Trends in the Labor Market

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Taub Center for Social Policy Studies in Israel

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Abstract

This work looks at two highly influential trends in Israel's current and future labor market. One has to do with changing occupational distribution; the other relates to changes in returns to education. The study finds that between 2013 and 2015 the number of work hours rose in those occupations at low risk of automation and computerization while the number of work hours in high risk occupations fell. This trend was especially prominent among women, and to a lesser extent among Arab Israelis and immigrants (versus the non-immigrant Jewish population).

An examination of returns to education finds an increase in the contribution of one year of formal education to wages between 2003 and 2014. Here, too, there are differences between men and women and the different social sectors. Especially prominent is the relatively consistent rise in the returns to education among immigrant men, and the larger increase among women than among men.

On the one hand, these developments reflect the Israeli labor market's resilience and the opportunities available in it as the labor force adapts to an information and service economy. On the other hand, there are implications regarding wage distribution, among them the polarization in the labor market and rising wage inequality.

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1. Occupational risk of automation and computerization: Recent developments

In a study published in the Taub Center's State of the Nation Report 2015, Shavit Madhala-Brik looked at trends in occupational risk (the risk of production process automation or computerization) within the Israeli labor market for the period 1995 to 2011 (Madhala-Brik, 2015).[1] This kind of risk emerges during the transition from a traditional economy powered by traditional industry and production methods, to an information and service economy, in which the high-tech and service sectors become the main growth engines, at traditional industry's expense. As in other developed countries, some occupations in the Israeli labor market have a relatively high probability of extinction, due to modernization of the economy and the labor market. Madhala-Brik's research shows that, in 2011, nearly 40 percent of Israel's labor supply, i.e., the total number of work hours in the economy, were in occupations at high risk of automation — meaning that employment in these occupations, in its current form, could be expected to cease over the next 20 years.[2] However, the study also found that the relative share of the labor supply in occupations at high automation/computerization risk declined over time — a trend that reflects changing occupational distribution.

The present study continues this line of research using more current data, and asks whether the relative share of those employed in high-risk jobs continued to decline, and whether the move toward lower risk in occupational distribution has occurred equally among workers in different sectors of Israeli society. An analysis of the trends found that the relative share of workers in occupations whose average probability of computerization is the highest, continued to drop between 2013 and 2015, but that the degree of change was more modest among minority groups, including Arab Israelis and immigrants.[3] Growing differences in occupational distribution between different sectors might also produce larger labor market disparities.

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1 The term "occupational risk" denotes the risk of a given occupation disappearing from the labor market, or completely changing its character. As such, the concept has direct bearing on occupational security.

2 It is important to remember that some workers who lose their employment in its current form will adjust to the economy's needs and find alternate employment, whether similar or totally different. Others may remain without employment, but we cannot know in advance what percentage of those working today will be left without employment in the future. Automation and computerization also embody potential for the development of new occupations, whether in the computerization support sphere or occupations requiring human capabilities that cannot be automated, such as creativity or interpersonal skills.

3 Immigrants are defined as Jews and others by religion (according to the Central Bureau of Statistics) who immigrated to Israel from 1990 on (household religion is determined by the faith of the head of the household).

The analysis relied on the Central Bureau of Statistics (CBS) *Labor Force Survey* data from 2013 and 2015. The occupations were ranked by risk level according to the probabilities noted in Frey and Osborne (2013).[4] A major limitation was the inability to expand the analysis to the years before 2013, because the Central Bureau of Statistics switched to a new occupational classification system (ISCO-88) that organizes occupations at the highest level of aggregation.[5] In addition, in 2012, the Labor Force Survey sampling method was changed, making reliable comparisons to earlier years impossible. The study therefore focuses on assessing trends for 2013 to 2015.

In order to maintain consistency, insofar as possible, with the research method used in the trend analysis for the period up to 2011, the old codes had to be replaced with the new ones, and the smaller groups had to be merged (per ISCO-88) into seven main occupational categories. After the necessary adjustments, an average risk level ranking was obtained for each aggregate occupational group. Although there is a certain heterogeneity within each of the groups, the direction of change in the share of an aggregate occupational group makes it possible to study major patterns characterizing the labor market in recent years.[6]

In the first stage of the analysis, change patterns for the general labor force were assessed by gender. Figure 1 shows the change in the relative share of workers in each occupation group between 2013 and 2015. The occupation groups are organized by level of automation risk, from low (left) to high (right). For both men and women, the relative share of workers in low-risk occupations increased, while the relative share of workers in high-risk occupations decreased; the decline is more prominent among women than among men. The main driver of this change is a rise in the share of workers in the academic occupations category, and a decline in the share of clerical occupations. The sharp drop in the share of women in the clerical category may be a sign that certain administrative or secretarial jobs have already been automated or computerized. An example of the processes that contribute to change in the relative share of clerical occupation work hours

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4 For additional information see Madhala-Brik (2015).

5 The switch was from a detailed occupational classification structure (three and four digits) to a less detailed structure (two digits or even just one digit). Additionally, in order to ensure greater consistency within the aggregation groups, adjustments were made by moving occupations across categories.

6 As noted, grouped occupations represent the average risk within the group, and there is likely movement of workers from high-risk occupations to low-risk occupations within the aggregate group. Thus, the reported changes should be seen as an underestimation of labor force modernization processes. Also it should be noted that processes of industry extinction affect changes in the occupations' relative share.

is the closing of bank branches and the switch to Online and telephone banking. Alternately, the movement toward low-risk jobs may stem from rising demand for high-skill occupations, along with a work force in which, overall, women have higher education levels than men. Since there is an inverse relationship between computerization risk and wage level (Madhala-Brik, 2015, p. 66 , Figure 6), these changes in women's occupational categories are causing gender gaps in the labor force to decline (Fuchs, 2016).

Figure 1. Change in occupations' relative share of total work hours, 2013-2015
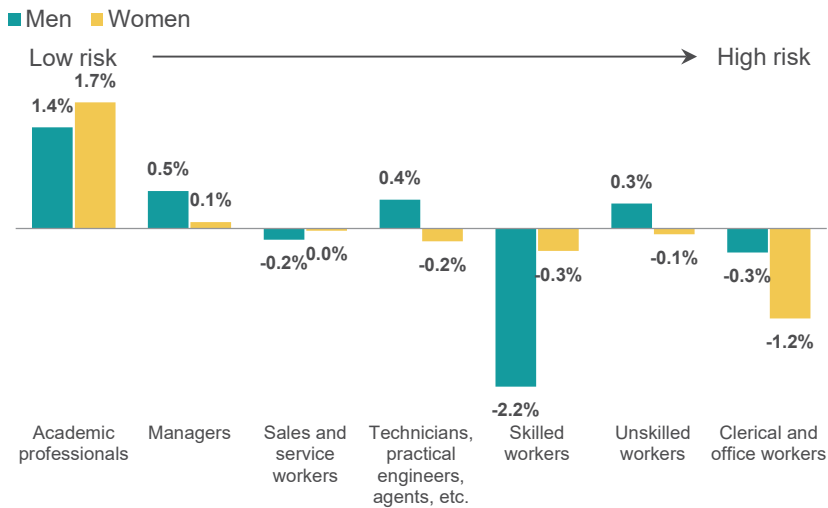
Note: Skilled workers includes those in construction, industry, light industry, and agricultural workers.
Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center | Data: CBS, *Labor Force Surveys*

At the second stage, a trend analysis was again carried out, but this time the focus was on comparing three separate groups: non-immigrant Jews, Arab Israelis and immigrants (Figure 2).[7] When comparing non-immigrant Jews and Arab Israelis, the most notable finding is a drop in the share of skilled Arab Israeli workers in industry and manufacturing, and a relatively large rise in the share of these workers in sales and services. These trends

7 The "non-immigrant Jews" category also includes the "others" category with reference to nationality; the "immigrants" category includes Jews who immigrated to Israel from 1990 on; the "Arab Israeli" category refers to Arab Israelis by nationality (according to the CBS classification).

point to a positive change (i.e., a decline) in automation risk. However, in the sphere of academic occupations, Arab Israelis show a more modest degree of change than do Jews. This finding indicates a lower level of improvement within the Arab Israeli population than within the Jewish population, regarding both automation risk and wage.

