Fiscal Survey and Selected Research Analyses

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This publication replaces the “Recent Economic Developments” series.
This publication will also be published semi-annually, and will include analyses by the Research Department of relevant topics in Israel’s economy, as well as a periodic fiscal survey.

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Part 1: Economic Developments and Fiscal Survey

Fiscal Survey: Analysis of the Proposed Budget for 2017 and 2018 and Expected Developments over the Remainder of the Decade*

- The expected deficit in the State budget in 2016 is less than 2.5 percent of GDP, markedly lower than the deficit target set for this year and slightly higher than the actual deficit in 2015. The deficit is lower than the target due to tax revenues that are markedly higher than were forecast when the budget was being compiled. This is due to more rapid than expected growth in consumer goods imports and in wages, and the continued high volume of real estate transactions.
- The proposed budget for 2017 and 2018 raises the deficit target to 2.9 percent of GDP in each of those years, well above the present targets of 2.5 percent in 2017 and 2.25 percent in 2018.
- In light of the increase in the deficit target, and based on current macroeconomic forecasts, it appears that implementing the measures incorporated in the proposed budget will essentially lead to meeting the government's new deficit targets in 2017 and 2018.
- Increasing the deficit target for 2017 and 2018 despite the strength in tax revenues primarily reflects a marked increase in the expenditure ceiling—by about NIS 16 billion beginning in 2017 (including about NIS 8 billion in respect of non-adjustment of prices)—further to the increase in the ceiling in the 2015 and 2016 budget.
- The increases in the expenditure ceiling in recent years—alongside the increasing use of accounting adjustments, use of one-off transfers from extrabudgetary entities, switching of revenues between years, and spreading expenses—indicate the difficulty in achieving the government's objectives in the defense, welfare, and social services areas within the framework of the budget determined by the ceiling, and that the expenditure rule has exhausted its ability to serve as a barrier to procyclical policy.
- The price adjustments lead to marked fluctuations in the expenditure ceiling, resulting from the gap between the price level forecast when preparing the previous budget and actual inflation. To prevent such fluctuation, there should be a switch to nominal budgeting based on the midpoint of the inflation target.
- The government plans to reduce corporate tax rates and personal income tax rates. The reduction will lower revenues mainly beginning in 2018, as in 2017 most of it will be offset by an increase in taxes on employers' allocations to severance pay funds for high wage employees, on owners of three or more homes, and on members of a kibbutz.
- Given that the economy is close to full employment, and in light of the decision to approve a two-year budget, it is important that the budget focus on measures to increase productivity—particularly an upgrading of human capital and of physical infrastructures—alongside improvement in the regulatory environment.
- At the planned deficit level, the debt to GDP ratio is expected to increase moderately in coming years. Against the background of the employment environment and high tax revenues, policy should lead to a decline, or at least stabilization, of the debt to GDP ratio, in order to allow fiscal policy to contribute to the economy's dealing with periods in which macroeconomic conditions will be less positive.
- In accordance with the amendment to the Foundations of the Budget Law from November 2015 (the "Numerator"), the government is required to correct, when approving the current budget, expected deviations from targets in the 2019 budget as well. Given the proposed measures in the budget, expected expenditures in 2019 are about NIS 5 billion higher than the increased expenditure ceiling proposed in the budget. Without adjusting this deviation, the deficit in 2019 is expected to be 3.5 percent of GDP. It is imperative that the government carry out the required adjustment to halt the increase in the deficit and to maintain the credibility of this important amendment to the law.
- The experience of the recent past in Israel and worldwide indicates that strength in tax revenues that is based on developments in specific markets may dissipate rapidly and lead to a rapid increase in the deficit. Therefore, the risks incorporated in the current permanent increase in expenditure together with the reduction in the revenue base, are significant.

This survey examines the two-year proposed budget for 2017 and 2018 submitted to the government, and focuses on budget aggregates—the deficit, total expenditures, tax revenues, and the debt to GDP ratio—and on their expected development in coming years. Based on the proposed

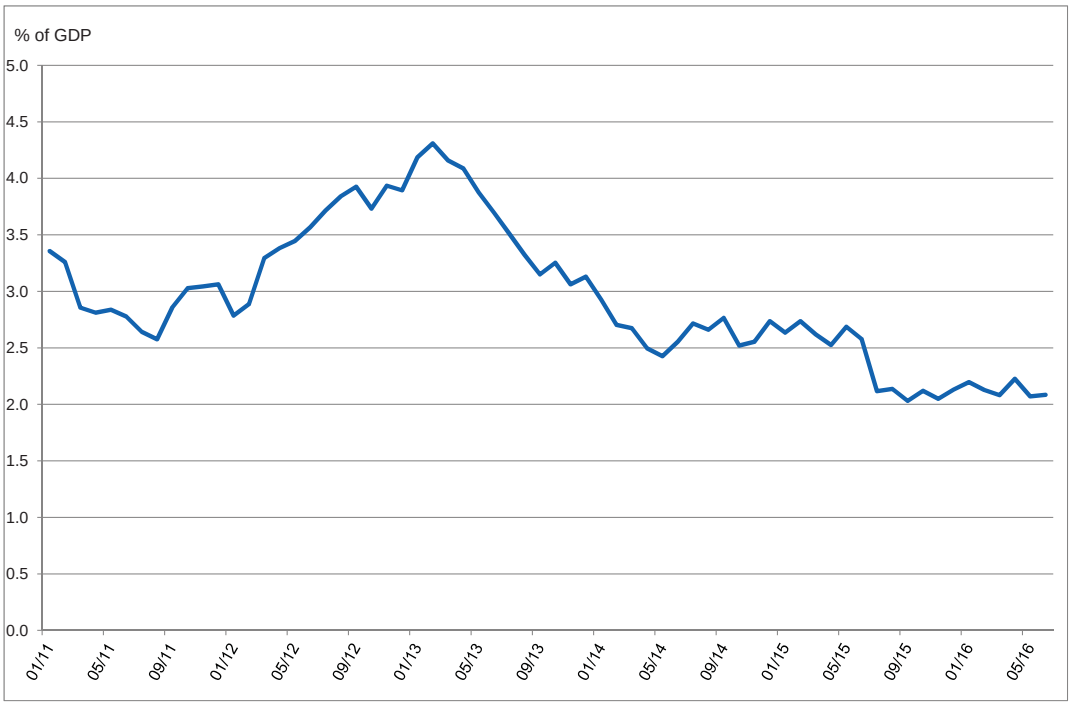
* A previous version of this survey was published ahead of the government discussions on the budget. In the current version, several figures were brought in line with decisions approved in the government's discussion.

budget, the deficit in the next two years will increase to 2.9 percent of GDP, compared with an expected deficit of less than 2.5 percent of GDP in 2016. The increase in the deficit reflects marked growth in the expenditure ceiling compared with the level set in the current law, and it is also expected to lead to a moderate but prolonged increase in the debt to GDP ratio. This survey does not deal with the specific details of the budget proposal and the related proposed reforms. These include a number of measures that can contribute somewhat to increasing productivity in the economy in the short and long terms, to increasing competition and raising the welfare of consumers and to reducing inequality. These processes include, among other things, the expansion of competition in the communication and trade industries and in the residential gas market, the reduction and increased efficiency of regulation, the steps to increase equality in post-primary and complementary education and to expand the teaching of core skills in poorer localities beyond school hours, increasing the equality in distribution of municipal tax receipts from government entities, the process to increase investment in communication infrastructure, correcting the disparities in the National Insurance Institute's approach to the self-employed, regulation of employee and employer rights regarding sums allocated for severance pay and the plan to expand the use of natural gas in trucks and buses. Although it is likely that there will be disagreements about specific components of the proposed plans, the adoption of many of these steps can contribute to Israel's economy and society. As noted, the current survey does not deal with these steps, whose fiscal cost is small, but rather with budget aggregates and their expected development.

1. The 2016 budget

Based on budget performance data for the first half of 2016, and based on estimates for the second half, the full-year deficit is expected to be less than 2.5 percent of GDP, markedly lower than the target of 2.9 percent of GDP that was set for this year and only slightly higher than the actual deficit in 2015.[1] The cumulative deficit (12-month moving average) has been entrenched since the middle of 2015 at a level of 2.1 percent of GDP (Figure 1). Although it is assessed that the expenditure rate will increase somewhat in the second half of 2016 (compared with the growth in the corresponding period of 2015), and that the growth in revenues will moderate, nonetheless, under these conditions as well the deficit is not expected to increase to more than

Figure 1
Cumulative deficit over the trailing 12 months, January 2011–June 2016



[1] Taking into account the advance of recording of transfers to the Purchase Tax Fund from 2016 to the end of 2015 will increase the gap between the deficit in 2015 and that in 2016 by another 0.25 percent of GDP, half of which is a result of reducing the reported deficit in 2015.

2.5 percent of GDP, and it is plausible that it will be even slightly lower than that.[2]

The main reason that the deficit this year is expected to be markedly lower than the target—and the forecasts by the Bank of Israel and the Ministry of Finance at the end of 2015—is the more rapid than expected growth in tax revenues. The gap between the current estimate of tax revenues in 2016 and the forecast at the end of 2015, when the budget for 2015 and 2016 was being approved, is about NIS 8 billion, even though real GDP grew by a rate similar to the original forecast. An analysis of the gap between actual and forecast revenues, using the Bank of Israel Research Department's tax model, indicates that it derives mainly from three factors (Table 1): a. Imports of consumer goods—primarily vehicles—are currently expected to grow at a rate of 7.7 percent, compared with a rate of 2.6 percent[3] in the original forecast; b. An increase in real wage per employee post by about 3.2 percent compared with the original forecast for an increase of 1.5 percent; and c. The continued vigorous activity in the housing market in contrast to an expectation for some moderation that was incorporated in the original forecast.[4]

When taking into account the values of these parameters as they are currently forecast, based on their development to date, the model fully explains the increase in taxes. This means that the growth in tax revenues is based on a combination of supportive developments: a stable growth rate similar to that of the past three years[5] together with labor market strength; composition of demand that is private consumption oriented—and hence tax intensive—and particularly high purchases of homes (at rising prices) and cars. This process is supported by a rapid increase in the GDP deflator relative to CPI—among other things due to declines in prices of imported commodities—which thus enables employers to pay additional wages without negatively impacting profitability.[6]

Government expenditures increased in the first half of the year by a rapid rate compared with previous years—6.5 percent—and this is in light of the marked budgeted increase in ministries' expenditures. Despite the rapid increase, the expenditures were slightly below the seasonal path consistent with full execution of the budget by the end of the year. However, in the second half of the year, further acceleration is expected in the budget execution rate, so that it is plausible that by the end of the year the budget will be fully utilized. Full execution of the budget will be supported this year by supplements of more than NIS 4 billion given to the defense budget (and related items) on the basis of the agreed-upon framework that was set after the budget was approved. Yet at the same time, interest expenses are expected to be lower than the original amount budgeted.

Table 1
Variables explaining the increase in tax revenues compared with the forecast from December 2015

	December 2015 forecast for 2016	Current estimate for 2016	Impact on the gap between forecast and actual tax revenues
	(Percent change)		(NIS billion)
Government revenue from taxes (NIS billion)[a]	273.0	280.8	7.8
Consumer goods imports	2.6	7.7	4.6
Increase in real wage per employee post	1.5	3.2	3.0
Increase in new home sales	-8.0	-2.7	1.1
Total additional revenue due to above variables	...	...	8.7

[a] Total government revenues from tax, excluding VAT on defense imports.

[2] The size of the annual deficit depends on, among other things, the scope of one-off steps that the Ministry of Finance carries out almost annually during the last few days of the year, in order to regulate the size of the deficit between two consecutive years. The scope of these steps reaches several tenths of a percent of GDP.

[3] Tax revenues from vehicle imports were higher, by more than NIS 2 billion, in January–June 2016 compared with the corresponding period of 2015.

[4] For a detailed discussion of the impact of the real estate market on tax revenues, see Chapter 6 of the Bank of Israel 2015 Annual Report.

[5] In 2013 excluding the effect of the start of natural gas production from the Tamar reservoir.

[6] The unexpected increase in tax revenue is not reflected in a simple examination of the ratio of total tax revenues to GDP. This is because the increase in their receipts goes together with a reduction in VAT rates and Corporate Tax rates in the third quarter of 2015 and in the beginning of 2016, respectively. These reductions totaled about 0.5 percent of GDP.

The government adopted, as noted, a new multiyear framework for the defense budget, which sets the budget level for each of the next five years, and delineates the conditions under which the budget would be changed. Alongside the size of the budget, a number of complementary steps were set regarding the structure of the budget, wages, human resources, retirement arrangements in the defense establishment, and support for disabled soldiers and bereaved families. The approval of the framework is an important step that will contribute to stability and credibility of the overall budgetary framework as well as to increased efficiency in defense activities. It is important that the government soon complete the examination of the components of the agreement that have not been finalized—such as retirement arrangements in the IDF, and adoption of the recommendations of the Goren Committee—and particularly that it ensures that the defense ministry budget framework is appropriate for the tasks for which it is responsible. In parallel, it should be confirmed that the early retirement mechanism included in the agreement does not create actuarial obligations at levels that will siphon a considerable portion of the defense budgets in the long term, particularly after the public-sector defined benefit pension burden has already begun to decline from its peak as a share of GDP. It is also important to verify that the technical mechanisms for implementing the framework—such as price adjustments—are clear and are agreed on between the Ministries of Finance and Defense, as a lack of agreement regarding those issues adversely impacted the effectiveness of the Brodet framework, the Defense Ministry's previous multiyear framework.

Based on the current forecast of the deficit, the debt to GDP ratio at the end of 2016 is expected to remain at a level similar to that at the end of 2015, or to slightly decline. This is due to, among other things, the continued increase in the GDP deflator at a more rapid rate than that of the CPI (to which about half the debt is indexed). As explained in the Fiscal Survey from January 2016,[7] the current deficit level and current growth rates support the stabilization of the debt to GDP ratio, and the annual changes in it mainly represent changes in relative prices (the ratio of the GDP deflator to the CPI and the NIS/$ exchange rate) and realizations of the government's assets (redemption of credit granted by the government to the public in the past, and sales of land).[8] In the past two years, these factors acted to markedly reduce the debt to GDP ratio.

2. The proposed budget for 2017 and 2018

The proposed budget for 2017 and 2018 submitted to the government includes an increase in the deficit target for each of those two years to 2.9 percent of GDP, compared with the current deficit targets set by law, of 2.5 percent of GDP in 2017 and 2.25 percent of GDP in 2018. The proposal to increase the deficit target in the law reflects mainly the parallel decision to increase the expenditure ceiling for 2017 by about NIS 8 billion more than the increase permitted under the existing law (Table 2), and the expenditure ceiling for 2018 by about NIS 10 billion (about NIS 2 billion plus the NIS 8 billion that will be added, as noted, to the budget base in 2017). In addition, the proposal cancels the expenditure ceiling reduction of about NIS 8 billion that is required by the existing law in respect of the below-forecast increase in prices in 2015 and 2016. Moreover, the budget proposal includes also a net reduction in tax rates—mainly in 2018—at a scope of about NIS 1 billion.[9] With this, despite the marked increase in tax revenues compared with the forecasts when the deficit ceiling was set, the deficit in 2017 and 2018 is expected to increase markedly per the budget proposal.

An analysis of the measures included in the budget proposal and an examination of the revenue forecast based on the Research Department's tax model indicates that the deficit in 2017 and 2018 is expected to be similar to the new target that was set. Assuming that the government adopts the steps proposed for reducing its expenses—or alternative steps at a similar scope—the level of expenditure is not expected to deviate from the new ceiling in those two years. Although some of the steps are essentially accounting entries or one-off measures, their impact is only expected to end in 2019 (see discussion below), so that their impact on the deficit in 2017 and 2018 will be in line with what was planned. In addition, the budget for 2018 includes a special reserve of NIS 3.5 billion intended for meeting unexpected needs that may arise after the budget is approved. However, the budget proposal includes several steps for which the probability of being implemented at the proposed scope is unclear, so that it appears that the government will have to be committed to adopting and implementing alternative measures at material amounts.

7 Bank of Israel (2015), Recent Economic Developments 140, April–September 2015.

8 Like every year, the Central Bureau of Statistics will update, at the beginning of September, the National Accounts since 1995. Generally these revisions come with some increase in GDP estimates over the course of the period, so that the reported level of the debt to GDP ratio will apparently decline compared with existing data.

9 The budget proposal includes a reduction in income tax rates for individuals and companies, alongside several steps to increase tax payments on the employer's allowance for severance pay, on kibbutz members, on owners of three or more homes, and gaming revenue. If these are approved as proposed, the net reductions of taxes in 2017 total several hundred million shekels, while the net cumulative reduction in 2018 will be about NIS 1 billion per year.

Table 2
Calculation of the expenditure ceiling for 2017 and 2018[a]

	(NIS billion)
1. Expenditure ceiling in 2016 budget (net, including credit)	**347.7**
2. Reduction of base, in line with government decisions[b]	0.9
3. Base for calculating expenditure ceiling for 2017 (1–2)	**346.8**
	(%)
4 a. Real rate of growth of expenditure, according to the expenditure rule	2.70
b. Increase of budget base beyond the rule	2.40
	(NIS billion)
5. Addition to 2017 budget [(4a+4b)*3]	17.8
6. Expenditure in 2017 based on expenditure rule (3+5) in 2016 prices[c]	364.6
7. Addition to the 2018 budget [6*(4a)], per expenditure rule[d]	10.0
8. Increase of budget base beyond the rule	1.5
9. Expenditure in 2018, per expenditure rule (6+7+8) in 2016 prices[c]	376.1

[a] All data are presented before the accounting reduction of military aid funds from budget expenditure (net) and defining the aid as "Contingent expenditure", which is not included in the expenditure ceiling.

[b] A reduction of a one-off addition of 0.25 percent that was included in the 2016 budget.

[c] The calculation is based on the assumption that the government will adopt the proposal not to adjust the budget for a deviation in prices in 2015 and 2016 from the budget forecast. Such an adjustment would require a reduction in the expenditure ceiling in 2017 of about NIS 8.1 billion. This reduction consists of 1) an adjustment of NIS 1.5 billion because the 2015 budget assumed that the average CPI in 2015 would decline by 0.2 percent compared with the 2014 CPI, while the actual decline was 0.6 percent; 2) an adjustment of NIS 6.6 billion because the budget forecast was that the CPI in 2016 would increase by 1.4 percent compared with the average CPI in 2015, while according to the Bank of Israel forecast from June 2016 the average CPI is expected to decline by 0.5 percent.

[d] The addition is calculated based on the last known data. Since the 2018 budget is part of the two-year budget, the calculation is based on the same data as the 2017 budget.

SOURCE: Based on budget data.

The revenue forecast is based mostly on tax revenue forecasting models that are themselves based on forecasts of macroeconomic developments, as noted above. According to the baseline forecast, which relies on the Research Department's staff forecast from the end of June 2016, the revenue forecast (Figure 3) is similar to that on which the Ministry of Finance built the budget proposal. In 2017, the Bank of Israel forecast is slightly higher than the Ministry of Finance's forecast, but in 2018 (a year about which the uncertainty regarding tax revenues is currently high) it is slightly lower. Based on this forecast, the deficit in the two years is also expected to be similar to the targets in the proposed budget. However, in light of the factors that contributed to the unexpected increase in tax revenues in the past year, it appears that the risks in the forecast tend to the downside (see discussion below).[10]

Tax revenue forecast and primary variables impacting on it: 2017 and 2018

The planned deficit level in 2017 and 2018 is expected to place the debt to GDP ratio on a path of moderate annual

[10] The slowdown in the rate of increase in real wages in 2017 relative to the increase in 2016 reflects the assumptions that nominal wages will increase by approximately the same rate as GDP per worker, that GDP prices and the CPI will increase by a similar rate, and that the pace of inflation will accelerate in line with the Research Department's forecast from June 2016.

Table 3
Tax revenue forecast and primary variables impacting on it: 2017 and 2018

	GDP[a]	Real wage per employee post	Consumer goods imports	New home sales	Tax revenue forecast[b]
	(Percentage change)	(Rate of change compared with previous year)			(NIS billion)
2017					
Baseline scenario	2.9	1.4	2.5	0.0	291
Wage moderation scenario	2.0	0.3	2.0	0.0	288
"Correction" scenario[c]	2.0	-0.5	-3.0	-10.0	278
2018					
Baseline scenario	2.0	0.8	2.5	0.0	299
Wage moderation scenario	2.0	0.0	1.5	0.0	291
"Correction"scenario[c]	2.0	0.5	2.0	0.0	282

a Nominal GDP net of CPI. This figure is not necessarily identical to the growth rate of real GDP, as it is affected by the change in the ratio of GDP prices to the CPI.

b In 2016 prices, excluding VAT on defense imports.

c The scenario reflects an offset of part of the "atypical" increase in GDP prices and in housing market activity and in automobile imports.

increases.[11] This is because a. Government revenue from repayment of loans by the public (primarily mortgages granted in the past) are expected to contract in accordance with amortization tables, among other reasons because the early repayment plan for mortgages led to a marked reduction in the stock of mortgages (and thus contributed to a reduction in the ratio of gross public debt to GDP in 2015); b. Revenues from the sale of land are expected to decline as they are designated to plans that are not recorded in the budget.[12] Assuming that GDP prices do not increase by more than the CPI does in 2017 and 2018, the result is a slight increase in the debt to GDP ratio. In light of the robust state of the labor market in the current period, as noted above, and against the background of the unique combination of conditions that supports an increase in tax revenues, policy should lead to a decline, or at least stabilization, of the debt to GDP ratio in a manner that will allow fiscal policy to contribute to the economy's dealing with periods in which the macroeconomic conditions will be less positive.

The expenditure level in the budget proposal deviates markedly from the ceiling set by the fiscal rule, less than a year after the government increased the budget base for 2015 and 2016. The deviations derive from the government authorizing a range of multiyear expenditure plans in previous years without examining whether they were in line with the multiyear fiscal rules set by law. A recent example is the coalition agreements signed when the current government was established, which included multiyear obligations for considerable expenditures, which was not in line with the expenditure and deficit ceilings.[13] When the time for implementing these plans arrived, the government chose to change the fiscal rules in order to put the extraordinary obligations into effect.[14] Contributing to this outcome as well were the government's decisions to deal with some of the deviations, when they became clear, by one-off steps such as spreading out expenses or temporarily transferring plans to the "contingent expenses" item, which is not subject to the expenditure ceiling, while funding them in the short term by public extrabudgetary entities,[15] such as

11 As noted, the debt to GDP ratio is likely to decline due to a revision in National Accounts data, but given the expected new level, a process of moderate growth is expected.

12 For example, the Buyer's Price plan and umbrella agreements with local authorities.

13 Bank of Israel (2015), Recent Economic Developments 139, October 2014–March 2015.

14 See Brender, A., (2009) "Targets or Measures? The Role of Deficit and Expenditure Targets in Israel's Fiscal Consolidation Efforts, 1985–2007", The Israel Tax and Economic Quarterly, 33 (129), May, pp. 7–33 (Hebrew).

15 See, for example, Bank of Israel (2015), Recent Economic Developments 140, April–September 2015, Page 21, and Bank of Israel (2015), Recent Economic Developments 139, October 2014–March 2015, June 2015, Page 24.

JNF, the Mifal Hapayis National Lottery, the Israel Sports Betting Council, the Israel Airports Authority and various government companies.

