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**Analyzing Wage Variance in Israel Relative to the OECD,  
Focusing on the Lower Part of the Wage Distribution<sup>1</sup>**

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# **Analyzing Wage Variance in Israel Relative to the OECD, Focusing on the Lower Part of the Wage Distribution**

**Yuval Mazar and Avi Fleishon**

## **Abstract**

This study uses the results of the PIAAC survey—a joint micro database covering Israel and the other OECD countries—to describe the variance of wages in Israel. It first shows that wage variance in Israel is higher than in other OECD countries, whether we control for explanatory variables—mainly human capital—or not. This means that the high wage variance in Israel is not due solely to the high variance of human capital.

Since labor productivity in Israel is lower than in other OECD countries, we focus on the lower part of the unexplained wage variance. We examine the rate of those receiving significantly low wages in Israel by international comparison, while controlling for workers' human capital, including education level, skills level, age, and gender. We find that about 17 percent of male workers and about 14 percent of female workers in Israel earn significantly less than what would be expected based on their human capital (number of years of study, and skills)—a rate that is almost double the average in the other OECD countries.

In contrast with low-wage earners generally, the group of those earning wages that are significantly lower than forecast is not characterized by low education or skills, but rather by semi-academic education, a relatively high age, a relatively high rate of Arabs, and a workplace that is close to their location of residence. This group also generally works in occupations with relatively low wages and in industries with low stock of physical capital.

We further found that the tendency of workers in this group to obtain professional training at their work place is lower than that of workers with similar skill levels who earn higher wages—a finding that is particularly prominent in Israel.

## ניתוח שונות השכר בישראל בהשוואה למדינות OECD, התמקדות בחלק התחתון של התפלגות השכר

יובל מזר ואבי פליישון

### תקציר

מחקר זה עושה שימוש בתוצאות סקר PIAAC – מסד נתוני מיקרו משותף לישראל ולמדינות ה-OECD – כדי לאפיין את שונות השכר בישראל. תחילה אנו מראים ששונות השכר בישראל גבוהה יותר מאשר במדינות ה-OECD; זאת הן ללא פיקוח על משתנים מסבירים – בעיקר על משתני ההון האנושי – והן עם פיקוח. משמע ששונות השכר הגבוהה בישראל אינה נובעת רק משונות גבוהה בהון האנושי.

כיוון שפריון העבודה בישראל נמוך בהשוואה למדינות ה-OECD, אנו מתמקדים בחלק התחתון של שונות השכר הלא מוסברת – אנו בודקים מהו שיעור מקבלי השכר הנמוך-משמעותית בישראל בהשוואה בין-לאומית תוך בקרה על ההון האנושי של העובדים, לרבות רמת ההשכלה, רמת המיומנויות, הגיל והמגדר. נמצא שכ-17 אחוזים מהעובדים וכ-14 אחוזים מהעובדות בישראל משתכרים שכר הנמוך-משמעותית ממה שהיה מצופה בהתבסס על ההון האנושי שלהם (מספר שנות הלימוד והמיומנויות) – שיעור כמעט כפול מן הממוצע של יתר מדינות ה-OECD.

בניגוד לבעלי שכר נמוך באופן כללי, קבוצת בעלי השכר הנמוך במידה משמעותית משכרם החוזי אינה מאופיינת בהשכלה או במיומנויות נמוכות, אלא בהשכלה אקדמית למחצה, בגיל מבוגר יחסית, בשיעור גבוה יחסית של ערבים ובמקום עבודה סמוך למקום המגורים. קבוצה זו מאופיינת גם בעבודה במשלחי יד שהשכר בהם נמוך יחסית ובענפים שמלאי ההון הפיזי בהם נמוך. עוד נמצא כי נטייתם של העובדים בקבוצה זו לעבור הכשרות מקצועיות במקום עבודתם נמוכה מזו של אלה הדומים להם ברמת הכישורים, אך מרוויחים שכר גבוה יותר – תופעה שבישראל היא בולטת במיוחד.

## 1. Introduction

Wage variance in Israel is higher than in other countries. This study focuses on the question of whether this higher level of variance—and in particular the fact that a high proportion of workers in Israel earn a low wage—is explained by their level of human capital. We will also look at the characteristics of individuals whose human capital does not explain their low wages, and the characteristics of countries in which a high proportion of workers earn less than would be predicted by their level of human capital. It may be concluded, though subject to some degree of caution, that their earning potential—as derived from their observable characteristics—is not fully realized.

Until the publishing of the findings of the PIAAC survey, which was carried out in Israel in 2014–15 and which looked at the basic skill levels of adults, it was accepted practice to measure the quality of human capital in Israel using years of schooling (which is on average higher than for the OECD countries). Thus, for example, Argov (2018) showed that the increase in years of schooling starting from the mid-1970s contributed between 0.6 and 0.8 percentage points to annual growth on average, which constitutes 33–45 percent of total growth in GDP per capita during that period. Zeira (2021), in his book, “The Israeli Economy: A Story of Success and Costs”, presents similar findings. He shows that the increase in human capital in Israel (according to average years of schooling) during the relevant period explains close to 40 percent of the growth in output per worker. It was commonly believed that Israel does not face any significant challenges with regard to the quantity of human capital and therefore in order to raise the level of labor productivity it should focus on other directions, such as improving physical capital and cutting back regulation. However, the PIAAC survey made it possible, for the first time, to estimate the skill level of workers in Israel relative to other countries, and not just their level of education as measured by years of schooling.

The results of the PIAAC survey and the public discourse that followed it shifted policy makers’ attention to the issue of improving the skill level of Israel’s human capital. Currently, the main discussion centers on improving the skills of low-achieving populations, by means of, for example, Israel’s education system and curricula alongside investment in vocational training, which has a high return for both the individual and the economy. This approach is manifested in the recommendations of the Committee to Advance Employment in 2030, which

were presented in 2020,<sup>1</sup> and the policy recommendations presented to the government by the Bank of Israel in 2023.<sup>2</sup>

Since the publishing of the PIAAC survey findings, there have been more than a few studies based on the new dataset. The Bank of Israel (2018) and (2019b), as well as the Aaron Institute for Economic Policy (2018), estimated the gap in labor productivity between Israel and the OECD using various methods. According to those estimates, the gap in labor productivity resulting from lower skill levels in Israel explains about 2.5 to 5 percentage points.

The Bank of Israel (2016) and the Taub Center (2016) showed that the largest gap in worker skills between Israel and the advanced economies exists in trade and services and domestic manufacturing, while in export industries, including those more exposed to competition, the gap is much smaller. Bank of Israel (2017) estimated the effect of the skills gap in Israel on inequality in the economy. Mazar (2019) found that the gap in worker skills narrows as the skill level rises, and in the upper decile of skills, the gap is in fact in favor of workers in Israel. The Taub Center (2018) looked specifically at the skills of workers at the extreme of the distribution and found that the proportion of information technology workers among the most skilled workers in Israel is the highest in the OECD, and by a significant margin. Furthermore, the Taub Center's State of the Nation Report (2019) found that the exploitation of skills among the most highly skilled workers in Israel (based on occupation) is higher than in the other OECD countries.

Other studies have looked at the skill gap between men and women (Mazar, 2017) and quantified the effect of the gender wage gap (which was found to be about 4 percentage points), as well as the wage return on skills in a comparison of public and private sector workers (which was found to be higher in the private sector). A comparison of the wage return on skills between Israel and other countries did not show Israel to be an outlier (Mazar, 2018; Mazar, 2019).

A more recent study (Schwartz, 2021) is related to the current research, except that it carried out the comparison based on the responses to the PIAAC questionnaires. He found a low level of skills in Israel; however, Israel is in fact characterized by a surprising surplus in skills. That study also estimated the utilization of workers' skills and found it to be low per se and relative to the OECD. Finally, the study carried out a simulation that showed that raising the level of

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<sup>1</sup> [The Committee for Employment Advancement Towards 2030: Final Report](#)

<sup>2</sup> [Recommended strategic pillars of action for the government, Bank of Israel, January 2023](#)

skill utilization in the workplace in Israel to that in the OECD would raise wages by about 4.1 percent, as compared to a smaller increase of about 1.8 percent that would result from raising the level of worker skills to the OECD average. These results are in line with those of the current research, which used a different method to arrive at its conclusions, as will be explained below.

Apart from Schwartz (2021) and studies of surplus education in Israel (Katz, 2017; Zussman et al., 2019), the attention devoted to the results of the survey and the gaps between Israel and the OECD have not—as far as we know—led to any significant public discussion of the issue of aligning a worker’s skill level with his occupation and consequently his wage level.

Our focus on the lack of alignment between skills and jobs in Israel is a continuation of Zussman, Lipiner, and Rosenfeld (2020)’s analysis of the nonalignment in Israel between level of education or field of study, and in contrast, occupation, and extends the discussion to skills, as measured by the PIAAC survey. The current paper presents a preliminary analysis of the nonalignment between skill level and wage level. Based on the analysis, we highlight an exceptional situation in Israel, in which the wages of a large number of workers are significantly lower than those of workers similar to them with respect to measured skill level, namely their human capital level as measured by the PIAAC survey.

An analysis of the characteristics of workers who earn less than predicted also has implications for the allocation of resources in the economy. In other words, it can reveal that low labor productivity may be the result not only of the effect on a worker’s productivity in a particular firm but also the fact that that same worker would have produced more in a different firm.

We believe that analyzing the unique characteristics of this group and the gaps between it and other groups will make it possible to consider measures that are likely to improve the alignment between skills and wages in Israel. Examples can be found in the OECD’s Career Guidance Policy Review for the various countries and in the OECD’s recommendations on this issue<sup>3</sup>, alongside investment in a policy of Lifelong Learning<sup>4</sup>, transportation access to areas of employment, investment in creating opportunities for remote work in the social and geographic periphery, etc. Reducing the proportion of workers in Israel who earn less than

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<sup>3</sup> [Career Guidance Policy Review Home Page](#)

<sup>4</sup> [Learning for Life](#)

predicted to the OECD average will make it possible to increase the growth rate in Israel and reduce the disparity in productivity between Israel and comparable countries.

The rest of the study is structured as follows: Section 2 presents the data and the motivation for focusing on workers who are earning less than predicted. Section 3 presents the basic model that will be used for the wage estimations and Section 4 presents the results. Section 5 compares Israel to the other OECD countries in the sample, including a subsection on vocational training. Section 6 presents another look at the basic estimation results, and Section 7 concludes.

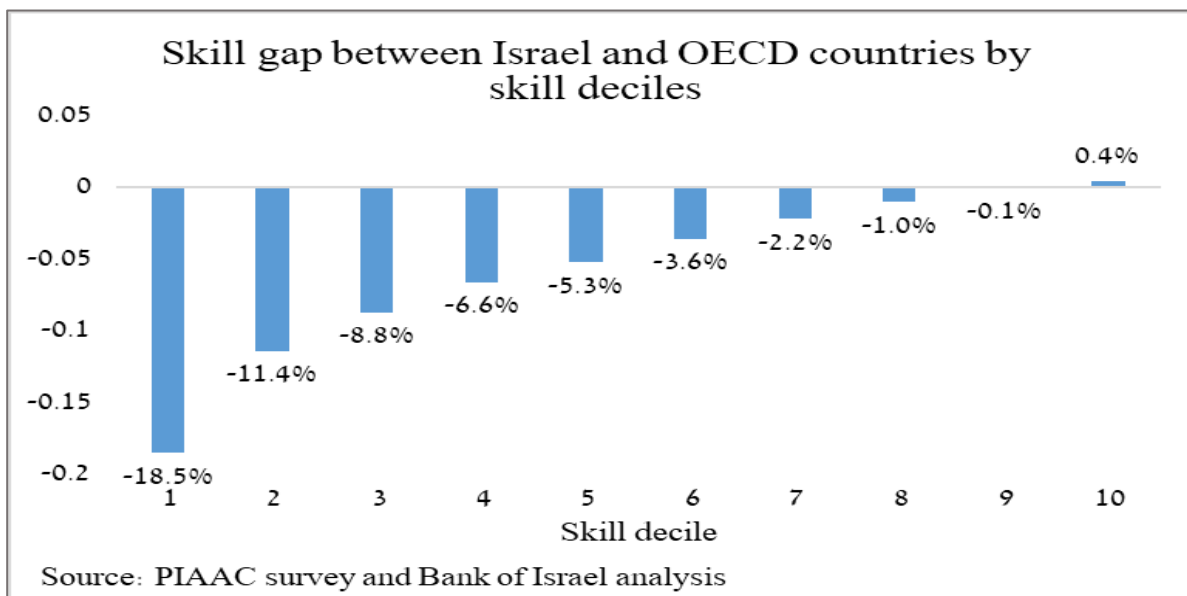
## 2. The data on wage variance in Israel relative to other countries

In this section, we present the data for Israel relative to the other OECD countries and the motivation for focusing on workers who earn significantly less than predicted. Before doing so, we will describe a number of facts for Israel by means of the following graphs, which are taken from past studies and international reviews.

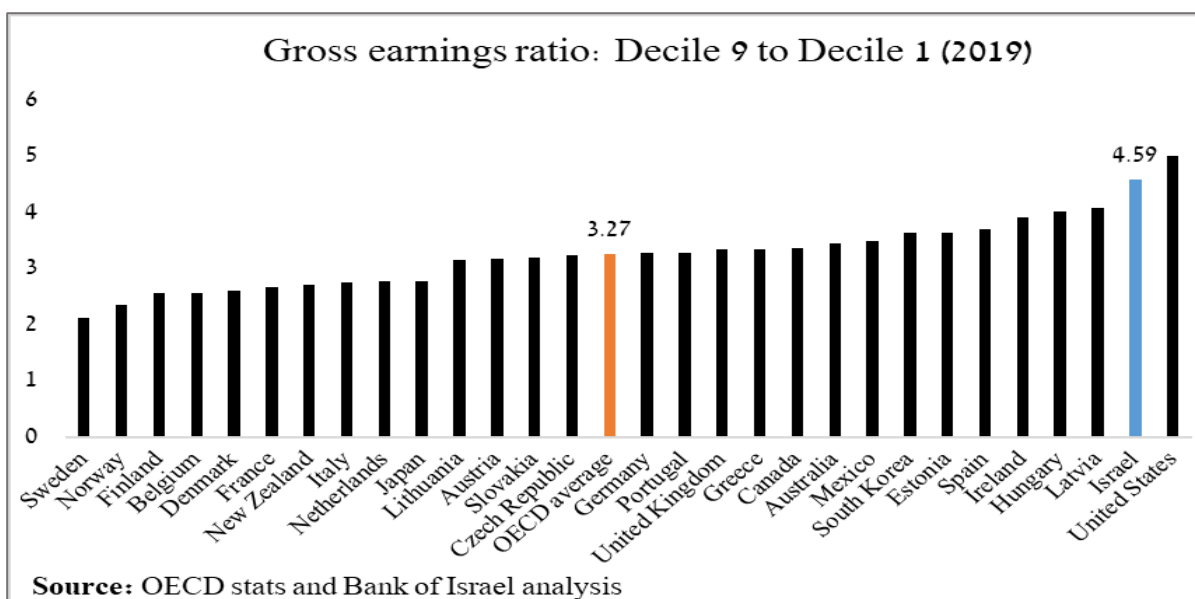
- i. Labor productivity in Israel is lower than the average of the other OECD countries (Bank of Israel, 2023).



ii. The basic skills of workers in Israel, as measured by the PIAAC survey, are lower than the OECD average, and the distribution of those skills in Israel is particularly unequal. Low skill levels is one of the explanations for low labor productivity in Israel (Bank of Israel, 2019).