Figure 2. Change in occupations' relative share of total work hours, 2013-2015

Note: Skilled workers includes those in construction, industry, light industry, and agricultural workers.
Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center | Data: CBS, *Labor Force Surveys*

A possible reason for these differences is the relatively low skill level of male and female workers in the Arab Israeli sector. According to Adult Competencies in Israel survey data for 2014-2015 (CBS, 2016, p. 46, Figure 5), the percentage of people aged 16-65 with high reading skills[8] was 10 percent for Jews and just 1 percent for Arab Israelis, and the situation is even worse for older and female Arab Israelis (CBS, 2016, Figure 13). It is important to note that these differences are not exclusive to language skills; in mathematics as well, the share of those with high skill levels within the Arab Israeli population was only 1 percent, compared with 13 percent for Jews (CBS, 2016, p. 60, Figure 18).

8 Test-takers may choose their test language: Hebrew, Arabic or Russian.

Another possible explanation for the rising share of sales and service workers and the falling share of skilled workers is the differential adoption of information technologies (Autor and Dorn, 2013). On the one hand, there is a low level of skill among workers formerly employed in manufacturing, industry or construction, occupations that have since become less competitive due to industry's declining share of GDP. On the other hand, the cost of automating repetitive tasks has declined (personnel costs outstrip the cost of machines that perform the same tasks), forcing these workers to move to jobs in the service and sales sector, which still needs low-skilled workers. Nevertheless, we can also see the movement of workers who are improving their education levels (especially younger workers entering the labor market), and this may explain the abandonment of occupations requiring low skills in favor of academic or managerial occupations.

When comparing immigrant and non-immigrant Jewish workers, we find that, although both sectors show a drop in the share of skilled workers and a rise in the share of those employed in academic occupations. Among immigrants, the decline in the share of skilled workers is greater, while the rise in the share of academic occupational workers is smaller, relative to non-immigrant workers. Immigrants also differ from the other sectors in terms of an increased share of unskilled workers, who have the lowest average wage.

A look at the situation of immigrants who were employed in unskilled occupations in 2013 and 2015 by age, year of birth, and gender calls attention to several findings. First, between 2013 and 2015, among men who immigrated to Israel between 1990 and 1995, there was an exceptional increase in the share of those aged 45-54 in unskilled occupations, relative to other groups. Moreover, the share of men in the 35-44 or 55-59 age groups who immigrated to Israel between 2002 and 2007 in unskilled occupations increased markedly. These data may indicate sustained integration issues among older males who have been in Israel for over a decade. Among men who immigrated to Israel between 1996 and 2001, there was a rise in unskilled employment only in those belonging to the 25-29 age group. This finding indicates labor market entry on the part of male immigrants who were children at the time of immigration and are now at the start of their career trajectory. For men who immigrated to Israel from 2008 on, there was an increase in unskilled employment only among those aged 25-29 (the relative share of this age group rose from 2008 on; see Appendix Figures 1a and 1b), meaning that these trends may be seen as indicators of "employment integration" processes.

Employed female immigrants of all ages who came to Israel since 2008 feature prominently as unskilled workers in all age groups. As with men, this points to "employment integration." As time since immigration increases, women's chances of improving their employment status and rising among the occupational categories are higher than those of men.

The difficulty that immigrants experience with employment integration in Israel can have many causes. One of the major causes is language — a poor command of Hebrew, and sometimes of English as well should the job require that. Data presented further on in this paper (Figures 9 and 12) also suggest that, in addition to the inferior occupational distribution changes shown by immigrants — a distribution that was of lower quality in terms of wage and automation risk when compared to that of non-immigrants — immigrants as a group, especially employed female immigrants, display a higher percentage of academic degree holders employed in occupations that do not require academic education, and in which academic training does not necessarily contribute to labor productivity.

The changes in occupational distribution among the various sectors show that, with regard to automation risk, the gaps between workers in the Arab Israeli and Jewish sectors, and between immigrants and non-immigrants, widened between 2013 and 2015. Should these trends continue, the difference between these sectors may grow and contribute to increased inequality in the labor market. As noted, these changes in occupational distribution reflect continued computerization and automation in the Israeli labor market. Although this process attests to the fact that the labor market is adapting to a new economic era, it is inevitable that remuneration gaps between skilled and less-skilled workers will widen.

Figure 3 illustrates three trends: growth in the share of highly skilled and high-wage workers employed in academic, engineering/technical and managerial occupations; stability in the share of unskilled and sales and service workers, whose wages are low; and a decline in the share of moderately skilled workers, such as administrative occupations and skilled workers (i.e., those working in construction, industry, light industry, and agriculture). This attests to continued skill polarization in the Israeli labor market, processes that have also been underway since the late 1990s in other developed countries (Kimhi and Shraberman, 2014) with implications for wages, as will be shown.

Figure 3. Change in the relative share of occupations in total work hours, by average occupational hourly wage ranking, 2013-2015
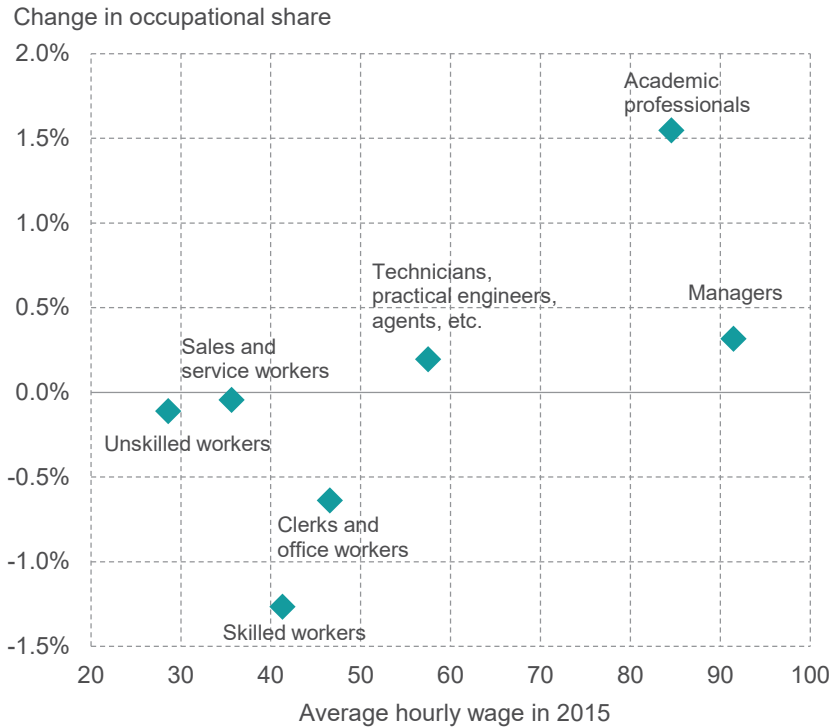
Change in occupational share

Average hourly wage in 2015

Note: Skilled workers includes those in construction, industry, light industry, and agricultural workers. The order of the occupational categories was changed and arranged in accordance with hourly wage level (2015 group average for those aged 25-60), because, despite the high correlation, the relationship between automation risk and average hourly wage is not one-to-one.
Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center | Data: CBS, *Labor Force Surveys*

2. The returns to education

Another means of illustrating labor market polarization trends is that of analyzing the returns to education.[9] An increase in the returns to education

9 The term "returns to education" means the wage premium for each additional year of schooling. The time and money that people devote to acquiring education are, in essence, an investment, which is why wage differences between more-educated and less-educated workers are commonly viewed as paybacks on that investment.

(and the very fact that there is a positive return) encourages workers, especially young workers, to continue pursuing formal education, thereby upgrading the quality and skill level of the labor force. It is important to remember, though, that widening gaps in the returns to education also contribute to larger income from labor disparities. In addition, Madhala-Brik's research (2015) shows that there is a negative correlation between worker education levels and occupational risk: the probability that workers of low education level will be employed in occupations destined to disappear in the near future is higher.

