

A Brief Assessment of Adult Skills in Turkey: Results from Survey of Adult Skills (PIAAC)

Furkan Kavuncu, Sezgin Polat*

Abstract

In this study, we compare the adults' proficiency in key information-processing skills in Turkey with the rest of the OECD countries using the results of OECD Programme for the International Assessment of Adult Competencies (PIAAC) survey. Several key observations can be summarized as follows; While the performance of adults in OECD countries are mostly grouped at intermediate levels, adults in Turkey are concentrated at elementary levels. Both in literacy and numeracy skills, individuals with tertiary education in Turkey perform the same as individuals with secondary education in the OECD countries. We observe that low level of skill use in the labor market might also reflects poor skill returns; thereby individuals prefer not to invest heavily in those skills. Findings of the PIAAC survey reveal that the improvement in quantity should be complemented with progress in quality in Turkey. Moreover, low returns to skills put more emphasis on institutional issues concerning the structure of labor demand. Lack of incentives in firms could be a factor restricting skill development of workers and could lead to low investment in skill upgrading. We complement our comparison by providing some evidence from other data sources and underline the importance of skill development for growth.

JEL Codes: J24, J21, I25, I26

Keywords: Skill, human capital, productivity, labor force.

* F. Kavuncu: Betam, Bahcesehir University, Istanbul, <https://orcid.org/0000-0002-7802-9060> (furkan.kavuncu@eas.bau.edu.tr). S. Polat: GIAM, Galatasaray University, Istanbul <https://orcid.org/0000-0002-8902-1312> (spolat@gsu.edu.tr). Current study has first appeared as a working paper at TUSIAD-Sabancı University Competitiveness Forum (REF). We would like to thank REF for financial support. We would also like to thank Izak Atiyas and Alpay Filiztekin for their valuable comments and suggestions. The usual disclaimer applies.

Türkiye'de Yetişkin Becerilerinin Kısa Bir Değerlendirmesi:

Yetişkin Yeterlilikleri Anketinden (PIAAC) Çıkarılmalar

Öz

Bu çalışmada, OECD Uluslararası Yetişkin Yeterlilikleri Değerlendirmesi (PIAAC) anketinin sonuçlarını kullanarak yetişkinlerin Türkiye'deki temel bilgi işleme becerilerindeki yeterliliğini diğer OECD ülkeleriyle karşılaştırıyoruz. Çalışmamızdan çıkan birkaç önemli gözlem şöyle özetlenebilir; OECD ülkelerindeki yetişkinlerin performansı çoğunlukla orta düzeylerde gruplandırılırken, Türkiye'deki yetişkinler temel düzeylerde yoğunlaşmıştır. Türkiye'de yükseköğretime sahip bireyler, hem okuryazarlık hem de matematik becerilerinde, OECD ülkelerindeki orta öğretim seviyesindeki bireylerle aynı performansı göstermektedir. PIAAC sonuçları Türkiye eğitim sisteminde nicel olarak sağlanan başarının niteliksel gelişme ile tamamlanması ihtiyacını ortaya koymaktadır. Öte yandan işgücü piyasasında, sayısal ve sözel becerilerin getirisinin düşük olması işgücü talebinin yapısına ilişkin başka kurumsal sorunların altını çizmektedir. Firmaların yarattığı teşviklerin yetersiz oluşu, beceri gelişimi önünde kısıtlayıcı bir engel olarak ortaya çıkmakta ve becerilere yapılan yatırımın düşük kalmasına sebep olmaktadır. Karşılaştırmamızı diğer veri kaynaklarından derlediğimiz bazı olguları ortaya koyarak ve büyüme için beceri geliştirmenin önemini vurgulayarak tamamlıyoruz.

JEL Kodları: J24, J21, I25, I26

Anahtar kelimeler: Beceri, beşeri sermaye, verimlilik, işgücü, eğitimin getirisi.

1. Introduction

International Assessment of Adult Competencies (PIAAC) is conducted by OECD in order to assess adult proficiency in information-processing skills. These skills, namely literacy², numeracy³ and problem solving⁴ in technology-rich environments are measured in order to provide better insight to policy makers in evaluating the labor market outcome of national education and training programmes. The survey also integrates the use of these skills at work and at daily life and offer further information on the individual perception of workers for their skill and qualification matches. For example, Jimeno et al. (2016) discuss that firm specific experience is correlated with skills measured by PIAAC, particularly for low educated workers. They argue that using skills at work increases numeracy score performance for these workers.

There is a growing literature on how problem-solving skills contribute to individual and social welfare. Broecke et al. (2017) discuss the role of skills in explaining the wage inequality across countries using decomposition analysis. Stijepic (2018) indicates that improvement in numeracy skills increase the likeliness of being employed with respect to other labor status such as unemployed or non-participant. Their results suggest that the employment effect of skills favor female workers more than male workers. Hanushek et al. (2015) finds higher returns to skill across countries and discusses the role of labor market institutions in rewarding skills. Hidalgo-Cabrillana et al. (2017) show that including broad aggregate skill indicators significantly improves standard development accounting model. There is a considerable number of studies focusing on skill performance and education system. Liu (2018) compares skill performance across countries having different education systems and reforms and argue that strong orientation towards vocational training have an advantage over high level of early tracking⁵ when numeracy and literacy performances are considered. Several studies compare vocational and general programmes and conclude that lower mismatch advantage of vocational education at early stage of work-life can disappear over time

2 Definition of literacy proficiency is given as “The ability to understand, evaluate, use and engage with written texts to participate in society, to achieve one’s goals, and to develop one’s knowledge and potential.”, OECD (2016b: 90).

3 Definition of numeracy proficiency is given as” The ability to access, use, interpret and communicate mathematical information and ideas, in order to engage in and manage the mathematical demands of a range of situations in adult life.”, OECD (2016b: 91).

4 Definition of problem solving is given as “The ability to use digital technology, communication tools and networks to acquire and evaluate information, communicate with others and perform practical tasks. The assessment focuses on the ability to solve problems for personal, work and civic purposes by setting up appropriate goals and plans and accessing and making use of information through computers and computer networks.”, OECD (2016b: 93).

5 Based on the classification described in Bol and Van de Werfhorst (2013), Liu (2018) notes that” Scandinavian countries follow the pattern of a high level of vocational education orientation and a low level of tracking. Education systems in Chile, Turkey and Korea provide examples of low orientation of vocational education yet high level of tracking.”

and general qualifications seems to favor workplace learning more than vocational programmes, (Verhaest et al., 2018, Hampf and Woessmann, 2017).

In this study, we will solely focus on those dimensions where Turkey differs from other OECD countries in the PIAAC survey. We will further limit our scope with literacy and numeracy proficiency in information-processing skills and exclude the section on problem solving in technology-rich environments.⁶ The first round of PIAAC survey covers 24 countries/economies and Turkey was included later on the second round along with eight other countries. We will also restrict our comparison with OECD countries/economies that are part of this assessment and leave partner countries out.⁷ We will first give a short general overview of adults' skills and the position of Turkey among OECD countries. We will later focus on skill use in the workplace and in everyday life. A section on labor market outcome of PIAAC skills will follow. We discuss and conclude our observations by providing some complementary facts related to labor market particularities of Turkey.

2. An Overview of Adults' Proficiency in Key Information-Processing Skills

We begin with a general comparison among OECD countries undertaking this survey. Table 1 and 2 provide summary of performances of OECD countries for literacy and numeracy skills on a 500-point scale and levels of difficulty of tasks performed within these ranges.⁸ For Turkey, both skill levels are substantially lower than other OECD countries. Among OECD countries involved in PIAAC, Turkey ranks second last, with the lowest score after Chile. The distribution of competencies according to sophistication of tasks can help to obtain a more accurate picture. Literacy skill levels 1 and 2 have the highest frequencies, (33.1% and 40.2%, respectively), meaning that skills requiring complicated tasks such as understanding rhetorical structures, interpreting or synthesizing information from complex or long texts (which correspond to levels 3-5) are lacking. Most workers remain within basic skills levels (1 and 2), whereas OECD countries have workers grouped mostly at levels 2 and 3 (33.9 and 35.4%, respectively) on average. As for numeracy skills, only around 15% of adults in Turkey perform at and

⁶ Many adults in all countries have no experience with computer use, extremely limited ICT skills, or low proficiency of problem solving in technology-rich environments (OECD, 2016a: 24). Furthermore, some adults who are less proficient or feel less confident in their computer use skills opt out or fail ICT core or have no computer use (OECD, 2016a: 55), thus average scores in the domain of problem solving in technology-rich environments can bias comparisons among countries due to selective participation.

⁷ Partner countries are Cyprus, Jakarta (Indonesia), Lithuania, Russian Federation and Singapore.

⁸ Each of the two proficiency scales was divided into proficiency levels, defined by particular score-point ranges and the level of difficulty of the tasks within these ranges. Table 1 and 2 provide descriptive summary of the types of tasks that can be successfully completed by adults with proficiency scores in a particular range. In other words, they suggest what adults with particular proficiency scores in a particular skills domain can do. Six proficiency levels are defined for literacy Adults' proficiency in key information-processing skills and numeracy (Levels 1 through 5 plus below Level 1), OECD (2016a: 37-38).

above level 3, and more than 60% of adults are grouped at level 1 (30%) and 2 (33.3%). The OECD average has more than two fifths of adults (43.1%) scoring at and above level 3.

Table 1: Performance of OECD Countries in Information-Processing Skills - Literacy Proficiency

	Mean score	Below Level 1	Level 1	Level 2	Level 3	Level 4	Level 5	Missing
		Below 176 points	176-126 pt.	226-276 pt.	276-326 pt.	326-376 pt.	376 pt. and above	
		%	%	%	%	%	%	%
Turkey	227	12.7	33.1	40.2	11.5	0.5	c	2
OECD average	268	4.5	14.4	33.9	35.4	10	0.7	1.4

Retrieved from OECD,2016a. Annex A, Ch2, Table A2.3 and A2.5).

<http://dx.doi.org/10.1787/888933366458>

Table 2: Performance of OECD Countries in Information-Processing Skills - Numeracy Proficiency

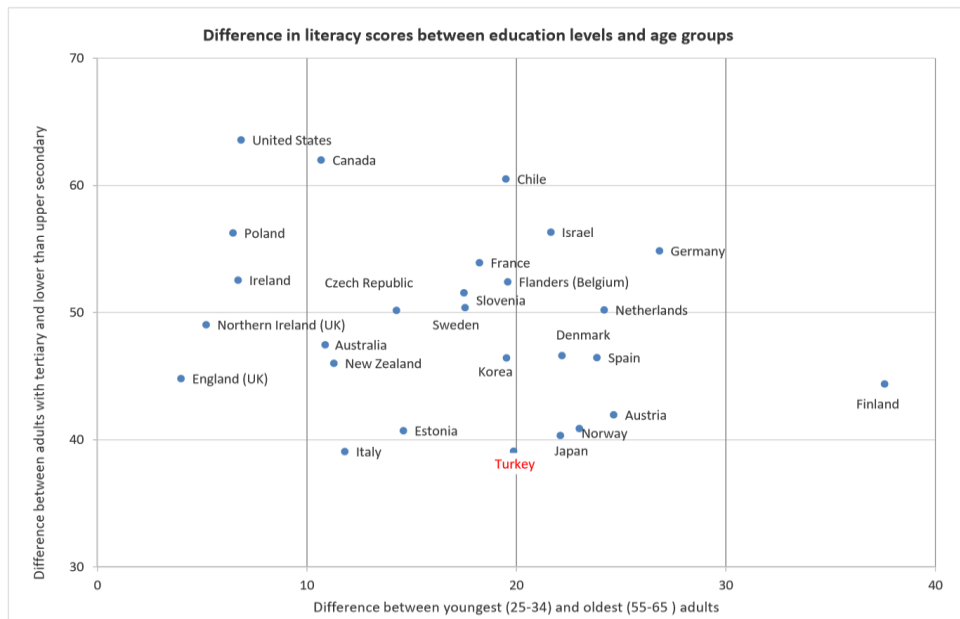
	Mean score	Below Level 1	Level 1	Level 2	Level 3	Level 4	Level 5	Missing
		Below 176 points	176-126 pt.	226-276 pt.	276-326 pt.	326-376 pt.	376 pt. and above	
		%	%	%	%	%	%	%
Turkey	219	20.2	30	33.3	13	1.4	c	2
OECD average	263	6.7	16	33	31.8	10.2	1	1.4

