakoç et al. (2017) for a brief evaluation of industrialization over whole 20th century. Chapters 11 and 12 of Hansen (1991) provides a detailed evaluation of import substitution and liberalization after 1980.

[2] The interaction between public and private sectors was, to a significant extent, organized by the State Planning Organization.

[3] Filiztekin and Tunalı (1999) shows that the so-called "Anatolian tigers" heavily depended on low wages to be able to compete domestically and globally

the expense of agriculture and industry, the rapid rise in domestic demand largely financed by external finance. Yet, external deficit (both in trade and balance of payments) remained large, resulting in long-term vulnerability.

Since the 1960s, the large sectoral shifts in employment coincided with significant improvement in skills acquisition. The average literacy rate was 38 percent in 1960 and steadily increased up to 95 percent in 2013 (TIUK, 2014). Crucially, the literacy rate was twice as much for male as for female in 1960, yet the gap narrowed to negligible levels over time. As for quality of education, while the student/teacher ratio in primary schools was 46 percent in 1960, it came down to 20 percent in 2013, indicating the change in school quality.[4] Gross enrollment ratio in primary and secondary education increased from about 60 percent to 90 percent between 1960-2013, however the rise in tertiary education gross enrollment rate increased from 5 to 95 percent over the same period. Therefore, it can be argued that what characterized the average education status over the long run has been steady increase in primary school enrollment and much faster participation to secondary and tertiary schools, whereas the college enrollment picked up only after 1990s. Not least, it should also be noted that the increase in the enrollment in technical schools (at tertiary level) has been less pronounced than that in tertiary school enrollment. Note that the most important reform affecting enrollment was that the compulsory education was increased from 5 to 8 years in 1997. However, despite all this improvement, education system has failed to produce a workforce with skills necessary for a diversified and technologically advanced industrial sector, which still produces standard goods without technical sophistication.

There exist several attempts to measure the contribution of TFP to growth in Turkey. Altug et al. (2008) finds that TFP contribution to growth remained at between 3-18 percent between 1950-1979, under different growth accounting specifications, and strikingly TFP growth was even negative in the agricultural sector. In contrast, its contribution increased up to around 30 percent between 1980-2005, most of which came from non-agricultural sector. They also decompose labor productivity into within and between-sectors components, finding that the sectoral shift component of labor productivity decreased over time (from 55 to 3 percent). Overall, it seems that during the transition from low-to-high productivity path, the importance of sectoral shifts decline, as the non-agricultural sectors dominate the overall picture with high within productivity. Filiztekin (2000) furthermore finds that the improvement in the manufacturing productivity explains half of the value added growth. The nexus is particularly relevant for the sectors with higher trade exposure, as he documents that trade share within manufacturing Granger-causes productivity growth.

2.2 Tunisia

Like Turkey and many other developing countries, Tunisia also experienced a period of import substitution industrialization, and later a vague of liberalization reforms in the post-1980 period. However, by many aspects the Tunisian experience is different from the Turkish one.

After independence in 1956 the pre-existing government was preoccupied to transfer the administration to Tunisians and to create sovereign institutions such as a central bank and a national currency. In 1962 Tunisia adopted a socialist agenda and in 1964 decided to seize

[4]However, the student/teacher ratio did not change much in high schools. Also the doubling of the ratio for college level indicates the huge increase in college enrollment particularly after the 1990s.

the 450,000 hectors of land of French settlers. At the same time, the government also collectivized the land of small-holders. This policy ended in 1969 after its failure to deliver significant improvements, coupled with internal opposition of large landowners and the refusal of international donors such as the World Bank, to continue financing the government.

Shortly thereafter, the new Government was keener to liberalize the economy. Notably, it adopted the "*Loi 1972*" which offered, and still continues to offer, incentives for exporting firms and marked a turning point in Tunisia's economic policies. However, the deep economic crisis of the 1980s left Tunisia with a severe balance of payments in 1986. Under the Washington Consensus and Bretton Woods, Tunisia adopted a structural adjustment plan whose main purpose was to ensure macroeconomic stability. The plan required a strong devaluation of the local currency and tight monetary and fiscal policies Naccache (2009), as well as increased trade integration and the gradual removal of price controls. At this time, Tunisia also entered into several foreign agreements including GATT (1989), the WTO (1994) and the free-trade agreement with the European Union (1995).

Nevertheless, trade liberalization was not rampant in the mid to late 1990s. This was primarily because of preoccupations with social stability and protecting Tunisian firms from international competitors. Tunisia undertook labor reforms with the goal of increasing labor market flexibility while maintaining some form of protection to workers. The main reforms of the labor code took place in 1994 and 1996, but had a limited impact according to Angel-Urdinola et al. (2015). A competition law and a new investment code were established respectively in 1991 and 1993. Although several reforms took place with the aim of accelerating growth in jobs and productivity, a tradition of command-led economy, the practice of cronyism, corruption, and rent extraction continued to led to unequal access to business opportunities and limited competition (Rijkers et al., 2017).

The educational attainment for Tunisians was relatively high as compared to regional peers. While today, the literacy rate in Tunisia is 79 percent for adults and 97 percent for youth aged between 15 and 24 in 2014, in the 70s and 80s this was around 48 and 74 percent, respectively. Compared to other North African and Middle Eastern countries, except for Jordan, this was relatively high.[5] In 1991, mandatory schooling was extended from 6 to 9 years in 1991, increasing average schooling years for most students. In 1984, the literacy rate for the working-age population was 37, and increased to 81 in 2014.

In addition, the quality of schooling, particularly for younger students improved substantially over the past few decades. According to UNESCO data, student-teacher-ratios for pre-primary schools dropped by half from the 80's where the rate was around 30 school students per teacher, to 15.8 students per teacher in 2016. The trend for primary, secondary, and tertiary schools was similar. In primary school the ratios dropped from 47.5 in the beginning of the 1970s to 16.2 in 2016; in secondary school the ratios dropped from 27.8 in 1971 to 13.6 in 2011; in tertiary school the ratios dropped from 17.6 in 1972 to 15.9 in 2012. Although the effects on society are not easily measurable, the economic effects are yet to be materialized. Contrarily to countries like Malaysia which were able to absorb quickly the massive increase of educated workers produced by the public education system (Marouani and Mouelhi, 2015), in Tunisia

[5] According to statistics from UNESCO, accessible here : http://data.uis.unesco.org/

the increase in education was accompanied by a massive unemployment of young graduates (30 percent on average and 40 percent for women)[6].

Productivity growth in Tunisia has more than doubled in the post-1995 period (Marouani and Mouelhi, 2015)[7]. This suggests that the reforms implemented may have had a positive effect on productivity. However, the impact was concentrated on the within sector component of productivity. Structural change was very low in the period before 1995 and nil since, while we would have expected trade liberalization and labor market reforms to enhance the inter-sectoral movement of resources. This observation based on sectoral data analysis is confirmed by the regressions of structural change on policy reform variables and by the analysis based on firm data from the manufacturing sector.

Regulatory, unofficial barriers to entry in some sectors and bad governance seems to be the main reasons behind the low structural change in Tunisia. The inefficiency of capital and labor markets also contributes to slowing the inter-sectoral reallocation of resources. The dominance of a traditional specialization pattern and the absence of incentives to diversify to higher productivity activities also explain the small magnitude of factor reallocation. Even foreign direct investment did not have an important impact on the structural transformation of the economy.

3 Literature review

The augmented version of the Solow model developed by Mankiw et al. (1992) is often the framework to analyze the interactions between education and growth. An alternative to this macroeconomic approach is the literature that focuses on sectoral and firm-level heterogeneity. The first strand of the literature takes a sectoral approach (Caselli and Coleman II 2001, McMillan and Rodrik 2011, McMillan et al. 2014, Diao et al. 2017), while the second is largely prevalent in the industrial organization literature on firm level productivity (Baily et al. 1992, Hopenhayn 1992, Griliches and Regev 1995, Olley and Pakes 1996, Melitz 2003, Levinsohn and Petrin 2003, Ackerberg et al. 2006). Our article contributes to the literature focusing on the impact of the sectoral composition on aggregate productivity, thus we limit our attention to mainly structural change aspects in this review.

How has structural change evolved over the past 50 to 60 years? The literature suggests a wide range of growth rates of total factor productivity across sectors, with the only commonality being the gradual gain in aggregate productivity due to the reallocation of labor out of agriculture and into other sectors. However, agricultural work is also a prime component of rural and unskilled employment, making rural-urban inequalities and skilled-unskilled work a prime component of the productivity estimate. It is, however, difficult to untangle the direction of causality because of the latent endogeneity of key variables. While Bárány and Siegel (2018) empirically link structural change to increased job polarization and wage differentials, Ngai and Pissarides (2007) argue that different rates of productivity explain sectoral employment changes.

The largest trend in structural change has been the reallocation out of the agricultural sector

[6]Data extracted from INS website, available here: http://www.ins.tn/fr
[7]This is in comparison to the 1983-1995 period.

into more productive sectors. In the US, Caselli and Coleman II (2001) find that agricultural employment explains a large part of the different regional productivity rates. They observe a regional convergence of productivity between sectors, where the major shift out of agricultural employment is driven, in a large part, by the South. The authors witnessed similar trends in the Midwest and Northeast, but did not obverse the same trends in the West. On a cross-country level, Duarte and Restuccia (2010) similarly find that there are large differences between countries in agricultural productivity. Their study investigates the link between sectoral labor productivity and structural change. They find that the catch-up is higher in manufacturing than in others. For the latter, the catch-up is the lowest, likely due to higher barriers for trade in services. This hypothesis is confirmed for the Middle-East and North Africa region by Bottini et al. (2011) who find a negative impact of service trade barriers on firms' productivity.