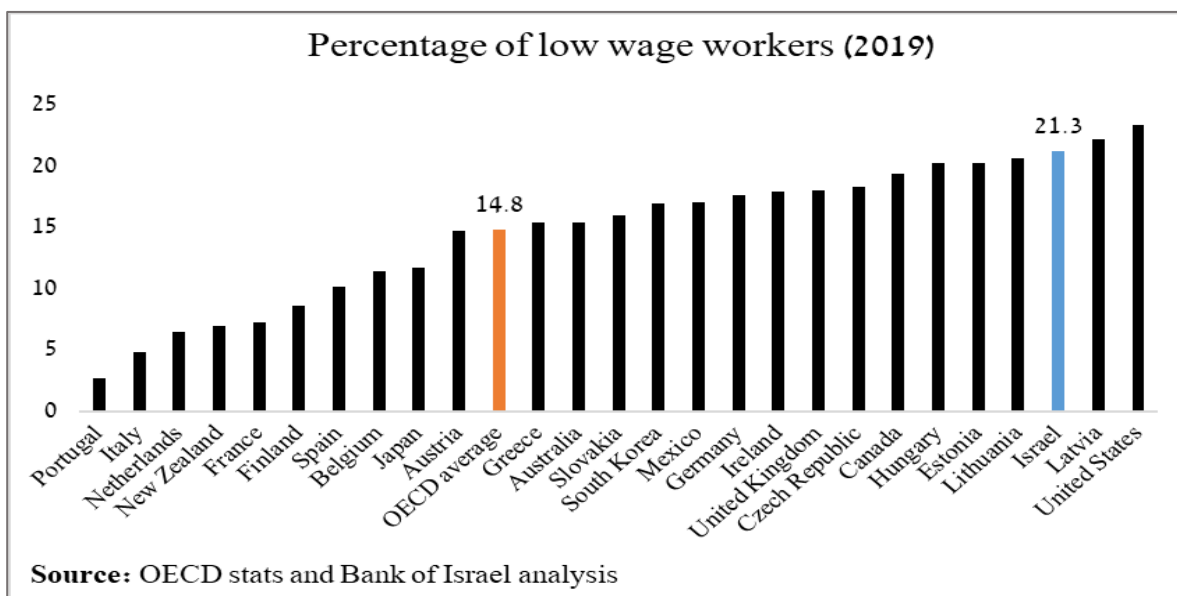


iii. Wage variance is higher in Israel than in the OECD countries.





iv. There is a high proportion of low-earning workers in Israel.<sup>5</sup>



In what follows, we will examine whether wage variance is high in Israel even after taking into account workers' observable human capital (years of schooling and basic skills). In other words, can the high wage variance in Israel be explained by the high variance in workers' human capital?

This will be accomplished using standard Mincerian regressions, and we will examine whether the unexplained wage variance in Israel remains high when estimating similar regressions on the basis of a joint dataset for Israel and the other countries, and whether the explanatory power of workers' observable human capital in predicting wage variance in Israel is less than in the OECD countries.

To do so, we consider four standard multivariate models (regressions) in which the dependent variable is logged hourly wages, to be estimated for each gender separately. We also examine the case of Israel when excluding Arabs and the ultra-Orthodox from the analysis. Following are the models:

1. A model without explanatory variables, which looks at whether Israel is characterized by a high level of wage variance.

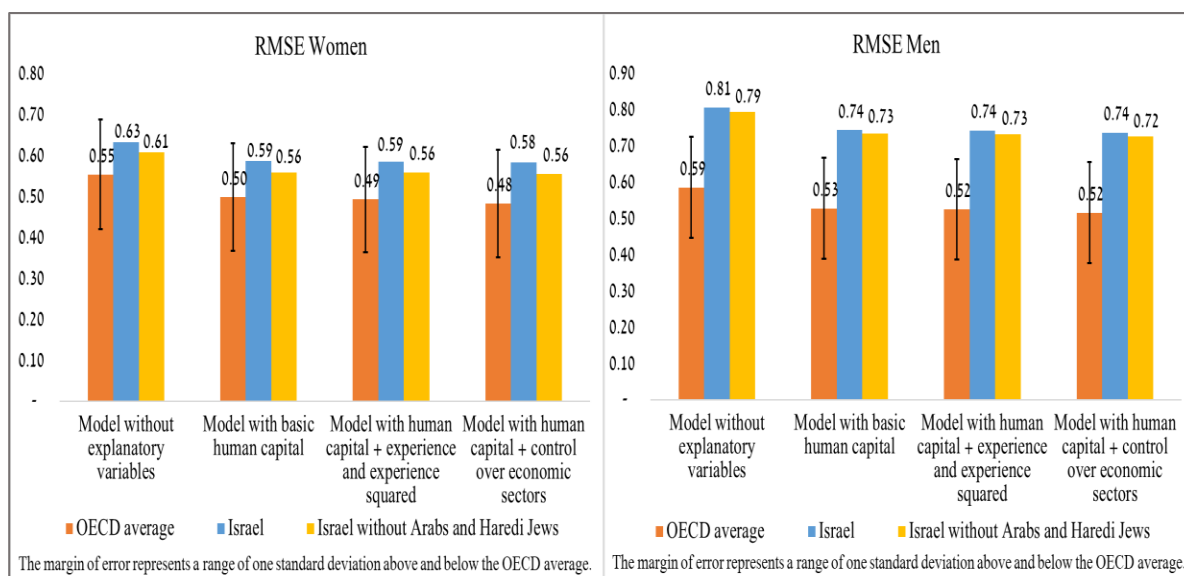
<sup>5</sup> Low-earning workers are defined by the OECD as those earning less than two-thirds of the median wage, normalized for number of workhours.

2. A model with basic human capital: level of education, worker skills, age and age squared and a control for Arabs and the ultra-Orthodox.<sup>6,7</sup>
3. Model 2 + work experience and work experience squared.
4. Model 2 + a control for industry.

The last model is used to test the extent to which the unexplained wage variance in Israel is manifested in a different distribution across industries than that in the OECD. This is not related to the question of causality between choice of industry and the worker's actual wage.

The indices we will look at for each of the aforementioned models are RMSE<sup>8</sup> and R-squared.

**Figure 1**  
**The RMSE of the various models for Israel and the OECD average**

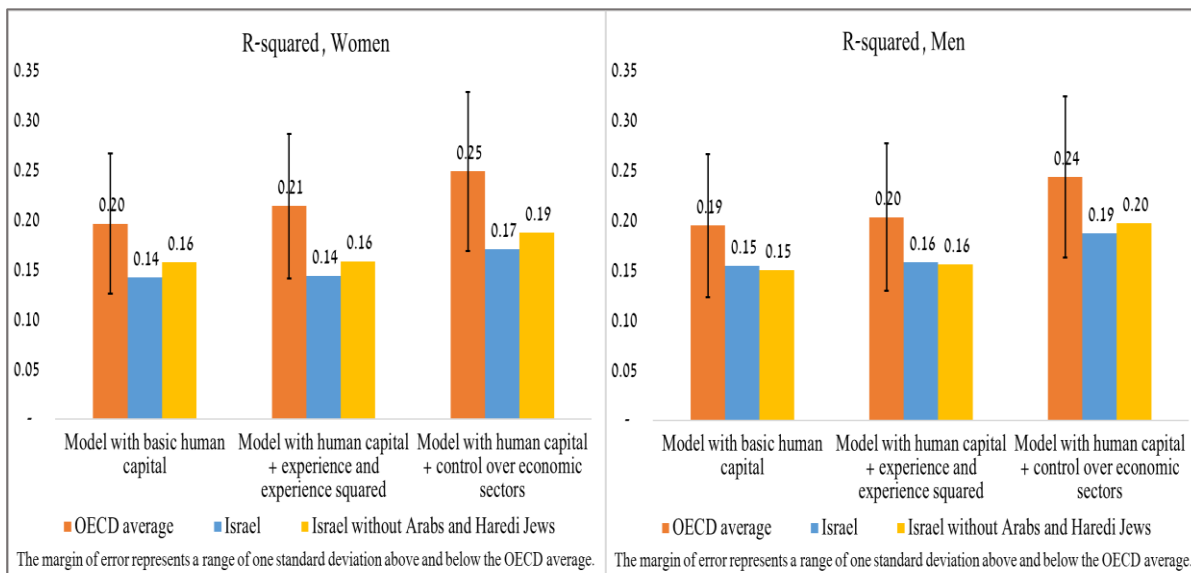


<sup>6</sup> In Appendix B, we also consider a model with only basic human capital without differentiating between the genders and without controlling for Arabs and the ultra-Orthodox.

<sup>7</sup> The definitions of the variables are presented in the next section.

<sup>8</sup> Root mean square error.

**Figure 2**  
**R-squared of the various models for Israel and the OECD average**



What can be learned from these graphs beyond what we know so far according to past research findings?

1. For each of the specifications we looked at, for both men and women, and also without Arabs and the ultra-Orthodox, the **unexplained** wage variance in Israel is exceptionally high relative to the OECD countries.
2. Controlling for human capital reduces the wage variance in Israel by 8.6 percent, compared to 10.2 percent in the OECD countries, and similarly in absolute terms (in percentage points).
3. In the case of men, unexplained wage variance, after controlling for human capital, is more of an outlier relative to the rest of the countries than in the case of women.
4. The addition of a control for experience does not contribute to understanding wage variance in Israel and the OECD countries and therefore from herein we will focus on a basic model without experience but including age (a “cleaner” variable with respect to exogeneity).
5. The distribution of workers by industry in Israel does not contribute to explaining wage variance.

**These findings lead to the conclusion that even after controlling for workers' observable human capital, unexplained wage variance in Israel is exceptionally high relative to other countries.**

In other words, the average distance between workers' actual wages and their predicted wages based on observable characteristics (human capital) is particularly high. This is true both for workers whose wage is higher than predicted and for those whose wage is lower than predicted.

Since the problem of low labor productivity has been recognized in past research<sup>9</sup> and since wages are meant to reflect a worker's productivity, here we will focus on the lower portion of the wage distribution and will try to shed light on that group of workers, namely those whose actual wage is significantly lower than what would be expected based on their measurable human capital, that is, their predicted wage.

The current research makes use of 2014 data on the basis of the last available PIAAC survey and therefore the question arises as to the validity of the data for later years.<sup>10</sup> We examined this question with the help of the Household Expenditure Survey for the years 2013 to 2020, which is the last available year and is free of the short-term effects of the pandemic. We examined whether there is a trend in wage variance and/or its unexplained variance (RMSE) using regressions that control for basic human capital.<sup>11</sup> The results show that there was no trend during those years in the two variables we looked at and there was certainly no decline in either of them.<sup>12</sup>

In sum, research has until now shown that one of the explanations for low labor productivity in Israel is related to the level of human capital. In this research, we explore whether labor productivity among low-earning workers in Israel still requires explanation even after taking into account their level of human capital.

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<sup>9</sup> For example, see Bank of Israel, 2023; Moshe, 2021; and numerous publications by the Chief Economist, the Aaron Institute for Economic Policy, and the Taub Center.

<sup>10</sup> Apart from the fact that wage variance is a variable that relates to the wages of the stock of workers, which does not change radically within a decade.

<sup>11</sup> We ran a Mincerian regression for each year separately and for each gender separately. The dependent variable was the logged hourly wage and the explanatory variables were years of schooling, age, age squared, and dummy variables for Arabs and the ultra-Orthodox. These regressions are similar in form to those built for Figure 1 and 2, which are based on the PIAAC. The main difference is the lack of data for skills. However, and as we shall see below, the findings presented above for PIAAC are not primarily due to the inclusion of the skills variable beyond what is captured by years of schooling.

<sup>12</sup> The regression results are described in Figure A3 in the Appendix.

### 3. Detailed presentation of the basic model

Using individual data (from the PIAAC surveys), it is possible to estimate (using regression) the wages of all workers and to define a group of workers who earn significantly less than predicted. In the next stage, we will characterize those workers and compare them and their proportion of the total workforce to the situation in other countries. The econometric model used is the wage regression model described by Mincer (1974).

The basic econometric model is the following:

$$(1) \quad \ln(W_{ij}) = \alpha_j + \beta_j S_{ij} + \delta_j X_{ij} + \epsilon_{ij}$$

$W$  – the individual’s hourly wage

$S$  – the worker’s observable human capital: his basic skills according to the PIAAC survey (the average of mathematical literacy and reading literacy<sup>13</sup>), age and formal education.<sup>14</sup> This is the workers’ **human capital, which** we know how to quantify.

$X$  – other variables that can affect wages (for example, Arabs and the ultra-Orthodox).

$i$  is the index for worker and  $j$  is the index for country.

The model is estimated for each gender separately.

Table 1 presents the estimation results for the basic regression while Figure 3 provides a graphic illustration.

For each country  $j$ , we calculate the predicted logged wage:

$$(2) \quad \ln(\widehat{W}_i) = \beta S_i + \delta X_i$$

Finally, we define a worker as earning significantly less than predicted if his actual wage is less than his predicted wage by a rate that exceeds a certain threshold, which is defined using  $K$ :

$$(3) \quad P_i = 1 \text{ IFF } \frac{W_i}{\widehat{W}_i} < (1 - K)$$

We will try to characterize this group relative to the rest of the workers using a group of variables  $M$ , some of which are not included in the wage regression.

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<sup>13</sup> Problem-solving in a technology-rich environment is not included in average skills since it was not collected for the entire sample and would reduce the number of observations.