Retrieved from OECD (2016a: Annex A, Ch2, Table A2.3 and TablA2.5)

<http://dx.doi.org/10.1787/888933366458>

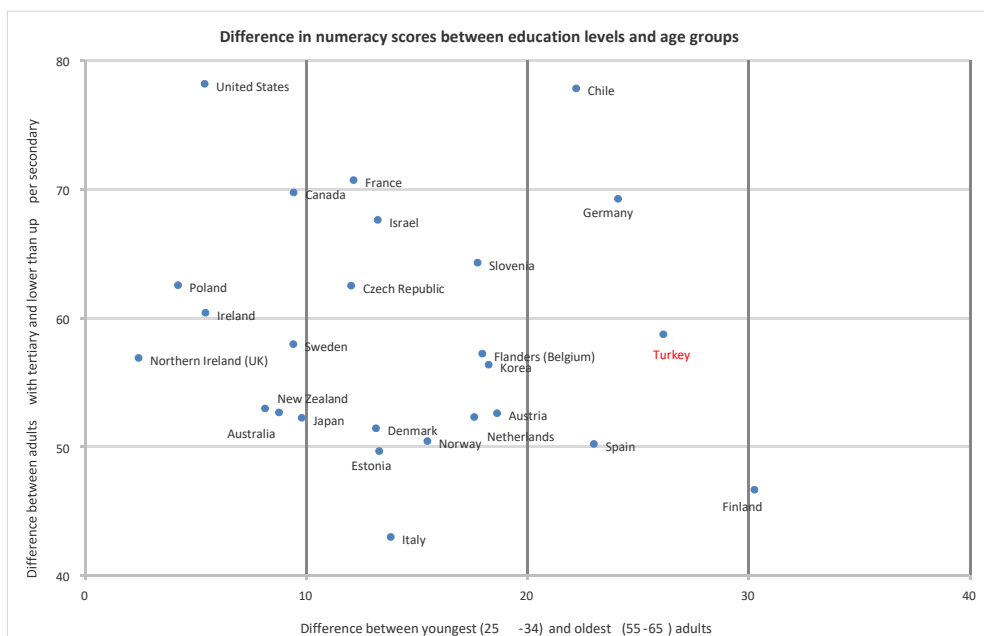
It would be informative to see how skills are distributed according to age and education levels. Figure 1 gives skill level differences between age groups and educational attainment. In terms of literacy skills, differences between age groups are not so high, while the difference in education level between tertiary and lower than upper secondary is quite small compared to other countries. Given the low level of literacy, it is striking to observe that higher education does not add to skill proficiency. As for numeracy (Figure 2), Turkey is situated fairly well in terms of educational difference among OECD countries, but the difference among generations is quite high.

Figure 1: Literacy skill differences between age groups and education levels.



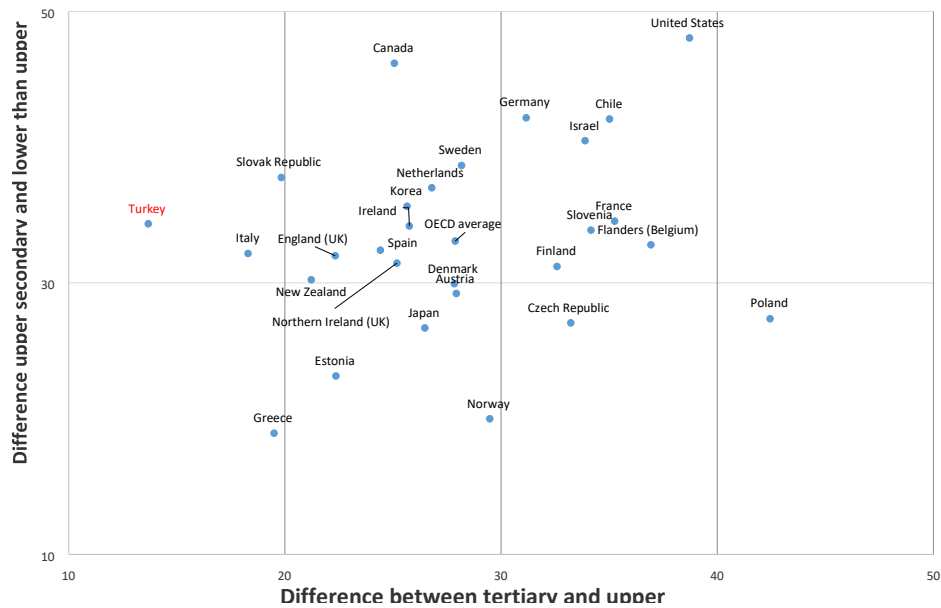
Retrieved from OECD (2016a: Annex A, Ch 3, Table A3.1 (L)) List of tables available online. <http://dx.doi.org/10.1787/888933366463>

Figure 2: Numeracy skill differences between age groups and education levels.



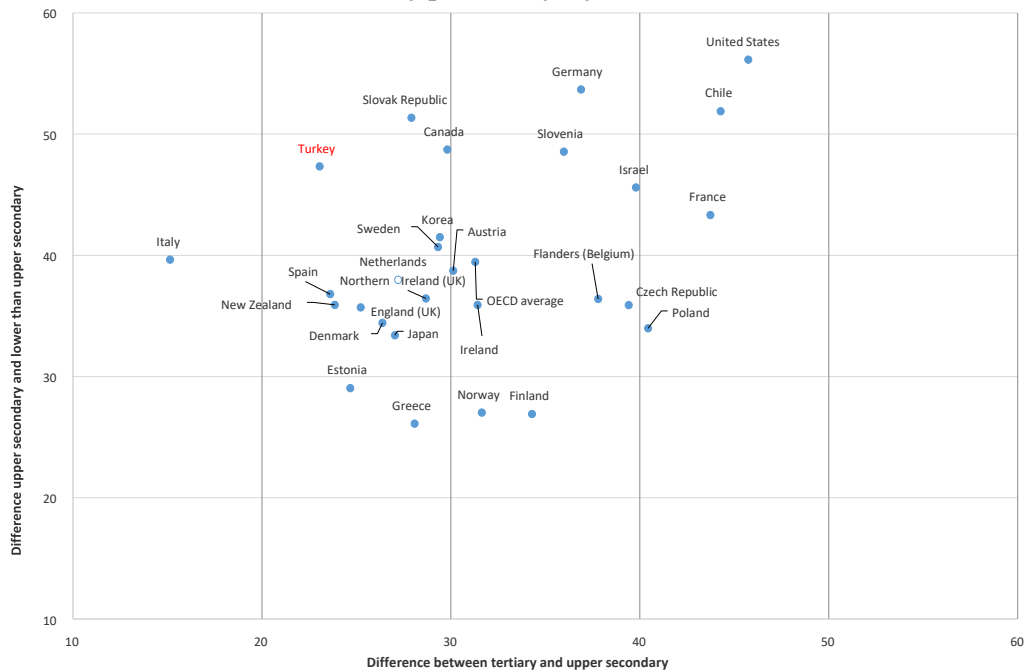
Retrieved from OECD (2016a. Annex A, Ch 3, Table A3.1 (N)). List of tables available online, <http://dx.doi.org/10.1787/888933366463>.

Figure 3: Mean literacy skill proficiency, by educational attainment
 Mean literacy proficiency, by educational level



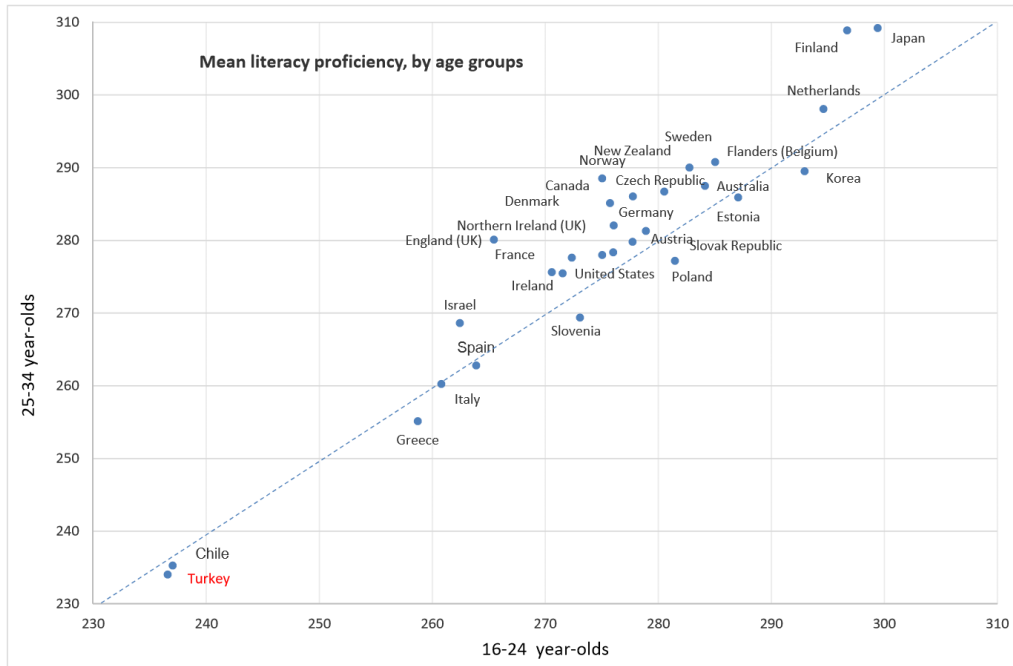
Retrieved from OECD (2016a: Annex A, Ch 3, Table A3.2 (L)). List of tables available online, <http://dx.doi.org/10.1787/888933366463>.

Figure 4: Mean numeracy skill proficiency, by educational attainment.
 Mean numeracy proficiency, by educational level



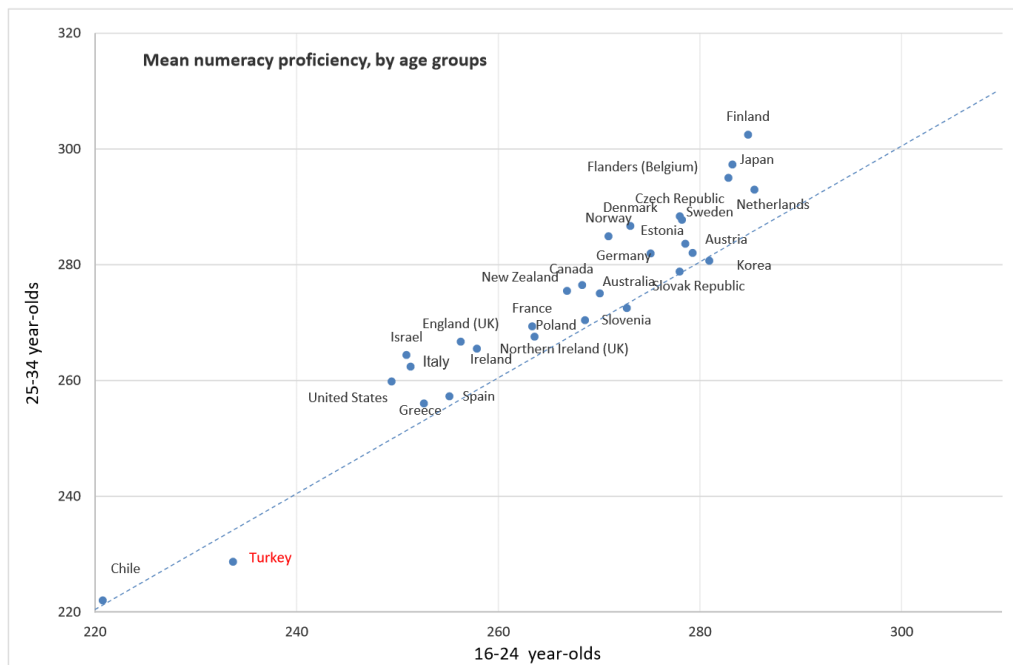
Retrieved from OECD (2016a: Annex A, Ch. 3, Table A3.2). List of tables available online <http://dx.doi.org/10.1787/888933366463>.

Figure 5: Mean literacy proficiency, by age groups



Retrieved from OECD (2016a: Annex A, Ch. 3, Table 3.5 (L)). List of tables available online, <http://dx.doi.org/10.1787/888933366463>.

