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Why Do Exporters Pay Higher Wages? Empirical Evidence from Israeli Companies

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Abstract

This study examines the extent to which the positive correlation between employment in an exporting company and wages reflects a causal relationship. In order to identify this relationship, I use several methods on the basis of three different datasets: controlling for observable and unobservable individual characteristics by means of a datafile that tracks workers over a number of years; controlling for observable and unobservable characteristics of individuals and companies by means of a datafile that tracks companies; and controlling for individuals' skills by means of cross-sectional data from an international skills survey (PIAAC). I find that while each percentage point in an industry's export rate is correlated with a 1-percent increase in wages, the causal relationship, which is similar across all of the methods, is much weaker and lies between zero and 0.2 percent. Finally, I find that the simple correlation between the export rate and wages in Israel is unusually large relative to other countries in the PIAAC sample, while the causal relationship is similar to the premium in other countries, although it is in the upper part of the distribution.

מדוע השכר של עובדים בחברות מייצאות גבוה יותר?

שי צור

תקציר

מחקר זה בוחן עד כמה המתאם החיובי שבין עבודה בחברה מייצאת לבין שכר משקף קשר סיבתי. על מנת לזהות קשר זה אני נעזר בכמה שיטות על סמך שלושה קבצי נתונים שונים: בקרה על התכונות הנצפות והבלתי נצפות של הפרטים באמצעות קובץ שעוקב אחרי עובדים לאורך מספר שנים; בקרה על התכונות הנצפות והבלתי נצפות של הפרטים והחברות באמצעות קובץ שעוקב אחרי חברות; ובקרה על המיומנויות של הפרטים על סמך נתוני חתך מסקר המיומנויות הבינלאומי (PIAAC) אני מוצא כי בעוד שכל נקודת אחוז בשיעור היצוא של הענף מתואמת עם שכר עבודה שגבוה יותר ב-1%, הקשר הסיבתי חלש בהרבה, דומה בין השיטות, ועומד על 0-0.2% לבסוף, מצאתי שהקשר הגולמי בין שיעור היצוא לבין השכר בישראל חריג בגובהו ביחס לקשרים במדינות האחרות שבמדגם PIAAC, בעוד שהפרמיה המחושבת על בסיס הקשר הסיבתי דומה לפרמיה במדינות אחרות, הגם שהיא נמצאת בחלק העליון של ההתפלגות.

1. Introduction

This study examines the extent to which the positive correlation between employment in an exporting company and wages reflects a causal relationship. For the sake of simplicity, the study differentiates between two extreme cases: In the first, workers in an exporting company enjoy a wage premium that only reflects their personal characteristics and/or the characteristics of the companies that employ them. These characteristics are not necessarily related to the export rate but do characterize many of the exporting companies. The second alternative is that the entire observed correlation between exports and wages is the result of a causal relationship between employment in an exporting company and wages.

Under optimal research conditions, we would have carried out a controlled experiment in order to answer the research question. For example, we would have allocated the workers randomly between exporting and non-exporting companies and then examined their wages. Such an experiment would solve the problem of selection of the workers (namely, that highly skilled workers tend to be employed in exporting companies and to earn a higher wage), but not the selection of the companies (namely, that more successful companies export more and pay higher wages). In order to solve the selection problem of the companies as well, we had to intervene in the possibility of exporting and to randomly allow for that possibility for only some of the companies.

To accomplish this, I use OLS (ordinary least squares) estimation to analyze the relationship between employment in an exporting industry/company[1] and wage level by controlling for the observable characteristics of the workers and the companies, as well as their unobservable characteristics which are assumed to be fixed over time (Fixed Effects, or FE). This method approximately measures the average change in the wages of workers who moved between exporting and non-exporting companies and/or between companies with different export rates. This measurement will simulate the experiment in which we would randomly allocate the workers between the various companies, if the movement of the workers between companies occurred for reasons unrelated to wage level. Such an assumption is not a negligible one and we will discuss the possible bias resulting from it for some of the results.

[1] The research includes analyses on both the industry level and the company level. For simplicity, I use the term “company” in parts of the general description.

Recall that the selection problem from the company side, which is the result of the fact that successful companies export more and pay higher wages, also needs to be dealt with. To this end, I first control for the companies' unobservable characteristics and in particular the industry to which they belong. Later, I also control for the fixed unobservable characteristics of the companies (FE) where on the company level FE measures the average change in wages as a result of changes in the export rate in a given company between periods. Since the annual fluctuations in the export rate are liable to reflect statistical noise rather than real economic change, I aggregate into three-year periods and estimate the effect of changes in the export rate in a given company between those periods on the wages paid by the company. This method of estimation simulates the experiment in which only some of the companies are allowed to export, on the assumption that changes over time in the export rate in a given company occurred for reasons that are unrelated to the level of wages it pays. This assumption is also non-negligible and we will discuss the possible bias that it causes in some of the results.

In the course of the analysis, I use two main datasets and compare the results obtained for each:

a. Worker panel datafile: This data includes workers born during the period 1975–85 and tracks their outcomes in the labor market during the period 2008–15. In addition to wage data for the years 2008–15, the datafile includes observables such as matriculation, psychometric scores and education, as well as information on the export rate in the industry in which the worker was employed at the two-digit level.[2]
b. Manufacturing Survey datafile: This data tracks manufacturing companies during the period 1995–2010, including detailed data on the companies' workers over time (such as gender, age and education). The data makes it possible to calculate the export rate of each company in each year and to control for the company's characteristics and performance in each year (such as, for example, number of employees).

[2] According to the industry classification of the CBS for 2011. The two-digit classification differentiates between, for example, sub-industries within manufacturing (such as between plastics and textiles) and within commerce and services.

The advantage of the Manufacturers Survey datafile is that it compensates for the lack of data that tracks workers.It continuously tracks manufacturing companies, including their export rates and performance (rather than the industry averages). The disadvantage of the Manufacturers Survey datafile is that its data on workers is incomplete since workers join or leave companies that may not be included in the survey; the worker panel datafile fills this gap, as mentioned above, such that the files described in (a) and (b) "complement" each other.

The approach I adopt gradually controls the factors that influence wages, to identify the causal effect of the export rate. This is in line with the trend that developed in the literature during the last two decades in the wake of Abowd, Kramarz and Margolis (1999). The results of the analysis that I carry out on the basis of the worker panel datafile indicate that if the various characteristics that are correlated with the export rate and with wages are not controlled for, then every percentage point in the export rate of the industry is correlated with a 1-percent increase in wages. Controlling for the observed characteristics of the individuals in the worker panel datafile, including gender, age, age squared and education (hereafter: Mincerian characteristics) as well as test scores (psychometric and/or matriculation scores) reduces the estimated return to approximately 0.7 percent. Controlling for the unobservable characteristics of the individual as well reduces the return to 0.4 percent. Focusing on the manufacturing industry on the basis of this datafile further reduces the return to 0.13 percent.

The results of the analysis carried out on the basis of the Manufacturers Survey datafile indicate that while each percentage point in the export rate of the industry is correlated with a 0.6 percent increase in wages when no characteristics are controlled for, controlling for the observable characteristics of the individual reduces the estimated return to 0.45 percent while controlling for unobservable characteristics is sufficient to reduce it to 0.16 percent (which is similar to the "final" level obtained for manufacturing with the worker panel datafile, namely 0.13 percent). Furthermore, in order to deal with the potential selection problem on the company level, I aggregate the Manufacturers Survey data on the worker level to the company level and divide the 15 years of the sample period (1996–2010) into five three-year periods. I find that after controlling for the workers' characteristics on the company level and adding the fixed effect on the company level, changes in the export rate over time between the three-year periods do not affect the average wage level paid by the company.

I also examine the research question using data from the PIAAC survey but by means of a slightly different method, namely by controlling for the workers' basic skills as adults (math and reading comprehension) in parallel to directly controlling for the size of the company in which they work and for the sector.[3] This examination indicates that the return per percentage point of the export rate drops from 0.6 percent without the control variables to 0.4 percent when controlling for the Mincerian characteristics, to 0.3 percent in the specification in which the score on the PIAAC exam is also controlled for, and to 0.22 percent when the size of the company is controlled for.

In order to illustrate the implications of the results, consider a worker in an industry that exports 25 percent of its output and who earns about 24 percent more than a worker in an industry that does not export at all (almost 1 percent for each percentage point in the export rate obtained using the worker panel datafile in the regression for the entire economy without controls, multiplied by 25). However, controlling for characteristics on the basis of three different datafiles indicates that the causal component is much smaller and sometimes statistically insignificant and is to be found in the range between 0 (when the result is not statistically significant on the basis of the Manufacturers Survey datafile) and 3 percent (0.13 percent which is obtained on the basis of the worker panel datafile for the manufacturing industry after controlling for the individuals' unobserved characteristics).

