

Research Department Special Report:

Raising the Standard of Living in Israel by Increasing Labor Productivity

Main points of the Report

a. Introduction

GDP per hour (labor productivity) in Israel is 24 percent lower than the OECD average, and the gap between Israel and other OECD countries has not narrowed in recent decades. This report points to the known causes for this gap, and suggests practical policy measures for reducing it. Obviously, this report is not exhaustive. The government has already taken measures that are not detailed here, and can take additional measures that are not analyzed in this report. Therefore, the aim of this report is to bring together the core measures required to close the productivity gap, such that the new government will have a comprehensive picture of the depth of the problem and the ways to deal with it. Economic research finds that GDP per worker (or per work hour)—labor productivity—is influenced to a great extent by human capital, which is measured by the education and training of manpower; the stock of capital—physical (mainly including buildings, machines, equipment, and infrastructure) and intangible (knowledge accumulated, for instance, through research and development, patents, and so forth)¹; and total factor productivity, which reflects technological innovation, efficiency of work processes, and other factors such as the quality of institutions and regulation.

The productivity gap may be a result of any of these factors, which have mutual effects on each other. Hazan and Tsur (2019) used "development accounting" to find that most of the gap in Israel reflects a relatively low stock of physical capital per worker compared to other advanced economies, and that the rest of the gap reflects inferior quality of human capital, despite the high number of years of study compared to the other countries. However, despite the clear inferiority of the stock of physical capital, this report emphasizes that the road to accelerated growth in labor productivity passes, first and foremost, through policy to improve human capital. While the decision on the optimal quantity of physical capital is mainly that of the business sector, the government can help maximize the potential human capital of its citizens, and ease the economic barriers that prevent some of them from obtaining high-quality education. Therefore, governments in the vast majority of developed countries provide free education services. The government of Israel provides free education from age 3 to age 18. Human capital influences the profitability of business sector investment in physical capital, as well as the level of innovation, the quality of regulation, the profitability of investment in infrastructure, and the efficiency of production processes. As such, a significant portion of this report is devoted to analysis and recommendations in the field of education. Alongside this, it discusses additional ways to increase the level of physical capital and innovation. Even though decisions regarding them are mostly made by the business sector, the government plays an important role in their growth, both directly through investment in infrastructure, and indirectly by removing barriers and creating optimal conditions for investment in them. These conditions include regulation and bureaucracy. These factors—as found in many studies—have a direct impact on total factor productivity, and thereby on labor productivity. They affect individuals' incentives to investment in cultivating their human capital, and increase firms' incentive to invest in physical capital.

This report surveys the causes of the labor productivity gaps in Israel and recommends ways of reducing them. The discussion begins with human capital, then deals with the issue of physical capital, and ends with total factor productivity issues. We find that, in recent decades, the government has spent less than in other advanced economies on education per child, on public

¹ For convenience, we will generally refer to the two types of capital that are not human capital as "physical capital".

capital, and on infrastructure. This gap in productivity-supporting expenditure amounts to about two percent of GDP per year, and is reflected in, among other things, the low skill level of the labor force in Israel and the low quality of infrastructure. It is unlikely that Israel will reach a similar level of productivity to the other countries with such a low level of expenditure in relevant fields. However, this report does not suffice with identifying the expenditure gap. It proposes desirable policy directions in each of the areas it discusses. These are based on consultations with a variety of officials in the public and business sectors and members of academia, as well as on studies conducted at the Bank of Israel, government ministries, and academia in Israel and abroad. In addition, some of the analyses and insights provided in this report reflect knowledge gathered during discussions within the "Productivity Committee" that was convened in the past two years, led by the Director General of the Ministry of Finance. Since the issue of productivity is complex and multi-faceted, the report does not pretend to present all of the necessary measures, and implementation of some of the recommendations will require further specific in-depth study. However, we believe that the implementation of the measures listed herein will prove to be an important step in significantly reducing the productivity gap between the Israeli economy and other advanced economies. It is important to emphasize that alongside the many insights derived from the discussion with the parties listed above, the recommendations in this document reflect only the Bank of Israel's position, are not binding on the entities with which we consulted, and may not even be in line with their positions.

Dealing with such large and prolonged productivity gaps is not a short-term or cost-free process. The analysis in this document indicates that reducing the gaps that have developed in workers' skills and in the stock of public capital will require a significant increase in public resources allocated to growth-supporting expenditures. Such an expansion is gradual by nature. Some of its components depend on prior steps, which are detailed in this document, to increase the efficiency of public expenditure in growth-supporting areas, which will be spread out over a number of years. The planning and approval of infrastructure investments are also not immediate. However, it is important that the government prepare even now in terms of the fiscal frameworks, so that it will be able to support an increase in productivity without risking the economy's financial stability.

The following are the main findings and recommendations in each of the sections.

b. Summary of the recommendations

Human capital

The Israeli population's quantity of education is high by international comparison of the number of years of schooling and the rate of those with higher education. However, the quality of education is low, at least as shown by the results of international tests for students and adults. These findings are worrisome, since economic research has found a direct causal link between the quality of education of the labor force and productivity (for instance: Hanushek and Woessmann, 2012). Israel also suffers from large inequality in achievements, both between various population groups (such as Jews compared with Arabs) and within Hebrew-speaking groups, even those that are not *Haredi*. Moreover, while the lag in basic skills of the upper half of the achievement scale in Israel compared to the same half in other advanced economies is not large, the skill lag in the lower half is large. We also found that in industries where workers' basic skills are lower than in the same industries in other advanced economies, labor productivity in Israel is particularly low. This finding is prominent in many industries geared toward the domestic market.

In order to support the efficient acquisition of basic skills, and particularly to improve the achievements of the lowest layer of student achievement, it is necessary to improve education beginning in early childhood (ages 0–3). Economic research shows that the educational environment at early ages has a critical influence on the ability to obtain knowledge and qualifications later in life, particularly among populations with weaker socioeconomic backgrounds (as shown in a number of studies conducted by Heckman with various partners, such as Garcia et al, 2017), among whom the skills and productivity gaps were found to be the largest in Israel. We therefore recommend increasing the accessibility of daycare centers for children from weaker backgrounds, and improving the quality of the staff in those centers—by raising minimum requirements, prior training, and adjusting working conditions and salaries—with the recognition that their job is not just care, but also educational. It is also important to make sure that the process is carried out without negatively impacting the incentive for the parents to work.

Improving the quality of educational staff is the most efficient way to improve scholastic achievements even at older ages, particularly for students from the lower levels of the achievement distribution (as found, for instance, in the comprehensive report of the US Department of Education [USDoE, 2013]). Moreover, studies (for instance: Chetty et al., 2014) have shown a causal connection between the quality of teachers and wages in the adult lives of their students. In Israel, according to various indices, the quality of teachers' education and skills is low compared to the rest of the population, and relative to other advanced countries. While the quality of new teachers in Israel gradually improved for a number of years, it began to decline in 2014, in parallel with the marked increase in the number of teachers hired by the system, with no improvement in the relative (hourly) wages of the new teachers (Bank of Israel, 2019a). We therefore recommend taking action to attract high-quality teachers to the education system, particularly to weaker schools, in order to gain continued improvement in teacher quality and reduce inequality in achievements. For this purpose, there must be an improvement in the payment structure for teachers and in their working conditions, particularly for new teachers (as emphasized in the McKinsey report, 2007), and especially for those that specialize in subjects where there is a lack (Mathematics, Sciences, and English), and particularly in schools with students from weaker backgrounds. Improving productivity and increasing the attractiveness of the teaching profession also require improvement in the teachers' physical work environment, particularly in view of the greater number of hours they spend at the schools as part of the reforms in the education system over the past decade.

In addition to improving the quality of education, we recommend completely equalizing the number of hours allocated to Arab students from weak backgrounds with the number of hours to which Jewish students of similar backgrounds are entitled. We recommend allocating a significant portion of the added hours in the Arab schools to Hebrew language instruction. Affirmative actions in the volume of teaching hours has been found to be efficient in improving the achievements of students from weak backgrounds in Israel (Lavy 2012). However, it is difficult to assume that this will be sufficient to achieve the full improvement that is required in Arab students' scholastic achievements, since the achievement gap against them is very large. Therefore, a comprehensive test of the functioning of the education system in the Arab society, including all of its components, is also necessary, while focusing on the differences in management and in the use of inputs between schools that are lagging behind and schools that are successful or improving in the Arab society.

The basic cognitive skills of young *Haredi* men (up to age 40) are lower in all parameters than those of the non-*Haredi* Jewish population of similar age. Among those of higher ages (over age 40), there are no significant skills gaps. Our assessment is that the decline in the rate of *Haredi* boys who have studied subjects relevant to the labor market in the education system in recent decades plays a central role in this decline. We therefore recommend continuing efforts to increase the study of subjects relevant to the labor market among the *Haredi* population: literacy, mathematics, problem solving in a computerized environment, and English. While there are institutes for complementary education and knowledge for adults, cumulative experience shows that it is difficult to make up at an older age the knowledge that is missing from childhood in subjects relevant to the labor market.

Investment in the cognitive skills of *Haredi* men is particularly important in view of the demographic trends that indicate an expected significant growth in their share of the prime working-age population in the coming decades. Without such investment, the economy will have to cope with a decline in revenue from income taxes and the increasing need for support budgets. Such fiscal pressure may require an increase in tax rates and/or make it difficult to finance investment in physical and human infrastructure. This difficulty increases the challenge facing the economy looking forward, and emphasize the urgent need to deal with the issue.

Professional-technological education in Israeli secondary schools is quite varied. Some parts of it contribute to human capital in technological areas, while other parts are found to be inefficient in improving the earning power of graduates (de Malach and Zussman, 2017, among others). We recommend amplifying Computer and Programming studies, both as cognitive skills for all students, particularly in the secondary schools, and as a major subject. However, we recommend acting in accordance with research findings (such as Hanushek et al., 2017) that emphasize that it is worthwhile at the secondary level to prefer general studies over professional training and specific qualification, particularly in view of the negative gap in cognitive skills of Israeli workers. We therefore recommend diverting some of the resources allocated to professional studies at the secondary school level to affirmative action in general studies, with an emphasis on recruiting high-quality teaching staff that will join programs at secondary schools with weaker populations. In parallel, we recommend strengthening the vocational training courses and concentrating them in post-secondary frameworks, both as part of adult education courses under Ministry of Labor and Welfare supervision and as part of the technological colleges. Focusing technological education on older ages is also important in view of the increasing need for professional training during a person's career, and in view of the increasing career length with the increase in life expectancy and retirement ages. We support the reform to reduce the number of technological colleges and to grow and improve the leading colleges, upon which the government decided at the beginning of 2018. It should be ascertained that the additional budget allocated for the reform is in line with these goals, and we should examine how to accelerate the reallocation of college budgets that was set out in the reform.

In general, we ascribe tremendous importance to the allocation of high-quality human capital to the education system, even at the expense of employment in other areas of activity in the economy. We therefore recommend, as stated, to invest the additional resources for the education system in improvement of the quality of instruction, particularly for students from weaker backgrounds. The volume of teaching hours in Israel is high by international comparison, and we therefore only recommend improving how those hours are allocated. We do not discount the importance of additional measures to reduce the number of students per class (the Ministry of Education has acted in recent years to lower the number), but we are not recommending it since the benefit from it is low (Angrist et al., 2017), certainly when compared with measures to improve the quality of instruction.

While this report does not deal with the teaching methods practiced in the education system, since that is not our area of expertise, we do emphasize that the development of technology around the world has an impact on both the desired teaching methods and the roles of the education system. Teaching methods must be updated so that the students get the most out of digital databases and learning software. These should free up human teaching resources, but rather than obviate the need for high-quality teachers, they increase that need. The labor market already includes an increasing element of artificial intelligence, which makes some of the population's skills superfluous and increases the importance of other skills, such as critical thinking, creativity, the ability to learn throughout one's lifetime, social and emotional capabilities, and so on. These skills will be acquired optimally through teachers who are themselves graced with them, which further justifies the need to invest in attracting them to the education system.

Physical and intangible capital

The investment rate in Israel (as a share of GDP) is lower than the OECD average. This inferiority reflects low rates of investment in business capital and a lag in investment in infrastructure. We will discuss these two areas separately.

Business capital

The investment rates in manufacturing in Israel are similar to, and even higher than, the rates in other advanced countries, while the rates in the nontradable industries (construction, trade and hospitality services, business services, and personal and social services) are significantly lower. An industry-level examination of labor productivity and workers' skills in Israel compared with other OECD countries shows a similar picture: Both are particularly low in the nontradable industries such as trade and construction, and in the manufacturing industries that are characterized by low technological intensity. Alongside this, the government's policy tools are focused specifically on the manufacturing and software services industries. This policy may even have contributed to the gaps between industries: Subsidizing physical capital and research and development for the export industries raises their price for the other industries, thereby distorting their allocation and the allocation of human capital between the groups of industries (Hercovitz and Lifshitz, 2015). Alongside this, the increase in demand in the economy, as in other advanced economies, has in recent decades tended toward the services fields.