Next, changes in the return per year of formal education between three points in time — 2003, 2011, and 2014 — are compared and analyzed.[10] The main goal of the analysis is to assess the changes that occurred over time in the average return per year of formal schooling in terms of hourly wage. The wage changes over time can be divided into two dimensions. One relates to changes in the return to education, i.e., how much, on average, an additional year of schooling contributes to a worker's hourly wage. The other has to do with wage changes in the labor market that are not necessarily related to education. In order to distinguish between changes in the different dimensions of the return to a year's education, wage analysis will be performed relative to the hourly wage of a person with 12 years of schooling in 2003.[11]

In our analyses, we refer to the net return to education. The reason for use of the term "net return " is that the wage equation at the heart of the analysis controls for additional attributes beyond years of schooling, including: potential experience,[12] sector (e.g., Arab Israeli, immigrant or

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10 The methodology used to analyze the returns to education over time was taken from the work of Acemoglu and Autor (2011), who chose to focus on the average return to education. The estimated return per year of education is the gradient of years of schooling obtained from the wage equation estimated separately for each year and each gender. In this context, the gradient refers to the relative change in hourly wage by years of schooling, compared with men and women who had 12 years of schooling in 2003; the remaining explanatory variables are measured by their mean value in the population under consideration, i.e., for male and female salaried employees aged 25-64 (in 2014 — excluding military and security services personnel).

11 The curves, each one separately, facilitate comparative analysis of the hourly wage gaps between more-educated and less-educated individuals in the same year. A change in the height of a curve from year to year indicates wage changes over time that are not necessarily related to education.

12 Potential experience is calculated on the basis of the individual's age and education, as a minimum between two numbers. The first is the length of time that the individual could have worked from the time of completion of formal studies; the second is the difference between the individual's age and age 6. For people with fewer than 12 years of schooling, potential experience will be related to age only (Katz and Murphy, 1992).

non-immigrant), and occupation. The ability of the occupation variable to explain wage difference is higher than that of years of schooling, years of potential experience, or the economic sector in which the worker is employed (Kimhi and Shraberman, 2014, p. 244, Figure 12). Therefore, controlling for occupation in the wage equation makes it possible to isolate the hourly wage differences caused by differences in worker years of schooling from those related to occupation (e.g., due to field of study). For example, practical electronics engineers are classified in the technical occupations group and usually have 15 cumulative years of schooling (two to three years after high school graduation, whether in "Grade 13-14" study frameworks, or in practical engineering certificate programs). By contrast, teachers with the B.Ed. degree also have 15 cumulative years of schooling, but in terms of occupational classification they belong to the academic group. A wage equation that controls for occupation makes it possible to isolate the contribution of number of years of schooling to wage from that of occupation, thereby also making it possible to assign the same meaning to a practical engineer's year of study as to a teacher's. Also, workers sometimes choose occupations based on what their parents did: in occupations such as medicine, law, the military and teaching, a high inter-generational correlation can be found. Therefore, controlling for occupation also controls for some of the effects rooted in worker cultural/socioeconomic differences, and perhaps other parameters that cannot be controlled for directly.[13]

The comparison base year 2003 was chosen because that was the year when Israel started recovering from the recession that accompanied the start of the second intifada. From 2003 on, the country's economic recovery was accompanied by a rising demand for workers, which in turn led to wage increases and higher labor market participation rates (Kimhi and Shraberman, 2015). In 2007, the average wage stopped rising and even began to drop in real terms, until 2011. Yet in spite of this decline, the mean return to education continued to rise throughout the period.[14]

It is important to note that the analysis proposed here does not attempt to delineate a causal relationship between education and wage, but tries, rather, to investigate changes that occurred over time in the correlation

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13 The explanation given here refers primarily to more detailed occupations than the aggregate groups (single-digit occupation), but controlling for aggregate occupations also helps control for some of the attributes noted previously.

14 Kimhi and Shraberman (2014) measured the returns to education as the ratio of hourly wage of those with 16 or more years of schooling, to the hourly wage of those with 12 or fewer years of schooling.

between education and wage.[15] Additionally, there are other variables that affect wage that were omitted from this analysis, whether because data were unavailable (as on individual educational preferences and parental education), or due to measuring difficulties (as with ability and character traits – creativity, interpersonal communication, or social connections). Adding occupation when estimating the correlation between education and wage at least controls for some of the factors that are likely to be omitted from the analysis.

Figures 4 and 5 present educational gradient curve, separately for men and women, in other words, the educational gradient shows the average change in hourly wage, given the number of formal years of schooling in each of the years. In 2003, the hourly wage of men with 18 years of schooling (Master's degree equivalent) was 31.7 percent higher than the hourly wage of men with 12 years of schooling (equivalent of high school graduation or matriculation certificate). In 2011, this disparity rose to 40.7 percent, a 9 percentage point increase over the 2003 gap. The gap increase is due to a rise in the marginal effect of a year of education (an increase in the value of the years of schooling coefficient in the wage equation) from 4.6 percent to 5.7 percent. In 2014, wages rose across the entire years of schooling range, the gap between the hourly wage of men with 18 years of schooling to those with 12 years of schooling was 35.6 percent, a decline of 5.1 percentage points compared with 2011, but still 3.9 percentage points higher than in 2003. The narrowing of the gaps between 2011 and 2014 was caused mainly by a rise in wages among men at all education levels, and by a decline in the marginal effect of a year of formal schooling during that period, from 5.7 percent to 4.8 percent.

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15 For more on the causal relationship between education and wage, see Card (1999) and, in Israel, Melzer (2015), Frisch (2008), and Kriaf (2008). Also, the econometric appendix looks in detail at the estimation method and its results.

Figure 4. Returns to education for men

Educational gradient, salaried employees ages 25-64, relative to the hourly wage of workers with 12 years of schooling in 2003
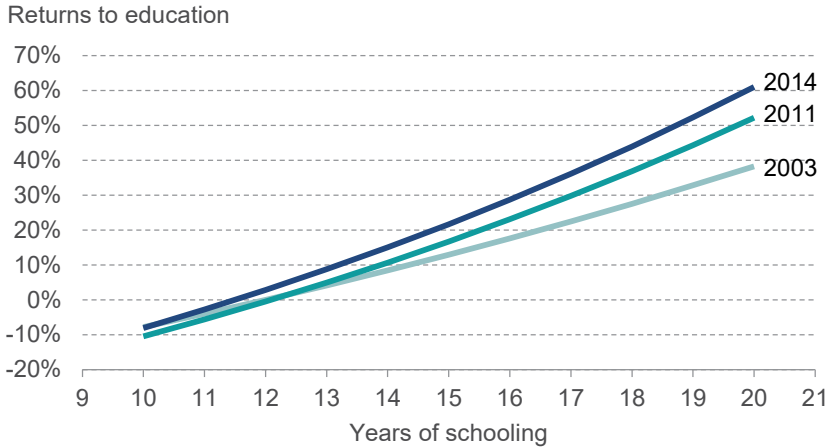
Returns to education
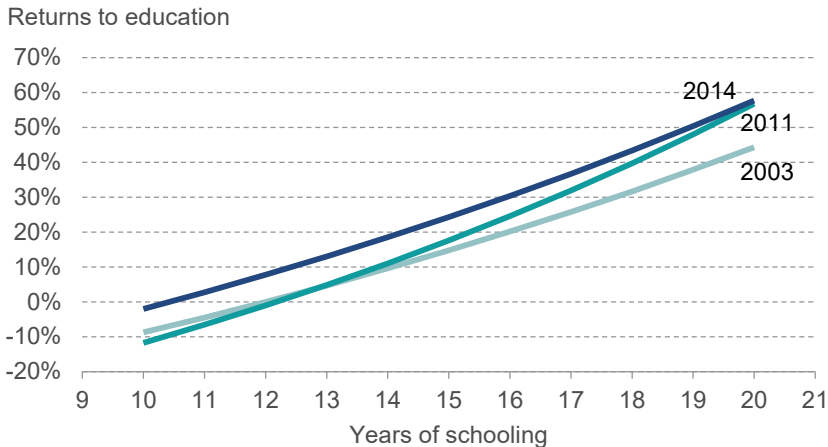
Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center
Data: CBS, Household Expenditure Surveys

The gaps in hourly wage by education were slightly lower for women than for men (Figure 5). Thus, in 2003, the gap between the hourly wage of women with 18 years of schooling and that of women with 12 years was 27.5 percent. In 2011, we can see a rise in the wage of those with 13 or more years of schooling, and a drop in the relative wage of those with fewer than 13 years of schooling. Accordingly, in 2011, the disparity between the hourly wage of women with 18 years of schooling and that of women with 12 years of schooling was 37.4 percent, a rise of 9.8 percentage points compared with the 2003 gap. In 2014, the women's wage gap by education continued to widen for the entire range of years of schooling compared with 2011. Thus, in 2014, the wage gaps between women with 18 years of schooling and those with 12 years of schooling reached 41.1 percent. The marginal effect of a year of schooling for women was 4.1 percent in 2003, 5.3 percent in 2011, and 5.6 percent in 2014.