Since the results on the basis of the PIAAC datafile, while controlling for basic skills and company size, are similar overall to those of the basic and more comprehensive tests on the basis of the worker panel datafile and the Manufacturers Survey datafile, it can be concluded that the PIAAC datafile provides results for Israel that are biased to only a limited extent. This tends to imply that an international comparison between export companies that is obtained for each country based on the PIAAC datafile will indeed be informative. In particular, there may be value in comparing the gap between the gross return and the return with controls. I found that while the gross gap in Israel is the highest, the controlled-for export wage premium is within the more commonly found range internationally, and therefore it showed the largest decline as a result of controlling for the characteristics. The export wage

[3] The sectors definition differentiates between, for example, construction and manufacturing. For more information see: See https://www.cbs.gov.il/en/publications/Pages/2015/Standard-Industrial-Classification-of-All-Economic-Activities-2011-Updated-edition.aspx

premium with controls is lower to the point of being negligible in most of the countries and in Israel it is the third highest. The premium appears to have clear economic importance after controlling for characteristics only in Norway, which is rich in natural resources. The reason for the existence of a large export wage premium in Norway is a subject for future research.

The connection between a company's exports and the wages it pays is based on the literature on the relationship between exports and labor productivity. Melitz (2003) uses a general equilibrium model with heterogeneous companies to show that companies with high productivity will be those that start to export when the country is opened to trade and that the broadening of trade following liberalization and the opening of new markets leads to growth among the exporting companies with the highest productivity, at the expense of non-exporting companies with low productivity. Empirically, exporting companies are characterized by higher productivity relative to non-exporting companies and there are findings that point to a causal relationship between the start of exporting and a one-time improvement in worker productivity (for example, Gallo, 2011).

But does the high productivity of exporting firms guarantee that they will pay higher wages? Exporting is likely to influence wages in a variety of ways, which will be discussed below, and therefore higher wages may in turn increase the incentive to work, raise productivity in the company, and increase its level of exports (Amiti and Davis, 2011). The positive relationship between exports and wages may be the result of two main channels that are analyzed in the literature.

The first is the "worker characteristics channel", according to which export industries wish to attract higher-skilled workers for various reasons, such as their use of advanced technology and the demand for high-quality products in foreign markets. Thus, higher wages reflect the observable and unobservable characteristics of the company's workers (Verhoogen, 2008; Yeaple, 2005). Empirical evidence shows that this is also the case in Israel. Thus, export companies that employ higher-quality workers also have higher productivity (Bank of Israel, 2016). As will be seen in the descriptive statistics presented below, workers in the export industries in Israel, as mentioned, contribute to the productivity of the companies that employ them and are paid accordingly. Similarly, Bernard and Jensen (1995) found that wages paid by exporting companies in the US are on average 9 percent higher than those paid by non-

exporting companies. Similar results were found for other countries, such as Sweden (Hansson and Lundin, 2003), Britain (Greenaway and Kneller, 2004) and Germany (Bernard and Wagner, 1997).

The second is the "rent allocation channel". In contrast to the effect of worker characteristics on wages, a significant premium, which reflects a causal relationship between exports and wages, will be the result of factors other than worker characteristics. One example is the hiring process, which identifies the worker's suitability to the company's needs, and later on the style of management or level of innovation which will specifically exploit the worker's abilities. These processes will result in the company benefiting from rent, which reflects excess profit. The company will share the rent with the worker by means of a higher wage than that predicted for the worker on the basis of observable and unobservable characteristics. However, do exporting companies behave according to that description? Helpman, Itskhoki, and Redding (2010) claim that companies with high productivity manage to grow up to a threshold where it is worthwhile for them to pay the fixed costs required in order to export their product. According to them, frictions in the labor market and in particular their effects on employment during recessions are likely to encourage those companies to continue paying high wages in order not to lose the investment in the job match and in the specific human capital that the worker has accumulated during the employment with the company. Another of their hypotheses states that the positive relationship between wages and exports is the result of the negotiating ability of skilled workers in these industries.

The goal of this study is therefore to identify the wage premium paid to workers in an exporting company and the gap between the statistical correlation and the premium that is due to the second channel, namely the "rent allocation channel". This identification has important policy implications in the case of Israel. Thus, in recent decades the government has sought to encourage the activity of the exporting industries, primarily by means of the Encouragement of Capital Investments Law.[4] Furthermore, during the last decade, the Bank of Israel has from time to time purchased foreign exchange in order to moderate the

[4] The law includes a specific criterion that companies will be eligible for tax benefits and grants (on most of the grant tracks) only if they export at least 25 percent of their output.

appreciation of the shekel, in part to support the activity of the export industries.[5] Therefore, the question arises as to whether the encouragement of the export industries over time is justified from the perspective of the economy as a whole, since, for example, it shifts workers to industries in which the workers and their employers share a rent that arises from superior innovation and management, which involve positive externalities. The answer according to this study is, as already mentioned, that such rent is quite small in size in the best of cases and is negligibly different statistically from zero according to some of the tests. The contribution of this study to the literature and in the international context is two-fold: first, it comprehensively characterizes the gap between the statistical correlation and the premium due to the causal relationship between the export rate and wages in a small open economy such as that of Israel. Second, it presents for the first time an international comparison of the export wage premium. This implies, as mentioned, that the export wage premium is important economically even after controlling for workers' characteristics only in Norway, a country rich in natural resources.

The rest of the article proceeds as follows: Section 2 describes the dataset. Section 3 describes the research methodology. Section 4 presents the descriptive statistics and the results based on the three approaches. Section 5 presents an international comparison of the export wage premium on the basis of the PIAAC data, and Section 6 concludes.

2. The data

The first datafile (hereafter: the worker panel datafile) is based on a tracking of individuals born during the period 1975–85. It includes the following variables: demographic-socioeconomic information taken from the Population Registry, including gender and year of birth; information on matriculation exams—the subject studied, the number of study units and the score; the psychometric score; information on higher education including number of years of study and degrees obtained; information on employment and wages from employee-employer files of the Israel Tax Authority—months worked and annual wages for each of the

[5] The Bank of Israel also purchases foreign currency in order to increase its foreign currency reserves in order to deal with exceptional fluctuations in the foreign currency market, in order to offset the effect of natural gas production and in order to moderate the effect of the exchange rate on inflation.

years between 2008 and 2015 (namely, when the individuals were aged 20–37); and the industry in which the worker was employed according to the two-digit industry classification of the CBS (2011). The export rate in 2006 for each of the industries based on the input-output tables for that year was merged into the file. Using the Manufacturers Survey for the years 2008 to 2015, information on export rates for manufacturing industries only was merged into the file for each year. In addition, total annual productivity of the industry was merged for each year.

The second datafile is based on the Manufacturers Survey sample carried out by the Central Bureau of Statistics (CBS). It includes data on the wages of workers in companies that were sampled in the Manufacturers Survey during 1995–2010. The data on individuals from the Tax Authority includes, among other things, the worker's gender, age and education. The source of the education data is the Education Registry, and it includes information on years of schooling. The data on companies and businesses include information on the industry to which the company belongs, including a breakdown by manufacturing sub-industries and also a variety of information on the company's economic activity, and in particular sales in Israel and sales abroad, value added and number of workers.

In addition to the worker panel datafile and the Manufacturers Survey datafile, we make use of PIAAC data (hereafter: the PIAAC datafile). It contains individual data for 2014 for a large number of countries, which includes, among other things, the skills of the workers on the basis of the reading comprehension and mathematics exams, the industry in which they are employed and their wages. This data is used to carry out an international comparison and to control for skills, in addition to the regular control variables. In addition, the datafile includes information on the size of the company in which the worker is employed. The analysis for the rest of the countries makes use of the WIO international database which provides data that can be used to calculate the export rate in each sub-industry and each country separately. The export rate for Israel will continue to be based on the input-output tables for 2006 also in this comparison.

3. Methodology

In order to identify the causal relationship between the export rate in the sub-industry in which the employees are employed and their wages, it is necessary to control for observable variables whose omission is liable to bias the estimates of the effect of exports on wages and to control for unobservable variables using methods that were briefly mentioned in the introduction. The control variables will be gradually added in order to identify the contribution of each of the following components to the positive correlation between export rate and wages: 1) the effect of the workers' observable characteristics; 2) the effect of the workers' unobservable characteristics; 3) the effect of both the observable and unobservable characteristics of the industries or the companies; and 4) the "net" effect of the export rate on wages. The first three will be reflected in the differences between the coefficients for the export rate in the various specifications that will be presented below. The fourth will be obtained at the end using the specifications that control for the first three components. I will refer to this process as AKM decomposition, following Abowd, Kramarz and Margolis (1999) mentioned in the introduction.

