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

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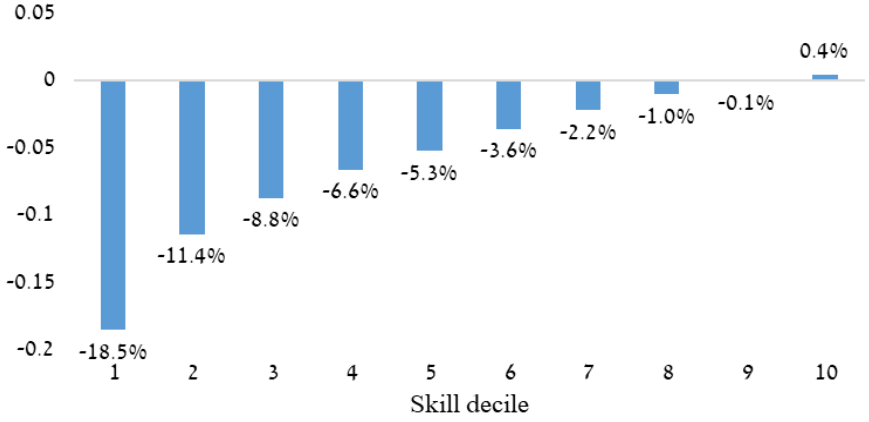
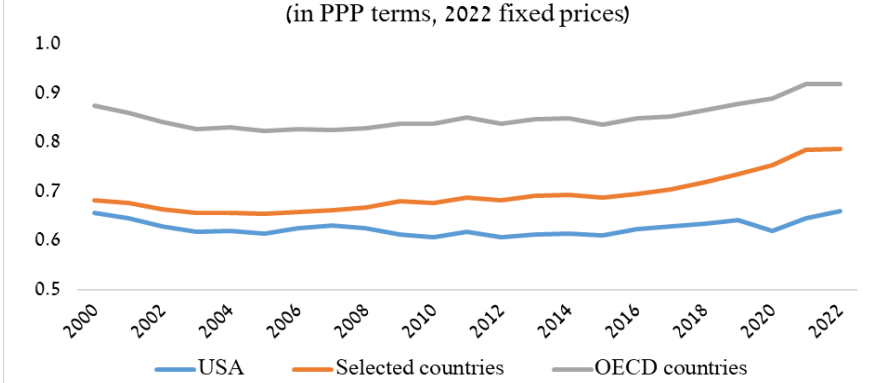
with special thanks to Victoria Bakish

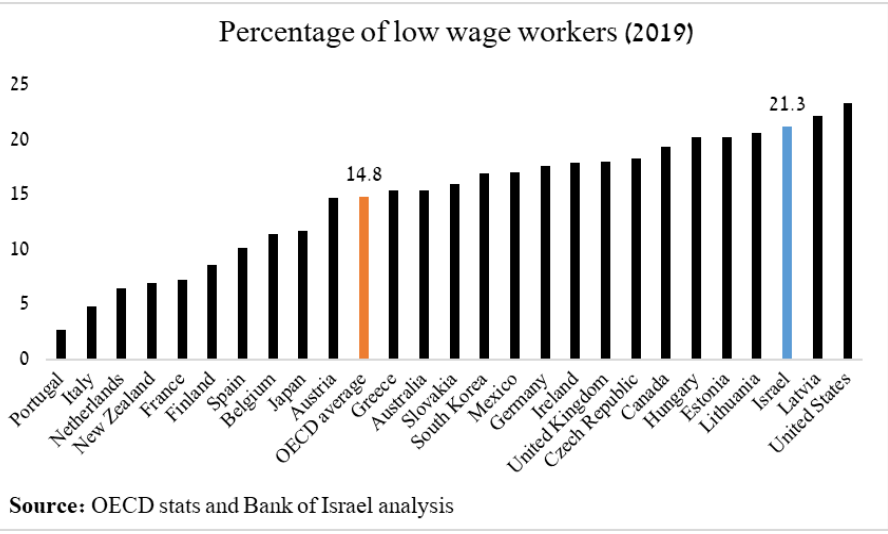
What we know from previous studies



Source: PIAAC survey and Bank of Israel analysis



Source: OECD stats and Bank of Israel analysis
GDP per person employed in Israel as a share of GDP per person employed of different countries.
Selected countries consist of small and advanced countries: Austria, Belgium, Denmark, Netherlands, Sweden and Finland.



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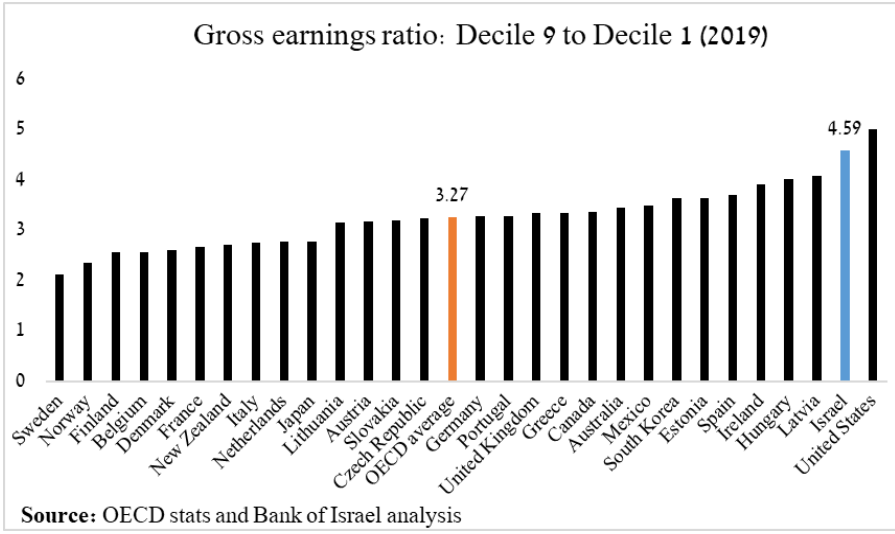


Source: OECD stats and Bank of Israel analysis

This study

- This paper provides an initial analysis of the link between skills level and wage level.
- Schwartz (2021) found that in Israel, despite the low skills level, the labor market has a high skills surplus, and that the utilization of workers' skills is low and inefficient relative to the OECD.
- We point to a unique situation in Israel, in which there is a significant group of workers with wages that are lower than their measured skill-level peers – the human capital level that we can measure according to the PIAAC survey.

This study

- This study uses the results of the PIAAC survey – a shared micro database of Israel and the other OECD countries. We first show that the wage variance in Israel is higher than in other OECD countries, both without control of the explanatory variables on wages and with control. This finding is found to be robust to various tests and models.
- Due to the lower labor productivity in Israel than in other OECD countries, we focus on the lower part of the unexplained wage variance. Specifically, we test the rate of low-wage earners in Israel by international comparison, while controlling for worker characteristics, including education level, skill level, age, and gender.

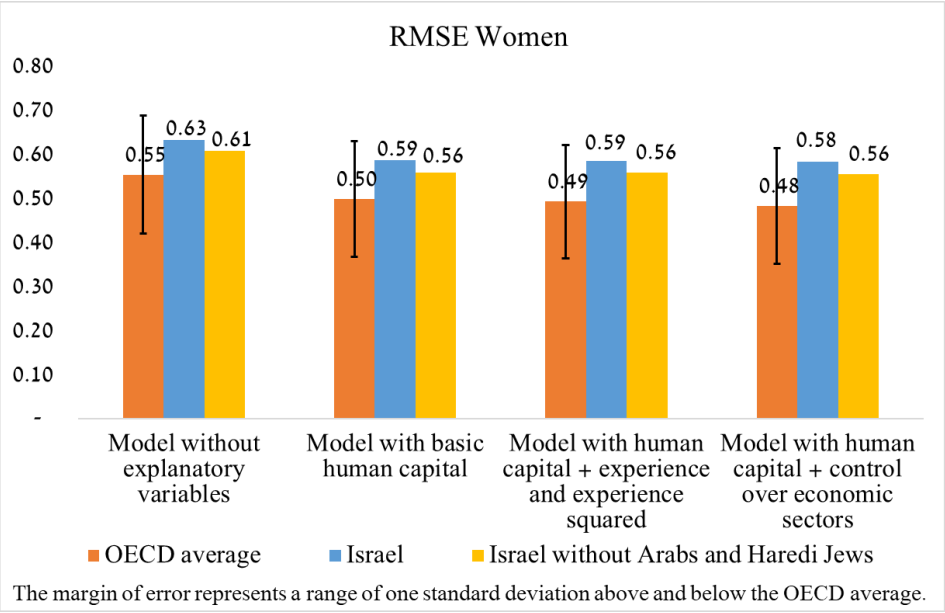
The main findings

- About 17 percent of male workers and 14 percent of female workers in Israel earn significantly less than their expected wage.
- This population generally has semiacademic education, is older, includes a relatively high percentage of Arabs, works in industries and professions with lower wages and productivity, works close to their homes, and has little professional training.
- This rate in Israel is much higher than the OECD average. This remains true even given the unequal wage distribution in Israel.
- Increasing the earning power of those workers will lead to significant improvement in per capita GDP in Israel.

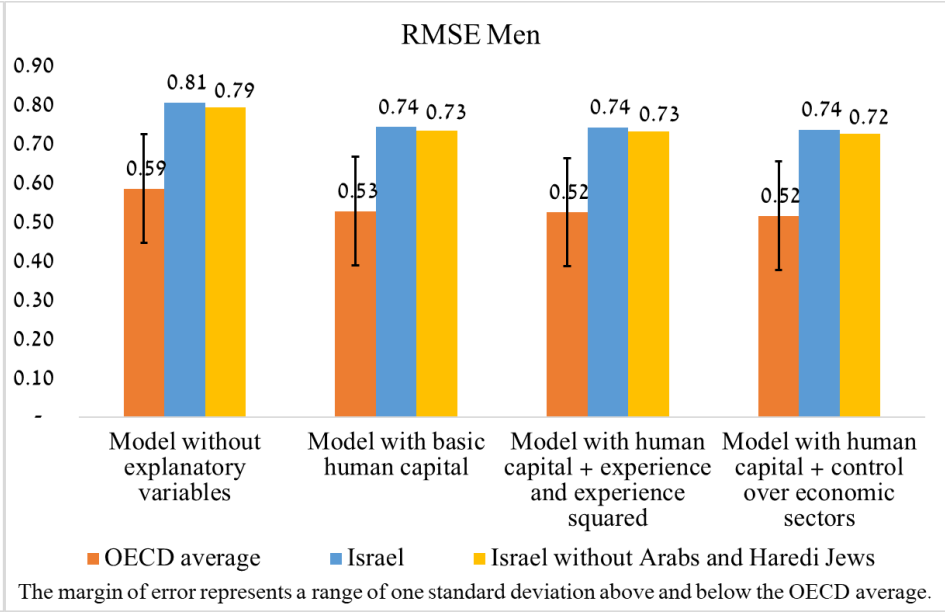
The rest of the presentation

- Presenting the basic model
- Specification of the population groups
- International comparison
- Investment in human capital, professional training

Even after controlling for human capital, the wage distribution in Israel is less equal



The margin of error represents a range of one standard deviation above and below the OECD average.