Figure 5. Returns to education for women

Educational gradient, salaried employees ages 25-64, relative to the hourly wage of workers with 12 years of schooling in 2003

Returns to education

Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center
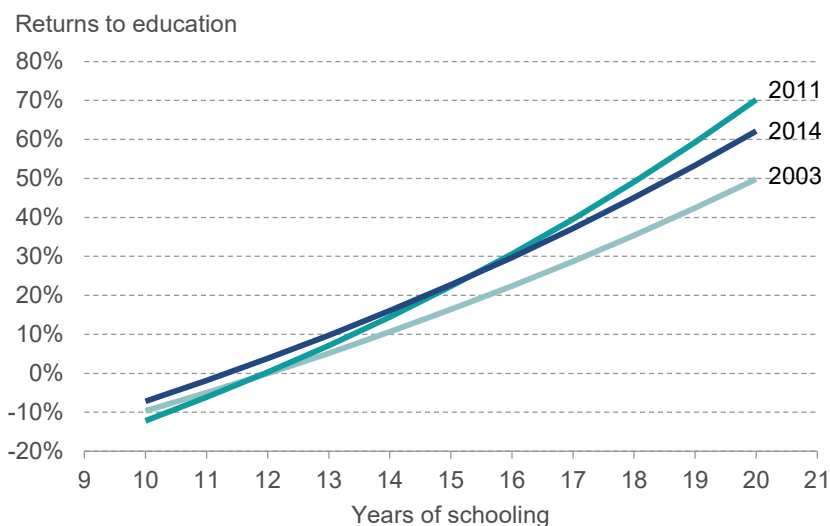Data: CBS, *Household Expenditure Surveys*

Despite our control for sectors (Arab Israelis, non-immigrant Jewish Israelis and immigrants) in the wage equations by genders, occupational distribution differences within the sectors and changes in these distributions over time are not fully reflected in returns to education differences between the groups. It was therefore decided to examine the differences in the returns to education curves and in the wage gaps, while estimating the wage equation for each sector separately.

Figure 6 shows the educational gradient curve for Arab Israeli men. The wage gap between those with 12 years of schooling and those with 18 years of schooling was 35.4 percent in 2003, while by 2011, it had grown to 48.8 percent, similar to the changes displayed by the male population as a whole. The contribution of a year's education to Arab Israeli men's wages was 5.1 percent in 2003, and 6.6 percent in 2011. By contrast, a comparison of the returns to education for workers with more than 15 years of schooling shows a decline between 2011 and 2014 that is not consistent with the change for all men, and that is due to the fact that Arab Israeli men's wages rose more moderately during those years than did those of all Israeli men. This can be explained by changes that occurred in the group's occupational distribution displayed earlier, including a rise in the share of unskilled workers and

those employed in sales, at the expense of skilled workers. In other words, some workers who were employed in middle-wage occupations moved to occupations characterized by low wages (see Appendix Figure 2).[16] Owing to these changes, the marginal effect of a year's schooling in 2014 for Arab Israeli men was only 5.6 percent.

Figure 6. Returns to education for Arab Israeli men
Educational gradient, salaried employees ages 25-64, relative to the hourly wage of workers with 12 years of schooling in 2003,

Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center
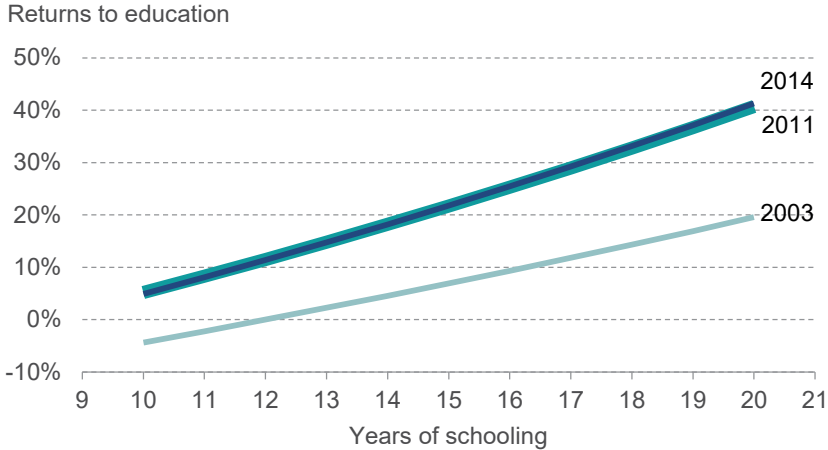Data: CBS, *Household Expenditure Surveys*

More-educated and less-educated male immigrants (Figure 7) displayed a rise in the returns to education, and the hourly wage gaps between immigrants with and without academic education widened. In 2003, the wage gap between a male immigrant with 18 years of schooling and one with 12 years of schooling was only 14.3 percent; in 2011, it was 21.3 percent; and, in 2014, it was 21.8 percent. The marginal effect of a year of schooling for immigrant men was 2.1 percent in 2003, 2.9 percent in 2011, and 3 percent in 2014.

16 Despite its importance, the returns to education for Arab Israeli women will not be analyzed in this study due to the low statistical reliability of the separate wage equations for these workers (resulting from an especially low number of observations for this group in the Central Bureau of Statistics' Household Expenditure Surveys, particularly in 2003.)

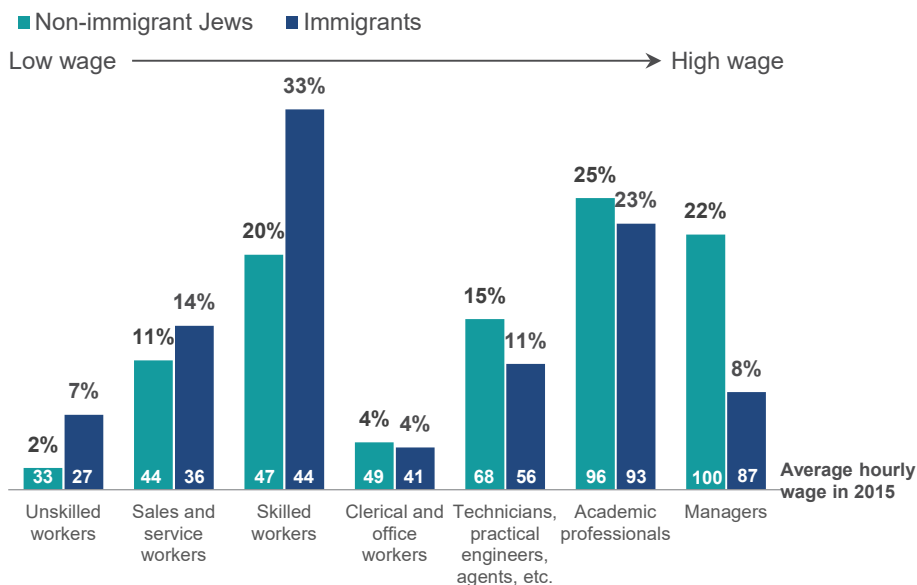### Figure 7. Returns to education for immigrant men

Educational gradient, salaried employees ages 25-64, relative to the hourly wage of workers with 12 years of schooling in 2003,

Returns to education

Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center
Data: CBS, *Household Expenditure Surveys*

The smaller gap between well-educated and less-well-educated immigrants, compared with the gap between the immigrant and the non-immigrant sectors, stems mainly from differences in the marginal return on a year of education between immigrant men and the male population as a whole. Occupational distribution differences between immigrants and non-immigrant Jews (Figure 8) also contribute substantially to gaps between the two groups, and changes that occurred over time in the immigrant occupational distribution (see Appendix Figure 3) helped, only slightly, to narrow the gap between immigrants and the other groups. In other words, the relative share of workers in low-wage occupations is higher, and over time we also find a rise in the relative share of unskilled workers at the expense of skilled workers among immigrants.