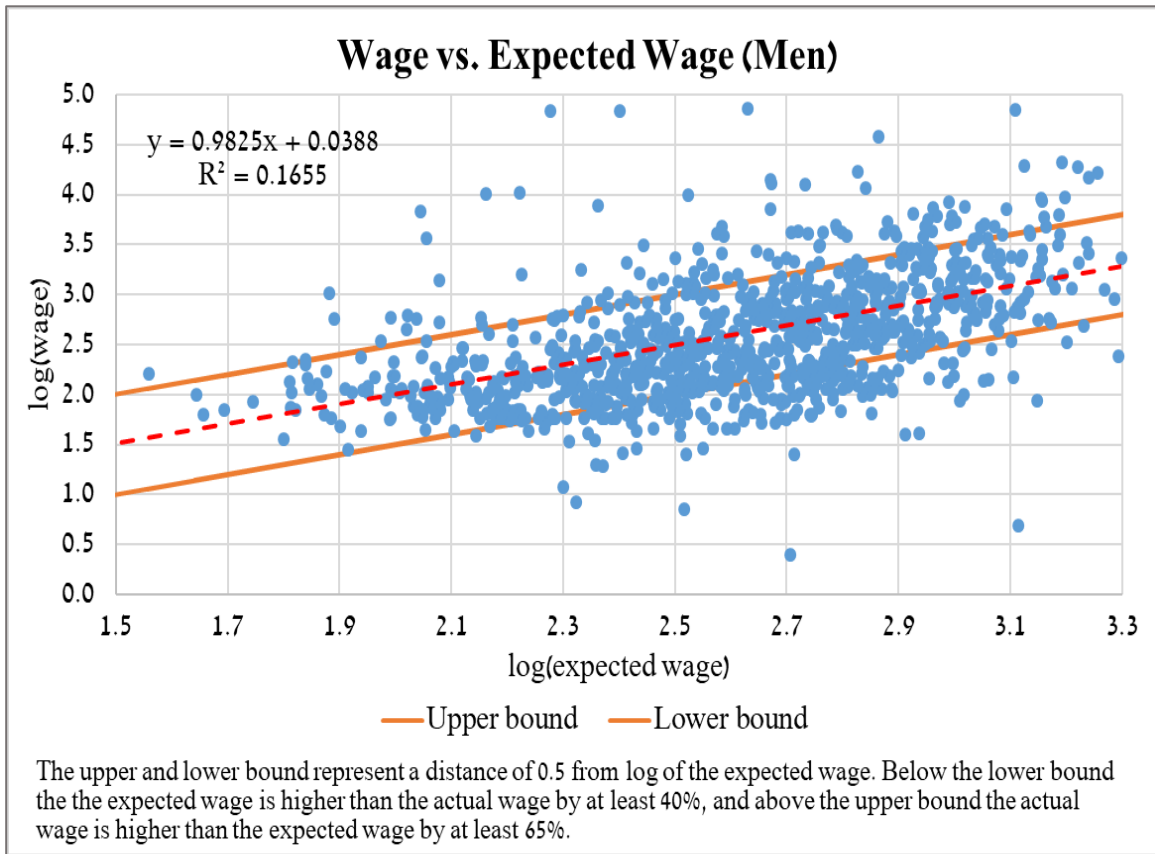
<sup>14</sup> Average years of education according to the highest certificate attained with a correction for the years of education among the ultra-Orthodox.

**Definition:**

A worker is defined as earning significantly less than predicted if his wage is **about 40 percent** less than predicted on the basis of his characteristics (i.e.  $K=0.4$ ). This rate was selected since the general definition of low-earning workers is workers who earn less than two-thirds of the median. A sensitivity test with  $K=0.3$  and  $K=0.5$  does not significantly change the results presented below (Appendix A). Figure 3 illustrates the results for men.

According to the main definition, we found that about 17 percent of men and 14 percent of women in Israel earn less than their predicted wage. In the next section, we will attempt to characterize this population.

**Figure 3**  
**Actual vs. predicted wage from the wage equation**



#### 4. Results for the basic model\*

**Table 1**

	Israel		Averages of OECD coefficients, excluding Israel	
	Men	Women	Men	Women
Skills	***0.143 (0.0239)	***0.136 (0.0199)	0.106	0.093
School	***0.0579 (0.00967)	***0.0532 (0.00832)	0.0541	0.0647
Age	***0.0570 (0.0178)	***0.0475 (0.0144)	0.0512	0.0243
Age squared	**0.000486- (0.000203)	***0.000447- (0.000165)	0.000486-	0.000195-
Constant	0.302- (0.382)	0.0960- (0.315)	0.211	0.526
N	1,040	994	23,107	23,825
R <sup>2</sup>	0.155	0.142	0.195	0.196

SE are presented in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

\* Note that there is no significance level given for the coefficients of the OECD countries because they are an average of the regressions for each country separately rather than a joint estimation for all the countries together.

In the basic model, we include a control in the form of a dummy for Arabs and the ultra-Orthodox and estimate the regressions separately for each gender. The assumption in the basic model is that these variables are correlated with the unobservable characteristics of workers, which have an effect on wages apart from that of observed human capital. It may be that some of the explanation for wage differences between these population groups and others is wage discrimination. In Appendix B, Figure B1 presents the proportion of workers earning less than predicted without controlling for the ultra-Orthodox, Arabs or gender. As can be seen, the proportion of workers earning less than predicted in Israel is much higher than the average for the OECD countries in this model as well, and as expected, their proportion is characterized by overrepresentation of Arabs and women. However, this issue is not the focus of the current research.

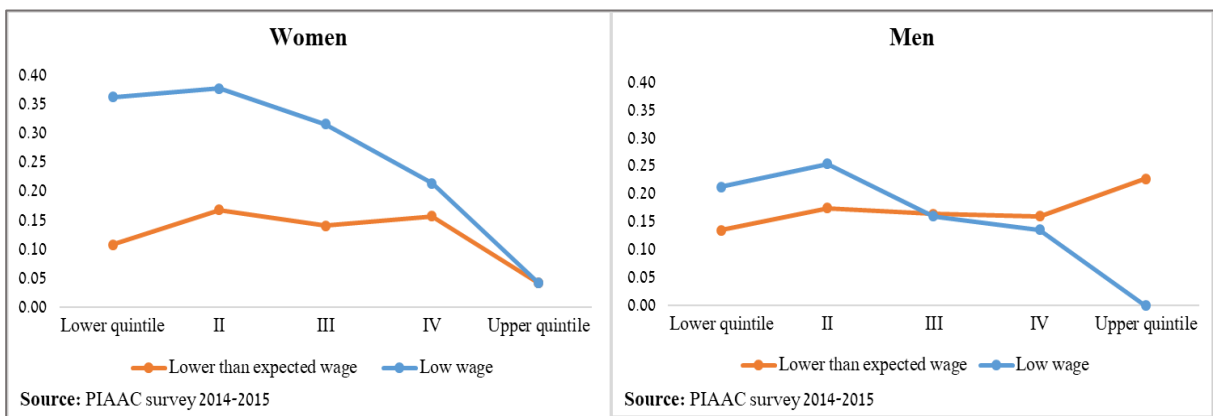
## Characterization of workers with lower than predicted wages

There is an obvious connection between the proportion of low-earning workers (fulltime workers with a wage that is less than two-thirds of the median fulltime wage<sup>15</sup>) and the proportion of workers with a lower than predicted wage. Nonetheless, it should be noted that the accepted international definition does not relate to the human capital that an individual has accumulated, while in the model we consider it is the worker's hourly wage relative to the wage predicted by the worker's human capital and its estimated return in terms of his wage.

We found that among male workers earning significantly less than their predicted wage, **57 percent** are low wage earners according to the accepted definition (**51 percent worldwide**) while among female workers, **92 percent (78 percent worldwide)** are low wage earners. Among low-earning men, **57 percent** are defined as earning a lower than predicted wage (**21 percent worldwide**) and among low-earning women the figure is **44 percent (30 percent worldwide)**. Therefore, there appears to be a nonnegligible overlap between these groups even though they are not identical.

Segmentation by socioeconomic cluster (Figure 4) reveals additional insights. While the proportion of low-earning workers drops significantly as the socioeconomic index of the worker's area of residence rises, the proportion of workers with lower than predicted wages is not linearly related to the socioeconomic index of the worker's area of residence.

**Figure 4**  
**Proportion of workers with significantly lower than predicted wages and the proportion of low wage earners according to the socioeconomic index of the worker's area of residence**



<sup>15</sup> See <https://stats.oecd.org/index.aspx?queryid=64193>



Table 2 and Figure 5 summarize and compare the individual characteristics of workers with lower than predicted wages, low-earning workers and the rest of the workers (whose wages are not significantly lower than predicted).

**Table 2**

**The characteristics of workers according to the various wage definitions\***

**a. Men**

	<b>Employees earning significantly lower wages than expected</b>	<b>Employees with low wage**</b>	<b>Employees whose wages are not significantly lower than expected</b>
<b>Share (%)</b>	17.4	17.5	
<b>Hourly wage (₪)</b>	25.9	22.6	60.8
<b>Skills</b>	253.3	220.5	254.4
<b>Share of Arabs (%)</b>	26.7	35.9	15.7
<b>Share of Haredi Jews (%)</b>	4.4	7.5	4.7
<b>Age (years)</b>	44	38	40
<b>Professional experience (years)</b>	23	18	20
<b>Education (years)</b>	13.2	11.4	13.1
<b>Public sector (%)</b>	26.1	19.4	29.3
<b>Share of employees who have undergone professional training (%)</b>	20.4	11.1	33.8
<b>Work where they live (%)</b>	52.0	47.3	28.0
<b>N</b>	184	219	857

\* Industry and occupation: Industry and occupation were not included in the first stage of the individual wage estimation as they are endogenous to wages and controlling for them will focus the discussion on a different channel, which will be discussed later in the paper (Section 4.2).

\*\* Workers whose workhour-adjusted wage is less than two-thirds of the median; in this table, we use hourly wages.

## b. Women

	Employees earning significantly lower wages than expected	Employees with low wage**	Employees whose wages are not significantly lower than expected
Share (%)	14.2	29.5	
Hourly wage (₪)	21.7	23.0	48.9
Skills	250.1	227.3	249.8
Share of Arabs (%)	11.4	13.6	7.7
Share of Haredi Jews (%)	3.2	6.7	7.1
Age (years)	46	41	41
Professional experience (years)	21	18	19
Education (years)	14.0	12.6	13.7
Public sector (%)	30.8	32.6	46.1
Share of employees who have undergone professional training (%)	18.9	15.5	37.8
Work where they live (%)	63.7	63.1	48.6
N	142	313	852

\* Industry and occupation: We did not include occupation and industry in the first stage of the individual wage estimation since they are endogenous to wages and controlling for them will focus the discussion on a different channel, which will be discussed later in the article (Section 4.2)

\*\* Workers whose workhour-adjusted wage is less than two-thirds of the median; in this table, we use hourly wages.

**Figure 5**

**The proportion of workers with significantly lower than predicted wages by population group, Israel**

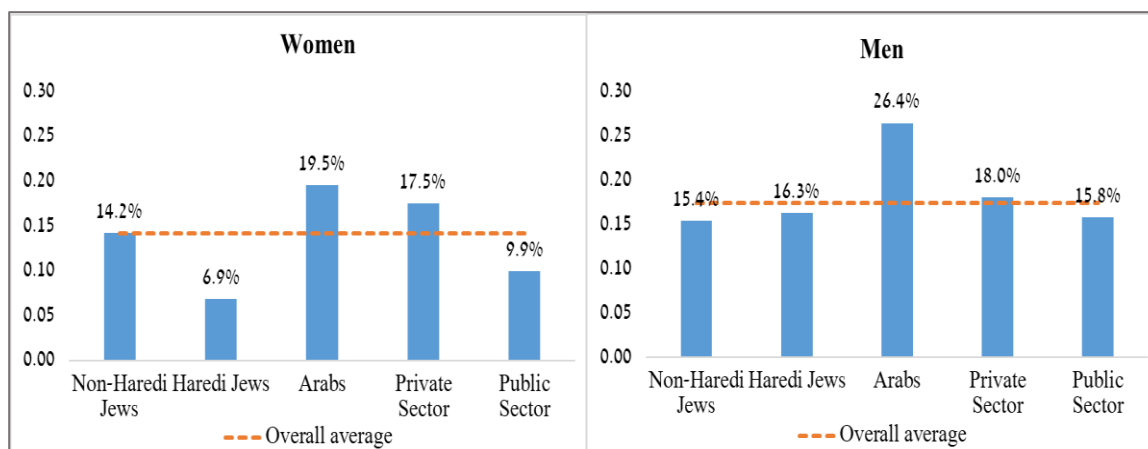
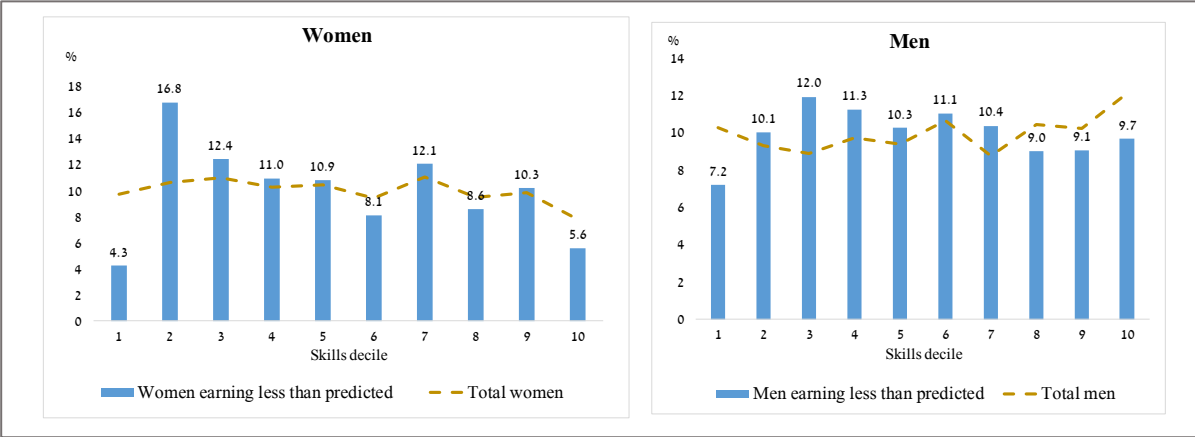


Table 2 and Figure 5 lead to several interesting results:

1. As expected from the econometric model, the observable human capital of workers with lower than predicted wages is much higher than that of workers with lower wages, and their skills are similar to the rest of the workers.
2. Despite the controls in the regressions, there is overrepresentation of Arabs among the workers with lower than predicted wages in both genders; however, among men there is underrepresentation of the ultra-Orthodox.
3. Workers with lower than predicted wages tend to be employed less in the public sector than workers whose wages are not lower than predicted and who are not low wage earners. This is because the structure of wages is denser in the public sector than in the private sector.
4. Workers with lower than predicted wages are older by four years than those with higher than predicted wages.
5. The proportion of workers with lower than predicted wages who work close to their place of residence is much higher than among the remaining workers.
6. There is a significant disparity between workers with lower than predicted wages and the remaining workers with respect to the percentage of workers who reported having undergone on-the-job vocational training during the previous year (seminars, workshops or training days). We will return to this important point below.