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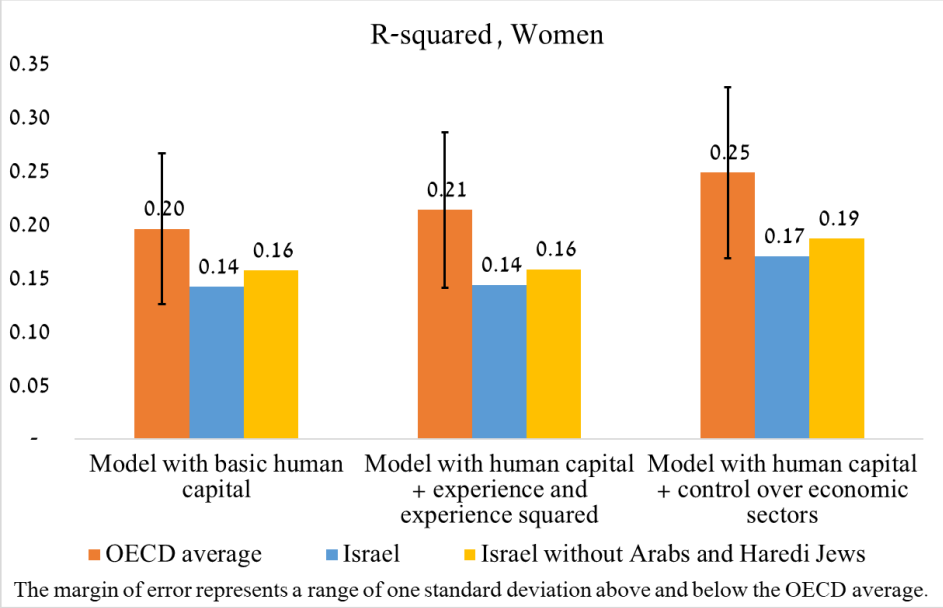
Even after controlling for human capital, the wage distribution in Israel is less equal



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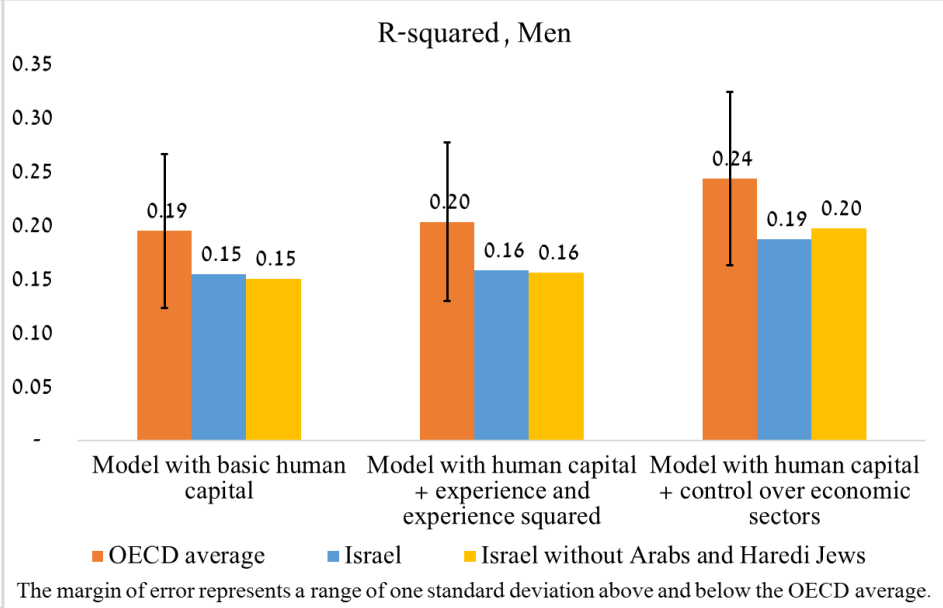


The margin of error represents a range of one standard deviation above and below the OECD average.

The main idea

- Using individualized data (from the PIAAC survey), we can test workers' expected wages (regression) and define a group with "significantly" lower wages than their expected wage.
- In the next stage, we can specify them and compare them to other countries.

Presentation of the model

The basic model (with education)

$$\ln(W_{ij}) = \propto_j + \beta_j S_{ij} + \delta_j X_{ij} + \in_{ij}$$

W – Individual's hourly wage

S – Workers' human capital: Their base skills according to the PIAAC survey (average numeracy and literacy skills), as well as age and education. This is the **measured human capital**.

X – Other variables that can influence wages (Arab, Haredi, and more).

Calculation of the wage that is in line with human capital and group definition

$$\widehat{W}_i = \beta S_i + \delta X_i$$

We define an employee with the potential to increase

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

Specification of this group compared to the other workers is via a group of variables M.