Figure 6: Mean numeracy proficiency, by age groups



Retrieved from OECD (2016a: Annex A, Ch 3, Table 3.5 (N)). List of tables available online, <http://dx.doi.org/10.1787/888933366463>.

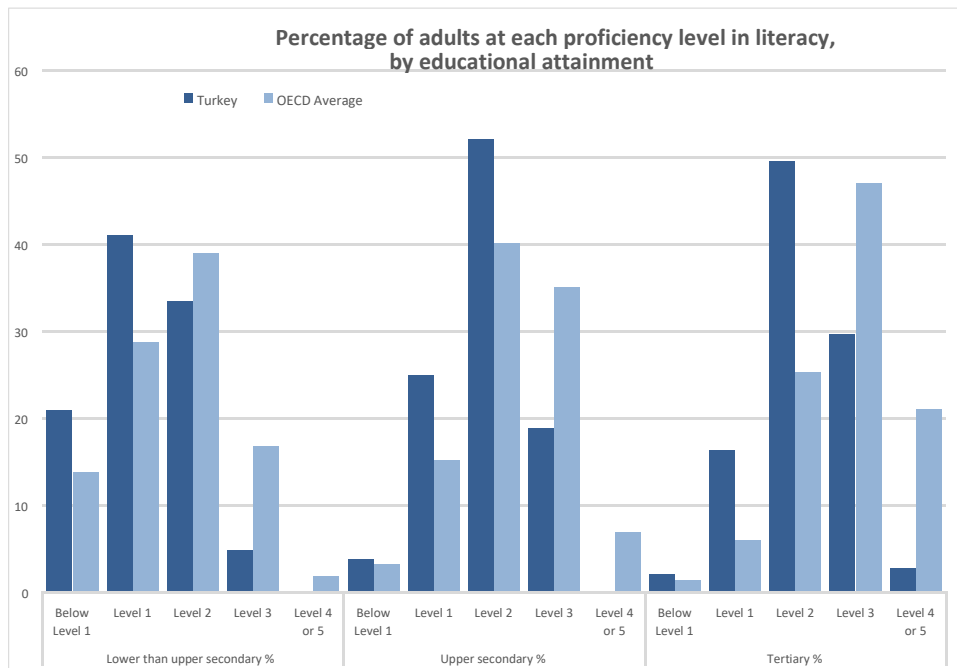
Taking a close look at differences among education level, it is striking to see that in terms of literacy skills (Figure 3), *marginal improvement* of tertiary level in Turkey is smaller compared to other OECD countries. The literacy skill scores only increase by an average of 13.7 between upper secondary and higher education (tertiary). Contrasting Turkey's position on numeracy (Figure 4), it seems that the difference is again quite low, as is the case in literacy skill, but now the educational gap is closer to the OECD average. It is worth noting that in relative terms, tertiary education can upgrade numeracy skills but not literacy skills in Turkey, which is rather intuitive, given the fact that numeracy is regarded as a key element in student assessment at all education levels in Turkey.

We complement this observation with age group differences in skill levels. In Turkey, educational attainment has dramatically changed across generations due to the extension of compulsory schooling (8 years), starting from 1998. It would be revealing to see the impact of education for the more educated generation. Figure 5 gives literacy proficiency levels of age groups. It seems that age group 16-24 performs slightly better than age group 25-34. However, the gap between OECD averages seems to hold even for the more educated generations. Note that compulsory schooling was extended to 8 years in 1998 and this reform has affected these age groups. A similar observation can be made for numeracy skills (Figure 6), with the younger generation (16-24) seeming to perform better than the elder one.

The overall observation suggests that although educational attainment has increased in Turkey, the skill gap with OECD countries has not decreased as one would have expected. In other words, extended years of education is not the remedy to upgrade skills; probably it is the quality of education that matters most. Looking closely at the distribution of skills across levels, which provides better insight in understanding the performance of adults, we see Turkey's pattern differs considerably from that of the OECD averages.

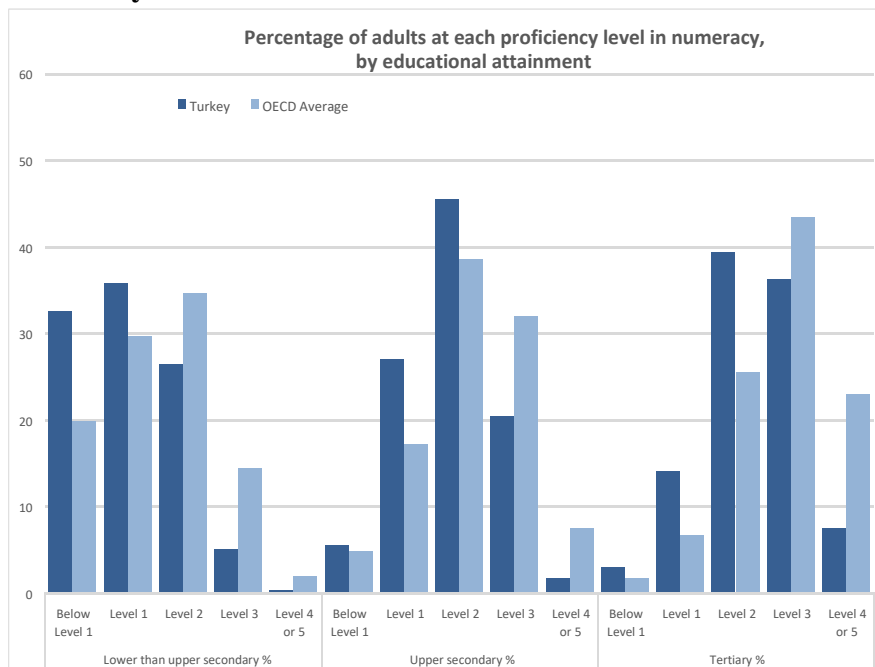
Figures 7 and 8 indicate that only a limited percentage of adults with secondary and tertiary education level can perform beyond level 2. Only a negligible number of adults reaches level 4. At tertiary education level, level 3 has the highest frequency in OECD countries where individuals are sorted. In terms of distribution across skill levels, it seems that in Turkey, adults with tertiary education perform the same as the secondary level of OECD countries in both literacy and numeracy skills. We have to underline that we do not know the composition of open and distance post-secondary graduates in this tertiary education group. Note that starting from 2006, Turkey has seen an expansion in tertiary education, and access to higher education has dramatically increased, (Polat, 2017). The fact that tertiary graduates have on average, the skill proficiency of secondary education level of average OECD countries raises the issue of quality versus quantity. Expanding higher education can increase access but does not guarantee quality and skill upgrading.

Figure 7: Percentage of adults at each proficiency level in literacy by educational attainment



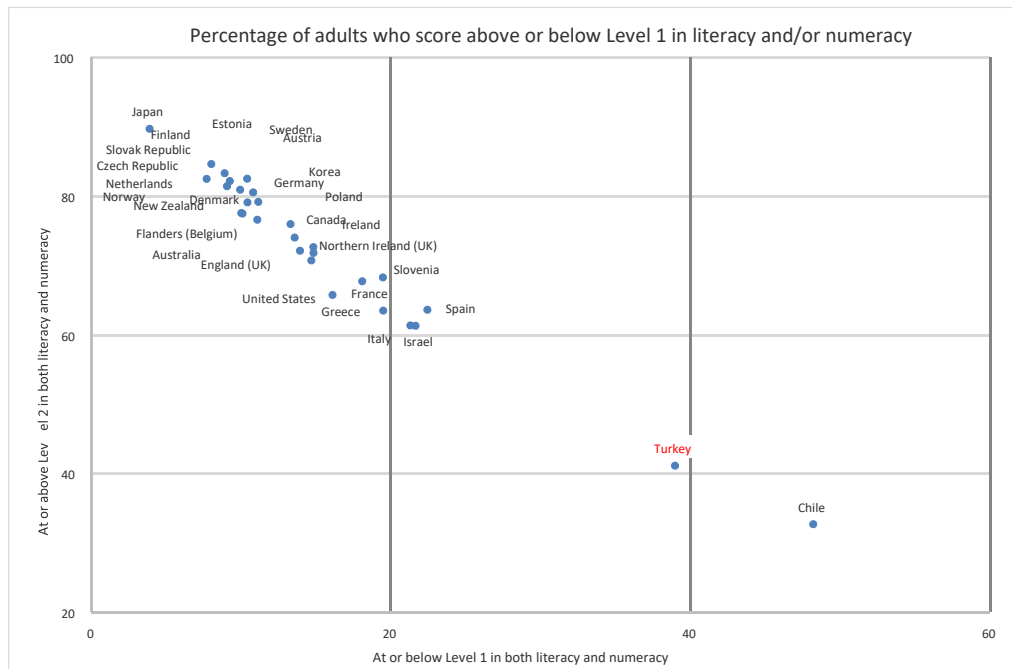
Retrieved from OECD (2016a, Annex A, Ch. 3, TableA3.3 (L)).
<http://dx.doi.org/10.1787/888933366463>

Figure 8: Percentage of adults at each proficiency level in numeracy by educational attainment



Retrieved from OECD (2016a: Annex A, Ch. 3, TableA3.3 (N)).
<http://dx.doi.org/10.1787/888933366463>

Figure 9: Percentage of adults who score at or below Level 1 in literacy and/or numeracy



Retrieved from OECD (2016a: Annex A, Ch. 3, Table A3.16). List of tables available online. <http://dx.doi.org/10.1787/888933366463>.

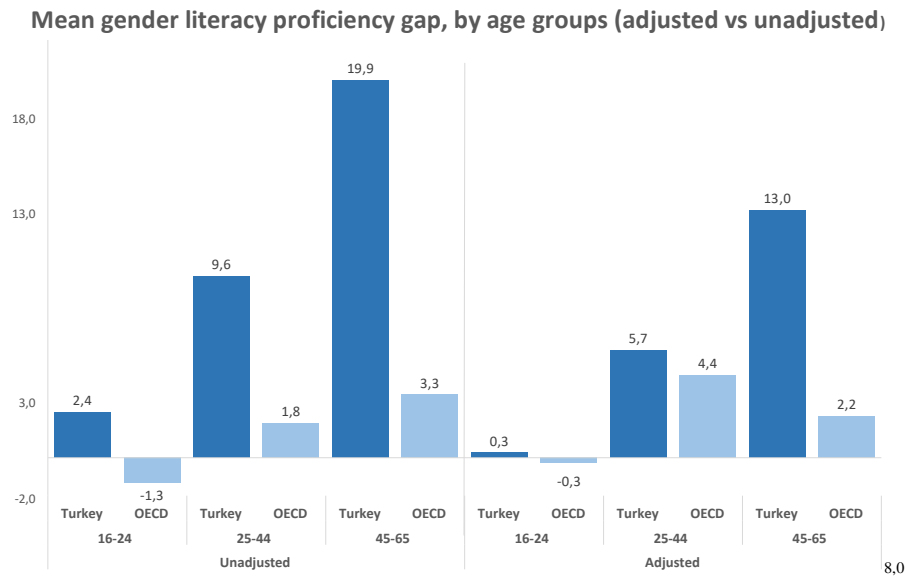
Another important issue for policy makers would be the evaluation of low performers in both skills. Grouping countries in terms of low performers, we see a striking distinction between Turkey and OECD countries. Figure 9 show that nearly 40 % of adults perform at or below level 1 in both literacy and numeracy, whereas only 40% of them have proficiency at level 2 or above in both skills. Given that level 2 distinguishes basic competencies such as paraphrasing and making low-level inferences, having a such a high share of poor performers needs more consideration by the policy makers.