Figure 8. Distribution of occupations in total work hours, 2015
Salaried employees ages 25-64

■ Non-immigrant Jews ■ Immigrants

Low wage ──────────────────────→ High wage

	Unskilled workers	Sales and service workers	Skilled workers	Clerical and office workers	Technicians, practical engineers, agents, etc.	Academic professionals	Managers	
Non-immigrant Jews	2%	11%	20%	4%	15%	25%	22%	
Immigrants	7%	14%	33%	4%	11%	23%	8%	
Average hourly wage in 2015	33 / 27	44 / 36	47 / 44	49 / 41	68 / 56	96 / 93	100 / 87	

Note: Skilled workers includes those in construction, industry, light industry, and agricultural workers
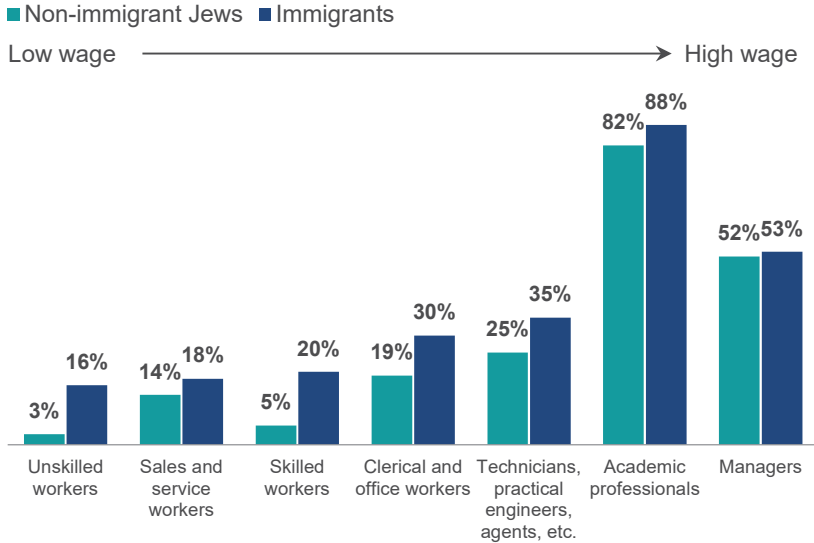Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center
Data: CBS, *Household Expenditure Surveys*

When analyzing the male immigrant group we must remember that the percentage of those with academic education employed in low-wage occupations is relatively high (Figure 9), and therefore, naturally, the return on a year's education for this group is smaller. The main reason why there was no rise in the return on education for immigrants between 2011 and 2014 (in contrast to the rise observed for the population as a whole) is the increase exhibited by this group in the relative share of unskilled (low-wage) workers at the expense of middle-wage occupations (see Appendix Figure 3). As noted previously, the latest wave of immigration (those who immigrated after 2008) contributed significantly to an increase in the share of unskilled workers despite the fact that some of them have academic degrees. The rise in the share of male immigrants in unskilled occupations effectively neutralized the effect of the increase of middle-wage and high-wage occupations among this group.

Figure 9. Share of men with academic degrees in total work hours, by occupation, 2015

Salaried employees ages 25-64

■ Non-immigrant Jews ■ Immigrants

Low wage ───────────────────────► High wage

Note: Skilled workers includes those in construction, industry, light industry, and agricultural workers
Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center
Data: CBS, *Household Expenditure Surveys*

When analyzing the returns to education for immigrants, it is important to distinguish between women and men. While for men the returns to education rose between 2003 and 2011, for women, as we can see in the educational gradient curves (Figure 10), the return actually declined during those years moving the entire curve downward, that is, for all years of schooling. The marginal effect of a year of schooling for these women was 1.7 percent in 2003 and 1.8 percent in 2011.

Figure 10. Returns to education for immigrant women

Educational gradient, salaried employees ages 25-64, relative to the hourly wage of workers with 12 years of schooling in 2003
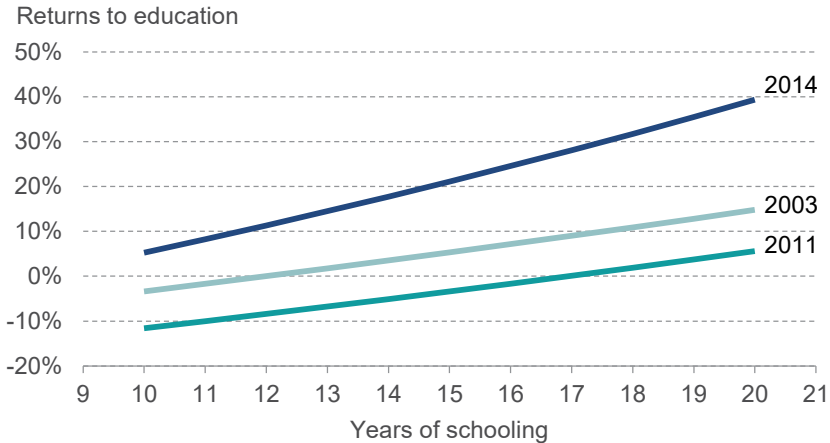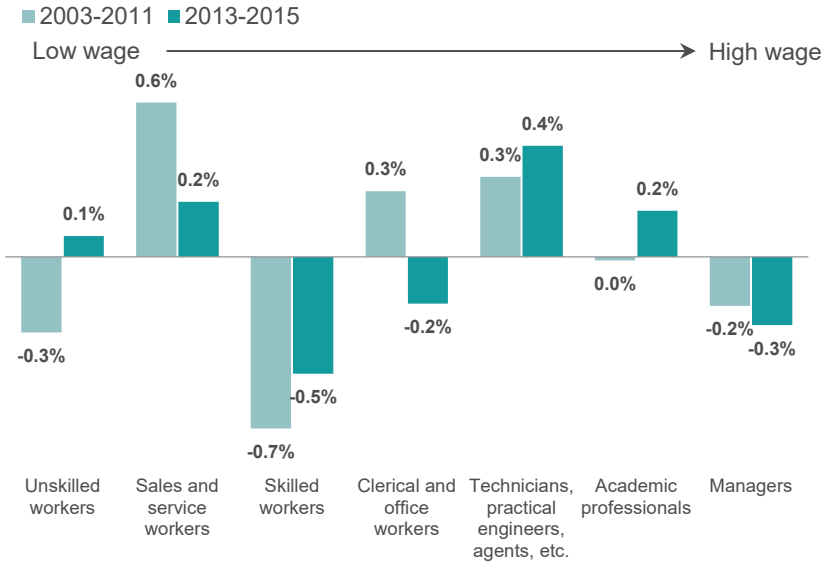

Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center
Data: CBS, *Household Expenditure Surveys*

The decline in the returns to education for immigrant women was due mainly to a rise in the relative share of workers in sales and service occupations, clerical occupations, and technical occupations, as well as to a drop in the relative share of those employed as skilled and unskilled workers and in managerial positions (Figure 11). By contrast, a comparison of the 2011 and 2014 educational gradient curves clearly shows a rise in the returns to education for female immigrants (Figure 10). This is an outcome of an increased share of women immigrants employed in academic occupations, a continued rise in their share in technical occupations, and a drop in their share in clerical occupations (Figure 11). In 2014, the value of a year of schooling for immigrant women was 2.8 percent.