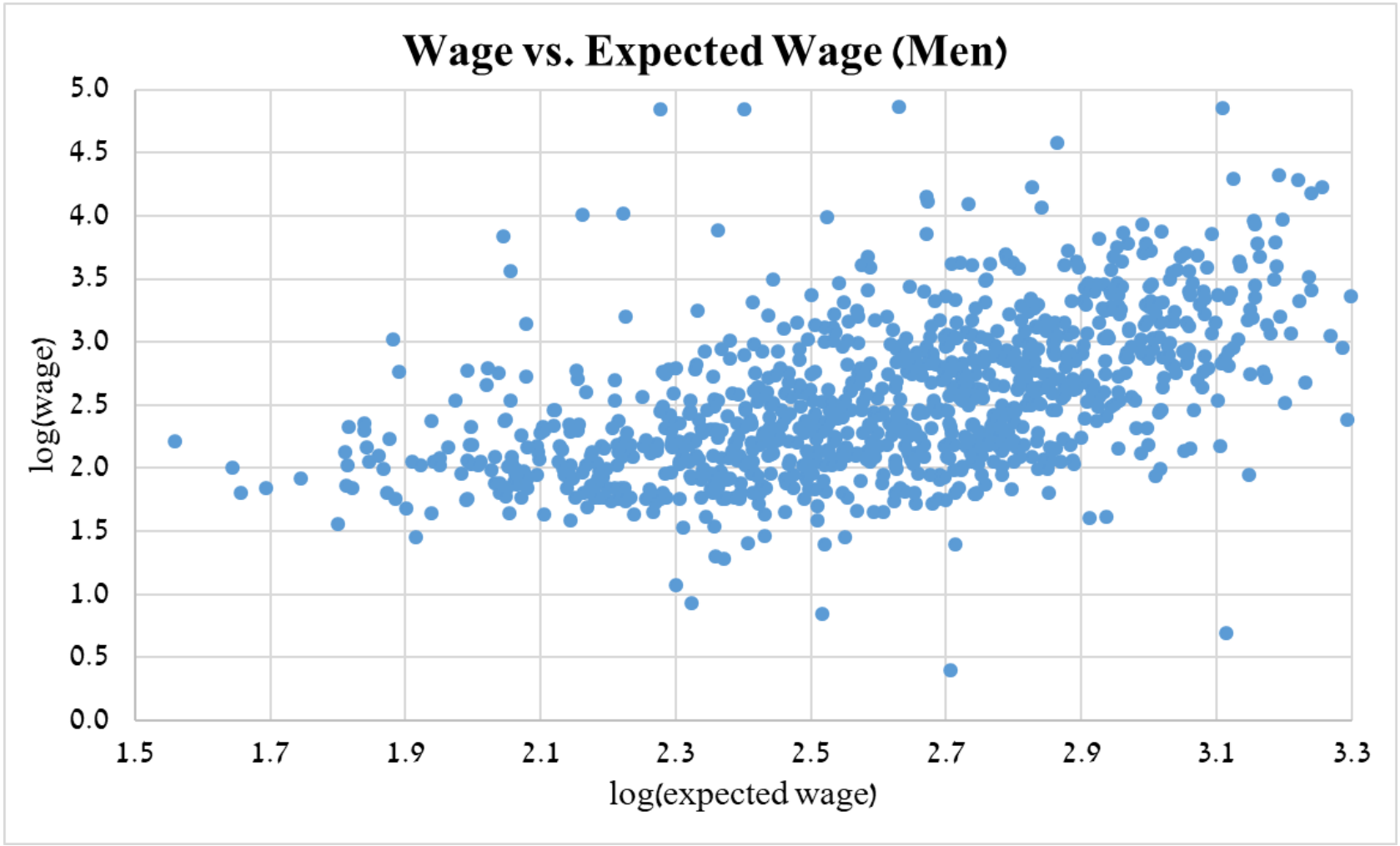
Results of the base model

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

SE are presented in parentheses

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

The model – graphic illustration



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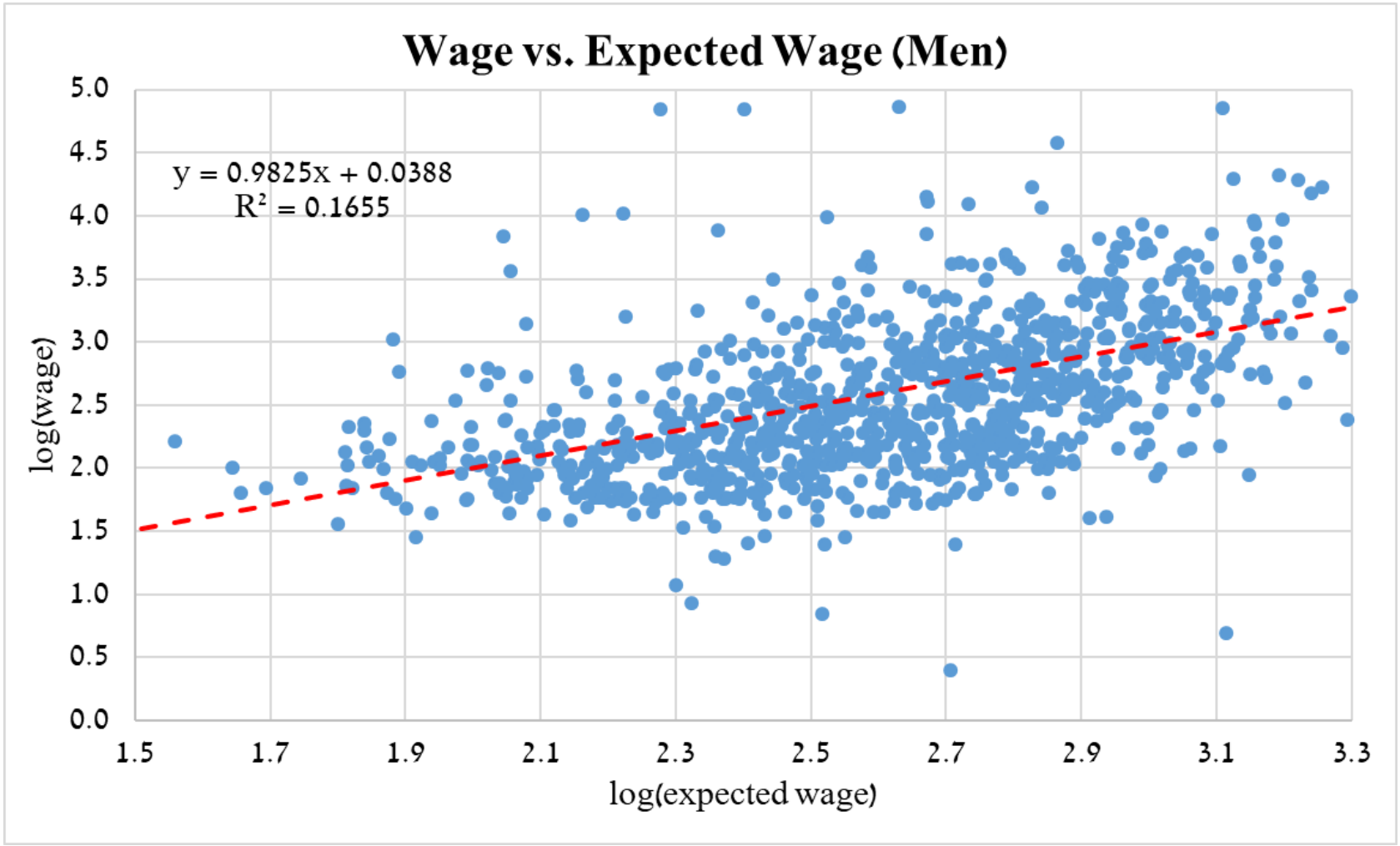
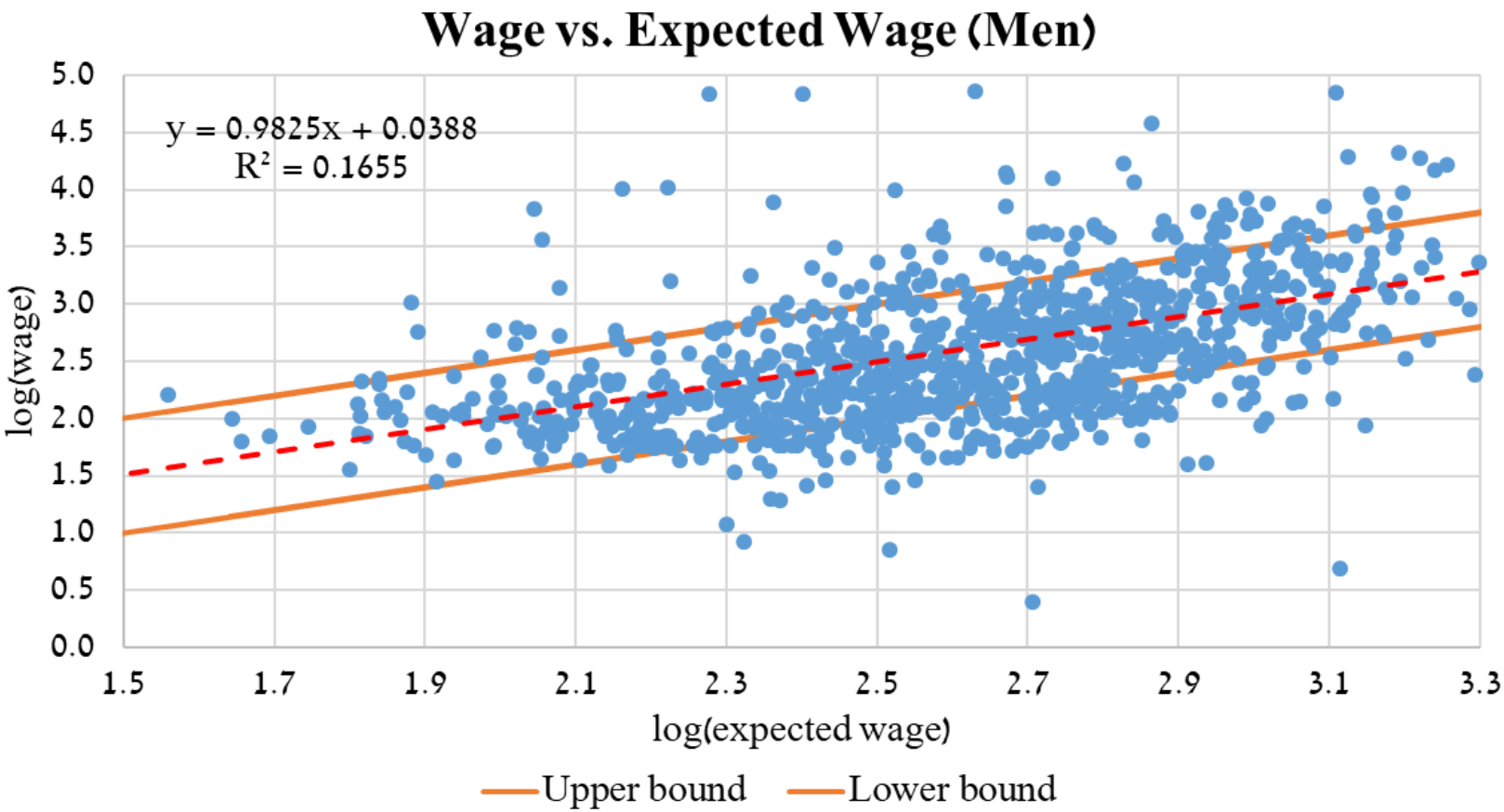
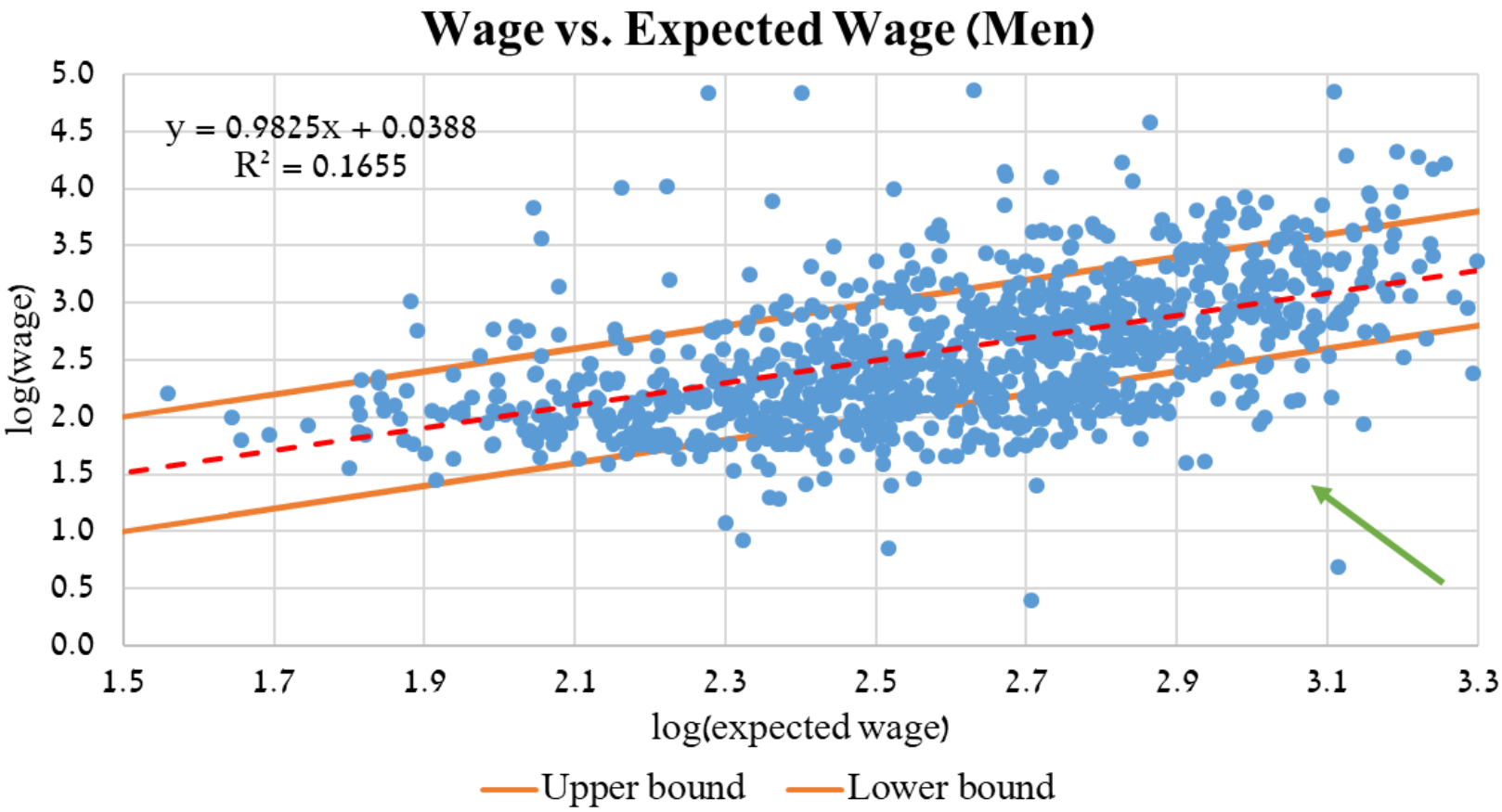


We defined a wage that is 40 percent lower than the predicted wage as having the potential for a wage increase.



The upper and lower bound represent a distance of 0.5 from log of the expected wage. Below the lower bound the the expected wage is higher than the actual wage by at least 40%, and above the upper bound the actual wage is higher than the expected wage by at least 65%.

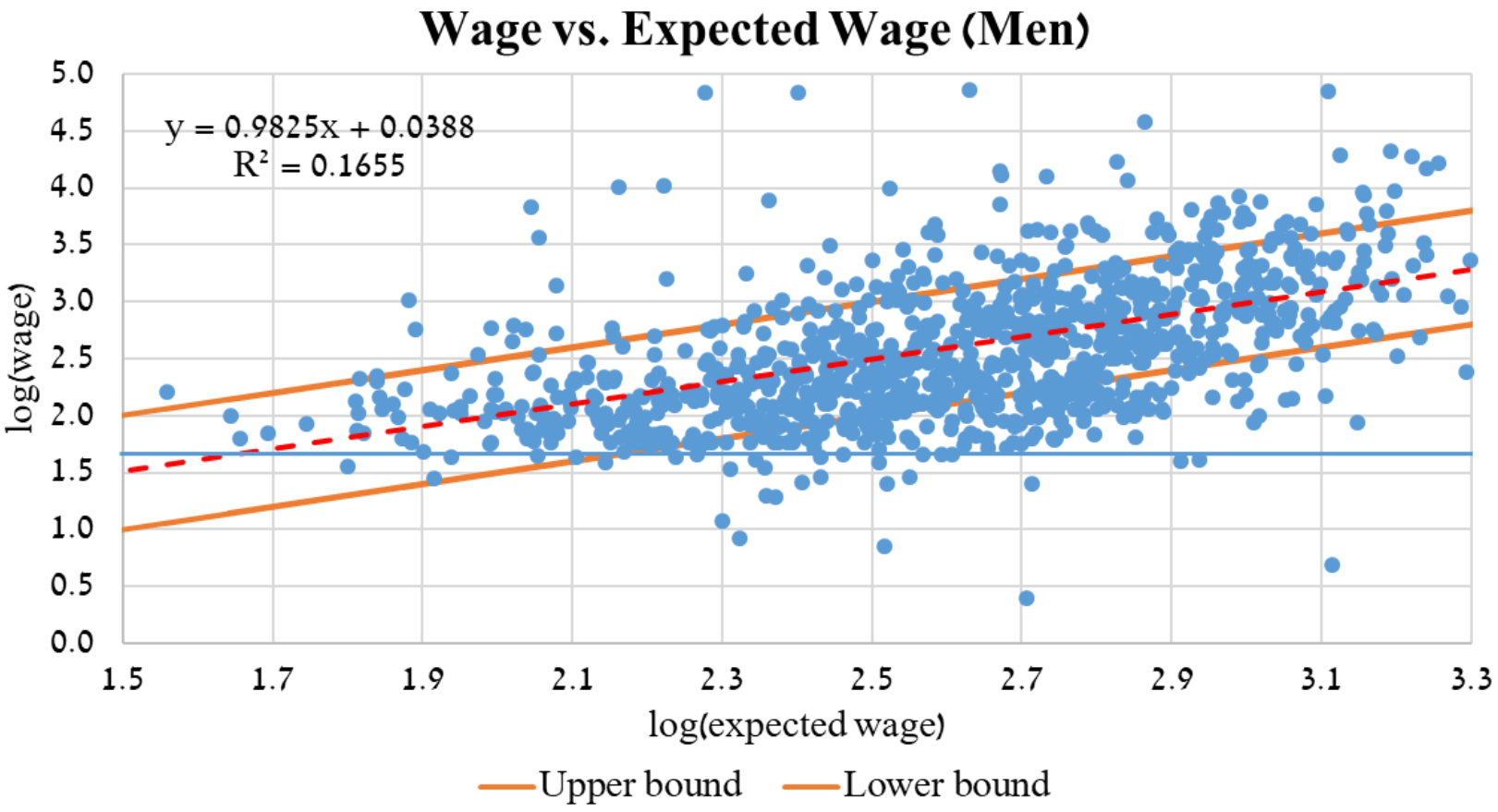
Target population: 17 percent of men and 14 percent of women