Table 3: Mean literacy proficiency, by gender

	Literacy		Numeracy	
	Men	Women	Men	Women
	Mean	Mean	Mean	Mean
Turkey	232	220.9	232.6	205.7
OECD average	268.7	266.6	269.2	256.9

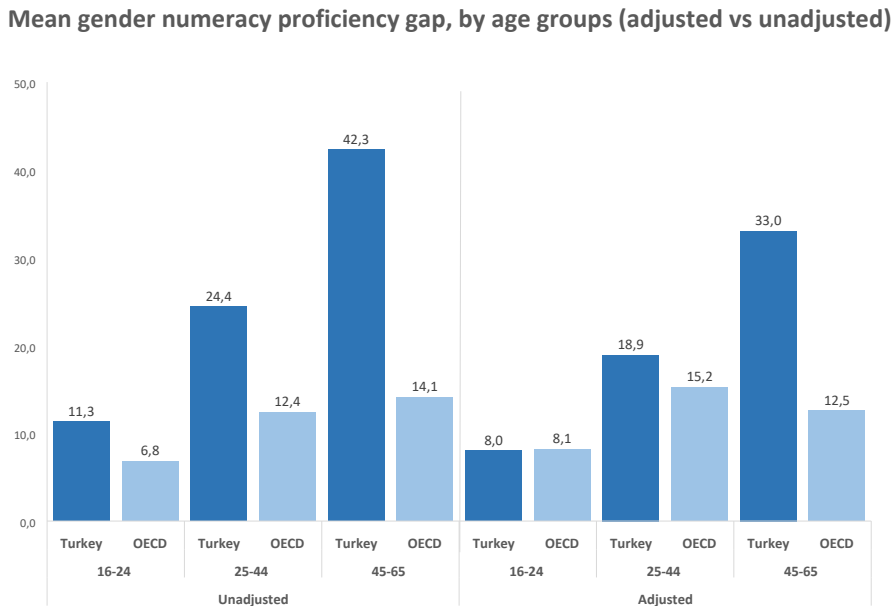
Retrieved from OECD (2016a: Annex A, Ch.3, Table A3.9 (L)). [http://dx. doi.org/10.1787/888933366463](http://dx.doi.org/10.1787/888933366463)

Figure 10: Mean literacy proficiency, by age and gender



Retrieved from OECD (2016a: Annex A, Ch 3, Table A3.10 (L)). List of tables available online, <http://dx.doi.org/10.1787/888933366463>.

Figure 11: Mean numeracy proficiency, by age and gender



Retrieved from OECD (2016a: Annex A, Ch. 3, Table A3.10 (N)). List of tables available online, <http://dx.doi.org/10.1787/888933366463>.

Gender is another important issue that needs to be addressed. Turkey has relatively high gender differences in skills (Table 3). Considering the fact that there is an

educational gender gap, and that it is significantly decreasing among the younger population, it will be more informative to compare each age groups. Figures 10 and 11 give raw (unadjusted) and adjusted differences after controlling for educational attainment. Raw differences are substantial, but the good news is that adjusted differences are rather low. Besides, the gender gap becomes almost negligible for literacy skills among younger generations (16-24). As for numeracy skills, it still holds, but in terms of level it converges towards OECD averages when scores are adjusted. It seems that educational gap which is significant higher for older generations is responsible for the bulk of gender gap in Turkey.

3. Skills Use in the Workplace and in Everyday Life

In addition to skill proficiency, the PIAAC survey also aims to measure how often adults use information-processing skills at work and in daily life. More specifically, in the three basic fields of reading, writing and numeracy, respondents are asked to assess how frequent they perform certain tasks when doing their job or in their everyday life.⁹ The scale of skill use ranges between 1 to 5, depending on the frequency of performing certain tasks related to the above fields. Scores between 1 and 2 mean that skills are performed rarely, ranges between never to less than once a month. Scores between 2 and 3 indicate that usage lies between once a month and less than once a week. Using skills more than once a week takes the value of more than 3 points.¹⁰ Note that scores show average frequency of use and the distance between levels is not linear.

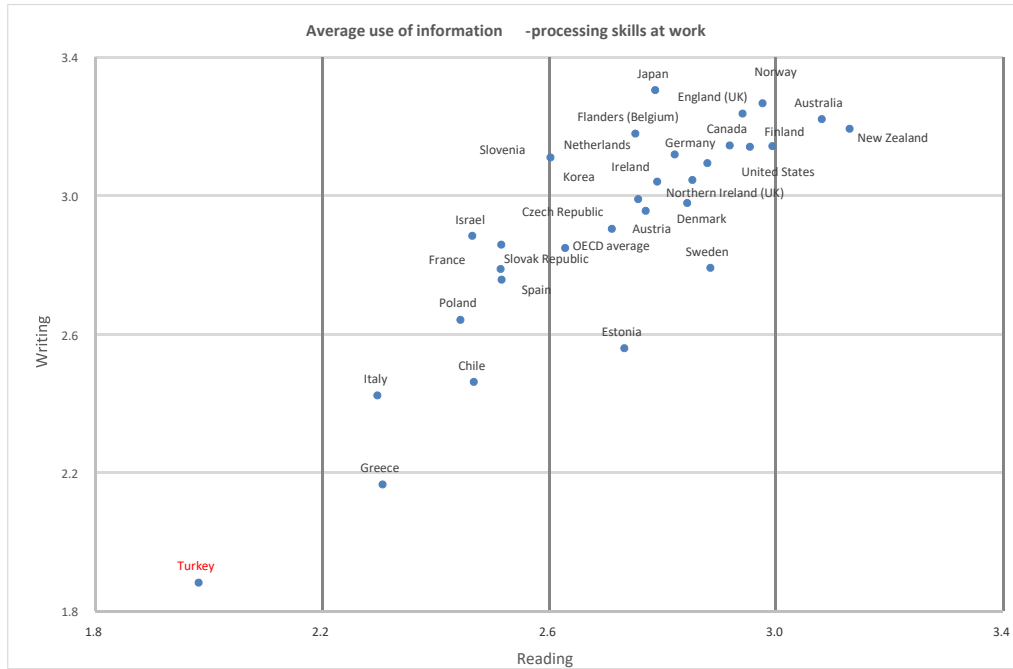
Results of skill use show that adults in Turkey perform both reading and writing skill with a limited frequency (less than once a month on average). Figure 12 shows that among OECD countries, Turkey is the only country having an average score of less than 2 points. Regarding using writing skills, while most countries have average scores well above 2.5 and some of them have scores even above 3 (more than once a month or at least once a week), adults in Turkey have a very low frequency, below 2 points. As for numeracy skill use, Turkey has a better score with more than 2 points (Figure 13), but again ranks as the lowest performer among OECD countries. In terms of ICT skill use, the frequency is very low, again less than 2 points. This very limited use (less than once a month on average) is striking, since questions on ICT use are addressed only to respondents who report using computer at work.

For all OECD countries included in the survey, literacy proficiency level and use of reading at work seem to have a strong correlation (Figure 14). Chile stands as an outlier with the lowest skill level but has a moderately higher skill use at work. For use of numeracy skill at work, the correlation is weaker. Some countries with higher average scores can have less frequent use at work than others (Figure 15).

⁹ PIAAC does not include any direct assessment of writing skills.

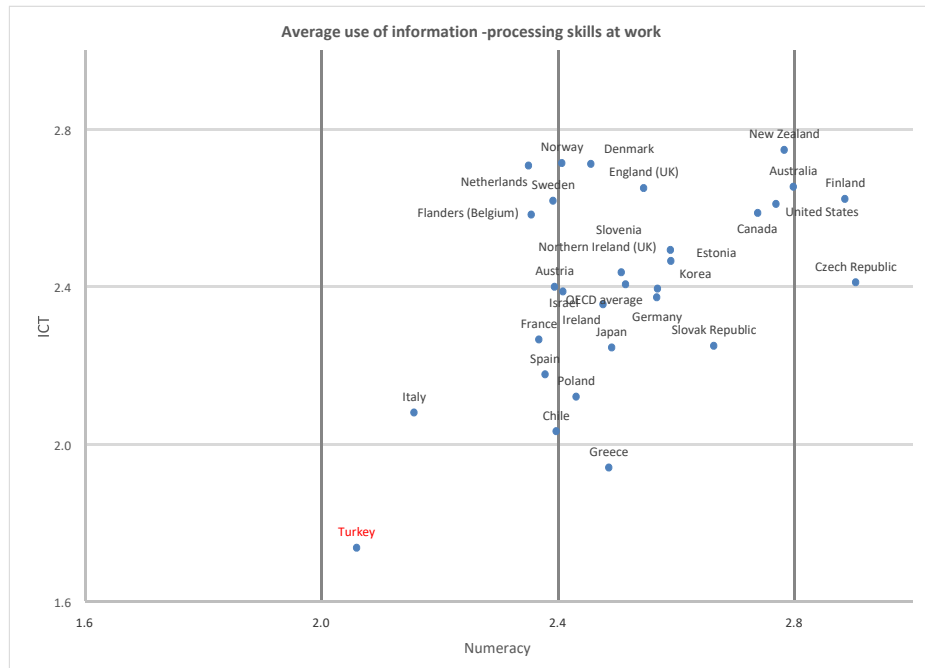
¹⁰ For tables 7 and 8, providing more detailed information, see appendix.

Figure 12: Average use of reading and writing skills at work



Retrieved from OECD (2016a: Annex A, Ch. 4, Table A4.1). List of tables available online, <http://dx.doi.org/10.1787/888933366479>.

Figure 13: Average use of ICT and numeracy skills at work



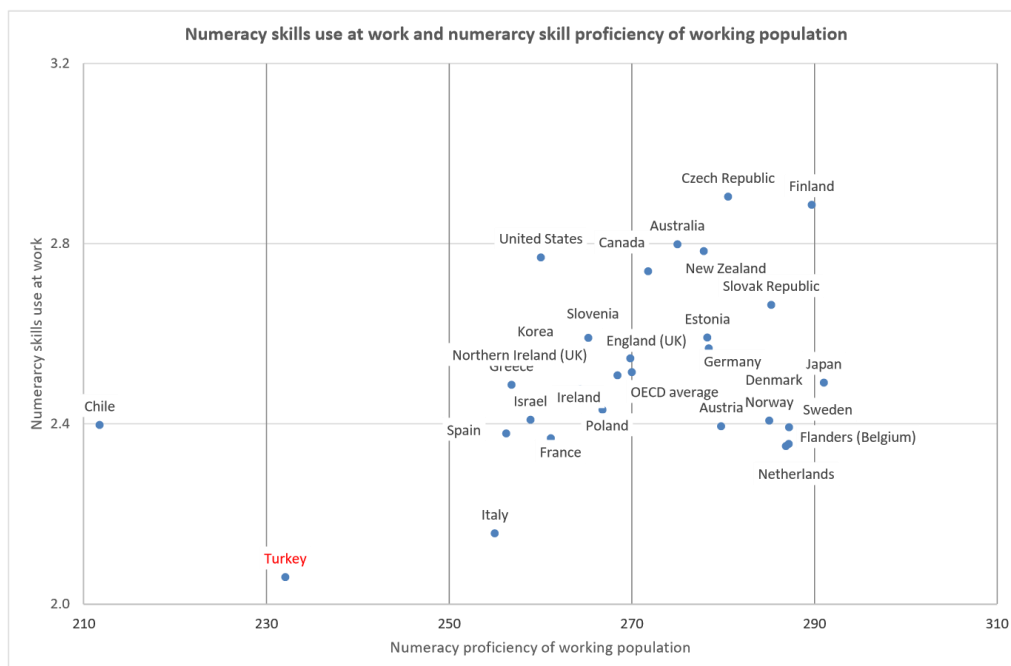
Retrieved from OECD (2016a: Annex A, Ch. 4, Table A4.1). List of tables available online, <http://dx.doi.org/10.1787/888933366479>.

Figure 14: Literacy skill use at work and skill proficiency of working population



Retrieved from OECD (2016a: Annex A, Ch. 4, Table A4.4).
<http://dx.doi.org/10.1787/888933366479>.