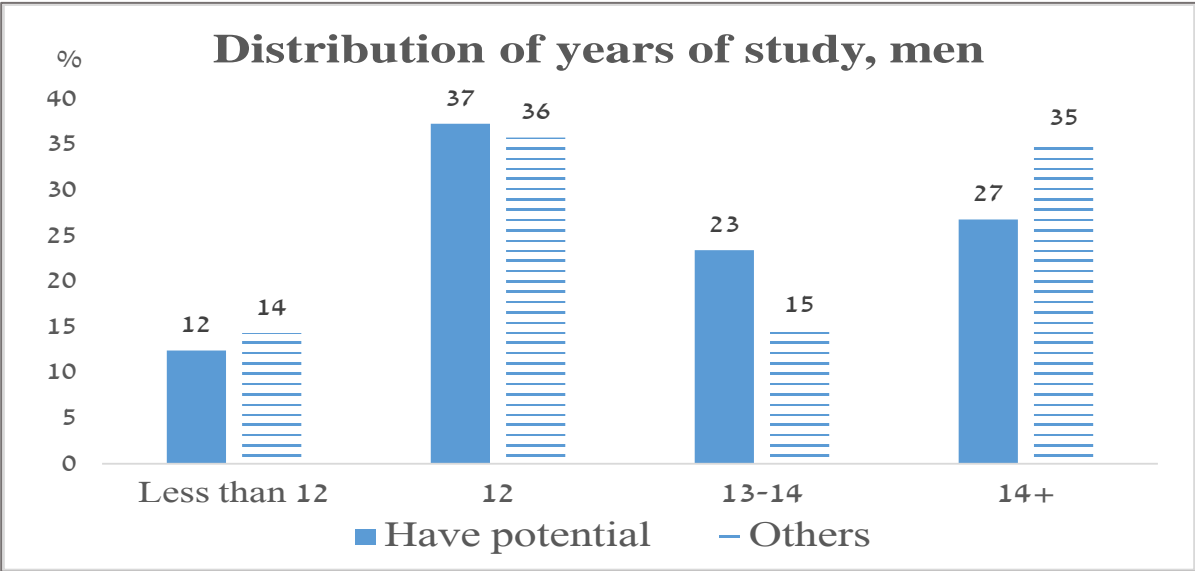
An examination of only average group characteristics does not always reveal information about all parts of the distribution. Figure 6 and 7 show that the skills of workers with lower than predicted wages are more concentrated than the rest of the population. In other words, among workers with lower than predicted wages there is underrepresentation of particularly low- and/or high-skilled workers. Similarly, there is a high representation of workers with 13–14 years of schooling. We would also mention that we did not find any significant differences with respect to parents' country of origin between workers with lower than predicted wages and the rest of the population.

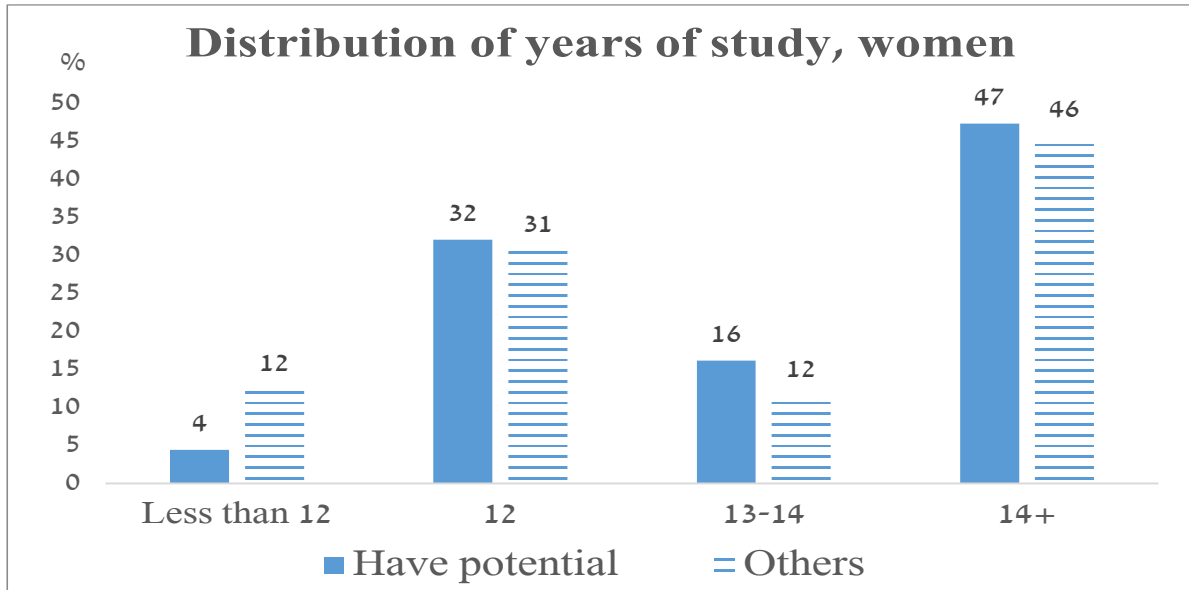
**Figure 6**  
**Distribution of skills among workers with significantly lower than predicted wages\***



\* The dashed line is not flat at 10 percent because the skill deciles were calculated for each gender separately.

**Figure 7**  
**Distribution of years of schooling among workers with significantly lower than predicted wages and other workers**





## 5. Comparison to other countries

### 5.1 The aggregate level

This section describes Israel’s situation relative to the OECD countries with respect to the proportion of workers with significantly lower than predicted wages. Figure 8 presents this proportion for Israel relative to the rest of the countries that participated in the PIAAC survey. It is important to emphasize that in order to find the proportion for each country, we separately estimated the same wage equation as that described in Section 2 and in Table 2.

**Figure 8**  
**Proportion of workers with significantly lower than predicted wages across countries**

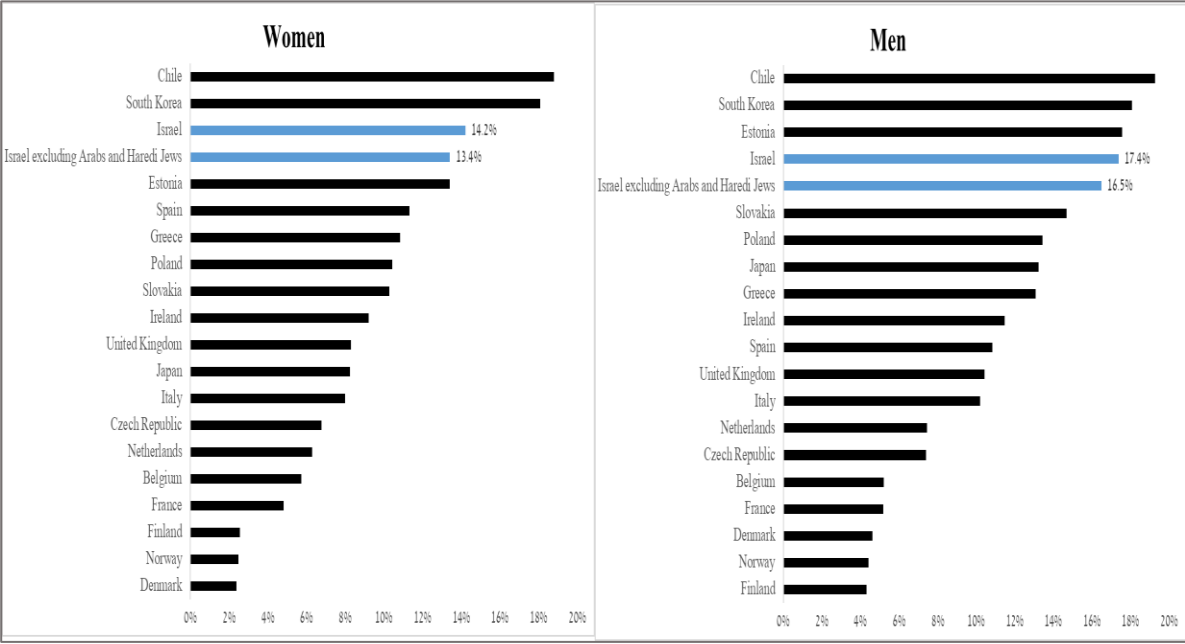


Figure 8 shows that the proportion of workers with lower than predicted wages in Israel is much higher than in other countries and is **almost double the average** of the rest of the OECD countries for both genders. The gap remains and only narrows somewhat if one considers only the Jewish non-ultra-Orthodox population. This is the main finding of the current research—namely, that there is a high proportion of workers with lower than predicted wages that cannot be explained only by low human capital (skills, experience or formal education). These results remain valid even when the gap between the actual wage and the predicted wage according to a worker’s characteristics is defined not as two-thirds of the predicted wage but as 30 percent or more of the predicted wage or as 50 percent or more (Appendix A).

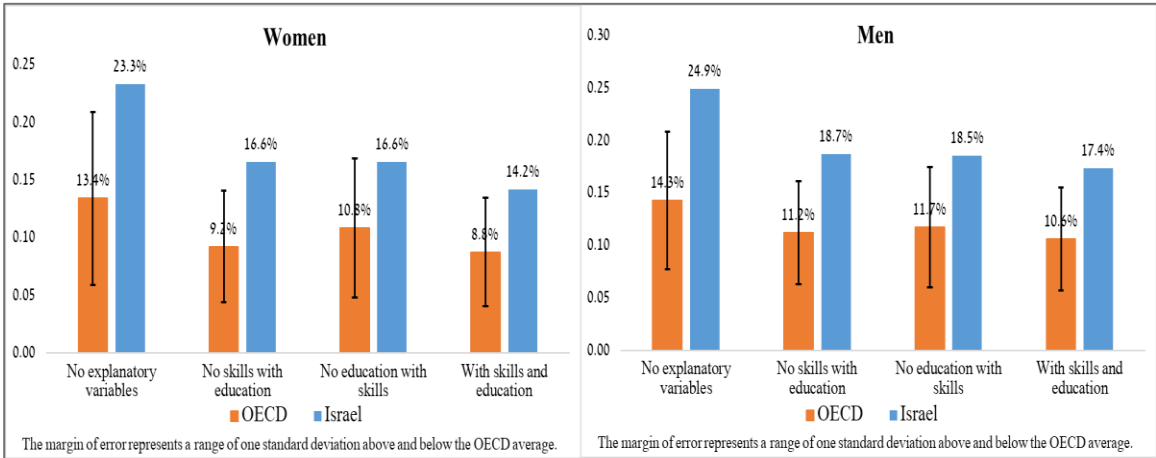
On the assumption that wages correspond to average labor productivity and that an improvement in earning power reflects an increase in labor productivity (rather than a decline in the share of capital within GDP), we carried out a simple (“back of the envelope”) calculation in order to estimate the extent to which an increase in the productivity of workers with lower than predicted wages would increase GDP per capita.

If the proportion of workers earning less than predicted was similar to the average proportion in the OECD countries, then the wages of **5.9 percent of men and 5.1 percent of women would rise as follows:**

1. If their wages rose to the lower bound (i.e., to 40 percent less than their predicted wage), there would an addition of **1.6 percent to GDP per capita.**
2. If their wages rose to the level of the predicted wage, then the addition would be **6.2 percent.**

We found that the proportion of workers in Israel with lower than predicted wages is relatively high even when observable human capital includes only skills or only education (Figure 9) and alternatively even when not controlling for the ultra-Orthodox, Arabs or gender (Appendix B).

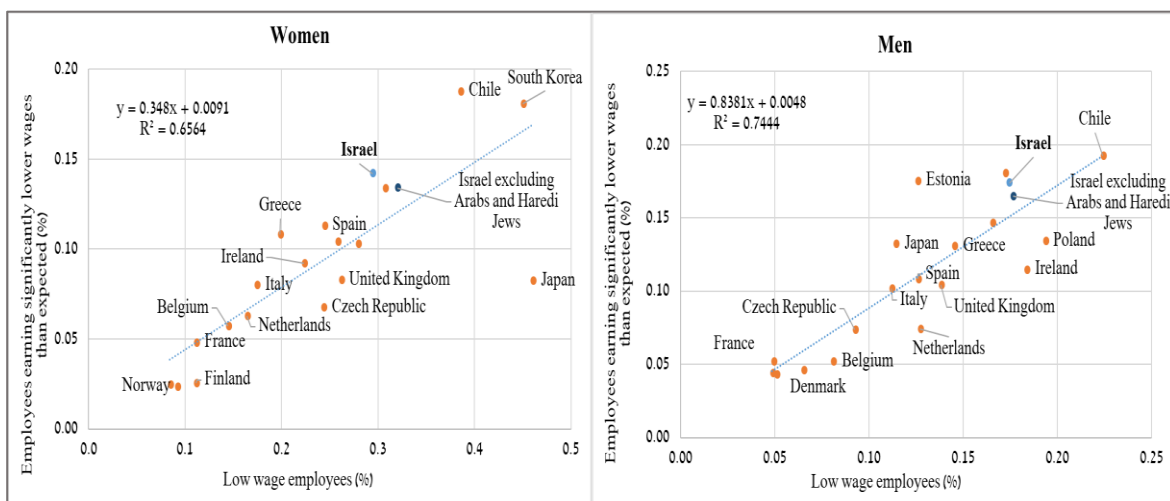
**Figure 9**  
**Proportion of workers with significantly lower than predicted wages under various specifications of controlling for human capital, relative to other countries**



The following question then arises: What can explain the high proportion of workers with lower than predicted wages in Israel?

Figure 10 shows a strong positive correlation (0.86 among men and 0.81 among women) between countries with a high proportion of low-earning workers and those with a high proportion of workers with significantly lower than predicted wages. The graph also illustrates that even taking into account the proportion of low-earning workers, Israel has a relatively high proportion of workers, especially women, with significantly lower than predicted wages.

**Figure 10**  
**Proportion of workers with lower than predicted wages relative to the proportion of low-earning workers in Israel and in the OECD**



## 5.2 Analysis by industry and occupation

### Industry

In order to understand the topic of this research, it is important to consider a cross-industry perspective. In past research, it has been found that the level of productivity in Israel is relatively low and not just because human capital in Israel is at a relatively low level.<sup>16</sup> One of the explanations for the low level of productivity in Israel is the low stock of capital per worker, which varies across countries and across industries within each country. It is worth recalling that our research looks at workers with significantly lower than predicted wages within each country, i.e., relative to other workers in that country. A cross-industry perspective can help put into focus the question of whether Israel has a high proportion of workers with lower than predicted wages even after taking into account the stock of capital per worker in each industry<sup>17</sup> and the level of human capital per worker. This of course says nothing about the causality involved, since there is clearly a connection between a worker's human capital and the choice of industry in which to work.