The upper and lower bound represent a distance of 0.5 from log of the expected wage. Below the lower bound the the expected wage is higher than the actual wage by at least 40%, and above the upper bound the actual wage is higher than the expected wage by at least 65%.

Specification of the target population

Among the "potentials", 57 percent have low wages (92 percent among women). Among those with low wages, 57 percent have potential (44 percent among women).



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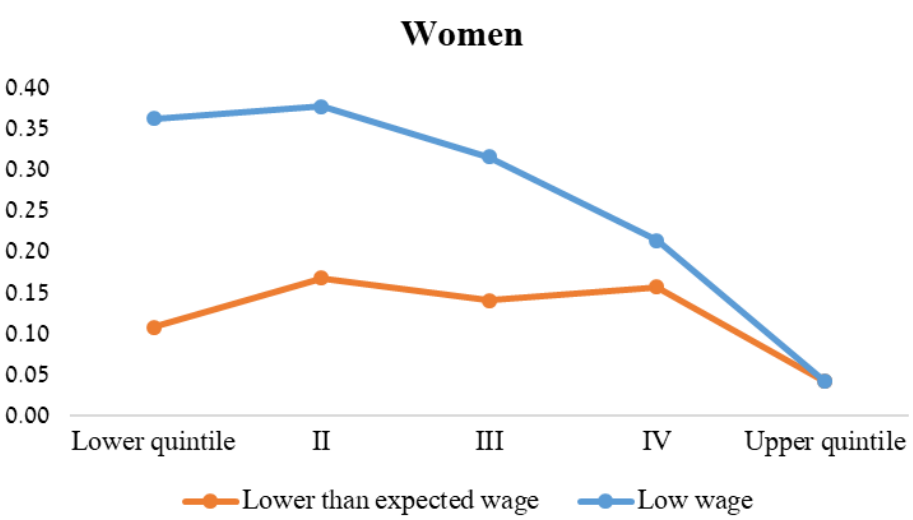
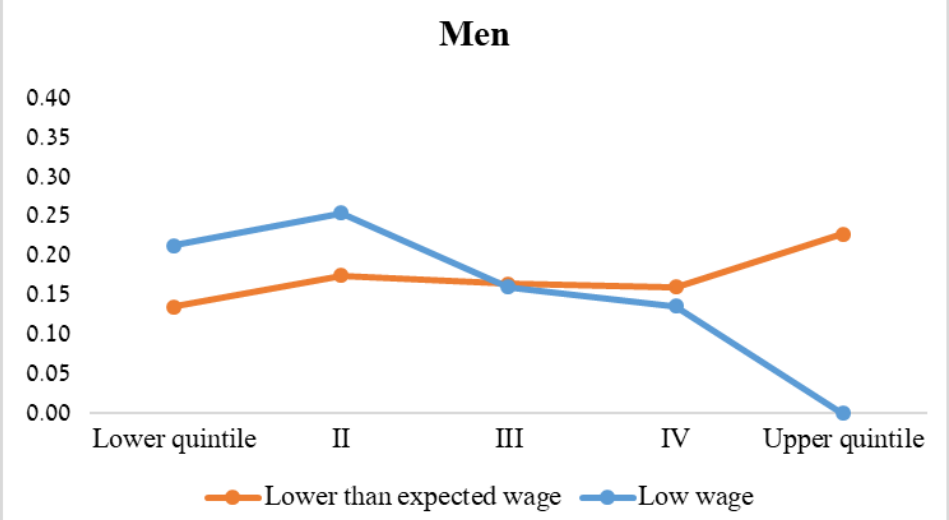
Different from low wages, testing via the localities socioeconomic ranking.



Source: PIAAC survey 2014-2015



Source: PIAAC survey 2014-2015

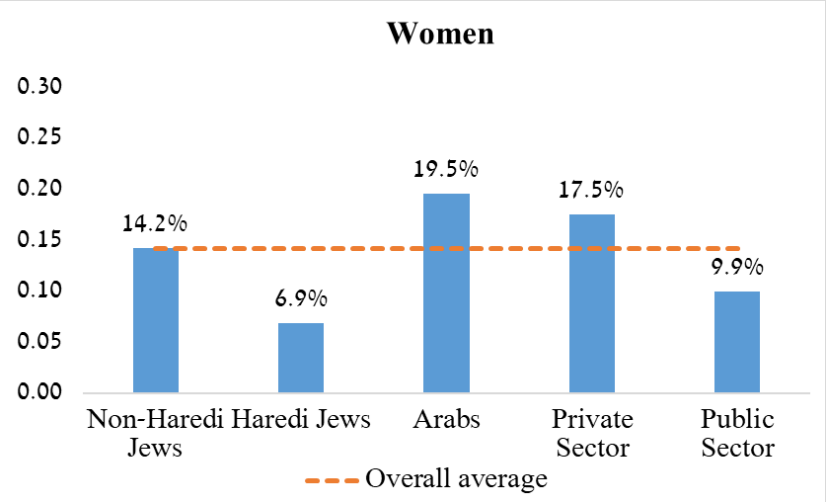
Initial findings regarding this population, men

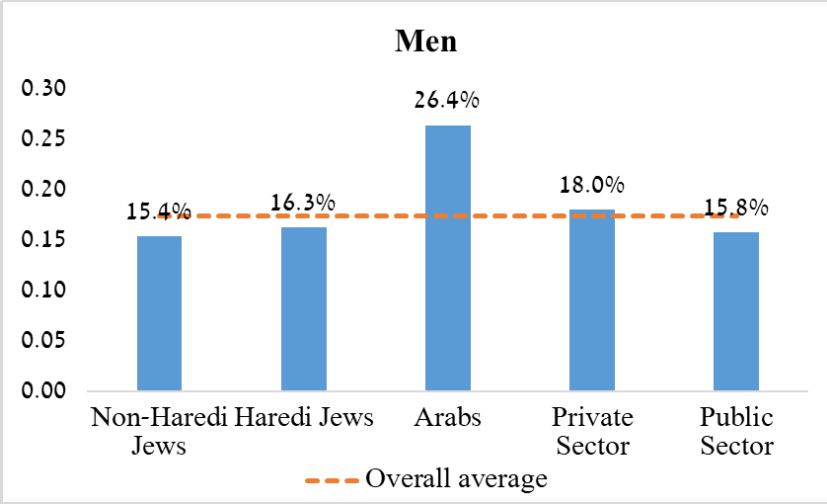
	Employees earning significantly lower wages than expected	Employees with low wage**	Employees whose wages are not significantly lower than expected
Share (%)	17.4	17.5	
Hourly wage (₪)	25.9	22.6	60.8
Skills	253.3	220.5	254.4
Share of Arabs (%)	26.7	35.9	15.7
Share of Haredi Jews (%)	4.4	7.5	4.7
Age (years)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

Comparison of populations, 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

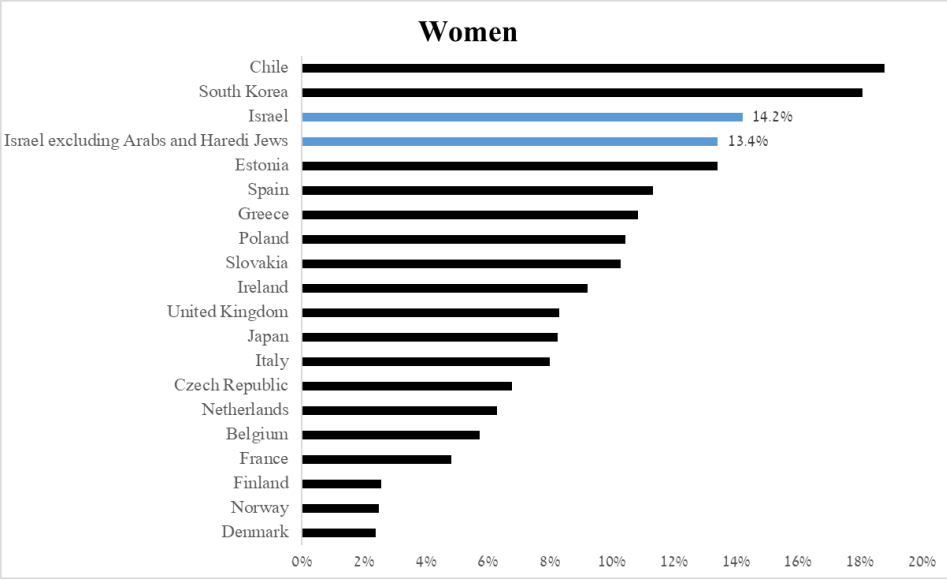
Rate of those with lower than expected wages, by population group