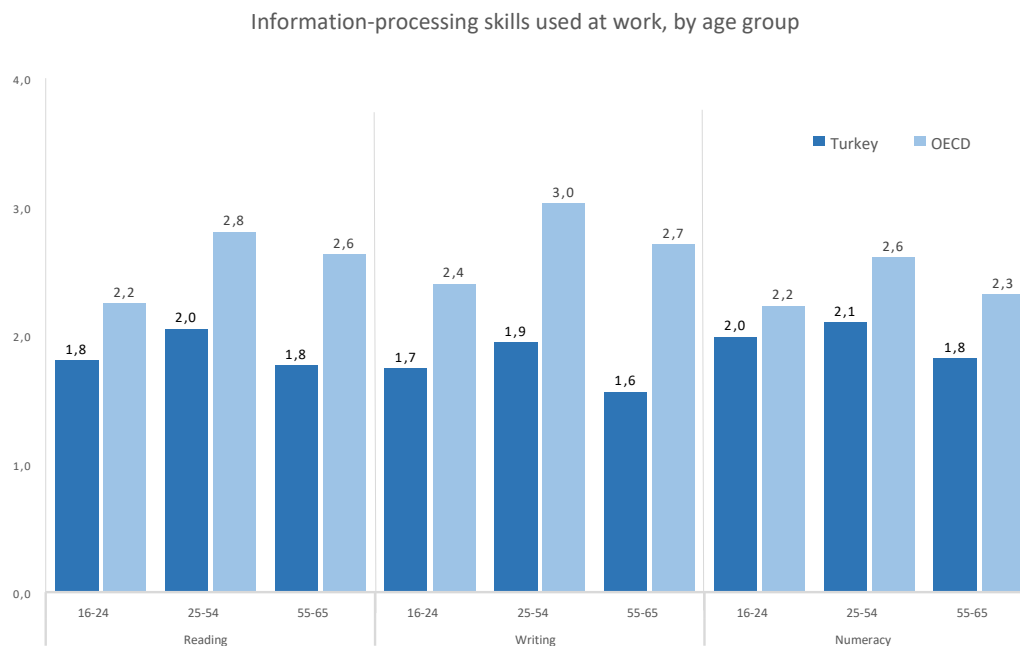
Figure 15: Numeracy skill use at work and skill proficiency of working population



Retrieved from OECD (2016a: Annex A, Ch. 4, Table A4.4).
<http://dx.doi.org/10.1787/888933366479>.

The fact that adults in Turkey have significantly lower level of skill use at work needs further clarification. Several factors can be at play. One candidate is the generational and educational differences. Labor market dynamics may also account for the outcome. It is possible that production technologies, work organization and job requirements are not so demanding for such skills, hence labor market offers less incentive for workers to use their skills. It is very likely that low labor demand requirements and low skill supply reinforce each other and generate a feedback mechanism. Using less skills (tasks including writing and reading reports, memos etc. at work) implies lower levels of cooperation and coordination at work place. These skill levels and their frequency of use at work are closely related to a firm's inner organization. Learning through interaction in the workplace is an important aspect of skill development, Eraut (2007). There are several studies showing that trust, cooperation and collaboration have close correlation with learning at the workplace (Steensma, 1996) and (Dodgson, 1993). Higher level of cooperation among co-workers and better coordination of teamwork require frequent use of writing and reading skills. When skill use at work yields less generous returns, also reflecting the demand side of the labor market, then it is optimal for individuals not to invest heavily in those skills.

Figure 16: Information-processing skills used at work, by age group



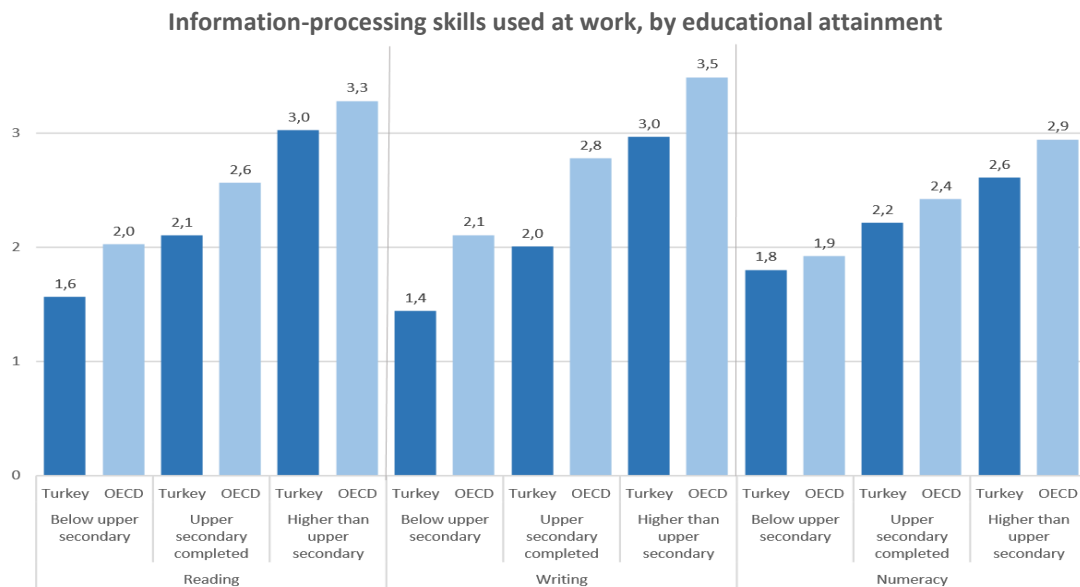
Retrieved from OECD (2016a: Annex A, Ch. 4, Table A4.8a).

<http://dx.doi.org/10.1787/888933366479>

We will further compare the performance of subgroups with respect to OECD averages. Figure 16 displays use of skills at work for broad age groups. While the oldest (55–65 year-olds) generation has very low scores compared to OECD averages for

numeracy skill use at work, the youngest generation (16–25 year-olds) performs relatively better. As for writing skill use at work, differences among generations do not change much and the gap with OECD average is still very substantial. As for the use of reading skill at work, the performance of younger generation is close to OECD averages, but still very low in terms of frequency. Considering that the younger generations have higher education attainment, we may argue that increased access to education has increased reading and numeracy skills, but not enough to close the gap. It seems that the performance of younger generations in terms of skill proficiency is not enough to catch-up with their peers in developed countries.

Figure 17: Information-processing skills used at work, by educational attainment



Retrieved from OECD (2016a: Annex A, Ch 4, Table A4.9a).
<http://dx.doi.org/10.1787/888933366479>.

Breakdown by broad education level can provide more insight on how labor demand can promote skill use at work (Figure 17) in Turkey. It is interesting that numeracy skill use gap varies much with educational attainment; in fact, we can say that the gap becomes even slightly larger as education attainment increases. For writing skill use, we observe that higher than upper secondary level in Turkey is just above the level of upper secondary completed level of OECD averages. Adults with upper secondary level have a frequency of use less than below secondary level of OECD averages. It is probable that generational difference in skill use boosts the existing gap in use of writing skill further. For reading, again, adults with upper secondary level have nearly the same frequency of

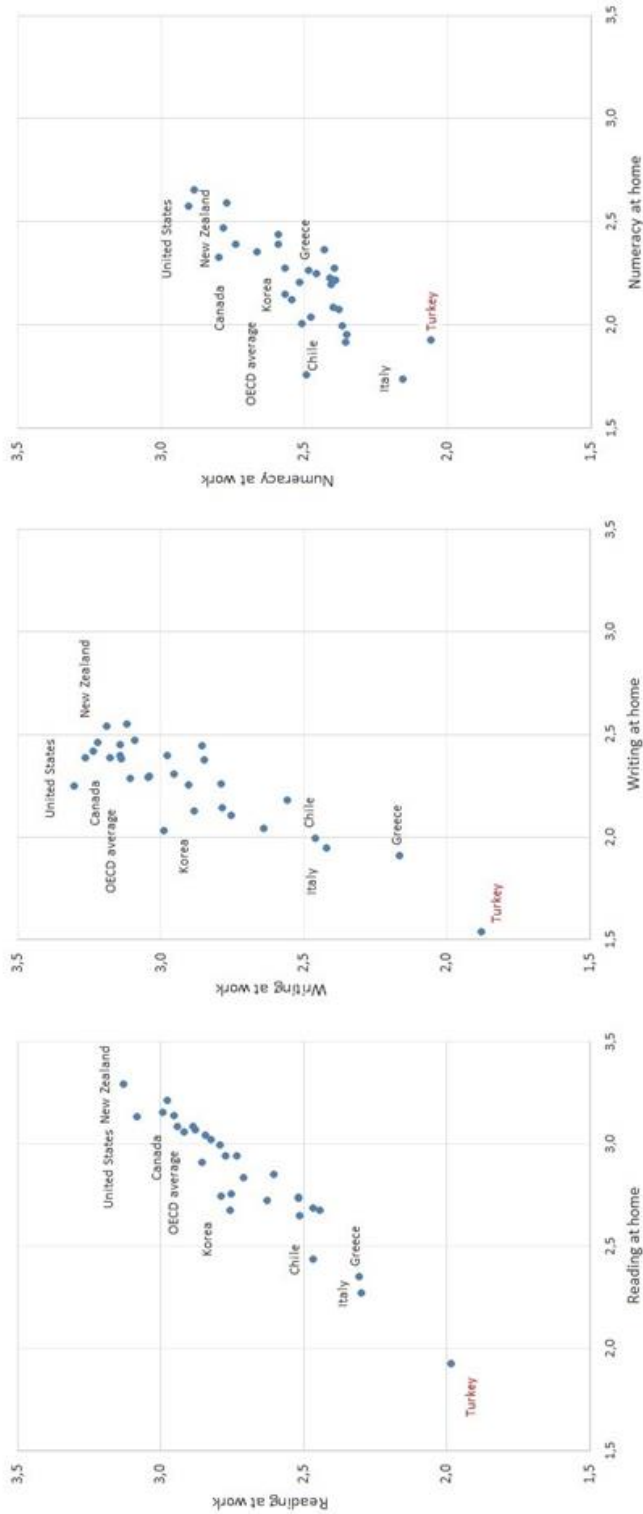
use as the adults with below secondary education level of OECD countries. Recent studies suggest that significant share of workers graduated from vocational high school have job that require basic education and cannot use their formal training at work, Aydede and Orbay (2016).

Another dimension which might help understand why use at work is quite low for Turkey, is the skill use at home. Figure 18 puts three type of skills at work and at home together. It is quite revealing that writing and numeracy skills are more frequently used at work rather than at home for OECD countries. It is possible that these activities are mostly job related and used to fulfil job requirements. Either it is the workplace organization that promotes frequent use of these skills, or it is the relative returns in using these skills that motivate workers. Reading skill is an exception. Adults, nearly in all OECD countries perform reading skills at home as often as they do at work. Turkey, in addition to less frequent use of reading skill at home (below level 2 - less than once a month on average), is one of the very few exceptions where reading at work is higher than reading at home. This observation also lends support to our previous argument that structural factors are at play. Performing less sophisticated tasks (basic use) at work is related to labor demand dynamics and the organization of work within the firm. Furthermore, Hamalainen et al. (2019) draw attention to the close relation between skill use at home and at work. They find that adults showing low performance in problem solving skills tend to use less of their skills both at work and at home.

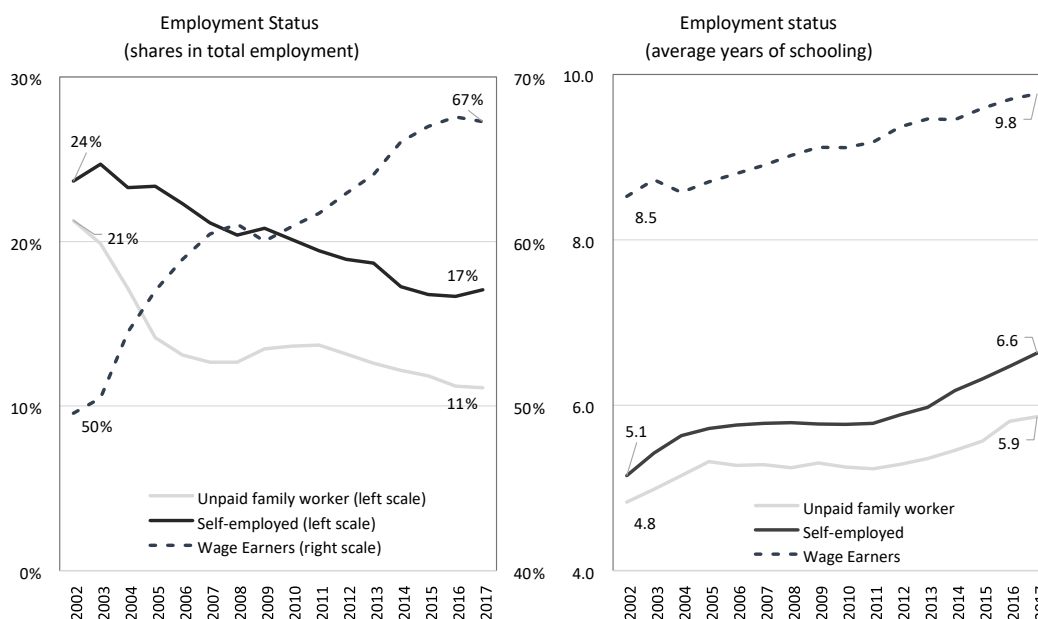
We need to discuss briefly the structural factors that are likely to explain the low use of skills in Turkey. One main factor could be the composition of employment status in Turkey. Compared to OECD countries, the share of paid work is still low (67.0%) in Turkey and that of self-employed and unpaid family workers are relatively high, (16.8% and 11.8%, respectively as of the PIAAC survey year 2015).¹¹ It is possible that paid employment requires more use of skills such as writing and reading at work than other labor status like self-employment. Although we observe a significant structural transformation (Figure 19), the share of “market labor” is still not so high and educational attainment for wage earners is low. We observe that educational gap between different employment status remains significant throughout the period. Average years of schooling of non-market labor is now around 6 which does not even reach to 8-year primary school attainment.