The government's decisions related to the expenditure ceiling to a great extent reflect procyclical budget conduct. When macroeconomic developments are positive and lead to an increase in tax revenues, the government increases its expenditures, while when economic conditions act to reduce tax revenues (for example, in 2012 and in the beginning of 2013)[16] the government acts forcefully to restrain expenditures and increases tax rates. This is the outcome that the expenditure ceiling was supposed to prevent, because in contrast to the deficit, which is correlated with economic activity due to the activity's impact on tax revenues, the large majority of expenditure is set directly by the government.

The repeated increases of the expenditure ceiling in recent years indicate the government's difficulty in achieving its policy targets in the areas of security, welfare, social services, and support for economic growth within the framework of the budget set by the fiscal rule. This is against the background of Israel's low level of civilian public expenditure as a percent of GDP in international comparison, and particularly after the path of expenditure growth was lowered in 2014. The numerous adjustments and their timing also indicate that the ceiling exhausted its ability to serve as a barrier to procyclical policy. Against this background the government should re-examine the level of the expenditure ceiling, the rate at which it changes in the medium term and the formulation of the fiscal rules in a manner that grants them greater credibility and stability.[17] In view of the size of the planned deficit for the coming two years, an increase in the ceiling will eventually require a parallel increase in government tax revenues, whose current level relative to most advanced economies is low. This can be done either by increasing tax rates or by cancelling inefficient exemptions. The current conduct, under which permanent expenditure components are increased during strong revenue periods, allows an increase in welfare payments and an improvement in government services without an immediate increase in the deficit, but is liable to lead to large deficits and to an increase in the debt to GDP ratio when macroeconomic conditions change over the course of the business cycle and the economy will be far from full employment. Under such circumstances, the government is likely to be required to reduce its activities and to increase taxes precisely when the economy will need fiscal support.

An additional important component in adjusting the expenditure ceiling is the gap between the increase in the CPI to its forecast increase used to compile the budget. According to the law, when such a gap is created, the government is to change the next budget by the percentage of the gap that was created. Thus, for example, based on current assessments the 2017 budget is to be reduced by more than NIS 8 billion, because the cumulative increase in prices in 2015–16 was about 2.4 percent lower than the forecast (Table 2).[18] The government decided not to make this adjustment, similar to a previous decision not to make the adjustment in the 2015 and 2016 budgets.

As in the short term, the link between expenditure budget items and the CPI is weak, and as in the medium term prices range near the midpoint of the inflation target set in law, it appears that there is an advantage to switching to budgeting based on the midpoint of the inflation target range—that is, to make a yearly price adjustment of 2 percent, unrelated to the development of actual prices during the year. Such a move would increase the transparency of the budget, would prevent the recurring shocks in the budgeting process, and will prevent the need to base the budgeting process on annual forecasts. The concern of price divergence over time can be reduced by adding a gradual-adjustment mechanism for expenses to deviations of actual prices from previous years' forecasts.

In terms of the composition of the budget: Given the proximity of the economy to full employment, it is important that policy focus on supporting the supply side, and in particular the areas in which barriers to economic growth are apparent, such as human capital at the forefront of technology and the level of infrastructures, alongside improving government services and reducing regulation. This is especially true when dealing with a two-year budget, in which activities that are not budgeted now will be delayed for a long time. In light of the lag in the skills level in the Israeli economy (see the discussion below in this publication) and in the quality of infrastructures, it appears that reducing taxes is not the most effective step to support activity in the current state of the economy. Moreover, an examination of expenditure components and proposed steps indicates that the coming budget apparently does not include a marked increase for education and infrastructures—two critical barriers to long term growth of the economy. With regard to infrastructure, although there is intent to move to extrabudgetary projects, such processes often involve extensive delays due to the long processes in the government until a franchisee is chosen and

[16] Bank of Israel, State Budget Execution in 2012 and the Picture of the Budget for Coming Years, January 2013.

[17] See discussion in Bank of Israel 2014 Annual Report, Chapter 6.

[18] The slow increase in the CPI was not reflected in a concurrent decline in tax revenues because GDP prices, which are the basis for tax collection, increased, as noted, by a slightly higher rate than the budget forecast.

contracts are signed. To the extent that the government feels it has fiscal space, promoting planning processes that are high quality (and at an appropriate budget) can assist in more rapid execution of the projects and lead to infrastructures that will be available for use earlier.

3. Risks to the forecast

The baseline revenue forecast for 2017 and 2018 is based on several assumption and forecasts related to developments of nominal GDP, wages, consumer goods imports and activity in the real estate and capital markets. As was presented, changes in these variables have central roles in the marked—and unexpected—increase in government revenues from taxes in the past year. It is therefore important to examine the sensitivity of the forecast to developments that are different than in the baseline forecast. Israel's experience in 2000, 2007, and 2011, and the experience of many other advanced economies in the past two decades, indicate that episodes of rapid growth in revenue based on rapid expansion of specific markets may rapidly turn into significant declines. The decline in all these episodes was much greater than could be explained by a slowdown in growth, and it derived mainly from the end of the additional unique factors that contributed to revenues at those times and in those countries: high revenues from the real estate market, capital gains taxes, and collecting taxes from high technology transactions.

In the current situation, there are several such risks—the large scope of real estate market activity, the rapid increase in automobile imports,[19] and to a lesser extent the rapid increase in wages. This is in addition to the forecasts for growth rates worldwide that have been revised downward repeatedly in recent years. Table 3 presents the sensitivity of the tax revenue forecast to changes in four variables: the GDP deflator (which reflects among other things the development of global prices of commodities imported into Israel and the pricing of exports of multinational companies in Israel), real wages, consumer goods imports and the scope of new home sales. As expected, we find that undramatic changes in these variables are able to markedly reduce tax revenues, even when the real growth rate is similar to the forecast. As a result, the deficit is liable to grow by a markedly higher rate than planned, and the debt to GDP ratio can increase more rapidly (see discussion below). It is important to emphasize that this is not the baseline forecast, but it is a reasonable scenario in the current environment and it appears that the probability of a deviation to the downside in the coming two years is greater than in the opposite direction. When the economy is near full employment, the risk inherent in the current decision to expand the structural deficit (through a permanent increase in expenditure and a reduction in tax rates) is significant.

4. The budget framework through 2020

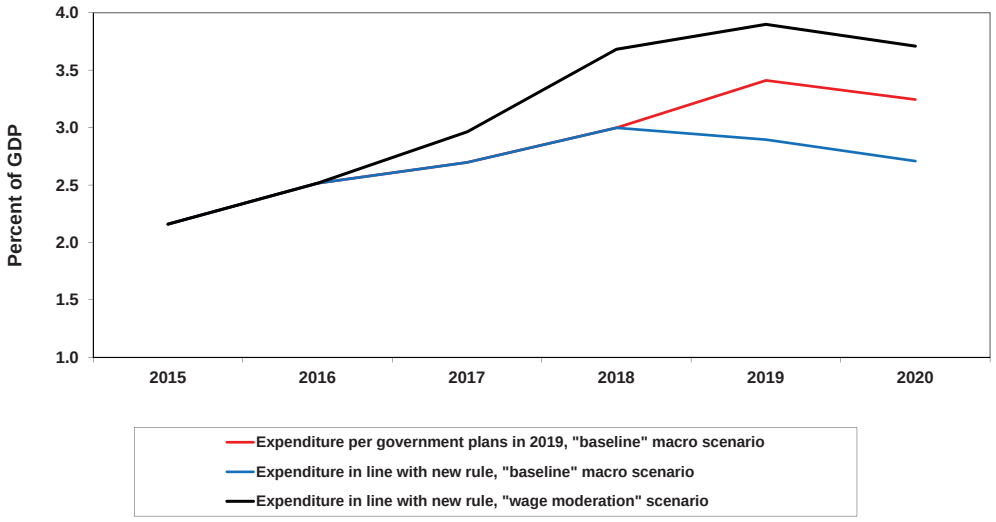
Based on the "Numerator" rule[20] that was approved at the end of 2015, the government needs to verify, when each budget is approved, that the expected budget in the coming three years (the current budget through 2019) does not deviate from the expenditure ceiling for those years or from the deficit target. This decision was reached in order to halt the process in which the government approved an expenditure plan at a considerable scope for years beyond the current budget, and when the time would come to put them into effect it would be forced to breach the multiyear expenditure ceilings and deficit targets that it set, or to backtrack from its commitments. The law also prohibits the reduction of tax rates when the forecast deficit for the coming years is higher than the target. It appears that in the months that passed since the law was adopted, there was in fact a halt in creating government obligations for new expenditures and it contributed to a marked improvement in budget discipline. Despite this, the government still faces a large surplus of expenditure plans that were accumulated in the period before the law was passed, and commitments derived from delay and spreading out of expenditures at a marked scope when the 2015 and 2016 budget was approved.

The significance of the law in the current year is that when approving the budget for 2017 and 2018, the government must ensure that expected expenditures in 2019 do not deviate from the expenditure ceiling set for that year by more than about NIS 2 billion, and that the expected deficit in 2019 is not greater than the target. The proposed budget framework for 2017 and 2018 markedly increases the expenditure ceiling in 2019, as it is calculated on the basis of the expenditure ceiling in 2018. However, even after this increase and even when taking into account steps to reduce expenditures included in the budget proposal (some of which are one-off measures or transfer the expenses between years), expected expenditures in 2019 are about NIS 5 billion higher than the expenditure ceiling set by

[19] The revenue forecast for 2016 assumes an additional increase in imports toward the end of the year, primarily due to vehicle purchases brought forward, ahead of an expected increase in taxes on them from January 2017.

[20] Amendment to the Foundations of the Budget law that was approved within the framework of the Increasing Economic Efficiency Law, 5775-2015.

Figure 2
Share of deficit in GDP under various policy scenarios, 2015–20



law.[21] Furthermore, even if the government carries out the adjustment of about NIS 5 billion in order not to deviate from the new expenditure ceiling—the expected deficit in 2019 is 2.9 percent of GDP, considerably higher than the current target—2 percent of GDP. At the time of approving the budget proposal, the government decided to increase the deficit target to 2.5 percent of GDP in 2019. However, on the basis of estimated expenditures and the revenue forecast for 2019, the expected deficit is 3.5 percent of GDP, if further steps to increase government revenues and to reduce expenditures are not taken.[22] It is important to note that all expenditure estimates assume that from now until the end of 2019 the government will not make a single decision that increases its expenditure in 2019 without reducing another expense by the same amount, other than supplements allowed by the special reserve of NIS 3.5 billion for unexpected expenses in 2018.

The steps that the government chose in order to reduce the deficit and expenditures in the 2017 and 2018 budget are liable to adversely impact the credibility of the Numerator rule, which as noted was approved less than a year ago. Despite the marked gap between the cost of the plans approved by the government to the (expanded) deficit ceiling in 2019, a marked portion of the adjustment that the government proposes is based on transitory measures, which do not provide a response to the expected gap in 2019. Thus, the contribution of this important law is negatively impacted already at the first opportunity in which it faces a significant test.[23] Furthermore, the government chose to reduce corporate and personal income taxes at a combined scope of more than NIS 2.5 billion, which is expected to increase the deficit even further. In this regard it is important to note that the expectation that tax rate reductions will increase government tax revenues is not supported by empirical evidence in the Israeli economy.[24]Although this is a well known theoretical possibility, very little evidence has been found for its existence, and certainly not in the range of current tax rates in Israel and in a time span of more than two years. Although there is some negative impact of tax increases on economic activity in the short run (which was taken into account in our analyses), it does not reach a level of reversing the impact—that is, a decline in tax revenue—and certainly not in a range longer than two years.

[21] Given the leniency in the law that allows the government at this stage not to correct a deviation of up to NIS 2 billion, the required correction in order to meet the "Numerator" requirements is NIS 6 billion, but if the correction will be limited to this amount, the planned government expenditures will remain above the expenditure ceiling allowed by the fiscal rule.

[22] According to the law, when the expected deficit, beyond the upcoming budget year, is greater than the target, the government is not required to increase tax rates ahead of time, but cannot reduce taxes permanently.

[23] Even though, as noted, it is primarily due to obligations created by the government before the law was approved.

[24] In Israel, it was found that revenues decline by about 70 percent of the rates of the reduction. For detailed discussion, see Brender A. and Eran Politzer (2014), "The Effect of Legislated Tax Changes on Tax Revenues in Israel", Bank of Israel Discussion Paper 2014.08.

Figure 3
Debt to GDP ratio under various policy and economic scenarios, 2015–20

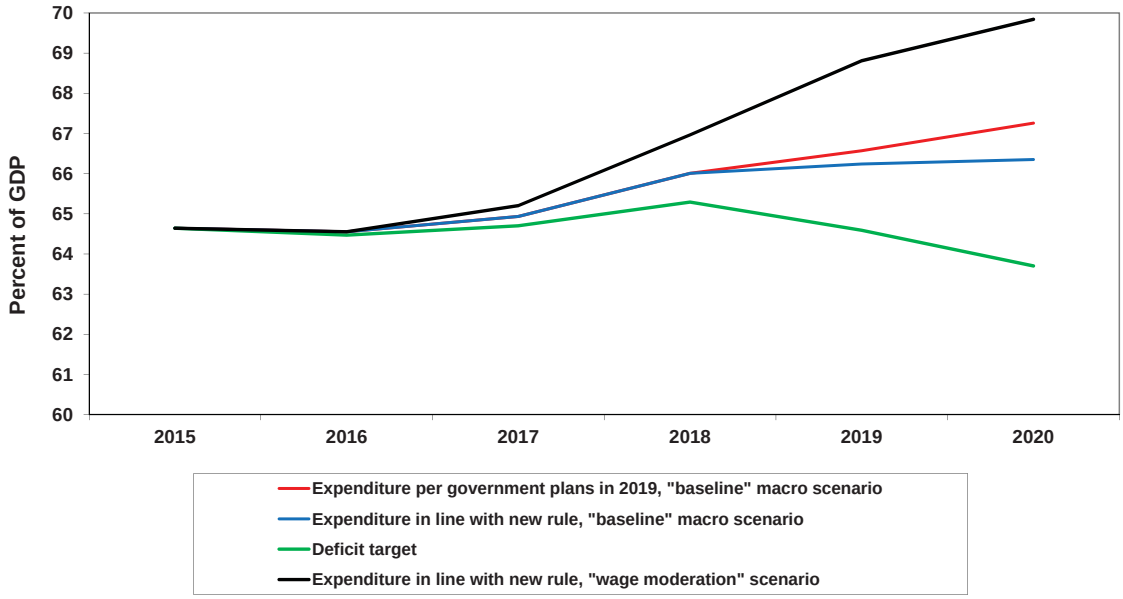


Figure 2 and 3 present the paths of the deficit (as a percent of GDP) and of the debt to GDP ratio, respectively, in 2015–20 under various policy scenarios and economic developments. All the scenarios assume that the deficit in 2016 will be 2.4 percent of GDP, that the government will not deviate from the expenditure ceiling in 2017 and 2018, and that GDP growth rates in 2019 and 2020 will be 3 percent,[25] without atypical developments of the other variables that impact on tax revenues.

Under the scenario of "Expenditure in line with the new rule, baseline macro scenario" (the blue lines in both figures), the government will make the required adjustments in order not to deviate from the expenditure ceiling in 2019, and the macroeconomic variables will develop in line with the "baseline forecast" described in Table 3. This reflects a situation in which the economy remains in the proximity of full employment throughout the entire period. In this scenario, the deficit will reach 2.9 percent of GDP in 2019 as well, and 2.7 percent of GDP in 2020.[26] The debt to GDP ratio will increase by about 1.5 percent of GDP by the end of 2020. Also presented, for comparison, is the path of the debt to GDP ratio in a situation in which the government maintains the path of the deficit set in law. Under this path the debt to GDP ratio declines by 1 percent of GDP (the green line in Figure 3).

The "Expenditure in line with the new rule, wage moderation" scenario (the black lines in the two figures) also assumes that the government will make the required adjustments in order not to deviate from the expenditure ceiling in 2019, but assumes that the macroeconomic variables will develop in line with the scenario described in Table 3. Under this scenario, the deficit will reach more than 3.5 percent of GDP in 2019 and 2020, and the debt to GDP ratio will increase by more than 5 percent of GDP by the end of 2020.

Based on the "Expenditure per government plans in 2019, baseline macro" scenario (the red lines in the two figures) the government will not make the adjustments required in order to prevent a deviation from the expenditure ceiling in 2019, and the expenditure base will increase from that year by NIS 8 billion. The macroeconomic variables will develop in line with the baseline scenario described in Table 3. Under this scenario, the deficit[27] will reach around 3.4 percent of GDP in 2019 and around 3.2 percent of GDP in 2020. The debt to GDP ratio will increase to 2.5 percent of GDP by the end of 2020.

[25] In a scenario where government expenditures increase in 2019, GDP also increased in line with the expected effect of the expansion in the short term.

[26] For simplification, we present the path of the debt to GDP ratio based on the data known today. The dynamic presented will not be materially impacted by a change in the base data, should there be such a change in the GDP series of the National Accounts.

[27] The deficit and the debt to GDP ratio are calculated in this scenario with reference to the impact of the increase in expenditure on GDP.

These scenarios present a limited range of possible developments for the period examined. Clearly use of more severe baseline macroeconomic scenarios—such as, for example, the "correction" scenario in Table 3—or a combination of a macro scenario more pessimistic than the baseline together with no fiscal adjustment, will lead to much higher deficits, while prolonged positive developments in the real estate and capital markets, or a rapid increase in wages over the course of time will lead to a lower deficit. However, in light of the economy's proximity to full employment and the current composition of growth supporting tax revenues, and against the background of the government's difficulties in recent years in dealing with the need to reduce its accumulated expenditure commitments, it appears that convergence to the results arising from the "Expenditure in line with new rule, baseline macro" scenario poses no small challenge to the government.

Part 2: Broader Review of Selected Issues

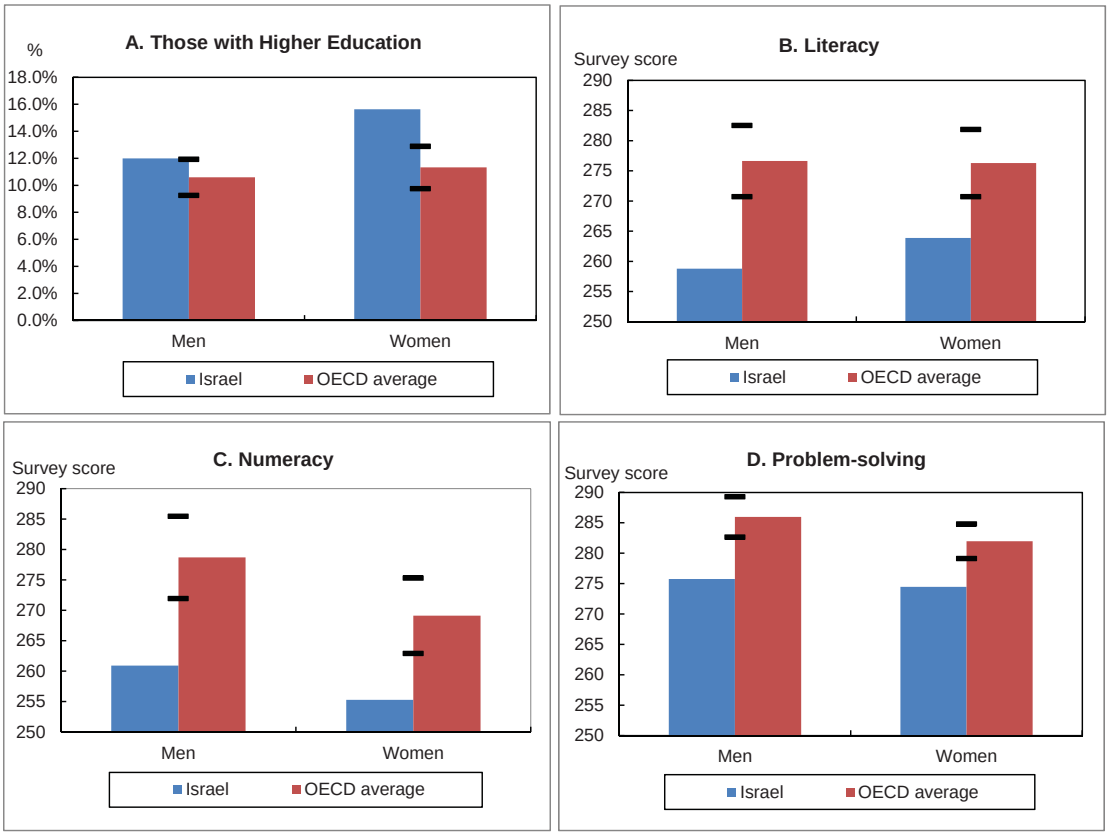
Survey of Adult Skills: General Background[1]

The OECD runs a Program for International Assessment of Adult Competencies (PIAAC). The program conducts a survey in OECD countries that examines the cognitive skills of individuals in the labor market, through a theoretical test in three areas of knowledge: literacy, numeracy, and problem-solving in a computerized environment. In addition, the survey includes a questionnaire on the personal qualities of the surveyed individuals and on their workplace and employment. The results of the survey help provide an understanding of the extent to which these skills are available and how workers use them in their work and at home. The survey is intended to equip policy-makers and researchers with essential information, including various international comparisons and demographic cross-sections.

The survey has thus far been conducted in most OECD member countries. Israel joined the survey in 2014 and 2015, with the second wave of countries to join, and the results are currently being published. Before looking at them, we add details on the structure and character of the survey.

In each country, individuals aged 16–65 are surveyed, using a sampling method appropriate to their country. The sample therefore reliably represents the entire population. In Israel, more than 9,000 individuals were sampled, and about 6,000 were ultimately surveyed.

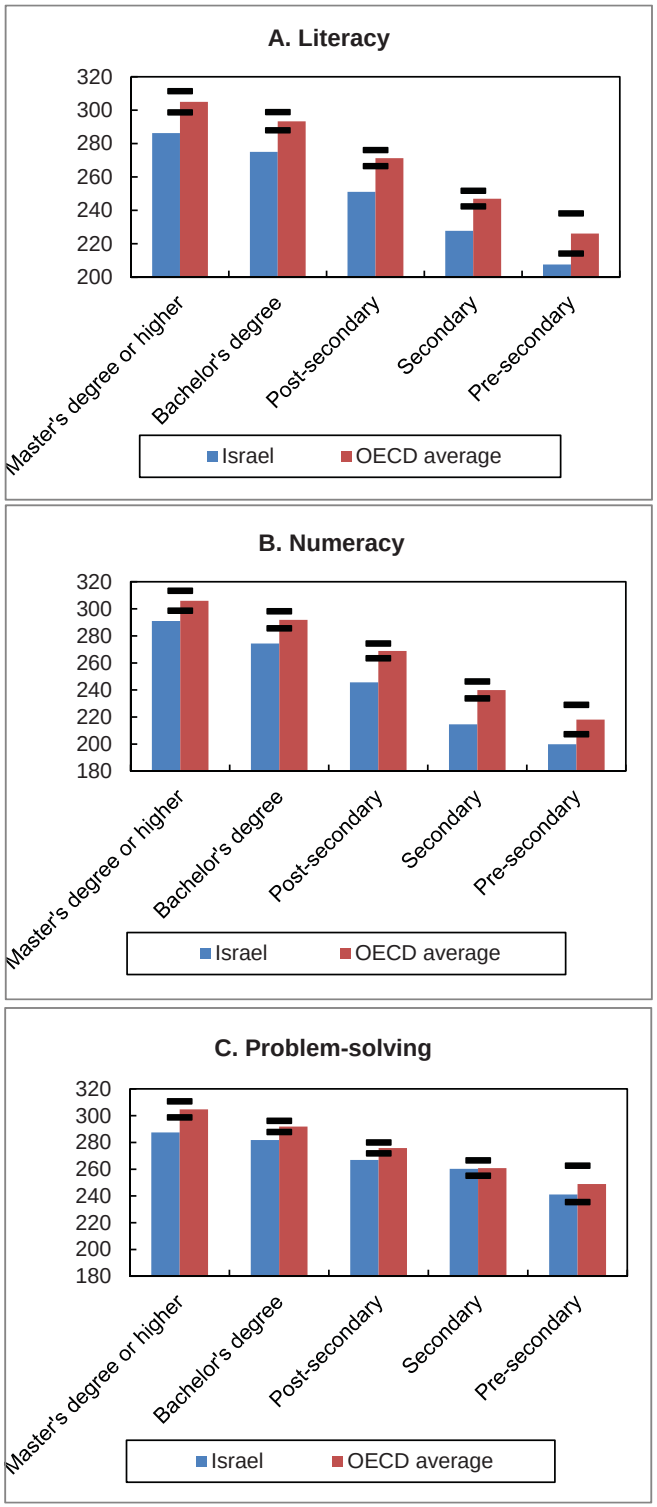
Figure 1
Education and Skills in Israel and the OECD, by Gender



The horizontal lines show the upper and lower bounds of the confidence interval of the OECD average at a significance level of 5 percent.
SOURCE: Based on PIAAC data from the Central Bureau of Statistics, the OECD.