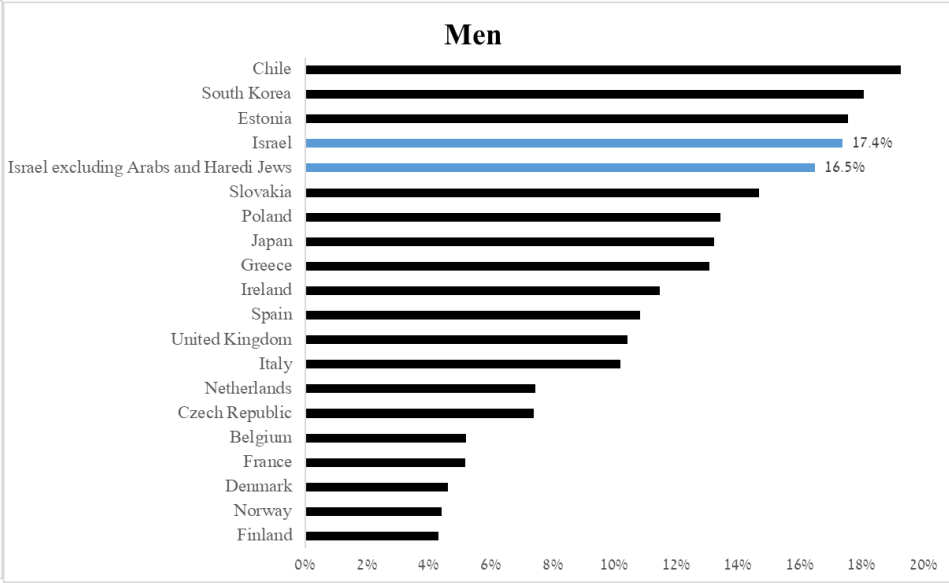




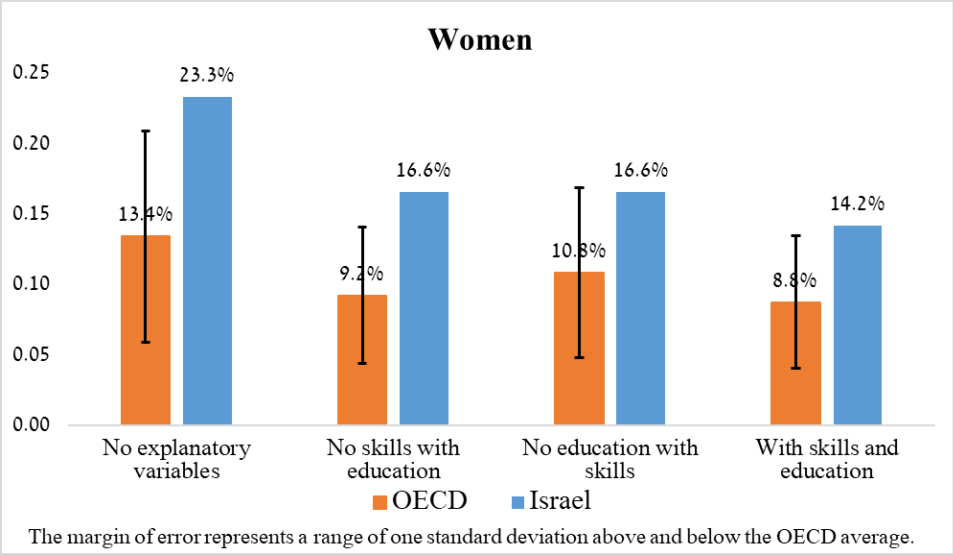
International comparisons

Rate of workers with significantly lower than expected wages, international comparison





Rate of workers with significantly lower than expected wages, with various specifications to control for human capital, international comparison



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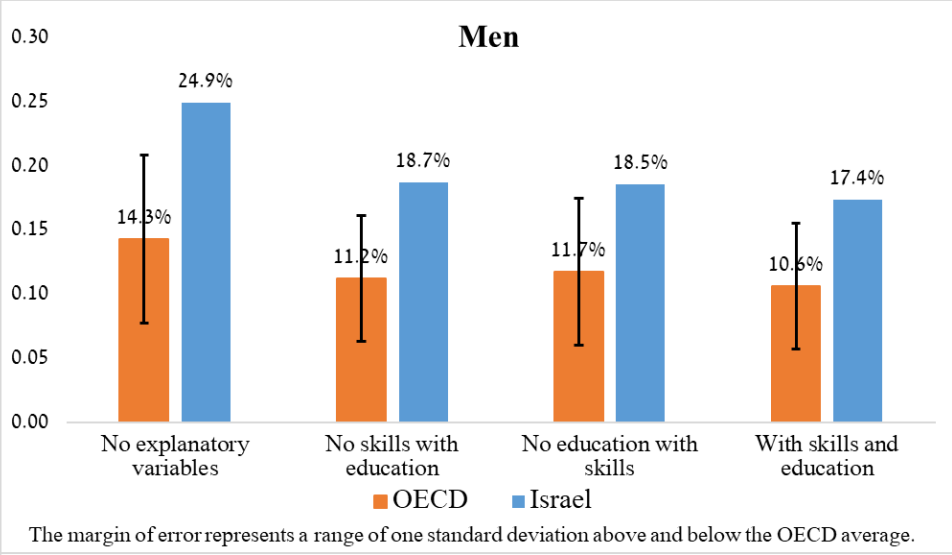
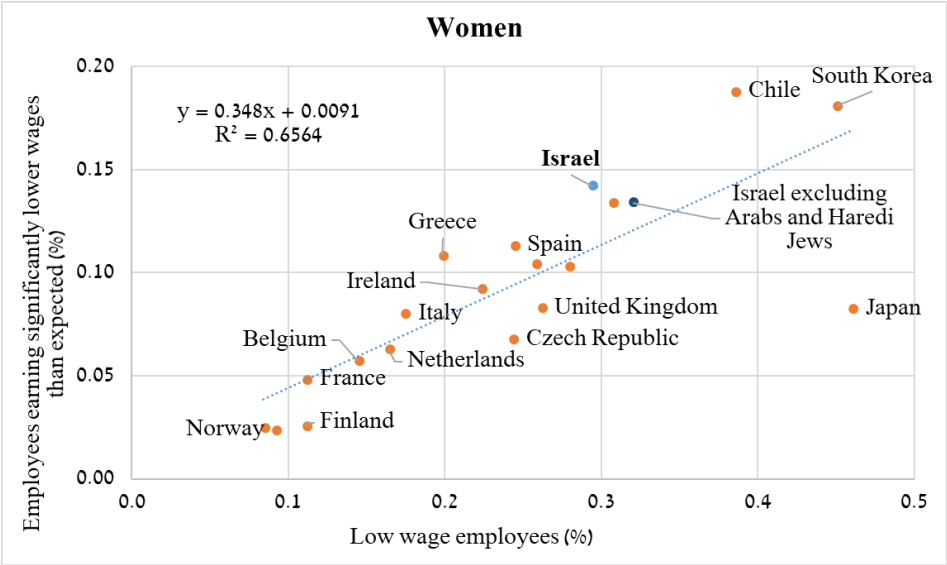
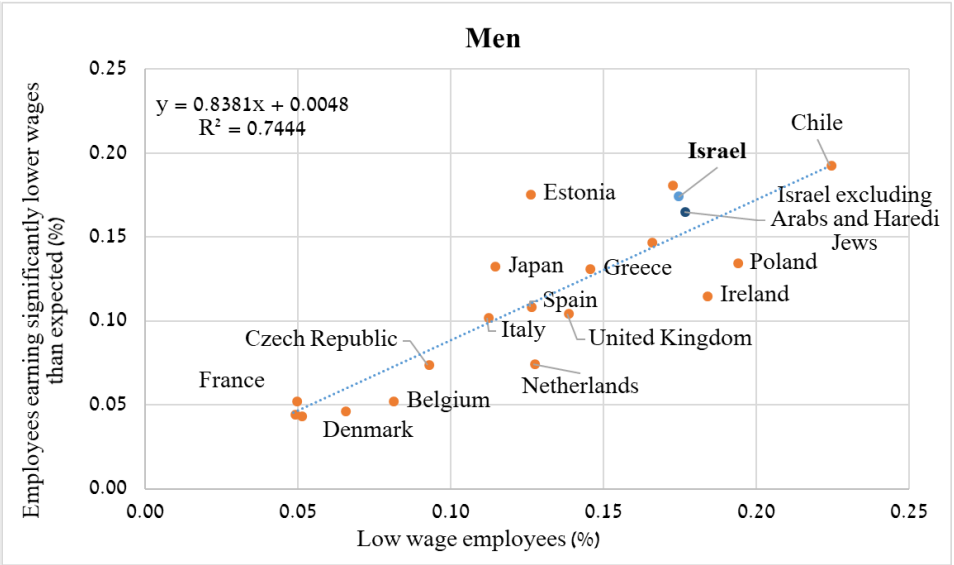


The margin of error represents a range of one standard deviation above and below the OECD average.

There is a strong correlation between the rate of workers with lower than expected wages and the rate of workers who receive low wages.

The rate of workers with lower than expected wages VS the rate of workers who receive low wages, Israel & OECD countries



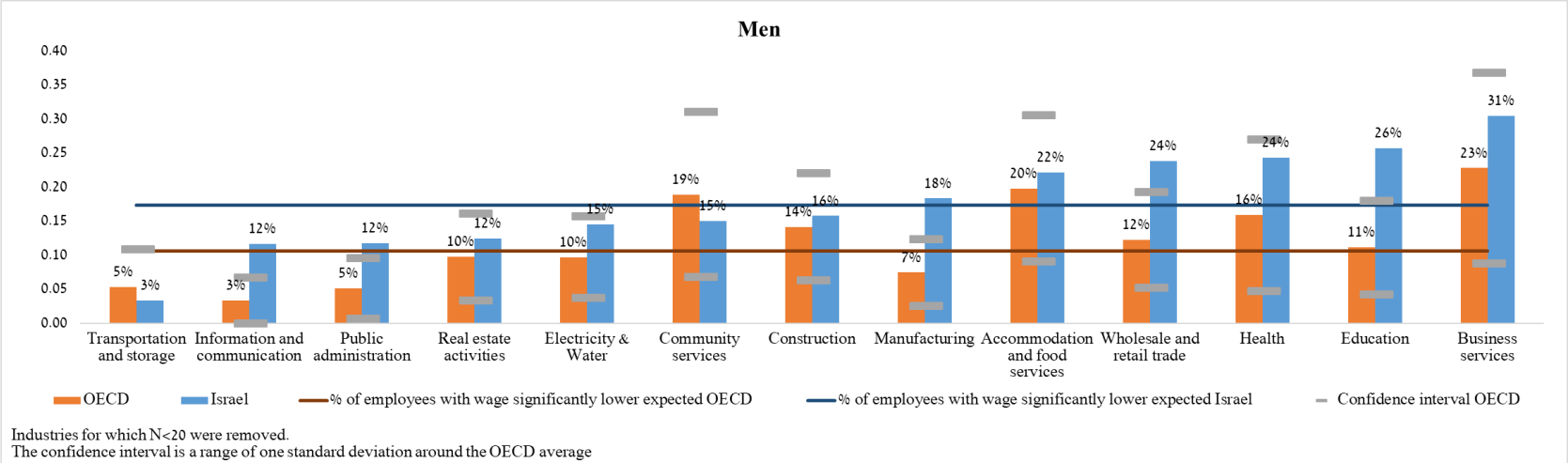


The international comparison shows there there is potential for GDP growth.