In view of all this, we recommend the gradual cancellation of the sweeping preference in taxation, capital grants, and innovation grants to the exporting industries and to manufacturing. The resources currently allocated to those preferences should be allocated on an equal basis among all industries. We recommend using existing mechanisms, such as the "strategic track", and new mechanisms to focus the subsidy on companies with unique knowledge and management methods that should trickle down to other companies. This will contribute to productivity in the entire economy (Greenstone et al., 2010; Bender et al., 2018).

In addition, part of the existing support budget should be allocated to creating targeted programs to encourage the implementation of innovation (as opposed to R&D) in the trade and services industries. This may serve to generate competition and change, partly through the insights being developed in the discussions of the committee currently working on promoting the issue. Existing

programs should also be adapted to these industries in order to reduce the distortion in the allocation of sources between industries.

Physical infrastructure

While the rate of investment in transport infrastructure in Israel in recent years is similar to the average rate in the OECD, it is far from what is necessary to close the gap in the overall level of infrastructure, particularly in public transit. This is particularly the case in view of the more rapid increase in population in Israel, and in view of the low level of the existing stock of capital. Moreover, some of the policy measures adopted in recent years actually encouraged the use of private vehicles. The combination of these factors has led to a lengthening of travel times and to significant transport distress reflected in the loss of costly work time, and forced employers and employees to make various adjustments in order to overcome mobility difficulties, mainly during peak travel hours.

We therefore recommend increasing the volume of investment in public transit infrastructure, with the aim of closing the gap in volume and quality compared to other advanced economies. Investment in mass transit systems in Israel must take into account the high population growth rate and density, which make it necessary to give preference to the use of underground public transit in the Tel Aviv metropolitan center, and transit with designated lanes in less dense areas. Of course, it is important that each project is accompanied by a specific cost-benefit analysis. In order to efficiently overcome the challenge of investment in a mass transit system, and in view of the difficulty in rapidly advancing such a system in the jurisdictions of dozens of municipal authorities—particularly the Tel Aviv metropolitan area—we recommend the establishment of transportation authorities, or some other regulatory system, to synchronize the needs of various cities within the area, which will have the power to create infrastructure and make decisions in this and other areas, similar to the "cluster" divisions initiated by the Ministry of the Interior (Ministry of the Interior, 2019).

On the transport demand side, and alongside potential improvements in mobility through public transit, we recommend applying a mileage tax, particularly during peak hours and in congested areas, and to combine it with a more precise pricing policy for the use of parking. Wage benefits and tax benefits that incentivize the use of private vehicles should also be reduced.

The state of landline and cellular communication infrastructure is currently reasonable, but it may fall behind in the coming years. Since the mid-1990s, Israel has had full coverage through excavated tunnels for landline infrastructure, and comprehensive cellular reception coverage. However, while the potential for meeting the pace of global technological development exists, the current market structure makes it hard to realize that potential. There must therefore be periodic examinations of the need to incentivize corporate investment in 5G technologies. Regarding landline technologies, the existing tunnels must be made accessible to all operators in order to ease the deployment of parallel infrastructure. If necessary, and in accordance with societal preferences regarding inequality, mechanisms based on market revenue should be created to provide operators with an incentive to deploy fiber optics in areas where profitability does not justify the investment.

Israel's current position is also reasonable in the area of energy infrastructure, but the economy is not prepared for changes in global regulation that will require Israel to adapt in the area of emissions. It is therefore necessary to advance a master plan for the energy economy in Israel, which will take these changes into account, particularly the need to adapt the high voltage

transmission system for use of renewable energy, and the need to increase competition and maintain Israel's energy security. In addition, the implementation of the reform in the Israel Electric Company must continue. In particular, it is important that there be continuous documentation and assessment of the reform's effects on the economy. This can be done through the company's development of system management that will include a unit to monitor and analyze the electricity consumption patterns of households and industries. Third, the progress achieved in completing the connection of the Leviathan, Karish, and Tanin natural gas fields to the mainland is critical, but the possibilities for connecting the natural gas to consumers must also be developed and expanded.

Total factor productivity

Total factor productivity is defined as the total of all factors contributing to growth other than human capital and physical capital.

Development accounting that takes into account the quality of education shows that its level and pace of growth in Israel are not low when compared with other advanced economies. However, it seems that the factors that determine total factor productivity make an indirect contribution to Israel's inferior labor productivity in view of their effect on the incentive to invest in physical capital. Israel is ranked 29th out of the 34 OECD countries in the regulatory ease of doing business, and one of the factors causing the low ranking is the area of contract enforcement, which studies (for instance: Nunn, 2007) have shown to be particularly important for growth. Regulatory processes must also be improved, according to various indices. Globalization is forcing companies that are active in Israel to deal with an environment that is characterized by maximum efficiency that involved a reduction of costs in order to compete with firms in various parts of the world. Streamlining regulation and improving bureaucratic processes will help the business sector deal with the challenges of competition in the global economy.

Some of the thinning of regulation involves an itemized effort to examine regulations and guidelines both old and new. This process has begun to take shape in recent years (RIA), at least concerning the administrative side as opposed to (private) legislation in the Knesset. Work methods that ensure that procedures that coincidentally obligate the business sector will not be added, except for within that orderly process, should be adopted. At the same time, government handling of the existing and necessary regulations can be streamlined to a great extent. In addition, we recommend including measures in public sector wage agreements that will improve public service, in particular targets for adopting digital processes in connection with business owners, and ministerial incentive payments for meeting these targets. In addition to all these, a legislative amendment is necessary to shorten the initial processes for establishing and expanding businesses, and these must be announced and supervised in retrospect, while ensuring that the mechanisms responsible for these processes are budgeted at a level that allows for effective enforcement and proper service.

One of the important ways to simplify and streamline regulation is to adopt regulations that are customary in other advanced economies, particularly the European Union and the United States, unless there is a special reason to justify a special Israeli standard. Such a process, which has been adopted in Israel in a number of areas, has a dual advantage: 1. It makes it possible to base standards on the experience gained in other advanced countries; and 2. It makes it easier to advance international competition both in the domestic market and for Israeli companies that operate in the domestic as well as international markets.

Finally, the lack of synchronization between school vacations and vacations in the rest of the economy—a phenomenon that is particularly prominent in Israel—harms the labor efficiency of those who have small children. We recommend adjusting vacation days in the school system to what is common in the rest of the economy by cancelling school on Fridays and transitioning the education system to a five-day school week, and cancelling vacation days that are customary on work days in the rest of the economy by a similar number of hours, such that the total number of school days does not change.

c. Estimates of expected costs and benefits of implementing the recommendations

The benefit calculation was done mainly through a model developed in the Research Department to assess the growth rate of the Israeli economy in coming decades (Argov and Tsur, 2019; hereinafter: the "growth model"). We occasionally used additional studies and analyses in order to corroborate the benefit calculations made through the model. We compare the growth model's base scenario, which assumes that policy measures will be taken in the future that will contribute to growth to the same extend as policy measures taken in previous decades, and a scenario in which the recommendations in this report are implemented. It should be noted that some of the recommendations in this report are essential in order to prevent a further fall in Israel's ranking in those areas. Table 1 presents the main points of the analysis, and distinguishes between measures reflected in the model's base scenario and supplemental measures. Appendix Table A1 presents the analysis in greater detail. In view of the difference in timing between expenditures and the realization of the benefits, we examined the worthwhileness of the processes recommended here using additional capitalization tests beyond those presented in the following sections. We found that the measures remained worthwhile at all reasonable capitalization rates.

		Estimated budgetary cost in percent of GDP	Estimated benefit for labor productivity in the long term, percent of GDP 6.6% in total. About 1.8% due to an increase in the	Time period to initial results in labor productivity
Measures in the area of human capital	priorities, administration and regulation	1% ^a	students, 2.8% due to improved quality of education, and 2% due to the contribution by improved human capital to increasing investment in physical capital.	Medium to very long.
Measures in the area of physical capital Measures in the	Budgetary and change in priorities	0.05%	About 4% in total. Due to the removal of distortions in supporting investment in physical capital and innovation, and an improved regulatory environment.	Medium: about 10 years
area of infrastructure capital		2% ^b	7.5% in total. 4.8 percent due to improved transportation infrastructure, and 2.7% due to improved communications infrastructure.	Medium to long: About 10-20 years.
Measures in the area of total factor productivity	Budgetary, regulation and administration	0.20%	2.1% in total. The vast majority due to improvements in bureaucracy and regulation. Contribution of 0.1% due to synchronizing vacation days.	Short to long
measures		About 3.3%	About 20.2%	

Table 1: The costs and benefits of the recommendations in the report

^a Such an addition, in accordance with the plans detailed in this document, will lead to a proximate equalization of per student expenditure in Israel with the average among OECD countries.

^b The cost required to converge the stock of infrastructure capital in Israel with the OECD median within 20 years, with investments prioritized according to the recommendations in this document. Some of the casts can be financed through taxes on the betterment of private property that will be affected by development, and the sale of state-owned land that will be bettered through investment. Investment of about one percent of GDP is required to prevent a further decline relative to the OECD.

Per student expenditure in Israel is lower than in most OECD countries, and Israeli students' grades on PISA tests are accordingly low (see Figure 2.2 below). In order to attain significant improvement in achievements, a combination of both additional budget and improved efficiency in the use of resources is necessary, as detailed below. For instance, we recommend improving the quality of teaching by improving wage conditions of the new teachers and by increasing payment to teachers who teach subjects that are in demand and at schools that serve students from weak backgrounds. However, all this, must come together with improved teacher evaluation, as detailed below, such that the focused wage additions will be channeled to the best teachers in the places where they would provide the greatest benefit. Obviously, insofar as we can obtain the necessary resources for the proposed programs by identifying and minimizing activities in the education system that have little benefit, instead of increasing the overall budget, it will be easier to advance the programs within the budget limitations of the economy.

If Israel increases per student expenditure to the OECD average level, the annual education budget will grow by about NIS 13 billion per year (in 2018 terms). As stated, we recommend targeting this additional budget to improving the quality of educational staff, and our assessment is that with the other recommendations detailed in this document, this addition will gradually bring average achievements in Israel closer to the OECD average. Such an improvement in the quality of education is expected to contribute about NIS 40 billion per year (in 2018 terms) to GDP in the long term, according to the growth model. An analysis published in the Bank of Israel Annual Report for 2018 (Bank of Israel, 2019b) reached a similar conclusion, on the basis of an analysis of individual data in Israel and in selected OECD countries.

In addition, the steps to improve the educational system are expected to generate benefit in terms of the number of years of schooling, mainly thanks to encouraging the study of core subjects among the *Haredi* population, and thanks to improved education in the Arabic schools. We assume that vigorous measures to integrate the study of subjects relevant to the labor market should increase the average number of effective years of study (for the labor market) among *Haredi* men by a year and a half compared to the assumption in the model's base scenario. This addition will add about one percent to the level of worker productivity in the long term. Measures in this area are also expected to contribute to the economic growth rate by increasing the chances of integrating into employment, which we do not deal with in this document. The measures to improve education in the Arabic schools are expected to also contribute a year and a half to the number of effective years of study of Arab men and women, and about one additional percent to the level of GDP per worker.

As such, the increase in the number of years of study is expected to contribute a total of about 2 percent to GDP in the long term. Our assessment is also that thanks to the measures to improve human capital, there will be more incentive to invest in physical capital (Hazan and Tsur, 2019), which will contribute an additional 2 percent to the level of GDP per worker.

To summarize, the implementation of the recommendations in the area of human capital should contribute about 7 percent to the level of GDP per work in the long term. In addition, since the expenditure will be necessary in years in which the effect on productivity has not yet borne fruit, the long-term benefit should be lowered accordingly. As such, the average annual benefit is estimated at 6.6 percent of GDP. The cost to which this benefit should be compared will be about one percent of GDP.

Our assessment is that the annual cost of the recommended measures to increase the business sector's stock of physical capital, excluding investment in infrastructure, is not large (0.05 percent

of GDP). This mainly has to do with the expected positive effect of measures to improve the quality of regulation, the change in priorities, and the gradual cancellation of the existing benefit to the export industries, while freeing up resources for more efficient processes. In terms of the benefit, the rate of investment in Israel as a share of GDP is roughly 1.5 percent lower than the OECD average. It is difficult to estimate what the effect of the proposed measures will be in terms of the investment rate. However, in order to illustrate the importance of a policy that will improve the background conditions for investments to be made, we note that an increase of 1 percent of GDP in investment in physical capital will contribute about 4 percent to the level of GDP per worker in the long term. We assume for purposes of a cost-benefit assessment that this will actually be the increase in investments.