I will first present the process to identify the causal connection that makes use of the worker panel datafile and the Manufacturers Survey datafile. Following that, I will present the analysis using the PIAAC datafile.

a. Regression equations and AKM decomposition on the basis of the worker panel file

The regression coefficient of the export rate, β_6, which is obtained from Equation (1), reflects the simple statistical correlation between the export rate and wages, since the equation does not include any controls:

(1) $$lwage_i = \alpha + \beta_6 \,\text{exp\_rates}_i + u_i$$

where *lwage* is the logged wage and exp_rates is the export rate of each sub-industry, with a value ranging from 0 to 100. The standard deviations in this subsection are calculated using the cluster method at the industry level.

In the next stage, I control for as many observable individual variables as possible that may be correlated with wages, with emphasis on education and skills. This is essentially the

Mincer model using cross-sectional data with the addition of a variable to reflect skills (beyond education) and the export rate variable.

(2) $$lwage_i = \alpha + \beta_1 \min_i + \beta_2 \text{exper}_i + \beta_3 \text{exper}_i^2 + \beta_4 \text{educ}_i + \beta_5 \text{skills}_i + \beta_6 \text{exp\_rates}_i + u_i$$

where *exper* is experience, *exper*^{2} is experience squared, *educ* is education measured as years of schooling, and *skills* are the skills represented by matriculation scores or psychometric scores.

Thus, $M1 = \beta_6(1) - \beta_6(2)$, which is the effect of individuals' observable characteristics on the correlation between the export rate and wages.

The panel estimations on the individual level with a fixed effect on the individual level make it possible to essentially track the movement of workers from exporting to non-exporting companies and vice versa and to track the change in wages as a result of that movement.

(3) $$lwage_i = \alpha + \beta_1 \text{exper}_{it} + \beta_2 \text{exper}_{it}^2 + \beta_3 \text{educ}_{it} + \beta_6 \text{exp\_rates}_{it} + \delta_i + u_{it}$$

where δ_i is the fixed effect (FE), which controls for unobservable invariant characteristics of the individual. In this estimation, changes in wages that are the result of changes in the export rate are due to the gap in wages for individuals who moved between industries and therefore "changed" the export rate of their place of work. Thus, $AKM2 = \beta_6(2) - \beta_6(3)$, which is the effect of unobservable individual characteristics on the correlation between the export rate and wages (given that we first control for observable characteristics, as is generally the practice).

In the next stage (Equation (4)), I estimate the same regression but after limiting the sample to include only manufacturing, with the goal of overcoming the high level of heterogeneity in the economy.

$AKM3 = \beta_6(3) - \beta_6(4)$ will reflect the effect of economy-wide industry heterogeneity on the correlation between the export rate and wages.

Finally, $AKM4 = \beta_6(4)$ reflects the causal relationship between the export rate and wages, on the assumption that in Equation (4) all of the factors that affect the correlation between the export rate and wages are controlled for. The robustness of this assumption will be examined using additional tests and based on the discussion of the results.

b. The regression equations and the AKM decomposition on the basis of the Manufacturers Survey datafile

The process of identifying the causal relationship using the Manufacturers Survey is intended to compensate for the disadvantage, described in the Introduction, of the identification process carried out using the worker panel datafile, in view of the fact that the Manufacturers Survey datafile includes a continuous tracking of the manufacturing companies, including their export rates and their performance (rather than an industry average). This disadvantage is due to the fact that the tracking of the workers is not complete due to workers who join or leave companies that are or are not included in the Manufacturers Survey datafile, while the worker panel datafile solves this problem. Therefore, the two methods complement each other.

The analysis on the basis of the Manufacturers Survey datafile is similar to the process carried out on the basis of the worker panel datafile except for three main differences:

1. The export rate is not the industry average but rather that for the company in which the individual is employed at any given point in time.
2. The regressions based on Equation (2) do not control for *skills*, i.e., skills represented by matriculation scores or psychometric scores. This is because they are not included in this datafile.
3. In the regression based on Equation (4), X_{ji} is the set of characteristics of company *j* (rather than of the industry) in which individual *i* is employed, which includes the number of employees.

In the second part of the analysis using the Manufacturers Survey the focus will be on controlling for the companies' unobservable characteristics. Thus, the data are aggregated on the company level *j* and into three-year periods between 1996 and 2010. The estimation equation is as follows:

(5) $$lwage_{jt} = \alpha + \beta_1 \text{exper}_{jt} + \beta_2 \text{exper}_{jt}^{\,2} + \beta_3 \text{educ}_{jt} + \beta_6 \text{exp\_rates}_{jt} + \beta_7 \text{X}_{jt} + \Omega_j + u_{jt}$$

where Ω_j is the fixed effect (FE) on the company level. In this equation, the average characteristics of the workers are controlled for on the company level. The index *t* in equation

(5) reflects periods of three years, and the coefficient β_6 reflects the effect of the changes in the average export rate between these periods. It is reasonable to assume that the change in the export rate between three-year periods will reflect an economic change more than annual changes will.

$AKM3 = \beta_6(3) - \beta_6(5)$ and in this case the gap reflects the effect of the employer's observable and unobservable characteristics on the correlation between the export rate and wages.

c. Use of the PIAAC file

In this method, the goal of which is similar to that of Equation (1) and (2), I first test the difference between the coefficient of the export rate obtained in the regression without controls and that obtained in the regression in which I control for as many observable individual characteristics as possible that may be correlated with wages, with emphasis on education and skills. Regression (1) is carried out here in the same manner, except that it is estimated for the year 2014 using the PIAAC datafile; it will be referred to as Regression (1P). Regression (6), like Regression (2), is essentially a Mincerian model with cross-sectional data. The estimation equation is as follows:

(6) $$lwage = \alpha_i + \beta_1 \min_i + \beta_2 \text{exper}_i + \beta_3 \text{exper}_i^2 + \beta_4 \text{educ}_i + \beta_5 \text{skills2}_i + \beta_6 \text{exp\_rates}_i + u_i$$

where the variable *skills2* is the average of the reading comprehension and math scores on the PIAAC tests. The PIAAC datafile makes it possible to also control for the size of the company in which the individual is employed, which is one of the most important—if not the most important—characteristic of the company in explaining the correlation between exports and wages (Helpman, Itskhoki and Redding, 2010). Therefore, the following regression is run:

(7) $$lwage = \alpha_i + \beta_1 \min_i + \beta_2 \text{exper}_i + \beta_3 \text{exper}_i^2 + \beta_4 \text{educ}_i + \beta_5 \text{skills2}_i + \beta_6 \text{exp\_rates}_i + \beta_7 \text{size}_j + u_i$$

As in the case of the process that was based on the worker panel datafile and the Manufacturers Survey datafile, the process based on the PIAAC datafile makes it possible to

track the development of the relationship between the export rate and wages with the addition of the various controls. An important advantage of this method is the use made of the hourly wage rather than the monthly wage. Thus, I am able to determine whether the use of monthly wages from the worker panel datafile (which does not include workhours) is a significant drawback.

4. Results

This section presents the results obtained from the three approaches to identifying the causal relationship between the export rate of the industry/company in which the individual is employed and wages. In parallel, I present the calculations and conclusions provided by the AKM decomposition.

a. The results of the analysis using the worker panel file

Table 1 presents the descriptive statistics of the worker panel datafile according to the export intensity of the industry in which the worker is employed. The left-hand panel presents the total number of employees in 2015 who were born during the period 1975–85, while the right-hand panel presents the same information but only for the manufacturing industry. The left-hand column in each panel presents the data for the total sample while the two right-hand columns present the data according to export intensity, namely above and below 25 percent (according to the export rate in the industry in which the individual is employed). The datafile includes 925,634 employees, of which 179,448 are employed in industries that export more than 25 percent of their output and in which the average export rate is 69.5 percent, as opposed to 4 percent in the industries that export less than 25 percent of their output. About one-tenth of the employees (born during 1975–85) work in manufacturing, which represents a sub-sample that will be used in later regressions in which the export rate changes over time, rather than being fixed at its 2006 level as in the overall sample.