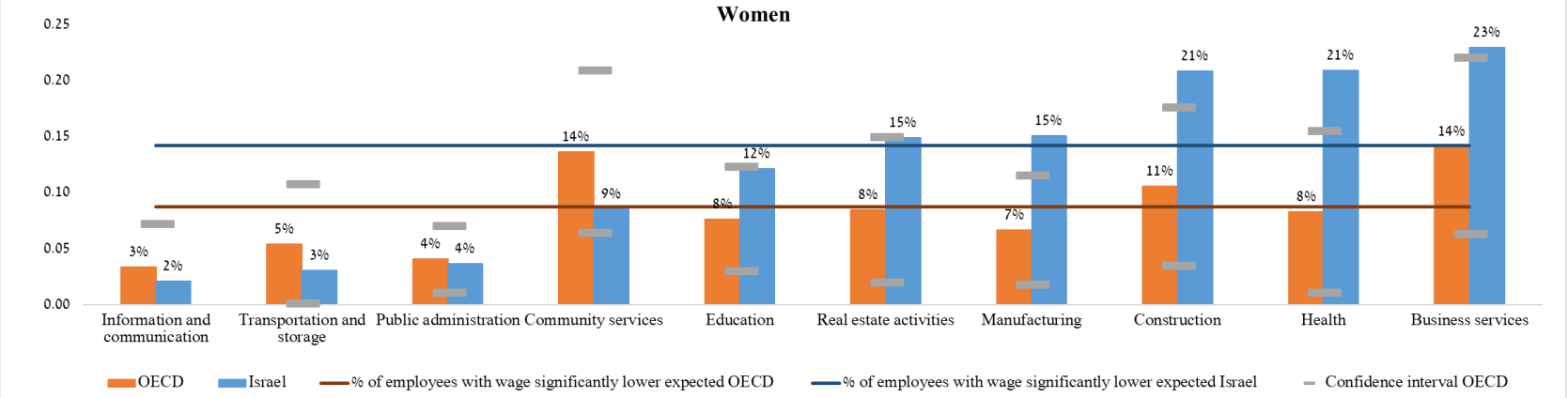
If the rate of workers earning less than potential (40 percent) were similar to the rate of workers earning less than potential in the OECD, it would mean wages increases for **5.9 percent of men and 5.1 percent of women**.

1. If we raise the wage to the lower bound (conservative estimate), we would obtain an additional **1.6 percent of GDP**.
2. If we raise the wage to the potential wage, we would obtain an additional **6.2 percent of GDP**.

There is high variance between the industries.

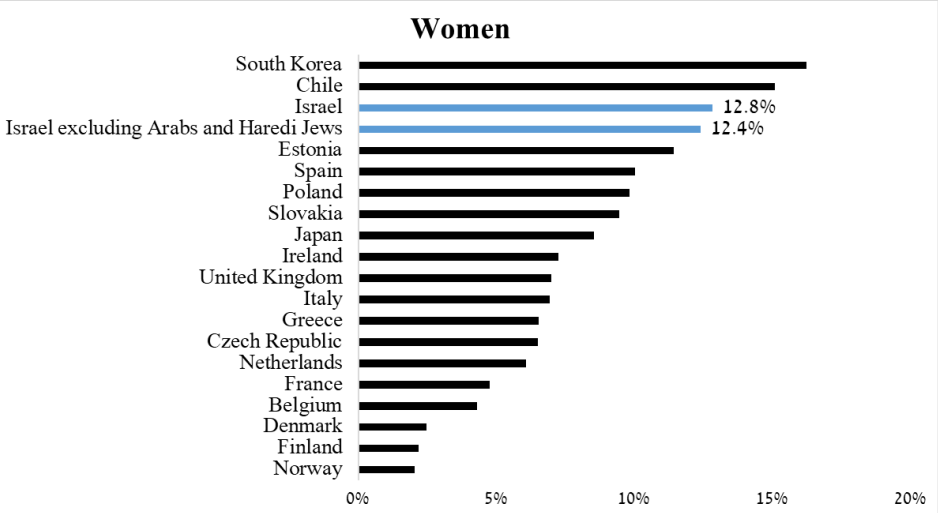


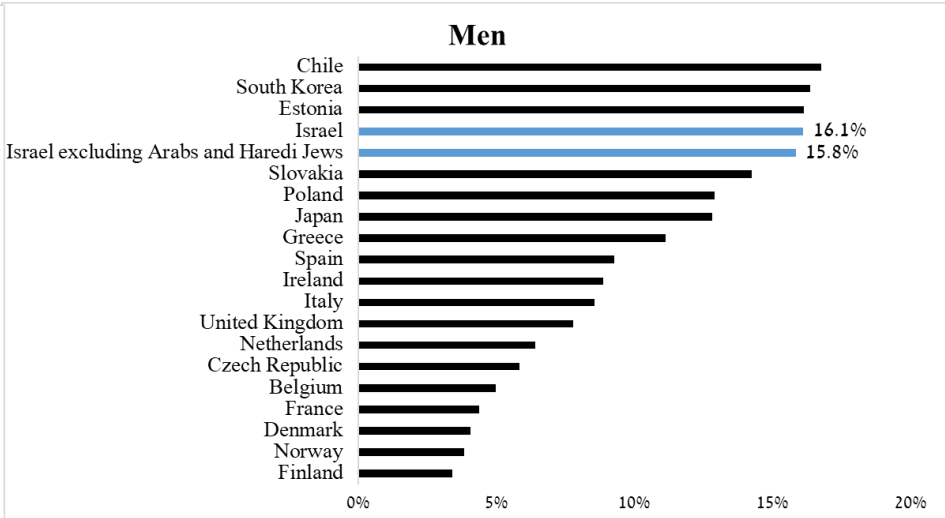
Industries for which N<20 were removed.
The confidence interval is a range of one standard deviation around the OECD average



Industries for which N<20 were removed.
The confidence interval is a range of one standard deviation around the OECD average

The rate of workers with significantly lower than expected wages, with different returns on education and skills between industries





The predicted wage for calculating the share of employees with lower than expected wages was derived from a regression of wage on age, age squareddummy variables for industries, and the interaction between the industry dummies and skills and education.

Multi-year model, Israel's coefficient

$$P(Low_wage_{ij}) = \delta_j + \beta_j X_{ij} + \epsilon_{ij}$$

Estimating Israel's coefficient in the joint international regression

	Basic model - equation 1 (I)	Basic model with control on industries (II)	Basic model with control on industries and occupation (III)	Model with all explanatory variables (IV)	Basic model + indicator for low wage (V)	Low wage as an explanation of the gap between Israel and the other countries (VI)
Women	0.05***	0.054***	0.062***	0.078***	0.035**	30%
Men	0.061***	0.065***	0.078***	0.099***	0.034***	44%

Estimating the coefficient of Israel excluding Arabs and Haredi Jews in the joint international regression

	Basic model - equation 1 (I)	Basic model with control on industries (II)	Basic model with control on industries and occupation (III)	Model with all explanatory variables (IV)	Basic model + indicator for low wage (V)	Low wage as an explanation of the gap between Israel and the other countries (VI)
Women	0.042***	0.047***	0.055***	0.062***	0.020	52%
Men	0.053***	0.060***	0.077***	0.087***	0.025**	53%

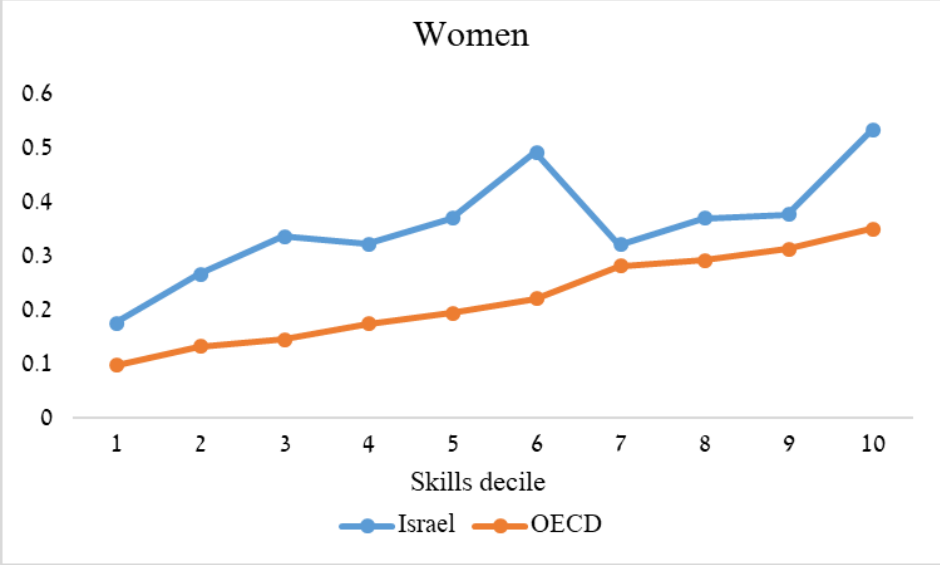
Investment in human capital

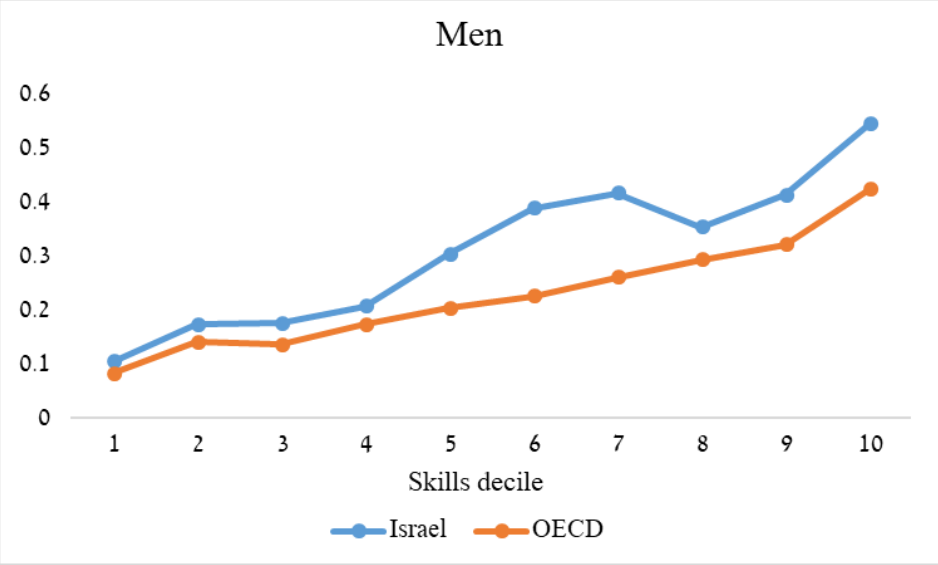
In the past 12 months, have you participated in organized training sessions within your job or training by supervisors or colleagues?

In the past 12 months, have you participated in seminars, study days, or workshops?