The reallocation of resources, educational advancement and the convergence to the production possibility frontier varies by region. McMillan and Rodrik (2011) and Diao et al. (2017) find that the reallocation of resources across sectors varied by global regions, but that Asian countries caught-up faster over the long run while growth enhancing structural changes did not necessarily lead to the same impacts in Africa. The literature finds a positive correlation between productivity and human capital growth, in particular for advanced economies and that the within-industry gaps in educational attainment are broadly consistent across countries (Hendricks, 2010), however little has been done on finding how skills converge as countries reach their production possibilities frontier.

Drivers of regional and country variation of structural change and productivity are many-faceted. McMillan and Rodrik (2011) attempt to understand why Asian countries observed continuous productivity increasing structural change while most African and Latin American countries have not. In a cross-country regression with 38 countries, they found a negative impact of the share of primary products in exports, a positive impact of the initial share of agricultural employment (proxy for countryside labor surplus), a positive impact of the undervaluation of the currency (competitive exchange rates) and a negative impact of labor rigidity. All other variables such as income levels, demographic indicators, institutional quality, and tariff levels were non-significant.

Between sector changes are still an important contribution to productivity growth for many countries. In a cross-country regression, Herrendorf and Valentinyi (2012) find that there is a larger gap between developing countries and the US in food, equipment and construction sectors. In particular, changes in the agricultural sector are still prominent determinants for many LDCs. In a follow-up to their previous paper, McMillan et al. (2014) find that structural change contributed positively to growth in Africa since 2000 primarily due to increasing agricultural productivity and rising food and commodity prices. Diao et al. (2017) find that growth enhancing structural change has also been accompanied by decreasing productivity in modern sectors in Africa. They argue that this is because structural change has been demand driven through external transfers and higher agricultural incomes. On the other hand, in Latin America labor recent growth accelerations were due to more within-sector increases in labor productivity.

Within sector changes are also an important predictor of productivity growth. In a cross-country analysis, Teixeira and Queirós (2016) found that human capital and product specialization are important determinants of economic growth. As countries move into more specialized goods and into more knowledge-intensive industries, the role of human capital becomes more prevalent. However, the interaction between human capital and structural change depends on the level of development of the country. Highly-developed (OECD) countries have a positive correlations between human capital and structural change over the longer period (1960-2011) while Mediterranean countries over the shorter term (1990-2011) perceive a positive correlation but the effect of human capital via specialization in high tech and knowledge intensive activities is negative. Their analysis suggests that pure resource reallocation to knowledge intensive industries does not increase growth for all countries. Buera et al. (2015) likewise find a correlation between demand for high-skilled labor and a compositional shift of value-added to sectors that are intensive in high-skilled labor.

There is no clear pattern on the relative contributions of structural change and skill-biased technological change to total productivity in most countries. In a case study in Germany, Schimmelpfennig (1998) shows that the contribution of structural change is higher than found by previous studies which overstate the role of skill-biased technological change, while for Swiecki (2017), this explains 43 percent of labor reallocation for the median country. Furthermore, for small countries, the added role of international trade in accounting for labor reallocation is non-negligible.

Advances in labor force skills and technology improve the growth perspective for the economy, but the academic literature finds that it also may drive further inequalities. Changes in the wages of high-skilled workers in comparison to low-skilled worker is primarily driven by skill-biased technological change (Acemoglu and Restrepo, 2018). Job polarization can be a result of changes in composition of job tasks, and therefore wages, within industries (Autor et al., 2003). At the same time, changes in consumer preferences can also reallocate skilled labor into different industries (David and Dorn 2013). Bárány and Siegel (2018) show that polarization, in terms of employment and average wage growth, started in the 1950s in the US and that structural change from manufacturing to services is the main cause.

4 Data and methodology

The decomposition analysis requires data on value-added by country and sector. Critically, to understand skills contributions, we also need to gather data on employment both by country, sector and by education level. There are several international databases with information on value-added per sector. Many contemporaries use data from the Groningen database for internationally comparable value-added data. Studies focusing on employment by sector can use sources such as the UNIDO data on employment by sector. However, matching between the two sources for employment by sector and education for both our countries was not possible. Instead, in a Herculean effort, we returned to original data sources to extract data, reclassify and harmonize between the two countries. The end result is a 5-sector database that includes information on value-added by sector, and employment by education and sector.

For Turkey, the data on the educational status of employees for each sector is obtained from Turkish population censuses.[8] GDP per sector was used to proxy for value-added data and

[8] Data is reported in census results for every five years from 1960 to 1990 and 2000. The years 2010 and 2015 can be found in the employment statistics in the database Turkish Statistical Agency.

were gathered from official statistical yearbooks provided by the Turkish Statistical Agency (Turkstat). The national sources for the Tunisia data have been gathered through two main national surveys. The value-added per sector data was obtained through annual statistical books from the Development Plans and Institute of Statistics. Data on employment by education level and sector was gathered from periodic censuses and labor force surveys. Both value-added and employment by education statistics were cross-checked with the data from the Tunisian Institute for Competitiveness and Quantitative Studies (*Institut Tunisien de la Competitivité et des Études Quantitatives (ITCEQ)*.[9] Data on trade flows were gathered from CEPII-CHELEM database that includes several world trade statistics and calculated indicators (CEPII and de Saint Vaulry, 2008).[10] Further data used for macroeconomic controls were gathered from the World Penn Tables database (Feenstra et al., 2015) and the World Bank's Climate Change Knowledge Portal.

4.1 Decomposition analysis

We followed the decomposition methodology employed by McMillan and Rodrik (2011) and Berman et al. (1998) to understand the respective contributions of within sector and structural change components to the overall productivity and skills upgrading in each sector and on the aggregate level. The two decompositions follow the same logic and are as follows:

- 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, Berman et al. (1998)

$$\Delta Sk_t = \sum_{i=1}^{n} \Delta sk_{i,t} \Theta_{i,t} + \sum_{i=1}^{n} \Delta \Theta_{i,t} sk_{i,t} \quad (2)$$

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

The workforce in Tunisia and Turkey showed improvements in levels of education from the 1960s to the 2010s (see Figure 1). Tunisia started the 1960s with a higher percentage of secondary degree educated workforce and relatively less percentage of individuals with no, primary or only *khitab* (or religious schooling) education than Turkey. However, in the 2010s the profile of the workforce in Turkey matched that of Tunisia, suggesting a rapid catch up in the skills base of the workforce.

[9] We are indebted to Monji Ben Chaabene for having shared his work with us.

[10] CEPII-CHELEM uses data from UNCOMTRADE. The advantage of using CEPII-CHELEM over UNCOMTRADE is that CEPII applies a harmonization strategy to improve the quality and representativeness of the data and creates useful indicators.

Productivity Decomposition The trends in the evolution of productivity for Tunisia and Turkey however demonstrated stark differences (see Figure 2). For Tunisia, overall productivity growth after independence was relatively large at 3.7% but stabilized between 1.5% and 2%. The within component explained most growth from the 1960's to 2015, except from the time between 1984 and 1989[11] where the between component explained more of productivity. The trend for Turkey is almost completely inversed. While the within component explained much of the change from the 1960s to 1975, reallocation of resources explained the lion's share of productivity from 1975 to 2006. It was only until the period of 2000 to 2006 that the within component became a dominant factor of productivity growth. In addition, while overall growth in productivity doubled from 1975 to 2006, it sharply dropped thereafter. In the years capturing productivity trends between 1975 and 2000, the between component explained over half of productivity growth, but from 2000 onwards, much of productivity was explained by the within component.

There has been quite a bit of volatility in the composition of productivity over the past 50 years in Tunisia. The results of the percentage shares of the productivity decomposition in Figure 3 (Panel Tunisia) show us that from the 60s to the 70s the total productivity primarily composed of a large change of within sector productivity, and a negative contribution from the reallocation across sectors. The relationship changed completely in the 80s when Tunisia's productivity became largely determined by reallocation of across industries. The first period saw the end of restrictive regulations on ownership and investment, and the beginning of windfall tax incentives for foreign investors in the investment law of 1972 (*la Loi 1972*), bringing Tunisian industry towards a more export-oriented activities in the decades to follow. The next few decades corresponds to the structural adjustment period which cut agricultural subsidies and led to a switch from import-substitution to export-orientation. The relationship changed again in the 2000s onwards where we observe the resurgence of productivity within sectors as the main (and almost the sole) driver of productivity growth.

In Turkey, the story is a bit more marked (Figure 3, Panel Turkey). Like Tunisia, the productivity in Turkey in the 1960's was dominated by the within component and in the next few decades, from the 1970s to 2000s, productivity was dominated by reallocation between sectors. This occurred at the same time of the periods of ISI and the initial phase of the opening up to global markets. From the 2000s onward, productivity within sectors gained ground. The timing of this change coincides with a reversal of political openness to global markets, a reduction of state interventionism and export promotion. It also coincides with the changes in educational reforms.

In Tunisia and Turkey, the between and within trends in productivity vary by sector (Figures 4 and 5). In Tunisia's agriculture and to some extent in manufacturing, most of the productivity is driven by within changes, while in services, productivity growth is equally about reallocation of labor. Productivity in Tunisia's agricultural sector is dominated by within changes for most of the periods in the last 50 years, while the other industries do not demonstrate any notable patterns except for in services where changes in the levels of employment are slightly more important for explaining productivity. In Turkey, the sector with the largest change in its contribution to productivity is also the agricultural sector that is heavily dominated by within

[11] This span refers to the point at year 1989.

changes. Like in Tunisia, the Turkish service sector, is growing slowly in productivity and is mostly dominated by the between component.