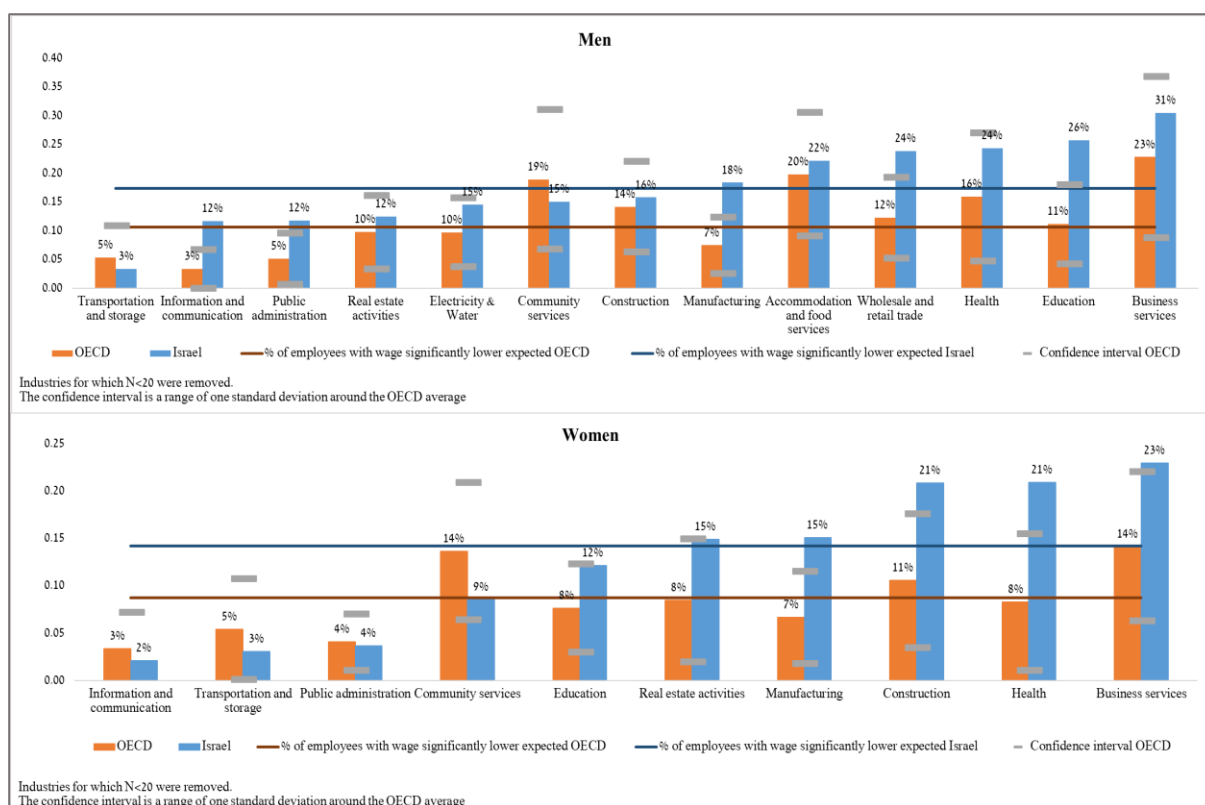
<sup>16</sup> See, for example, the Hurwitz Conference, 2014 policy paper issued by an economic workgroup headed by Professor Zvi Eckstein on labor productivity in Israel. They found that within a gap of about 30 percent in output per workhour in 2011 relative to the OECD average, two-thirds were explained by total factor productivity and another about one-third by the low level of capital per worker in Israel.

<sup>17</sup> The PIAAC survey does not make it possible to examine the division of industries with statistical inference at the two-digit level, although it is clear that even within each industry there is a high level of variation across sub-industries in the stock of capital per worker.



Figure 11 shows that, as in the case of Israel, there is a high variance across industries in the OECD with respect to the proportion of workers with significantly lower than predicted wages. However, it also shows that the proportion of these workers in Israel is higher than the average of the OECD countries in most industries and in particular in public services, in trade and business services, and in manufacturing. Therefore, it can be said that the **reason for the high proportion in Israel is not only due to the difference between Israel's industrial profile and that of other countries or the stock of capital per worker.**

**Figure 11**  
**Proportion of workers with lower than predicted wages, by industry; Israel and the OECD average**



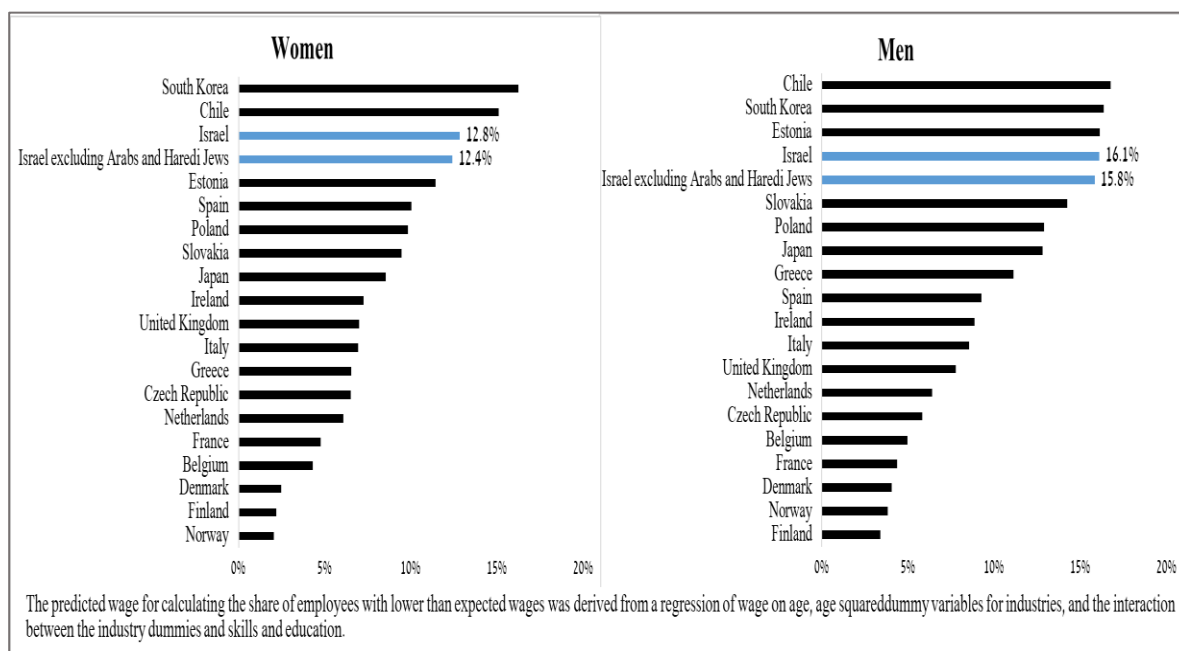
Following disaggregation by industry, we find that a worker's return on education and skills varies across industries and therefore we estimated an additional model in which we allow the return on skills and education to vary by industry in each country.

$$\ln(W_{ijk}) = \alpha_{jk} + \beta_{jk}S_{ijk} + \delta_j X_{ij} + \epsilon_{ijk}$$

where  $k$  is the index for industry.

The results of the model indicate that although the proportion of workers with lower than predicted wages drops both in Israel and the rest of the OECD when industry is controlled for and the return on human capital is allowed to vary across industries, the proportion remains particularly high in Israel (Figure 12).

**Figure 12**  
**The proportion of workers with significantly lower than predicted wages when the return on education and skills can vary by industry**

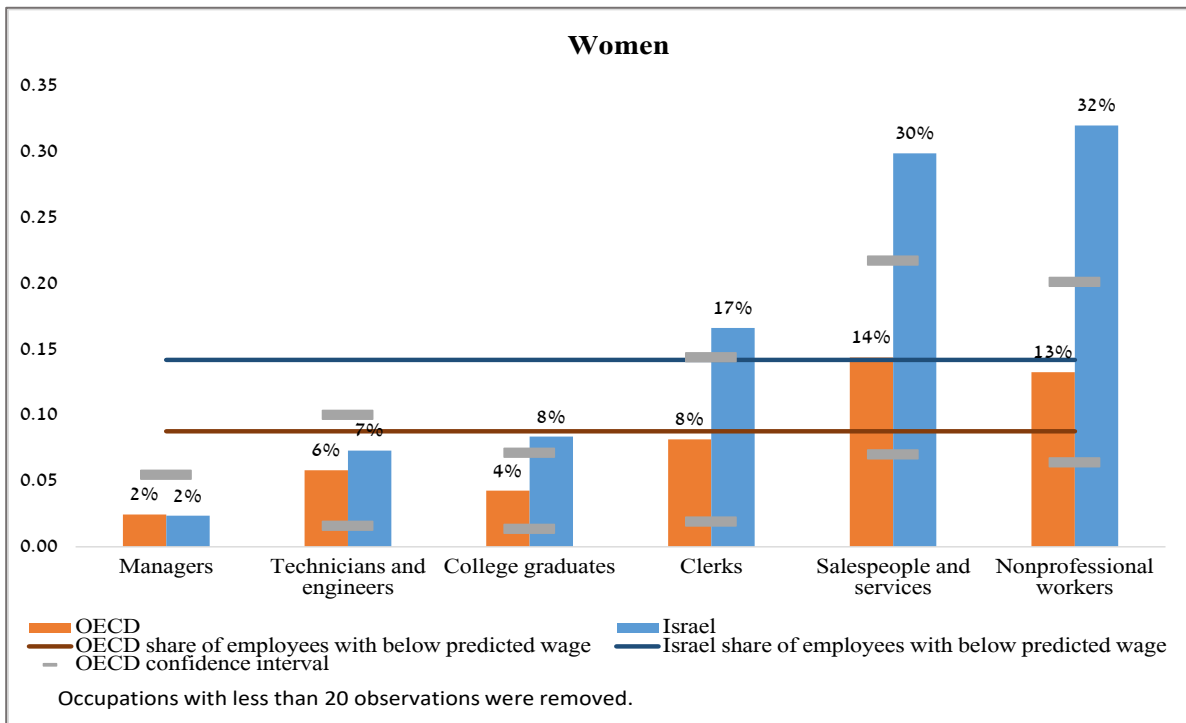
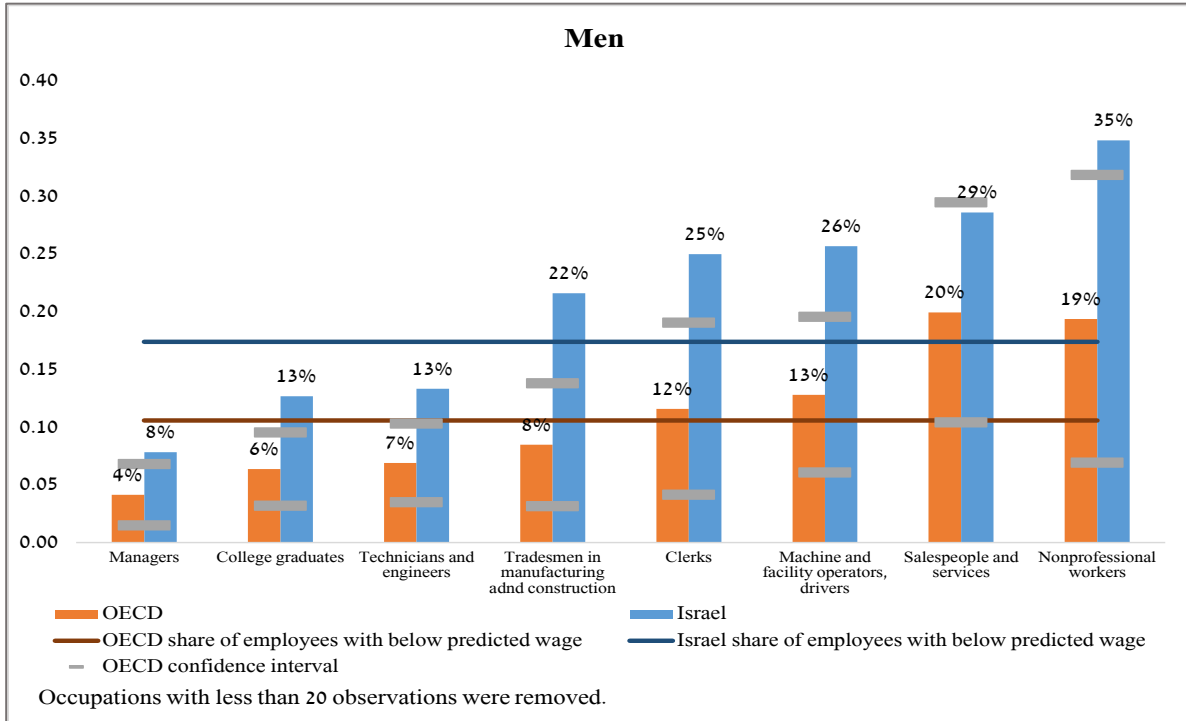


### Occupations

Figure 13 shows the frequency of men and women with lower than predicted wages relative to other countries according to occupation. As expected, in white- and blue-collar occupations there is significant overrepresentation of workers with lower than predicted wages; however, not all workers with significantly lower than predicted wages are concentrated in the same occupations. Thus, they are represented on a not insignificant scale in a wide variety of occupations. Similarly, and as was found with respect to variation by industry, the proportion of workers with lower than predicted wages in Israel is higher than the OECD average in almost every occupation. Therefore, the distribution of occupations in Israel does not on its own explain why the proportion of workers with significantly lower than predicted wages is higher in Israel.

**Figure 13**

**The proportion of workers with lower than predicted wages by occupation, Israel and the OECD average**



## Statistical testing of the disparities between countries

Using a basic econometric model and a single joint estimation for all individuals in the various sample countries, we now test the degree to which the proportion of workers with lower than predicted wages in Israel is an outlier. Every worker  $i$  in each country is an observation that receives a value of 1 if his wage is significantly lower than predicted (in the country where he works) and 0 otherwise, according to the basic model presented in Section 2.

Specifically, Table 3 presents the estimated parameter ( $\delta_{Israel}$ ) for Israel (relative to other countries) in the following econometric model:

$$(1) \quad P(Low\_wage_i) = \delta_{Israel} + X_i + \epsilon_i$$

The regression identifies the factors that affect the likelihood of a worker earning significantly less than his predicted wage (first stage, Equation I) in a single joint regression for all countries, which includes a dummy variable for Israel.  $X_i$  are individual characteristics, which are discussed below.

The proportion of workers with lower than predicted wages, which is the regression's dependent variable, is calculated according to the basic econometric model described by Equation (1). Each cell in Table 3.1 and 3.2 presents the coefficient for Israel in the regression.