The main budgetary cost of the measures proposed in this document is in the area of physical infrastructure, and the vast majority of it has to do with the important need to improve transport infrastructure. Measures to improve transport infrastructure, totaling about 2 percent of GDP per year, can gradually improve Israel's relative position, such that the level of infrastructure will reach around the OECD median within 20 years. If this target is attained, it will contribute about 5.6 percent to the level of GDP per worker. In this case as well, we must take into account the expenditure in years when the contribution to productivity has not yet borne fruit, and reduce it from the long-term benefit, such that the average annual benefit is estimated at 4.8 percent of GDP. The cost that to which we must compare this benefit will be about 2 percent of GDP. It should be noted that increasing investment by one percent of GDP is necessary just in order to maintain Israel's current position in the international ranking of infrastructure quality, and this investment will generate about half of the total benefit. However, an additional percent of investment is needed in order to achieve significant improvement in Israel's ranking, and an improvement in the level of GDP per worker, compared with the base scenario of the growth model.

The measures we have recommended in the area of communications and in the area of energy are essential in order to maintain Israel's relative position in these areas. The measures in the area of communications will contribute about 2.7 percent to the level of GDP per capita, but these are already included in the base scenario of the growth model. In other words, if they are not taken, growth will be lower than what is presented in the scenario. The quantitative effect of the measure sin the area of energy is difficult to estimate, but their contribution to the continued proper functioning of the economy will grow over time, insofar as it is necessary to adjust to a changing environment.

As to the proposed measures in total factor productivity, we believe that most of the measures proposed in the area of regulation and bureaucracy can be implemented by changing work management and labor relations in the government offices, without significant budgetary cost. Among other things, this is because taking the real costs of adopting regulation into account while budgeting proper enforcement and a reasonable level of service will lead on its own to a significant dilution of surplus regulation. Based on the results of the growth model, adopting the recommendations in this area may contribute 2 percent to the level of GDP per worker, assuming that Israel manages to climb from the 20th percentile to the 50th percentile in quality of regulation ranking among OECD countries.

d. Fiscal aspects of the proposed measures

The cost of the measures proposed herein, once they reach full implementation in a number of years, is high. It is estimated at close to 3 percent of GDP per year.² However, the long-term benefit that results from this cost is also significant: about 20 percent of GDP per year. The high cost indicates the huge gaps that have developed over the past decades, and the fact that public expenditure on growth-supporting items in Israel is significant lower than required to close (or even maintain) the productivity gaps. This is partly due to the rapid population growth in Israel. Since we are spending less per student on education, it is no surprise that the skills of the labor force are lower. The low public investment over the years is reflected in the low quality of infrastructure and in the low stock of capital.

The high yield justified the investment in the proposed reforms if they are implemented efficiently. The increase in expenditures will be gradual, since the planning and regulatory advancement of the investments in physical capital and the promotion of structural processes take time. Alongside this, due to the size of the required expenditure, it is important that the financing be achieved in a way that will minimize its burden as much as possible. This consideration is true both in choosing between financing through a change in budgetary priorities (lowering expenditures that do not support increased productivity) and increasing the public debt or raising the tax burden, and in choosing the specific measures from each of these components. The choice between raising the tax burden and reducing expenditures obvious depends on the social preferences of the public and the government.

The decisions that will be made will apparently be influenced by the fact that the level of civilian public expenditure in Israel is currently about 8.5 percent of GDP lower than the OECD average. This gap remains significant even when taking into account the lack of investment in the stock of public capital and in human capital, which the program is meant to close. This gap narrowed only slightly due to the accelerated growth of these expenditures in recent years [not necessarily in growth-supporting items (Bank of Israel, 2019a)]. In contrast, the tax burden in Israel is lower than in the other countries. It is important to note that even when taking Israel's exceptional defense expenditures into account, expenditures as a share of GDP are lower than in most OECD countries, which shows that adjusting the budgetary structure to defense needs is based completely on lowering other costs.

The possibility that it will be decided to increase the tax burden (which is defined as total tax revenues as a share of GDP) in order to finance the expenditures recommended herein requires a discussion of the macroeconomic implications of such a move. Economic research has dealt a great deal with the question of the connection between the size of the tax burden and economic growth, and with the possibility that a higher tax burden harms growth over time.³ Jaimovich and Rebelo (2017) found, based on both an independent analysis and a review of empirical literature, that there is no strong connection between the tax burden and economic growth. Similar findings appear in Piketty et al. (2014) and in Saez et al. (2012). In contrast, Bergh et al.

² Of which, as stated, an addition of 1 percent of GDP is required just to maintain Israel's relative position in the level of per capita physical capital among the OECD countries.

³ This discussion differs from the issue of the effect of raising tax rates on activity in the short term. There is broad support in the economic literature for the fact that in the range of 2–3 years, increasing tax rates slows growth, although there are significant gaps in the quantitative estimates of this effect (for a review, see Ramey, 2019). However, this effect dissipates and does not exist in the long term. Romer and Romer (2010), whose estimates are in the upper range of the distribution of estimates of the short-term effect, even base their model on the assumption that changes in tax rates have no effect on growth in the long term.

(2011), who reviewed studies that tried to deal with the empirical challenge in studies of this kind, concluded that a 1 percentage point increase in the tax burden is correlated with a decline of 0.05–0.1 percent in the growth rate of advanced economies, although they emphasize that it is very difficult to reach a causal conclusion regarding the connection between the tax burden and growth, mainly because of changes in the tax burden that take place over the course of the business cycle. The use of the coefficient they found shows that increasing the tax burden in Israel by 3 percent of GDP could lower the annual growth rate by 0.15–0.3 percent. However, even if these estimates are correct, according to the analysis that we present, the proposed measures will add about 0.5 percent to the growth rate.

One possible alternative to the budgetary adjustment discussed above is financing the investments by increasing the deficit. Generally, financing high-yield projects through debt is an economically reasonable possibility. However, adding to the budgetary deficit on the scale of the cost discussed here (about 3 percent of GDP) may put the stability of the economy at risk, because expected yield will only be obtained in the long term, and according to experience from both Israel and abroad, the maturity time of the investments is not certain. Furthermore, the current structural deficit of the economy is already too high, and it currently estimated to be at least 3.5 percent of GDP (despite the low level of growth-supporting expenditures) and is expected to grow significantly in 2021 and thereafter. The consequence of such a deficit level is a continued increase in the public debt to GDP ratio. Theoretically, accelerated growth—such as what is expected to result from the measures proposed in this document-makes it possible to maintain a higher deficit over time without increasing the debt to GDP ratio compared to a situation without investment in growth. However, the deficit level that stabilizes the debt to GDP ratio even after the accelerated growth that we project is significantly lower than the current deficit level in Israel. In particular, the growth expected in the basic model enables the stabilization of the public debt to GDP ratio at a level of about 60 percent with an annual deficit of about 2.5 percent of GDP. Accelerating it by 0.5 percent, in accordance with the assessment above, makes the same stabilization possible with a deficit of 2.7–2.8 percent of GDP, obviously assuming that all of the additional expenditures are actually designated for the items mentioned above. As stated, this is in comparison with the current deficit level of 3.5 percent of GDP, which is still expected to grow from 2021 onward. For this reason, it is important that the government act to reduce the structural deficit even before the proposed expenditures to increase productivity are implemented, in order to ensure the stability of fiscal policy and the availability of sources for financing the investments.

Beyond the macroeconomic risks of deficit financing, such financing creates risks to the quality of project selection and to cost control. When public projects are financed without effective short-term budgetary limits that reflect to the public and to policy makers in real time the cost of the sources required for investment, the risk of inefficient allocation of investments, and of exceeding costs, increases. This is because long-term projects are characterized by uncertainty regarding cost components, selection of developers, additions to the project that will be required to make it easier for parties harmed during or as a result of the construction, and the need to directly compensate various parties. Without subjecting every additional expenditure beyond the original framework to the priorities of the current budget, this could cause an incentive for "overgenerosity" in these components.

Either way, the implementation and financing of the projects recommended here are expected to move forward gradually, due to the planning stages and the structural difficulties in implementation of processes of this kind. It will be important to examine the efficiency of performance and the benefits during the planning and implementation, and to make the necessary fiscal adjustments with the required caution.

The recommendations and calculations provided below assume that there will be no dramatic change in the contribution of innovation to global productivity, and to the productivity gap between Israel and other advanced economies. Israel's economic history shows that the growth rate of total factor productivity did not accelerate—and actually even slowed somewhat—in the years when the global Internet revolution took place and the Israeli high-tech sector's share of business activity took off. We cannot reject the possibility that the Israeli economy will particularly benefit from the technological changes that are about to occur, thereby closing the gap in the standard of living between Israel and other countries. However, until this happens, it is worthwhile for the government to act determinedly to carry out reforms in the areas of education and infrastructure, and to improve the business environment. Moreover, an analysis recently published by the OECD (2019a) emphasizes that the most important component of preparedness for the digital world is investment in the population's skills.

Implementation of the proposed reforms in these fields is not to be taken lightly, particularly in view of the political challenge and the considerable cost. However, our assessment is that an informed policy that aims to gradually equalize investment in growth engines in Israel with the level of investment common in most other advanced economies will also bring labor productivity close to the level of those other countries. Adopting the recommendations contained herein at a cost of about 3 percent of GDP per year should accelerate the growth of the Israeli economy so that the gap to Israel's disadvantage compared with the OECD average will be closed, and the gap relative to the group of comparison countries will be narrowed. Since the employment rate in Israel is high by international comparison, it seems that increasing labor productivity, for instance through the ways proposed herein, is the main path to improving quality of life in Israel in the coming decades relative to the other advanced economies.

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Chapter 1: Introduction

Per capita GDP is the most common index for international comparison of the material standard of living in the economy. Hence its importance. In 2018, per capita GDP in Israel was estimated at about \$40,000 (Figure 1.1), 13 percent lower than the average among developed economies.



Per capita GDP is by definition equal to per capita labor input (total work hours or number of employed persons) multiplied by labor unit productivity (referred to as labor productivity and reflects either GDP per hour worked or GDP per worker). The number of total hours worked per capita in Israel is about 10 percent higher than the OECD average, largely because the number of hours per employee in Israel is particularly high. After the employment rate in Israel increased significantly in recent decades, employed people as a share of the population (labor intensity) is similar to the OECD average.



In contrast with labor intensity, labor productivity in Israel is low by international comparison (Figure 1.2). In 2017, GDP per worker in Israel was \$82,000—9 percent lower than the OECD average. If we take into account the high number of work hours in Israel, the gap in productivity worsens: GDP per work hour in Israel was estimated in 2017 at \$42.7—24 percent lower than the OECD average. Moreover, while growth in productivity tends to be faster in countries where productivity is low, the growth rate in Israel since the mid-1970s is no higher than the average in OECD countries or in leading countries (US). In other words, Israel is not converging with the rate of productivity in the advanced economies. In particular, the labor productivity gap to

Israel's disadvantage expanded from the beginning of the 1990s, narrowed slightly between 2005 and 2011, and has since remained stable.⁴

In this context, it should be noted that the slow growth rate of labor productivity is a challenge that many advanced economies have been dealing with in recent years. Between 1995 and 2007, average productivity per worker in the OECD increased at an average annual rate of 1.7 percent, while between 2012 and 2017 (following the peak of the Global Financial Crisis), it grew by an average of just 0.8 percent.

Since labor intensity in Israel has increased greatly in recent decades, and is currently higher than in other advanced economies (despite the low participation rate in some population groups), the key to continuing to narrow the gap in per capita GDP vis-à-vis the advanced world involves an increase in labor productivity. The economic literature (for instance: Feldstein, 2008) strongly ties improvements in labor productivity to increases in real wages. In other words, an increase in labor productivity will lead to an improved standard of living by increasing workers' real wages. However, we must remember that increasing productivity is a means to improving per capita GDP, which is also affected by the employment rate. We must therefore focus on policy measures that will not contradict the government's policy to increase the employment rate, and avoid such recommendations as increasing the cost of labor by regulatory means, which, while it may lead to an increase in productivity, may also lower employment under certain circumstances and have a negative impact on per capita GDP.

Economic characteristics unique to Israel

The birthrate in Israel, in all major population groups, is higher than in other advanced economies. Since the data for comparison is per capita GDP, any effort in narrowing the income gaps between Israel and the other countries must also take the expected population growth into account. This is even more so the case with education policies, since Israel's high birthrate means that the young are a much higher proportion of the population.