On sectoral level we observe common trends in the shares of employment in the agricultural sector and services, but different changes in other sectors. Apart from the 90s, in Tunisia, we observe mostly stable levels of productivity per sector but steady changes in the share of employment across most sectors (Figure 6). As expected, the employment share in agriculture dropped substantially, while the share of employment in services increased. While we observe some increase in the share of employment in government, the share of employment in construction remained minimal, and the share of employment in manufacturing stayed more or less constant over time. In Turkey the trends were similar, with a sharp drop in the share of employment in agriculture over the 50 years period and a large increase in the share of employment in the services sector (Figure 7). Unlike Tunisia, in Turkey while the share of employment in the construction sector remained close to 0, employment in government also remained stagnant and manufacturing steadily rose. This suggests that while in Tunisia, the low productivity government sector employment may have expanded, in Turkey this is was not the case.

Skills Decomposition The evolution for skills decomposition for Tunisia is more or less continuously positive over the entire period (Figure 8), with only marginally negative contributions came from changes within sectors. In Tunisia, skill upgrading (or the change in the overall share of high skilled employment) from the 1960s to the 2015 was primarily due to the reallocation of skills to different sectors. Once we approach the 90's onward, skills-upgrading starts becoming due, to a larger part, to each sector containing higher skilled workers. The swelling of high-skills within sectors do not coincide with an economy shifting towards more productive activities (c.f. Figure 3), set the background for the 2011 Jasmine revolution, and provided fuel for frustration among unemployed, high-skilled youth. At the same time, jobs for high-skilled workers in the government services and public sector, with low to no tangible productivity, was the strongest growing sector of employment at that time.

In Turkey, the skills composition of employment was more volatile than in Tunisia. In first the period of ISI and a more command-led economy, substantial growth of educated labor force working within sectors drove overall skills-upgrading, while moving high-skilled workers between sectors actually negatively contributed to overall skills-upgrading. In the following periods until 1990, skills-upgrading within sectors had an overall negative contribution to overall skills upgrading. Like Tunisia, the between component of skills upgrading, capturing the increase of employment in sectors requiring high skilled workers sharply dominated from the 1970s onwards. The remarkable negative contribution of the within component of skills upgrading from the 70's up until the 90's, suggests a loss of relative education levels of workers within sectors. This may have been a result of the gradual opening of the economy to global economy, at the same time as the sharp improvement of the mandatory years of education.

5 Modeling productivity growth: regression analysis

This section aims to document the relevance of skill-biased structural change on sectoral productivity growth in Turkey and Tunisia. As documented in the previous sections, reforms and modernization since the 1960s resulted in rapid structural change and productivity growth in both countries. Moreover, as in many other parts of the world, average years of schooling and as well as the share of university graduates in total labor force increased significantly in both countries, and yet the contribution of skills upgrading to productivity is largely overlooked in the literature. We aim to fill this gap by quantifying the impact of skill upgrading on productivity in this comparative case study.

Our main aim in this section is to estimate the contribution of each of the following measures of skill upgrading to productivity growth:

- **Total skill upgrading:** increase in the share of the highest skilled category of labor in total employment,
- **Skill upgrading within sectors:** increase in the share of the highest skilled category of labor in total employment due to the within sector component,
- **Skill upgrading between sectors:** increase in the share of the highest skilled category of labor in total employment due to the between sector component. This is also known as Skill Biased Structural Change (SBSC).

Estimating the causal impact of skill upgrading on productivity growth is admittedly a very difficult task given limited data availability and the endogenous nature of relationship between productivity and skills. In our attempt to establish a sound empirical link between the two, we face the following challenges. First, structural change is a long run phenomena whereas the data on sectoral employment by education starts only from 1965 for Turkey and 1967 for Tunisia. Education data is based on censuses for Turkey and it is available for every 5 years with the exception of 1995. In order to maximize the number of observations, we rely on decompositions at the sectoral level rather than using economy wide productivity growth. The sectors that are commonly defined in the official statistics of both countries are agriculture, manufacturing, construction, services and public administration. This leaves us a total of 50 observations by five sectors on skill upgrading for Turkey for the years: 1965, 1970, 1975, 1980, 1985, 1990, 2000, 2006, 2010 and 2015. The data for Tunisia is more abundant and yet more irregular spanning the years: 1967, 1975, 1984, 1989, 1994, 1997, annually between 2000 and 2007, and again for all years between 2010 and 2015, all of which provide 95 observations. Since years in which data is available for both countries do not perfectly overlap (especially for the period before 2000) we prefer to run separate regressions for both countries to maximize the observations per country.[12] We acknowledge, however, that the small sample size is an important problem which may cast doubt on our estimations. Hence our results should be interpreted with caution.

The second challenge is that skills and productivity are highly endogenous and it is notoriously difficult to isolate the independent effects of the two. Our main variables of interest are the total skill upgrading, skill upgrading within sectors and skill upgrading between sectors and we use each of them one at a time. Given the nature of endogenous relationship between skills and productivity growth, it is ideal to use Arellano-Bond type system GMM estimators. However, there are reasons why that is not possible in the case of Turkey. First, we have only 50 observations for a total 5 sectors in Turkey, which can lead to problems of over-fitting and instrument proliferation taking into account the fact that the time dimension is larger than the cross section, i.e. $T = 10$ versus $N = 5$. Pooling the Turkish and Tunisian data does not solve the

[12]More specifically, pooling the data results in a total of 70 observations of country-year pairs, 35 for each.

problem as in that case we would need to drop the sectors and use the overall decomposition results for the two countries as there would be repeated values in the panel.[13] And doing that would reduce the sample size even further without providing any added benefit for a sounder estimation strategy. Instead, our empirical strategy relies on first documenting the correlations based on OLS estimations and then with the available data at hand, trying to investigate whether skill upgrading has a causal impact on productivity growth using three different sets of instrumental variables for Turkey. For Tunisia, we follow the same procedure and yet also include GMM estimators by means of increasing sectoral breakdown to sectors to cross-check the validity of OLS and IV estimations as there are more observations for Tunisia.

Our first set of instruments is the lagged values of skill upgrading for each of the three measures that we defined above plus the lagged values of share of university graduates in each sector as a percent of the total economy wide employment. Since the data is available for every five years for Turkey, the instruments that we use are the fifth lags. For Tunisia, since the data is irregular, we use the first lagged value available if there are more than 1 years apart between two observations (such as using skill upgrading between 1967-1975 for predicting skill upgrading between 1975-1984) and lag $n-5$ when observations allow (such as using skill upgrading from 2005 to 2010 to predict upgrading from 2010-2015). Our identifying assumption is that the lagged values of skill upgrading and the sectoral share of university graduates in economy-wide employment affect productivity only through their impact on current skill upgrading and there is no direct association between current productivity growth and the lagged values of our instruments. Although our instruments pass commonly used identification tests in most specifications, these are admittedly strong assumptions which may in fact not hold. Hence we relax these assumptions one by one and try other instruments as explained below.

In our second set of specifications we replace the lagged values of skill upgrading with an indicator that proxies the technology intensity of European Union exports to the rest of the world. The instrument that we use to predict skill upgrading comes from the CEPII-CHELEM database and it measures the degree to which the goods are processed by sectors. This variables captures the competitiveness of European goods in international markets by weighing the value of net trade flows from European countries to the rest of the world with the value of all trade. They refer to this indicator as the revealed comparative advantage (RCA). [14] Using 2010 as the base year, our indicator is estimated through the following method:

$$RCA_{i,k} = 1000 * \frac{W_k}{YPPA_i}\left[\frac{X_{i,k} - M_{i,k}}{W_k} - \frac{X_i - M_i}{W}\right] \tag{3}$$

where W represents world exports; $YPPA$ is GDP measured in thousands; X represents exports; and M represents imports for each good k and country i. The indicator is later classified into categories of goods that correspond to their place in global value chains as determined by CEPII. The data is grouped in 6 different levels of goods including primary, basic manufacturing, intermediary goods, equipment, mixed products and consumption goods. To give a more concrete example of how this works, a car is classified as a final consumption good, but the parts that make up the car, such as the wheels are classified as intermediate manufacturing

[13]More specifically, pooling the data means year-sector pairs would not be unique any more as there are two pairs for each year and sector when Turkey and Tunisia are combined.

[14]We use the second version of this indicator. The advantage of using the second version over the first is because the later version is weighed by total world exports (rather than just all other exports), measured in current USD PPPs and includes trade in services.

goods, and the rubber (from the rubber tree) that makes the wheels as a primary good. Further description of the type of goods in each category is available in Table 1.

This classification can be viewed as an approximation for the technological content of the goods. If we consider technology from a more historical view, the development of rubber into a wheel is the next step on the value chain and technologically more advanced than the extraction of the rubber from the tree itself. However, we acknowledge that this classification does not capture advances in the quality of the final goods. For example, cobalt, a mineral extracted from the ground, is classified as a primary good. The use of cobalt to produce batteries involves intermediate manufacturing processes, but with a few screws, metals and glass, the batteries become a part of a final good, a cell phone. While one can argue that there is technological advancement that is captured by the use of raw material for a final product, this does not capture the difference between a basic (yet sturdy) Nokia phone and an i-phone type smart phone.