[1] A more detailed background and explanations can be found in the Central Bureau of Statistics, "Adult Skills in Israel, 2014–2015: http://www.cbs.gov.il/webpub/pub/text_page.html?publ=1168&CYear=2015&CMonth=1 (Hebrew only).

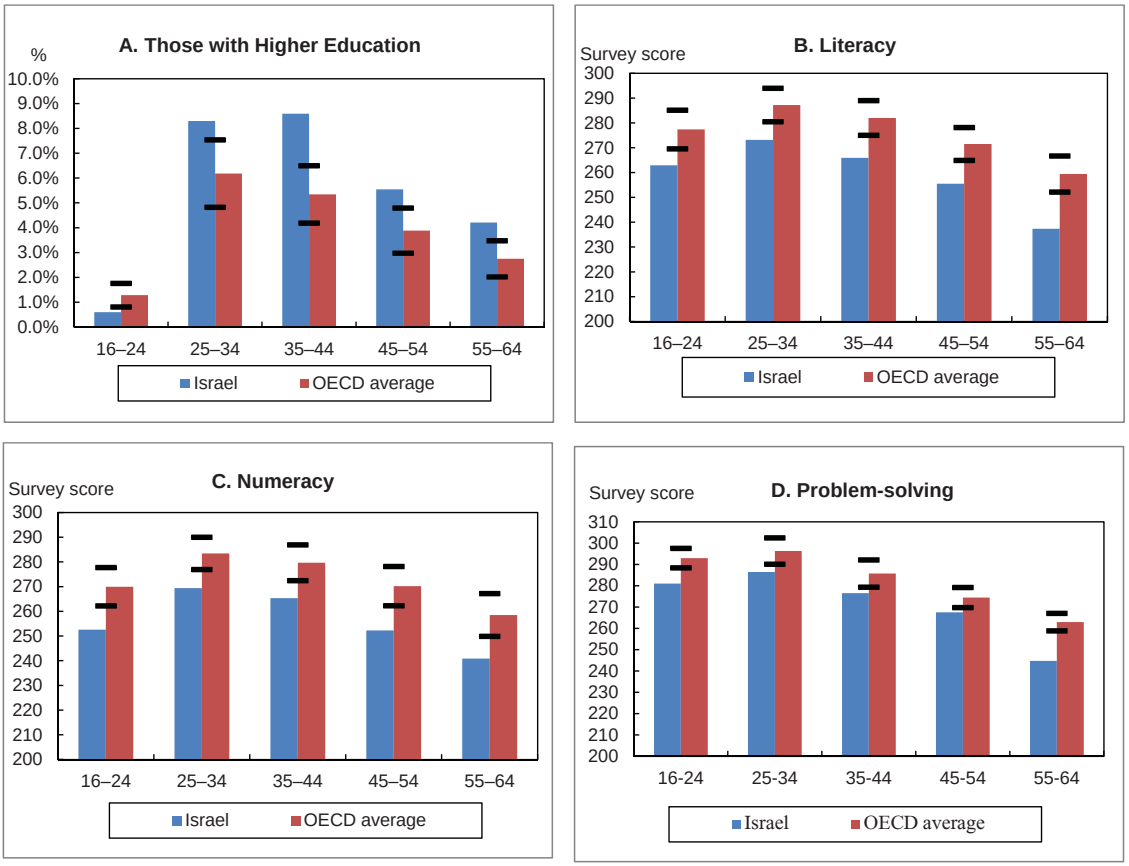
Figure 2
Skills in Israel and the OECD, by Education Level



The horizontal lines show the upper and lower bounds of the confidence interval of the OECD average at a significance level of 5 percent.

SOURCE: Based on PIAAC data from the Central Bureau of Statistics, the OECD.

Figure 3
Education and Skills in Israel and the OECD, by Age Group



The horizontal lines show the upper and lower bounds of the confidence interval of the OECD average at a significance level of 5 percent.
SOURCE: Based on PIAAC data from the Central Bureau of Statistics, and the OECD.

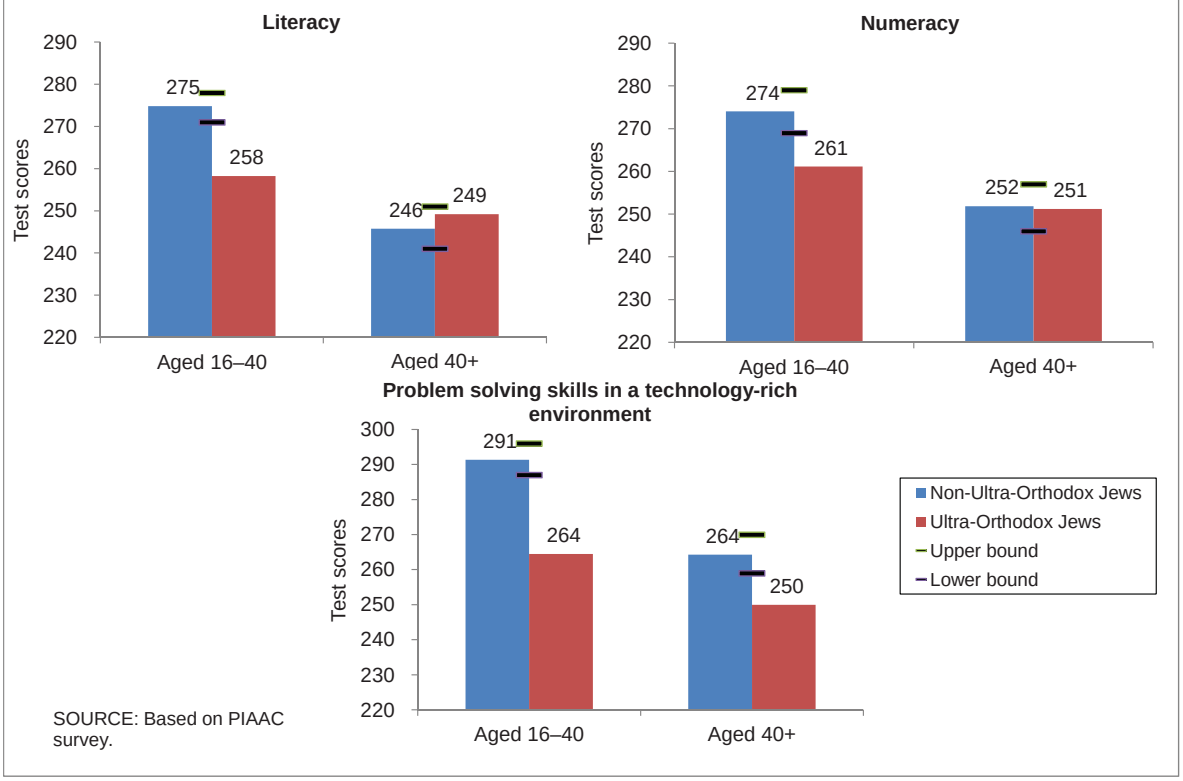
All of those surveyed in all countries are asked the same questions and examined with the same tests. The process is conducted in their mother tongue (in Israel it was conducted in Hebrew and Arabic, and it was also possible to answer in Russian). In general, the individuals provide their responses by computer, but it is also possible to provide written answers on paper. The survey respondents respond first to detailed background questions, including question on their place of work (including wages and work hours), formal education, age, gender, and more. The surveyors then examine the cognitive skills of the respondents in three areas:

- Literacy: The ability to understand, evaluate and use written text.
- Numeracy: The ability to access, use and interpret mathematical information and ideas, and to transmit them to others.
- Problem-solving in technology-rich environments: The ability to use digital technology, communication tools and networks in order to solve problems and perform tasks in a technological environment.

The skills are estimated on a scale of 0–500 points, with an average grade of 250, and a standard deviation of 50. A gap of one full standard deviation is considered very large. By way of illustration, this is the gap that exists in Israel between two individuals with large differences between them (about 7 years) in the number of years of schooling.

Figures 1–3 show a comparison between Israel and the OECD average by three basic cross-sections: gender, age and education. The low skills of Israelis are statistically significant in almost all areas and almost all cross-sections. The skills of men and women are lower than the average skills in the OECD to a similar extent. Skills in Israel are significantly low at each level of education, particularly in verbal and quantitative areas, and are low in all age groups. This is all despite the high level of formal education in Israel: The rate of individuals with a Bachelor's degree or higher is higher than the average among both men and women, and among both older and younger people. The data further show that the skill level increases with education, and that it is higher among younger people.

Figure 4
Average Test Scores of Ultra-Orthodox and Non-Ultra-Orthodox Jewish Men, by Age



SOURCE: Based on PIAAC survey.

Below, we use the results of the skills survey in order to conduct two analyses: The first examines the skills of Israeli workers by industry and in comparison with the OECD countries. The second examines the yield on skills in terms of wages, and examines whether there are differences in this area between the public and business sectors.

Dividing the surveyed population into sectors shows marked variance. In the Arabic population, the skills measured in the survey are significantly lower than in the Jewish population, even though it was possible to be tested in Arabic.

Dividing the Jewish population into ultra-Orthodox and non-ultra-Orthodox yields more complex findings. The skill level of adult ultra-Orthodox males—those above age 40—is similar to that of non-ultra-Orthodox males in the same age group, other than problem-solving in technology-rich environments, where their skills are lower. In contrast, the skills of young ultra-Orthodox males—those aged 16–40—are significantly lower than those of Jewish males who are not ultra-Orthodox, in all skill sets examined (Figure 4). This distribution of skill gaps among age groups is consistent with the change that has taken place in recent decades in the ultra-Orthodox educational system—reducing men's exposure to studies that develop these skills. Among ultra-Orthodox women—in both age ranges—the gaps are similar, but are about half the size of the gaps among men.

An analysis of Mintzerian wage equations[2] regarding men shows that out of a 13 percent gap in hourly wage between ultra-Orthodox and non-ultra-Orthodox Jewish men, deducting the effect of age, tenure and work hours—about 11 percent (84 percent of the total gap) is explained by the skills gap. This means that almost the entire gap in hourly wage between ultra-Orthodox and non-ultra-Orthodox Jewish males reflects a skills gap between the two sectors. Regarding Arabs, the hourly wage gap, with the same adjustment, between Jewish and Arab men is 28 percent, of which 22 percent (about 77 percent of the gap) is explained by the skills gap.

[2] A common statistical estimation method for quantifying the link between wages and independent variable values such as tenure, gender, education, and so forth.

Is there a difference in the return on cognitive skills between the public sector and the business sector?

- The return on the cognitive skills of workers is higher in Israel than in other advanced countries. The gap is derived from the business sector (and not from the public sector).
- The return on cognitive skills in the business sector is higher than in the public sector—a finding that is common in other advanced economies as well, but the difference is more pronounced in Israel. The gap in Israel is derived from the gap between the sectors among employees with higher education.
- The difference between the two sectors in the return on skills reflects variance between the two sectors in the wage setting mechanism. While the business sector rewards skills even if they are not tied to officially measured characteristics, the public sector wage agreements reward skills predominantly in relation to formal education and tenure.

Introduction

The public sector in Israel and in most advanced economies is characterized by a salary structure and employment arrangements that are different from the business sector. For the most part, these include collective labor agreements in which the process of setting wages and promotion is formal. Therefore, there are those who argue that it is difficult in the public sector to compensate employees on the basis of performance, and that wages are based mainly on observed variables such as education and tenure. According to the literature, these are also reflected in lower wage variance among public sector workers than among those in the business sector.

A new skills survey by the PIAAC makes it possible to examine whether the connection between unobserved skills[1] and wages in the business sector really is stronger than in the public sector. It does so by estimating salary increases paid in respect of the employee's cognitive abilities as measured in the survey. Here, for the first time in Israel, wage comparisons including employee skills estimates are presented, and a comparison is made between the return on skills in the business sector and the return in the public sector, and according to division by gender and level of education of the employees.

Written by Yuval Mazar.

[1] In this paper, "skills" is used as a short form for cognitive skills (unless noted otherwise).

Descriptive statistics

According to the question in the survey—"Who is your employer, the public sector or the business sector?"—we identified the public sector employees in Israel and compared their share of the economy to that of OECD countries participating in the survey (Figure 1).[2] The data show that the rate of public sector employees in Israel is 25 percent—in the center of the distribution of advanced economies that participated in the survey.

Table 1 presents a summary of the descriptive statistics—main data on public sector wages compared to wages in the business sector. The table shows that without controlling for employee characteristics, hourly wages in the public sector are higher than in the business sector, but the rate of those with higher education[3] in the public sector is higher. In a Mincer regression[4] with employee age and education, the coefficient of the public sector with the average hourly wage is negative and significant: minus 7.5 for men and minus 4.3 for women. An additional control for skills variables does not significantly change the correlation of the public sector for men. For women, the control for skills variables slightly reduces (in absolute terms) the negative correlation of the public sector.

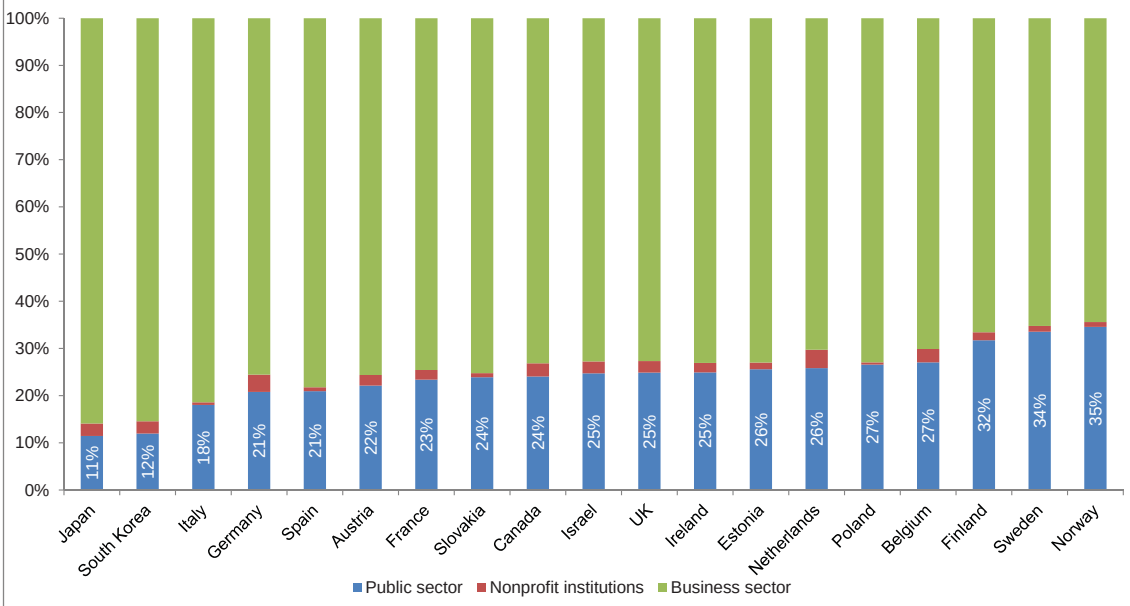
In tests examining the three types of cognitive skills—problem solving in a computerized environment, quantitative/mathematical problem solving, and reading ability—the average marks in the two sectors are similar (Table 2). In contrast, an examination of employees' cognitive skills as a dependent variable in a multi-variable regression, given their level of education, gender and age, shows that workers in the public sector are less skilled by about five points than workers in the business sector in problem solving in a computerized environment and in the quantitative field. In literacy skills, there was no significant difference found between the two sectors. The gap between the comparison with no controls for these qualities and that with controls is

[2] This question makes it possible to more precisely identify public sector workers than through the common method in other surveys by the Central Bureau of Statistics—according to the public service industries: education, public administration, health and long-term care, and nongovernmental organizations. This is because there is a sizeable number of workers from the business sector in these industries. About one-fifth of those employed in the public sector work in industries that are not defined as public services. Moreover, from the standpoint of industry data, it can be seen that employees of large government companies in Israel attributed themselves to the public sector, contrary to the common classification in Israel.

[3] Workers with a Bachelor's degree or higher.

[4] A method of statistical estimation that is common in quantifying the connection between wages and the values of independent variables such as tenure, gender, education, and so forth.

Figure 1
Distribution of workers in the public sector*, in nonprofit institutions and in the business sector: International comparison according to PIAAC survey



* Excluding estimate of the number of soldiers in compulsory service in Israel.

Table 1
General descriptive statistics

Gender	Sector	Average monthly wage (NIS, 2014)	Average hourly wage (NIS, 2014)
	Business	9,246	53
	Public	9,663	58
Workers with no higher education (73 percent of the business sector and 49 percent of the public sector)			
Men	Business	8,869	48
	Public	8,892	46
Women	Business	5,863	43
	Public	5,532	42
Workers with a higher education (27 percent of the business sector and 51 percent of the public sector)			
Men	Business	17,195	83
	Public	15,746	80
Women	Business	10,347	60
	Public	10,285	66

Table 2
Average achievements on skills tests separated by sector (standard deviation in parentheses)

		Problem solving in a computerized environment	Quantitative skills	Reading skills
With no higher education	Business sector	275	254	256
		(53)	(64)	(56)
	Public sector	275	260	265
		(52)	(61)	(54)
	Business sector men	265	241	245
		(52)	(61)	(52)
	Public sector men	267	242	250
		(52)	(61)	(53)
	Business sector women	266	239	249
		(50)	(56)	(53)
	Public sector women	264	235	248
		(51)	(59)	(53)
With higher education	Business sector men	297	288	285
		(49)	(57)	(49)
	Public sector men	281	279	282
		(50)	(56)	(48)
	Business sector women	297	280	284
		(50)	(59)	(50)
	Public sector women	274	267	276
		(47)	(55)	(55)

a result of, among other things, the higher rate of educated workers in the public sector, and the positive coefficient between education and skills.[5]

This means that the public sector chooses employees based on observed and identified qualities, while the business sector chooses employees of the same skill level, but identifies skills through unobserved qualities as well. The analysis by level of education reveals a more complex connection. The skill level of employees without higher education is similar in both sectors, but among employees with a higher education, the skill level is higher in the business sector. In contrast, there are more workers with a higher education in the public sector than in the business sector, and since more highly educated workers are more highly skilled, the two sectors are equal in the average level of skill.

Table 3 shows that regarding workers without higher education, the entry benchmark in the public sector, from the standpoint of skill, is higher than in the business sector, while regarding workers with higher education, the distribution of achievements on skills tests in the two sectors is similar, but the level of achievements on these tests is higher in the business sector.

Estimating the return on skills of workers in the business sector and in the public sector

Below, we estimate the return (in wages) on the skill of workers in the public sector and in the business sector.

[5] Between two people similar to each other in all parameters other than the number of years of schooling, the gap of averages in the level of skill (between the one who completed n years of schooling and the one who completed n+1 years of schooling, meaning a difference of one year of schooling) is about 7 points on average.

Table 3
Distribution of achievements in mathematical skills tests by sector

	Percentile	5	10	25	50	75	90	95	Average
With no higher education	Public sector	154	184	223	264	300	335	353	260
	Business sector	141	171	214	259	298	331	350	254
With higher education	Public sector	188	208	245	282	316	347	364	279
	Business sector	180	212	257	294	327	353	368	288

The basic equation estimated is a Mincer wage equation:

$$w_{ij} = \alpha_j + \beta_j \cdot x_i + \delta_j \cdot s_i + \varepsilon_j$$
$$j = g, b$$

where w_{ij} is a log of the hourly wage of employee i in sector j.

b is the business sector, and g is the public sector.

x_i are the characteristics of the employee, which in all equations include age, age squared, tenure at the workplace, and experience squared, number of work hours, a dummy variable for Arab and a dummy variable for ultra-Orthodox. In some of the models, we add the employee's education as an additional control variable.

s_i is the estimated skill of the worker.

ε_{ij} is the unexplained remainder of wages.

δ_j, the main parameter on which we shall focus, is the coefficient of the "skills" variable, which estimates the return (in wages) on skills. We examine whether it differs between the two sectors.

Table 4 lists the results of the estimation, separately for men and women.

The return (in wages) on skills ranges between 3 and 25 percent, and declines prominently when the effect of formal education on employees in the equation is neutralized. This is due to the positive correlation between education and skill. Table 4 also shows that the return on skills is higher for men, particularly in the business sector.

Table 4
Additional hourly wage from an increase of one standard deviation in workers' skills
(gaps between sectors that were found to be statistically significant are in bold)

Women

Sector:	Business	Public	Business	Public	Business	Public
Problem solving in a computerized environment	**13.2%**	**3.0%**	16.4%	12.9%	11.3%	6.8%
Reading	**14.7%**	**10.4%**	15.5%	16.5%	10.3%	7.7%
Mathematical skills	16.2%	15.3%	15.5%	18.9%	10.6%	10.0%
Control for employee characteristics, excluding formal education	X	X	V	V	V	V
Control for formal education as well	X	X	X	X	V	V

Men

Sector:	Business	Public	Business	Public	Business	Public
Problem solving in a computerized environment	**19.1%**	**5.9%**	18.5%	13.5%	11.8%	6.1%
Reading	**20.9%**	**12.5%**	17.3%	19.1%	10.5%	7.9%
Mathematical skills	24.5%	19.3%	19.7%	21.8%	13.9%	12.3%
Control for employee characteristics, excluding formal education	X	X	V	V	V	V
Control for formal education as well	X	X	X	X	V	V

In this specification (Equation 1), without controlling for any of the employee characteristics, a gap is obtained in favor of the private sector in the return on all types of skills, even though only some of them are statistically significant. In the estimation without controlling for formal education of the employees, but controlling for other characteristics, the gap in the return on skills is wiped out, other than for problem solving in a computerized environment. And even regarding this skill, it is not significant. The narrowing of the gap in the return on skills between the sectors is a result of the increase in the return on skills in the public sector, which increases significantly with the addition of the age and experience variables in the public sector. The reason is that the return on wages for age and tenure are higher in the public sector than in the private sector, and there is a negative correlation between age and employee skill in both sectors. This negative correlation is stronger among men in the public sector than among men in the business sector.

After also controlling for formal education of the employees, the return on skills in the public sector declines more than in the business sector. However, even after controlling for education, the gap in return between the sectors is not significant in either type of skill.