**Table 3.1\***

### Estimating Israel's coefficient in a joint international regression

	Basic model - equation 1 (I)	Basic model with control for industries (II)	Basic model with control for industries and occupation (III)	Model with all explanatory variables (IV)	Basic model + indicator for low wages (V)	Low wage as an explanation of the gap between Israel and other countries (VI)
Women	0.052***	0.058***	0.069***	0.078***	0.051***	2%
Men	0.058***	0.061***	0.074***	0.098***	0.029*	51%

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Table 3.2\***

### Estimating Israel's coefficient excluding ultra-Orthodox and Arabs in a joint international regression

	Basic model - equation 1 (I)	Basic model with control for industries (II)	Basic model with control for industries and occupation (III)	Model with all explanatory variables (IV)	Basic model + indicator for low wages (V)	Low wage as an explanation of the gap between Israel and other countries (VI)
Women	0.044***	0.051***	0.062***	0.062***	0.036**	18%
Men	0.049**	0.055**	0.074***	0.086***	0.018	62%

\* In the basic model, the only explanatory variable is the dummy for Israel.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The “clean” model (Model I) essentially tests what is presented in Figure 8, in which we compare the proportion of workers with lower than predicted wages in Israel to that in the rest of the countries and test whether the gap is statistically significant. In fact, as can be seen in Table 3, their proportion in Israel is higher than the average for the sample countries by about 5 percent for men and 6 percent for women, though omitting Arabs and the ultra-Orthodox reduces the coefficient for Israel by about 15 percent.

Another control in the second stage is based on the distribution of workers by industry (Model II). This increases the estimated coefficient for Israel, as can be seen in Figure 11, which shows that the allocation across industries in Israel is not the only reason for the relatively high proportion of workers with significantly lower than predicted wages. A similar phenomenon is found when controlling for a worker’s occupation (Model III).

Model IV, in which we control for a worker’s characteristics (education, skills, age, age squared, number of children and a dummy variable for being married), includes explanatory variables that were present in the initial regression, in which we defined workers with significantly lower than predicted wages. The coefficient for Israel increases, a finding that formally demonstrates that human capital is relatively high in Israel, particularly with respect to years of schooling.

Finally, we included an additional indicator for a low-earning worker (who earns less than two-thirds of the median hourly wage) and found that the relatively high proportion of low-earning workers in Israel explains about one-half of the gap between Israel and the average for the rest of the countries with respect to the proportion of men with lower than predicted wages and only 2 percent of the gap in the proportion of women. This finding, and in particular the difference in explanatory power of the low-earnings indicator between the genders, reflects the fact that in Israel there is a high proportion of low-earning men whose wage is also significantly lower than predicted relative to the other countries (57 percent in contrast to an average of 21 percent in the other countries). In contrast, among women the overlap between low-earning workers and those with significantly lower than predicted wages is not an outlier relative to the average of the other countries; see Section 4 above.

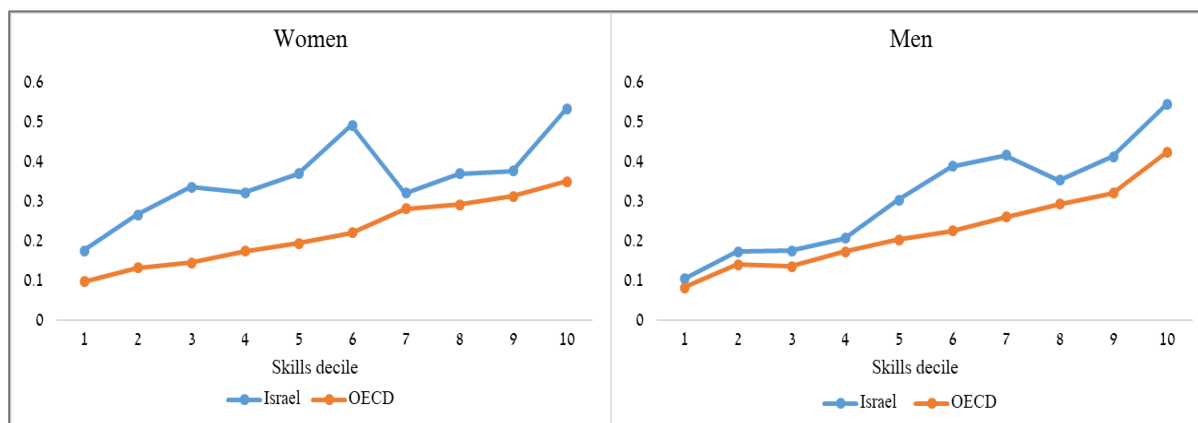
### 5.3 Investment in human capital by means of on-the-job vocational training

In this subsection, we take a closer look at the connection between the proportion of workers with lower than predicted wages and investment in human capital in the workplace itself, that is, vocational training offered by the employer.

It appears that in the case of workers in Israel there is no macroeconomic deficit in investment by employers in the workplace. The average proportion of workers in Israel who report recently undergoing on-the-job vocational training is higher than the OECD average, which is the case for all skill deciles (Figure 14). Similarly, Figure 14 and Figure 15 show that there is no exceptionally large correlation in Israel between a worker's wage and the vocational training undergone, particularly in the case of men. Table 4 (righthand panel) also shows that among women in Israel about one-half of the coefficient for vocational training in a multivariable regression of hourly wages is explained by the mix of vocational training in the economy, which varies from industry to industry and is similar to the OECD average.

**Figure 14**

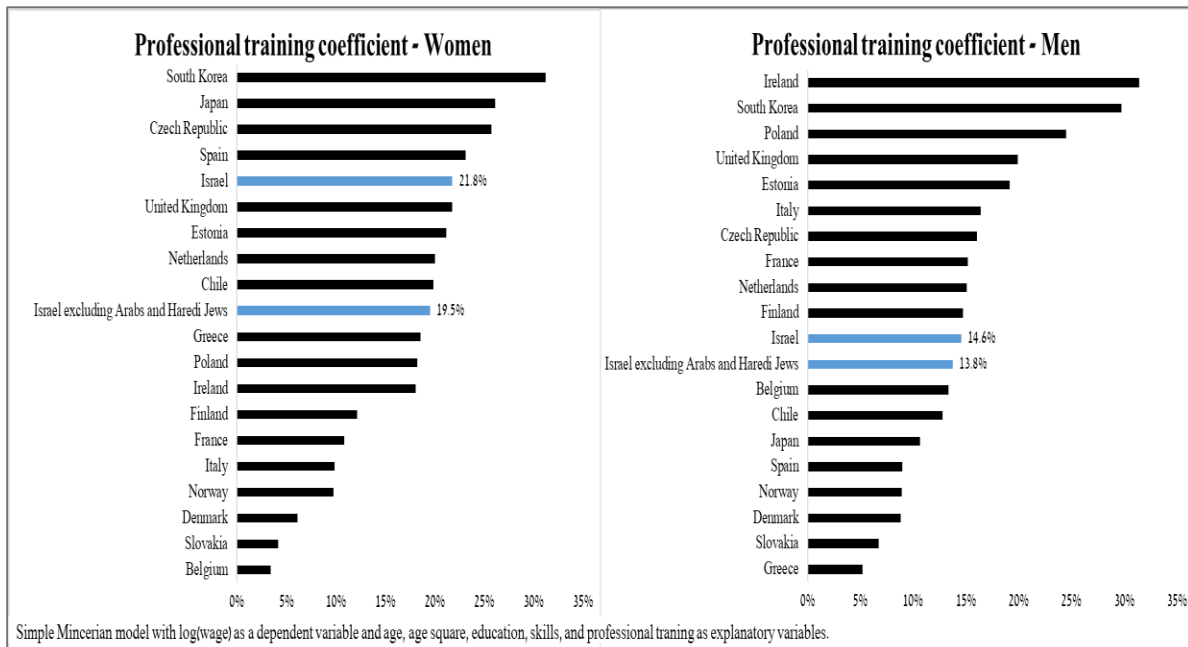
**The proportion of workers who reported recently undergoing on-the-job vocational training, by skill decile\***



\* The skill deciles are built for each country separately.

**Figure 15**

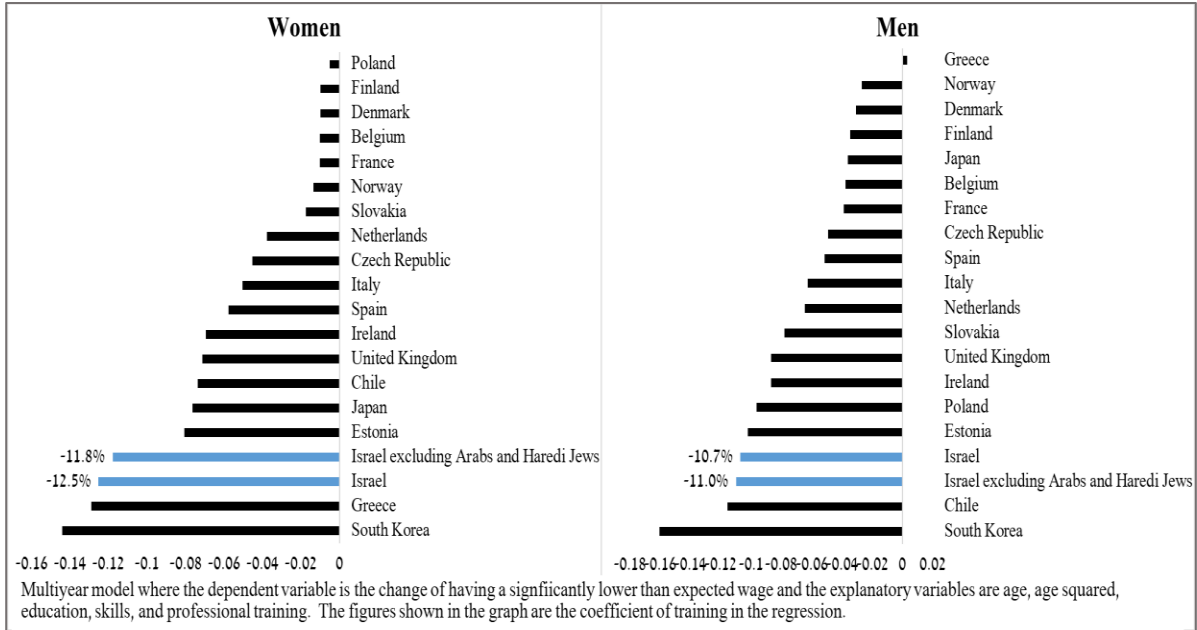
**The connection between vocational training and hourly wage in a multivariate regression**



Nonetheless, we found that the disparity in Israel between workers with lower than predicted wages and other workers with respect to the proportion who recently underwent vocational training is particularly high even after controlling for human capital (Figure 16). This finding indicates that even though Israel does not suffer from a macroeconomic deficit with regard to on-the-job vocational training relative to the OECD countries, a deficit does emerge if one focuses on workers with lower than predicted wages.

**Figure 16**

**The gap in the proportion of workers participating in on-the-job vocational training between workers with lower than predicted wages and other workers (based on the results of a multivariate regression model)**



Moreover, in an alternative model for calculating the predicted wage (presented in Section 2), which includes on-the-job vocational training in addition to basic human capital, the proportion of workers with lower than predicted wages in Israel declines by 7.1 percent among men and 14.9 percent among women, in contrast to 3.7 percent among men and 2.9 percent among women on average in the OECD (Figure 17 in comparison to Figure 8). However, even if vocational training is included in the definitional stage, Israel still has a high proportion of workers with lower than predicted wages, also in comparison to the rest of the OECD (Figure 17).

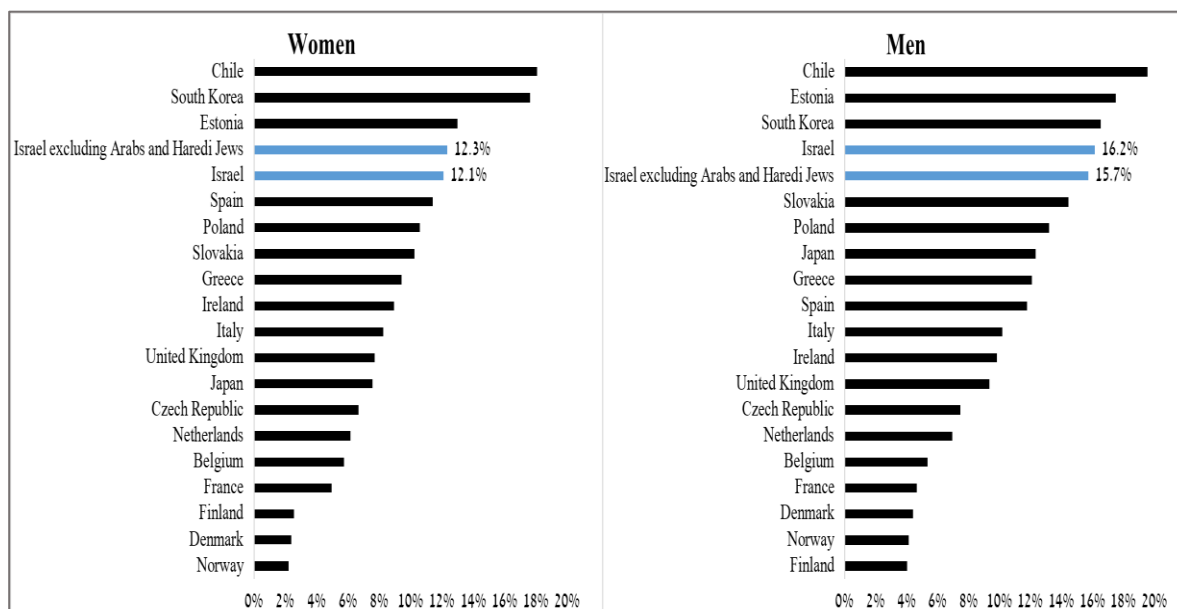
The analyses that we carried out (Table 4, lefthand panel) also show that among women, more than one-half of the gap between the proportion of workers who participated in on-the-job vocational training and the proportion of workers with lower than predicted wages is explained by the difference in occupational mix or distribution by industry.

Note that we did not include vocational training within the basic model because we believe that, in contrast to education and basic skills which are for the most part acquired prior to a worker’s entry into the labor market, vocational training is more endogenous, given that it is acquired during the course of a worker’s career and is dependent on the worker’s place of work.



**Figure 17**

**Proportion of workers with lower than predicted wages after controlling for vocational training**



**Table 4 – The change in the effect of vocational training in Israel and in the OECD on wages and on the likelihood of having a significantly lower than predicted wage, after controlling for industry and occupation**

	P(low wage)= F(age , age <sup>2</sup> , skill, school, <b>training</b> , i.occupation, i.branch)		Log(wage) = F(age , age <sup>2</sup> , skill, school, <b>training</b> , i.occupation, i.branch)	
	Men	Women	Men	Women
Coefficient of training in Israel - excluding industries and occupations	***0.107-	***0.125-	***0.146	***0.218
Coefficient of training in Israel - including industries and occupations	***0.082-	**0.057-	**0.118	***0.113
Change	0.025	0.068	0.027-	0.105-
<b>Percent change in the coefficient of professional training in Israel plus industries and occupations</b>	<b>23%</b>	<b>55%</b>	<b>19%-</b>	<b>48%-</b>
Average coefficient of training - OECD excluding industries and occupations	0.064-	0.051-	0.154	0.167
Average coefficient of training - OECD including industries and occupations	0.035-	0.023-	0.092	0.092
Change	0.029	0.028	0.062-	0.075-
<b>Percent change in the average coefficient of professional training in the OECD plus control for industries and occupations.</b>	<b>45%</b>	<b>55%</b>	<b>41%-</b>	<b>45%-</b>

**Note:** The table presents the coefficient of on-the-job vocational training in various regressions. The righthand panel of the table describes the change in the vocational training coefficient in Israel and in the OECD when one adds dummy variables for industry and occupation to the regression of human capital and vocational training on wages. The lefthand panel describes a similar change in the coefficients of a regression of human capital and vocational training for the likelihood of having a lower than predicted wage (as calculated in the basic model). All of the regressions are available from the authors.