In using this measure, we rely on the assumptions that *i*) both Turkey and Tunisia are small, price-taker countries whose supply of goods do not significantly impact world demand, or significantly pose any dumping or anti-competitive risks, and *ii*) that world trends are exogenously determined outside of Turkish and Tunisian internal industrial and educational trends. We then make the critical identifying assumption that an increase in the technology intensity of European exports to the rest of the world has a direct impact on skills demand and incentives for skill upgrading in Turkey and in Tunisia but otherwise have no direct impact on the sectoral productivity. In other words, we assume that sophistication of EU exports to the rest of the world affects sectoral productivity in our countries only by changing the incentives to whether or not to employ high skilled labor in Turkey and Tunisia due to export competition. This might be a strong assumption to make, however, as explained above we argue that Turkey and Tunisia are small open economies for which the technology intensity of EU exports to the rest of the world should be exogenous and it should have an impact on productivity in our countries only by realigning the sectoral allocation of skilled labor.[15]

We are aware that there may also be an impact of increasing technological intensity of European goods on the demand for more technologically advanced equipment and processes, that may then directly impact productivity, but given that the indicator is calculated in relative terms, technological catch up should theoretically remain the same for global economies keeping the place of Tunisia and Turkey in terms of the race to the technological frontier stable. Secondly, for countries not on the limits of the technological frontier, we do not expect increasing technology in other countries to improve the rate of innovation in our countries.[16] Lastly, while some displacement of workers may occur due to improved technology in the product and process cycles resulting from increased competitiveness of goods, it is hard to argue that for small countries, not on the production possibilities frontier, that the net and strongest impact of technological content of goods is not on the increase of the demand for skills.

Relying on these assumptions, we construct our instrument as follows: we create a new variable where we assign CHELEM's *i*) technology intensity of EU agricultural exports for predicting skill upgrading in agricultural sector in Turkey and Tunisia, *ii*) technology intensity of EU intermediary goods exports for predicting skill upgrading in manufacturing sector in Turkey

[15] As will be explained below our instrument passes the basic identification tests, at least for Turkey.
[16] This can be checked with additional robustness tests on patenting in Tunisian and Turkish economics.

and Tunisia, *iii*) technology intensity of EU equipment exports for predicting skill upgrading in construction sector in Turkey and Tunisia, *iv*) technology intensity of EU consumption goods exports for predicting skill upgrading in services sector in Turkey and Tunisia, and finally we assign 0 in predicting skill upgrading in for government services in Turkey and Tunisia.

In the third and last set of instruments, we drop the sectoral share of university graduates in total employment all together and use CHELEM's technology intensity of EU exports to the rest of the world, its square and the interaction of the intensity measure with old age dependency ratio (elder individuals as a % of working age population) for Turkey and Tunisia. Old age dependency captures the empirical regularity of quantity-quality trade off in fertility decisions which should directly affect the incentives for skill upgrading. However old age dependency ratio does not vary by sectors. Hence by creating the interaction term, we hope to capture how the change in demographics in Turkey and Tunisia interplay with technological sophistication of rival exports for different sectors.[17]

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

$$\Delta y_{i,t} = \beta_0 + \beta_1 \Delta Skill_{i,t} + \beta_2 \Delta X_{i,t} + \beta_3 \rho_t + \Delta W_t' \gamma + \lambda_i + \tau_t + \epsilon_{i,t} \quad (4)$$

where $\Delta y_{i,t}$ 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 which we extract from CEPII and de Saint Vaulry (2008) database. We are able to match CHELEM's relative comparative advantage data with agriculture, manufacturing and services properly, however since there is no comparable RCA for construction and public administration sectors, we assign zero for the two sectors. In OLS specifications, we also control for EU comparative advantage using the same methodology, but not in 2SLS. ρ_t is the average rainfall provided by the World Bank's Climate Change Knowledge Portal.[18] ΔW_t denotes real capital stock growth (at constant 2011 national prices) and change in human capital index between $t-1$ and t, both of which we take from the Penn dataset.[19] And finally λ_i denotes sector effects and τ_t year effects.

We start with baseline OLS estimations for Turkey and Tunisia in Tables 2 and 3. Columns (1), (4) and (7) shows the raw correlations between productivity growth and *i*) total skill upgrading, *ii*) skill upgrading between sectors, and *iii*) skill upgrading within sectors when only the year effects, sector effects and sector specific linear trends are controlled. The estimations show that there is a positive and statistically significant association between total skill upgrading and productivity growth for Turkey but not for Tunisia. The magnitude is in the order of 0.6 percentage points increase in productivity growth for a 1 percentage point increase in skill upgrading. When we look at the association between productivity and skill upgrading between sectors and within sectors separately, we see that skill upgrading between sectors, i.e. skilled

[17]The rationale for including the square of technology intensity of EU exports is twofold; first we contemplate that sophistication of rival exports might have second order effects on skill upgrading in countries in question. And second, Dieterle and Snell (2016) suggest that using only linear first stages may miss important information about effect heterogeneity and instrument validity and recommend including a quadratic in the instrument in the first stage.

[18]Since Turkish data is available for every 5 years, we take 5 years average of the rainfall data for Turkey, however since the data is irregular, we use the annual rainfall data for Tunisia.

[19]We acknowledge that physical and human capital stocks are also endogeneous, however primary goal of our paper is to estimate the causal effect of skill upgrading on productivity growth rather than the causal impact of other important determinants of productivity.

biased structural change is not statistically associated with productivity growth whereas skill upgrading within sectors is highly statistically significant with a coefficient of 0.9 percentage point for Turkey.

In columns (2), (5) and (8), we include rainfall, real capital and human capital stock growth and in columns (3), (6) and (9) we include the change in the relative comparative advantage of national exports and EU exports as two additional controls. Our estimations show that even with additional controls, skill upgrading within sectors is very strongly associated with productivity growth for Turkey whereas the association of any definition of skill upgrading with productivity is null for Tunisia. In terms of magnitude, both columns (8) and (9) show that a percentage point increase in skill upgrading within sectors is on average associated with 1.1 percentage point increase in productivity growth for Turkey. As before, there is no statistically significant association between productivity growth and skill biased structural change for Turkey or Tunisia. Interestingly, average rainfall negatively affects productivity growth in Turkey whereas it has a positive impact in Tunisia with absolute magnitudes almost identical for both countries. This could be due to the fact that agriculture is still a prominent sector in Tunisia for which there could be a boost in productivity after heavier rainfall, lifting the overall productivity whereas it is the opposite in Turkey. Our results also show capital accumulation is positively and significantly associated with productivity growth for Turkey, with a coefficient of about 1.4-1.6 percentage points increase in productivity for a 1 percentage point increase in the real capital stock. In our baseline OLS estimations, neither the increase in human capital stock, nor the EU comparative advantage for EU exports measures are significantly correlated with productivity growth whereas the relative comparative advantage measure for Tunisia is statistically significant although the magnitude of the coefficient is negligible.

Next, we decompose skill upgrading into periods for both countries to be able to discuss the association between productivity and skill upgrading in relation to economic policies. Tables 4 and 5 summarizes the findings for Turkey and Tunisia. Our dependent variable is again the sectoral productivity growth but this time we interact our skill upgrading measures with time dummies, also controlling for rainfall, physical and human capital accumulation, year and sector effects.

Our estimations show that the periods 1965-1970, and 2000-2006 were those of strong association between skill upgrading and productivity for Turkey. During 1965-1970 there was an import substitution regime which led to rapid industrialization and significant productivity growth, which all coincided with rapid increase in school enrollments. The 2000-2006 period marks another important turning point in the history of Turkish political economy due to several reasons. First, this period captures the effect of Compulsory Education Law of 1997 which led to an increase in minimum years of schooling from 5 years to 8 years. Second, it is the period under which Turkey implemented a series of key structural reforms thanks to the 2001 Crisis and the consequent IMF Stand-by Arrangement. And third, it marks the first term of the AK Party government. The productivity growth in the first term of AK Government is in line with the findings of Hall and Nishikawa (2014) who suggest that the ruling party growth performance has an inverted U-shape, as the previous economic downturn is followed by the strong ruling party facing small number of veto players and being able to implement its economic program, all resulting in fast growth in the initial phases of its tenure. As 2 and 4 show the period from 2000-2006 was the period where productivity growth was highest since

1970s and the only period where the skill upgrading between sectors and within sectors were positively associated with productivity growth. Moreover, the magnitude and the significance of the coefficients show that the real driver of productivity growth was skill biased structural change which strongly suggests that the structural reforms, privatization and the reduction in agricultural subsidies under the IMF program led to the reallocation of skilled labor across sectors. On the other hand, the period from 1975 to 1980 is the only period where the skill upgrading was negatively and statistically significantly associated with productivity growth. This is plausible taking into account the fact that Turkey was going through times of political and economic turbulence at the time that ended with the *coup d'etat* of 1980 and the opening of the economy.

As for Tunisia, the relationship between skill upgrading and productivity growth was positive and significant in periods 1975 to 1984 and 1984 to 1989, but not in any of the recent periods. Periods from 1994 to 1997 and between 2010 and 2015 seem to be particularly poor in terms of negative contribution of skills upgrading to productivity. The first period corresponds to the opening of the economy after the collectivization experience of the 1960s. The second period corresponds to the implementation of the stabilization policies under the structural adjustment program. It is puzzling why the link between productivity and skills was more significant during this period than afterwards. More investigations are needed. For the 2010-2015 period, the explanation lies probably in the high increase of hiring in the public administration, which do not have a direct impact on productivity. The political uncertainty and social conflicts may complete the explanation. The weaker link between the share of educated workers in the labor force and productivity in Tunisia is not surprising. In 2015, the share of university educated working for the Government is around 16% in Turkey and more than 50% in Tunisia.

So far, our estimations aimed to document the basic correlations between measures of skill upgrading and productivity without attributing any causal interpretation. In what follows below, we rely on 2SLS estimations which we hope will allow to document the causal effect of skill upgrading on productivity growth. Tables 6 and 7 show the results of our first set of 2SLS estimations where we use the lagged values of skill upgrading and the share of university graduates in economy wide employment as instruments. The findings are similar to those of OLS, both in terms of statistical significance and signs. More specifically, our results confirm that total skill upgrading and productivity growth are positively related and statistically significant for Turkey but there is no meaningful association for Tunisia. Moreover, as before, our results suggest that the impact on average comes from skill upgrading within sectors for Turkey rather than the movement of skilled labor across sectors.