This result shows that the business sector rewards skill more than the public sector does, but it reflects the correlation between skills and other qualities of the employees, since when taking these qualities into account, the gap between the returns in most of the examinations we conducted did not turn out to be significant.

Table 5 separates the estimation between employees with higher education (at least a Bachelor's degree) and employees without a higher education. The Table shows that the gap in favor of the business sector in return on employee abilities originates with educated employees, for whom the return is clearly higher in the business sector—five times higher for women and three times higher for men regarding skills in problem solving in a computerized environment.

We found that for workers with a higher education, about 20 percent of the gap between the business sector and the public sector in the return (in wages) on skills in problem solving in a computerized environment is explained by the high return for workers in the ICT industry in the business sector. However, even without this group, the gap remains statistically significant.

Figure 2 illustrates the size of the coefficients in the regression. The graphs show wage as a function of employee skill in the business sector and in the public sector. They show only the effect of skills in problem solving in a computerized environment, since the results regarding the other two skills examined are similar (Table 5).[6]

The Figure 2 group clearly shows that the excess return on skills is reflected in notable wage differentials for employees with a higher education. For instance, in terms of women—regarding employees from roughly the 70th percentile (with a score of 330 or above on the test) upward in terms of skills, there was a positive wage gap in favor of employees in the business sector, which increases with the level of skill. For men with higher education, the wage gap in favor of the business sector developed from roughly the 30th percentile

Table 5
Additional hourly wage (percent) **from an increase of one standard devation in employee skills separated by education** (gaps between sectors that were found to be stastically significant are in bold)

Women

	Business sector	Public sector	Business sector	Public sector
	Higher education		No higher education	
Problem solving in a computerized environment	**19.5%**	**4.0%**	6.7%	13.0%
Reading	19.0%	5.5%	7.1%	7.8%
Mathematical skills	20.0%	7.2%	6.9%	12.2%
Control for formal education	V	V	V	V

Men

	Business sector	Public sector	Business sector	Public sector
	Higher education		No higher education	
Problem solving in a computerized environment	**21.1%**	**7.0%**	7.0%	7.1%
Reading	17.1%	10.8%	7.5%	6.3%
Mathematical skills	21.2%	15.7%	8.5%	10.4%
Control for formal education	V	V	V	V

[6] The wages in the figures were calibrated according to the parameters estimated in the regression at the average point of each variable.

upward in terms of skill (with a score of 275 or above on the test).

Among employees with no higher education, there was no gap found between the sectors in the return on skill for wages. However, among women with no higher education, the return on skills in the public sector is higher than in the business sector, but the gap is not statistically significant.

We also asked whether the different return on skill can be explained by the different type of work performed in each of the sectors. We therefore also examined the strength of the use of a computer and dealing with complex problems in a computerized environment. We found, separately by sector and education, that work in the public sector is more complex, but that the differences are not significant and from this standpoint, the two sectors are similar. A marked part of the work pattern is explained by employees' level of education.

Resiliency testing for the econometric portion

We limited the sample to the primary working ages (25–54). Among workers with a higher education, the gaps in return between the sectors became even larger.

We removed the limitation on high or outlier wage observations. The results remained resilient.

We added a variable representing the socioeconomic cluster of the place of residence of the surveyed individual (on a scale of one to 10). The results remained resilient.

We examined the regressions only for workers employed full-time.[7] Regarding workers with a higher education, the gap in the return on skills in favor of the business sector increased. For instance, for women with higher education, the ratio between the business sector and the public sector in terms of return on problem solving in a computerized environment increased to 6.5, compared with a ratio of 4.6 according to the basic model. In contrast, regarding workers without higher education, and particularly women without higher education, the gap in the return on skills remained insignificant.

In conclusion, the main finding is that the return on skills for workers with higher education in the business sector, mainly for women, is higher than in the public sector, and the finding is resilient to changes in specification and sample. Among workers with no higher education, there was no gap found in the return on skills between the two sectors, apparently because the basic wages of most public sector employees is set through wage tables, which include the skills of workers only if they are consistent with their formal education.[8] Under the reasonable assumption that the skills of workers are positively correlated with their performance, then as expected, wages in the business sector are affected by workers' performance more than wages in the public sector are.

International comparison

To the best of our knowledge, few studies have thus far examined the issue of the difference between the public sector and the business sector in terms of the return on employee skills according to the PIAAC survey. The main study to which we compared the results in Israel is by Hanushek, Schwerdt, Wiederhold, and Woessmann (2013).[9],[10]

Through the technique presented in this paper, we estimated the return on the abilities of the Israeli worker:

$$w_i = \alpha + \beta \cdot x_i + \delta \cdot s_i + \varepsilon_i$$

In this case, x_i are the individual characteristics of the worker, which include professional experience at the place of work, professional experience squared, and a dummy variable for gender.

The comparison was made only with workers aged 25–54, and the explanatory variable included experience at

7 More than 29 hours per week according to the international definition.

8 Through Mincer regressions, we found that without controlling for skills variables, the return on formal education in the two sectors is very similar. We also found that controlling for the skills variables has more of an effect on the return on education in the business sector.

9 Eric A. Hanushek, Guido Schwerdt, Simon Wiederhold, Ludger Woessman, "Returns to Skills Around the World: Evidence from PIAAC", NBER WP 19762, 2013.

10 Similar to what is being done in this paper, another paper that relied on PIAAC data examines the gaps in the return on skills between the business sector and the public sector in South Korea. M. Jae Moon, Ju-Ho Lee, Jin Park, Jieun Chung, Junghee Choi (2016), "Skills and Wages of Public Employees: Investigating Korean Bureaucracy Through PIAAC," KDI School of Public Policy and Management, Paper number 16-02. There are other papers in specific countries relating indirectly to the differences in the return on skills between the two sectors.

Figure 2a
Hourly wage for women with no higher education as a function of their skills at problem solving in a computerized environment

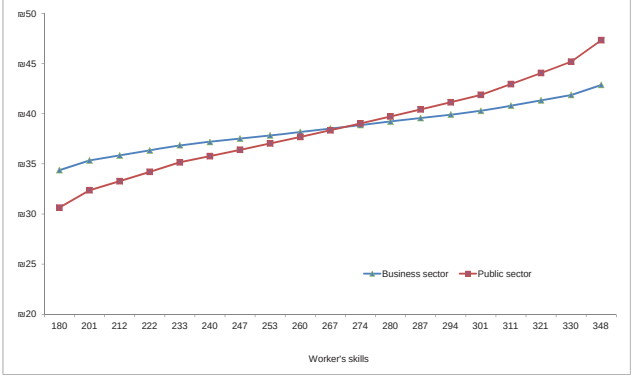


Figure 2b
Hourly wage for men with no higher education as a function of their skills at problem solving in a computerized environment

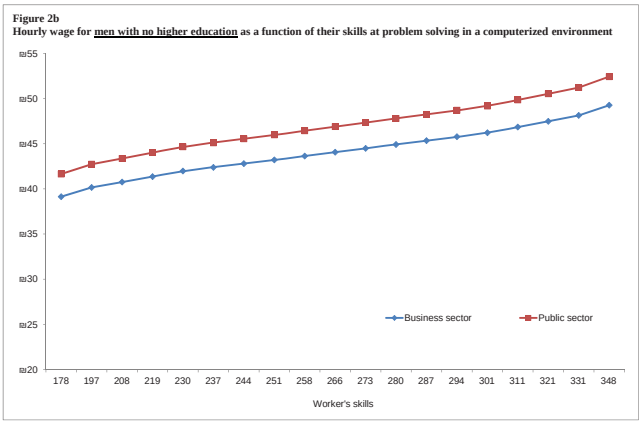


Figure 2c
Hourly wage for women with higher education as a function of their skills at problem solving in a computerized environment

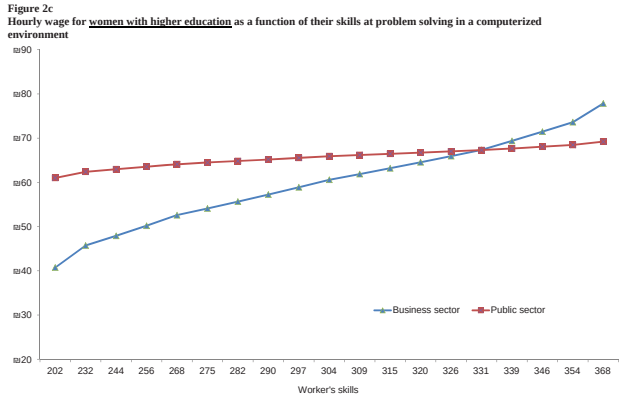
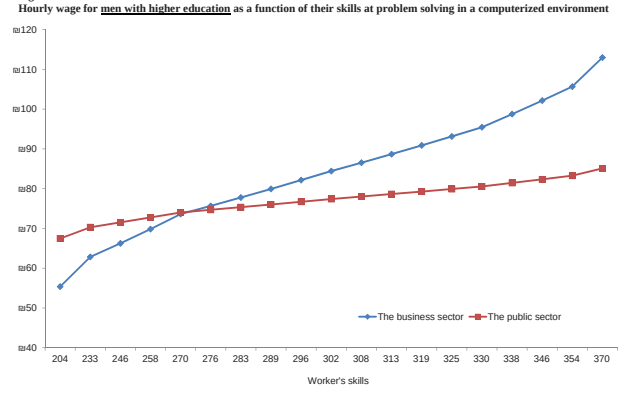


Figure 2d
Hourly wage for men with higher education as a function of their skills at problem solving in a computerized environment



the worker's place of work, experience squared, and the worker's gender.[11]

Regarding Israel, a separate regression was estimated in line with the definitions of the population group and the explanatory variables listed above.

Figure 3 shows the return on an increase of one standard deviation in the mathematical skills of the workers, an increase that is reflected in their hourly wage.

Figure 3 shows that the return on the employee's skills is higher than the return in the other countries, and from this standpoint, Israel is in second place after the US. We found that there is a significant negative statistical connection between the average level of achievements in mathematical skills in each country and the return on skills (Pearson coefficient of correlation: -43 percent). In a simple binary regression between the two variables, an elasticity of -2 was estimated, meaning that an increase of 1 percent in the average achievements of a given country is expected to lower the return on skills by about 2 percent. In other words, the more rare a skill is in a country, the more its "price" in the labor market increases.

Hanushek et al. (2013) showed that the variance between countries is explained, inter alia, by the size of the public sector, by the rate of unionized workers, and by the level of employment rigidity, and that these are negatively correlated with the return on the worker's abilities.

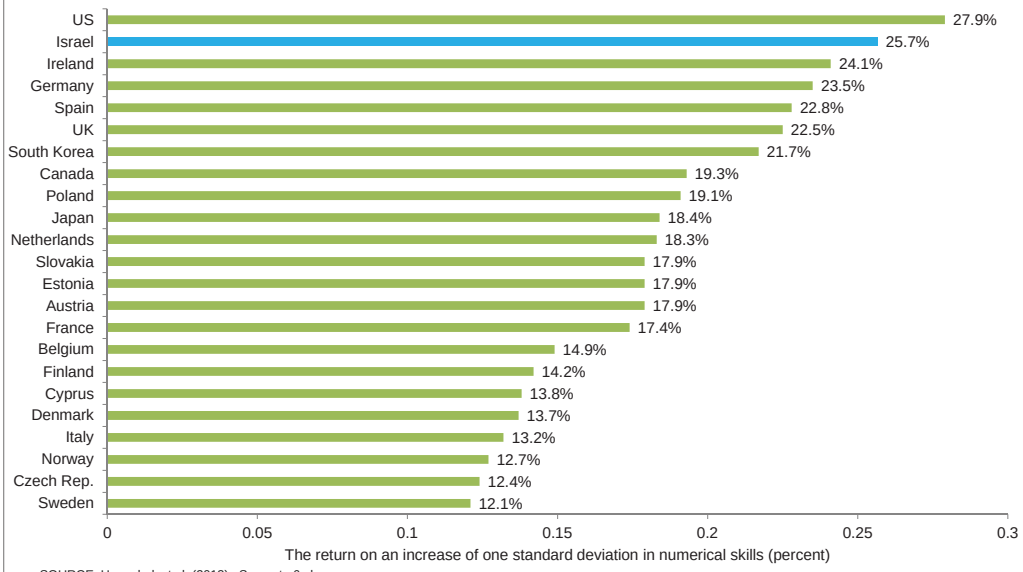
Our examinations also found that controlling for the formal education of the workers or the industry in which they are employed lowers the yield on skills in Israel to a similar extent than the average in other countries. In Israel, the yield on mathematical skills is 37 percent lower after controlling for the education of the workers (9.6 percentage points) and 39 percent lower (10.0 percentage points) when controlling for the industry, while on average in the OECD countries, it is 42 percent lower (7.5 percentage points) when controlling for education, and 46 percent lower (8.1 percentage points) when controlling for industry.

We used an interaction variable[12] to conduct an international comparison of a gap of one standard deviation between the business sector and the public sector:

[11] The elasticity for Israel in Figure 3 is higher than the elasticity listed in Table 2, since, as detailed above, this case did not have the same definition of population or the same controlled variables.

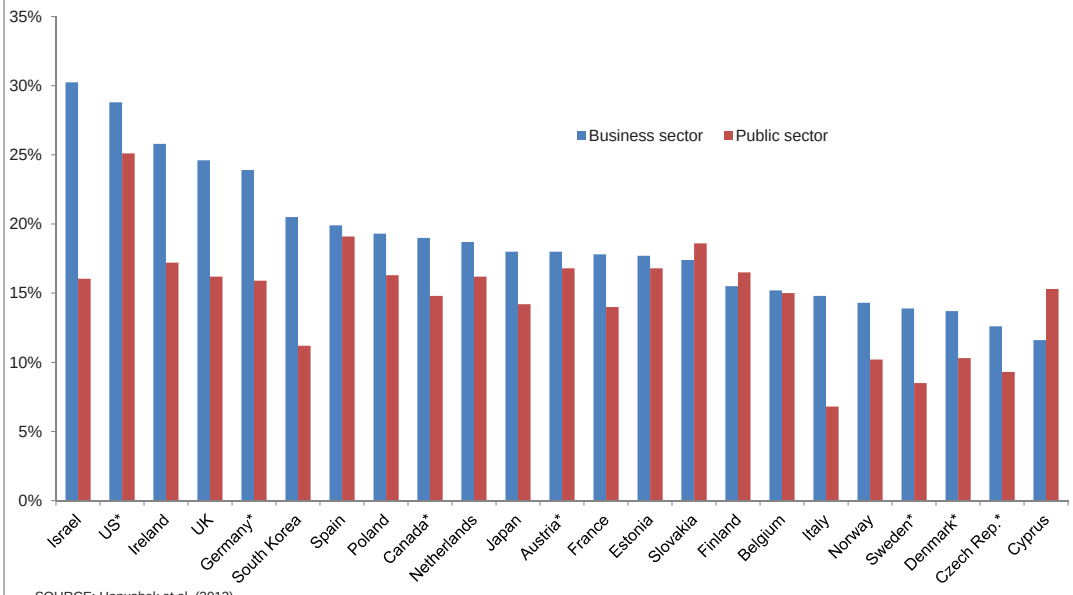
[12] The survey was conducted such that not every participant did every test. Therefore, there were many attributions made in the survey. As a result, each participant received 10 scores attributed to him according to his attributes. This procedure was run on these scores.

Figure 3
International comparison of the additional wage as a result of an increase of one standard deviation in the mathematical skills of workers



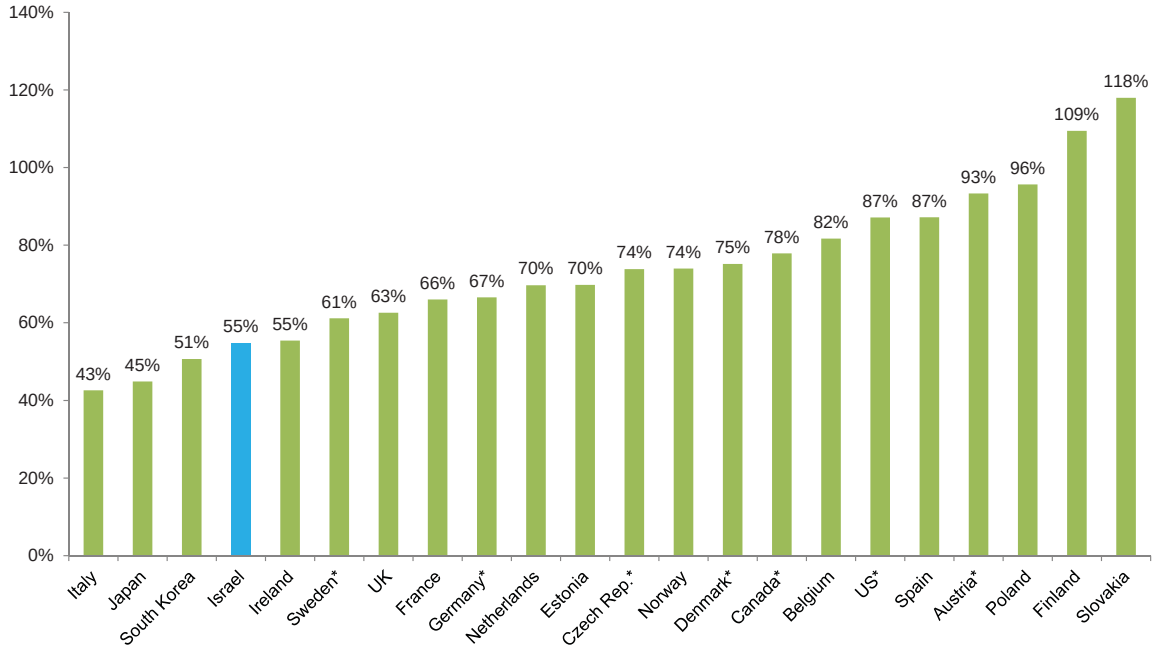
SOURCE: Hanushek at al. (2013). See note 6 above.

Figure 4
International comparison of the additional wage (percent) in the business sector and in the public sector as a result of an increase of one standard deviation in the mathematical skills of workers



SOURCE: Hanushek at al. (2013).

Figure 5
Ratio (percent) between the return on mathematical skills in the public sector and the yield in the business sector



SOURCE: Hanushek at al. (2013).

$$w_i = \alpha + \beta \cdot x_i + \delta \cdot s_i + \gamma \cdot Public \cdot s_i + \varepsilon_i$$

where x_i are the individual characteristics of the worker, which in this case include age, age squared, and gender.

The equation was estimated only for workers aged 25–54 who worked at least 30 hours per week.

Similar to Israel, in most countries that participated in the survey, the return on skill in the public sector is lower than in the business sector (Figure 4).[13] Figure 4 shows an international comparison of the return on mathematical skill in the business sector and in the public sector. The figure shows that the return in Israel is particularly high in the business sector, while it is similar to the average of the other countries in the survey in the public sector. These findings are also reflected in Figure 5, which shows the ratio (in percent) between the return on mathematical skill in the public sector and the return in the business sector ($\frac{\delta + \gamma}{\delta}$) in Israel and in the other countries reviewed in the survey. The figure shows that in Israel, the ratio of the return on mathematical skill in the public sector to the return in the business sector is lower than in other countries.

Conclusion

For the first time in Israel, we examined the return on cognitive skills in the public sector and in the business sector. The comparison shows that, similar to the situation in most advanced economies, the return on these skills in the business sector is higher than in the public sector. The gap in the return is derived from workers with higher education. This finding reflects greater elasticity in the wages of educated workers in the business sector to the workers' skills, which is a result of the difference between the wage setting mechanisms of the two sectors and not from a difference in the distribution of the workers' cognitive skills. While the public sector rewards formal education more (when controlling for skills) and employs more workers with higher education, the business sector rewards the skills themselves more regarding workers with higher education, and particularly among highly educated women.

[13] Very similar results were obtained by running the regression without controlling for the worker's employment experience.

Basic Skills of Workers in Israel and Industrial Productivity

- The basic cognitive skills of workers in Israel are lower than the OECD average, even though the proportion of Israeli workers with an academic degree is higher than the OECD average.
- Compared with other advanced economies, the proportion of low-skilled workers in Israel is high, particularly in nontradable industries and tradable industries that sell most of their output to the domestic market.
- The low skill of workers in those industries is correlated with low labor productivity and with the type of the work, indicating a low-cost labor-intensive production function, a low level of physical capital, and an absence of advanced technology.
- The most effective investment in basic cognitive skills is obtained through education at an especially young age, and adopting this approach is recommended. Improving the basic skills of adults through special programs for population groups among whom the survey found particularly low achievement is also recommended.
- Assuming that physical capital and technology constitute supplementary factors of production to the workers' skills, improving the workers' basic skills will provide a fundamental incentive for firms in industries with low productivity to increase the capital stock per worker and streamlining through technological innovation.

Labor productivity (output per worker) in Israel is 14 percent lower than the average in advanced economies.[1] Box 2.1 in the Bank of Israel Annual Report for 2013 found that in comparison with these countries, productivity per worker was especially low in industries that sell to the domestic market and in nontradable industries. Brand and Regev[2] reached a similar conclusion, and also found that relative productivity increased in industries that became exposed to competing imports in the mid-1990s. Figure 1 shows that the gap in productivity in accommodation and food services, the construction industry, and the trade industries[3] generates the largest negative contribution to the general gap in productivity, while productivity per worker in the electronics industry is higher than the OECD average, thereby narrowing the gaps in productivity between Israel and the other developed countries. The analysis presented here uses the Programme for the International Assessment of Adult Competencies (PIAAC) survey of skills conducted by the Central Bureau of Statistics. It finds that the innovative tradable industries are based on high-quality workers, while the rest of the economy lags behind, and is based on an unskilled labor force—a population group whose availability in Israel is greater than its availability in other developed countries.

1. The education and skills of the working-age population and the connection between these variables and growth

The finding that Israel has an abundance of unskilled workers may seem surprising, since the country has a relatively high proportion of people with advanced degrees (Figure 2A). Figures 2B–2D, however, show that the skills of workers in Israel are inferior in an international comparison in the three areas examined in the skills survey. In other words, the fact that people in Israel have more years of education does not reflect superior skills, at least in the basic cognitive areas examined in the survey.[4] Indeed, the economic literature discusses at great length the idea that there is only a limited connection between the quantity of education, as measured in years of study, and the population's cognitive capabilities.[5] The fact that it is easy to measure the number of years of study, and the availability of information about it have led the public discussion and decision makers in Israel and worldwide to focus on this figure. Workers' skills, however, especially their cognitive capabilities, are not derived solely from their years of education, but also from its quality[6], and from other personal and environmental variables.

Furthermore, the studies by Hanushek and Woesmann in 20085 and 2012[7] found that an increase in the number of years of study does not significantly explain the existing differences in economic growth between countries, given a

Written by Shai Tzur.

1 Output per work hour is even lower in an international comparison—a 24 percent negative difference—since the average number of work hours per worker is higher in Israel.

2 Brand, G. and E. Regev (2016), "Causes of the Widening Productivity Gaps Between Israel and the OECD: A Multiyear Industry-Level Comparison," Taub Center for Social Policy, 2015 Nationwide Status Report.

3 Productivity in agriculture is sensitive to the calculation method, and the results reported in the study by Brand and Regev (2016) differed from the results obtained by the Bank of Israel and the OECD.