¹¹ As of 2015, the share of self-employment in total employment is 32.86%. Self-employment is defined by OECD as the employment of employers, workers who work for themselves, members of producer co-operatives, and unpaid family workers. OECD (2018), Self-employment rate (indicator): <http://dx.doi:10.1787/fb58715e-en> (Accessed on 08 December 2018).

Figure 18: Average use of information-processing skills at work and in everyday life



Retrieved from OECD (2016a: Annex A, Ch. 4, Table A4.2). <http://dx.doi.org/10.1787/888933366479>.

Figure 19: Evolution of main types of employment status in Turkey

Data: Turkish Household Labor Force Surveys (2002-17), authors own calculations.

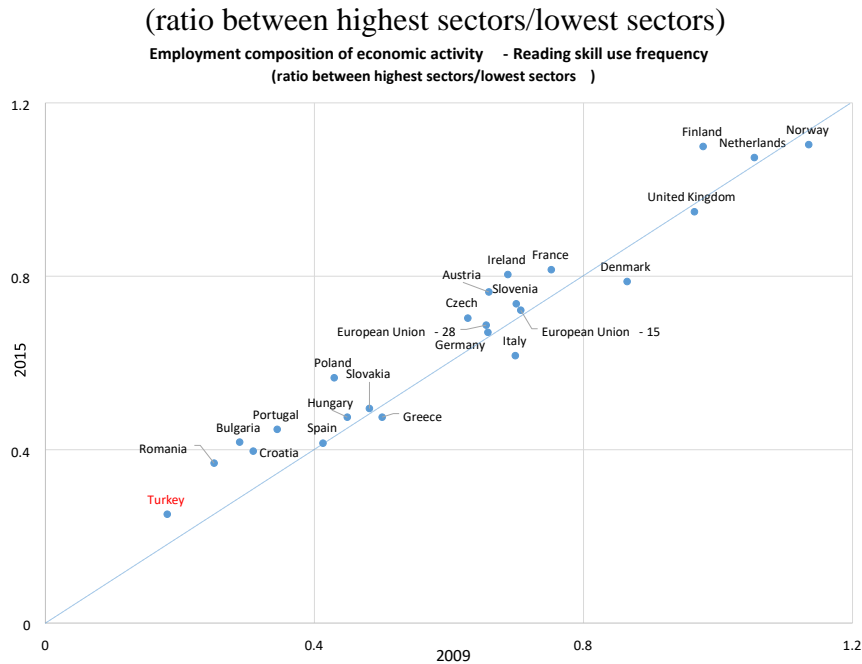
It seems that adults use numeracy skills relatively more at work, probably for practical reasons. Another factor which could explain lower skill demand in Turkey is the higher share of small firms in employment. To make a comparison, the share of small firms (1-19 employees) is around 40.8%.¹² It would be reasonable to assume that as the size of firm grows, the division of labor and complexity of task needs more communication in order to sustain coordination and cooperation.¹³ We should also underline that among OECD countries, the lowest use of writing and reading skills are mostly concentrated in sectors like construction, food and beverage service activities, food products and wearing apparel.¹⁴ These are the sectors that mostly attract less qualified workers in Turkey due to structural factors. Moreover, in terms of international trade, Turkey has a comparative advantage in sectors like manufacture of wearing apparel. We could say that the low skill use at work partly reflects sectoral composition in Turkey.

¹² OECD (2017: 44) <http://dx.doi.org/10.1787/888933565013>

¹³ OECD (2016a) also documents that skill use increases as the size of the firm grows for average OECD countries. See OECD (2016a: 111, Figure 4.11)

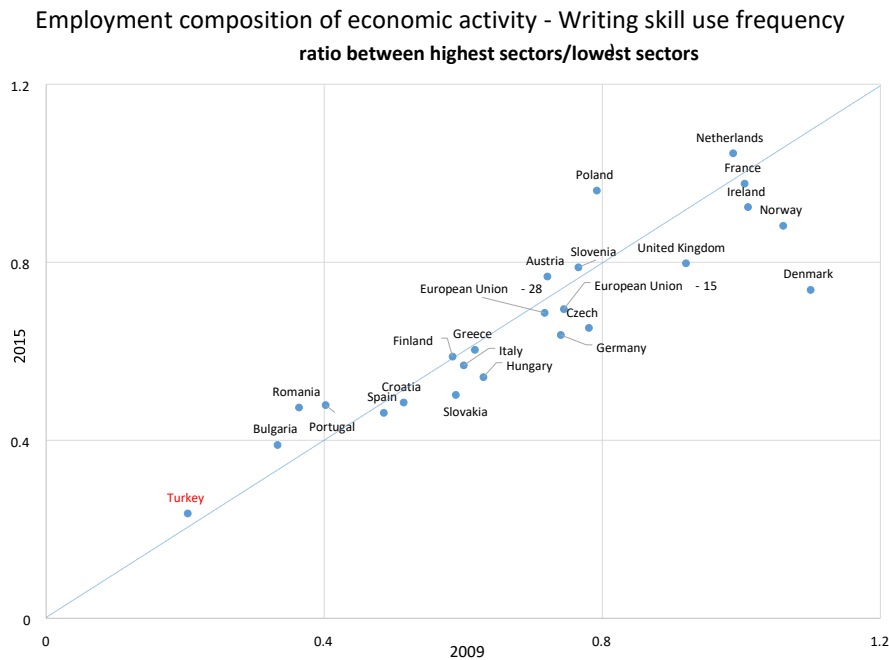
¹⁴ OECD (2016a: 109, Table 4.2)

Figure 20: Employment composition of economic activity - Reading skill use frequency



Data source: Eurostat (based on EU Labour Force Survey data) Employment of population 15 years or over. Further information: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfsa_egan22d&lang=en

Figure 21: Employment composition of economic activity - Writing skill use frequency



Data source: Eurostat (based on EU Labour Force Survey data) Employment of population 15 years or over. Further information: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=lfsa_egan22d&lang=en

Using the ranking of OECD (2016a)¹⁵ which documents how skill use varies across sectors, we calculated share of highest skill use with respect to lowest use. Figure 20 and 21 show how Turkey fits into with respect to European countries. Turkey has the lowest employment ratio among European countries, when sectors are grouped according to highest and lowest skill use in reading and writing. Although the share of highest use sectors in employment has increased compared to 2009, the relative position of Turkey remained intact since employment of highest use sectors have increased for other countries as well.

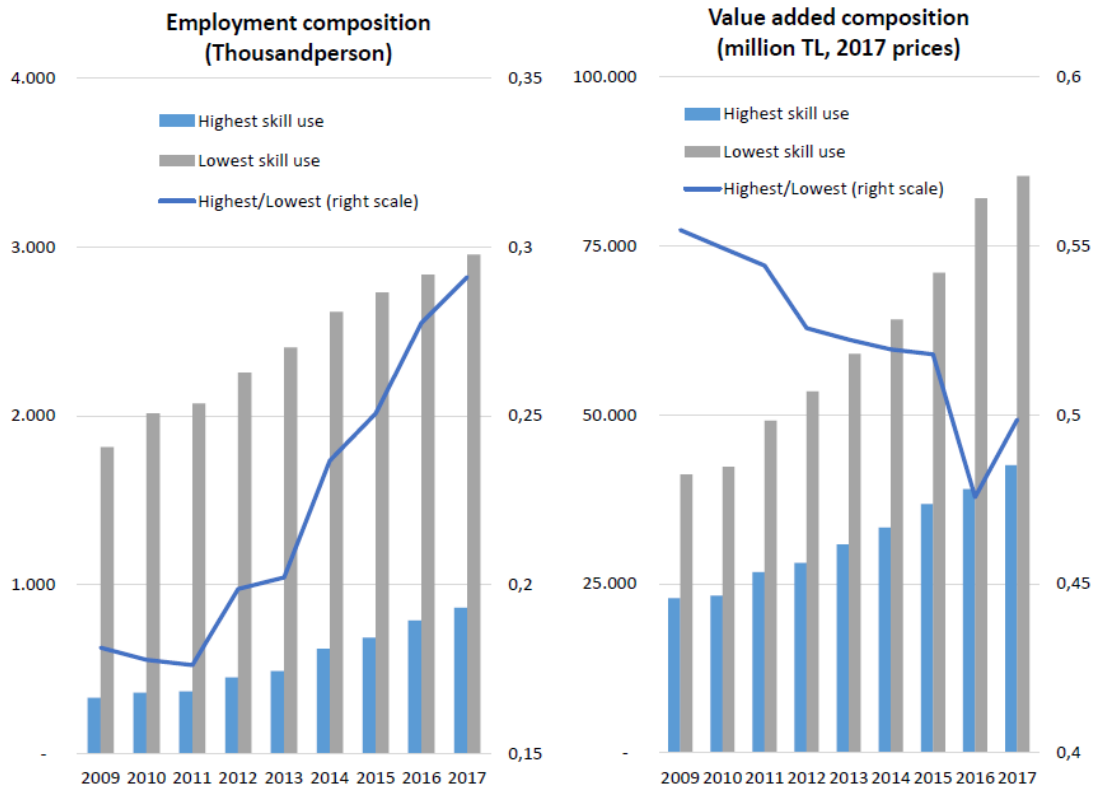
Comparing value-added in factor prices of these sectors might be useful to understand how production evolved throughout 2009-17. When we calculate the value-added ratio of these sectors, we can see that while relative employment share has increased across years, value added share witnesses a decline (Figure 22). It is hard to speculate whether there is productivity difference, but inverse correlation suggests at least a weak output growth for highest use sectors. When we compare employment share of age groups (figure 23), employment of highest use sectors has increased in 25-34 year-olds but less so for the 35-44 year-olds which probably reflects the generational educational gap mentioned above.

4. Labor Market Outcomes and Skills

The observation that the level of literacy and numeracy skill proficiencies are relatively low and their use at work are very limited raises the question whether these skills are sufficiently rewarded at the labor market. Low returns to skills can be a reason why individuals do not invest in skill development during formal education or training at workplace in Turkey. It is possible that skill proficiencies serve as a signal in the labor market and might hence increase the employability of adults. Table 4 gives the marginal effect of education and skill proficiency on the likelihood of being employed for each OECD country. It is interesting to see that although educational attainment increases the likelihood of being employed in most countries, formal education level does not have a positive and significant effect for Turkey. Numeracy skill, on the other hand, has a positive and significant impact, and apparently gives more information/signal on the quality of workers.

¹⁵ See OECD (2016a: 109)

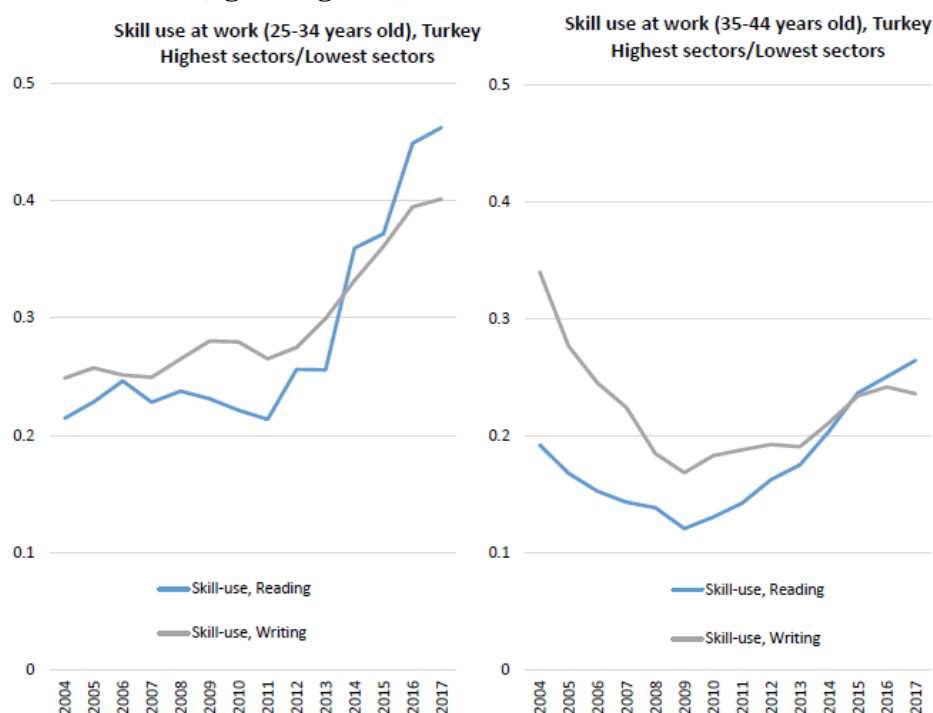
Figure 22: Employment and value-added in high and low use of information-processing skills at work



Data: Turkish Household Labor Force Surveys (2002-17) and authors own calculations are based on OECD (2016a).