First stage results indicate that our instruments perform fairly well for Turkey but weakly for Tunisia. In all specifications in Tables 6 and 7, Hansen's J Statistics show that the instruments are uncorrelated with the error term and satisfy the over-identification requirements. F statistics for the first stage for Turkey are above 10 with the exception of skill upgrading within sectors. Moreover, first stage coefficients of instruments for Turkey are highly significant with the exception of fifth lag of skill upgrading within sectors in column (3). The negative coefficients for the two instruments reflect base effects, as larger changes in the past period on average leads to lower growth in the current period. Overall, based on the instrument validity tests in the first stage, we can at least confidently argue that for the period between 1970-2015, the effect of skill biased structural change on productivity growth was on average null for Turkey. As for

Tunisia, although the instruments perform relatively poorly and it is harder to argue based on poor instruments, there is no convincing evidence of impact of skill upgrading on productivity growth whatsoever.

In our second set of estimations, we employ the technology intensity of EU exports to the rest of the world as an instrument along with the lagged share of college graduates. Results in Tables 8 and 9 show that total skill upgrading increases productivity growth in Turkey (but not in Tunisia), however it is again the skill upgrading within sectors that affects productivity and not the movement of skilled labor across sectors. A percentage point increase in skill upgrading within a sector on average increases sectoral productivity by 1 percentage points whereas a percentage point increase in total skill upgrading increases productivity in a sector by around 0.6 percentage points. First stage results at the lower panel of Tables 8 and 9 show that the coefficients of technology intensity of EU exports are positive and highly significant in predicting total skill upgrading and skill upgrading within sectors for Turkey but it is insignificant for Tunisia. All of the first stage estimations passes the over-identification tests for both Tunisia and Turkey and Sanderson Windmeijer F statistics suggests that we reject the null hypothesis that our skill upgrading measures are unidentified (except for skill upgrading within sectors for Tunisia, Column (3) of Table 9). Overall, our second set of estimations confirm the earlier findings that skill upgrading within sectors positively affected sectoral productivity growth in Turkey, but the reallocation of skilled labor across sectors did not have any impact. As for Tunisia, the impact of skill upgrading on productivity growth is again, null.

In our final set of estimations, we employ the technology intensity of EU exports to the world, its square and its interaction with national countries' old age dependency ratio as instruments to predict skill upgrading for Turkey and Tunisia. Although these instruments perform relatively weaker compared to the first two sets of estimations, they do a better job in predicting skill upgrading within sectors for Turkey. Column (3) of Table 10 suggests that all the coefficients of instruments are highly significant, the instruments pass the Hansen's over-identification test and we can comfortably reject the Sanderson Windmeijer weak identification test for which the null hypothesis is that the endogenous regressors in question is unidentified. Technology intensity of EU exports has a positive coefficient suggesting that within skill upgrading in Turkey increases with the improvement in the sophistication of EU goods. The coefficient of the squared IV is also statistically significant, providing evidence of a nonlinear first stage. The interaction between the technology intensity of EU exports and old age dependency ratio of Turkey is negative, suggesting that the positive effects of technology spillovers are dampened with aging population per working age population. A recent study by Acemoglu and Restrepo (2018) show that aging leads to greater industrial automation, and in particular, to more intensive use and development of robots. The study also provides evidence of more rapid development of automation technologies in countries undergoing greater demographic change. The study shows that given its pace of aging population, Turkey had an above average imports of industrial robots between 1996 and 2015 when compared with other OECD countries (page 39, Figure 8). Hence the negative coefficient of the interaction term might be capturing, *ceteris paribus*, the impact of relatively fast robotization of the manufacturing and the rise of services sector in light of aging population on disincentivizing skill upgrading in Turkey. In other words, as the services sector and the care economy mostly requires middle skills, and as the share of labor in manufacturing sector declines, aging population might limit the incentives for skill upgrading on average across sectors, holding all else constant.

If we are willing to accept the validity of the instruments and first stage results, second stage estimations in Tables 10 and 11 once again suggest that total skill upgrading and skill upgrading within sectors positively affect productivity growth for Turkey but there is no evidence of impact of skill upgrading on productivity growth in Tunisia. The magnitudes of the coefficients are in the same range as in OLS and previous 2SLS estimations.

Overall, both the OLS and the 2SLS estimations point to the same empirical finding that for the period between 1970-2015; *i*) skill upgrading has been an important determinant of productivity growth for Turkey, but not for Tunisia, *ii*) Skill upgrading within sectors was the main driver in Turkey and it was as important as physical capital, and *iii*) there is no evidence that skill biased structural change had any impact on productivity growth neither in Turkey, nor in Tunisia.

6 Conclusion

This article aimed at understanding the links between skill demand and productivity growth using a structural change perspective. We relied on decomposition techniques and regressions using Tunisian and Turkish postwar sectoral data.

The decomposition results showed that productivity growth is explained by within component changes in the first period in both countries, but that structural change also played a big role during the last 40 years in Turkey and in the 70s and 80s in Tunisia. In terms of skills changes, we show that there has been an increase in the share of skilled labor due to the within component in Turkey, but it follows with a higher role of structural change in Turkey and Tunisia.

Our regression results show that skill upgrading has a causal impact on productivity growth in Turkey. The main driver of productivity is the increase of the share of highly educated workers within sectors and not the reallocation of skilled labor between sectors. Our results suggest that skill upgrading is as important as physical capital accumulation for Turkey. We do not find a similar effect for Tunisia.

The policy implications of the outcomes are important. In Tunisia, a weak instruments may be limiting further causal inferences, however descriptively, reallocation of skilled labor and reallocation of resources (structural change) do not seem to have a strong measurable impact on productivity, while it is evident that there is a growth of skills within sectors. This suggests that there is a need for jobs that can accommodate and efficiently gain the benefits of higher skilled workers. In Turkey, the measurable impact of up-skilling suggests that human capital has improved productivity, but more can be improved by encouraging growth in more productive sectors, or by placing more emphasis on within sector productivity growth such as through technological adaption in low productivity industries.

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Table 1: Classification of goods in value chains from CEPII-CHELEM

Level in Supply Chain	Types of Goods
Primary Goods	Agricultural,products; all types of extractive resources (minerals; carbon, gas and, petrol, etc)
Basic Manufacturing	Cement, ceramics, and glass; Iron and metal; Basic and organic chemicals
Intermediate Goods	Transformed iron,goods; Textiles; Wood work and paper; Metal work, wood work, motors, electronic work, car parts; Fertilizer, paint, plastics and rubber articles
Equipment	Agricultural, material, machines, building material, telecommunication material, transport equipment, etc.
Mixed Goods	Leather; Furniture; Printed goods; Plastic articles; Refined petroleum and electricity; Meat,fish and edible greasy substances
Consumption Goods	Clothing, garments,and carpets; Manufactured articles (like toys, etc); Watches, clockwork, cameras and optical and electronic equipment for public consumption; Household appliances, cars and automobiles; Sanitary and pharmaceutical, goods; Cereal-based products, animal products, vegetable products, drinks and, tobacco.