There are two population groups in Israel that are underrepresented in the labor market and that have low cognitive skills: Arab women, and *Haredi* men. Their share of the population, particularly the working-age population, is expected to grow markedly in the coming decades (Figure 1.3). As of 2017, the *Haredi* population comprises about 10 percent of the entire population, and about 8 percent of the prime working age population, and its share is expected to grow significantly in the coming decades due to its high birthrate: about 7 children per *Haredi* woman compared with about 2.7 among non-*Haredi* Jewish women. *Haredi* students accounted for 19 percent of all students as of 2015 (Blass and Bleich, 2016), and according to the Central Bureau of Statistics demographic forecast (2018), their share of the prime working age population is expected to grow to about 28 percent by 2065.

⁴ This result is obtained, for instance, from an analysis of GDP per worker data in fixed prices and equivalized to purchasing power parity (Bank of Israel, 2013; 2019c).



As of 2017, the Arab community accounts for about 21 percent of the entire population, and about 19 percent of the prime working age population. This population group's share of the prime working age population is expected to increase slightly in the coming decades, due to the high birthrate it has had in the past. However, the downward trend of the birthrate in the Arab community, to 3.3 children per woman in 2015 (which is close to that of the general Jewish population) has led to stability in the rate of Arab students in the school system since 2006 (25 percent), and the weight of Arabs in the prime working age population is expected to increase only slightly (to 21 percent by 2065).

In the context of employment, the challenge is due to the low participation rate of these population groups—mainly among *Haredi* men and Arab women. As of 2018, the participation rate of primary working age *Haredi* men was 53.9 percent, and among primary working age Arab women it was 40.0 percent, while the participation rate among non-*Haredi* Jews (men and women) was 88.1 percent. However, concerning labor productivity, which is the focus of this report, the challenge is particularly in the low volume of schooling and the low quality of teaching in these population groups. The number of years of schooling among the Arabs remains lower than among non-*Haredi* Jews, and the rate of increase is slow. While the *Haredi* population spends many years in school, those years of schooling are largely ineffective in the labor market, particularly among men. This will be discussed further in the chapter dealing with human capital.

Another important issue is Israel's unique security situation. For the most part, empirical research supports the notion that a security burden slows the economy in the long term (or at the very least does not contribute to its growth). This is because it raises the risk premium for business investments in the economy, and due to the high financial costs derived from it (Figure 1.4), there are fewer available sources for investment in infrastructure and in human capital. It is difficult to quantify the effect of the security burden, partly because there are also positive effects such as the training of young people with particularly high human capital for the high-tech industries. However, overall, security needs have an effect on the economy that is apparently negative, and they have a negative effect on productivity in Israel. This report proposes other tools to improve



productivity in Israel, given the country's security situation—something with which we do not deal.

An examination of labor productivity (GDP per worker) by industry in Israel compared with the OECD shows that productivity in Israel is particularly low in nontradable industries such as trade and construction. It is also low in import-protected tradable industries that serve the domestic economy, such as the food, beverages and tobacco industry and the publishing industries (Figure 1.5). Moreover, looking at the economy over time, since the mid-1970s, the increase in productivity of the trade and services industries is near zero, while productivity in the manufacturing industry is growing steadily (Figure 1.6). According to a study by Regev and Brand (2015), such an extreme picture is not typical of other countries, where the nontradable industries with low productivity, as well as some of the manufacturing industries that sell to the domestic market, are responsible for most of the growth in productivity gaps between Israel and the rest of the world since 1995.⁵

Relative productivity by industry

⁵ For more information, see the discussion in Figure 6 of Regev and Brand (2015).



Regev and Brand (2015) also examined the connection between the increase in productivity (since 1995 and relative to the OECD average) within manufacturing and the rate of exposure to competing imports. Their analysis shows that in industries where competing imports account for a small share of the industry's output, the growth rate of productivity per worker was lower than the OECD average. As such, these industries contributed over the years to the increase in productivity gaps between Israel and the OECD.

Moreover, an analysis conducted by the Bank of Israel found that the rate of unskilled workers in Israel is high by international comparison, mainly in the nontradable industries or in tradable industries that sell most of their product to the domestic market. This reinforces the finding that these industries are characterized by significant productivity gaps vis-à-vis the OECD. In parallel, investment in physical capital as a share of GDP is particularly low in these industries, compared with parallel industries in other advanced economies (as shown in Section 3). As a result of the inferiority in human capital and in physical capital, the nature of work in those industries is consistent with a production function that is based on unskilled manpower. The rate of workers who are required in their work to deal with complex problems, or the frequency with which they are required to read instructions is low in Israel, particularly in these industries (Figure 1.7). Even though the measurement of productivity in the services industries is complex and is exposed to errors, the large number of the indicators that point to relatively low productivity in these industries strengthens the assessment that an important part of the productivity gaps are connected with activity in the nontradable or partially tradable services industries.

In contrast with these industry groups, productivity in Israel is higher than the OECD average in advanced technology industries such as computer and information services, research and development, and computers and electronics (Figure 1.5). It seems that in the manufacturing industries, labor productivity and labor compensation per worker (relative to the parallel industry in the OECD) increase with technological intensity (Figure 3.2 below).





Chapter 2: Human capital

General overview

Human capital is the knowledge and personal skills of individuals, which provides them, among other things, with the ability to do work that generates economic value. There is no direct measure of human capital, so it is measured indirectly—by quantifying formal education through the number of years of schooling, and by evaluating its quality through surveys that examine the skills of individuals in various areas. The economic literature finds these estimates to have a significant ability to explain growth and productivity. The extent of Israel's lag behind the OECD median in the multi-year index of test scores deletes a considerable portion of the long-term annual growth rate and of the GDP level. A study by Argov and Tsur (2019) shows that increasing students' scores to the OECD average should contribute about 4 percentage points to the GDP level in the long term. Calculations based on elasticities estimated in international studies generated an even greater contribution (Hanushek and Woessmann; Bouis; Duval and Murtin, 2011; 2012).

The quantity of education in Israel is high by international comparison. The rate of those with higher education (Bachelor's degree or higher) in Israel is one of the highest among the advanced economies (Figure 2.1). However, as stated, the quality of education in Israel is particularly weak, as shown by the education system's results in comparative international tests and by surveys that examine the cognitive skills of workers in the economy. According to the results of PISA tests (2015) in Mathematics and Sciences, carried out among 15-year-old students, Israel is ranked near the bottom of the OECD (the vertical scale in Figure 2.2).



One of the causes of the weakness in Israeli scores (and apparently also skills) is the clear negative connection between the students' socioeconomic background and their achievements. A small portion of the students coming from the lowest socioeconomic quartile manage to position



themselves in the top quartile of achievements in the PISA test relative to the other OECD countries, and the gaps in Israel are large, both between the various segments of the population and within each segment (Figure 2.7 and 2.8 below).

The low achievements of students in the education system are reflected later on in their labor market skills. According to the PIAAC survey, the basic cognitive skills (literacy, numeracy, and problem solving in a technological environment) of Israeli workers are lower than the OECD average (Figure 2.3). The lag in the basic skills of Israeli workers exists among most age and education groups, which indicates that the problem comes from the basic education stages. There is also a particularly high level of inequality in scores on this test in Israel, and we can see that the gap to Israel's disadvantage is especially large in the lower parts of the skills distribution—compared to the parallel groups in the other countries (Figure 2.3).



The education system's resources and the efficiency of their use

Between 2000 and 2015, there were fluctuations in per student expenditure in Israel. It declined until 2010, and then increased to a level similar to what it was in 2000. The increase took place with the implementation of large-scale reforms in the elementary ("Ofek Hadash" (New Horizon)) and secondary ("Oz LeTmurah" (Courage to Change)) school systems. During the period in which per student expenditure recovered, some improvement was achieved in Meitzav tests and in international tests, and the gap between Israeli students narrowed (Blass, 2019). Blass (2017) also found that the achievement gaps between Hebrew speakers and Arabic speakers narrowed in recent years, particularly between students of similar socioeconomic backgrounds in the two population groups. Reingewirtz and Shani (2019) found that individual learning as part of the "Ofek Hadash" reform contributed to students' scores in Mathematics and English.

In contrast with the encouraging findings outlined above, other components of the reforms and of monetary investment in the system have so far not generated the hoped-for results. Either way, it is too early and too complex to assess the extent to which the changes in per student expenditure in Israel in the past two decades affected achievements.

The foregoing discussion raises a major question: Does the correlation shown in Figure 2.2 between the volume of per student expenditure and students' achievements show causality between investment and achievements? Jackson et al. (2015) found, based on an analysis of per student expenditure in the US, that a 10 percent increase in per student expenditure contributed about 0.3 years to the number of years of schooling, and about 7 percent to the wages of people born between 1955 and 1985, with a larger impact on students from a weak background. They also found that cutbacks in the education budgets in the US during the Global Financial Crisis harmed students' reading and mathematics scores, particularly those from a weak background.

These findings attest to the chance of improving students' achievements through increased investment in education. However, increasing expenditure on its own does not ensure the improvement in achievements, since the improvement depends on the use and efficiency of the existing and additional resources. One of the indicators that the efficiency of the use of resources is not optimal is that teachers' salaries in Israel are similar to the average in the OECD countries,

while their basic skills (in mathematics and reading comprehension according to the PIAAC study) are lower than for teachers in those other countries, and they are not improving over time (Bank of Israel, 2019a).⁶ As we will detail below, this may be a result of the particularly large gap between the wages of senior teachers and those of newer teachers, and of the weak link between teachers' wages and performance.

In contrast with the indicator of efficiency outlined above, other indices that are sometimes cited as reflecting inefficiency in the education system are not exceptional in Israel.⁷ For instance, the position volume of teachers in Israel is higher than in other OECD countries, and the rate of teaching hours as a share of total teaching position hours in Israel is the same as the OECD average (68.5 percent).

It is reasonable to assume that achievements can be improved under the existing resources through greater efficiency of the system and by diverting resources to expenditure items with higher achievement yields. Financing the recommendations included here through such actions is certainly preferable to increasing total expenditure. However, arriving at the achievement level of more successful countries will also apparently require a gradual budgetary supplement, which will be subject to improvement in the relevant processes. For instance, we recommend improving the quality of teaching by improving the wage conditions of new teachers, and by increasing payment to teachers who teach subjects that are in demand and at schools that cater to students from weak backgrounds. However, this is all on condition that the teacher assessment process is improved, so that it will be possible to ensure that the focused salary supplement is channeled to the best teachers in the places where they provide the maximum benefit.

This report avoids making far-reaching recommendations that will shake up the education system. Putting the system on a stable work routine is important on its own. The proposals here are mainly measures that do not contradict the reforms that have already been put in place or existing processes, or adjustments that are clearly necessary to some of those processes. Furthermore, we deal very little here with pedagogy, since that is not our area of expertise.⁸ We do, however, note that while the findings concerning student achievements in Israel are based on measurable output, the education system has a main and increasing role in providing abilities that are not currently measured, such as independent learning, critical thinking, interpersonal skills, and so on (Deming, 2017). Below, we will discuss the implications of this role for the required policy.

2.1 Early childhood

The most efficient acquisition of cognitive abilities is at young ages, when they can influence the individual's ability to obtain knowledge and skills at later ages in the course of obtaining

⁶ The ratio of teachers' salaries in Israel to the salaries of those with Bachelor's degrees is similar to the average of this index in the other OECD countries (0.88 in Israel and 0.86 in the other countries). Since the number of hours teachers in irael work is higher than in the OECD, the hourly wage in Israel is slightly lower (data from Education at a Glance, 2018). The comparison of skills presented in Bank of Israel (2019a) was in relation to the skills of the general population in each country.

⁷ For instance, "TheMarker" (2015). That article discusses the question of why the student-teacher ratio is similar to the OECD average while the number of students per class is high. The main reason is the high number of hours that Israeli students learn compared with the OECD average. One argument that comes up in this context is the existence of many "empty hours"—hours that are reported as teaching hours but are not actually devoted to teacher. Blass et al. (2010) examined this issue by looking at control data, and found no evidence of this. ⁸ More discussion on this topic appears in Zohar and Bosherian (2019) as part of the Interim Report of the

Consensus Committee on "Adapting the Curriculum and Study Materials to the 21st Century".

matriculation certificates and higher education. Following the report of the Committee on Economic and Social Change (the "Trajtenberg Committee"), the government decided to adopt the Free Education from Age 3 Law. The implementation of the law led to the inclusion of the vast majority of children aged 3–6 in a Ministry of Education learning framework. The Trajtenberg committee also recommended moving infant day care (up to age 3) from a care model to a model combining day care and education. However, the public response for toddlers from the end of maternity leave to the age of 3 remained partial, and remains within day care centers under the supervision of the Ministry of Labor and Social Affairs. Seventy-six percent of toddlers at these ages remain in private daycares with varying degrees of quality, or without a proper response (National Council for the Child, 2018).