Note: For skill use in reading, OECD (2016a) report sectors (ISIC 2-digit code) with highest use as 62, 69, 71, 72 and 70 and for lowest skill use as 10, 15, 38, 56 and 81. For skill use in writing, OECD (2016a) report sectors with highest use as 61, 64, 65, 69 and 70 and for lowest skill use as 14, 15, 56, 81 and 96.

Figure 23: Employment in high and low use of information-processing skills at work (age categories)



Data: Turkish Household Labor Force Surveys (2002-17), authors own calculations are based on OECD (2016a).

Note: For skill use in reading, OECD (2016a) report sectors (ISIC 2-digit code) with highest use as 62, 69, 71, 72 and 70 and for lowest skill use as 10, 15, 38, 56 and 81. For skill use in writing, OECD (2016a) report sectors with highest use as 61, 64, 65, 69 and 70 and for lowest skill use as 14, 15, 56, 81 and 96.

Table 4: Effect of education and skill proficiency on the likelihood of being employed

	Dependent variable: Employed							
	Years of education		Proficiency (literacy)		Years of education		Proficiency (numeracy)	
	Marg. Prob.	p-value	Marg. Prob.	p-value	Marg. Prob.	p-value	Marg. Prob.	p-value
Turkey	-0.135	0.855	1.601	0.119	-0.339	0.657	1.735	0.055
OECD Average	3.131	0.000	0.836	0.062	2.699	0.000	1.681	0.002

Retrieved from OECD (2016a: Chapter 5, Table A5.2 (N) and Table A5.2 (L)).

<http://dx.doi.org/10.1787/888933366489>

Marginal effects (as percentage-point change) of education and numeracy on the likelihood of being employed among adults not in formal education.

Another outcome of labor market where skills may have a significant impact is the hourly wages. OECD (2016a) report (chapter 5) provides wage regressions at the country level, estimating the contribution of skills after controlling for major determinants such as education, experience and tenure. Wage regressions indicate that education seems to

serve as a better predictor of ability than skills do, since returns to education (years of schooling) are well above OECD averages, while skill returns are not statistically significant in the regressions.¹⁶ One other way to understand the impact of skill on wages is to look at the variation of wages. OECD (2016a) study also provides regression-based decompositions (Table 5), which can explain the effect of endowments (education, experience, skill proficiencies) and other factors for each country. Results show that, compared to other countries, literacy and numeracy skills in Turkey have a relatively small and statistically insignificant impact. Major human capital proxies like education, experience and field of study could account for more than 25% of total variation in adults' hourly wage in Turkey. As far as PIAAC sample of Turkey, we can argue that only numeracy skills can be signal for employability but do not overall effect of skills on labor market outcomes is not significant.

Table 5: Contribution of education, literacy and numeracy to the variation in hourly wages

	Proficiency (literacy and numeracy)	Education	Field of study	Experience	Individual characteristics
	% explained	% explained	% explained	% explained	% explained
Turkey	1.1	11.5	4.2	11.6	0.3
OECD Average	4.8	12.5	1.4	8.8	4.2

Contribution of each factor to the percentage of the explained variance (R-squared) in hourly wages. Retrieved from OECD (2016a: Chapter 5, Table A5.5). <http://dx.doi.org/10.1787/888933366489>

Lastly, we will briefly discuss workers' mismatch of skills and qualifications based on the methodology used in OECD (2016a) report. Qualification mismatch is defined in terms of subjective assessment of each worker for his/her job requirements (educational attainment level).¹⁷ Workers are classified as overqualified if their self-reported educational attainment level is higher than their own evaluation specific for their job. Skill mismatch refers to a classification based on the ranges of skill levels measured in that job. A worker is qualified as under-skilled (over-skilled) if his/her skill proficiency is below (above) the minimum (maximum) value measured.¹⁸ The last mismatch is related to fields of study, and arises when workers are employed in a different field from the education they received. It seems that mismatch ratios are very close to OECD

¹⁶ OECD (2016a: Chapter 5, Table A5.4).

¹⁷ Related question is "If applying today, what would be the usual qualifications, if any, that someone would need to get this type of job?"

¹⁸ The survey asked workers whether they feel they "have the skills to cope with more demanding duties than those they are required to perform in their current job" and whether they feel they "need further training in order to cope well with their present duties". According to the survey's measure of skills mismatch, workers are classified as well-matched in a domain if their proficiency score in that domain is between the minimum and maximum score observed among workers who answered "no" to both questions in the same occupation and country. Quintini (2014: 41-42).

averages and there is no apparent dissimilarity specific to job-matching in Turkey (Table 6). Given the low level of skill proficiency, the moderate level of under-qualification raises the question of low labor demand requirements. OECD (2016a) study documents lower or sometimes insignificant variation with respect to age-groups and firm-size.

Table 6: Qualification, literacy and field-of-study mismatch (% of mismatched workers, by type of mismatch)

	Qualification mismatch			Skills mismatch						Field-of-study mismatch	
	Well-matched	Over-qualified	Under-qualified	Literacy			Numeracy			Well-matched	Mismatched
				Well-matched	Over-qualified	Under-qualified	Well-matched	Over-qualified	Under-qualified		
Turkey	75.5	11.6	12.9	84.7	12.8	2.5	87.5	6.1	6.4	56.2	43.8
OECD average	65.6	21.7	12.7	85.4	10.8	3.8	85.6	10.5	3.9	60.4	39.6

Source: OECD (2016a: Chapter 5, Table A5.7).

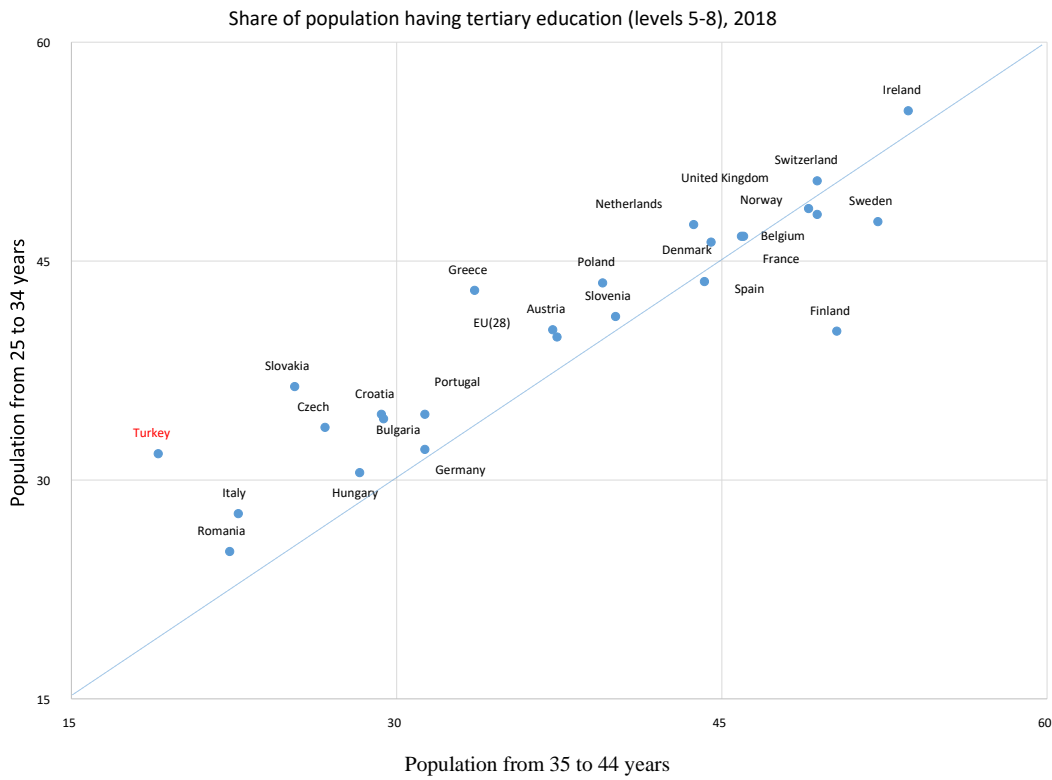
5. Discussion

The picture emerging from Adults' skill survey show that Turkey cannot provide enough quality education and training for adults. It is clear that Turkey is lagging far behind most OECD countries in almost all aspect of skill proficiency. Besides skill supply, there is also the issue of demand for such skills. If labor market does not sufficiently reward skill use, it would not induce workers to invest in skill promotion. From this perspective, it is not a coincidence that we observe low levels of skill proficiencies and skill use at work in all three domains (reading, writing and numeracy) in Turkey. The fact that there is so little improvement in years of schooling put into question the funding of education. Compared to OECD countries and Euro (22), it is apparent that Turkey is spending not less in terms of its GDP. However, the composition of spending suggest that tertiary education has a priority. Obviously, this is the result of ongoing expansion in higher education that started in 2006. We can detect the expansion effect between age groups (Figure 24). Compared to age group 34-44 year-olds, younger generation is significantly more educated. The share of tertiary graduates exceeds 30%, nearly catches that of Germany.

When we discuss PIAAC results in terms of education level, we underline the fact that average proficiency level of a tertiary graduate in Turkey is equivalent to secondary education level of average OECD countries. The picture hardly changes even when we compare younger age groups which supposedly have higher education than older ones. Figure 25 show that much of the tertiary expansion has increased the share of shorter cycle (2-years vocational) higher education. It is likely that the quality of these short-cycle vocational institutions is very limited in improving skill proficiency.

Unfortunately, because the household labor force surveys do not provide any distinction within tertiary education level, we do not have any information on wage premiums.

Figure 24: Share of tertiary graduates by age groups

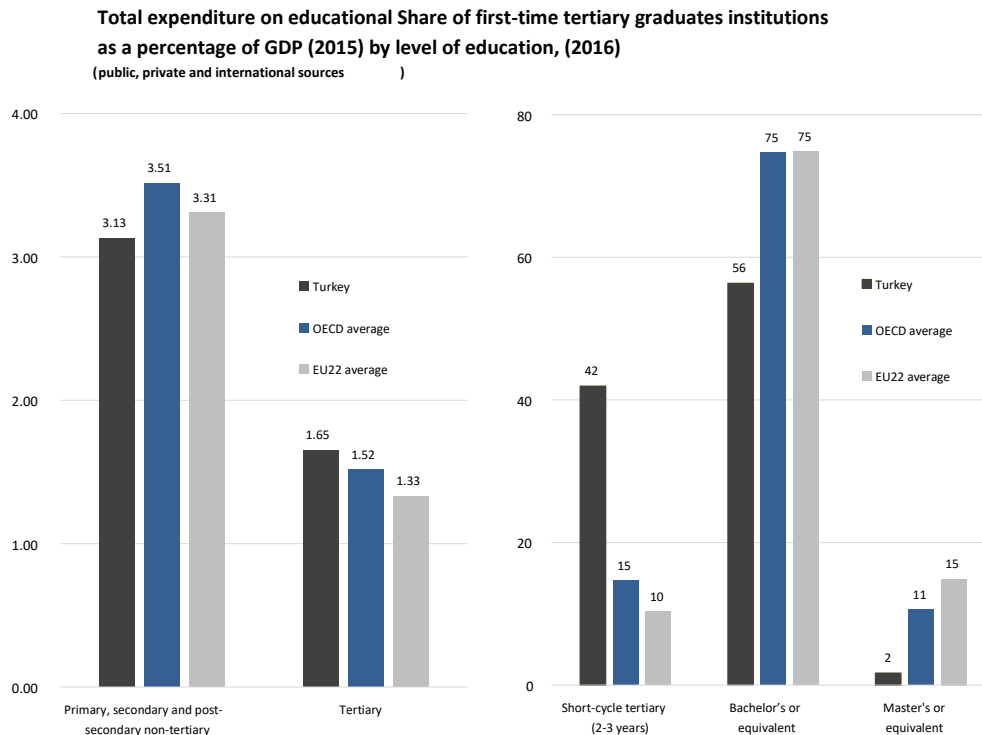


Data source: Eurostat (based on EU Labour Force Survey data)