#### 5.4 Macro-level connections

What characterizes the countries with a relatively high proportion of workers with significantly lower than predicted wages? Table 5 presents the binary correlations between the different variables and the proportion of workers with lower than predicted wages and the RMSE (Equation I) in the sample countries, as well as GDP per capita and the proportion of low-earning workers in those countries.

We start in the upper panel of variables. Countries with a high proportion of workers with lower than predicted wages also have a high proportion of workers with higher than predicted wages. Those countries are also characterized by a high proportion of low-earning workers and a lower than average GDP per capita. This implies that the proportion of workers who earn less than their predicted wage is positively correlated with wage variance and negatively correlated with GDP per capita. The latter correlation is associated with the nature of the institutions in that country.

We examine the variables presented in Table 5 relative to the main parameter, i.e., the proportion of workers with significantly lower than predicted wages (Model I for each country). However, we will also examine its correlation with GDP per capita, a primary economic indicator that includes within it the quality of institutions in that country, as mentioned above. Thus, it was found, for example, that countries with a relatively high average wage and/or a relatively high level of skills (as reflected in the PIAAC survey) are also countries with a relatively low proportion of workers with significantly lower than predicted wages and a relatively high GDP per capita. In contrast, countries with a relatively high wage variance and relatively high return on education are those with a relatively high proportion of workers with lower than predicted wages and relatively low GDP per capita.

In order to examine whether the correlation between the different variables and the proportion of workers with lower than predicted wages goes beyond that implied by the connection between the variables and the aforementioned proportion on the one hand and GDP on the other, we estimate the following simple two-stage model. In the first stage, we estimate the connection between all of the variables and GDP by estimating the following regressions:

$$X = b1 * GDP + epX\_X$$

$$Y = b2 * GDP + eps\_Y$$

where  $X$  are the explanatory variables for each country,  $Y$  are the proportion of workers with lower than predicted wages and  $GDP$  is expressed in per capita terms. In the second stage, we examine the correlation between the residuals of these regressions. The correlations obtained in the second stage appear in the righthand column of Table 5, for men and women separately.

We found that average years of schooling and in particular its distribution have only a low correlation with the proportion of workers with lower than predicted wages. The wage return on skills was also found not to be highly correlated with the main variables nor with subjective variables (the lower panel in Table 5 and 6), which has to do with the match between a worker's education and place of work, the two variables appearing in the lower part of Table 5. Similarly, a high correlation was not found between the size of the minimum wage relative to the average wage and the proportion of workers with lower than predicted wages.

In contrast, **the level of skills and the return on education** were found to be positively correlated with the proportion of workers with significantly lower than predicted wages, even when the correlation with GDP per capita is neutralized. Although the return on education is somewhat higher in Israel than in the OECD in the case of men, it is not an outlier. Therefore, it cannot explain why the proportion of workers with lower than predicted wages is relatively high in Israel. In contrast, the skill level in Israel is low and therefore it is a fundamental variable that can contribute to explaining the high proportion of workers with lower than predicted wages, even after taking into account that Israel's GDP per capita is relatively low.

Another variable that is worth mentioning is **on-the-job vocational training**. In countries such as Israel (Figure 15), where there is a strong association between the likelihood of a worker earning significantly less than his predicted wage and whether he has undergone vocational training, the proportion of workers with lower than predicted wages is relatively high while the correlation between that proportion and GDP per capita is not. It may be that this robust finding is an indication that vocational training is important in realizing earning potential, but that in most cases it is underutilized. The reason for this may be connected to the positive externality of vocational training: the current employer pays for it but it also benefits a worker's next employer and therefore employers may be hesitant to pay for it. For this reason, in countries with a particularly strong association between vocational training and wages, we find a relatively high proportion of workers who are far from their predicted wage (apparently due to a lack of vocational training, among other things).

**Table 5 – Correlation between a country’s characteristics on the one hand and wage variance and GDP per capita on the other**

**Men**

	Correlations				Data		
	Earning significantly less than expected (residual correlations)	RMSE	Low wage	Per capita GDP	Israel	Median	Range
Earning significantly less than expected							
RMSE	0.73		0.86	-0.56	17.4%	11%	15%
Low age	0.85	0.69		-0.12	0.74	0.51	0.51
Per capita GDP 2019	-0.56	-0.12	-0.36		17%	13%	18%
Average wage	-0.46	-0.38	-0.54	0.80	40,663	43,250	62,224
Wage standard error	0.82	0.82	0.80	-0.54	2.55	2.66	1.13
Minimum wage relative to average wage	0.10	-0.15	0.18	-0.22	0.28	0.24	0.25
Return on education	0.53	0.40	0.76	-0.59	43.0	39.8	12.7
Return on skills	0.27	0.45	0.21	0.17	0.06	0.05	0.08
Average skills	-0.38	-0.15	-0.58	0.46	0.14	0.11	0.18
Years of study	0.36	0.40	0.11	0.60	5.08	5.37	1.56
Education standard error	-0.12	-0.34	-0.01	-0.37	13.1	13.1	4.5
<b>Effect of training on having a significantly lower than expected wage</b>	-0.76	-0.53	-0.72	0.18	0.21	0.21	0.18
<b>Matching</b>							
Needs more training	0.30	0.30	0.28	-0.47	-0.11	-0.06	0.16
Can make do with a lower education level	-0.12	-0.37	-0.16	0.04	0.33	0.31	0.53
Needs a higher education level	0.08	-0.29	0.09	-0.31	0.13	0.18	0.12

**Women**

	Correlations				Data		
	Earning significantly less than expected (residual correlations)	RMSE	Low wage	Per capita GDP	Israel	Median	Range
Earning significantly less than expected							
RMSE	0.73		0.81	-0.54	14.2%	9%	16%
Low age	0.74	0.83		-0.47	0.59	0.50	0.41
Per capita GDP 2019	-0.54	-0.07	-0.47		29%	24%	38%
Average wage	-0.37	-0.34	-0.53	0.80	40,663	43,250	62,224
Wage standard error	0.70	0.77	0.80	-0.54	2.55	2.66	1.13
Minimum wage relative to average wage 2019	0.33	0.06	0.16	-0.22	0.28	0.24	0.25
Return on education	0.61	0.50	0.58	-0.45	43.0	39.8	12.7
Return on skills	0.06	0.14	0.11	0.01	0.05	0.06	0.06
Average skills	-0.56	-0.30	-0.29	0.39	0.14	0.09	0.15
Years of study	0.13	0.16	-0.17	0.63	5.00	5.27	1.58
Education standard error	0.10	-0.10	-0.07	-0.39	13.7	13.3	3.6
<b>Effect of training on having a significantly lower than expected wage</b>	-0.73	-0.59	-0.66	0.26	0.18	0.19	0.17
<b>Matching</b>							
Needs more training	0.14	0.29	0.52	-0.54	-0.13	-0.05	0.14
Can make do with a lower education level	-0.07	-0.40	0.15	0.10	0.32	0.31	0.49
Needs a higher education level	0.30	-0.01	0.01	-0.22	0.14	0.17	0.14

- Those earning more than predicted are defined as earning 40 percent or more above their predicted wage.
- Education is measured as years of schooling, with a correction for years of education in the case of the ultra-Orthodox.
- The “skills” variable was calculated according to the average of the scores in reading literacy and mathematical literacy, normalized using standard deviation.
- The variable “effect of vocational training on the likelihood of earning significantly less than predicted” is the coefficient of vocational training in a regression where the dependent variable is the likelihood of earning less than predicted while the independent variables are human capital and vocational training.
- The variables “needs more training”, “a lower level of training would be sufficient” and “there is a need for a higher level of education” are based on reporting by the survey participants with regard to the additional training that they feel they need in order to handle their tasks at work and with regard to the level of education they need on the job.

## 6. Additional tests

### **The proportion of workers with lower than predicted wages in Israel if worker characteristics or the parameters were similar to the OECD averages (Binder-Oaxaca Decomposition)**

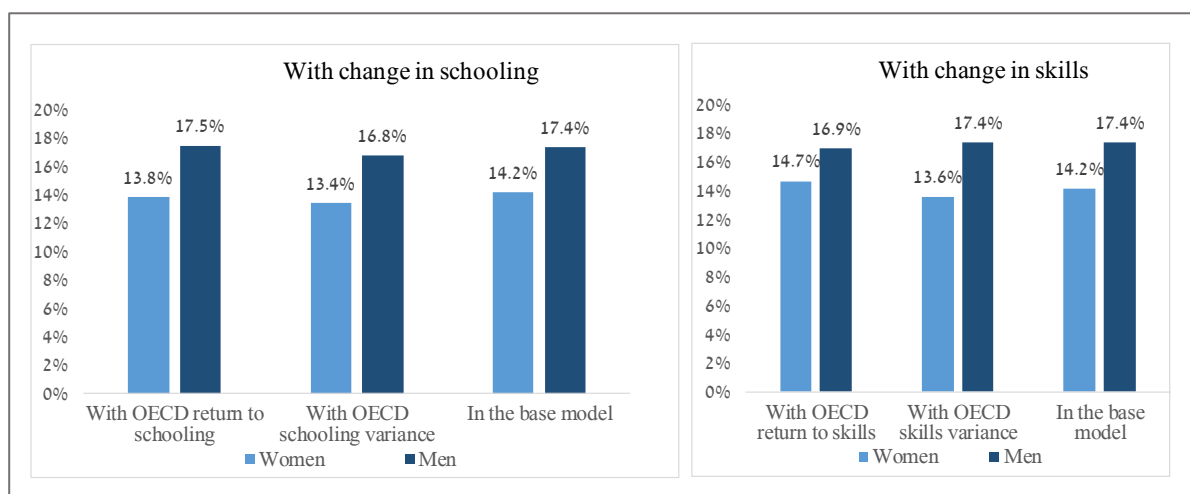
For education and skills, we examined how the proportion of workers with lower than predicted wages in Israel would change if the variance of those characteristics in the population or their return were identical to those in the OECD, for each gender separately:

1. By means of a linear transformation, we assumed that the variance in the human capital characteristics of Israeli workers was identical to that in the OECD, while preserving the average of the characteristic.
2. We assumed that the return on a characteristic among Israeli workers is identical to that in the OECD countries, while preserving the average of the predicted wage.

This provides the percentage of workers whose wage is significantly lower than predicted that would exist if education and skill levels in Israel were similar to those in the OECD (Figure 18). We did not find any significant effect in this static exercise, implying that the correlation

between these characteristics and the proportion of workers with lower than predicted wages goes beyond the connection between them.

**Figure 18**  
**Percentage of workers with lower than predicted wages in a statistical simulation of education, skill and returns in Israel**



## 7. Conclusion and policy recommendations

Previous studies have shown that in comparison to other advanced economies, Israel is characterized by low labor productivity, which is primarily due to its low capital-to-worker ratio, the low skill levels of workers (human capital) and issues related to the unexplained residual, such as low efficiency in areas related to Ease of Doing Business. This study shows, for the first time, that relative to other countries there is a high proportion of workers in Israel whose human capital—as measured by years of schooling, skill level and experience—is not fully realized in their wages. These workers were defined in the research as earning a wage that is significantly less than predicted.

In contrast to low-earning workers who are on average characterized by a lack of education and skills, workers with lower than predicted wages are no different from other workers with respect to their average measured human capital; however, in addition to their being characterized as having a very low wage, they tend to be older, they are relatively overrepresented in the business sector, a relatively high proportion are employed close to their

place of residence, they lack on-the-job vocational training and there is an overrepresentation of Arabs among them.

An analysis of the sample data shows a positive correlation between skill level and the proportion of workers with lower than predicted wages, beyond the negative correlation of skill level with GDP per capita. This finding implies that a low level of skill in a country has a strong negative association with the proportion of workers earning less than their predicted wage, beyond the direct effect of GDP per capita.

Similarly, we found that the gap in on-the-job vocational training between workers with significantly lower than predicted wages and other workers is an outlier and therefore it is able to explain why this proportion is an outlier in Israel. It can be concluded that counseling and guidance provided to these workers at the beginning of their careers, as well as on-the-job training, will improve the situation in Israel and will contribute to raising labor productivity and thus improving quality of life.

Additional policy directions for improving the utilization of workers' human capital:

Investment in career guidance for new workers (according to the OECD Career Guidance Policy Review)

Making information about the return on education and career paths more available.

Offering incentives to choose fields of study and vocational training that have a high return for the individual.

Lifelong learning – investment in retraining and professional updating for older workers.

Investment in efficient transportation to areas of employment.

Investment in “remote work” infrastructure in the social and geographic periphery.

Encouraging the adoption of technology in low-productivity sectors.

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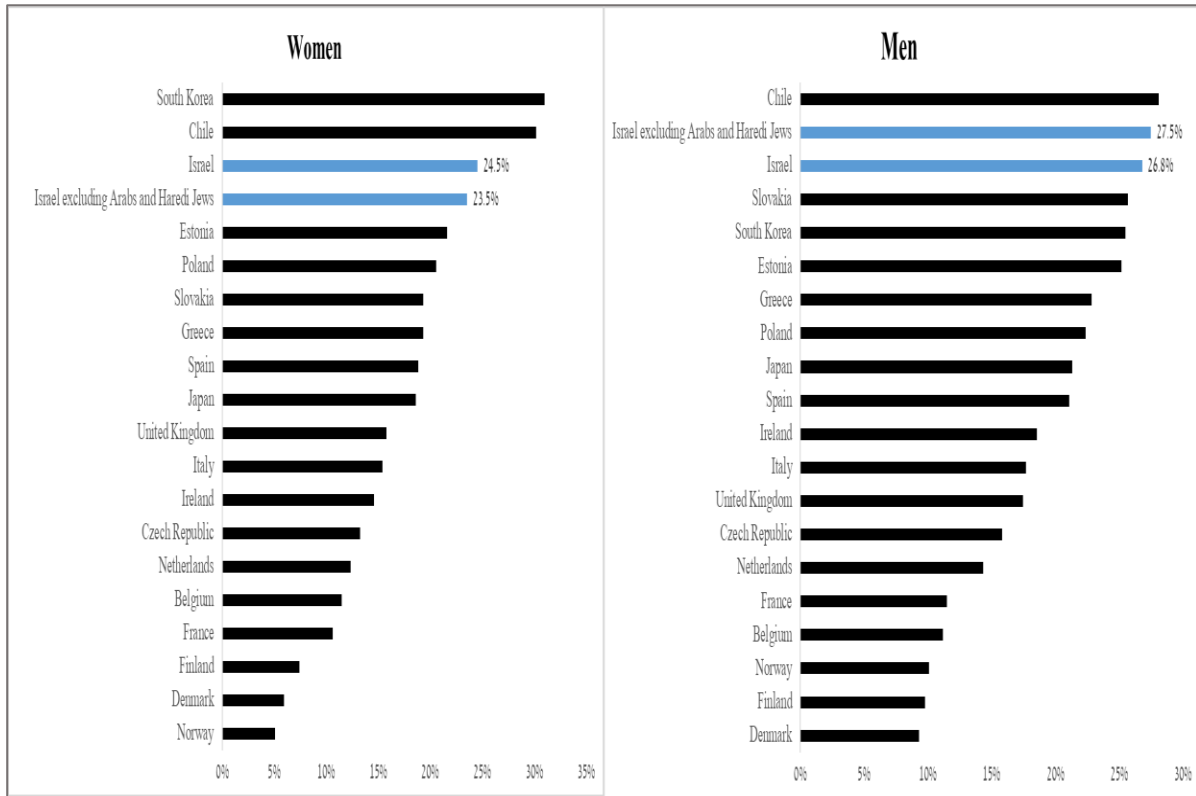
## Appendix A

Israel is ranked low among the OECD countries in terms of the proportion of workers with lower than predicted wages (a variable with various definitions), as can be seen from Figure A.1 to A.4.