Toddlers who are eligible for public solutions, about 24 percent of all toddlers, are in daycare centers supervised by the Ministry of Labor and Social Affairs. These centers are focused on providing care while the toddlers are there, and are mainly intended to allow the parents to work at a regular job. Rosenthal (2004) argued that the quality of the daycare centers in Israel is low, and children in these centers may therefore suffer damage that will be difficult to correct at later stages in life. Since then, there has been action to advance the quality of education-care at supervised centers through the development and implementation of a supervisory standard and professional training in conjunction with the Joint Distribution Committee – Ashalim and academic entities. In November 2018, the Infancy Council was established. It is responsible for the medical, care, and social aspects of childhood from birth to first grade. In addition, at the beginning of 2019, a government committee was established (in accordance with Government Decision 4496) with the aim of improving and streamlining daycare centers.

The main challenge to improving the quality of daycare centers involves the educational aspect. Alongside the focus on the need for care while at the center, the operating organization's association with the Ministry of Labor and Social Affairs requires a pedagogical arrangement. This arrangement relates to a number of aspects, including educational activity that is currently supported by educational instructors that the organization must employ. However, in order to begin a significant educational continuum in the preschool years, there must be an authorized pedagogical presence who is regularly at the daycare center. The importance of this issue was reinforced by international studies (Elango et al., 2015; Garcia et al., 2017), which looked at various early childhood educational programs implemented around the world, and showed that such programs have an impact on success indicators in later life (employment and wages), and that the main beneficiaries are children who come from less well-off families. However, in order for them to benefit from such programs, the early childhood framework must provide a high-quality educational environment for the child, at least to the level of the parental environment.

Expenditure on daycare frameworks for toddlers up to two years in Israel is very low by international comparison, particularly the government's portion of this expense divided among the number of children registered for a daycare framework (Figure 2.4). Israel is ranked among the lowest in this index.



It is reasonable to assume that such a low expenditure (particularly in relation to the number of children) does not make it possible to provide sufficiently high-quality educational service, despite the many efforts made by the parties responsible for this area.

The emphasis needs to be placed, as stated, on children from weak socioeconomic backgrounds. Such children do not benefit from a public response, due to the significant lack of daycare centers in some parts of the country, sometimes because of barriers in the effectiveness of the local authorities, particularly in Arab localities, and due to limited availability in other areas. The Ministry of Labor and Social Affairs in its construction budget prioritizes local authorities with targeted population groups (the Arab sector, the *Haredi* sector, and the periphery), and the pace of day care center construction increased. However, thus far, it is reasonable to assume that children from weaker backgrounds are joining private frameworks with lower quality than daycare centers where there are children from stronger backgrounds. In addition to focusing on children from weaker segments, it is important that public assistance be set up in such a way that does not harm the incentives for parents to work, and in this context, focusing expenditures on public subsidies for the existing system should also be examined.

Recommended policy directions

• Improving the quality of staff recruited to the daycare centers by raising minimum requirements, implementing prior training, and adapting work conditions to these requirements. The staff's skills, and particularly the education, qualification, and training that the staff receive during their work, determine the quality of the educational framework. Work conditions that reflect an understanding of the complexity of the kindergarten teacher's

job will help attract high-quality manpower to this demanding job, and retain teachers with the appropriate education and training.

- Building curricula and improving the training of daycare center staff, with an emphasis on improving their ability to impart life skills and a successful beginning to the pedagogical continuum to the children.
- It should be recognized that improving the quality of the daycare centers may make the service more expensive for parents as well, subject to the subsidy level to which they are entitled if at all.
- Increasing daycare accessibility for children from low socioeconomic backgrounds by allocating the largest share of the construction budget to building centers in areas with children from weaker backgrounds, and by the government removing municipal barriers that make it difficult to realize the government's 2010 decision to build more daycare centers.
- There is no intention to overturn the service in the daycare centers, and certainly universal public financing. The research-proven benefit of early childhood education frameworks is mainly for the weaker population groups, and this tool must therefore focus on making a high-quality system accessible to those groups.

2.2 Quality of teaching in the elementary and secondary education system

Global technological developments have an impact on both the possible and desirable learning methods, and on the roles of the education system. The teaching methods need to generate the best from digital databases and software, but 40 percent of school principals in Israel report a significant lack of digital teaching technology, compared with an average of 25 percent in the OECD (according to data from the Teaching and Learning International Survey (TALIS), 2019). Either way, technological development does not obviate the need for high-quality teaching staff, but rather intensifies it. The labor market already includes an increasing amount of artificial intelligence that makes some of the population's skills redundant and increases the importance of critical thinking, creativity, lifelong learning ability, social and emotional abilities, and so forth. These skills are best taught by teachers who are themselves graced with them, even if technology may do away with some human teaching resources.

Teacher quality is therefore critical to the quality of instruction and to student achievements. The Mckinsey report (2007) analyzed 25 education systems around the world, and reached the conclusion that "the quality of an educational system cannot exceed the quality of its teachers". The effect of teacher quality on student achievements is positive and statistically significant in most studies, stable over time, and greater in elementary schools. For instance, it was found that an improvement of one standard deviation in the quality of the teacher leads to an improvement of 0.1 standard deviations in student scores in mathematics and reading (Rockoff, 2004).⁹

An increase in teachers' wages should under certain circumstances lead to an increase in teacher quality. Hanushek at al. (2014) show that in countries where teachers' wages are higher than for other Bachelor's degree graduates, both teachers' skills and students' achievements on Pisa tests

⁹ The study does not directly identify teacher quality, but uses statistical methods that identify the link between the teacher's unobserved characteristics and the scores of his or her students (fixed effect). The study emphasizes that identifying teacher quality is not a trivial matter, but it cites studies (such as Murnane, 1975) that showed the link between principals' evaluations and the teachers' contribution to their students' scores. Principals' evaluations also have an advantage in that they recognize that teacher quality does not only contributed to student scores, but also to their "soft" abilities, such as critical thinking and interpersonal abilities. A number of studies (such as Aaronson, Barrow and Sandler, 2007) have shown that the effect was found to be particularly positive for students from lower socioeconomic backgrounds and for population groups considered to be sidelined.

are higher. The hourly wage of teachers in Israel, equivalized to wages of those with Bachelor's degrees in Israel, is 6 percent lower than the parallel average in OECD countries (according to data from "Education At A Glance", 2018) but the gap in teachers' skills (Bank of Israel 2019a) is deeper than can be explained only by teachers' relative wages. Therefore, we will discuss both the possible effect of wages and their structure, and the possible effect of other factors.

Over the past decade, a number of reforms have been implemented in the education field.¹⁰ These have changed the employment conditions for teachers by increasing their global salary, but also their total hours, such that their hourly wage has barely changed. In the first years following the reform, the total number of teachers and the ratio between it and the number of students increased, which apparently contributed to teaching quality and made it possible for them to give more personal attention to each student and his or her needs. However, later on, the demand for teachers increased more rapidly than the increase in the labor force at relevant ages, perhaps due to the policy of lowering the number of students per classroom. Over all, there was no significant change in the measured quality of teachers in recent years (Figure 2.5).



In view of the changes in wage structure and the increase in demand for teachers, the minimum requirements for acceptance into teaching studies declined, and the number of students increased. While the increase in number made it possible to absorb more teachers in the system, thereby responding to the increase in demand, it seems that this has come at the expense of quality and at the expense of compatibility between the teacher's training and the area of knowledge he or she teaches. For instance, the Central Bureau of Statistics (2019) indicated that the level of knowledge in mathematics among students studying to teach the subject declined between 2012

¹⁰ The Dovrat Committee, some of whose recommendations have been implemented at one stage or another; the "Ofek Hadash" reform in elementary and middle schools, which raised the number of hours per teacher and the average wage per teacher in the system (such that the hourly wage relative to the average wage in the economy did not rise), and which added one-on-one teaching hours; and the "Oz LeTmurah" reform that raised teachers' average wage per position and added further monetary payment for teachers in schools with values and scholastic achievements.

and 2019, at least based on their achievements on the psychometric and matriculation exams. The State Comptroller (2019) also indicated that a significant portion of teachers in the various subjects did not undergo appropriate training in that field in order to teach them.

An examination of the various committees established to assess teacher training recommended that the number of academic teaching colleges be reduced, and that they be gradually moved to the responsibility of the Planning and Budgeting Committee (VATAT), with the aim of strengthening the academic teaching colleges, particularly on the academic level, and upgrading the training and professional standing of teachers. Up to now, three teaching colleges have been put under VATAT responsibilities (Achva, Beit Berl, and Seminar HaKibbutzim), while 19 colleges remain under Ministry of Education responsibility. In February 2015, the Ministry of Education and VATAT agreed to regulate the transfer of the teacher training system, but the rest of the process has encountered difficulties and opposition. It is important to advance this process as part of the overall drive to improve the quality of teachers in Israel, alongside the continuation and improvement of the recruitment and training high-quality academic manpower through retraining.

While teachers' wages should affect the Ministry of Education's ability to recruit high-quality teachers, Israeli teachers' average hourly wage disadvantage (relative to those with a Bachelor's degree) is not large. However, a particularly important factor may be the wage level at the outset of a teacher's career. The McKinsey report on factors in the success of the best education systems in the world (McKinsey, 2007) found that in order to attract good candidates to the education system, it is particularly important to improve their starting wages, while the upward trend of wages over the course of the career is less important. Wage gaps between teachers toward the end of their careers (ages 55–64) and those at the outset (ages 25–34) expanded between 2003 and 2014 from 98 percent to 114 percent, while the hourly wages of teachers at the outset of their careers in the secondary schools actually declined in real terms during that period. This, while the increase in wages of veteran teachers was not based on indices of success in their work. Rytov and Krill (2017) found that the gaps between veteran teachers and young teachers are excessive in such a comparison (Figure 2.6). The wage agreement signed in 2018 with secondary school teachers places significant emphasis on narrowing these gaps, such that improvement in the quality of recruitment among these teachers is expected.



The McKinsey Report's authors posited that high-quality teachers would persist at their jobs even if their later wage increases were smaller than those to which workers in other professions are entitled. However, other conditions that may have an impact on the extent of young and high-quality teachers' persistence at their jobs should be discussed. The "TALIS" (2019) survey shows that teachers' physical work environment in Israel needs improvement. 50 percent of principals reported a lack of appropriate teaching space (compared with 25 percent in the OECD), and 39 percent reported a general lack of infrastructure and its inconsistency to needs (compared with 26 percent in the OECD). The lack of infrastructure is reflected, for instance, in the absence of personal work space while teachers are not in class (non-frontal work hours), a lack of areas for one-on-one teaching, and a lack of other basic facilities. It also may be that the problem of infrastructure and the resultant crowding contributes to the higher number of violent incidents in Israeli schools compared with the OECD average, although the problem of violence is not only within the education system.

Alongside the difficulties outlined above, it is important to note that most of the areas reviewed in the TALIS were not shown to be exceptionally problematic compared with the OECD average. For instance, despite the problem of violence, there are no signs that disciplinary problems are making it too difficult to manage classes in Israel. Overall, the rate of teachers who are happy with their choice to be teachers is even slightly higher in Israel than the OECD average.

Recommended policy directions

- Upgrading the digital technology that is available for teaching and increasing the use of these tools in learning.
- Building a basis for effective teacher evaluation based on both their success to improve student scores and their success in advancing other educational goals.

- Improving teachers' pay at the outset of their careers through future wage agreements, at the expense of reducing pay pursuant to senority that is not based on performance.
- Continuing to advance the transfer of teaching colleges to the responsibility of the VATAT in order to improve the quality and standing of teacher training.
- Improving pay for teachers with appropriate training for teaching Mathematics, English and Sciences.
- Recognizing the seniority of teachers with other professional experience in the field in which they teach, particularly in subjects where there is a lack of teachers. Such recognition should increase the number of those applying for academic retraining programs.
- Improving the physical conditions of the teaching environment.

2.3 Inequality in education

One of the causes of the low basic skill level in Israel is the clear negative link between the socioeconomic background of students and their achievements. For instance, just 15.7 percent of students from the lowest socioeconomic quartile manage to position themselves in the top quartile of achievements in the PISA test—one of the lowest rates in the OECD (Figure 2.7). As Figure 2.3 shows, the inferiority of achievements in Israel is particularly prominent in the lowest level of achievements, and as Figure 2.8 shows, there is also great inequality within each educational stream. A survey of skills among graduates also found that there is particularly high variance in basic skills in Israel, particularly when divided into sectors.





A policy to improve the human capital of individuals from a weak socioeconomic background should increase the average skill level by a considerable amount. To illustrate, we conducted a simulation in which the very large current gap against the five lowest deciles in Israel vis-à-vis the OECD will narrow to the point where it will be identical to the gap between the sixth decile in Israel and the parallel decile in the OECD (3.2 percent, Figure 2.3). In such a case, about 55 percent of the existing gap to Israel's disadvantage in the PIAAC survey compare with the OECD average will be closed, and such a change should contribute 2 percent to the level of per capital GDP in the long term.