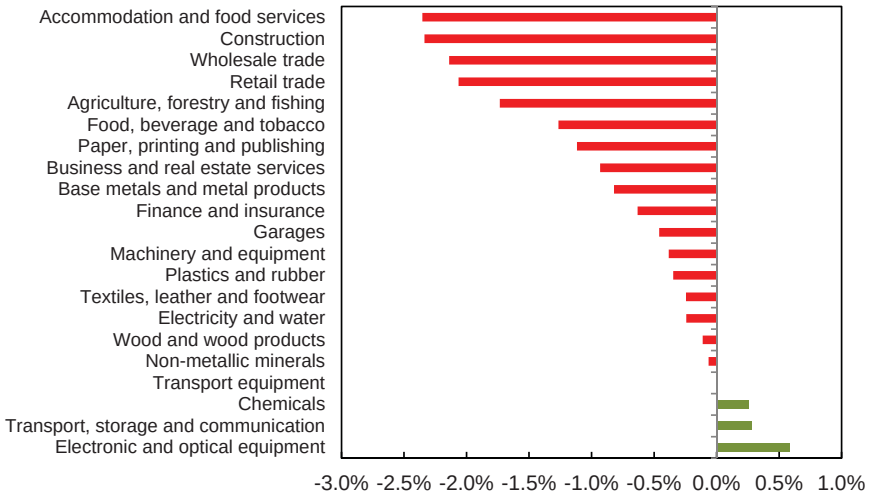
4 In an examination that is not presented here, we found that the skills of workers in Israel were inferior in all educational groups, and it is therefore difficult to attribute the inferiority in skills to any particular element of the education and training system chain.

5 Hanushek, Eric A. and L. Woessmann (2008), "The Role of Cognitive Skills in Economic Development," Journal of Economic Literature, pp. 607–668.

6 Additional findings about the quality of education in Israel appear in Bank of Israel (2015), "The Connection between the Quality of Education and Growth: Israel Compared to the World," Recent Economic Developments (139).

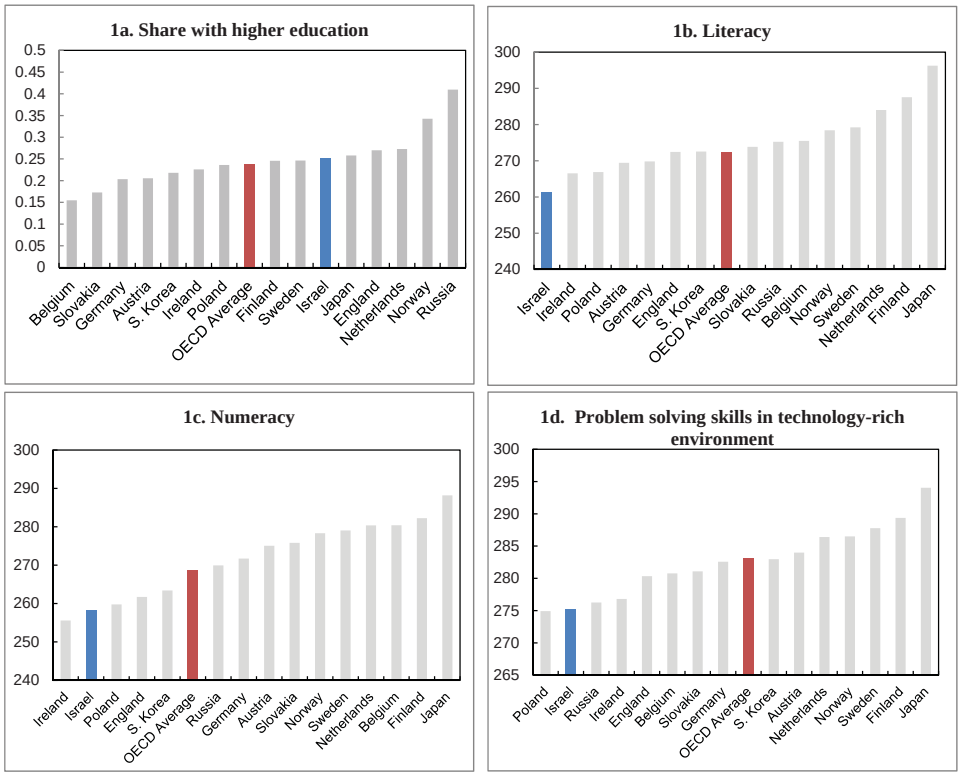
7 Hanushek, Eric A. and L. Woessmann (2012), "Do Better Schools Lead to More Growth? Cognitive Skills, Economic Outcomes, and Causation," Journal of Economic Growth, 17.4, pp. 267–321.

Figure 1
Contribution of the Industry Productivity Gap[a] to the Total Business Sector Gap, Israel Compared to OECD Average, 2011



SOURCE: Based on labor productivity data from the Central Bureau of Statistics, from the OECD, and from statistics bureaus of the US and the EU.

Figure 2
Education and Skills of Those Aged 16–65 in Israel and Other OECD Countries, Based on PIAAC Survey and Tests



SOURCE: Based on PIAAC data from the OECD and Central Bureau of Statistics.

fixed level of cognitive capabilities (according to the scores in international examinations conducted in the educational system). In contrast, cognitive capabilities do significantly explain the variance in growth, even when a fixed number of years of education is used. This result clearly shows that skills are important for growth, and it can be concluded that if the scope of education increases in a way that does not contribute to workers' cognitive skills, it will not contribute to economic growth and to the population's welfare.

2. Workers' skills by industry

In the preceding section, we saw that Israel has a large supply of low-skilled workers. In this section, we will show that workers' skills are inferior primarily in the industries in which productivity per worker is lower than the prevailing figure in the developed countries, and that this inferiority contributes to explaining the difference in productivity per worker in those industries.

Figures 3A–3D indicate that while there is a negative correlation between the difference in productivity and the difference in formal education, there is a positive correlation between the difference in productivity and the difference in literacy skills and in problem solving in a technology-rich environment. Only relatively small industries deviate significantly from the trend line. No correlation was found between the difference in productivity and the difference in numeracy skills. In general, the findings are consistent with the findings of Hanushek and Woessmann: In some industries, the advantage in the rates of higher education is not reflected in an advantage in labor productivity (and is even reflected in inferior productivity), while in most industries an advantage in cognitive skills[8] usually is reflected in an advantage in productivity.[9]

We will now focus on a comparison between industries with a positive contribution to productivity—manufacturing industries with a high proportion of exports—and industries with a pronounced negative contribution to productivity: manufacturing with a low proportion of exports, accommodation and food services, and the construction industry. Figures 4A–4D show that in all three categories of skills, workers' capabilities are consistently and significantly low in most industries, except for high-export manufacturing[10] and the accommodation and food services industry. Skills were particularly inferior in construction and trade—industries with a significant negative contribution to the difference in skills.[11] Skills were also inferior in low-export manufacturing[12],[13], even though the proportion of academics in these industries was higher than the proportion in the OECD countries. These are medium-low technology manufacturing industries, and their negative contribution to the difference in productivity per worker is clear in Figure 1.[14]

In contrast to the industries with inferior skills, skills in high-export manufacturing industries are not significantly lower than the average in the advanced economies, except for literacy. In these industries, productivity per worker is slightly higher than the average in the advanced economies, and they reduce the negative difference in productivity. The accommodation and food services industry is an exception—its productivity is lower than the average in the advanced economies, but its level of skills is similar. We clarify the reasons for this below.

Most of the findings therefore indicate that workers in industries with low productivity have inferior skills. These results also do not change when the results of tests for workers in the 25–35 age bracket are considered: In industries with a productivity problem, the same difference in skills exists among workers who are new to the labor

8 Statistical and technical limitations do not allow weighing examination scores to produce a single score in order to test the aggregate connection between skills and productivity.

9 Appendix Table 1 displays in greater detail the education and skills of workers in Israel and the difference between them and workers in the OECD in 15 industries, where manufacturing is divided into two groups of industries according to the proportion of exports.

10 The manufacturing industries (according to the 1993 classification of industries) in which exports account for at least 50 percent of total sales in the industry (according to the 2006 Input and Output tables) were mining and quarrying, textiles, leather and footwear, chemicals, plastics and rubber, machinery and equipment, electrical equipment, electronic components, control and supervision equipment, medical and optical equipment, and transport equipment.

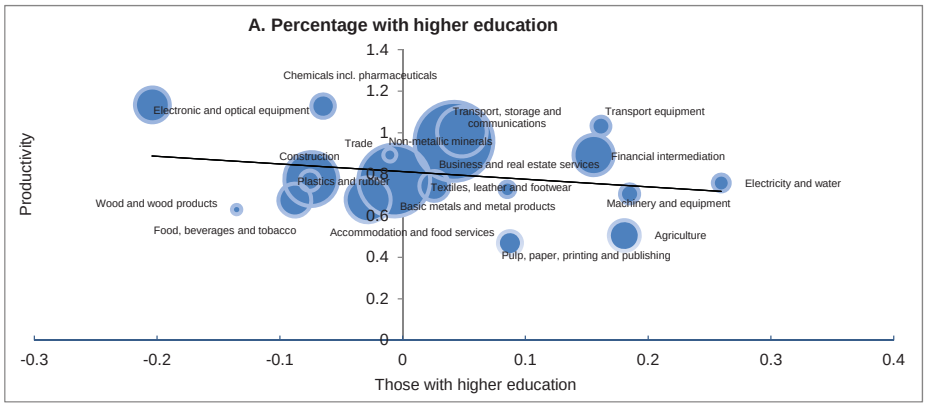
11 Their proportion of business sector employment is 10 percent and 19 percent, respectively.

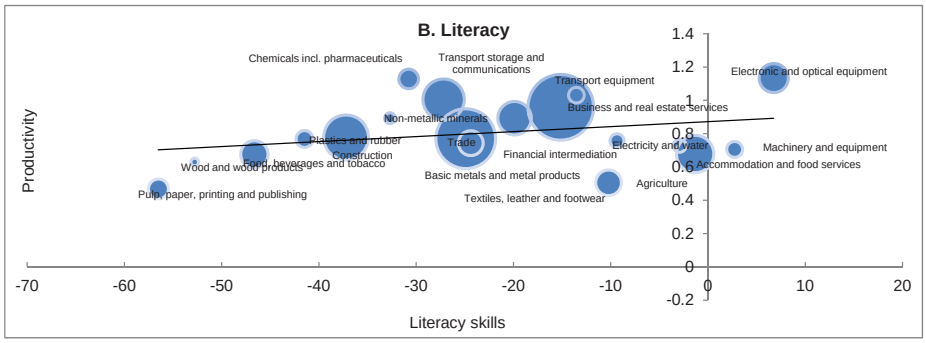
12 Low-export manufacturing industries (according to the 1993 classification of industries), in which exports accounted for less than 50 percent of total sales in the industry (according to the 2006 Input and Output tables) were food, beverages, and tobacco; clothing; wood and wood products; paper and paper products; printing and publishing; non-metallic minerals; basic metals; metal products; and furniture.

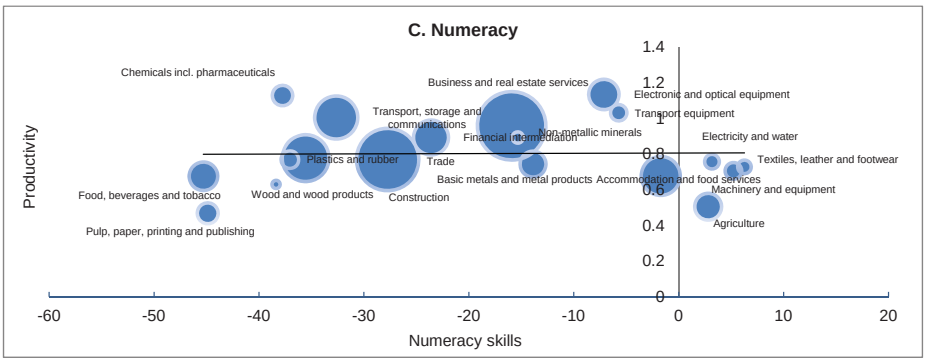
13 These industries employ about half of all manufacturing workers (about 10 percent of the workers in the business sector).

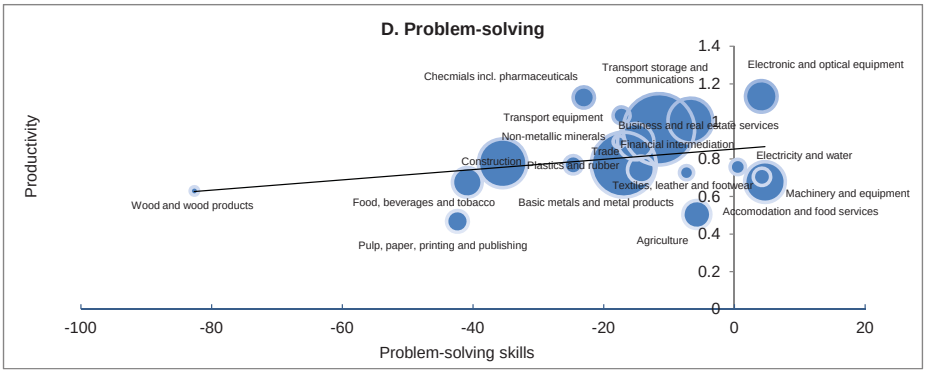
14 The division into high-export and low-export manufacturing industries is practically insensitive to the use of the export proportions characteristic of Israel, in contrast to the use of the percentages of exports characteristic of the major advanced economies (the US, the UK, Japan, and Germany). It therefore appears that the relatively high productivity and high quality of human capital are a result of general characteristics of the industries, including competition from overseas. The alternative explanation holds that the causality is in the opposite direction: when industries in Israel are successful exporters, their success is due to high productivity and high-quality human capital.

Figure 3
The Gaps in Workers' Skills and Education and the Productivity Gap in Primary Industries, Israel Compared to the OECD Average



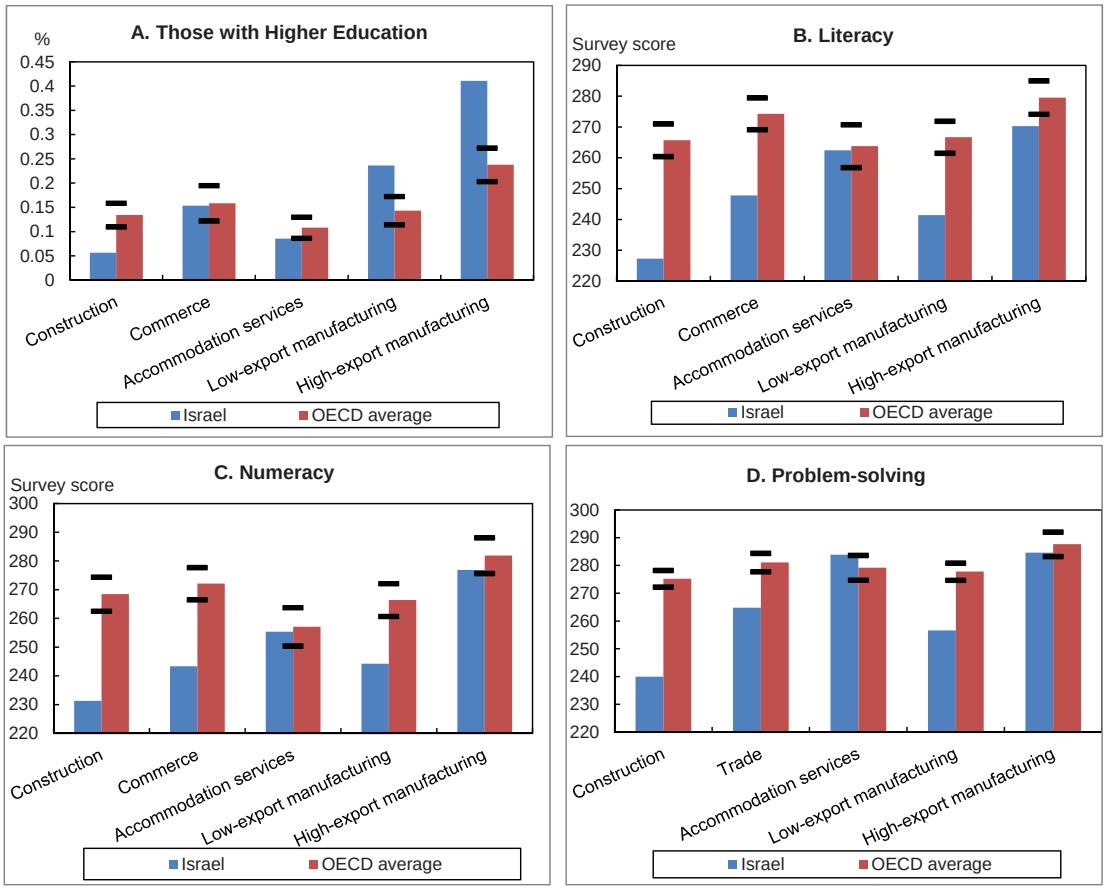






The size of the circles denotes the rate of those employed in the industry out of the total number of business sector employees.
SOURCE: Based on PIAAC data from the Central Bureau of Statistics and from the OECD, and from statistics bureaus of the US and the EU.

Figure 4
Education and Skills of Workers in Selected Industries, Israel and the OECD, According to PIAAC Survey Tests

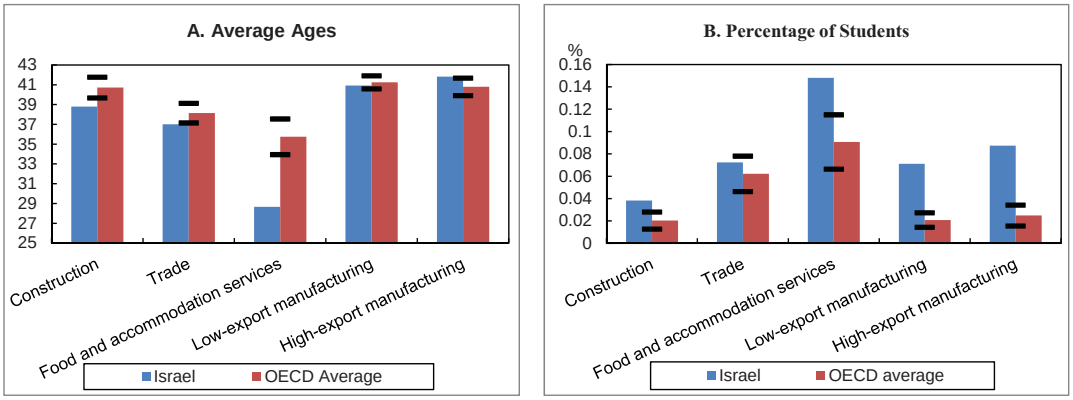


The horizontal lines denote the upper and lower bounds of the confidence interval of the OECD average, at a significance level of 5 percent.
SOURCE: Based on PIAAC data and labor productivity data from the Central Bureau of Statistics and from the OECD.

market—in other words, the inferiority in skills is not solely a result of a possible erosion of skills due to the type of activity and the low productivity per worker. Furthermore, the findings indicate that it is unreasonable to expect relative productivity to improve as a result of hiring workers with better skills, because the higher quality of skills among new workers in Israel, compared with their predecessors, is no more pronounced than the higher quality of skills among new workers in the rest of the world, compared with their predecessors. The lag in productivity is projected to persist unless a real change in workers' skills occurs.

In the accommodation and food services industry, the relative skills of the workers is surprisingly good, being similar to the OECD average, even though productivity in the Israeli industry is relatively low. The reason may be that in this industry, Israel employs foreign (mainly illegal) and generallypoorly-paid workers with poor skills who are not included in the skills survey. Figures 5A and 5B offer another explanation for the unique pattern in this industry: The average age of workers in the industry in Israel is significantly lower than the average age in the OECD—28 compared with 35—and such a difference is almost completely absent in other industries (the difference in the construction industry is on the borderline of significance). In addition, the industry employs a relatively high proportion of students (15 percent in Israel, compared with 9 percent in the OECD). On the average, young workers, and certainly students, achieve better results on skills tests than other workers in Israel (see the background remarks for the survey in Figure 3). It can therefore be concluded that in the accommodation and food services industry, Israel has a different composition of workers—one that includes young people in temporary jobs, including jobs held simultaneously with academic studies. Although these workers have high cognitive skills, their professionalism and salary are low—characteristics that are correlated with relatively low productivity.

Figure 5
Age and Schooling of Workers in Selected Industries, According to PIAAC Survey



The horizontal lines denote the upper and lower bounds of the confidence interval of the OECD average, at a significance level of 5 percent.
SOURCE: Based on PIAAC data from the Central Bureau of Statistics and from the OECD, and from statistics bureaus of the US and the EU.

3. The labor environment by industry

In Sections 1 and 2, we learned that even though the proportion of academics in Israel is higher than in most OECD member countries, the quality of human capital in Israel is low, at least according to the tests of workers' skills. We also learned that the quality of human capital is low mainly in the industries with low productivity, including among young people who recently joined the labor market. Figures 6A–6D hint that the low quality of workers is correlated with indications of an unskilled labor-intensive production function[15], a low level of physical capital per worker, and inferior technology. For example, in the construction industry, there is a relatively low proportion of workers who are not asked to perform physical work, while in export manufacturing, the proportion of such workers is relatively high. The workers in construction and trade make relatively little use of a computer in their work, compared with workers in other countries. In all industries—with the exception of the export manufacturing—there is less of a need to read instructions and deal with complex problems.

Summary and conclusions concerning policy

There is a high proportion of educated workers in Israel (BA or higher), but the basic cognitive skills of workers in the country are nevertheless low in comparison with the capabilities of workers in the OECD. The relative abundance of unskilled workers is channeled mainly into nontradable industries or industries that sell primarily to the domestic market. The low quality of the workers in these industries is correlated with relatively low productivity, a low-cost labor-intensive production function, a low level of physical capital, and a lack of advanced technology.[16]

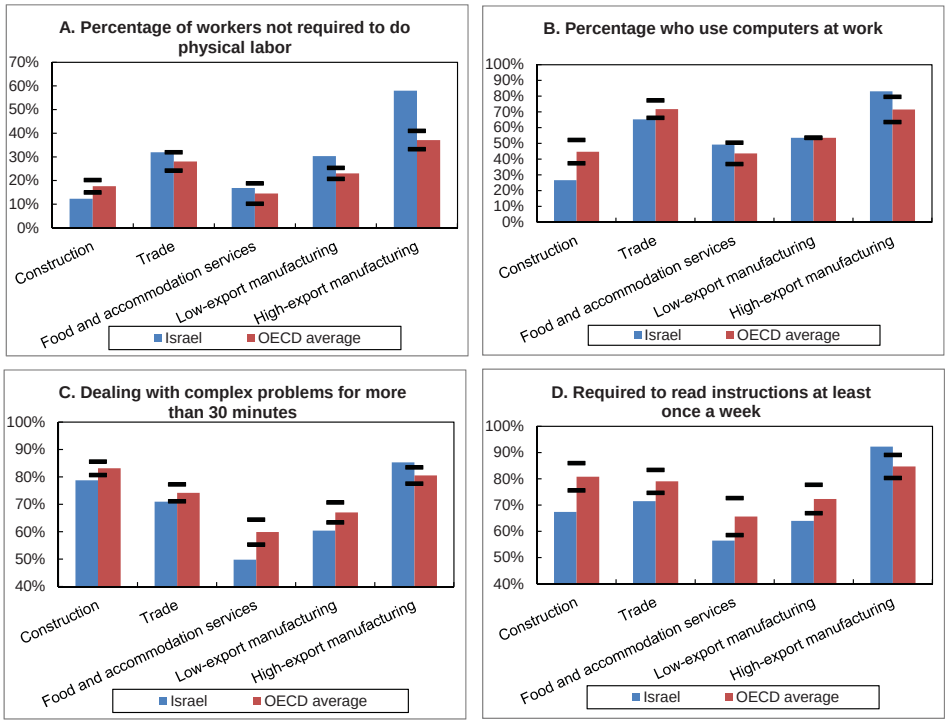
It follows that a real improvement in the quality of education in Israel is needed in order to increase the supply of skilled workers. According to the prevailing approach in the literature, the most effective investment in basic cognitive skills is obtained through education at an especially young age[17] (preschool and elementary school ages), and it is recommended to adopt this approach. It is particularly recommended to increase the extent of affirmative action in education, especially for preschoolers. This recommendation received support when the Central Bureau of Statistics

[15] The economic literature dealing with growth describes the process of creating goods and services (output) in companies and economies with a "production function" that includes (1) two production factors—physical capital and labor—and (2) a residual referred to as "overall productivity." This residual includes all the other variables that affect output, such as the quality of human capital, technology, physical infrastructure, quality of institutions, regulation, geography, and so forth. The output produced by each worker depends on the volume of the physical capital at his disposal (capital per worker) and on the residual. When companies use many workers and little physical capital, they are referred to as "companies with a labor-intensive production function."