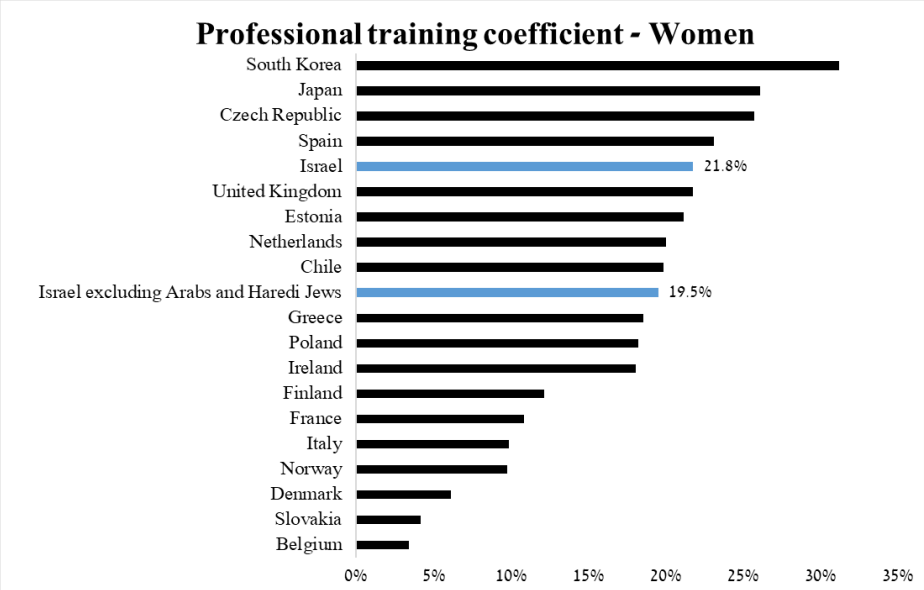
In the past 12 months, have you participated in remote study courses that were not for a degree?

Rate of workers that attended seminars as part of their job, by skills decile



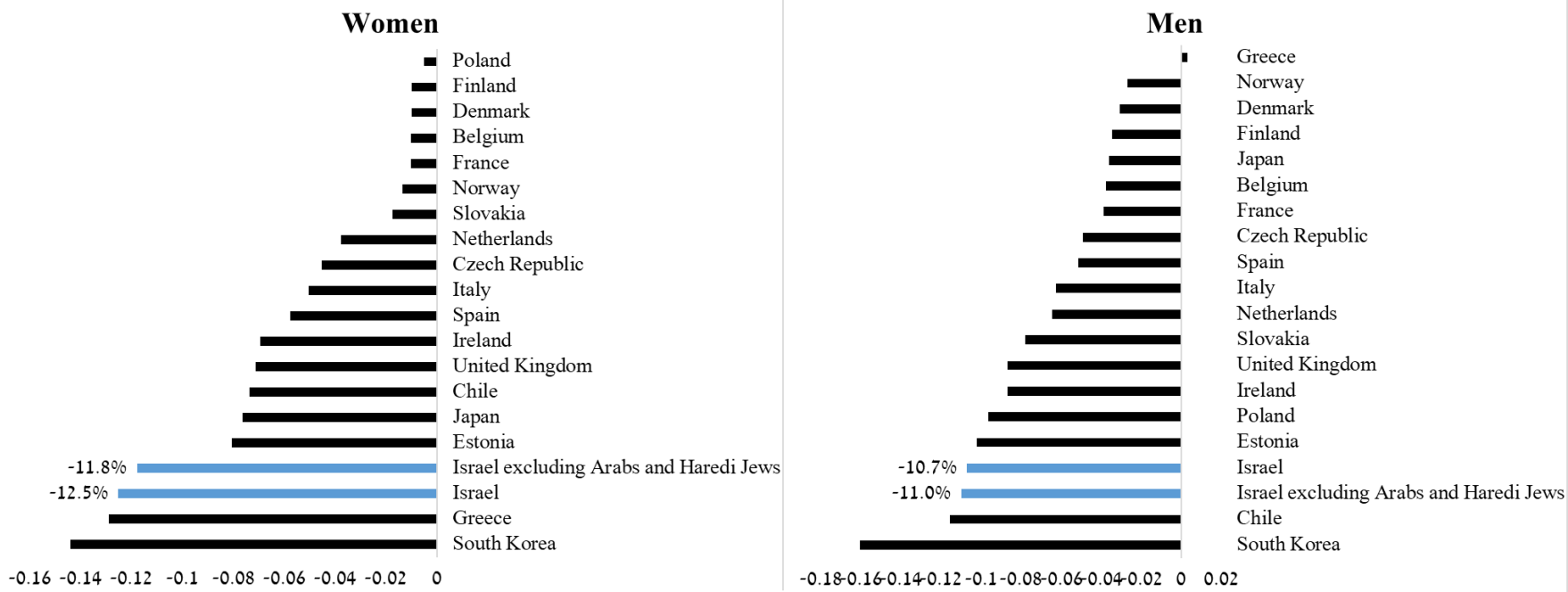


The link between professional training and wages, multiyear regression



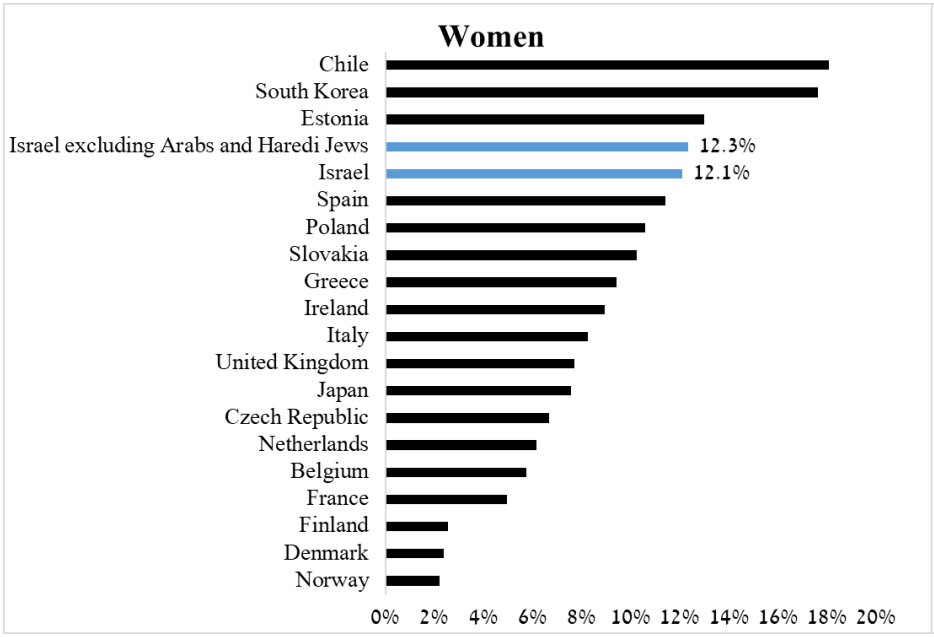
Simple Mincerian model with log(wage) as a dependent variable and age, age square, education, skills, and professional traning as explanatory variables.

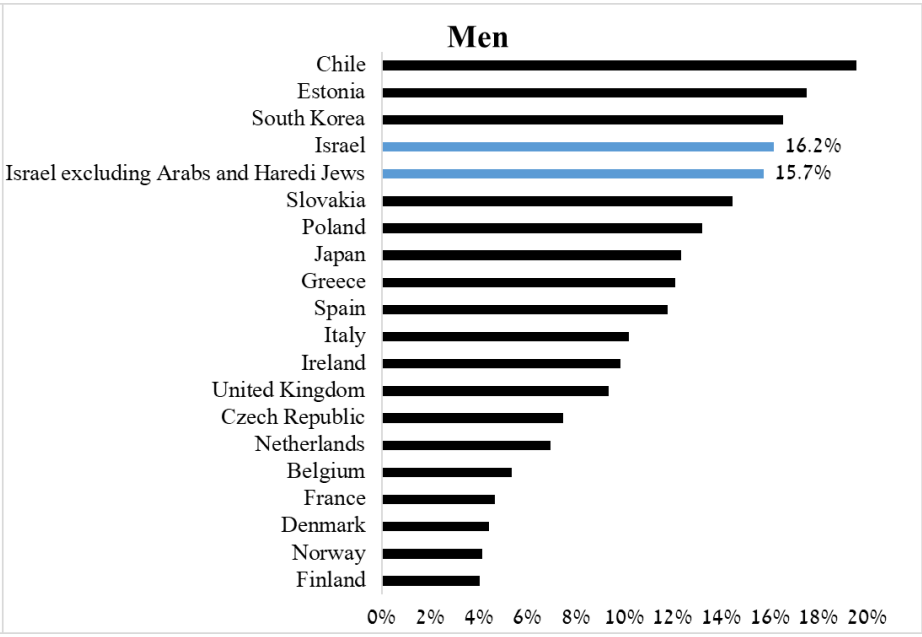
The difference in the rate of workers who attended training sessions during their work and those who earn less than the expected wages of the rest of the population (multiyear model)



Multiyear model where the dependent variable is the change of having a signfiicantly lower than expected wage and the explanatory variables are age, age squared, education, skills, and professional training. The figures shown in the graph are the coefficient of training in the regression.

Rate of workers with significantly lower than expected wages, when also controlling for those with professional training





International summary: Sizes, links, and correlations, men (correlation with women: 0.95).

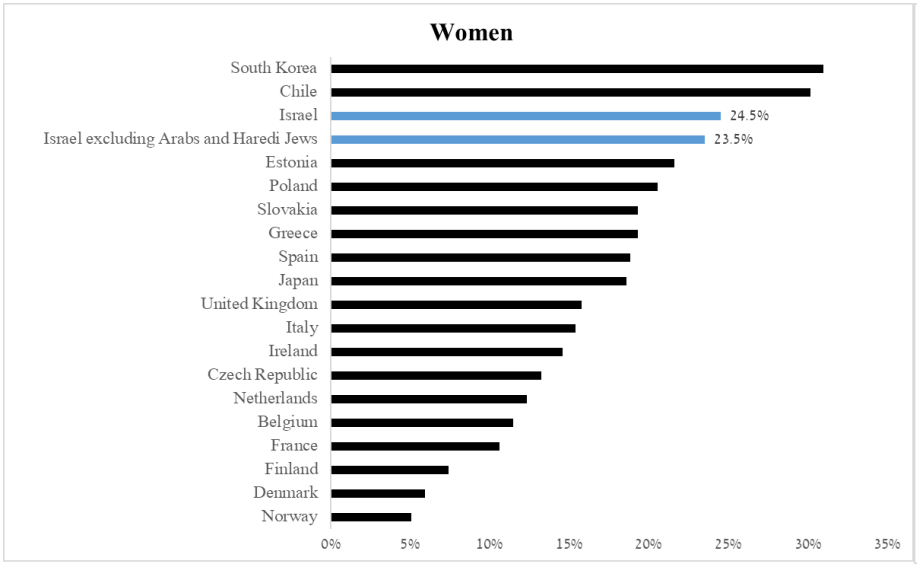
	Correlations				Data		
	Earning significantly less than expected (resideual correlations)	RMSE	Low wage	Per capita GDP	Israel	Median	Range
Earning significantly less than expected		0.73	0.86	-0.56	**17.4%**	11%	15%
RMSE	0.73		0.69	-0.12	**0.74**	0.51	0.51
Low age	0.85	0.69		-0.36	**17%**	13%	18%
Per capita GDP 2019	-0.56	-0.12	-0.36		**40,663**	**43,250**	**62,224**
Average wage	-0.46	-0.38	-0.54	0.80	**2.55**	**2.66**	**1.13**
Wage standard error	0.82	0.82	0.80	-0.54	**0.28**	**0.24**	**0.25**
Minimum wage relative to average wage	0.10	-0.15	0.18	-0.22	**43.0**	**39.8**	**12.7**
Return on education	0.53	0.40	0.76	-0.59	**0.06**	**0.05**	**0.08**
Return on skills	0.27	0.45	0.21	0.17	**0.14**	**0.11**	**0.18**
Average skills	-0.38	-0.15	-0.58	0.46	**5.08**	**5.37**	**1.56**
Years of study	0.36	0.40	0.11	0.60	**13.1**	**13.1**	**4.5**
Education standard error	-0.12	-0.34	-0.01	-0.37	**0.21**	**0.21**	**0.18**
Effect of training on having a significantly lower than expected wage	-0.76	-0.53	-0.72	0.18	**-0.11**	**-0.06**	**0.16**
Matching							
Needs more training	0.30	0.30	0.28	-0.47	**0.33**	**0.31**	**0.53**
Can make do with a lower education level	-0.12	-0.37	-0.16	0.04	**0.13**	**0.18**	**0.12**
Needs a higher education level	0.08	-0.29	0.09	-0.31	**0.06**	**0.07**	**0.18**