Note: Level-5-8 cover respectively, short-cycle tertiary education, bachelor's or equivalent level, master's or equivalent level and doctoral or equivalent level. Further information:

http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=edat_lfse_03&lang=eng

Figure 25: Total expenditure on educational institutions and composition of tertiary graduates



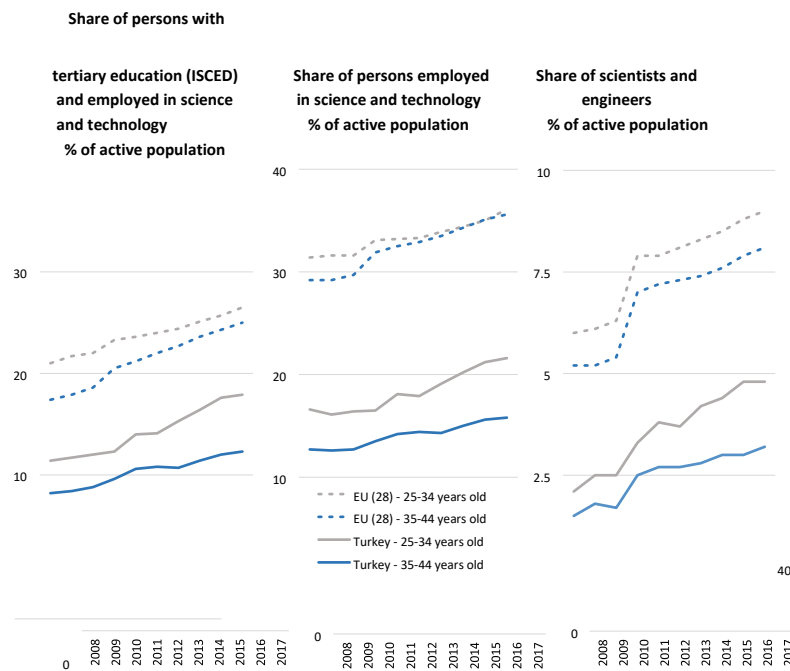
Data source: OECD (2018). Further information.

https://www.oecd-ilibrary.org/education/education-at-a-glance-2018_eag-2018-en

The supply side is relatively easy to detect, however skill demand and labor market rewards are hard to measure. We will present two complementary observations from different classifications of skill demand. Figure 26 compares Turkey with European Union (28 countries) according to three indicators of human resources in science and technology.¹⁹ In order to differentiate the generational trends, three indicators are regrouped for relatively younger age-groups. The gap in human resources is quite huge for Turkey. Average employment share of EU(28) are almost doubling that of Turkey. However, the expansion in higher education which started in 2006 seems to change the trend in a positive way. It is good news that younger generation (25–34 year-olds) performs better than older generation (34–45 year-olds). While it seems that there is a convergence for age-groups in EU in recent years, there is a divergence for Turkey.

¹⁹ This indicator is based on occupational classification. See the notes in below the figure

Figure 26: Human Resources in Science & Technology



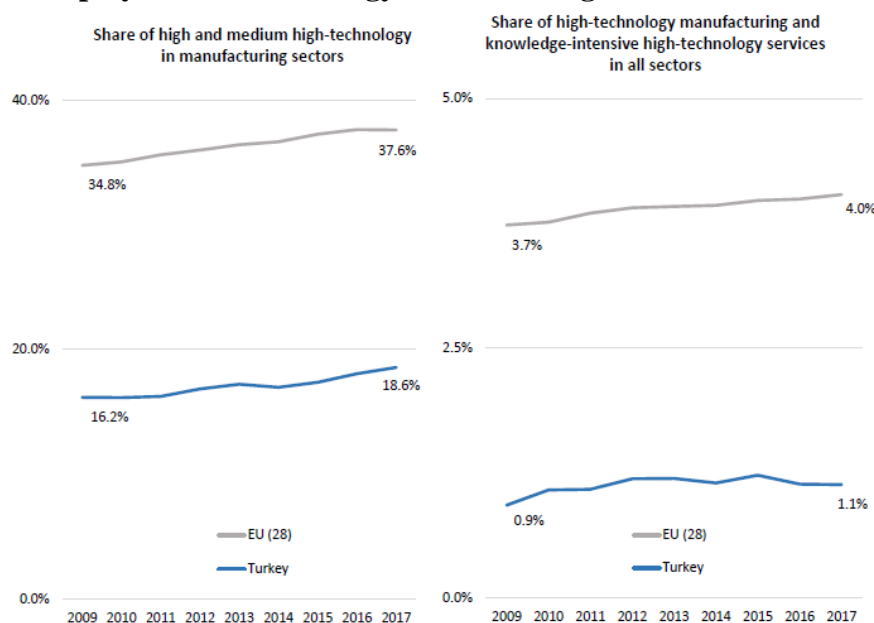
Data source: Eurostat (based on EU Labour Force Survey data)

Note: Human resources in science and technology by occupation include ISCO-08 major groups 2 and 3; Scientists and engineers include people who work in ISCO-08 groups 21 Science and engineering professionals, 22 Health professionals, 25 Information and communications technology professionals

further information:

http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=hrst_st_ncat&lang=en

The last indicator of skill demand is the employment shares of technology and knowledge intensive sectors. Figure 27 displays the comparison of Turkey with respect to EU(28). It is evident that the structural gap between EU(28) and Turkey did not change across years. High and medium technology sectors have a relatively less weight in the manufacturing sector and knowledge intensive sectors have much less share in the total sectoral composition. There is almost no convergence in sectoral employment shares when we take into account the knowledge content in total output. Note that knowledge intensive distinction is important for service sectors particularly in term of service exports in EU(28) countries. Figure 27 certainly reflects relatively poor performance of service exports in Turkey, compared to other developed countries.

Figure 27: Employment in technology and knowledge-intensive sectors

Data source: Eurostat

Note: High and medium technology sectors include in NACE Rev.2 (2-digit) 21, 26, 20, 27, 28, 29, 30, 19, 22, 23, 24, 25, 33. Knowledge-intensive services sectors include in NACE Rev.2 (2-digit) 59, 60, 61, 62, 63, 72. Further information:

http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=htec_emp_nisced2&lang=en

6. Conclusion

Our assessment of PIAAC results for Turkey remains within the limits of OECD (2016a) report. Despite this limitation, there are several key points worth emphasizing, particularly for public policy. We observe that adults in Turkey lack the skill proficiency required for sophisticated information processing tasks (level 3) and can only perform basic tasks on average with low skill level for literacy and numeracy (level 2). The use of skills at work or in everyday life has a frequency of less than once a month. Moreover, we repeatedly observe that the educational system has a limited capacity to upgrade skill proficiency, with labor market dynamics not encouraging their use. Although access to education has considerably increased (8 years of compulsory schooling in 1998, higher education expansion since 2006), the younger population's performance does not get close to their peers' in other OECD countries. The performance gap remains substantial. Turkey's education system has to shift focus from quantity to quality and prioritize skill upgrading at work as well as at formal education. Low returns to skill is another institutional issue which probably reflects the structure of the economy and labor demand dynamics. Lack of incentives in the labor market restricts skill development of workers and leads to low investment in skill upgrading. We think that increases in product sophistication require enhanced proficiency in reading and writing so as to

coordinate division of labor and sustain cooperation within the firm. It seems that this challenge needs further institutional elaboration for Turkey at all levels of skill development.

References

- Aydede, Y. and B. Z. Orbay (2016), "Comparison of Economic Benefits of University and Vocational High School Education Among Different Majors in Turkey," *European Journal of Higher Education*, 6(2): 176-192.
- Bol, T. and H. G. Van de Werfhorst (2013), "Educational systems and the trade-off between labor market allocation and equality of educational opportunity," *Comparative Education Review*, 57(2): 285-308.
- Broecke, S., G. Quintini and M. Vandeweyer (2017), "Explaining International Differences in Wage Inequality: Skills Matter," *Economics of Education Review*, 60: 112-124.
- Dodgson, M. (1993), "Learning, Trust, and Technological Collaboration," *Human Relations*, 46(1): 77-95.
- Eraut, M. (2007), "Learning from Other People in the Workplace," *Oxford Review of Education*, 33(4): 403-422.
- Hamalainen, R., B. De Wever, K. Nissinen and S. Cincinnato (2019), "What Makes the Difference—PIACC as a Resource for Understanding the Problem-Solving Skills of Europe's Higher-Education Adults," *Computers & Education*, 129: 27-36.
- Hampf, F. and L. Woessmann (2017), "Vocational vs. General Education and Employment Over the Life Cycle: New Evidence from PIAAC," *CESifo Economic Studies*, 63(3): 255-269.
- Hanushek, E. A., G. Schwerdt, S. Wiederhold and L. Woessmann (2015), "Returns to Skills Around the World: Evidence from PIAAC," *European Economic Review*, 73: 103-130.
- Hidalgo-Cabrillana, A., Z. Kuehn and C. Lopez-Mayan (2017), "Development Accounting Using PIAAC Data," *SERIEs*, 8(4): 373-399.
- Jimeno, J. F., A. Lacuesta, M. Martinez-Matute and E. Villanueva (2016), "Education, Labour Market Experience and Cognitive Skills: Evidence from PIAAC," Technical report, Banco de España.
- Liu, H. (2018), "Education Systems, Education Reforms, and Adult Skills in the Survey of Adult Skills (PIAAC)," OECD Education Working Papers No. 182.

- OECD (2016a), *Skills Matter: Further Results from the Survey of Adults Skills*, OECD Publishing.
- OECD (2016b), *The Survey of Adult Skills: Reader's Companion*, OECD publishing.
- OECD (2017), *Entrepreneurship at a Glance 2017*, OECD Publishing.
- OECD (2018), *Education at a Glance 2018*, OECD Publishing.
- Polat, S. (2017), "The Expansion of Higher Education in Turkey: Access, Equality and Regional Returns to Education," *Structural Change and Economic Dynamics*, 43: 1-14.
- Quintini, G. (2014), "Skills at Work: How Skills and Their Use Matter in the Labour Market," OECD Social, Employment and Migration Working Papers No. 158.
- Steensma, H. K. (1996), "Acquiring Technological Competencies Through Inter-Organizational Collaboration: An Organizational Learning Perspective," *Journal of Engineering and Technology Management*, 12(4): 267-286.
- Stijepic, D. (2018), "Employment Effects of Skills Around the World: Evidence from PIAAC," *International Labour Review*, 159(3): 307-338.
- Verhaest, D., J. Lavrijsen, W. Van Trier, I. Nicaise and E. Omey (2018), "General Education, Vocational Education and Skill Mismatches: Short-Run Versus Long-Run Effects," *Oxford Economic Papers*, 70(4): 974-993.

Appendix

Table A1: Measuring the use of information-processing skills (Survey of Adult Skills)

Value	Frequency
1	"Never carried out"
2	"Less than once in a month"
3	"Less than once a week but at least once a month"
4	"At least once a week"
5	"Every day"

Source: OECD (2016a: 97, Ch. 4, Box 4.1).

Table A2: Group of tasks measured for each skill

Skills put to use at work/everyday life	Group of tasks measured in the survey
Reading	Reading documents (directions, instructions letters, memos, e-mails, articles, books, manuals, bills, invoices, diagrams, maps)
Writing	Writing documents (letters, memos, e-mails, articles, reports, forms)
Numeracy	Calculating prices, costs or budgets; using fractions, decimals or percentages; using calculators; preparing graphs or tables; using algebra or formulas; using advanced mathematics or statistics (calculus, trigonometry, regressions)
ICT Skills	Using e-mail, Internet, spreadsheets, word processors, programming languages; conducting transactions on line, participating in online discussions (conferences, chats)

Source: OECD (2016a: 97, Ch. 4, Box 4.1).