[16] In analyses we conducted previously, we found that in industries selling to the domestic market, the investment in physical capital as a proportion of output was low in comparison with investment in the OECD, while investment in manufacturing (a tradable industry) was similar to the OECD average. See Table 3 in the productivity report for the Eli Hurvitz Conference on Economy and Society, 2014. http://www.idi.org.il/media/3742188/productivity_2014.pdf (in Hebrew).

[17] Heckman, James J. and Dimitry V.Masterov (2007), "The Productivity Argument for Investing in Young Children," *Applied Economic Perspectives and Policy*, Volume 29 Issue 3, pp. 446–493.

Figure 6
Type of Work According to Workers' Reports to the PIAAC Survey



The horizontal lines denote the upper and lower bounds of the confidence interval of the OECD average, at a significance level of 5 percent.
SOURCE: Based on PIAAC data from the Central Bureau of Statistics and from the OECD, and from statistics bureaus of the US and the EU.

found[18] that inequality in test scores in Israel was especially pronounced in comparison with other advanced economies, and noted that studies had found that closing gaps at later ages usually involved incomparably higher costs.[19] At the same time, improving the basic skills of adults through special programs for population groups among whom the survey found especially low achievement is also recommended.[20]

Improving workers' basic skills will improve their ability to adjust to a dynamic economic environment, increase the range of their employment possibilities, and increase the wages that they can obtain. In the long term, a policy devised with these objectives in mind will give firms an incentive to increase the stock of human capital per worker, and to streamline through the use of technological innovation, and will do so in a fundamental way. In other words, it will address the problem, not its symptoms. In contrast, direct subsidies for investment and innovation in the economy may well contribute to the removal of other barriers, but its success will be confined to the treatment of symptoms, and by itself, it is also liable to cause structural distortions in the economy in the long term. By way of illustration, it is liable to cause firms to prefer investment in machinery to hiring workers, even if the economic situation justifies hiring workers.

The tools that the government has been using over the years to support industries focus on the tradable—especially high technology—industries, an area that employs workers with highly developed skills.[21] The nontradable industries, however—which by nature sell exclusively to the domestic market, such as construction, trade, and services—employ workers with poor skills and receive little support. A general

[18] "New – Preliminary Findings from the Israeli Survey of Adult Skills, 2014-2015," http://cbs.gov.il/reader/newhodaot/hodaa_template.html?hodaa=201606198 (in Hebrew).

[19] See Carneiro, Pedro and James J. Heckman (2012), "The Evidence on Credit Constraints in Post-Secondary Schooling," *The Economic Journal*, 112.482, pp. 705–734.

[20] The survey found that among Arabs, skills were especially poor in all areas of knowledge, and among ultra-Orthodox Jews, skills were especially poor in problem solving in a technology-rich environment. Further discussion and results appear in the Central Bureau of Statistics publication, "New – Preliminary Findings from the Israeli Survey of Adult Skills, 2014-2015", http://cbs.gov.il/reader/newhodaot/hodaa_template.html?hodaa=201606198 (in Hebrew).

[21] These tools includes the Encouragement of Capital Investment Law, subsidizing research and development, and trade risk insurance, and in the past also included subsidies for venture capital funds.

policy of improving the skills of children and adults in the lower levels, combined with measures for enhancing competition and innovation in the industries that have been left behind, is likely to contribute to realization of a significant part of the growth potential in the industries that sell to the domestic market, and to increasing economic welfare in the long term.

The link between socioeconomic status and health[1]

- In Israel, as in other countries, the segment of the population with a low socioeconomic status displays higher illness and mortality rates than the segment whose socioeconomic status is high.
- The literature dealing with this area points to mechanisms that explain how socioeconomic status may be the reason for the state of a person's health and even that of his children. At the same time, there is also a reverse causality, since poor health may affect a person's ability to work as well as the socioeconomic status itself.
- A low socioeconomic status that has a negative impact on health may also have a negative impact on well-being, output and productivity, and may result in additional costs to the government in financing health services and benefits. When there is reverse causality, indices of low socioeconomic status may still signal the existence of increased healthcare needs, thereby helping in the direction of resources to improve health.
- The weaker population tends to rely more on hospitalization services and less on most community health services. This composition might lead to treatment that is provided too late in degenerative illnesses and to lack of efficiency and waste. The use of community health services is also affected by the availability and accessibility of those services.
- In localities in Israel, a lower socioeconomic index is correlated with relatively higher mortality rates. The (age-adjusted) average mortality rate in localities in the lower half of the socioeconomic index is 11 percent higher than in the localities in the upper half.
- A lower level of education is correlated with a worse state of health, which is apparently affected by less healthy behavior, increased exposure to risk factors and stress, and difficulties in accessing health services. This correlation may explain why those with lower education have higher rates of absenteeism from work for health reasons than those with higher education, as well as unemployment and nonparticipation in the labor force for those reasons. This gap in working age morbidity may adversely impact output and productivity.
- Children whose parents have low income or experienced periods of poverty in the past have a lower chance of benefiting from good health. Income and higher education among adults are correlated with a lower likelihood of a deterioration in health within a 2–3 year period.

Written by Eran Polytzer.

[1] The major part of the discussion is based on Avni, S., E. Politzer, and A. Shmueli (2016), "The Economic Burden of Health Gaps Connected to Socioeconomic Gaps in Israel", a report for the Israel National Institute for Health Policy Research. This study is supported by a grant from the Israel National Institute for Health Policy Research..

1. Background—The link between socioeconomic status and health

The link between socioeconomic status and health outcomes such as mortality or morbidity is strong, ancient, and observed in both wealthy and poor countries. A variety of studies and data show that higher income, higher education and higher social status are correlated with a longer life expectancy and better health, and that this link exists at all socioeconomic levels. This is also the situation in Israel. For instance, residents in localities that are socioeconomically stronger have low mortality rates (as detailed below); there is a higher risk of mortality among those with lower education than among those with higher education[2]; and the life expectancy of Arab women is 3 years less than the life expectancy of Jewish women (84.1 years).[3]

While the correlation between socioeconomic status and health is clear, the nature of that link, directions of causality, and mechanisms through which the link exists are not completely clear.[4] Researchers have indicated a number of mechanisms that may explain how low education and income could be a cause of poor health. These include a stronger tendency toward behavior that is damaging to health (such as smoking, drinking alcohol, and unbalanced nutrition) due to obtaining little information on the damages of such behavior, social effects, or less future-focused education; work in more dangerous professions (such as construction and manufacturing); less access to advanced healthcare services due to financial limitations or limited information; psycho-social stress due to exclusion and low social status;

[2] Among Jewish men aged 45–64, the mortality risk of those with 9–12 years of schooling is 50 percent higher than the risk among those with 13 or more years of schooling (9.3 compared with 6.3 deaths per thousand, age-adjusted). The data are for the decade ending in 2004, and indicate a widening of the gap compared to the previous decade. See: Jaffe, D., Y. Neumark, Z. Eidenback and O. Manor (2008), "Educational Inequalities in Mortality Among Israeli Jews: Changes Over Time in a Dynamic Population", *Health and Place, 287–298.*

[3] Average life expectancy between 2010 and 2014. Central Bureau of Statistics, "Statistical Abstract of Israel, 2015 – Number 66".

[4] For a review of the literature dealing with the link between socioeconomic status and health (emphasizing the economic literature), see: Cutler, D., A. Lleras-Muney and T. Vogl (2011). "Socioeconomic Status and Health: Dimensions and Mechanisms", in Glied, S. and P. Smith (Eds.) *The Oxford Handbook of Health Economics* pp. 124–163, Oxford University Press; Cutler, D. and A. Lleras-Muney (2012). "Education and Health: Insights from International Comparisons", *NBER Working Paper Series* No. 17738; J.P. Smith, (1999). "Healthy Bodies and Thick Wallets: The Dual Relation Between Health and Economic Status", *Journal of Economic Perspectives* 13, Number 2—Spring 1999, pp. 145–166.

residence in separate neighborhoods and localities awash in health risks (such as pollution and a lack of green spaces), and more.

In contrast, some of the correlation may be a result of reverse causality, since poor health can have a negative impact on income due to difficulty in working. In addition, damage to health at a young age may be a third cause explaining the correlation, since it has a negative impact on both health in adulthood and on socioeconomic status if it leads to obtaining less education later on. However, since many studies show that high income and high education among parents contributes to the health of the child[5], and the health of children has an effect on their health and income as adults, it is possible that here too, socioeconomic status has an effect on health, the nature of which in this case is intergenerational.

It is possible to relate to health as a kind of inventory that, for the most part, erodes or diminishes over the years, whether due to health shocks resulting from the aforementioned reasons, or for random reasons. Even when the health shocks are random, a high socioeconomic status (of a person or his family) may protect a person from a permanent erosion of his health inventory resulting from the shock (for instance thanks to the ability to obtain better healthcare services, a better understanding or better adherence to medical instructions, a stable and more healthy environment in which to recover, and so forth). If similar health shocks have a greater effect on people with a lower socioeconomic status, then random shocks (at a similar pace) will over time lead to the development of health gaps based on socioeconomic status.

Identifying the causal directions and their contribution to the correlation between socioeconomic status and health has implications for the required policy measures. If low income, education and social status are damaging to health, social policy that improves the income, education and status of those suffering from poor socioeconomic status will also improve their health. If so, when considering such social policy measures, the increased benefit they will have on public health should also be taken into account.[6] The more reverse causality there is, the less the health benefit derived from improved income among the poor and from investment in greater education will be (and such measures may even divert resources from the required improvements in the healthcare system itself).

Be the weight of each causality direction as it may, the correlation between socioeconomic status and health can help identify increased healthcare needs and direct resources to the population groups suffering from poor health. For instance, the inclusion of socioeconomic factors in the formula for risk adjustment (capitation) that distributes the health basket budget among the health funds may help in directing the appropriate resources to socioeconomically weaker population groups, which have more healthcare needs than stronger population groups. Moreover, even without fully identifying the causality directions and their weights, policy can attempt to have a direct impact on the mechanisms that may connect socioeconomic status with health. For instance, education and incentives toward a healthy lifestyle (including balanced nutrition, physical activity, smoking prevention, and so forth); increased awareness of genetic examinations and the damage from intrafamily marriage; improved access to healthcare services for weaker population groups; supervision of safety and hygiene at dangerous workplaces; and similar measures may improve the health of weaker population groups more significantly than the health of the rest of the population, and reduce the gaps resulting from socioeconomic status.

2. Assessing the cost of health gaps

Poor health of a broad population group may lead to costs to the economy and to players active in it (relative to an imaginary (counterfactual) scenario in which there are no health gaps). The possible costs include:

A negative impact to the well-being of citizens and their family members due to early mortality and living with poor health;

A negative impact to output and productivity in the economy due to the mortality of working-age workers, and due to excess morbidity at those ages causing a negative impact to employment, absenteeism from work, and less accumulation of human capital;

5 In panel data for the US, Condliffe and Link (2008) find that children with a low socioeconomic status suffer from many more health shocks as they grow up, and recover less well from previous health shocks, than children with a high socioeconomic status. Apouey and Geoffard (2013) find that family income affects the health of children age 2 and above in the UK, and show that among children from families with low incomes, chronic morbidity is more common and more serious. Both find a significant effect even after taking steps to reduce endogeneity of family income. See: Condliffe, S. and C. R. Link (2008). "The Relationship Between Economic Status and Child Health: Evidence from the United States", *American Economic Review*, 98:4, pp. 1605–1618; Apouey, B. and P. Geoffard (2013). "Family Income and Child Health in the UK", *Journal of Health Economics* 32, pp. 715–727.

6 This approach (referred to as "Health in All Policies") calls on policymakers to take into account the ramifications of policy measures on health in a variety of fields. See, for instance: World Health Organization (2014) "Health in All Policies: Helsinki Statement, Framework for Country Action."

Costs of additional medical treatment due to excess morbidity, financed by the government or the individuals (costs which may be smaller if the health gaps are a result of the undersupply of healthcare services);

Additional disability benefits due to excess morbidity (and against that—savings in old-age benefits due to early mortality).

In order to assess the costs resulting from a negative impact to health due to socioeconomic gaps, we must identify the extent of these gaps' effects on health, including a deduction of the possible effects acting in the opposite direction. We will not attempt that task here, but we will present estimations attaching monetary values to the correlations between socioeconomic status and health. These estimations examine the existing gaps compared to a counterfactual scenario of equality, in which the weaker population enjoys the same average health as the stronger population.[7] The use of the difference between the actual cost and the cost in the alternative scenario essentially assumes that the observed correlation is entirely the result of the socioeconomic gaps' effect on health, and not of reverse causality. This assumption is too strong, and the costs shown may therefore serve only as a ceiling for the actual costs. In contrast, the costs shown only take into account the health gaps of the weak population group, while such gaps exist more continuously, among people with better socioeconomic standings. Taking the health gaps throughout the entire socioeconomic scale into account would certainly have increased the cost estimates.

It is notable that the estimate uses an equality scenario in which the health of the entire weaker population group is improved, but does not set out how this equality scenario can be achieved, and in particular does not assess what the cost of its realization would be. Therefore, this work is not a cost-benefit test of programs to reduce health gaps, but it may serve as a first step in this direction, since it provides an estimate of the potential benefit of reducing such gaps.

3. Evidence of the link between parents' income and education and their children's health

High parental education and income may protect their children from the long-term damages of health shocks. Evidence of this can be found in a number of countries (see footnote 5 above). The Central Bureau of Statistics' long-term survey provides evidence from Israel as well of the correlation between parental income and education and their children's health.

Table 1 shows the marginal effects of probit regressions that examined how various factors are correlated with the likelihood that a child (up to age 18) will be in "very good" health (the highest level), according to the subjective assessments of the survey's respondents.[8] The regressions were estimated for a single survey year (2014–15), and controlled for demographic variables (age, gender, nationality and religion). The estimates show a positive and significant, though very small, correlation between household income and the health of the children in that household. An additional NIS 100,000 of annual household income (beyond the average income) increases the likelihood of the children having good health by only 0.5 percentage points (version (1) of the regression in the table), and this estimate changes only slightly when controlling for other variables.

A more significant correlation was found between a worsening of the economic situation in the past year and worse health among the children (Version (2)). The likelihood of children from families whose financial situation deteriorated being in very good health was 3.4 percentage points lower than that of children whose families did not experience such a deterioration. It is notable that the direction of causality behind this correlation is not completely clear, since a worsening in the health of a child may have a negative impact on parental or household income. The negative correlation is maintained and even strengthened when examining families in the top four quintiles of the income distribution, meaning that the negative link exists even in households that are not poor where the financial situation has worsened.

There is stronger evidence of the effect of parental income over their lifespan on the health of their children. Children of parents who had experienced poverty in the past, five or

[7] This method is also used in other studies that attempted to assess the cost of health gaps. See: "Estimating the Costs of Health Inequalities", a report prepared for the Marmot Review, London: Frontiers Economics (2010); Mackenbach, J.P., W.J. Meerding and A.E. Kunst (2011). "Economic Costs of Health Inequalities in the European Union", *Journal of Epidemiology & Community Health* 65, pp. 412–419.

[8] Self-reporting on the state of health may suffer from bias, which may also be linked to socioeconomic status. In this framework, we did not examine the existence of such deviations or their effect on the estimates we obtained. Regarding heterogeneity in health reporting in surveys conducted in Israel, see Shmueli (2003). Etile and Milcent (2006) found heterogeneity by income in the reporting on health in France, and showed that the use of a dummy variable for the worst health, instead of for all four possible levels, helps deal with the heterogeneity. In this work, we adopted a similar approach, with a dummy variable for the best health. See: Shmueli, A. (2003), "Socio-economic and Demographic Variation in Health and in its Measures: The Issue of Reporting Heterogeneity", *Social Science and Medicine*, 57, pp. 125–144; Etile, F. and C. Milcent (2006), "Income-related Reporting Heterogeneity in Self-assessed Health: Evidence from France", *Health Economics*. 15, Issue 9, pp. 965–981.

Table 1

The correlation between household income and parental education variables and the likelihood that a child will have very good health (by subjective evaluation) - marginal effects from a probit regression

The likelihood of very good health among children (percentage points; Z values in parentheses)	(1) Base	(2) Plus Past income variables	(3) Excl. 20 percent poor	(4) Education in place of income	(5) Education and income together
Household income (NIS thousand per year)	0.005**	0.006**	0.007***		0.003
	(2.13)	(2.36)	(2.64)		(1.43)
Worsening of financial situation in the past year		3.37-**	4.79-**		2.56-
		(2.00-)	(2.44-)		(1.48-)
One parent felt poor 5 or more years ago		4.77-***	4.85-***		3.13-**
		(3.93-)	(3.66-)		(2.34-)
Mother's years of schooling				0.13	1.33
				(1.11)	(0.98)
Father's years of schooling				0.34***	2.60*
				(3.02)	(1.95)
Arab household	4.55-**	3.22-	3.69-	3.04-	0.30-
	(2.01-)	(1.44-)	(1.51-)	(1.34-)	(1.28-)
Christian household	7.96***	7.54***	7.88***	7.61***	7.68***
	(4.29)	(3.98)	(3.86)	(4.08)	(4.09)
Ultra-Orthodox household	0.068	2.48**	2.40*	4.88***	4.79***
	(0.06)	(1.97)	(1.69)	(2.75)	(2.69)
Age and gender	+	+	+	+	+
Number of observations	4,296	4,296	3,788	3,721	3,610
Wald chi2	49.4	68.4	64.99	61.86	67.73

Note: * denotes that the coefficient is different than zero at a significance level of at least 10 percent. ** denotes a level of at least 5 percent. *** denotes a level of at least 1 percent.

more years ago[9], are significantly less likely (4.8 percentage points) to be in very good health. This link even exists if we exclude the 20 percent poorest households from the sample. The link remains significant even when examining the effect on children aged less than 5 years (a regression that is not presented here). In this case, the health of a child who was not yet born cannot be the cause of a parent's feeling of poverty, and reverse causality (a child's morbidity affecting parental income) is therefore not possible.

An examination of parental education found a positive correlation between a father's education and the health of the children. Controlling for income variables (which control somewhat for the quality of education), an additional year of schooling for the father increases the likelihood of good health for the children by 2.6 percentage points. The mother's education also has a positive correlation with the health of the children, but this correlation is not significantly different than zero.

9 Survey respondents were first asked, "From age 15 until today, were there periods when you thought you were poor?" and were then asked, "When was the last time you thought you were poor?". Someone reporting that they felt poor five or more years ago essentially reported that he did not feel poor in the past five years.

4. Evidence of the link between income and education and the change in health among adults in Israel

Using the Central Bureau of Statistics' long-term survey, we also examined the correlation between income and education of adult individuals (above age 18) and the likelihood that their health will deteriorate within 2–3 years (between 2012 and 2014-15). The estimates presented in Table 2 (Version (1)) show that higher household income in 2012 is significantly correlated with a (slightly) lower likelihood of a decline in health (by self-assessment) two-to-three years thereafter. Adding NIS 10,000 to the (average) annual income is correlated with a 0.2 percentage point lower likelihood of worsening health. This correlation is obtained taking into account the age and gender of the individual, his demographic group, and his health at the starting point (2012). Since the deterioration of health today does not affect past income, it is more likely that a significant part of the correlation reflects a causal connection between past income and a deterioration of health.[10] The change in income in past years is not significantly correlated with a decline in health, and it therefore seems that the correlation between income and health is weaker in the short term.

The correlation between an individual's education and the likelihood of a deterioration in his health over three years is also statistically significant (Version (2)). The likelihood of a deterioration in the health of an individual with more than 12 years of schooling (17 percent) is 7.2 percentage points lower than the likelihood of someone with a lower level of education (a result obtained when controlling for age, gender, health at the beginning of the period, and demographic group). The correlation between higher education and the relatively low likelihood of a worsening of health remains significant when including the individual's household income in the regression (Version (3)). Among

Table 2

The correlation between adult individuals' income and education and the likelihood of a worsening of their health over 2–3 years, marginal effects according to probit regression

The likelihood of a worsening of health between 2012 and 2014/5 (percentage points; Z values in parentheses)	(1) Income	(2) Education	(3) Income and education together
Household income in 2012 (NIS thousand per year)	0.02-***		0.017-***
	(5.52-)		(4.82-)
Change in household income, 2014 compared with 2012 (NIS thousand per year)	0.0046-		-0.004
	(1.45-)		(1.27-)
Higher education (more than 12 years of schooling)		7.19-***	6.25-***
		(5.57-)	(4.76-)
Health in 2012	***-1.51	***-1.49	***-15.7
	(-17.34)	(-17.71)	(-17.9)
Arab	8.14**	7.5***	6.75**
	(2.70)	(2.64)	(2.3)
Christian	1.59	0.93	0.69
	(0.52)	(0.32)	(0.23)
Ultra-Orthodox	1.53	3.97	2.52
	(0.35)	(0.87)	(0.56)
Age and gender	+	+	+
Number of observations	5,648	5,794	5,648
Wald chi2	345.51	362.57	376.63

[10] Although, it is still possible that health in the more distant past may be a third factor affecting both a decline in health today and income in the past.

individuals with similar education, adding NIS 10,000 to the (average) annual income is correlated with a reduction of 0.17 percentage points in the likelihood of a negative impact to health.

In all estimations, the likelihood that Arabs will experience a worsening of health over the period (2–3 years) is about 7 percentage points higher than that of the rest of the population (even when taking differences in income, education, age, gender and health at the beginning of the period into account).