The proportions of workers who earn at least 30 percent less than their predicted wage relative to other countries is presented in Figure A.1 and A.2 and the proportions of those who earn at least 50 percent less are presented in Figure A.3 and A.4.

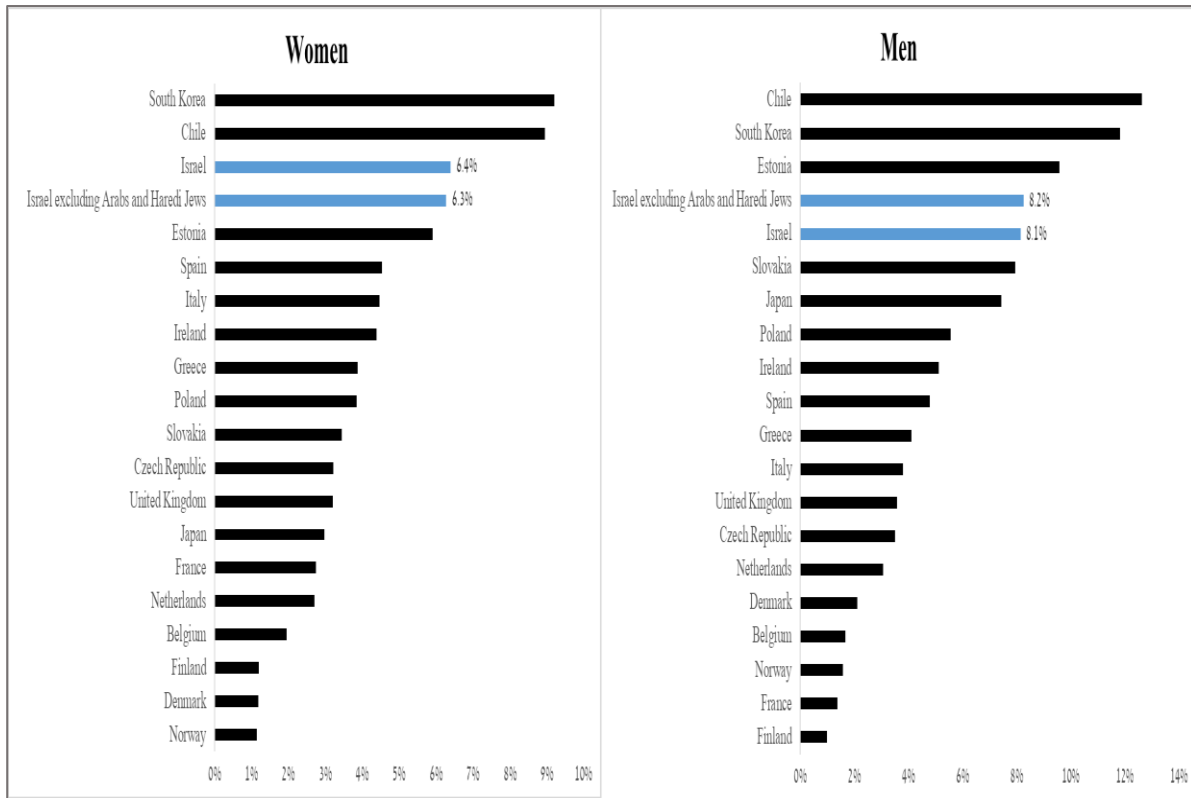
**Figure A.1 and A.2**

**The proportion of workers who earn at least 30 percent less than their predicted wage**



**Figure A.3 and A.4**

**The proportion of workers who earn at least 50 percent less than their predicted wage**

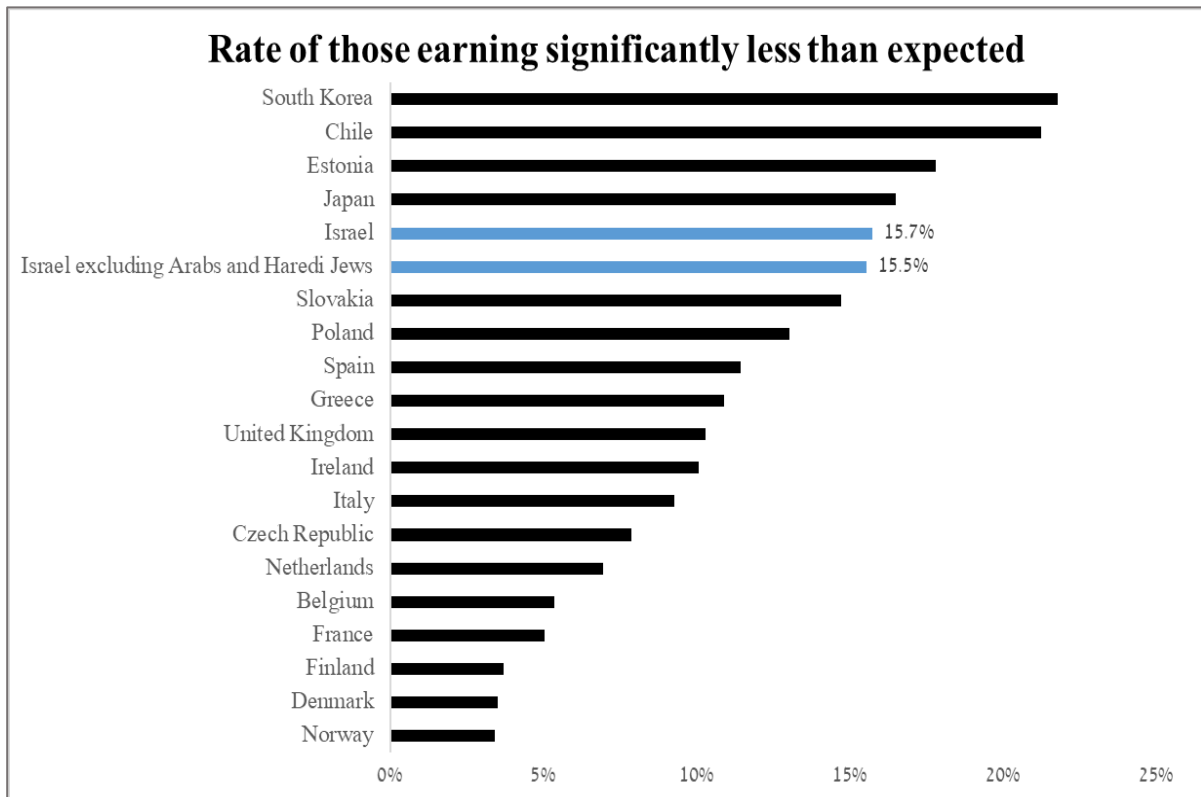


## Appendix B

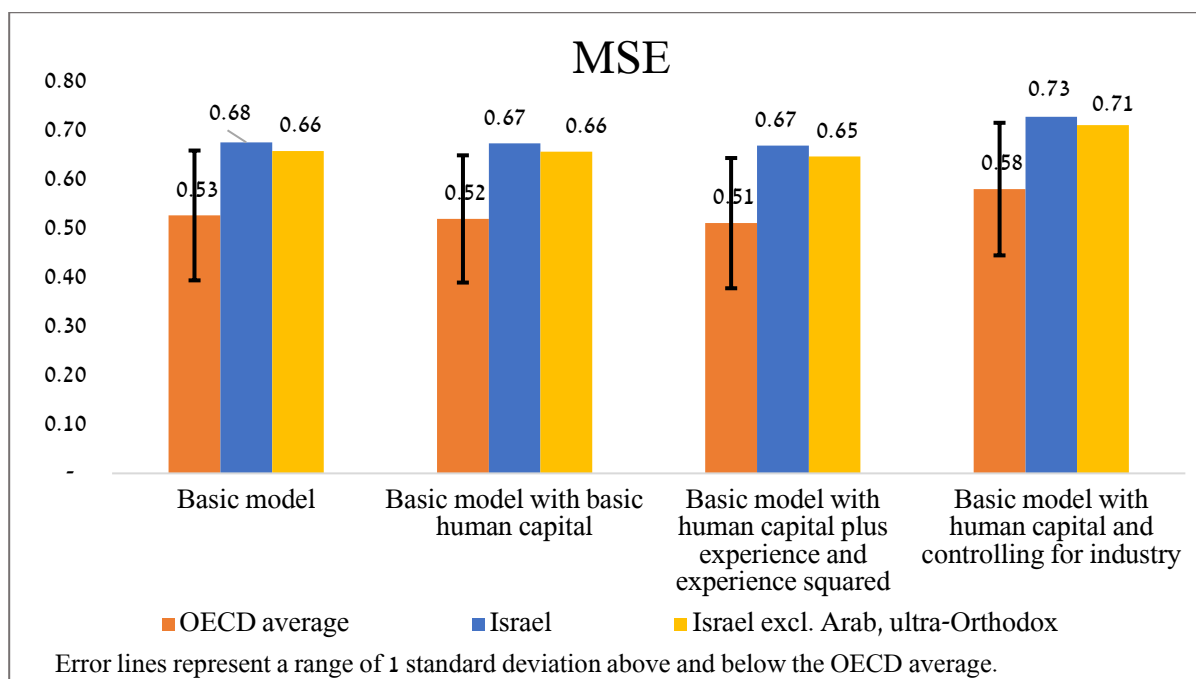
Israel's proportion of workers who earn significantly less than predicted is high relative to the OECD countries even when controlling only for human capital but not the ultra-Orthodox, Arabs or gender, can be seen in Figure B.1.

Table B.1 shows that the skill levels of these workers are higher than those of low-earning workers and are similar to those of the rest of the population. The professional experience and education of these workers are similar to those of other workers and a similar proportion of them work in the public sector; however, they tend to be older and about two-thirds of them work close to home, in contrast to about one-third of the workers who do not earn significantly less than predicted. Furthermore, the percentage of workers in this group who underwent on-the-job vocational training during the previous year is low and is similar to the proportion of low-earning workers. A low proportion of ultra-Orthodox workers earn significantly less than predicted; however, the proportion of Arabs is somewhat higher than their proportion of total workers while the proportion of women is significantly higher.

**Figure B.1**



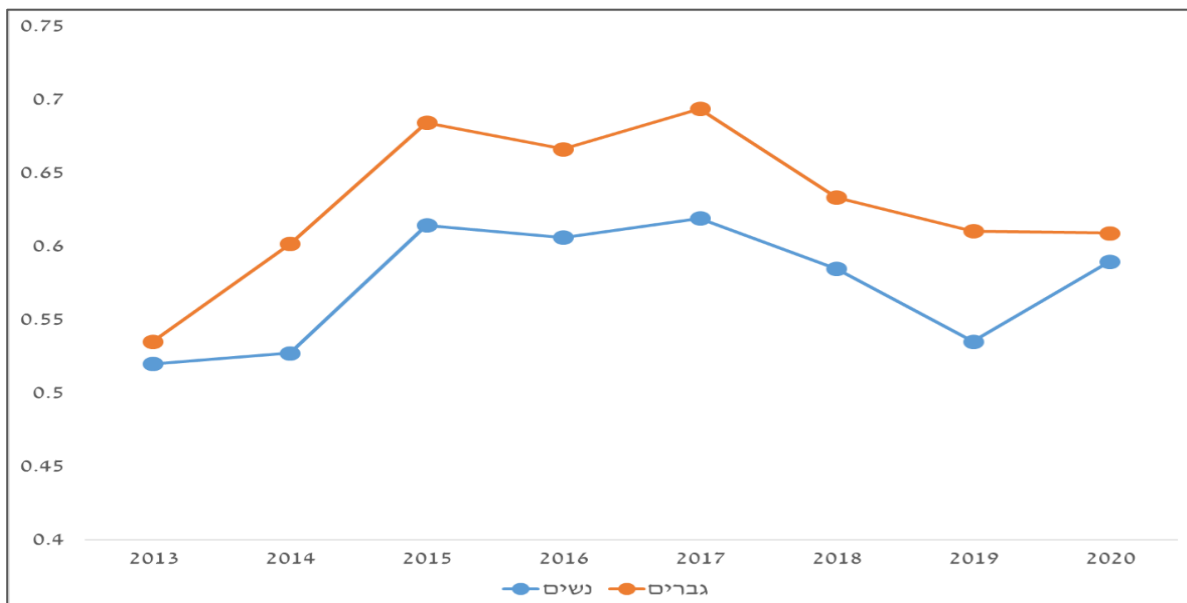
**Figure B.2**



**Table B.1**

	Those with salary that is markedly lower than predicted wage	Those with low salary in general terms*	Those who do not have potential for a salary increase
Share (%)	15.7	23.6	
Hourly wage (NIS)	23.2	22.8	54.5
Basic skills	253.9	224.8	251.6
Share of women (%)	66.1	64.0	48.5
Share of Arabs (%)	14.9	21.6	12.4
Share of ultra-Orthodox (%)	4.6	7.0	5.8
Age (years)	44	40	41
Professional experience (years)	21.0	17.5	19.8
Years of schooling	13.6	12.2	13.4
Share of workers working in the public sector (%)	33.4	27.8	37.1
Share of workers who had professional training (%)	17	14	36
Work in their residential locality (%)	61.3	57.5	38.2
N	316	532	1719

**Figure B.3**  
**The RMSE of wage regressions based on the Expenditure Survey for 2013 to 2020,**  
**by gender**



\* The dependent variable in the regressions is logged hourly wages where the explanatory variables are age, age squared, dummy variables for Arabs and the ultra-Orthodox, and years of schooling. The regressions were estimated for each year separately and for each gender separately.