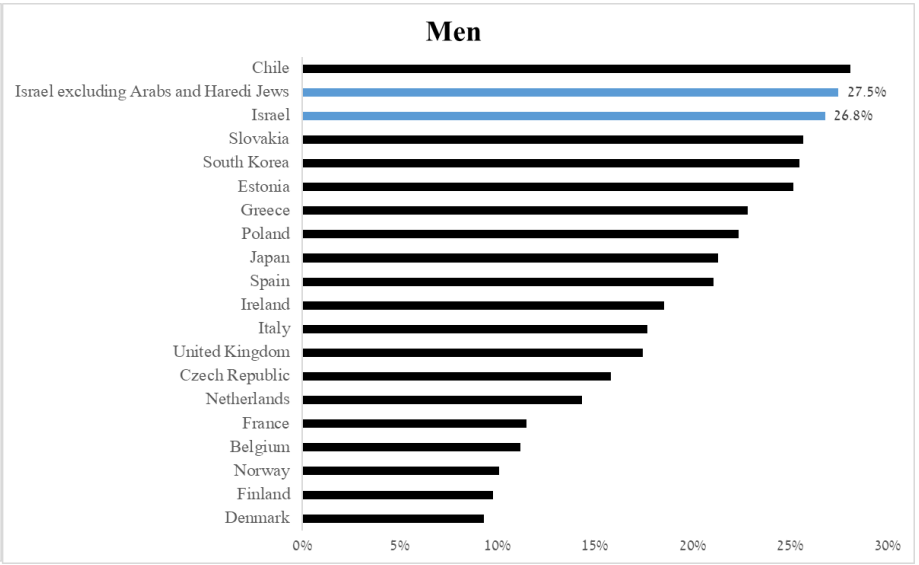
International summary: Sizes, links, and correlations, women

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

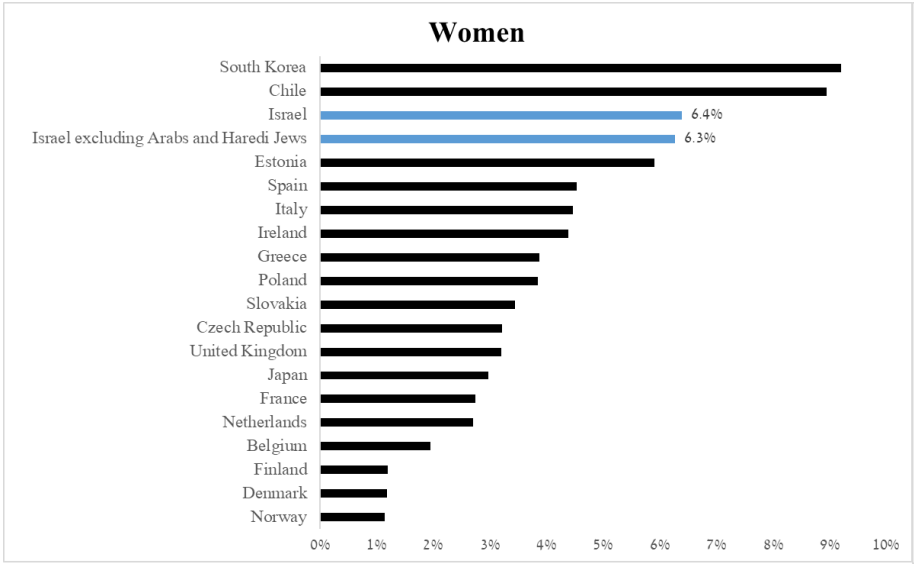
Additional tests

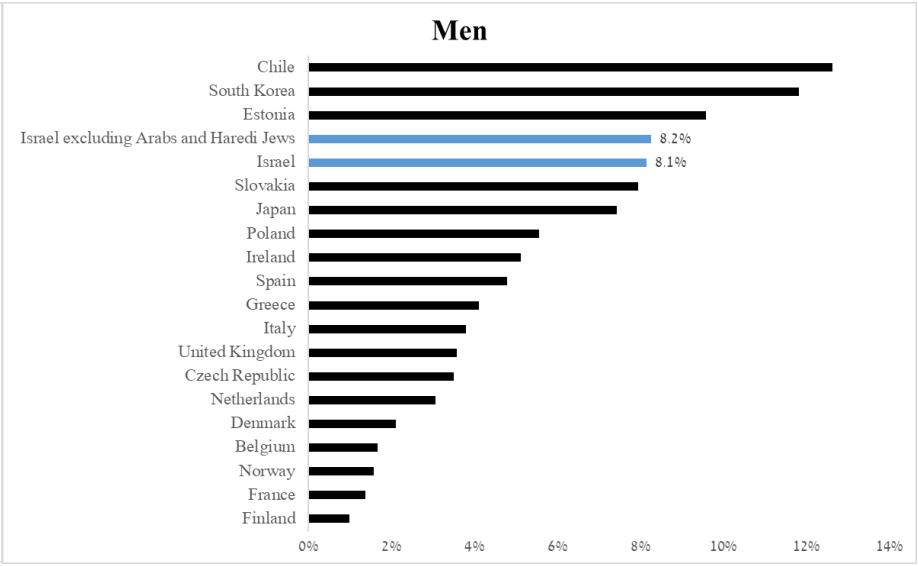
Rate of workers with wages 30 percent lower than expected



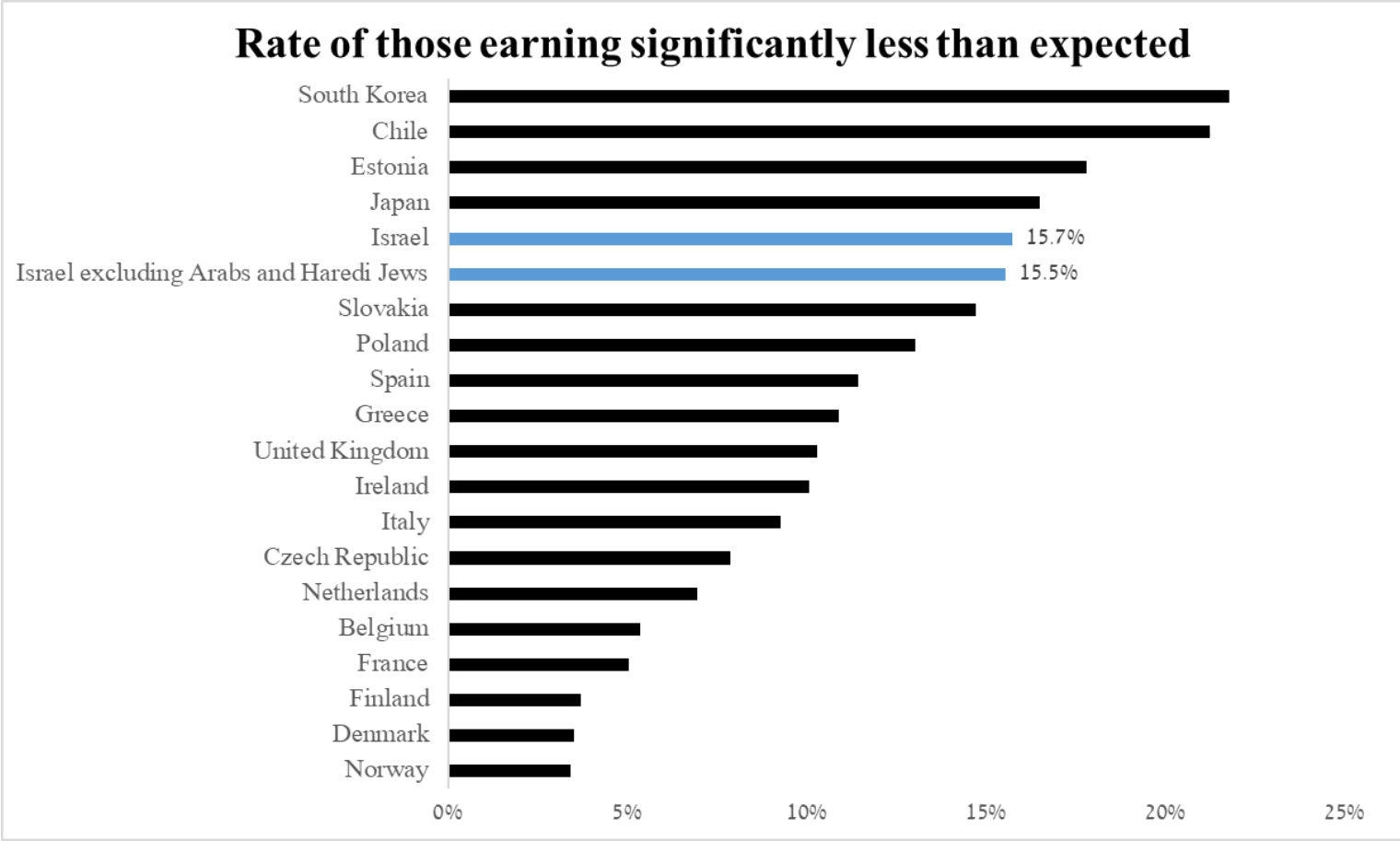


Rate of workers with wages 50 percent lower than expected





* Excluding control for women, Haredi Jews, and Arabs



Conclusion and implications for the future

- Until now, we have known from previous studies that labor productivity in Israel is low due to the low ratio of capital per worker, low worker skills (human capital), and issues having to do with the ease of doing business.
- This study shows for the first time that **even given the human capital of workers**, Israel has a relatively high rate of workers with unutilized human capital.
- It seems that channeling and guiding these workers at the start of their careers can improve the situation in Israel from this standpoint, which would contribute to increasing labor productivity in Israel and to improved quality of life.

Policy directions for reducing the target group

- Investment in guidance for new workers (in accordance with the OECD's Career Guidance surveys).
- Providing access to decision-supporting information on the return to schooling and career paths.
- Incentives to choose study and professional training paths with high returns for the individual.
- Lifelong learning – investment in professional retraining and professional refreshment for older workers.
- Investment in smart transport to employment areas.
- Investment in "remote work" infrastructure for the social and geographic periphery.
- Encourage the adoption of technology in low-productivity industries.

Thank you!