The method of budgeting teaching hours in elementary education has changed greatly in the past 15 years. Between 2001 and 2007, the "Shoshani method" was used, through which all teaching hours were distributed in accordance with a formula based on a deprivation index, such that affirmative action—the difference in teaching hours per class between students from the highest deprivation quintile (weak background) and students from the lowest deprivation quintile (strong background) reached about 30 percent in elementary schools in 2007. As part of this method, supplements were given to the low deprivation deciles where the results of the formula could not suffice to maintain the curriculum. In 2008, the elementary schools moved to the "integrated standard" method that was already in use in the middle schools, in which hours are distributed in the first stage to all classes in accordance with the curriculum, and in the second stage, the remaining hours are distributed using the deprivation formula, which was also changed.

The "integrated standard" method is still currently in use, but within that we must distinguish between the situation until 2014 and the situation from 2015. Until 2014, just 6 percent of total standard hours were distributed according to the deprivation formula, and many other hours (about 25 percent of all hours budgeted by the Ministry of Education) were not distributed according to this formula. As a result, the rate of affirmative action declined to 18 percent in 2009 (compared with 30 percent when the "Shoshani method" was in use), and even lower in 2014. From 2015, the "Program to Reduce Gaps and Promote Equality" is being gradually implemented (over five years) in the elementary and middle schools. The program includes budget supplements and the diversion of some of the nondistributed hours by differential criteria

in favor of increasing affirmative action. According to a simulation conducted by the Ministry of Education in the program's report, the difference in total hours per class between the weakest background quintile and the strongest is expected to increase in the elementary schools from 10 percent to 24 percent, and in the middle schools from near zero to 24 percent, by the end of the process.

An increase in total teaching hours has a positive impact on achievements in mathematics and in verbal literacy, although the average effect is small. The positive effect is more prominent when the teachers are from within the system (as opposed to external teachers from various programs), and when the additional hours are focused on population groups from weak backgrounds and on students with learning difficulties and emotional difficulties (Kidron and Lindsay, 2014). Additional hours in basic subjects have been found to have more of a statistically significant positive effect than other intervention programs (Lavy, 2012) in Israel as well. This effect is particularly strong for students from weak backgrounds, and more efficient in schools where there is some extent of administrative independence. Most of the elementary schools in Israel already include a limited self-management component, but it is hard to determine whether this component is sufficiently significant in Israel to enhance the effect of the additional hours.

Another cause of the gaps is the quality of teaching in schools with various backgrounds (Figure 2.9). It is reasonable to assume that this is mainly due to the link between the socioeconomic background of the students in that residential locality and the socioeconomic background of the teachers in those same localities. In addition, the jobs of teachers in schools with weaker backgrounds are apparently more demanding, which in itself dissuades teachers and lowers the supply of teachers for those schools. On the other hand, the motivation of teachers in Israel to contribute to society, and particularly to improve the socioeconomic standing of students from weak backgrounds is higher than among teachers in the OECD countries.¹¹ This motivation can be harnessed to narrow the gaps in teacher quality between schools from various backgrounds.



¹¹ Ninety-one percent of teachers in Israel reported in the TALIS survey that the possibility of "advancing students from weaker social backgrounds" was an important consideration for them in choosing the profession, compared with 75 percent in the OECD.

The Ministry of Education's programs on the topic are small, and do not provide an attractive quality-based incentive package.¹² In the past (between 1975 and 2007), wage supplements were given to teachers who taught in national priority areas, but the method discriminated between population groups, so the Supreme Court ordered the cancellation of national priority area status.

Recommended policy directions

- Formulating tools to evaluate management and performance, which will be based on the success of the school's management according to the trend of change in students' achievements at each school over time (and less according to achievement levels themselves), while taking into account changes in the composition of students from weaker backgrounds, the disable, immigrants, and minorities, in order to prevent distortion of the results.
- Increasing the administrative independence of the schools which higher-than-expected achievements in view of the socioeconomic background of the students, and implementing administrative change at schools with lower-than-expected achievements. The implementation of this recommendation requires a significant change in the work and supervision methods of the Ministry of Education's departments and regions.
- Improving the quality of teaching and management at schools that cater to students from weaker socioeconomic backgrounds, through focused investment on the professional development of teachers and principals in those schools. This should be partially implemented and accompanied by research.
- Creating incentives to divert high-quality teachers to weaker schools, accompanied by research, and formulating reliable quality indices that are based on a uniform database, by building a program that enhances and presents the professional challenge, and provides teachers with unique pedagogical tools. In addition, those teachers should be given a grant for joining¹³ and extended remuneration in order to retain them, subject to a test of this tool's effectiveness. Expanding the implementation of personal contracts can be considered in view of this goal.¹⁴

¹² The programs are: "Hotam" (Seal; Impression), "Halutz Hinuchi" (Educational Pioneer), and "Menifa" (Fan). Incentives are currently provided for teachers to teach in Eilat and the Hevel Eilot Regional Council, and for Arabic teachers to teach in the Beduin sector in the Negev. In addition, there are special incentives called "personal contracts" for a limited time of 1–3 years that are given to teachers defined by principals and supervisors as excellent. The teachers must teach an "in-demand subject" (particularly core subjects) at schools from a list of peripheral localities at four levels, on condition that the teacher did not also teach in the locality in which he or she lives. In 2013, about 1,000 teachers (out of more than 150,000 teachers in the system) received an average grant of NIS 54,000. We also note the annual grant given to all teachers in schools that excel in the teaching, social, and values areas. In 2017, about 25,000 teachers received an average grant of about NIS 4,000. Finally, an example from another field is the comprehensive incentive given, starting in 2012, to physicians for working at hospitals in the periphery and in high-demand professions. The total budget allocated for this program in the 2012 collective agreement with the physicians was utilized within three years, and the program was extended in 2016 and 2017.

¹³ Such a grant for new teachers reflects an increase in their starting wage, which the McKinsey Report (2007) and a study by the US Department of Education found to be important in attracting high-quality teachers. The "Halutz Hinuchi" program run by the Ministry of Education in conjunction with the Institute for Democratic Education and other funds is an example of a designated program that is run in this spirit.

¹⁴ The most relevant study for the proposal brought here is a study by the US Department of Education (2013) that examined the policy to incentivize high-quality teachers from seven US states to move to positions in schools catering to students from weak backgrounds. The incentive was provided through a grant that amounted to about 20 percent of the annual salary for teachers identified through the "value added" method as high-quality—those whose contributions to student scores was high. Twenty-two percent of the teachers identified expressed agreement in principle to the proposal. From those, teachers were selected to work for two years in schools with students from weak backgrounds. In each of the years, the program contributed 4–10 points to the scores of
• Improving the teacher evaluation system in order to allow principals from weak-background schools to sort teachers who want to join them.

2.4 The Haredi sector

Beginning in the mid-1970s, subjects relevant to the labor market (Mathematics, English, and Sciences¹⁵) have greatly declined as a share of the curricula for boys in the *Haredi* stream. Studies in these subjects exist to a small extent, mainly in the afternoon during secular studies times at the elementary school level in *Talmud Torah* schools, and include a small amount of English and Computer studies. Most *Haredi* teens will not learn these subjects at all starting in high school.

Another problem that is less emphasized in the discussion about *Haredi* education is in the area of learning literacy (Cohen, 2005). The manner of study in the *Haredi yeshivot* is different than in the public school system. For instance, there are few tests, writing assignments, or classroom presentations. The result is that *yeshiva* graduates in most cases are not skilled in writing, speaking, submitting assignments, or doing tests—all skills relevant to the labor market and to progressing in it. *Haredi* students are forced to deal with a lack of such literacy when they choose to pursue studies in Israeli academia that require these skills.

The gap that has already developed during childhood is reflected in later stages in the negligible rates of people from the *Haredi* population applying for and receiving matriculation certificates. Naturally, the different choice in education habits is also reflected in the area of higher education (Figure 2.10). The rates of those applying for academic study is particularly low among *Haredi* men, many of whom turn to religious studies at *yeshivot*, which contributed little to the human capital required in the labor force. The average number of years of study among young *Haredi* men (aged 35–39) was estimated in 2015 at 19.4 years (compared with 15 years among non-*Haredi* Jews). Despite this, the wages of *Haredi* men with more than 12 years of study is equivalent, on average, to the wage of a non-*Haredi* Jew with just 10 years of study. At least half of this gap reflects the lower skills of the *Haredi* men, as found based on the PIAAC tests (see Appendix A1).

participating students on a scale of 0–100. The effect was felt mostly in the elementary schools, while there was no statistically significant effect in the middle schools. The researchers calculated and found that in order to reach similar achievements by lowering class size, it would be necessary to spend an additional \$13,000 per class beyond the cost of the program to reassign teachers—in other words, about NIS 30,000 in terms of the cost of education in Israel.

¹⁵ The "language" area of knowledge is studied as part of the Haredi program, adapted to them.



A study conducted by the Taub Center for Social Policy Studies in Israel (2017) found that in recent years, there has been a marked increase in the number of *Haredi* students registering for institutes of higher education (about one-third of whom are men). However, it is not sufficient to bring a significant number of *Haredi* men to academic study. The Planning and Budgeting Committee (VATAT) indicated problems in the quality of teaching at the *Haredi* institutions due to low minimum requirements, distance from the parent institution, and studies in saturated fields such as business management and law (Malach, Cohen, and Zicherman, 2015). Moreover, Malach et al. (2016), and Regev (2016) showed a worrying finding regarding the high dropout rates among *Haredi* men who begin academic study. The weighted dropout rate among *Haredi* men between 2005 and 2014 was 58 percent (of whom 20 percent dropped out during preparatory school and 38 percent during degree studies). By comparison, the dropout rate among non-*Haredi* Jewish men is about 30 percent, and among Arab men it is 40 percent.

The low amount of study in subjects relevant to the labor market at early stages, and application at adult stages to studies that have no connection with the labor market, are reflected in the low level of human capital (relevant to the labor market) among the *Haredi* population, and particularly among the men. An examination according to PIAAC survey data indicates that the

basic skills of young *Haredi* men (up to age 40) are lower in all parameters than those of the non-*Haredi* Jewish population at similar ages (Figure 2.11). In contrast, among older men (above age 40), there are no statistically significant gaps in skill levels—particularly in the areas of numeracy and literacy (there is some gap in problem solving in a technological environment). This finding brings into sharper relief the difference between the older *Haredi* population, many of whom learned subjects relevant to the labor market, and the younger society, which has distanced itself from these subjects. This pattern of gaps in basic skills is not noticeable among women, but there are skills gaps in the area of problem solving in a technological environment. It is likely that the large gaps to the disadvantage of the *Haredi* population in the area of problem solving in a technological environment (among both men and women) has to do with their lifestyle that is less influenced by communications technology. These gaps are also reflected in labor productivity gaps between the *Haredi* and the non-*Haredi* Jewish population in Israel (see Appendix A1).



The vast majority of *Haredi* women learn the basic skills that are relevant to the labor market at various types of *Haredi* institutions, including schools from the public-*Haredi* school system. However, it is difficult to assess the achievements in these frameworks, since they are not tested with the same assessment tools that are common in the other streams. In particular, they are not tested at all in English or sciences. As such, it is difficult to improve the quality of teaching of those girls.

A problem that develops at later stages is that 90 percent of girls graduating secondary school in the *Haredi* stream continue on to seminaries for two or three years. This creates a situation where the number of girls studying teaching is much higher than the number of teaching positions set by the Ministry of Education as required for the educational frameworks. This is despite the fact that the return in terms of labor productivity and wages that the girls can generate from technical studies in public-*Haredi* technical schools, and certainly from academic education, is expected to be higher.

Recommended policy directions

- Encouraging the *Haredi* population to study subjects that are relevant to the labor market, particularly reading comprehension, mathematics, problem solving in a technological environment, and English, and to a greater extent among men. The limitation on implementation of this recommendation is not technical or budgetary, but more essential. It derives from a worldview that opposes the studies themselves. The solution begins with understanding the serious ramifications of the problem, particularly in the long term. Attempts to work around the problem through frameworks for older students are expensive, and lead to just partial success (Argov, 2019).
- Establishing an advisory steering committee that includes representatives from the Ministry of Education, the *Haredi* teacher training institutes, religious leaders, parents from the *Haredi* community, and public representatives who are not from the *Haredi* sector, to examine solutions to advance the study of subjects relevant for employment.
- Creating cooperative ventures between the public schools and the *Haredi* frameworks in order to ease the lack of appropriate teachers to basic theoretical subjects.
- Increasing the *Haredi* education system's use of assignments that develop skills relevant to the world of labor, such as submitting written assignments, and dealing with tests.
- Promoting the ability to work on a computer, including through informal and voluntary education (after-school groups).
- Improving the measurement of girls' achievements in the *Haredi* frameworks, particularly in English and sciences.
- Limiting the budget for teacher training in accordance with the expected needs of the education system, while supporting an increased variety of training tracks for *Haredi* women.