Figure 1: Composition of education

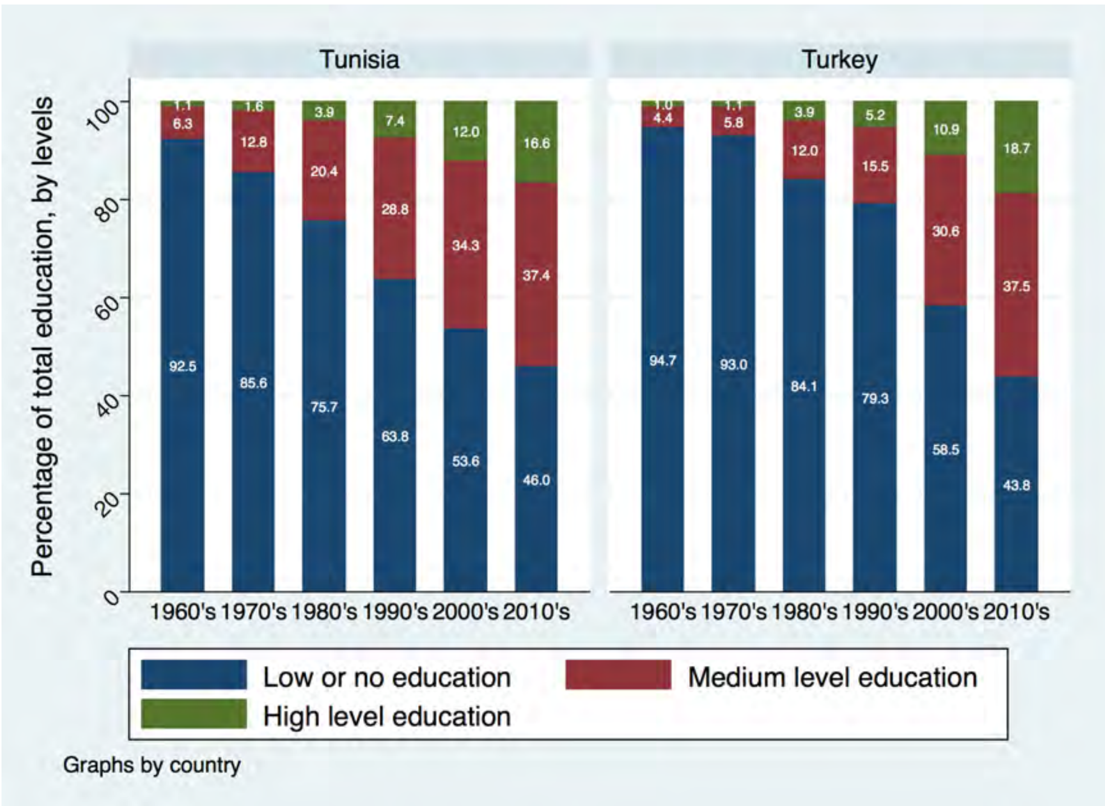


Table 2: OLS Estimations for Sectoral Productivity Growth, Turkey

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Skill Upgrading	0.006**	0.007*	0.007*						
	(0.003)	(0.004)	(0.004)						
Skill Upgrading Between				0.007	0.006	0.006			
				(0.006)	(0.006)	(0.007)			
Skill Upgrading Within							0.009***	0.011**	0.011**
							(0.003)	(0.004)	(0.005)
Average rainfall (mm)		-0.002***	-0.002**		-0.002**	-0.002*		-0.003**	-0.003**
		(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)
Capital stock growth (2011 national prices, in logs)		0.146***	0.146***		0.151***	0.147***		0.159***	0.163***
		(0.036)	(0.044)		(0.035)	(0.043)		(0.041)	(0.051)
Human capital stock (% change)		0.018	0.024		0.012	0.017		0.027	0.035
		(0.027)	(0.030)		(0.032)	(0.034)		(0.027)	(0.030)
Comparative advantage of EU exports (% change)			-0.000			-0.001			-0.000
			(0.001)			(0.001)			(0.001)
Comparative advantage of TR exports (% change)			-0.000			-0.000			-0.000
			(0.000)			(0.000)			(0.000)
Observations	50	45	45	50	45	45	50	45	45
R-squared	0.678	0.679	0.689	0.639	0.629	0.641	0.684	0.694	0.706
Year Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Sector Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Sector Specific Linear Trends	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 3: OLS Estimations for Sectoral Productivity Growth, Tunisia

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Skill Upgrading	0.006	0.006	0.007						
	(0.006)	(0.006)	(0.007)						
Skill Upgrading Between				0.006	0.006	0.011			
				(0.009)	(0.009)	(0.010)			
Skill Upgrading Within							0.011	0.011	0.010
							(0.013)	(0.013)	(0.013)
Rainfall (mm)		0.002***	0.002***		0.002***	0.002***		0.002***	0.002***
		(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
Capital stock growth (2011 national prices, in logs)		-0.011	0.000		-0.012	0.003		-0.016	-0.007
		(0.016)	(0.018)		(0.018)	(0.019)		(0.013)	(0.017)
Human capital stock (% change)		-0.080	-0.083		-0.079	-0.078		-0.088	-0.093
		(0.078)	(0.083)		(0.079)	(0.083)		(0.079)	(0.083)
Comparative advantage of EU exports (% change)			-0.001			-0.001			-0.001
			(0.001)			(0.001)			(0.001)
Comparative advantage of TN exports (% change)			0.000***			0.000***			0.000***
			(0.000)			(0.000)			(0.000)
Observations	95	95	95	95	95	95	95	95	95
R-squared	0.277	0.277	0.352	0.273	0.273	0.352	0.277	0.277	0.344
Year Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Sector Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Sector Specific Linear Trends	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 4: Estimations by Periods: Sectoral Productivity Growth, Turkey

	(1) OLS		(2) OLS		(3) OLS
Skill Upgrading 1970	0.012*	Between Upgrading 1970	-0.023	Within Upgrading 1970	0.015**
	(0.006)		(0.023)		(0.006)
Skill Upgrading 1975	0.009	Between Upgrading 1975	0.069	Within Upgrading 1975	0.006
	(0.013)		(0.049)		(0.012)
Skill Upgrading 1980	-0.034**	Between Upgrading 1980	0.009	Within Upgrading 1980	-0.113**
	(0.014)		(0.029)		(0.047)
Skill Upgrading 1985	0.010	Between Upgrading 1985	0.082	Within Upgrading 1985	0.026
	(0.027)		(0.075)		(0.027)
Skill Upgrading 1990	-0.010	Between Upgrading 1990	0.018	Within Upgrading 1990	-0.019
	(0.009)		(0.021)		(0.025)
Skill Upgrading 2000	-0.003	Between Upgrading 2000	0.002	Within Upgrading 2000	-0.025
	(0.007)		(0.007)		(0.055)
Skill Upgrading 2006	0.013***	Between Upgrading 2006	0.017***	Within Upgrading 2006	0.060*
	(0.004)		(0.004)		(0.034)
Skill Upgrading 2010	-0.007	Between Upgrading 2010	-0.031	Within Upgrading 2010	-0.014
	(0.028)		(0.054)		(0.039)
Skill Upgrading 2015	0.004	Between Upgrading 2015	-0.002	Within Upgrading 2015	0.008
	(0.006)		(0.005)		(0.026)
Average rainfall (mm)	-0.002**	Average rainfall (mm)	-0.002**	Average rainfall (mm)	-0.002**
	(0.001)		(0.001)		(0.001)
Real capital stock growth	0.129***	Real capital stock growth	0.119***	Real capital stock growth	0.142***
	(0.042)		(0.038)		(0.044)
Human capital growth	0.020	Human capital growth	0.031	Human capital growth	0.029
	(0.030)		(0.028)		(0.026)
Observations	45	Observations	45	Observations	45
R-squared	0.820	R-squared	0.754	R-squared	0.837
Year Effects	YES	Year Effects	YES	Year Effects	YES
Sector Effects	YES	Sector Effects	YES	Sector Effects	YES
Linear Trends	YES	Linear Trends	YES	Linear Trends	YES

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 5: Estimations by Periods: Sectoral Productivity Growth, Tunisia

	(1) OLS		(2) OLS		(3) OLS
Skill Upgrading 1975	-0.004	Between Upgrading 1975	-0.012	Within Upgrading 1975	0.041
	(0.009)		(0.016)		(0.036)
Skill Upgrading 1984	0.084*	Between Upgrading 1984	0.094*	Within Upgrading 1984	0.088
	(0.046)		(0.054)		(0.081)
Skill Upgrading 1989	0.079**	Between Upgrading 1989	0.036	Within Upgrading 1989	0.136
	(0.033)		(0.038)		(0.103)
Skill Upgrading 1994	0.005	Between Upgrading 1994	0.012	Within Upgrading 1994	0.010
	(0.012)		(0.023)		(0.021)
Skill Upgrading 1997	-0.049**	Between Upgrading 1997	-0.101	Within Upgrading 1997	0.003
	(0.022)		(0.072)		(0.058)
Skill Upgrading 2000	0.004	Between Upgrading 2000	0.011	Within Upgrading 2000	0.007
	(0.012)		(0.023)		(0.022)
Skill Upgrading 2005	-0.022	Between Upgrading 2005	-0.081***	Within Upgrading 2005	-0.015
	(0.018)		(0.024)		(0.028)
Skill Upgrading 2010	0.007	Between Upgrading 2010	0.030	Within Upgrading 2010	-0.001
	(0.015)		(0.026)		(0.027)
Skill Upgrading 2015	-0.039**	Between Upgrading 2015	-0.073**	Within Upgrading 2015	-0.083**
	(0.018)		(0.033)		(0.037)
Rainfall (mm)	0.002***	Rainfall (mm)	0.002***	Rainfall (mm)	0.002***
	(0.000)		(0.000)		(0.000)
Real capital stock growth	-0.032	Real capital stock growth	-0.044*	Real capital stock growth	0.012
	(0.023)		(0.026)		(0.031)
Human capital growth	-0.057	Human capital growth	-0.046	Human capital growth	-0.091
	(0.076)		(0.076)		(0.074)
Observations	95	Observations	95	Observations	95
R-squared	0.356	R-squared	0.362	R-squared	0.317
Year Effects	YES	Year Effects	YES	Year Effects	YES
Sector Effects	YES	Sector Effects	YES	Sector Effects	YES
Linear Trends	YES	Linear Trends	YES	Linear Trends	YES

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 6: 2SLS Estimations of Sectoral Productivity Growth-1, Turkey

	2SLS Instrumented: Total Skill Upgrading	2SLS Instrumented: Between Upgrading	2SLS Instrumented: Within Upgrading
Skill Upgrading	0.007*		
	(0.004)		
Skill Upgrading Between		0.005	
		(0.005)	
Skill Upgrading Within			0.021**
			(0.009)
Average rainfall (mm)	-0.002***	-0.002***	-0.003***
	(0.001)	(0.001)	(0.001)
Capital stock growth (2011 national prices, in logs)	0.153***	0.162***	0.162***
	(0.029)	(0.031)	(0.033)
Human capital stock (% change)	0.024	0.019	0.046*
	(0.023)	(0.026)	(0.026)
Comp. advantage of TR exports (% change)	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Observations	45	45	45
R-squared	0.685	0.633	0.640
Year and Sector Effects	YES	YES	YES
Sector Specific Linear Trends	YES	YES	YES
FIRST STAGE AND IDENTIFICATION			
Coefficients of Instruments			
L5. Share of College Graduates in Tot. Emp.	-38.420***	-24.406***	-14.145**
	(7.606)	(3.756)	(6.370)
L5. Total Skill Upgrading	-0.372**		
	(0.138)		
L5. Between Skill Upgrading		-0.390***	
		(0.130)	
L5. Within Skill Upgrading			-0.342
			(0.212)
Sanderson-Windmeijer F Statistic	13.04	22.918	2.744
	pval (0.000)	pval (0.000)	pval (0.084)
Hansen J Statistic	0.563	0.946	1.401
	pval (0.453)	pval (0.331)	pval (0.237)

(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*.