Figure 11. Annual average change in the relative share of occupations in female immigrants' total work hours
Salaried employees ages 25-64

■ 2003-2011 ■ 2013-2015

Low wage ⟶ High wage

Note: Skilled workers includes women in construction, industry, light industry, and agriculture.
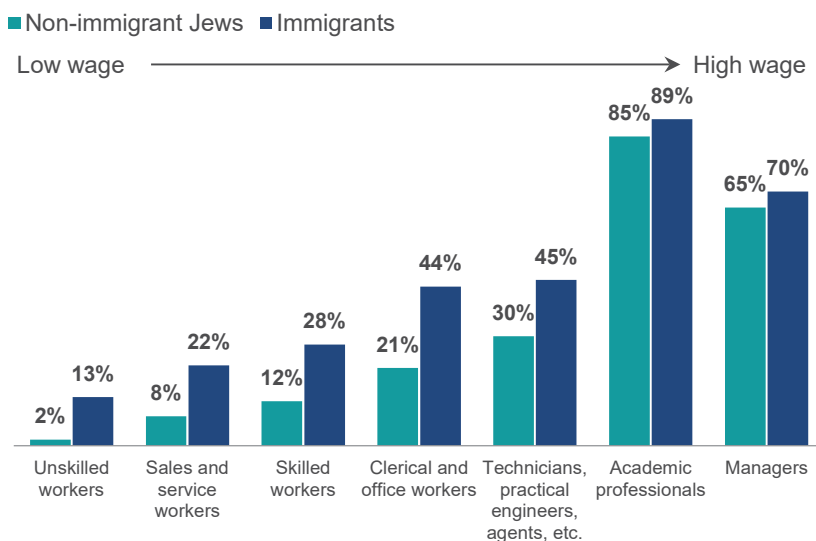Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center
Data: CBS, *Household Expenditure Surveys*

Another finding that emerged from our analysis of the returns to education for women immigrants was a very high percentage of academic degree holders among those employed in low-wage occupations — higher even than the percentage of immigrant men (Figure 12). This narrows the wage gap between well-educated and less-well-educated immigrant women, and even hints at the difficulty these women have in finding employment suited to their educational background. The impressive improvement in the marginal effect of a year's schooling for immigrant women (a 58 percent increase in the value of a year of schooling between 2011 and 2014) can apparently be attributed to the younger women in this group, who were minors when they arrived in Israel and who joined the labor force in recent years. They are, on average, as academically educated as their mothers, but their training is much better suited to the Israeli labor market, making it more likely that they will enjoy a marginal effect of a year's schooling similar to that found for the female population as a whole.

Figure 12. Share of female academic degree holders in total work hours, 2015

Salaried employees ages 25-64

■ Non-immigrant Jews ■ Immigrants

Low wage ⟶ High wage

	Unskilled workers	Sales and service workers	Skilled workers	Clerical and office workers	Technicians, practical engineers, agents, etc.	Academic professionals	Managers
Non-immigrant Jews	2%	8%	12%	21%	30%	85%	65%
Immigrants	13%	22%	28%	44%	45%	89%	70%

Note: Skilled workers includes those in construction, industry, light industry, and agriculture.
Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center
Data: CBS, *Household Expenditure Surveys*

During the immigration wave of the early 1990s, Israel absorbed a large number of immigrants from the former Soviet Union, many of whom had academic degrees and training in a variety of technical fields. Over the course of the first decade (by the first half of the 2000s), some of these immigrants had undergone a successful employment integration process and found jobs that were suited to their education levels in their country of origin. As the data indicate, however, there were other immigrants — women in particular — for whom employment in "temporary" occupations became a permanent situation, due to incompatibility between their skills and the needs of the Israeli economy, and the difficulty of adjusting to the labor market over time. Nevertheless, it bears remembering that the employment rates of male and female immigrants are equal to those of non-immigrant Jews[17] (see Appendix Figures 4 and 5), or even slightly higher. This would seem to explain how they have managed to reduce hourly wage gaps and wage gaps in general between themselves and their non-immigrant counterparts.

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17 Immigrants who came to Israel before 1990.

To conclude, between 2003 and 2014, all sectors and genders showed a rise in the returns to education, with women displaying a particularly notable increase. The rise in the returns to higher education (16 or more years of schooling) compared with that enjoyed by those with 12 years of schooling, combined with growth in the labor supply of academic degree holders during this period (Appendix Figure 6), point to increased demand for highly-skilled workers. Should this trend continue, it may be expected to improve these workers' bargaining position vis-à-vis employers. Moreover, continued growth in the demand for skilled workers would in all probability be accompanied by wage increases as well.

Conclusion and discussion

This study looked at two trends in the Israeli labor market: changes in the labor force's occupation mix, with an emphasis on automation and computerization risk, and changes in the returns to formal education, as reflected in wages. Between 2013 and 2015, a decline was seen in the share of high automation risk occupations and a rise in the share of low-risk occupations. These trends reflect modernization of the labor force and of the economy — the share of information and service industries in the GDP is increasing at the expense of traditional industry.

The impact of these processes varies between the sectors that make up Israeli society, as well as between men and women. The decline in the share of high automation risk occupations among women was larger than among men, mainly because of a greater decline in the relative share of clerical occupations and a larger rise in the share of academic occupations (fields where the share of women is higher).

The change displayed by Arab Israeli workers differs from the trend observed in the other sectors: the decline in the relative share of skilled Arab Israeli workers was larger than in other groups, because a substantial portion of workers in the sector were formerly employed as skilled workers (i.e., in construction, industry, light industry, and agriculture), meaning that the waning of traditional industry affects them to a greater degree. Arab Israeli workers also exhibited an increase in the relative share of sales and service workers and workers in clerical occupations, which are characterized by high automation risk and relatively low wages.

Immigrants also displayed a downturn in the share of skilled workers (though at a slightly lower rate than the decline observed among Arab Israelis). In this case as well, the reason is a high percentage of immigrants who were employed in these occupations. The rise in the share of sales and service workers in the immigrant group was smaller than in the Arab

Israeli sector, and the share of unskilled workers increased to a greater degree. There is a dual explanation for this. Firstly, the share of immigrants employed in sales and services was high from the outset, compared with the other groups. Secondly, because unskilled occupations do not require many capabilities, they are appropriate for immigrants, whose skills, at least during their first years in Israel, are not always suited to the Israeli economy. At the same time, long-term employment in these occupations indicates difficulty integrating into the labor market. The share of male immigrants aged 45-54 who immigrated to Israel between 1990 and 1995 and who are employed as unskilled workers grew to an exceptional degree compared with immigrants in other age groups and from other immigration time periods. It is reasonable to assume that those belonging to this group were employed as skilled workers but did not manage to improve their status along their employment path.

The returns to formal schooling in worker wages increased over time, leading to larger wage gaps between workers with higher education and those without. The increase in the returns to education was greater for women than for men; it was also greater for non-immigrants than for immigrants and Arab Israelis. The differences between the sectors also appear to be related to the distribution of occupations among the various groups. This distribution reflects the lower degree to which the skills of male and female workers in the minority groups are compatible with employer demands. Education's relatively small contribution for male and female immigrants is due to a higher share of immigrants employed in middle-wage and low-wage occupations, including those with higher education.

These labor trends also have implications for wage distribution. The increased share of high-wage and low-wage occupations at the expense of middle-wage occupations could potentially intensify wage inequality. The first decade of the 21st century witnessed the start of a skills-oriented polarization process in the labor market — yet despite this, wage inequality declined, thanks both to great fluctuation in the upper portion of the wage distribution, and to a minimum wage increase.[18] Since 2013, the wage disparities have widened, though, despite these minimum wage increases (Appendix Figure 7).

Population group differences in worker movement from high automation risk occupations to lower-risk occupations are also of importance in determining the wage gaps between them. Minimizing these differences by strengthening the weaker groups could reduce wage disparities both between the groups and in the economy as a whole (Appendix Figure 8).