Monthly wages in export-intensive industries are 76 percent higher overall and 52.3 percent higher in manufacturing. However, since the gap in the average export rate is higher for the economy as a whole than in manufacturing, these gaps reflect a gap of 1.1 percent in wages for each percentage point in the export rate in the analysis of both the entire economy and

only manufacturing. Recall that the main research question is to what extent this gap reflects the individual characteristics of the workers and/or other characteristics of the company in which they are employed and to what extent it reflects a causal relationship between working in an exporting company and wages. The large differences in the characteristics of workers between export-intensive industries and the others tend to imply that observable characteristics are to a large extent responsible for the gap. Thus, although the age and experience of the worker are quite similar across the industry groups, men tend to work in export-intensive industries, and the years of schooling of workers in export industries are higher by 0.5 years and 0.8 years in the economy as a whole and in manufacturing, respectively. Comparing the cognitive abilities of the workers using psychometric scores and matriculation scores in math again shows the advantage of working in the export-intensive industries.

With respect to the estimation results, the regression coefficient of the export rate, which appears in Column (2) in Table 2 (the regression without any controls), constitutes the starting point of the analysis. Its value of 0.945 implies that an increase of one percentage point in the export rate is correlated with an increase of 0.945 percent in monthly wages. This relationship, which is based on an analysis of the continuous export rate, is similar to that obtained by way of the descriptive statistics, in which the average wage in industries that export more than 25 percent of their output was compared to the rest of the industries and a gap of 1.1 percent in wages was found for each percentage point in the export rate.

The next stage in the analysis implements the regression specification described by Equation (2) in Section 3. In Column (2), the individuals' basic characteristics, i.e. gender, years of schooling, experience and experience squared, are controlled for, as is the practice in Mincerian wage regressions. Controlling for these characteristics when considering the entire sample for the year 2015 generates a coefficient of 0.72, which implies that an increase of one percentage point in the export rate is accompanied by an increase of 0.72 percent in wages.

Column 3–4 and Column 5–6 in Table 2 present the regressions for the workers for whom there are data on matriculation scores in math and workers for whom there are data on

psychometric scores, respectively.[6] The left-hand column in each pair of columns includes basic Mincerian controls, while the right-hand column in each pair controls for the matriculation score or the psychometric score as well. Controlling for these scores lowers the export coefficient in the regression to a negligible value of about 0.04 percentage points in both cases, such that the coefficient when controlling for the matriculation score or the psychometric score (Column 4 and 6) ranges from 0.64 percent to 0.66 percent.

In the next stage, controls are introduced for fixed individual characteristics (FE) (Table 3). This estimation essentially captures the effect of the change over time in the export rate that characterizes a given individual's place of work on the wage. Figure 1a presents the maximal change for each individual in the export rate that characterizes his place of work. The results imply that the export rate for many individuals changes over time to a not insignificant extent. In the sample for the entire economy, more than half of the individuals moved to an industry with an export rate that differs from that of their previous place of work at least once. Furthermore, the most common (maximal) change is 7.5 percentage points in the export rate, and more than 10 percent of the sample experienced it. In the sub-sample of the worker panel datafile, which only includes manufacturing, the variance is based both on the movement of workers between industries and the change in the export rate of a given industry in which the individuals was continuously employed. About 55 percent of the individuals experienced a change in export rate, and the change is concentrated in the lower segment of the distribution, due to the fact that the differences in export rate within manufacturing are more moderate. The most important conclusion to be drawn from this graph is that estimating the effect of the export rate, which changes over time, on wages is based on a not insignificant level of variance.

The results of the regressions that include FE for the sample of all industries, during the period 2008–15, are presented in Column 1 of Table 3. The export rate coefficient is 0.39 percent as compared to about 0.65 percent without FE (Table 2). This is a significant decline and reflects the importance of tracking individuals over time and controlling for unobservable characteristics, rather than only observable ones. In Column 2, I focus on manufacturing,

[6] The matriculation data for the 1977 cohort are only partial and therefore the sample includes only the 1978 and later cohorts for whom data on math matriculation is available.

which is relatively homogenous compared to the overall economy, and most of its sub-industries export at one rate or another. Focusing on manufacturing significantly lowers the coefficient to 0.126 percent.

It is worth noting that although the estimations in Table 3 deal with the classic selection problem, according to which skilled workers tend to work in companies that export more and earn more relative to other workers, they are still vulnerable to the econometric concern that workers whose skills improve over the course of their career (beyond the influence of experience which is controlled for) will move to companies that export more and will benefit from higher wages. The potential bias in this case is positive, such that the "true" coefficient may be lower and not statistically significant. Nonetheless, identifying the decline from the simple correlation reflected in a coefficient of 0.945 percent for each percentage point in the export rate to approximately 0.13 percent has value in itself.

In summary, the regression coefficient of the export rate in Column 1 of Table 2, which does not include any controls, is 0.945 percent and is the highest value obtained among all of the regressions in the study. This value is represented by the full right-hand column in Figure 2. The coefficient drops to 0.66 after controlling for the individual's characteristics (including psychometric score). Therefore, the contribution of individual observable characteristics to the gross gap is the gap between these two values (0.285—the green section of the right-hand column). The addition of the fixed effect on the individual level reduces the coefficient from 0.66 to 0.39 (a gap of 0.27—the orange section). Finally, focusing on manufacturing reduces the coefficient to 0.126. The gap between 0.39 and 0.126 (0.263 – the grey section) represents the contribution of industry characteristics while 0.126 represents the component that is as close as possible to the causal relationship between the export rate and wages, at least according to the analysis in this section.

b. The results of the analysis on the basis of the Manufacturers Survey file

Table 5 presents descriptive statistics for one extreme of the sample period, namely the year 2010. The sample includes 1,387 companies for that year and these are divided into pentiles according to their average export rate for all of the years during which they appear in the sample. The most notable result in the table is the lack of any real difference in the quality of

workers in the first three pentiles of the export rate (according to their education) or in their wages. Furthermore, the average age of workers in these companies is about 40 in all of the pentiles, and most of the workers are men (about 70 percent).

Table 5 presents the change in the coefficient of the effect of the export rate on wages as control variables are gradually added. The coefficient without controls is 0.58 percent and it declines to 0.45 percent after controlling for observable individual characteristics.

In the next stage, the FE for individuals is added to the analysis. Figure 1 shows that the export rate of the companies did not change in the case of 57 percent of the individuals who work for them. For about 35 percent of the individuals, the export rate of their place of work changed by more than 5 percentage points, indicating that the estimation that exploits the change in the export rate for given individuals is based on sufficient variation. The estimation shows that the coefficient continues to decline—from 0.45 percent to 0.16 percent—after controlling for the unobservable fixed effect (FE) of individuals. This value is similar to that obtained for manufacturing in the analysis which utilized the worker panel datafile (about 0.13 percent; Column 2 in Table 3) while using similar controls. This similarity points to the robustness of the results, which appear not be sensitive to the structure of the files (a panel of workers or a panel of companies); to whether the export rate is an industry average or is more disaggregated at the company level; or to the various estimation periods (2008–15 versus 1995–2010).

Controlling for the size of the company (number of employees) reduces the coefficient somewhat to 0.1 percent. This result reflects the positive correlation between size and export rate and is consistent with Itskhoki and Redding (2010). Thus, companies with high productivity manage to expand up to the threshold at which it is worthwhile for them to absorb the fixed costs required to export their output, and they are able to continue paying high wages in order not to lose the investment in the job match and in the specific human capital that the worker has accumulated during his or her time with the company.

Column 5 and 6 in Table 5 present the effect of the act of exporting itself on wages (a dummy variable equal to 1 when the company exports and 0 otherwise), rather than the effect of the export rate, while controlling for the fixed effect (FE) on the level of the individual. It can be concluded that moving to an exporting company (or when an existing company starts to

export) increases a given worker's wage by 4 percent for the Manufacturers Survey sample (Column 5). Column 6 shows this gap for the lower third of the export rate, so as to focus on more similar companies and to estimate the extent to which the move from a negligible export rate to a positive though relatively low export rate raises a worker's wage. The coefficient obtained is lower than that for the entire sample but is still positive and statistically significant (2 percent).

The analysis so far has not dealt with the selection problem on the level of the company. Successful companies tend to both export and pay higher wages. One of the ways of dealing with this problem is to include a fixed effect at the level of the company. However, and as discussed in Section 3, it is unclear whether an annual panel regression with a fixed effect on the company level will produce a coefficient with economic significance for the effect of the export rate on wages. Recall that the addition of a fixed effect on the company level focuses the analysis on the effect of changes in the export rate from year to year. In theory, this is the optimal control for unobservable company characteristics. However, year-to-year changes in the export rate for a given company may reflect localized noise that is not expected to influence the company's wage policy.