Table 7: 2SLS Estimations of Sectoral Productivity Growth-1, Tunisia

	2SLS Instrumented: Total Skill Upgrading	2SLS Instrumented: Between Upgrading	2SLS Instrumented: Within Upgrading
Skill Upgrading	0.003		
	(0.013)		
Skill Upgrading Between		0.005	
		(0.016)	
Skill Upgrading Within			0.063
			(0.087)
Rainfall (mm)	0.002***	0.002***	0.002
	(0.000)	(0.000)	(0.001)
Capital stock growth (2011 national prices, in logs)	-0.001	-0.002	0.005
	(0.016)	(0.017)	(0.015)
Human capital stock (% change)	-0.093	-0.091	-0.091
	(0.075)	(0.079)	(0.105)
Comp. advantage of TN exports (% change)	0.000**	0.000**	0.000*
	(0.000)	(0.000)	(0.000)
Observations	90	90	90
R-squared	0.354	0.351	0.121
Year and Sector Effects	YES	YES	YES
Sector Specific Linear Trends	YES	YES	YES
FIRST STAGE AND IDENTIFICATION			
Coefficients of Instruments			
Lagged Share of College Graduates in Tot. Emp.	-11.345***	-9.412***	-1.799
	(3.317)	(2.013)	(2.050)
Lagged Total Skill Upgrading	-0.342		
	(0.125)		
Lagged Between Skill Upgrading		0.039	
		(0.101)	
Lagged Within Skill Upgrading			-0.323
			(0.166)
Sanderson-Windmeijer F Statistic	6.276	11.840	0.506
	pval (0.003)	pval (0.000)	pval (0.605)
Hansen J Statistic	1.775	1.232	0.545
	pval (0.183)	pval (0.267)	pval (0.460)

(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*.

Table 8: 2SLS Estimations of Sectoral Productivity Growth-2, Turkey

	2SLS Instrumented: Total Skill Upgrading	2SLS Instrumented: Between Upgrading	2SLS Instrumented: Within Upgrading
Skill Upgrading	0.006**		
	(0.003)		
Skill Upgrading Between		0.010	
		(0.007)	
Skill Upgrading Within			0.010**
			(0.005)
Average rainfall (mm)	-0.002***	-0.002***	-0.003***
	(0.001)	(0.001)	(0.001)
Capital stock growth (2011 national prices, in logs)	0.155***	0.148***	0.168***
	(0.030)	(0.030)	(0.034)
Human capital stock (% change)	0.024	0.014	0.034
	(0.023)	(0.027)	(0.022)
Comp. advantage of TR exports (% change)	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Observations	45	45	45
R-squared	0.684	0.629	0.703
Year and Sector Effects	YES	YES	YES
Sector Specific Linear Trends	YES	YES	YES
FIRST STAGE AND IDENTIFICATION			
Coefficients of Instruments			
Technology Intensity of EU Exports to World	0.115***	0.023	0.092***
	(0.032)	(0.014)	(0.031)
L5. Share of College Graduates in Tot. Emp.	-43.642***	-23.666***	-19.976***
	(7.642)	(5.099)	(6.792)
Sanderson-Windmeijer F Statistic	16.57	11.031	5.045
	pval (0.000)	pval (0.000)	pval (0.007)
Hansen J Statistic	0.226	0.959	0.022
	pval (0.627)	pval (0.328)	pval (0.881)

(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*.

Table 9: 2SLS Estimations of Sectoral Productivity Growth-2, Tunisia

	2SLS Instrumented: Total Skill Upgrading	2SLS Instrumented: Between Upgrading	2SLS Instrumented: Within Upgrading
Skill Upgrading	0.005		
	(0.013)		
Skill Upgrading Between		0.006	
		(0.016)	
Skill Upgrading Within			0.019
			(0.075)
Average rainfall (mm)	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)
Capital stock growth (2011 national prices, in logs)	-0.002	-0.003	0.001
	(0.016)	(0.017)	(0.014)
Human capital stock (% change)	-0.089	-0.087	-0.098
	(0.075)	(0.079)	(0.065)
Comp. advantage of TR exports (% change)	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)
Observations	90	90	90
R-squared	0.354	0.351	0.349
Year and Sector Effects	YES	YES	YES
Sector Specific Linear Trends	YES	YES	YES
FIRST STAGE AND IDENTIFICATION			
Coefficients of Instruments			
Technology Intensity of EU Exports to World	0.003	0.002	0.012
	(0.0145)	(0.009)	(0.007)
Lagged Share of College Graduates in Tot. Emp.	-10.984***	-9.152***	-1.832
	(3.208)	(1.966)	(1.977)
Sanderson-Windmeijer F Statistic	6.470	12.294	0.463
	pval (0.003)	pval (0.000)	pval (0.632)
Hansen J Statistic	0.534	0.527	0.560
	pval (0.465)	pval (0.468)	pval (0.454)

(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*.

Table 10: 2SLS Estimations of Sectoral Productivity Growth-3, Turkey

	2SLS Instrumented: Total Skill Upgrading	2SLS Instrumented: Between Upgrading	2SLS Instrumented: Within Upgrading
Skill Upgrading	0.010**		
	(0.005)		
Skill Upgrading Between		0.012	
		(0.015)	
Skill Upgrading Within			0.013***
			(0.005)
Average rainfall (mm)	-0.002***	-0.002**	-0.003***
	(0.001)	(0.001)	(0.001)
Capital stock growth (2011 national prices, in logs)	0.142***	0.143***	0.166***
	(0.031)	(0.045)	(0.034)
Human capital stock (% change)	0.024	0.012	0.038*
	(0.023)	(0.030)	(0.022)
Comp. advantage of TR exports (% change)	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
Observations	45	45	45
R-squared	0.667	0.623	0.702
Year and Sector Effects and Sector Specific Linear Trends	YES	YES	YES
FIRST STAGE AND IDENTIFICATION			
Coefficients of Instruments			
Technology Intensity of EU Exports to World	0.116	-0.099*	0.214***
	(0.121)	(0.057)	(0.077)
Technology Intensity of EU Exports to World2̂	-0.013	0.008	-0.021**
	(0.013)	(0.008)	(0.008)
Technology Intensity of EU Exports*Old Age Dependancy TR	-0.009***	-0.003*	-0.006***
	(0.003)	(0.002)	(0.002)
Sanderson-Windmeijer F Statistic	4.186	2.163	7.262
	pval (0.016)	pval (0.119)	pval (0.001)
Hansen J Statistic	2.651	3.940	1.135
	pval (0.266)	pval (0.139)	pval (0.510)

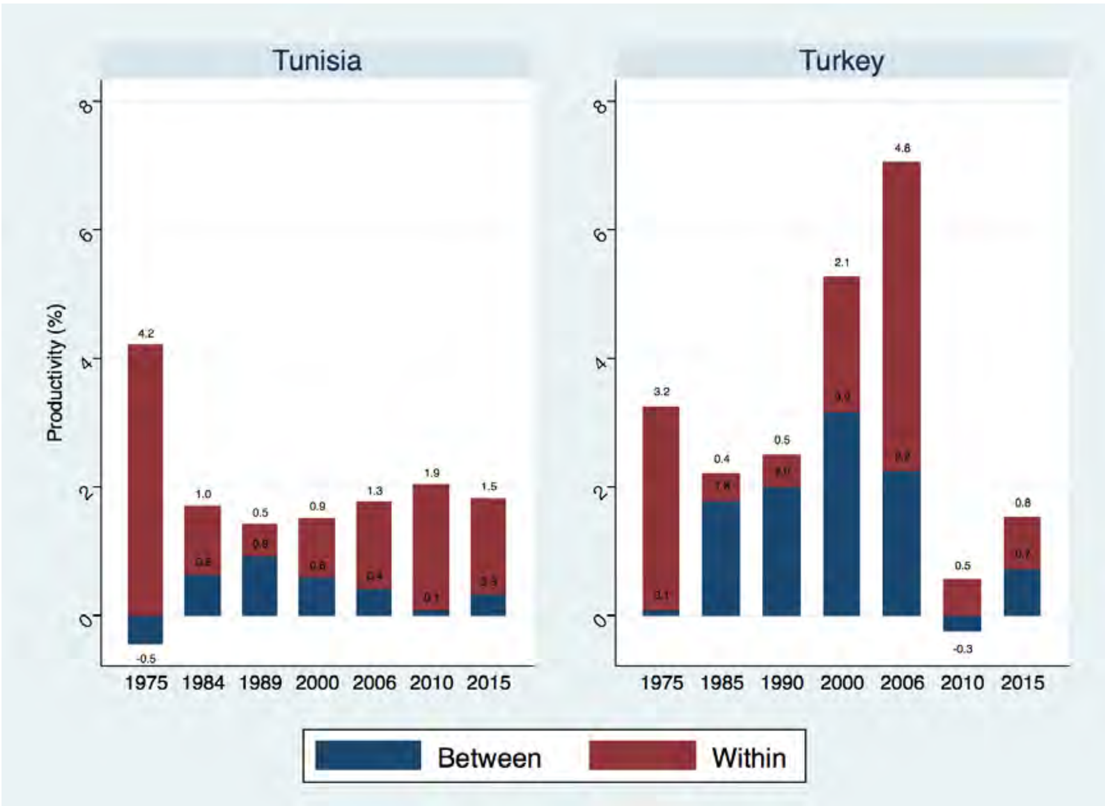
(1) Newey West standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.
(2) Null hypothesis for S.-Windmeijer weak identification test is that *the particular endogenous regressor in question is unidentified*.
(3) Null for Hansen's J statistic is that the *instruments are uncorrelated with the error term*.