2.5 Students in the Arab society

The achievements of students from the Arab society are very low compared with the rest of the population. For instance, the average score of students from the Arab sector in the PISA test is one entire standard deviation lower than that of students from the Jewish public school system, whereas according to studies in the field, the common assessment is that a difference of one-third of a standard deviation is the equivalent of one year of schooling. In terms of skills, the PIAAC survey found a similar gap. The achievements gaps are reflected later on in productivity gaps, which have a significant effect on the economy's output (see Appendix A2).

The gaps in education are to a large extent the result of a gap in the Ministry of Education's inputs. "The program to narrows gaps and promote equality" is expected to significantly increase the average level of affirmative action in the elementary and middle schools. However, while the rate of affirmative action in the Jewish sector was close to the target that the program set for the entire system before it was implemented, the rate of affirmative action in sources allocated to the Arab sector is not expected to close even after implementation is complete.

The report on the "Program to Narrow Gaps and Promote Equality" (Ministry of Education, 2014) deals with the under-budgeting of the Arab sector, and notes that "despite the fact that the average budget per Jewish student is lower than the average budget per Arab student, an analysis of the investment through a combined prism of sector and deprivation index reveals a problem. In each deprivation index, the average investment in the Jewish sector is higher than the average investment in the Arab sector."

The report details the reasons why the rate of affirmative action is not sufficient, including: "The high number of study hours and programs that require initiative on the part of school principals or local authorities", and the fact that "some of the additional programs require the budgetary participation of the local authority". In view of the low socioeconomic status of the Arab sector, and the accordingly low fiscal state of its local authorities, it is reasonable to assume that a large part of the explanation for the under-budgeting of education in the Arab sector can be found here. Therefore, diverting some of the hours financed by Ministry of Education sources to affirmative action according to a clear formula can be expected to correct the under-budgeting of the Arab sector. The volume of teaching hours allocated to affirmative action has increased in the first two years of the program. However, the importance of this issue requires that attention be paid to the gaps that are expected to remain even after implementation of the program, as well as the efficiency of the use of the additional hours.

The under-budgeting of the Arab sector is even more pronounced if we take into account the study hours that are not from Ministry of Education sources. Jewish students from strong backgrounds benefit from additional hours from municipality sources or from parental payment, while those from weaker backgrounds also benefit from additional hours through various nonprofit organization. In contrast, students from the Arab sector hardly benefit at all from additional hours from nonministry sources. For instance, the hours from sources that are not the Ministry of Education (local authorities, nonprofit organizations, and parents) were estimated at about 10 percent of total hours a decade ago, almost all of which were invested in the Jewish sector, while in the Arab sector they were infinitesimal (at least until 2009, the final year for which the Ministry of Education's standard control data were analyzed in the study by Zussman et al. (2010)). While these sources are not part of the government's policy, they do indicate the volume of inputs required in order to reach the level of achievement reached by students in the Jewish sector. Beyond this level of monetary inputs, there are many other challenges in the education system in the Arab sector, including the quality of teaching and of management.

The under-budgeting of the Arab sector is even more problematic if we take into account the need of students from the Arab society to learn Hebrew in order to integrate into the general labor market. A study by Lifshitz and Tachoko (2018) found that not knowing the Hebrew language has a negative effect on success in the labor market. While the Ministry of Education is expanding the Hebrew teaching program and making it more sophisticated, particularly employment Hebrew in the Arab sector, the volumes are not large, and it seems that additional input is required to meet this goal, particularly by integrating teachers from the Jewish sector to teach spoken Hebrew, as was done, for instance, in the "It will be okay" program. Either way, the need to learn Hebrew already leaves fewer hours for learning main subjects. Let us illustrate the ramification of the need to learn Hebrew and of the under-budgeting of the Arab sector on the volume of actual learning. An Arab students from a weak backgrounds in Grades 5–6 studied subjects that are included in the PISA test (native language, Sciences, and Mathematics) about two hours less per week than a Jewish student in the Jewish public stream from a similar background. Most of the gap was in Mathematics (5.9 weekly hours compared with 7.1).

Recommended policy directions

• Increasing affirmative action in study hours in accordance with the principle of broad progressive budgeting in the entire system, according to the socioeconomic background of the students. Examining the effectiveness of the guidance and training within the program

that is intended to ensure the efficiency of use of the additional hours—the "Merom" program. Decisions should be made on future steps on the basis of this test. Ensuring a significant correction of the low budgeting for study hours in the Arab sector has declarative importance for further steps.

- Devoting a significant portion of the additional hours in the Arab sector to improving Hebrew as a tool for future integration into the labor market.
- A comprehensive test of the functioning of the education system in all parts of the Arab society, and the ways to improve it, through a comparative analysis between schools that manage to improve their students' achievements and those who remain at the same level.
- Formulating tools to attract high-quality teachers to Arab schools, particularly with the aim of improving the use of the resources allocated to learning basic subjects (mathematics, reading comprehension, and English), and in order to support the integration of Arab students into Computer courses, where there is a significant lack.

2.6 Science and technology studies in secondary school

The rapid development of technology makes it necessary for workers to have the capability to learn and adapt to changes in the employment environment. As such, their success over time depends to a great extent on their basic skills, particularly their skills in a digital environment. Among other things, many sources in the high-tech industry and in government note the lack of skilled human capital as a major constraint in the development of industry, and therefore of economic growth (Kandel Committee, 2012; Ministry of Economy, 2014: Chief Economist, 2017).

From the standpoint of the acquisition of basic skills, it seems that programming knowledge obtained during Computer Science classes is the most relevant for this industry. Studies in recent years have shown that the return on the skills obtained in Computer Science studies is very high, while the rate of those studying Computer Sciences in academic frameworks and in expanded secondary school frameworks is not high. Moreover, providing basic or advanced knowledge in programming during school to as many students as possible should contributed to the skills of future workers throughout the economy, and not just those expected to be hired by the high-tech industry.

The most common degree among workers in the high-wage high-tech industries, by a wide margin, is a Computer Science degree (including Computer Engineering or Software Engineering), followed by Electrical Engineering and Electronics (Figure 2.12). The figure also prominently shows the relatively low rate of graduates with Biology degrees among workers in high-wage high-tech, despite the fact that 70 percent of those who studied Biology in secondary school also study the subject in university, and their average scores on psychometric tests are relatively high, similar to the average of those studying engineering.





Figure 2.13 shows the relatively strong connection between the choice of matriculation major and the likelihood of studying Computer Science at the academic level. The Figure shows that the likelihood that someone matriculating in Computers will obtain a degree in Computer Sciences is about five times higher than the likelihood of someone matriculating in Biology

among girls, and almost three times as high among boys, regardless whether they take five units of Mathematics (shown in the figure) or four.

In view of these figures, the trend over the past 15 years of a significant increase in the number of those taking the expanded matriculation in Biology—a field of science where academic graduates have significantly lower wages than the wages of Computer Science graduates— compared with a standstill in the (absolute) number of those matriculating in Computer Science and Physics is worrying. To wit, among all 12th grade students in 2016, only 6.6 percent took the five-unit matriculation in Computer Sciences, compared with 15.6 percent who took the five-unit matriculation in Biology (and 11.5 percent in Mathematics). Furthermore, in 2016, 52.5 percent of schools had students take the matriculation in Biology, while only 39.5 percent had students take the matriculation in Computer Science.

Explanations for this phenomenon range from the relative difficulty of learning Computer Science compared with Biology, through the under-representation of girls in Computer Science due to social, environmental, and psychological factors, to the difficulty in recruiting good Computer Science teachers in view of their higher alternative wage in the market.

Recommended policy directions

- Increasing exposure to basic technological, computer, and programming studies and making them accessible as a basic skill, by changing the allocation of teaching hours, and not be increasing their total number.
- Reducing the differences in difficulty between the various science subjects studied at the same study unit level by increasing the level of difficulty in subjects where it is necessary, both in terms of the on-going task load and in terms of the chances of success in tests.
- More properly reflecting the level of difficulty in the system of bonuses for the various matriculation tests at the time of registering for institutes of higher education, an in particular encouraging people to take Computer Science tests. As of now, in some academic institutions, the bonus given for a five-unit matriculation in Biology is higher than the bonus given for a five-unit matriculation in Computer Science.

2.7 Vocational training and cultivating cognitive skills in secondary school

In many countries, vocational training and experience at the secondary school level provide a response for professional preparation just before entering the labor market. A main reason for a vocational training and experience component in the secondary schools is the window to the working world that is opened by such experience, particularly for students who have difficulties in general studies and are about to drop out of the education system. However, this is not the case in Israel, where the time period of military service suspends entry to the labor market for a significant portion of secondary school graduates.

Most secondary school students in the technological-vocational education tracks (about 97 percent) are under the responsibility of the Ministry of Education, while the rest are in vocational schools under the supervision of the Ministry of Labor and Social Affairs. Since the system under Ministry of Labor and Social Affairs supervision was established, most of the attention in the system has been directed toward the professional aspect, with the structural integration of work days at enterprises (two-three days per week) and the goal of a professional certification that is equal to that of older vocational training graduates. At the same time, and particularly

since the 1990s, vocational study in the Ministry of Education frameworks is done mainly within the classroom, and the matriculation certificate is an important goal. This section focuses on the system supervised by the Ministry of Education, which we think must remain the main system in which we must strive to maintain the vast majority of secondary school students, out of a desire to maximize the potential cultivation of basic skills in the education system.

Therefore, vocational education in the secondary schools must be high-quality and modern, so that it provides basic capabilities such as theoretical skills and "soft" abilities (such as teamwork, the ability to communicate, discipline, work ethic, problem solving, initiative, dealing with sources of information, and so forth) with a view toward employment flexibility. Moreover, the situation in Israel requires an increase in theoretical core studies. There is a very high level of inequality in scholastic achievements, and the industries characterized by low productivity by international comparison include workers with inferior basic theoretical skills (numeracy, literacy, and problem solving).

De Malach and Zussman (2017) examined the effect of vocational education in the secondary schools (supervised by the Ministry of Education) on short-term and long-term result variables among students from the Arab sector in Israel during the 1990s. They found a causal connection between vocational education studies and lowering the dropout rate. However, according to some of the findings, vocational studies had a negative impact on the matriculation rates of boys. In addition, the researchers did not find that vocational studies had an impact on the employment or wages of graduates compared with similar students who learned in theoretical tracks (after controlling for the basic characteristics of the students).

The finding that vocational education does not have an effect on wages leads to the conclusion that vocational education (in contrast with technological-general education), certainly in its current construct, does not contribute to labor productivity. From this, it could have been concluded that since it does not have a negative impact on wages, there is no apparent need to make any changes. However, studies in some of the vocational tracks are more expensive than learning in the general track, because the learning is done in small classes, and due to the need for special equipment, materials, and teaching staff. It therefore seems that there is no costbenefit justification for the additional cost of vocational education.

In recent years, steps have been taken to increase the amount of training obtained during studies at secondary schools under the supervision of the Ministry of Education. The Ministry initiated a program to increase the rate of practical engineers and technicians in grades 13 and 14 (the TOV project), and to increase the rate of students gaining practical work experience during secondary school ("industry startup"). These programs were developed as "a response to the lack of high-quality professional manpower in the economy and in industry, particularly the lack of technicians and practical engineers in technological occupations" (Ministry of Education, 2019). However, an analysis of the situation of workers in various occupations in the economy shows that there is no overall lack of workers in these fields, and moreover, that demand for workers in various occupations changes rapidly and is therefore difficult to project.¹⁶ We must therefore focus on the system under the supervision of the Ministry of Education, in providing basic theoretical, professional, and technological skills. These will enable learning and professional change throughout a person's life and prevent a decline in employment rates and in the wage path at older ages, as is happening in countries that overemphasize specific professional experience at

¹⁶ To understand the methodology, see the examination presented by the Bank of Israel (2011). The examination was revised for later years for the purpose of this document, and its main results did not change.

younger ages (Hanushek, 2017). Vocational training at secondary school ages should be concentrated narrowly on a few vocational schools as a framework for those who have dropped out of other frameworks, and general skills must also be provided in these frameworks as well.