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18 For more on wage changes by percentile, see Kimhi and Shraberman (2014), Figures 6 and 7, pp. 233-235.

To complete the picture of expected changes in both the labor market and the entire Israeli economy, we must also look at changes and trends in other factors of production, particularly physical capital, infrastructures and technological production capabilities. The state of existing physical infrastructures and the way in which capital is allocated by the government and the private sector in this sphere, as well as the level of investment in production compared with investment in other channels, all affect GDP and, consequently, labor productivity (Brand, 2016). These issues lie far beyond the scope of this study, but an exploration of them would advance our understanding of the array of economic processes that affect the labor market and the changes discussed in this paper.

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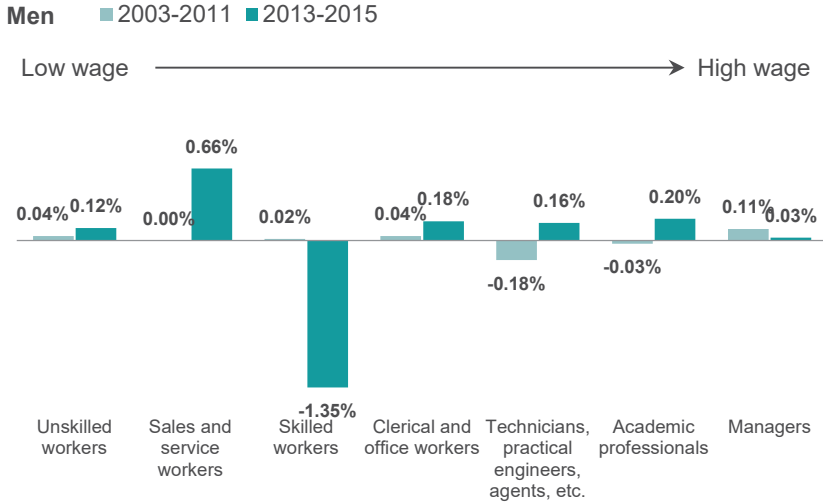
Appendix

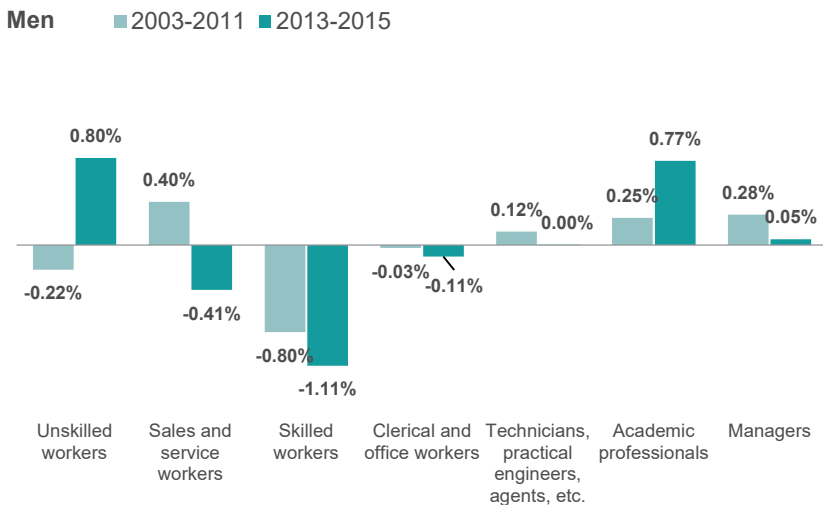**Appendix Figure 1. Distribution of immigrants by age groups**
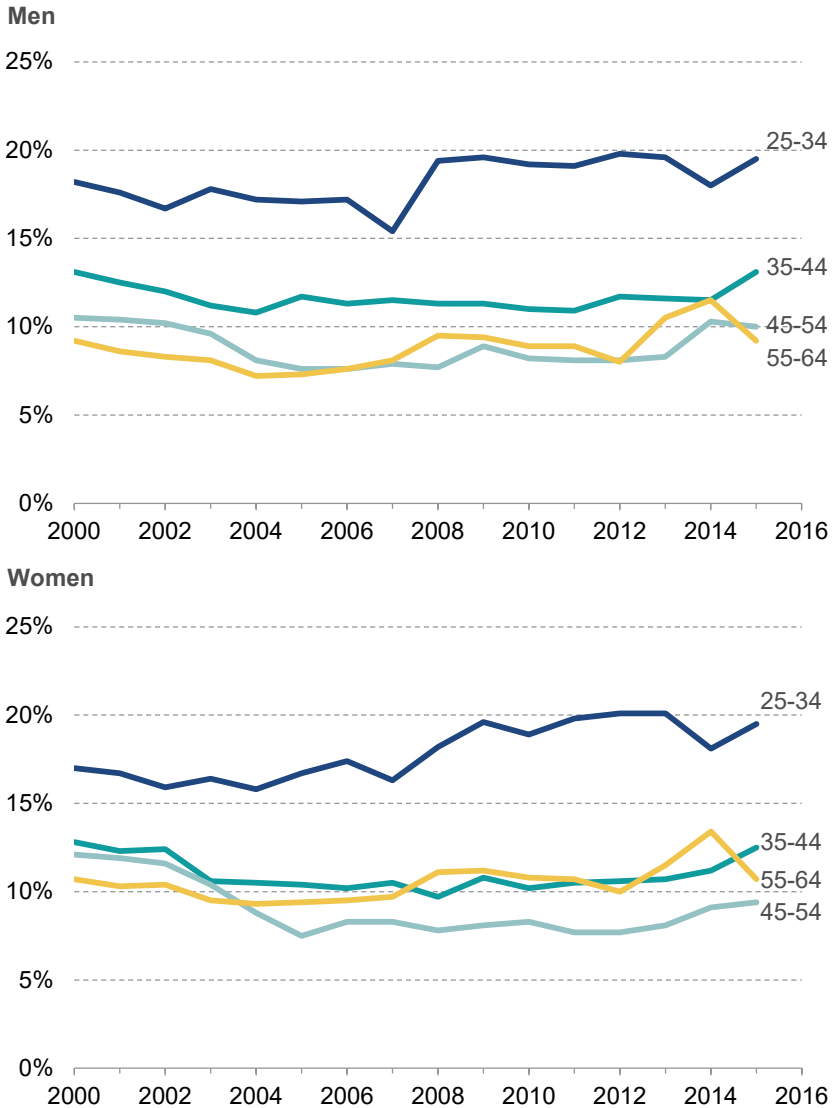
Men

Women

Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center | Data: CBS, *Labor Force Survey*

Appendix Figure 2. Average annual change in the relative share of occupations out of work hours — Arab Israeli men

Men ■ 2003-2011 ■ 2013-2015

Low wage ──────────────────────────────▶ High wage

0.04% 0.12%   0.00%   0.66%   0.02%   0.04% 0.18%   -0.18%   0.16%   -0.03%   0.20%   0.11% 0.03%   -1.35%

| Unskilled workers | Sales and service workers | Skilled workers | Clerical and office workers | Technicians, practical engineers, agents, etc. | Academic professionals | Managers |

Appendix Figure 3. Average annual change in the relative share of occupations out of work hours — immigrant men

Men ■ 2003-2011 ■ 2013-2015

-0.22% 0.80%   0.40% -0.41%   -0.80% -1.11%   -0.03% -0.11%   0.12% 0.00%   0.25% 0.77%   0.28% 0.05%