In order to solve the selection problem on the company level, the Manufacturers Survey data is aggregated from the worker level to the company level and the 15-year sample (1996–2010) is grouped into three-year periods. Controlling for worker characteristics is accomplished with the average on the company level, and a fixed effect is added on the company level.

Table 6 presents the results for the estimations described above. The coefficient of the export rate in Column 1 is not significantly different from zero. In other words, changes in the export rate over time between three-year periods does not affect the average wage paid by the company. In order to verify that this result does not reflect insufficient variation in the companies' export rates over time, the sample was truncated so as to include only companies whose export rate changes by at least 10 percent over the sample period. In this case, the result obtained is again not statistically different from zero. These estimations are repeated in Column 3 and 4 but only for companies included in the sample three times (i.e. three three-year periods). In this case as well, the result is not statistically different from zero.

Apart from dealing with the selection problem on the company level as described above, focusing on the effect of changes in a given company over time resolves the identification problem that is due to the "general equilibrium problem". It may be that the difficulty in identifying the effect of the export rate on wages is due to the fact that the increase in a given company's export rate leads to an increase in the wages of that company, which in turn leads to an increase in wages also among its competitors which export less. Thus, it is not possible to identify the effect of the increase in the export rate on wages, even if it does exist. The analysis over time with the addition of the fixed effect does not expose this threat since it focuses on the change in exports and in wages in a given company.

In contrast, although the estimations in Table 6 deal with the classic estimation problem—in which successful companies export more and pay higher wages compared to other companies—they are not immune to the econometric threat that companies which are becoming more successful increase their export rate and pay higher wages. However, the potential bias from this threat is positive and given that the coefficient is in any case not statistically different from zero, this concern is negligible.

The comparison using the AKM decomposition between the current analysis and that based on the worker panel leads to the following insights: First, the simple correlation between the export rate and wages is less than 0.35 in the current analysis based on the Manufacturers Survey. This value reflects the larger contribution of the observable individual characteristics—an expected result in view of the fact that individual characteristics are more heterogeneous for the entire economy than only for manufacturing—and the larger contribution of industry heterogeneity in the entire economy. Finally, the analysis on the basis of the Manufacturers Survey makes it possible to identify the contribution of the companies' unobservable characteristics. Thus, as seen in Table 6, a coefficient that is not statistically different from zero is obtained after controlling for companies' unobservable characteristics, such that the blue segment in the graph (the premium in manufacturing after controlling for companies' unobservable characteristics) is equal to zero and does not appear in the graph.

In order to illustrate the economic meaning of the various coefficients and the gap between them, we multiply them by 25 in order to reflect the change in wages as a result of moving

to an industry/company in which the export rate is 25 percentage points higher. If we relate to the statistical correlation as a causal relationship then such a "move" would increase the worker's wage by 24 percent if it is between two companies in the economy (on the basis of the worker panel datafile). However, according to the regression results, the individual characteristics (both observable and unobservable) contribute about 14 percentage points of the 24 percent and if account is also taken of industry heterogeneity and the companies' unobservable characteristics we are left with a premium of between 0 and 3 percent.

c. The regression results for the PIAAC data

This section presents the analysis based on the PIAAC survey, which has the following two goals: to confirm the findings in the previous sections on the basis of an additional database and to enable an international comparison that will be presented in the following section. Additionally, the datafile makes it possible to analyze hourly wages, unlike the analysis in the previous section which was based on monthly wages. Column 1 presents the simple correlation between the export rate and monthly wages while Column 2 presents the same relationship for hourly wages. The simple correlation for monthly wages is 0.62 percent while for hourly wages it is 0.56 percent. Both are weaker than that found using the workers panel datafile, but are similar to the result obtained using the Manufacturers Survey datafile. The lack of any significant difference in the power of the relationship for monthly versus hourly wages is encouraging, as it provides evidence that the analysis in the previous sections based on hourly wages (data on workhours is not included in the workers panel datafile) does not significantly compromise the quality of the analysis.

Controlling for the Mincerian characteristics weakens the relationship between the export rate and hourly wages from 0.56 percent to 0.425 percent while controlling for the PIAAC score reduces the coefficient to 0.34 percent. Controlling for company size reduces the coefficient to 0.29 percent and adding dummy variables for each sector reduces the coefficient to 0.23 percent. It is worth noting that it is not possible to control for the fixed effect (FE) on the level of individuals or industries. Nonetheless, the effect of the export rate on wages (hourly in this case) is not significantly different from the coefficients obtained in previous sections with controls (0–0.15 percent).

5. An international comparison of the export wage premium using the PIAAC data

Similar results for the export wage premium (which reflects a causal relationship) are obtained in the analysis based on the PIAAC data and in the analysis based on the worker panel data. Since the PIAAC data produces results for Israel that are not biased to any major degree, there would appear to be value in an international comparison of the export wage premium between Israel and other countries.

Figure 3 shows that the magnitude of the simple correlation between the export rate and wages in Israel is an outlier relative to other countries within the sample. In contrast, controlling for individual characteristics, company size, and industry reduces the coefficient of the export rate to within the vicinity of those for other countries. However, and notwithstanding this similarity, it can be said that in Israel the export wage premium remains relatively high and is third-ranked after Norway and Greece (Figure 3 is sorted according to the premium with controls).

A comparison between Israel and Norway shows that the gross gap in both is particularly high relative to those of other countries. However, while in Norway the premium for exports remains almost identical even after controlling for the characteristics of workers and employers, the premium in Israel drops to a much lower range. In other words, the simple correlation in Israel primarily reflects the characteristics of workers and to some extent also the characteristics of employers, while in Norway the simple correlation reflects a relationship between exports and wages that may be causal. Figure 4 provides evidence that the contribution of individual and company characteristics to the simple correlation in Israel is the largest among the sample of countries.

The relatively strong simple correlation in Israel between exports and wages is consistent with the finding reported in Bank of Israel (2013) according to which labor productivity in the export industries in Israel is particularly high relative to other industries, even more so than in other countries. Moreover, the fact that the gross gap in Israel, after controlling for individual and industry characteristics, experienced the largest drop is consistent with the particularly large gaps in the quality of human capital that exist in Israel between industries in the economy, which goes hand-in-hand with gaps in labor productivity (Bank of Israel, 2016; Brand and Regev, 2016).

6. Conclusion

In this study, I have examined the extent to which the positive correlation between being employed at an exporting company and wages reflects a causal relationship between exporting itself and wages. When various characteristics that are correlated with exports and wages are not controlled for, every percentage point in an industry's export rate is correlated with a one-percent increase in wages. Three methods are used to show that the causal relationship is much weaker. Thus, controlling for the observable and unobservable characteristics of individuals in a worker panel datafile, while focusing on manufacturing, reduces the return to approximately 0.13 percent. The results of the analysis using the Manufacturers Survey datafile also show that when no characteristics are controlled for then every percentage point of the industry export rate is correlated with a 0.6 percent increase in wages, while controlling for observable individual characteristics reduces the estimated return to 0.45 percent and controlling for unobservable individual characteristics is sufficient to reduce it to 0.16 percent (which is similar to the "final" level obtained for manufacturing when using the worker panel datafile).

In order to deal with the potential problem of selection on the company level, I aggregated the Manufacturers Survey data from the worker level to the company level and divided the 15-year sample period (1996–2010) into five three-year periods. It was found that after controlling for worker characteristics on the company level and adding a fixed effect at the company level, the changes in the export rate over time between the three-year subperiods do not have an effect on the average wage paid by the company.

Finally, I found that when using the PIAAC sample and after controlling for a variety of characteristics, including worker skills, the premium for working in an exporting company is similar to that obtained by means of the two other datafiles, i.e., about 0.2 percent. I also found that while the simple correlation between the export rate and wages in Israel is an outlier relative to other countries in the PIAAC sample, controlling for characteristics reduces the coefficient of the export rate to a range that is similar to those obtained for other countries, even though it is still somewhat higher than for most of them. The fact that the gross gap in Israel, after controlling for individual and industry characteristics, experienced the largest drop is consistent with the particularly large gaps in the quality of human capital that exist

between industries in Israel and in particular between exporting and non-exporting industries, which is consistent with the gaps in labor productivity.

The main conclusion from this research is that unobservable individual characteristics, the identification of which was made possible by the methods used in the research, are particularly important factors in the identification of the gap between the simple correlation between the export rate and wages and the causal relationship. Identifying the gap between the simple correlation and the causal relationship has economic importance since it reflects the difference between a mistaken hypothesis, namely that if a worker moves from a non-exporting company to a company that exports, say, 25 percent of its output, the result will be a 23 percent increase in his wage, and the hypothesis that I have found support for in this research that the move will raise the worker's wage by only a few percent in the best case and not at all in the worst case.