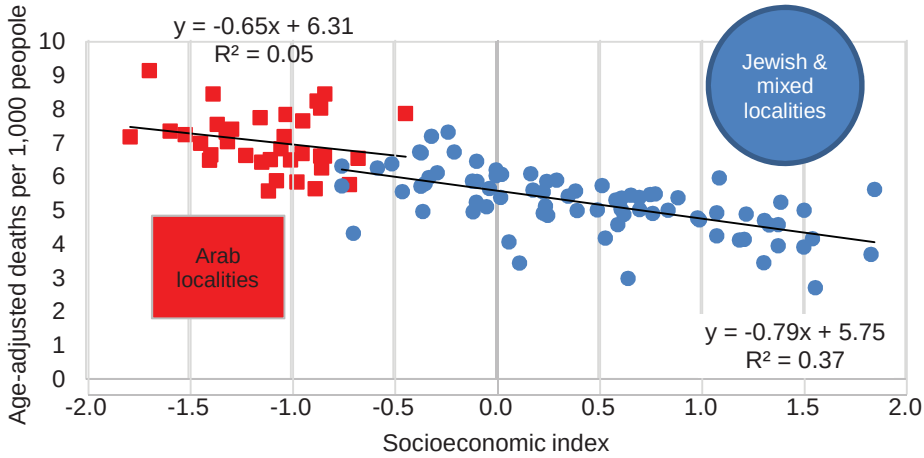
5. The correlation between a locality's socioeconomic status and mortality rates

A low socioeconomic status is correlated with increased mortality both in Israel and in other advanced economies. A simple examination of age-adjusted mortality rates in 119 large localities in Israel[11] shows that mortality rates in each year in weaker localities (based on their socioeconomic index[12] ranking), is higher than in the stronger localities. As Figure 1 shows, this correlation is typical of both Arab- and Jewish-majority localities, and the gradient exists through all index values: Even among stronger localities, the mortality rates in the stronger of those localities is lower than in those less strong. The all-localities correlation shows that a decline of 1.35 percentage points in the socioeconomic index ranking of a locality is correlated with one additional death out of every thousand people in that locality. The age-adjusted mortality rate in localities in the lower half of the socioeconomic index is 11 percent higher than in the upper half.

Detailed mortality data show that mortality gaps are significant in all age cohorts (Figure 2). For instance, out of every 10,000 people aged 55–64 living in localities in the lower half, 14 more people die each year than in localities in the upper half (a gap of 25 percent). Mortality rates among toddlers aged 0–4 in localities in the lower half are 89 percent higher than in the upper half (6 extra deaths per 10,000 toddlers).

The reasons for the positive correlation between the socioeconomic index ranking of the locality and its mortality rates are not completely clear, but the gap is significant: On average, the surplus deceased in localities in the lower half of the index lost about 33 future life years, of which 12 were during working ages.[13] In a counterfactual scenario, had the

Figure 1
Age-Adjusted Mortality Rate and Socioeconomic Index in Localities with More than 10,000 Residents, Divided by Majority Nationality

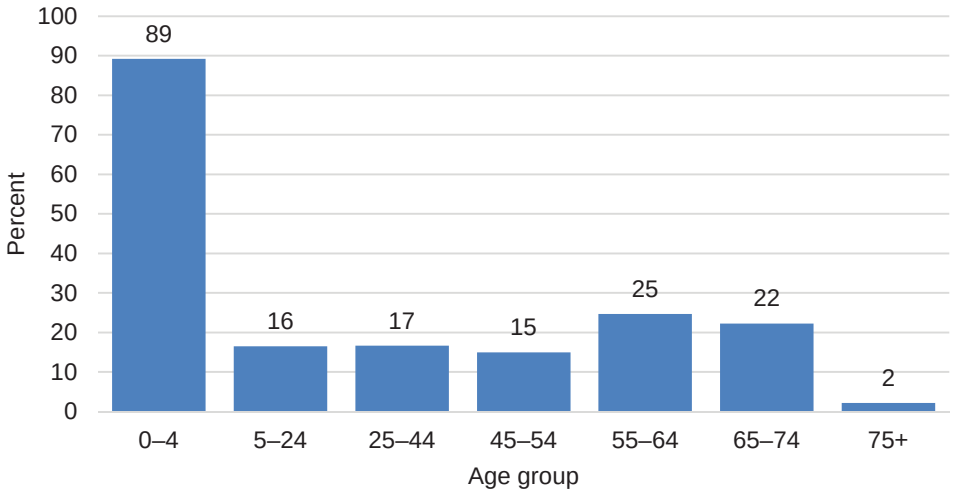


[11] Localities with more than 10,000 residents, which include 84.5 percent of the Israeli population. The data on these localities are taken from "Socioeconomic Profile of Localities in Israel, 2005–2009", Central Bureau of Statistics and Ministry of Health.

[12] This index reflects the socioeconomic level of the population in a locality, and the Central Bureau of Statistics calculates it based on 16 variables in areas of demography, education, employment and retirement and standard of living (including per capita income).

[13] The number of additional years of life is calculated by the number of years between the time of actual (surplus) death and the time of death had the person continued living to full life expectancy expected at the age at which he died. Since we use life expectancy of the entire population, and not just the upper half of localities, this contains some underestimate. In addition, for the purpose of the calculation and due to data limitations we assumed that deaths after age 75 (4 percent of the population) do not lead to any lost years of life. It is notable that the calculation is static and, for instance, does not take into account the possible dynamic effects of child mortality on the number of children their parents will have.

Figure 2
Surplus Average Mortality Rate in the Lower Half of Localities Relative to the Average Mortality Rate in the Upper Half of Localities, by Age Group
(percent)



mortality rates in the lower half of the index for each age and gender been identical to the average in the upper half, each resident in the lower half would have gained another 4.6 days of life each year on average (of which 1.4 days during working age). This may be an overestimate the most cases there are of reverse causality, where morbidity causes people who lived in stronger localities to move to weaker localities (where the cost of living is, for the most part, lower), and leads to higher mortality rates in the weaker localities.

6. The correlation between education and working-age morbidity

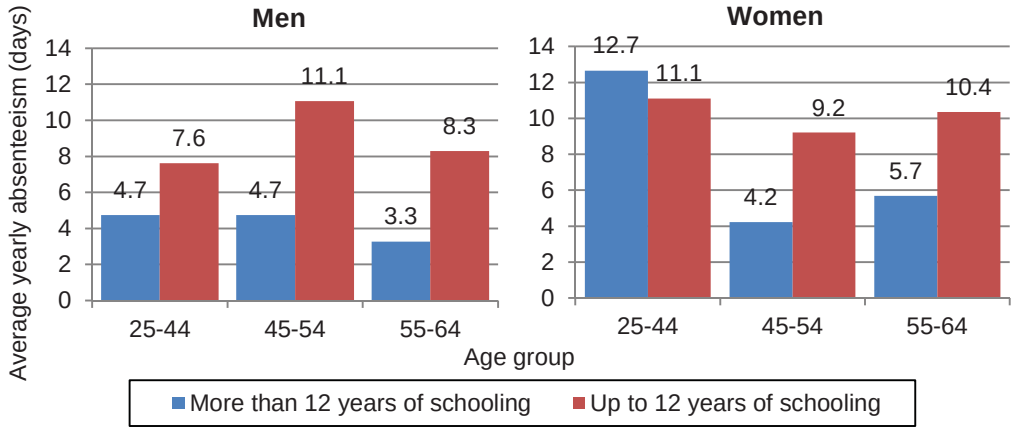
Similar to other countries, the figures in Israel indicate a positive correlation between lower education and relatively high morbidity. Figures from the Central Bureau of Statistics Social Survey show that the likelihood of a worker with more than 12 years of schooling reporting that his health is generally "very good" is 72 percent higher than the likelihood of a worker with less education (when controlling for the worker's gender and age). The likelihood of a worker with higher education reporting a chronic physical or health problem is 42 percent lower than that of a worker who does not have such education (Table 1). Surplus morbidity among those with lower education may have a negative impact on their ability to participate in the labor force and persist at employment, and may also increase absenteeism and presenteeism (a negative impact on productivity due to working while sick). In the following sections, we estimate the correlation between workers' education and their absenteeism due to illness, and the correlation between education and unemployment or nonparticipation in the work force due to illness.

a. Absenteeism due to illness

In this section, we used data on individuals surveyed in the Central Bureau of Statistics Social Survey (2010) and who reported that they are working, but that they were absent from work in the past month due to illness.[14] The survey data show that the likelihood of an average worker with high school or lower education (up to 12 years of schooling) being absent from work due to illness (controlling for gender and age) was 18.4 percent—higher than among workers with post-secondary education (15.9 percent). In addition, the average duration of absence among workers with lower education (4.9 days per worker) is longer

[14] The survey was conducted among a fixed population group of those aged 20 and above, and included 4,823 working individuals, representative of 2.9 million workers in the population. There were full data regarding 3,703 working individuals, of which 607 individuals reported that they had been absent in the past month "due to illness or a health problem that is not a result of an accident". These represent 363,000 workers among the population.

Figure 3
Absenteeism Due to Illness—Yearly Average Per Worker By Level of Education, Gender and Age Group



than that of workers with higher education (3.9 days).[15],[16] Figure 3 shows the average annual number of sick days per worker by level of education, in the main age groups. Excluding educated women aged 25-44, who are absent slightly more than women with lower education in the same age range, we found that in both genders, and at all ages, workers with lower education are absent from their jobs for more days than workers with higher education. The link between higher education and absence from work remains negative, but is not significant when controlling for age, gender, nationality and origin of the workers, the differences between physical work and other work, and the extent of the workers' job satisfaction. In contrast, even when taking into account all of these characteristics, the correlation with duration of absence due to illness remains significant: An educated worker's absence is about 0.8 days (per month) shorter than a worker with lower education.[17]

In order to find hints to the mechanisms responsible for the link between education and absenteeism from work, we examined the correlation between higher education (more than 12 years of schooling) and factors that may have an effect on health, while controlling for the worker's age and gender (Table 3). It is clear that relative to workers with higher education, those with lower education have worse health behaviors—they smoke more (from a young age) and suffer more from passive smoking, are less aware of healthy nutrition, do less physical activity, and suffer more from obesity. Workers with lower education suffer more from stress and report a weaker social network. In terms of access to healthcare services, workers with lower education are more likely to forego medication or medical treatment for financial reasons. Workers with lower education work more at jobs that require physical effort (and are sometimes more dangerous), and tend to be less satisfied with their jobs. These characteristics may on their own have a negative impact on health, and may therefore have an effect on the observed link between education and health. Here too, reverse causality is also possible in some cases: Lower health may have a negative impact on obtaining education due to physical difficulty, or due to its impact on future return on education. However, since education is, for the most part,

[15] It seems that these gaps are not a result of the overuse of sick days as an alternative to vacation days in the lower half, since those absent in both halves are entitled to a similar amount of paid vacation days—about 19 per year. Moreover, according to the survey, the share of employees entitled to paid sick leave from the first day of absence in the lower half (55 percent) is lower than in the upper half (61 percent). This gap actually reduces the incentive to take short sick leaves (which sometimes replace vacation days).

[16] The longest duration that can be reported as an absence in the survey was "11 days or more". The calculation here was made assuming that the average length of leave for individuals that reported such an absence is 15 days. Assuming an average of 20 days does not significantly change the estimated cost shown below.

[17] An examination of absenteeism was made through a logistic regression in which the dummy variable for absence was the dependent variable. An examination of the duration of absence was made through an OLS regression in which the duration of absence in days was the dependent variable. In this regression, the level of significance of higher education as an explanatory variable for the duration of absence is higher than 5 percent (t=2.1).

obtained at a young age, while the health gaps examined here also exist among adult workers, it is likely that in most cases it is not the sole explanation.

The gaps in absenteeism between workers with higher education and those with lower education are significant: Had the workers with lower education been absent from their jobs at a rate similar to those with higher education, the economy would benefit from additional work days valued at NIS 1.6 billion per year—0.15 percent of GDP (in 2014 terms).[18]

b. Unemployment or nonparticipation in the labor force due to illness

Thus far, we have examined the effect of morbidity on worker absenteeism, but a person's illness may have implications for his employment and labor force participation. According to data from the Central Bureau of Statistics Social Survey (2012), about 1.7 percent of the adult population does not work due to illness (meaning physical limitation, disability or chronic illness). About one-quarter of them are unemployed (actively looking for work), and the rest do not participate in the labor force at all. The rate of those who do not work due to illness among those with high school or lower education (2.3 percent) is twice as high as the rate among those with postsecondary or academic education (1.1 percent). This difference is even larger among individuals aged 25–54 (Figure 4), and is mainly the result of gaps between men. It

Table 3

The likelihood of workers with higher education having certain characteristics relative to those with lower education (percent)

The likelihood of a worker with higher education, relative to one with lower education[a]	(percent)
State of health:	
Reporting that his health is generally "very good"	+72
Reporting a prolonged health or physical problem	-42
Healthy behaviors:	
Smoking at least once per day	-43
Reporting that he began smoking prior to age 18	-56
Being exposed to second-hand smoke to a great or very great extent	-48
Examining nutritional information on food packages, or reporting that nutrition habits are influenced by advertisements regarding healthy nutrition	+128
Being physically active at least once a week	+123
Being obese (BMI of at least 30)	-30
Stress and social support networks:	
Feeling stressed or depressed or reporting that worries interfere with sleep	-14
Reporting social connections (including meetings or phone conversations)	+234
Assessing that there are people who have helped him during crisis or distress	+139
Type of work:	
Working at an occupation that requires physical labor[b]	-44
Having job satisfaction	+77
Access to healthcare services:	
Foregoing medications or medical treatment for financial reasons[c]	-55

[a] Based on odds ratios from logistic regressions where the dependent variable is the characteristic that appeasrs in each row in the table, and the explanatory variables are gender, age and a dummy variable for those with higher education.

[b] Agriculture, manufacturing, construction.

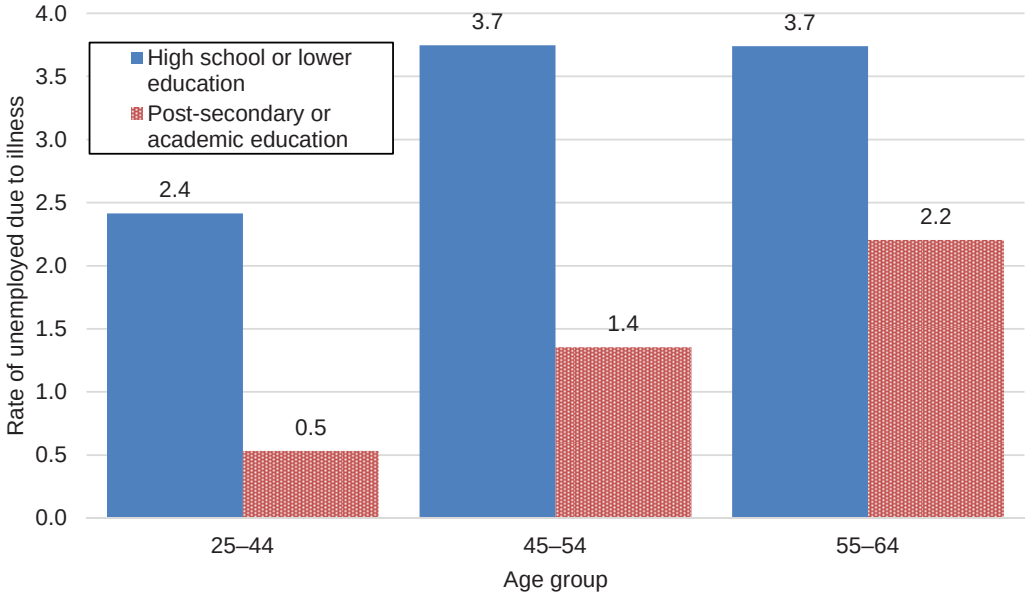
[c] Figure from the Social Survey, 2013.

[18] For the purpose of this calculation, we used the wage for workers with lower education who were not absent at all in place of the actual wage of those absent, in order to deduct the effect of absenteeism on wages (for workers who do not receive full payment for sick days). With that, it should be noted that wages may also have an effect on the scope of absenteeism (when no full payment for sick days), since it constitutes an alternative cost to absenteeism.

should be noted that here too, there may be mutual effects in the connection between education and not working due to illness.

index rating for localities in Israel.[19] The hospitalization rate in the lower half of localities (by socioeconomic index rating) is 10 percent higher than in the upper half—an additional 14.5 hospitalizations per 1,000 residents per year.

Figure 4
Rate of Unemployed Due to Illness, by Age Group and Level of Education



In a counterfactual scenario, had the rate of people not working due to illness among those with lower education been similar to the rate among those with higher education (at each age and gender cohort), and had the additional workers earned similar wages to other workers with lower education, the economy would have benefited from additional labor valued at about NIS 3.3 billion per year—0.32 percent of GDP (in 2014 terms).

7. The link between use of medical treatment and socioeconomic status

a. Hospitalization

The correlation between low socioeconomic status and relatively high morbidity is also reflected in the correlation between low socioeconomic status and the relatively high amount of hospitalizations. Figure 5 shows the negative correlation (-17.06) between the (age-adjusted) hospitalization rate per 1,000 people and the socioeconomic

Therefore, in a counterfactual scenario, had the rate of hospitalizations in the weaker localities been identical to the average rate in the stronger half of localities, there would have been 5 percent fewer hospitalizations per year (about 65,000 out of a total of about 1.3 million in 2014 terms). Taking into account an average hospital stay (4 days[20]) and the average cost per day of hospitalization according to the Ministry of Health price schedule from the end of 2014[21], the hospitalization cost that would have been saved in such

[19] There are hospitalization data for 241 localities (in which there are 2,000 or more residents) and regional municipalities. In total, 99 percent of the Israeli population lives in the localities that were examined.

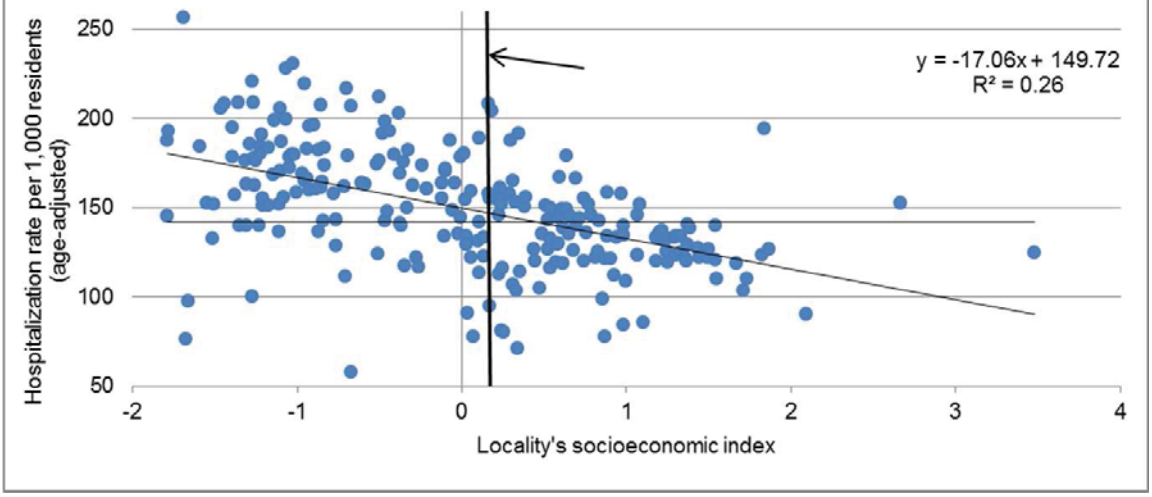
[20] The average length of stay in the general hospital wards (Central Bureau of Statistics, 2015). The duration by place of residence is unknown.

[21] According to the price schedule from December 1, 2014, the price per day of general hospitalization is NIS 2,800 for the first three days, and NIS 2,435 for each additional day. There is a special rate for some wards. It is worth noting that the rate actually paid to the hospitals by the health funds is lower than the official scale due to discounts that they receive. At the government hospitals, the average rate of discount for the health funds was 16.9 percent in 2012 (Ministry of Health, 2014).

a scenario totals about NIS 530 million per year (in 2014 terms).[22]

From a direct monetary standpoint, the lower volume of use of most community health services by poor people saves expenditure. Therefore, from this standpoint, had those with lower income used community health services similarly to those with higher income—it would have meant increased expenditures on community health services. Such a measure would certainly have involved an increase in availability of the services and efforts to encourage the use of community services and preventive medicine instead of the hospital system. In a counterfactual scenario in which the lower half would use the services to the same extent as the average in the upper half, it would have required about NIS 290 million per year in additional expenditure (in 2014 terms, based on a summation of the gaps for each gender in each of the age cohorts). The generally low volume of use in the poor half does not necessarily indicate lower morbidity. This gap is affected by the availability of secondary specialists for the poor population, which is sometimes limited, and by tradeoff between community services and hospitalization services—which the poor use more.[25] Since hospitalization services are more expensive, and people generally use them at more serious stages in the development of illness, the mix of services consumed by the poor hints at a lack of efficiency, and may lead to delayed treatment of degenerative diseases.

Figure 5
Hospitalization rate per 1,000 residents (age-adjusted) and socioeconomic index in localities with more than 2,000 residents and in regional municipalities (average for the years 2005–2009)



b. Community health care

While a low socioeconomic status is correlated with more hospitalizations, an examination of the use of community health services sometimes shows a reverse picture. While the total number of visits to doctors is similar in the two income halves[23], the poor half relies more on the services of primary physicians (and visits them 5 percent more often than in the richer half), while visiting secondary specialist physicians 8 percent less often. The poor half uses the services of para-medical specialists much less than the richer half (32 percent less), and has 37 percent fewer MRI scans.[24]

[22] This assessment remains similar when striking a number of outlier localities (mostly ultra-Orthodox)—where there are lower hospitalization rates notwithstanding the fact that they have low socioeconomic rankings—from the sample, and when taking into account the limited availability of hospitalization and medical services in general in peripheral localities.

[23] The individuals in the Health Survey (2009), which is merged with the Income Survey, were divided into halves by equivalized household income.

[24] Data standardized for gender and age. Primary physician: general practitioner, pediatrician, internist and gynecologist. Secondary physician is a specialist who is not a primary physician. Para-medical treatments include physiotherapy, occupational therapy, communication clinic, or nutritionist. MRI scans examined are scans that were done on an outpatient basis.

[25] Since the Health Survey examines the uses provided both through public financing and through private financing, the lower penetration rate of private insurance among those with lower income may also affect their access to specialists, to para-medical professionals, and to advanced examinations such as MRI.

Table 4

Use of community health services divided into socioeconomic halves by number of community doctors in the residential district and by household income, 2009 (adjusted for age and gender)

Rate of community doctors	Income halves	Population (thousands)	Number of visits to primary doctor	Number of visits to secondary (specialist) doctor	Number of uses of para-medical professions	Outpatient MRI scans per 100 residents
Few doctors	Lower half	1,964	5.3	1.6	0.7	0.8
	Upper half	944	4.7	1.9	1	1.9
Many doctors	Lower half	1,379	5.4	1.8	0.8	1.5
	Upper half	1,772	5.3	1.8	1.2	2.2

In order to examine the effect of availability of community health services on usage patterns, we again examined the gaps between those with higher incomes and those with lower incomes separately in districts where the rate of physicians working in the community is high and in those where it is low.[26] This examination shows that in districts with less availability of physicians in the community, some of the gaps in use between those with higher income and those with lower income widen. In particular, where community services are more available, those with lower incomes and those with higher incomes make similar number of visits to secondary specialist physicians. However, where the availability of services is low, a gap opens between the two halves, and those with higher incomes use the services of specialists 12 percent more than those with low incomes (Table 4). The existence of gaps in the volume of use where services are readily available (such as regarding para-medical services and MRI scans) may show that those with low incomes suffer from problems of access to community services, more than problems of availability of these services (due to cultural barriers, language difficulties, financial problems, and so forth). Discounting the effect of availability on usage patterns reduces the savings that are correlated with individual income by 50 percent, with the latter totaling about NIS 155 million per year (meaning this would be the savings had the availability gaps been closed, which involves costs in and of itself). A similar result would also be obtained when calculating the savings using gaps between localities by their socioeconomic index.[27] In any case, in the counterfactual scenario of equal use by both income groups, the cost of increasing the use of community services is lower than the savings derived from reduced use of hospitalization services, such that the existing mix of services may indicate inefficiency (with the caveat that it is unclear how much the expense of closing the gap in the use of community services would actually lead to savings of a similar extent in expenditure on hospitalization services.)