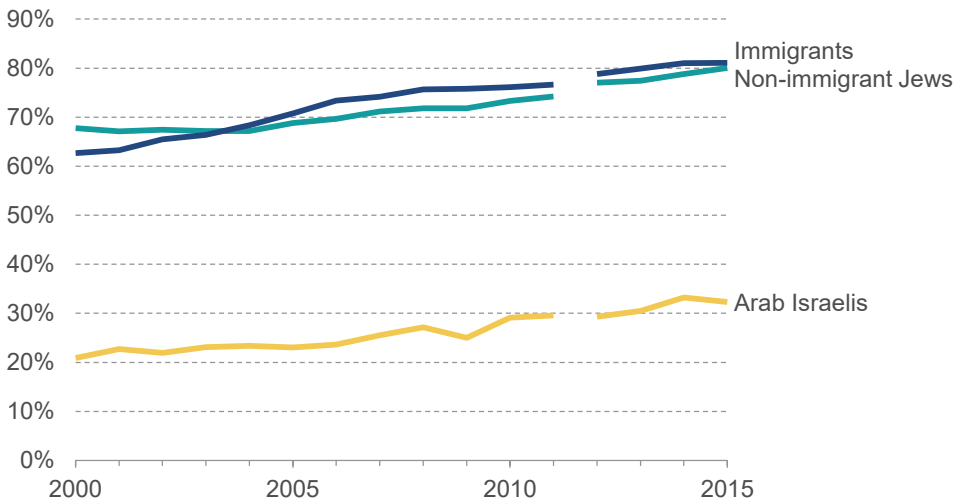| Unskilled workers | Sales and service workers | Skilled workers | Clerical and office workers | Technicians, practical engineers, agents, etc. | Academic professionals | Managers |

Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center | Data: CBS, *Labor Force Survey*

Appendix Figure 4. Employment rates among ages 25-64
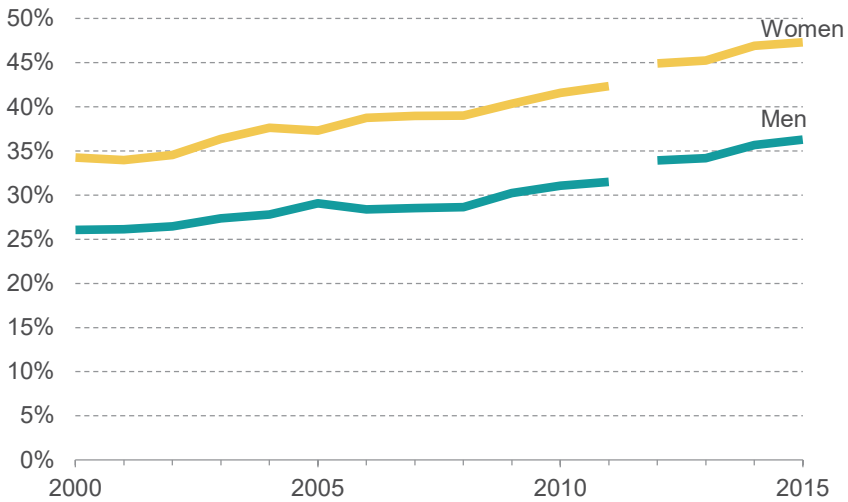
Men
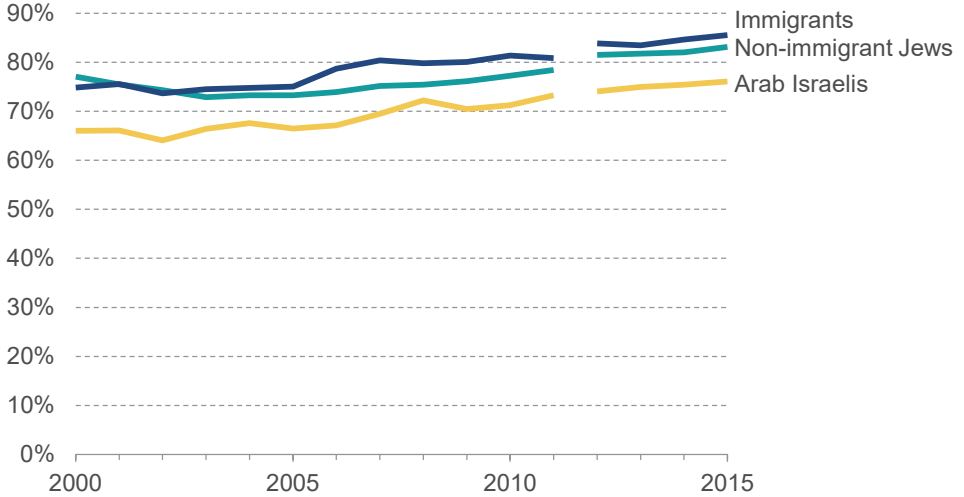
Women

Note: In 2012 there were wide ranging changes in the survey methodology.
Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center | Data: CBS, *Labor Force Survey*

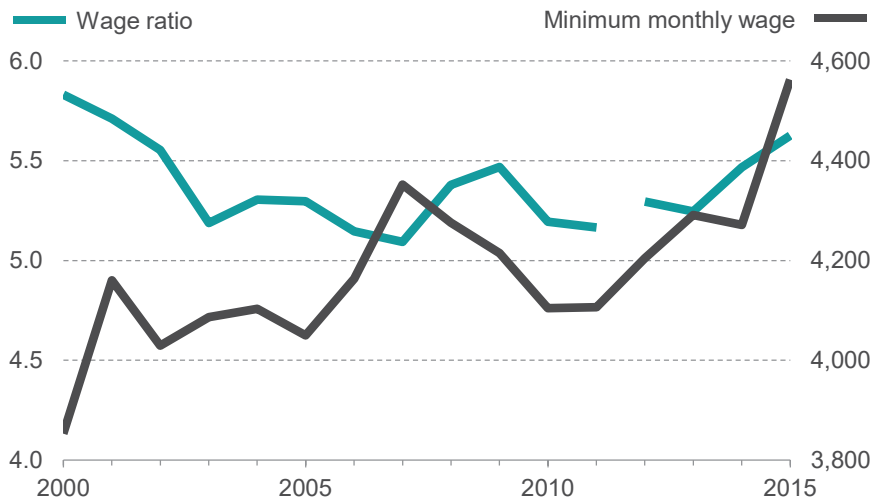## Appendix Figure 5. Share of those with an academic education out of total work hours

Ages 25-64

Note: In 2012 there were wide ranging changes in the survey methodology.
Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center | Data: CBS, *Labor Force Survey*

Appendix Figure 6. Ratio between the 90th wage percentile and the 10th wage percentile and the minimum wage, 2015 prices
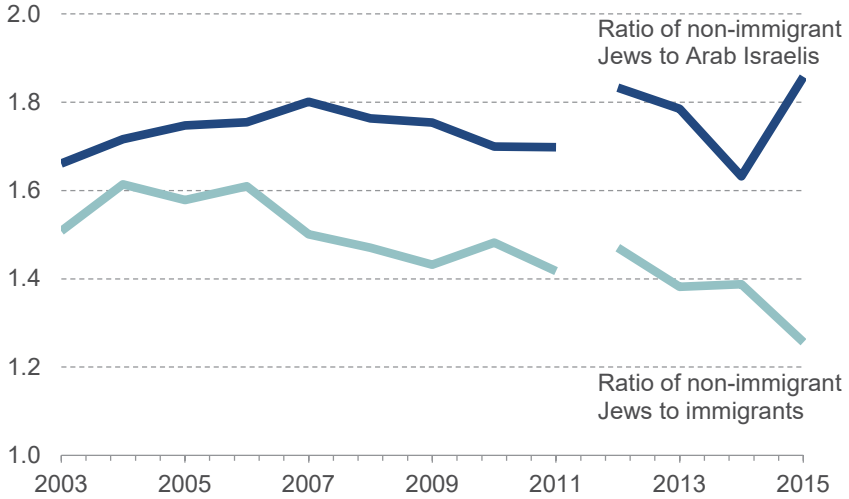

Note: Average monthly wage for full-time employee (35 weekly hours or more).
Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center
Data: CBS, Household Expenditure Survey; National Insurance Institute

Appendix Figure 7. Ratio of average monthly wage of full-time workers

Ages 25-64

Note: In 2012 there were wide ranging changes in the survey methodology. Full-time employment is 35 weekly hours or more.
Source: Claude Berrebi, Kyrill Shraberman and Shirley Yarin, Taub Center
Data: CBS, *Household Expenditure Surveys*