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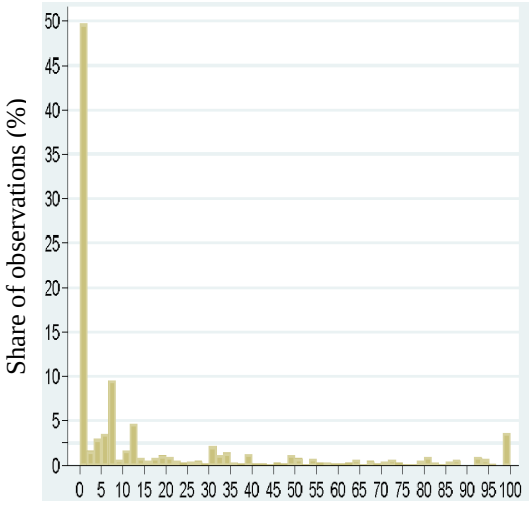
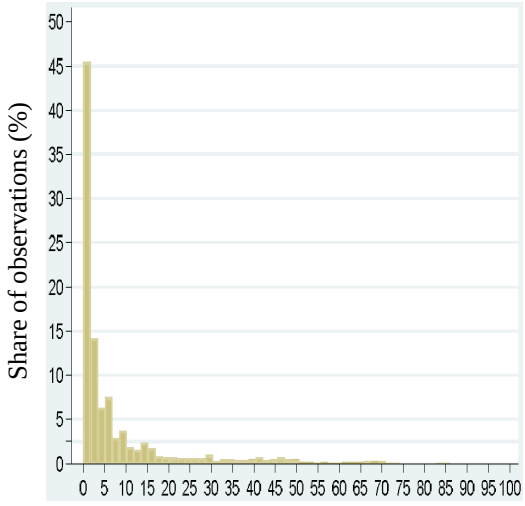
Figure 1

Distribution of Changes in the Export Rate Characterizing Individuals' Employmnent

a. File following employees

Total economy	**Only manufacturing**
Based on per industry export data in 2006	**Based on annual per industry export data**
	
Maximum gap in the export rate (%)	**Maximum gap in the export rate (%)**

b. File of Manufacturing Survey

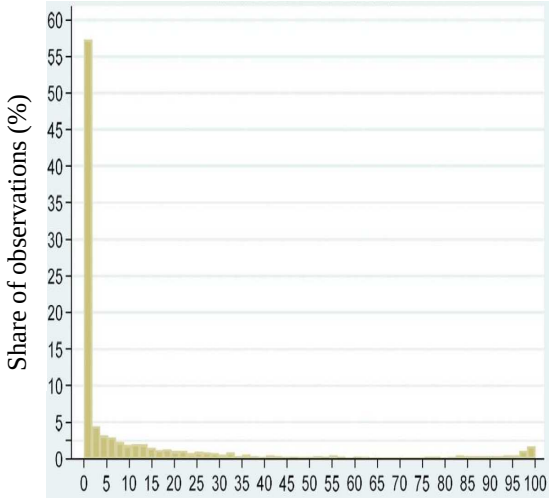
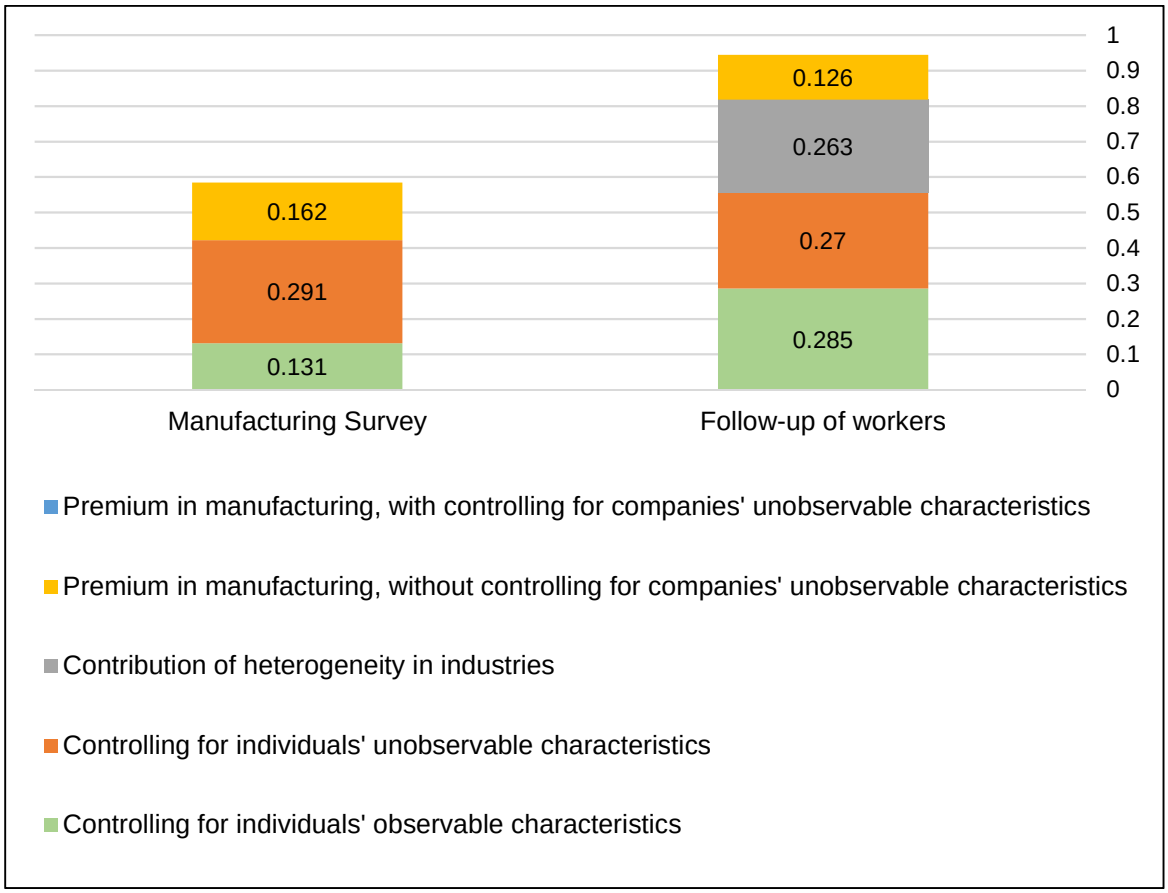
Based on annual per industry export data at the firm level

Maximum gap in the export rate (%)

Figure 2

AKM Decomposition: The Gap between Regression Estimations Based on the File Following Workers and the File of the Manufacturing Survey



* The premium is not statistically signficantly different than zero, so is not seen in the figure.

Figure 3

The Export Premium in Hourly Wage: The Gross Gap and the Gap after Controlling for Characteristics based on PIAAC