[26] In districts in which the number of physicians is high relative to the population, there are 2–2.9 physicians employed in the community per thousand people, and in districts where the number of physicians is low relative to the population, there are no more than 1.7 physicians per thousand people. It should be noted that the availability of physicians in each district may also be affected by the socioeconomic status of the population in that district. Therefore, it is possible that discounting the effect of availability may also discount some of the gaps connected with the socioeconomic state of the district.

[27] In the calculation that examined the differences in the rate of use between localities based on their socioeconomic index reading (and not between individuals according to their income), the cost of increasing use in the lower half is higher—about NIS 540 million—but is reduced to a similar amount of about NIS 145 million when taking into account differences in the availability of physicians in the community. In this calculation, the usage gaps between the stronger and weaker localities are actually wider in the districts where the availability of community physicians is higher. This result may show availability gaps between the localities even within these districts, and hints that those with lower incomes living in "stronger" localities tend to use the community services more than those with lower incomes in the weaker localities, even when taking into account the availability of physicians in the district.

Characteristics of companies that delisted their shares from the Tel Aviv Stock Exchange

1. Background

The past 20 years have witnessed a global phenomenon of public companies choosing to delist.[1] Martinez and Serve (2010) report that 25 percent of public companies in Europe delisted between 1995 and 2005, and Grullon, Larkin and Michaely (2015) report that the number of public companies in the United States declined by 50 percent between 1997 and 2014. This phenomenon has also been prevalent in Israel in the last few years and as a result the number of public companies declined by 37 percent from the beginning of 2011 until April 2016 and the number of equity companies by 33%. The delisting was achieved in different ways: a buyback offer, a merger with another company, delisting from the local stock exchange but remaining listed on a foreign stock exchange, and forced delisting due to failure to abide by stock exchange rules.

There are many advantages to being listed on the stock exchange, including diversification of financing sources; the possibility of spreading the risk in the investment portfolio of the company's original shareholders; making the company's stock liquid; increasing the company's bargaining ability with the banks; and the application of market discipline that brings the interests of the managers closer to those of the shareholders. These advantages are liable to be curtailed and even cancelled out if the agent— a manager in a company with decentralized control and the controlling shareholder in a company with centralized control—manages the public company in a way that is inclined towards his personal benefit at the expense of the shareholders and lenders to the company. This is known as "The Agent Problem" (Jensen and Meckling (1976)).

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[1] Various possible reasons are proposed in the literature for the reduction in the number of public companies. Doidge, Karolyi and Stultz (2015) reviewed various explanations: the existence of a more general phenomenon in which the number of companies—private and public—is declining; a sharp drop in the number of small public companies compared with a more moderate increase in the number of large companies; regulatory processes that went into force at the beginning of the millennium which set stricter rules of corporate governance, and so forth. The researchers came to the conclusion that some of the proposals they offered did not explain the phenomenon and some explained it only partially. Grullon et al (2015) found that the phenomenon of public companies delisting in the United States is consistent with the increase in centralization and the decline of competition in the various sectors, which is leading to an increase in the profitability of the existing companies.

This article examines the characteristics of equity companies that chose to delist from the Tel Aviv Stock Exchange and become private between 2011 and 2016, and considers whether they reflect a decline in the benefit of their status as public companies or an increase in the cost of being listed. Specifically, the article examines the hypothesis that the tendency of a company to go private increases as its agent problem intensifies. (See for example Leuz, Triantis and Wang (2008), Weir and Wright (2006)).

In order to measure the gravity of the agent problem in companies, we use the fact that the law gives the companies maneuvering room in which they can decide the rules of corporate governance they will adopt and the quality of the corporate governance mechanisms that the law imposes on them (hereinafter "corporate governance"). Following on this, we built an index of the quality of the corporate governance of companies in Israel, with which we measure the nature of these mechanisms in companies that delisted and in the control group of similar companies that remained listed. The index includes 27 components, focusing on two main points: (1) the extent of non-dependency of the corporate governance mechanisms in a company on the controlling shareholder; (2) the level of the financial and professional expertise of the people responsible for corporate governance. Also included in the index is a component that reflects the difference between control and rights in cash flows attributed to the controlling shareholder, which is accepted in the literature as reflecting an incentive for the controlling shareholder to freeze out the minority shareholders. We assume that the lower the score the company receives on its corporate governance according to the index, the more serious the agent problem it has. In Appendix A all the components of the index are set out, as well as the way the score was calculated for each of them and for the company overall.

The findings show that the lower the quality of corporate governance in a company the greater its tendency to delist. We also found that compared with the control group—which included similar companies that remained listed—the companies that delisted were characterized by a low level of leverage, by reduced growth possibilities, and by a low percentage of their shares held by institutional investors. These characteristics may be consistent with companies with less access to raising capital in the market (the supply side) and companies with less of a need to raise capital in the market in order to continue operating (the demand side). One way or the other, it seems that these are companies for which the platform created by the capital market for varying their financing sources has little value. We found no evidence of any connection between the liquidity of stock and the decision of a company to delist.

In the next section we will present a list of the control variables recognized in the literature as correlating with the tendency of a company to delist, and then we will present a method for statistical analysis and describe the sample used for the statistical examination. Finally, we will present the results of the analysis, a summary and conclusions.

2. Other variables correlating with the tendency of a company to delist

In addition to the focus variable—the quality of corporate governance— the statistical model includes control variables recognized in the literature as correlating with the tendency of a company to delist. We present these variables and the way they are calculated in Table 1. We also state the expected direction of the correlation between them and the tendency to delist. Another variable which uniquely affects the tendency of companies in Israel to delist is the law to reduce centralization. This law restricted the number of layers of public companies in a business group to two. One of the ways to reduce their numbers is to delist companies from the local stock exchange. In order to control for the mean effect of the law on the extent of delisting, we defined a dummy variable: "The Centralization Law", which takes the value of 1 for a company with more than 2 layers of public companies above and/or below it, and a value of 0 otherwise.[2]

3. The sample and the methodology

There are a variety of reasons for a company to delist, and so it is unclear if there is any significance to an analysis of all the companies that delisted as one group. Thus it can be supposed that some of the companies that were delisted in transactions where their shares were sold to a third party were delisted due to their owners' wish to make a capital gain from an exit, and they are characterized by a higher growth potential than companies delisted by way of a buyback offer or merger with another company belonging to the controlling shareholder. Moreover, there is a difference between companies that delisted in Tel Aviv but remained public and listed on a foreign stock exchange and companies that delisted and became private. It may also be assumed that the characteristics of companies that chose to delist after being removed from the main list of the Stock Exchange and are therefore under the threat of forced delisting in the future are different from the characteristics of companies that chose to delist under no such threat.

In view of the foregoing, we chose to focus on a subgroup of companies with all the following characteristics: (1) equity companies; (2) a balance sheet of at least NIS 100 million; (3) the delisting was voluntary; (4) the companies were listed on the main list of the Stock Exchange; (5) the company was delisted by the controlling shareholder by way of a buyback offer or by way of a merger with a company under the controlling shareholders' control; (6) after delisting, the company became private; (7) the delisting was carried out in the period between the beginning of 2011 and May 2016. The sample of companies with these characteristics included 26 companies. We removed another two companies from that group which delisted very shortly after control in them was transferred, so that the group of delisted companies used for the statistical analysis comprises 24 companies.

For each delisted company we matched the two companies closest to it in size as measured by their total balance sheet assets, which were listed and operated in the same sub-industry in the year before the delisting notice. When the match with that sub-industry was insufficient, we matched a company from the same industry.

At the end of the process we obtained a sample of 72 companies of which 24 were delisted during the years of the sample and 48 remained listed.

For each of the companies in the sample we calculated all the variables in Table 1 and we ran the basic model used here as a logit regression.

Variable 1:

$$prob(Delisting_i = 1) = \beta_0 + \beta_1 * cgi_{i,t-1} + \beta_2 * age_{i,t-1} + OCF_{i,t-1} + \beta_3 * leverage_{i,t-1} + \beta_5 * sales\ growth_{i,t-1} + trading\ volume_{i,t-1} + tobin's\ q_{i,t-1} + Institutional_{i,t-1} + \beta_7 * concentr_{i,t-1}$$

where the Delisting variable takes the value 1 for a company delisted in the sample years and the value 0 otherwise. The definition of the other variables is given in Table 1.

[2] For discussion purposes we defined a controlling shareholder in the same way as it is defined in the company's financial statements. When there was no reporting in the financial statement we defined a controlling shareholder as a shareholder with a holding of at least 20% of the firm's shares, while the next two largest shareholders hold less than his holding.

Table 1
The variables expected to be correlated with a company's decision to delist and the expected direction of the correlation

The variable	The coding in the regression	The definition	The expected direction of the correlation
Corporate governance score	CGI	The corporate governance score for a company in the year before the delisting notice, calculated according to the index specified in Appendix A.	-
Age of the company	Age	The number of months that passed from the time the company was listed until the end of the year before the delisting notice. The natural log of this variable is used in the regression.	+/-
Institutional holdings	Institutional	Institutional investors holdings of the shares of the delisted company at the end of the year before the delisting notice.	-
Cash flows	OCF	The ratio between the cash flow from current operations and the company's net income at the end of the year before the delisting notice.	+
Leverage	Leverage	The ratio between the long-term liabilities and assets in the balance sheet at the end of the year before the delisting notice.	+/-
Income growth	Sales growth	The rate of change of income at the end of the year before the delisting notice relative to income in the preceding year.	-
Growth opportunities	Tobin's Q	The ratio between the average market price of the company in the three days after publication of the financial statement plus the company's debt, at book values, and the company's assets at their book value in the year before the delisting notice. We will refer to the natural log of Tobin's Q in the regression.	-
Return on assets	ROA	The ratio between the company's operating profit and its assets at their book value at the end of the year before the delisting notice.	-
Stock liquidity	Trading volume	The average daily turnover in the delisted company's shares at the end of the year before the delisting notice.	-
Centralization of ownership	Ownership	The percentage of the company's shares held by the controlling shareholder at the end of the year before the delisting notice.	+/-
The Centralization Law	Concent	A variable that takes the value 1 if there are more than 2 layers of public companies in the company's chain of ownership at the end of the year before the delisting notice and the value 0 otherwise.	+

4. Theoretical statistics

In Table 2 we present theoretical statistics of all the variables in the final sample, of the variables calculated only for the companies that delisted and of the variables calculated only for the companies in the control group. The figures show that the delisted companies are characterized by an average corporate governance score of of 0.499, which is lower than the average score of the control group—0.561. The differene in the average scores of the two groups is significant to a level of 10 percent. The average size of a delisted company in the sample is NIS 3.2 billion, compared with NIS 3.4 billion in the control group. The difference in the average size of company between the two groups is not significant because size was used as a key to correlation of the companies in the control group with every delisted company. The average age of the delisted companies is 22 years, greater than the average age of the companies in the control group which is 18 years, but the difference in ages is not significant.

* Denotes differences with a significance level of 10 percent.

The average percentage of institutional investors holdings of the delisted company's shares is 5.7 percent—significantly lower than that of the control group at 8.6 percent. This figure is consistent with low "visibility" of the delisted companies and with lower accessibility to capital. The average leverage of the delisted companies is 0.213, significantly lower than that of the companies in the control group at 0.321. We can also see that on average, the delisted companies are characterized by lower liquidity of their shares, expressed in lower daily trading turnover than that of the control group, but the difference is not significant. The average growth potential of the delisted companies, as assessed by the market and reflected in Tobin's Q, is lower than that of the control group, as is their average profitability, although the differences between the two groups are not significant.

5. The regression results

The regression results are set out in Table 3, where the dependent variable is a binary variable which takes the value 1 for a company that was delisted and 0 for a company that belongs to the control group and was not delisted.

In column (1) we measure the basic model and examine the correlation between the different variables and the tendency of a company to delist its shares. The correlation between the quality of corporate governance and the tendency of a company to delist is negative with a significance level of 5%. This result is consistent with the hypothesis that the lower a company's quality of corporate governance the higher the agent costs it incurs, and its tendency to delist will increase. This column also shows that the companies that were delisted are characterized by reduced growth opportunities as expressed by the low Tobin's Q, with low leverage and with low "visibility" reflected by the low percentage of institutional holdings. These characteristics are likely to be consistent with a company's decision to go private for reasons of low accessibility to capital. According to this explanation, the restrictions in the supply of capital are created as a result of low motivation of market players to invest in companies with low growth potential. They also reflect the low level of leverage in comparison with the control group and the low institutional interest in the company's shares. An alternative explanation is on the demand side, according to which due to the reduced growth opportunities of the companies that delisted, they have less need to increase capital than the companies in the control group, a characteristic that is also expressed in the relatively low level of leverage.

One way or the other, the characteristics of the companies that delisted are consistent with the assumption that the advantage the capital market gives to public companies in the form of the ability to diversify their sources of capital by raising capital from the public is less relevant for them. Moreover, the characterization of the companies that delisted, like those with a low quality of corporate governance, is consistent with their higher costs of raising capital.

In columns (2) and (3) we replaced the Tobin's Q, which reflects the market's assessments of the company's future performance, with accounting performance variables, which reflect its past performance.[3] Following on this, we did not find any correlation between the tendency of a company to delist and the growth rates of its sales, and we obtained a weak negative correlation (significance level of 15%) between this tendency and the profitability level. In column (4) we included the "Centralization Law" in the model. The directions of the coefficients of the variables in the model and their significance level are similar to those obtained in model (2). The coefficient of the "Centralization Law" variable is positive and significant—a finding that is consistent with the effect of the Centralization Law on the tendency of the companies to delist.[4] In column (5) we separated the controlling shareholder's rights in capital from the quality of corporate governance index and ran them as a separate variable that expresses the centralization of ownership. The correlations obtained in the previous models

[3] The distinction between the variables was made against the background of high correlation between them and the desire to prevent a problem of multicollinearity.

[4] It is worth noting that the results are also consistent with the measurement of the regression on a partial sample of companies that delisted, which does not include companies whose delisting correlates with the Centralization Law.

Table 2
Theoretical statistics of all the companies in the sample, the companies that delisted and those in the control group, from 2011 until May 2016

The variable		The final sample (1)	The delisted companies (2)	The control group (3)	The difference (3)-(2)
Corporate governance	Average	0.540	0.499	0.561	0.062*
	Median	0.562	0.501	0.572	
	Standard deviation	0.127	0.116	0.128	
Centralization of ownership	Average	0.547	0.564	0.538	-0.026
	Median	0.571	0.603	0.567	
	Standard deviation	0.210	0.239	0.196	
Cash flow from current operations	Average	0.140	0.115	0.153	-0.038
	Median	0.100	0.111	0.075	
	Standard deviation	0.188	1.218	0.213	
Age of the company (months)	Average	235	267	219	-48
	Median	212	226	203	
	Standard deviation	167	156	171	
Size (NIS million)	Average	3,353	3,199	3,431	232,114
	Median	1,669	1,994	1,357	
	Standard deviation	3,766	3,367	3,982	
Leverage	Average	0.285	0.213	0.321	0.108*
	Median	0.235	0.111	0.306	
	Standard deviation	0.240	0.221	0.244	
Return on assets	Average	0.082	0.074	0.086	0.012
	Median	0.069	0.059	0.078	
	Standard deviation	0.084	0.057	0.095	
Institutional holdings	Average	0.076	0.057	0.086	0.029*
	Median	0.082	0.060	0.088	
	Standard deviation	0.065	0.057	0.067	
Income growth	Average	0.219	0.333	0.162	-0.171
	Median	0.056	0.061	0.053	
	Standard deviation	0.680	1.007	0.440	
Trading turnover (NIS thousand)	Average	3,010	1,254	3,888	2,633
	Median	310	163	357	
	Standard deviation	9,199	2,130	11,885	
Tobin's Q	Average	1.205	1.111	1.252	0.142
	Median	1.035	1.014	1.040	
	Standard deviation	0.525	0.351	0.591	

Table 3
The results of running the logit regression of the dummy variable, which takes the value 1 for a company that delisted between the beginning of 2011 and May 2016 and 0 otherwise, on the companies' corporate governance scores and on the additional variables

The dependent variable: A binary variable that takes the value 1 for a company that delisted and 0 otherwise.

The corporate governance score	**5.410** **(2.621)**	**-5.634** **(2.656)**	**-5.904** **(2.555)**	**-5.485** **(2.702)**	
The corporate governance score on the company level					**-5.257** **(2.545)**
Centralization of ownership					-1.441 (1.701)
Age of the company	**0.874** **(0.379)**	**0.814** **(0.389)**	**0.773** **(0.380)**	**0.895** **(0.396)**	**0.901** **(0.380)**
Leverage	**-4.109** **(1.475)**	**-3.405** **(1.283)**	**-3.048** **(1.277)**	**-5.125*** **(1.767)**	**-4.434*** **(1.480)**
Institutional holdings	**-9.475*** **(4.977)**	-8.805* (4.763)	-7.774* (4.775)	**-12.347** **(5.676)**	**-10.927** **(5.276)**
Cash flows	-0.695 (1.498)	0.046 (1.491)	-0.521 (1.541)	1.711 (1.609)	-0.882 (1.495)
Share liquidity	0.213 (0.144)	0.105 (0.122)	0.058 (0.114)	0.204 (0.149)	0.199 (0.151)
Tobin's Q	**-2.006** **(1.003)**			**-2.312** **(1.098)**	**-2.214** **(1.022)**
Return on asserts		-4.540 (3.251)			
Sales growth			-0.066 (0.337)		
Correlation with the Centralization Law				1.629* (0.905)	
Pseudo R^2	0.209	0.187	0.229	0.255	0.216
Number of observations	72	72	72	72	72

*** Denotes a significance level of 1%; ** denotes a significance level of 5%; and * denotes a significance level of 10%. Results with a significance level of 1% or 5% are in bold. The sample on which we ran the regression includes companies that delisted voluntarily from the Tel Aviv Stock Exchange by way of a buyback offer by the controlling shareholder or by way of a merger with a company under the control of the controlling shareholder during the aforesaid period. With each company that delisted we correlated two companies of a similar size from the same sub-industry. In total the sample included 72 companies of which 24 were delisted and 48 were used as a control group. The standard deviation is shown in parentheses.

still hold in this specification, but no connection of any kind was found between the centralization of ownership as we defined it and the tendency of a company to delist.

Contrary to some of the results in the literature, we did not find any correlations between the tendency of a company to delist and its accessibility to cash. Neither did we find any evidence that the motivation for delisting is low liquidity of the stock. In that case we also found a positive correlation but it is not significant.

6. Summary and conclusions

Within the above discussion we characterized the equity companies that delisted voluntarily in the last few years by the controlling shareholder by way of a buyback offer or by way of a merger with a company under the control of the controlling shareholder. We specifically examined companies that were delisted from the Tel Aviv Stock Exchange in the last few years, characterized by low quality corporate governance relative to the companies that remained listed. The empirical findings show that the companies that were delisted were indeed characterized by low quality corporate governance relative to the companies in the control group. This finding is consistent with the assumption that the costs of the existence of an agent problem in the company affect the decision to remain listed as a public company. We also see that the companies that delisted are characterized by low growth opportunities, by low leverage, and by a low percentage of institutional investors. These findings can be explained by the relatively restricted access of the companies that delisted to capital or by the lower demand for capital on their part.

The findings are consistent with the interpretation that the companies that delisted did not want to exploit or had difficulty exploiting the clear advantage of the capital market, which is the ability to diversify sources of financing by raising money from the public. Delisting would appear to be beneficial for them in that it reduces the expenses involved in operating as a public company without causing them to lose any significant advantage provided by their status as public.

It should be emphasized that the decision on the quality of corporate governance, as well as on the delisting, is the company's own decision. It is therefore possible that the findings revealed by the regression derive from reverse causality according to which a company that in any case seeks to delist and go private has no interest in curtailing its agent problem. It can also be asserted that there is a variable that has been omitted from the statistical model that explains both the corporate governance of the companies that delisted and the tendency to delist. In view of this, we can assert that there is a causal connection between them. Further studies are required in order to substantiate the assertion of a causal connection.

Every component of the index that contributes to the quality of corporate governance was given a score of 1 if it was true and 0 otherwise. A component that contributes to the quality of governance with a continuum of values (for example the percentage of external directors on the board of directors) was given a score of 1 if it was greater than the median of the values of that component in the model as a whole and 0 otherwise.

A company's corporate governance score was calculated as the ratio between the sum of the values of the components in the company and the number of components in the index (equally weighted). Components that were missing values were not taken into account in the calculation of the company's score for corporate governance.

Annex A – The composition of the index for examining the quality of the corporate governance		
The component in the index	How the score for the component was calculated	Notes
The percentage of directors with financial skills	1 if greater than the median in the sample; 0 otherwise	A director is defined as having financial skills if he has a doctorate in a financial area, is an accountant, has served in a financial capacity in a real institution or has managed a financial institution.
The percentage of professional directors	1 if greater than the median in the sample; 0 otherwise	A director is defined as profession if his education or employment experience are connected with the company's area of activity.
The percentage of directors with an MBA	1 if greater than the median in the sample; 0 otherwise	
The extent of the directors' engagement in other companies	0 if greater than the median in the sample; 1 otherwise	
The chairman of the board is a controlling shareholder	0 if true; 1 otherwise	
The percentage of directors who are controlling shareholders or are dependent on a controlling shareholder	0 if greater than the median in the sample; 1 otherwise	
A controlling shareholder or his relative is a senior office holder in the company and/or in a subsidiary	0 if true; 1 otherwise	
The percentage of external directors in the company	1 if greater than the median in the sample; 0 otherwise	
The percentage of external directors on the board with financial skills	1 if greater than the median in the sample; 0 otherwise	
The percentage of professional external directors on the board	1 if greater than the median in the sample; 0 otherwise	
The percentage of external directors with an MBA	1 if greater than the median in the sample; 0 otherwise	
A controlling shareholder and/or a dependent are members of the audit committee	0 if true; 1 otherwise	
The percentage of external directors on the audit committee	1 if greater than the median in the sample; 0 otherwise	
The percentage of external directors with financial skills on the audit committee	1 if greater than the median in the sample; 0 otherwise	
The percentage of professional external directors on the audit committee	1 if greater than the median in the sample; 0 otherwise	
A controlling shareholder is the organizational superior to the internal auditor	0 if true; 1 otherwise	
The audit committee is the organization superior to the internal auditor	1 if true; 0 otherwise	
The internal auditor is a company employee	0 if true; 1 otherwise	
There is a balance sheet committee	1 if true; 0 otherwise	
A controlling shareholder and/or a dependent are members of the balance sheet committee	0 if true; 1 otherwise	
The percentage of external directors on the balance sheet committee	1 if greater than the median in the sample; 0 otherwise	
The percentage of external directors with financial skills on the balance sheet committee	1 if greater than the median in the sample; 0 otherwise	
There is a compensation committee	1 if true; 0 otherwise	
The members of the compensation committee are senior office holders in the company examined	0 if true; 1 otherwise	
There is a nominations committee	1 if true; 0 otherwise	
There is a corporate governance committee	1 if true; 0 otherwise	
The difference between control and ownership	1 if greater than the median in the sample; 0 otherwise	
A description of the components of the quality of corporate governance index of firms. The index included 27 components. All the components, apart from the 'difference between control and ownership' component, are given a score of 0 or 1. The score of the 'difference between control and ownership' component was determined as the difference between the control rights—100% in firms in which there is a controlling shareholder—and ownership rights, which are the rights in the examined company's capital, when these are concatenated with the final controlling shareholder. A firm's score is calculated as the ratio between the total values obtained by the components calculated for it and the number of components that are not absent.		