Table 11: 2SLS Estimations of Sectoral Productivity Growth-3, Tunisia

	2SLS Instrumented: Total Skill Upgrading	2SLS Instrumented: Between Upgrading	2SLS Instrumented: Within Upgrading
Skill Upgrading	0.007		
	(0.018)		
Skill Upgrading Between		0.011	
		(0.025)	
Skill Upgrading Within			0.018
			(0.069)
Average rainfall (mm)	0.002***	0.002***	0.002***
	(0.001)	(0.001)	(0.000)
Capital stock growth (2011 national prices, in logs)	0.001	0.002	-0.004
	(0.032)	(0.034)	(0.029)
Human capital stock (% change)	-0.083	-0.078	-0.093
	(0.066)	(0.067)	(0.070)
Comp. advantage of TR exports (% change)	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
Observations	95	95	95
R-squared	0.346	0.344	0.337
Year and Sector Effects and Sector Specific Linear Trends	YES	YES	YES
FIRST STAGE AND IDENTIFICATION			
Coefficients of Instruments			
Technology Intensity of EU Exports to World	0.121*	-0.087**	0.033
	(0.068)	(0.043)	(0.033)
Technology Intensity of EU Exports to World$\hat{2}$	0.006**	0.005**	0.002
	(0.003)	(0.002)	(0.001)
Technology Intensity of EU Exports*Old Age Dependancy TN	-0.009	-0.007*	-0.003
	(0.006)	(0.004)	(0.003)
Sanderson-Windmeijer F Statistic	2.230	2.395	0.905
	pval (0.093)	pval (0.076)	pval (0.444)
Hansen J Statistic	4.266	4.334	4.115
	pval (0.119)	pval (0.115)	pval (0.128)

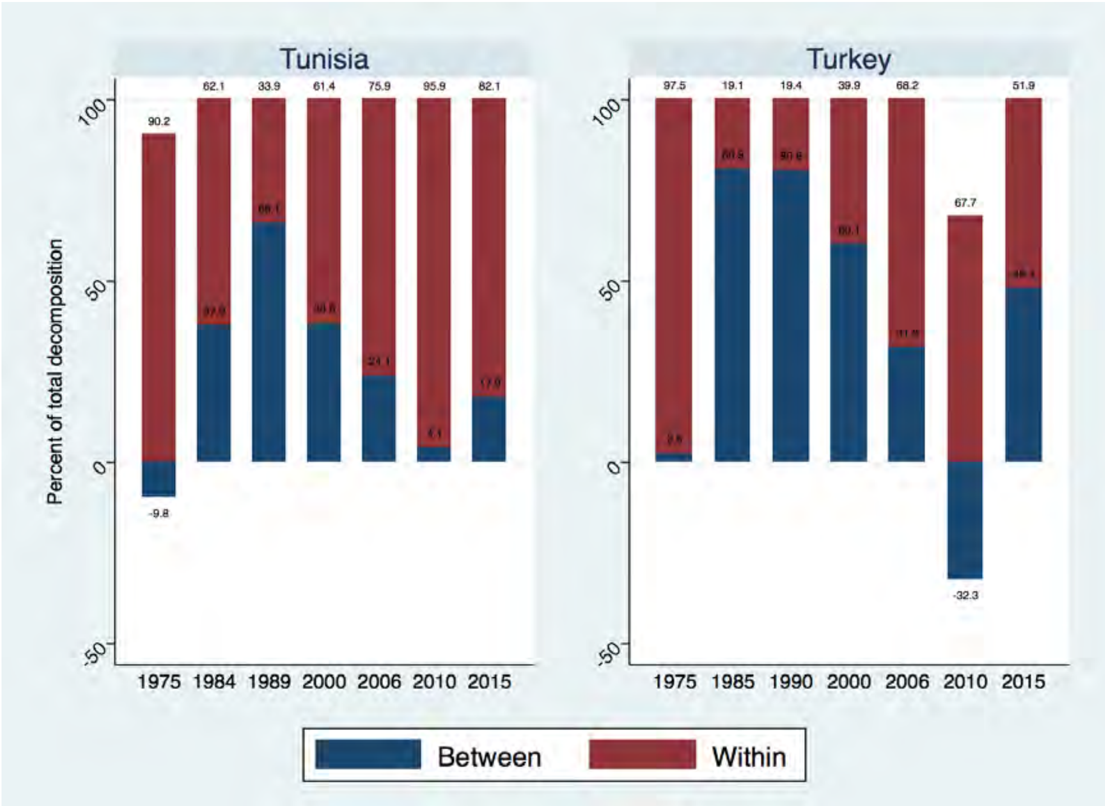
(1) Newey West standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1.
(2) Null hypothesis for S.-Windmeijer weak identification test is that *the particular endogenous regressor in question is unidentified*.
(3) Null for Hansen's J statistic is that the *instruments are uncorrelated with the error term*.

Figure 2: Total Productivity Decomposition



Note: The bars should be interpreted as representing the span of years between the prior year and the current year. For the 1975 estimates the prior years from 1965 for Turkey and from 1967 for Tunisia.

Figure 3: Structural Change and Within Component



Note: The bars should be interpreted as representing the span of years between the prior year and the current year. For the 1975 estimates the prior years from 1965 for Turkey and from 1967 for Tunisia.

Figure 4: Productivity in Tunisia

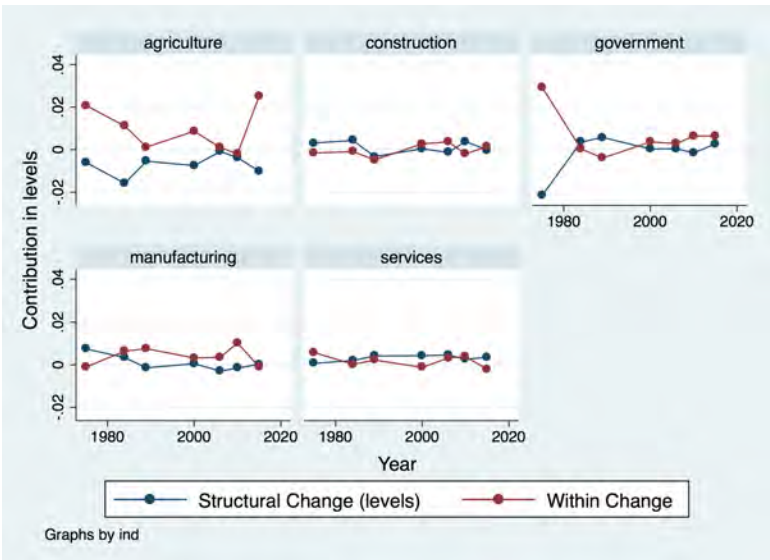


Figure 5: Productivity in Turkey

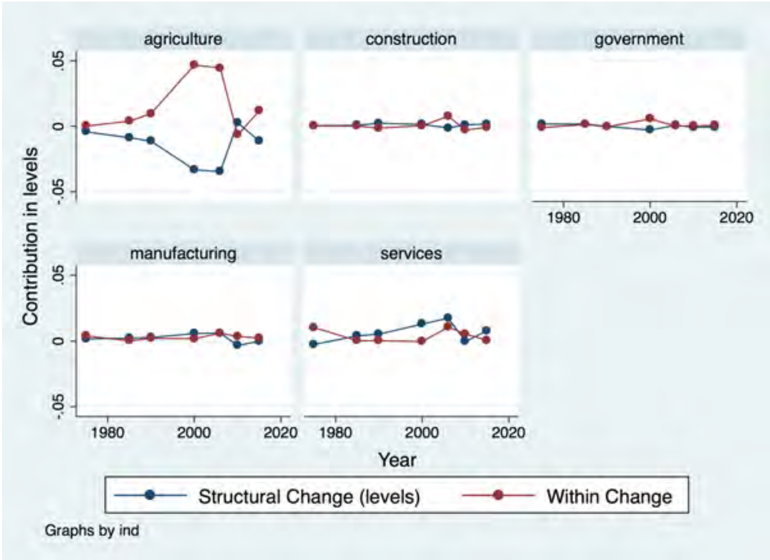


Figure 6: Share of Productivity and Employment (Tunisia)

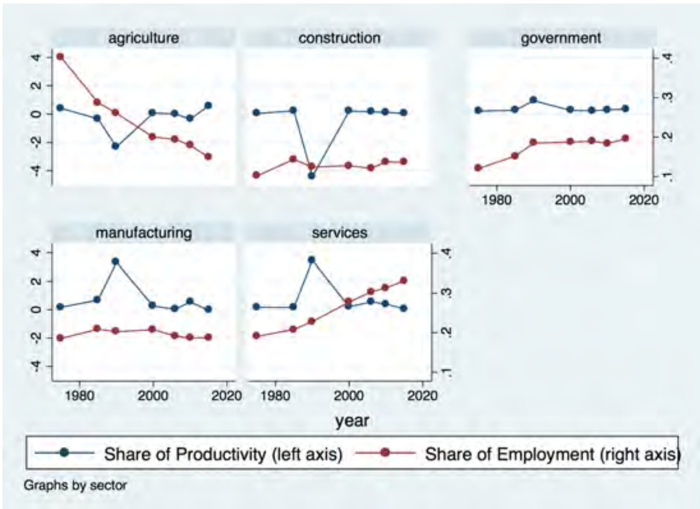


Figure 7: Share of Productivity and Employment (Turkey)

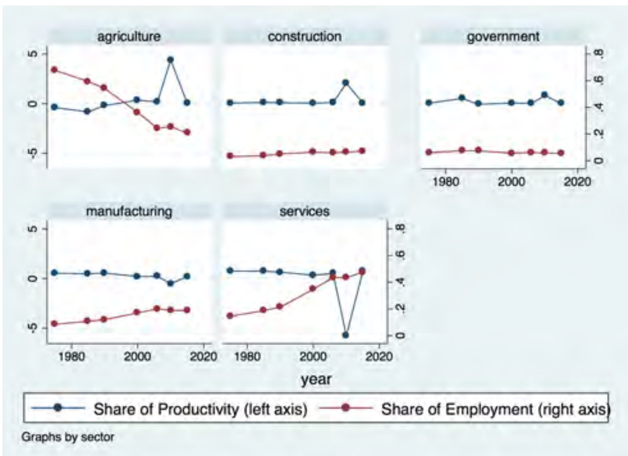


Figure 8: Skills Decomposition