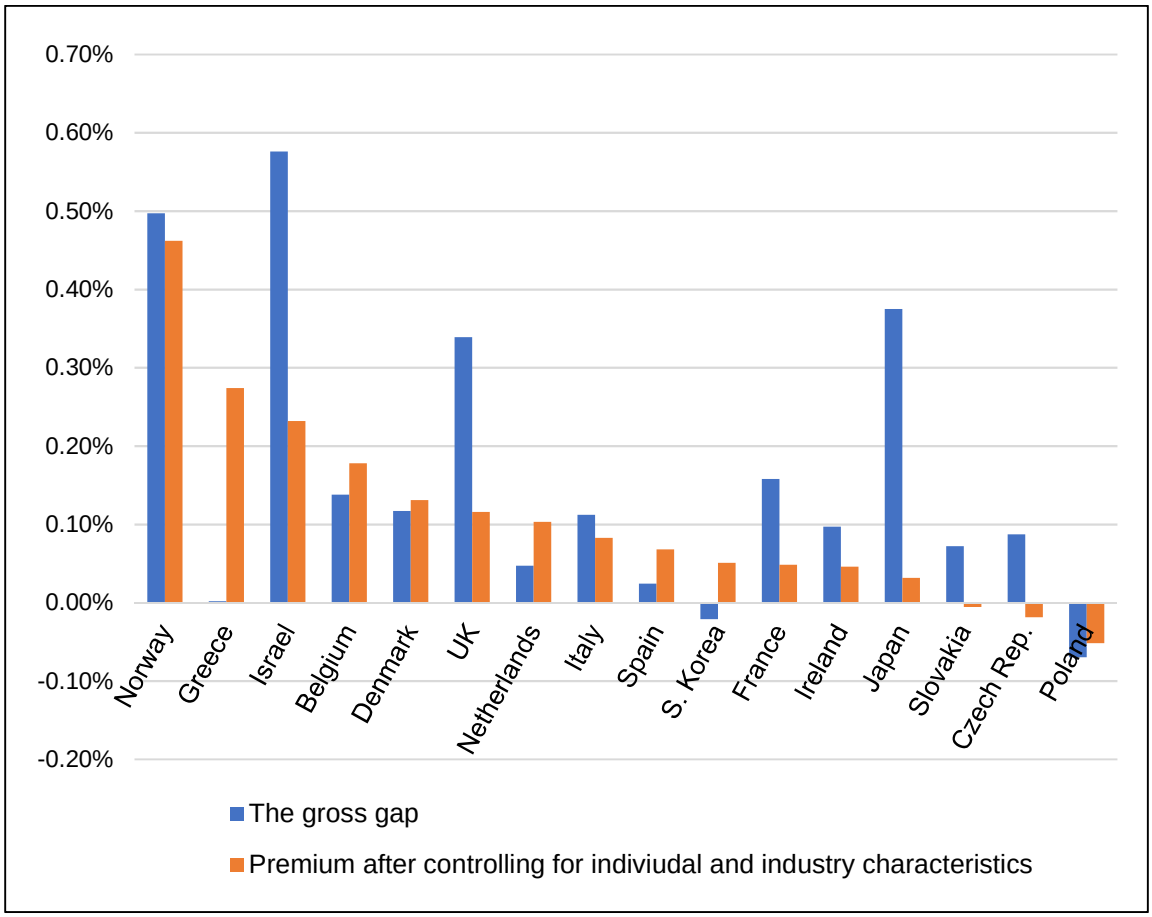


Figure 4

Contribution of Individual and Company Characteristics to the Export Rate Premium

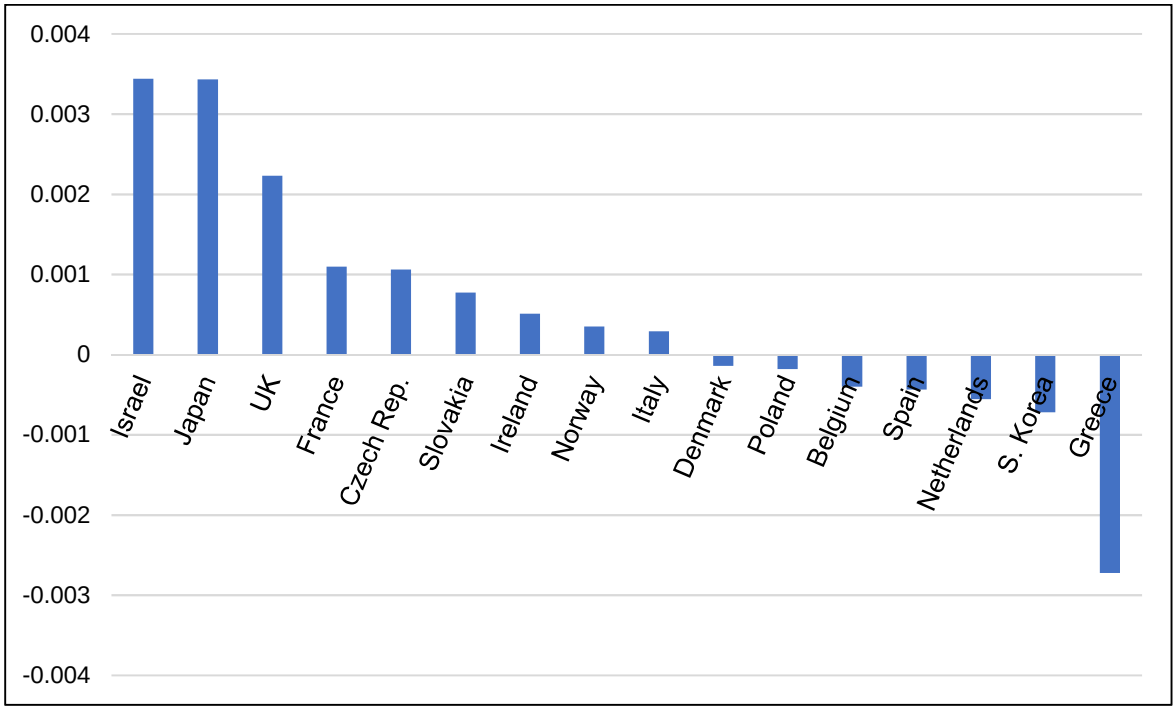


Table 1

Descriptive statistics of employees, based on export-intensity of the industry, 2015

	Total economy			Manufacturing		
	Full sample	Export 25% or more	Export less than 25%	Full s ample	Export 25% or more	Export less than 25%
Number of observations	925,706	179,455	746,251	98,342	70,803	27,539
Export rate (%)	16.7 (28.7)	69.5 (25.8)	4.0 (5.3)	52.3 (28.1)	66.9 (18)	14.6 (4.2)
Monthly wage	10,444.5 (13321.6)	16,038.0 (24922.3)	9,099.4 (7838.7)	13,215.6 (28768.1)	14,711.8 (33554.1)	9,368.8 (6340.4)
Age	34.9 (3.2)	35.0 (3.2)	34.9 (3.2)	35.2 (3.2)	35.2 (3.1)	35.1 (3.2)
Share of men (%)	50.5 (50)	63.0 (50)	47.5 (50)	67.8 (50)	67.7 (50)	67.9 (50)
Years of experience	13.8 (3.9)	13.2 (3.9)	13.9 (3.8)	14.1 (3.9)	13.8 (3.9)	14.8 (3.7)
Years of schooling	13.2 (1.8)	13.6 (1.9)	13.1 (1.7)	13.1 (1.7)	13.3 (1.8)	12.5 (1.2)
Bagrut matriculation and psychometric test grades, based on partial sample of individuals for whom data is available						
Psychometric test	553.0 (108.8)	594.9 (100.5)	538.4 (107.8)	569.6 (105.3)	577.7 (102.9)	525.7 (107.5)
Number of observations	370,351	95,545	274,806	37,232	31,495	5,737
Bagrut (matriculation) grade in math	84.9 (22.1)	91.1 (23.1)	83.2 (21.4)	85.7 (23.2)	87.9 (23.2)	77.4 (21.2)
Number of observations	398,221	88,100	310,121	38,238	30,429	7,809

Notes: In parentheses - standard deviations. The export rate by industry (as of 2006) in the 2-digit industry in which the individual was employed in 2015.

SOURCE: Employer-employee file of the Central Bureau of Statistics, people born 1975–85.

Table 2

The impact of the per-industry export rate on wage, net of employees' observed characteristics, cross-sectional data for 2015

	Total sample		Born in 1978 or later, with a bagrut diploma in math		With a psychometric test grade	
	(1)	(2)	(3)	(4)	(5)	(6)
Export rate (%)	0.945*** (0.00286)	0.723*** (0.00267)	0.670*** (0.00357)	0.637*** (0.00359)	0.701*** (0.00345)	0.661*** (0.00351)
Years of schooling		0.157*** (0.000436)	0.118*** (0.000604)	0.0980*** (0.000676)	0.109*** (0.000633)	0.0918*** (0.000701)
Gender		0.374*** (0.00153)	0.374*** (0.00227)	0.373*** (0.00226)	0.352*** (0.00239)	0.324*** (0.00244)
Age		0.0669*** (0.00594)	0.0905*** (0.0162)	0.107*** (0.0161)	0.123*** (0.00914)	0.143*** (0.00911)
Age^2		-0.000539*** (8.49e-05)	-0.000695*** (0.000242)	-0.000866*** (0.000241)	-0.00115*** (0.000131)	-0.00141*** (0.000130)
Grade on bagrut test in math				0.00369*** (5.67e-05)		
Psychometric text grade						0.000667*** (1.22e-05)
Intercept	8.797*** (0.000950)	4.898*** (0.103)	4.906*** (0.269)	4.526*** (0.268)	4.489*** (0.158)	4.006*** (0.158)
Number of observations	925,706	925,706	398,221	398,221	370,351	370,351
R-squared	0.105	0.253	0.249	0.256	0.260	0.266

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

Notes: In parentheses - standard deviations. The export rate by industry (as of 2006) in the 2-digit industry in which the individual was employed in 2015.

SOURCE: Employer-employee file of the Central Bureau of Statistics, people born 1975–85.

