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Information technology in Turkey: Creating high-skill jobs along with more unemployed highly-educated workers?



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ABSTRACT

We measure the impact of the growth in ICT sector in Turkey on unemployment rates using domestic IT production and total ICT market-size based variables as proxies, from 1990 to 2013, and the sub-period 2000–2013 of rapid ICT growth. Results show that changes in youth and female unemployment rates are correlated positively with growth of domestic IT production. Within educational subcategories, the correlation is positive and significant especially for youth females at lower educational levels; and negative at the vocational high school level, especially for youth male. At the same time the growth in number of individuals employed as well as workforce size are correlated positively with growth in domestic IT production for male youth at the university level, and negatively at the vocational high school level for females. The youth workforce composition changes significantly during the period of our study. Data suggests that growth in domestic IT production is correlated with more youth undertaking university education and that although additional jobs are created, especially for males, the number of unemployed youth with university degrees also increases. We examine these results in the context of Turkish educational policy changes and discuss the need for coordinating these with policies promoting ICT.

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1. Introduction

The Information and Communications Technology (ICT) sector has been experiencing a remarkable positive-reinforcement cycle since the Second World War: better, faster and cheaper devices lead to increased applications; and the resulting widespread deployment in turn enhances economies of scale, allowing for even better, faster and cheaper devices. The advancement and ubiquity of computer-based technologies, that allow for fast and accurate processing of large quantities of data and can provide relevant information to the right place at the right time, has been predicted since at least the 1960s (Licklider & Taylor, 1968); and such early expectations have often been surpassed in many respects with developed countries transitioning to post-industrial information societies. However predictions that widespread deployment of technology would diminish unemployment (Licklider & Taylor, 1968) have been a matter of some contention, regardless of whether the reason for any increase is ascribed to involuntary unemployment or to rent seeking behavior (see, for instance, Mabry & Sharplin, 1986).

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Advancement of the ICT sector has created new employment fields and can produce positive effects on firm performance on a micro-basis; while contributing to economic growth on a macro-basis both as a production input, and as a production output (see, for instance, [Colecchia & Schreyer, 2002](#); [Jung, Na, & Yoon, 2013](#); [Sassi & Goaid, 2013](#); [Shahiduzzaman & Alam, 2014a, 2014b](#); [Vu, 2011, 2013](#)). Prior research with regard to employment has focused mainly on the impact of new technologies on the wage and skill levels of employees in the economy, and a majority of the findings show a positive relation between new technologies and wage and skill levels. This suggests that high skills are complementary to new technologies (e.g., [Aksoy, 2009](#); [Caselli, 1999](#); [Doms, Dunne, & Troske, 1997](#); [Goldin & Katz, 1998](#); [Katz & Murphy, 1992](#)). However technologies such as automated assembly, bookkeeping software, automated inventory control and other management information systems substitute labor skills ([Mokyr, 1990](#)). [Acemoglu \(1998\)](#) concludes that new technologies are not skill-complementary by nature, but they can be by design. [Gera and Masse \(1996\)](#) argue that ICT changes the significance of human capital and the occupational structure of employment in an economy by shifting demand from low-skill jobs to high skill specialized ones along with a shift from goods producing sector to the service sector, for both existing and newly created jobs. [Dobbs et al. \(2012\)](#) argue that as a result of labor saving business-sector investments in information technology and machinery starting from the 1970s and accelerating after 1980s, low to medium skill jobs have declined but technology can create more job opportunities by allowing low-skill workers to perform high-skill occupations with the help of smart devices. Traditional national accounts frameworks do not have satisfactory explanations for the impact ICT on economic growth, productivity, and employment ([OECD, 1996](#)). Attempts to statistically measure the impact of the ICT sector are often constrained by the extent and quality of available indicators even in ICT-based economies, and are particularly difficult for developing markets. At the same time, the rapid growth of the ICT sector in developed and developing countries has increased the importance of determining the share and impact of these activities in the economy ([Atik, Türker, & Düzgün, 2007](#)).

Turkey has been actively developing the ICT sector, and in 2012 total ICT investments undertaken just by Turkish State-Owned Enterprises amounted to US\$1.431 billion ([Turkish Ministry of Development Report, 2012](#)). The government has been promoting the ICT sector and plans to increase the ICT market size from 2.9% of the GDP in 2011 to 8% by 2023. The number of graduate students in ICT-related fields in educational institutions increased 29% from 2011 to 2012, with new entrants increasing by 17%. The market, overall, is dominated by communications technologies and imports. Even though Turkey has one of the fastest growing ICT sectors in the world, the growth is from a small base. At the same time educational regulations keep changing, with the mandatory school duration increasing from 5 years to 8 years in 1997, but reverting to a 4+4+4 scheme starting 2012–2013 wherein students after 4 years would have additional options such as home schooling or apprenticeships, and are often ascribed to social and political goals other than economic considerations. Insofar as the impact of ICT on employment depends on the skill levels, Turkey has the lowest level in tertiary education expenditure and second lowest level of total education expenditure among the OECD countries, at 1% and 4.1%, respectively, of the GDP ([OECD, 2012](#)). Computer and Internet usage in Turkey rise with education levels; depend on age, with the 15–24 age-group being responsible for the largest share; and also depend on gender, with men using computers and the Internet twice or more as much as women ([Turkstat, 2012](#)). Furthermore for our sample period we see a rise in information-related occupations, with men's share consistently greater than that of women. Women, traditionally, may also choose not to enter the workforce in the absence of economic necessity.

Thus, it is of interest to evaluate the impact of the growing Turkish ICT sector on Turkish unemployment rates and the work adds to the empirical evidence for the special conditions in Turkey, especially for youth. Our analyses show that the change in unemployment rates is correlated positively with growth in domestic IT production for youth, both for males and females and also for the overall female workforce, especially during the period of high growth while the total ICT market size that includes communications and imports does not impact unemployment rates. Results by educational status indicate that the change in unemployment rate for youth tended to be positively correlated with the growth of domestic IT production at the lower educational levels, especially for those who were literate but had not completed school at any level; while being negatively correlated, especially for males, at the vocational high school level. These results are explainable in terms of the nature of the domestic Turkish IT industry and traditional gender preferences. Furthermore the results for control factors are in line with expectations, such as GDP growth showing a significant and negative correlation with changes in unemployment rates, FDI showing a negative but statistically insignificant correlation, and changes in growth of minimum wage showing a positive but statistically insignificant coefficient commensurate with a workforce predominated by lower skill levels.

More importantly, especially for Turkey, it may be possible for the youth workforce composition to shift significantly in response to market needs as well as changing government regulations. For instance given efforts at improving literacy, from 2000 to 2013, the illiterate youth workforce has declined from 157,000 to 53,000 so while there is a positive correlation between change in unemployment rate and growth in domestic IT production, the overall workforce itself has declined significantly. For the literate but no school completed category, the youth female workforce increased from 24,000 to 114,000, while the numbers employed increased from 20,000 to 114,000, leading to a net increase in unemployed individuals of 7000 while the unemployment rate fell from 16.67% to 6.65%. The change in unemployment rate was significantly and positively correlated with domestic IT production. At higher levels, the youth workforce size as well as number of individuals employed are also correlated with growth in domestic IT production. Domestic IT production growth is correlated positively with growth in youth males employed at the university level while a similar relationship holds for

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