Table 3

The Impact of the Per-industry Export Rate on Wagesm, with Controlling for Individual's Fixed Characteristics, Total Economy vs. Only Manufacturing, Employees Panel for 2008–15

	All industries	Only manufacturing
	(1)	(2)
Export rate (%)	0.389***	0.126***
	(0.00121)	(0.00425)
Years of schooling	0.153***	0.128***
	(0.000311)	(0.000817)
Age	0.189***	0.141***
	(0.000731)	(0.00168)
Age2	-0.00194***	-0.00128***
	(1.15e-05)	(2.57e-05)
FE at employee level	Yes	Yes
Intercept	2.654***	4.136***
	(0.0112)	(0.0276)
Number of observations	7,276,263	745,437
R-squared	0.765	0.901

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

Notes: In parentheses - standard deviations. The export rate by industry (as of 2006) in the 2-digit industry in which the individual was employed in 2015.

SOURCE: Employer-employee file of the Central Bureau of Statistics, people born 1975–85.

Table 4

Descriptive Statistics of Employees, Cross-Section for 2010 out of Companies Panel for 1995–2010

	Export Quintiles based on Average Exports of all Companies					
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	Full sample
Number of companies observed	278	277	278	277	277	1387
Maximum export rate (%)	0.4	5.7	33.4	74.7	99.4	99.4
Minimum export rate (%)	0.0	0.5	6.1	33.7	74.9	0.0
Median export rate (%)	0.1	2.0	12.5	56.2	88.7	56.2
Mean export rate (%)	0.2 (0.1)	2.3 (1.4)	13.5 (6.6)	56.9 (12.7)	88.0 (7.3)	48.5 (38.8)
Number of individuals observed	18915	16043	19425	21150	54452	129985
Monthly wage	8246.8 (10494.3)	8856.3 (9689.5)	8424.4 (9331.7)	13257.1 (12825.8)	14411.8 (19413.4)	11746.8 (15267.6)
Age	39.6 (13.1)	41.1 (12.8)	40.3 (12.7)	41.8 (12.4)	39.4 (11.3)	40.2 (12.2)
Share of men (%)	0.7 (0.5)	0.7 (0.4)	0.7 (0.5)	0.7 (0.5)	0.7 (0.5)	0.7 (0.5)
Years of experience	17.9 (13.3)	19.5 (12.8)	18.5 (12.8)	19.0 (12.6)	16.6 (11.4)	17.8 (12.3)
Years of schooling	12.7 (2.6)	12.6 (2.6)	12.9 (2.5)	13.9 (2.8)	14.0 (2.7)	13.4 (2.7)

Notes: In parentheses - standard deviations. The export rates and the quintiles refer to average exports of every company as reflected in all the years in the sample, the other data refer to data on individuals for 2010.

SOURCE: Manufacturing Survey by the Central Bureau of Statistics, 1995–2010.

Table 5

The Impact of the Company's Export Rate on Wage in Manufacturing, Dynamic Export Rates and Controlling for the Individual's Fixed Characteristics

	Only manufacturing					For companies in which the export rate is less than 33%
	(1)	(2)	(3)	(4)	(5)	(6)
Export rate (%) Coefficient in %	0.584*** (0.0879)	0.453*** (0.0592)	0.162*** (0.0243)	0.102*** (0.0259)		
Dummy variable for positive exports (greater than 0.5%) Coefficient in %					3.97*** (0.0112)	1.98*** (0.00653)
Years of schooling		0.0656*** (0.00417)				
Gender		0.466*** (0.0195)				
Age		0.149*** (0.00388)	0.147*** (0.00417)	0.145*** (0.00401)	0.145*** (0.00405)	0.126*** (0.00304)
Age^2		-0.00156*** (4.60e-05)	-0.00105*** (4.67e-05)	-0.00103*** (4.50e-05)	-0.00103*** (4.52e-05)	-0.000908*** (3.56e-05)
Log of number of posts				0.0669*** (0.00679)	0.0730*** (0.00661)	0.0697*** (0.0125)
Control for years	No	Yes	Yes	Yes	Yes	Yes
FE at the worker level	No	No	Yes	Yes	Yes	Yes
Intercept	8.433*** (0.0303)	3.757*** (0.111)	4.689*** (0.0961)	4.402*** (0.100)	4.376*** (0.102)	4.771*** (0.0672)
Number of observations	2,138,240	1,989,382	1,989,382	1,988,726	1,991,636	953,717
R-squared	0.062	0.393	0.889	0.890	0.890	0.895

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

Notes: In parentheses - standard deviations.

The export rate changes each year based on the company in which the individual is employed.

SOURCE: The Manufacturing Survey by the Central Bureau of Statistics, 1995–2010.

The dummy variable for positive export rate is given a value of 1 only if the export rate of the company in which the individual is employed is greater than 0.5, and 0 otherwise.

Table 6

The Impact of the Company's Export Rate on Wage in Manufacturing, Company-Level Sample, Divided into Five 3-Year Periods, Regression with Controlling for the Company's Fixed Characteristics, Panel of Companies, 1995–2010

	Only manufacturing - Divided into Five 3-Year Periods[a]			
			Companies that appear in at least 3 periods	
		Companies whose exports changed by at least 10 percent in a given period		Companies whose exports changed by at least 10 percent in a given period
	(1)	(2)	(3)	(4)
Export rate (%)	-0.0191	-0.0318	-0.0112	-0.0345
	(0.0228)	(0.0230)	(0.0232)	(0.0235)
Years of schooling	0.0560***	0.0938***	0.0564***	0.0878***
	(0.00586)	(0.0115)	(0.00611)	(0.0117)
Gender	0.475***	0.608***	0.457***	0.570***
	(0.0384)	(0.0667)	(0.0405)	(0.0680)
Age	0.0482***	0.0360***	0.0567***	0.0438***
	(0.00577)	(0.0134)	(0.00621)	(0.0145)
Age2	-0.000375***	-0.000230	-0.000482***	-0.000339*
	(6.96e-05)	(0.000162)	(7.47e-05)	(0.000178)
Control over periods	Yes	Yes	Yes	Yes
FE at company level	Yes	Yes	Yes	Yes
Intercept	6.175***	5.939***	6.043***	5.913***
	(0.150)	(0.317)	(0.159)	(0.329)
Number of observations	6,260	1,572	4,830	1,410
R-squared	0.941	0.949	0.938	0.948

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

Notes: In parentheses - standard deviations.

a The file was divided into five 3-year periods. For each period, the average values were calculated for each company: wage, exports, schooling, gender, and age.

SOURCE: The Manufacturing Survey by the Central Bureau of Statistics, 1996–2010.

Table 7

The Impact of the Export Rate on Monthly and Hourly Wage, with Controlling for Individual, Industry, and Company Characteristics, Data from PIAAC File, 2014

	(1)	(2)	(3)	(4)	(5)	(6)
	Monthly wage	Hourly wage	Hourly wage	Hourly wage	Hourly wage	Hourly wage
Export rate (%)	0.621***	0.562***	0.425***	0.340***	0.299***	0.232***
	(0.0729)	(0.0627)	(0.0602)	(0.0603)	(0.0619)	(0.0892)
Years of Schooling			0.0819***	0.0561***	0.0498***	0.0483***
			(0.00757)	(0.00827)	(0.00846)	(0.00873)
Dummy variable for male			0.199***	0.183***	0.196***	0.225***
			(0.0376)	(0.0370)	(0.0372)	(0.0388)
Experience			0.0249***	0.0238***	0.0263***	0.0256***
			(0.00661)	(0.00650)	(0.00663)	(0.00660)
Expereience2			-0.000312**	-0.000241*	-0.000304**	-0.000285**
			(0.000136)	(0.000134)	(0.000137)	(0.000137)
PIAAC score (average of literacy and numeracy)				0.143***	0.132***	0.117***
				(0.0201)	(0.0205)	(0.0209)
Control for size group (employed people)						
10+					0.0308	0.0374
					(0.0500)	(0.0505)
50+					0.0788	0.114**
					(0.0530)	(0.0545)
250+					0.125**	0.158**
					(0.0619)	(0.0639)
1000+					0.275***	0.322***
					(0.0662)	(0.0695)
Control for industry in the agreement	No	No	No	No	No	Yes
Intercept	7.631***	2.439***	0.927***	0.580***	0.635***	0.599***
	(0.0278)	(0.0244)	(0.115)	(0.123)	(0.128)	(0.151)
Number of observations	1,459	1,347	1,340	1,340	1,298	1,298
R-squared	0.047	0.056	0.181	0.211	0.226	0.244

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

Notes: In parentheses - standard deviations.