Recommended policy directions

- The possibility of learning in vocational tracks must be maintained as a window to the world of that knowledge, and for students who have a tendency in this direction. However, the Ministry of Education system must avoid investing in specific training and qualification tests, where the benefit for the student's future is doubtful at such an early stage in his or her lift.
- Diverting some of the resources designated for the training component in vocational education—such as expenditures on workshops, machinery, and expensive materials—to financing affirmative action in the secondary schools, particularly in the resources allocated to studying basic subjects (Mathematics, reading comprehension, and English).
- Cultivating and integrating very high-quality teachers into study tracks that are alternatives to vocational education, which cater to students from weak backgrounds. The secondary education system has a number of programs operating in this manner, some of which are financed and led by nongovernment entities. However, these serve only a negligible number of students.
- In parallel, we recommend strengthening the vocational training programs and concentrating them in the post-secondary frameworks, while improving accreditation between the secondary schools and the post-secondary technological training systems. These systems will be discussed in the next section.

2.8 Post-secondary professional and technological education

Professional training should bridge the incompatibility between individuals' skills and labor market demand, and contribute to productivity in the economy (OECD, 2015). However, government intervention in this area is necessary due to market failures similar to those that exist in obtaining an education. Many studies (for instance Cedefop, 2011) show that the return on one year of post-secondary professional (nonacademic) education is similar to the return on one year of academic education. However, some individuals have liquidity constraints that prevent them from financing training despite this return, while employers are worried about financing the training themselves, since the worker's employment horizon with the company is not ensured.

A study conducted in Israel on studies in technological colleges indicated a significant benefit for their graduates, and that the wages of graduates are similar to that for graduates of some academic degrees (Ministry of Finance, 2018). However, in Israel, there is no up-to-date research on the relevance of professional training (that is not within the technological colleges) for the labor market in Israel, or on the return that these training programs provide to their graduates. A clear methodology for opening budgeted courses is also lacking, while there is supervision over a wide variety of courses and institutes for which the need is unclear.

In 2018, the government decided to implement a reform in the technological education system. As part of the reform, it was decided to differentiate between colleges with 800 students or more and smaller colleges. The large colleges will be entitled to an increased budget of NIS 19,500 per student, to a threshold in terms of the number of students that was defined even before the reform and cannot increase according to the rules of the reform. In contrast, the small colleges

(those with less than 800 students) are entitled to the old rate of NIS 11,500 per student, unless they manage to grow to more than 800 students, which will then entitle them to the increased rate, but only up to the threshold of 800 students.

This reform is intended to improve the quality of the colleges from the standpoint of specialization and economy of scale. The reform includes a budget supplement of NIS 200 million over the next four years¹⁷, and expert committees were established to revise curricula. The reform does not include the Grade 13–14 system that operates separately and is under the supervision of the Ministry of Education. According to the new budget structure, the per student rate should increase significantly at colleges that meet the minimum size requirement, but the student quota at each college is expected to remain fixed at this stage.

"The Committee to Advance Employment to 2030 broadly discussed the issue of professional training programs that are not within the technological college framework." (Ministry of Labor, 2019). In its draft summary report, the Committee recommends integrating general human capital studies in the curricula of the technological colleges to enable a change in profession later in life, to set in place quality criteria in terms of the program's return in wages, to update the curricula on an on-going basis in conjunction with employers and according to market demands, and to view professional training courses as a starting point from which one can continue to more advanced studies. These recommendations are consistent with the principles of the reform in the technological colleges, and are basically complementary to it.

Recommended policy directions

- We ascribe tremendous importance to the implementation of the principles of the reform in the technological colleges. Alongside this, the restriction on the number of students in each college may slow the realization of the potential of the large high-quality colleges to grow in accordance with the aims of the reform. As such, and given that the current stage of the reform has already been approved by the government for the next four years, we must make sure at the next stage of the reform that the number of students enrolled in each college can grow in greater congruence to its success, mainly at the expense of smaller and less successful colleges.
- The principles of the reform should be applied to the Grade 13–14 system supervised by the Ministry of Education, and the frameworks should be consolidated under the responsibility of the Ministry of Labor and Social Affairs in order to avoid duplicating the mechanisms.
- It is important to implement the recommendations of the 2030 Employment Committee report concerning the professional training array, including directing budgeting and government resources to high-yield training. For this purpose, the process of changing the professional training programs must be accompanied by research from its outset, and implementation must be continued in accordance with its results.
- The mechanisms of the Supervisor of Technological Colleges and of the professional training array should be consolidated in order to encourage an ease the transition from basic training programs to advanced studies at the technological colleges.

¹⁷ In addition, NIS 250 million were allocated on a one-time basis for construction and equipment.

Chapter 3: Physical capital

General overview

This chapter relates to the two main components of physical capital in the economy: business capital and physical infrastructure. Physical capital is a significant factor in the economy's production function. As such, it has a direct effect on labor productivity. Physical infrastructure is part of physical capital, and thereby contributes directly to labor productivity, but may also increase it through a contribution to total factor productivity.

3.1 Business capital

The stock of capital in the business sector includes machines and equipment, vehicles, premises, and intangible assets. The stock of capital is accumulated through purchase or construction of physical assets, and through purchase or development of software and the creation of intellectual capital, for instance through the registration of patents. Throughout the previous decade, investment rates in Israel (as a share of GDP) were lower than the OECD average (Figure 3.1). The gap in investments rates narrowed considerably following the outbreak of the Global Financial Crisis, but this was because the crisis was accompanied by a large fall, apparently partly cyclical, in investments in advanced economies, and not due to an increase in investment rates in Israel.



A look at the data by industry shows that the investment rates in manufacturing, electricity and water, and transport and storage are similar—and even higher—than the rates in other advanced economies (Table 3.1). In contrast, the investment rates in other industries, mostly nontradable (construction, trade and hospitality services, business services, and personal and social services), were lower than what is common in the other advanced economies. An examination of data for

2016 (not shown here), after the succession of crises had ended, including countries for which data for that year was available, shows a similar picture.

Table 1. Business sector investment in physical capital as a share of industry added value, 2010–2015			
	Israel	OECD average	Comparison countries*
Total	22.2	23.7	23.2
Agriculture	21.7	35.4	40.2
Manufacturing, mining and quarrying	29.0	24.9	22.0
Electricity and water	67.7	50.2	50.4
Construction	6.6	9.2	9.5
Trade, vehicle repair, and hospitality and food services	6.6	10.2	10.6
Financial services	8.1	9.9	11.2
Transportation and storage	52.6	36.5	53.0
Information and communications	16.3	25.9	25.9
Personal and social services	12.4	19.8	15.5

Table 1. Business sector investment in physical capital as a share of industry	added value 2010-2015
Table 1. Dusiness sector investment in physical capital as a share of industry	auueu value, 2010-2013

* Comparison countries: Ireland, Belgium, Sweden, Denmark, and Netherlands.

SOURCE: Based on OECD.

3.1.1 The Encouraging Capital Investments Law

The government's policy tools are focused to a great extent on the manufacturing and software services industries, and give legal and practical preference to industries that export a significant portion of their output. These preferences exist in both the grant track that is under Ministry of Economy responsibility and the tax benefit track that is under the responsibility of the Israel Tax Authority. In addition, the law is particularly beneficial for companies whose operations are located in the development areas in the geographic periphery, and in terms of the grant track, the encouragement of activity is concentrated only in those areas. We will first discuss the extent of economic justification for the law, and then the question of social preference for the geographic periphery.

The economic justification for the law is usually based on two arguments. The first is that giving benefits to companies with high productivity apparently increases total economic productivity more than giving benefits to companies with lower productivity, due to positive external effects. It is therefore preferable to give tax benefits to exporting companies that have high productivity. The second is that the activity of exporting companies is apparently supplemental. Since exporting companies have higher productivity and greater competitive ability, the likelihood that they will move their activity abroad is greater than it is for companies that operate for the domestic market. Therefore, giving tax benefits to exporting companies increases the chances that they will operate in Israel, thereby contributing to an increase in total economic activity.

In terms of the first argument, the concerted actions of the Ministry of Economy and Labor as part of the "grants track" and the tax benefits to enterprises that export more than 25 percent of their output certainly support the maintenance and expansion of the beneficiaries' activity. However, they don't necessarily increase the efficiency of those firms and/or contribute to total productivity of the economy. The coefficient between exports and high productivity upon which this argument is based may mostly result from the fact that more efficient firms successfully export from the outset, and streamlining as a result of exposure to exports has a small effect. Moreover, the activities that help exporting companies and manufacturers may contribute (together with other factors) to inferior productivity of nonexporting industries, since they distort the allocation of means of production both within manufacturing and between the manufacturing industries is higher than in other advanced economies, but is low in the

nontradable industries (Table 3.1 above), and why worker quality and labor productivity in the nontradable industries are lower than in the parallel industries in other countries (Bank of Israel (2016), Figure 1.5 and Figure 3.2).



In terms of the second argument, we must reject the assumption that the activity of an exporting company is supplemental for the Israeli economy. The economy has been in a full employment environment for a number of years, and the economy has limited factors of production. Even if the economy were in a situation of unemployment, there is no justification for a permanent investment encouragement law to solve a temporary problem. As an example, even if it is from an earlier period when the grants track was dominant, Navon and Frish (2009) found that the law made no significant contribution to increased investment, and that is mainly subsidized investments that were planned in any case.

An examination and international comparison of fiscal incentives shows that the most common incentives globally are based on capital investments or R&D, some of which are directed to multinational corporations. According to a survey that was included in the report of the team examining benefits under the Capital Investments Encouragement Law (Ministry of Finance, 2015), most countries (particularly Ireland, the US, Germany, India, Netherlands, Hong Kong, Japan, Lithuania, China, Singapore, Spain, France, South Korea, and Switzerland) grant tax benefits for R&D, patent revenue, and encouraging innovation, as well as encouragement incentives to high-technology companies and multinational corporations. Some countries (Germany, India, Hungary, Japan, Lithuania, Spain, Poland, France, South Korea, and Switzerland) grant benefits based on geographic area to encourage economic activity in those areas, where the benefit is generally conditioned on the employment of new workers and capital investments, and some (Netherlands, Singapore, Czech Republic, and Canada) are focused on giving incentives to small and medium businesses.

Most of the countries have not adopted policies that are beneficial to large companies that export some of their output to another country, except for multinational corporations that obtain tax benefits, mainly for R&D investments or on revenue from intellectual property developed in the country. The justification for subsidizing multinational corporations is that technological innovation and knowledge should trickle down to other companies in the economy. Bender et al (2018) recently showed a connection between the presence of multinational companies and the use of advanced management methods that contribute to labor productivity. Identifying the activity that brings with it these advantages is not a trivial matter, but in recent years, legal and economic literature dealing with this challenge has developed (for instance, Nguyan and Maine, 2010; Hasen, 2017).

Based on economic theory, empirical findings, and international experience, we conclude that granting a permanent benefit to an exporting company, even if it has higher productivity, is not justified in and of itself. The benefit must be given to companies that bring with them unique knowledge or other positive characteristics that trickle down to other companies. Tax benefits within the "preferred technological enterprise" track that have been used since the beginning of 2017 work in this direction. These benefits are conditioned on R&D expenses and the quantity and quality of the companies' workers, but they are also conditioned on the export criteria, which, as stated, is of doubtful efficiency. The Ministry of Economy and Industry's support track for the "From R&D to Advanced Production" path and the "First Manufacturing Plant" path, as well as the track to increase productivity in manufacturing (Director General's Directive 4.44) work in the desired direction. However, even in these programs, we must conduct an in-depth examination of the potential overflow of knowledge and innovation from them to other companies in the economy, and how effective they are at behavioral change. We must examine the success of these programs according to the extent to which the incentives given by the government actually lead to additional activity that would not have been done without the incentive.

In terms of the government's desire to benefit development areas in the geographic periphery, while this is fundamentally a social issue and therefore seems irrelevant for this discussion, there should be an examination of the optimal way to achieve the aims of this preference with minimal distortion of economic efficiency. The tax benefits given based on the export criteria as part of the Capital Investment Encouragement Law are not conditioned on the level of employment or on the wage level that the companies pay (except on the "Preferred Technological Enterprise" track). The grants track is intended only for development areas and contains a variety of tracks, some of which do have a goal of increasing high-quality employment in those areas. It is also worth examining whether it is worth allocated the existing grants budget to a wider variety of industries, provided that they meet the major targets of supporting the periphery.

Recommended policy directions

- Gradual cancellation of the tax benefits given to exporting companies and based on industry preference, while keeping in mind the government's existing commitments, in order to prevent frequent shocks in the incentive structure.
- Formulation of an alternative objective method to identify areas of activity that have positive external effects for the economy, and adapt effective assistance programs to them. Alternatively, the general corporate tax can be lowered on the basis of sources that will become available. Either way, actions should not be taken that may expand total tax benefits.

• Maintaining the benefits for giant companies rich in knowledge, including the benefits given as part of the strategic track, while increasing the economy's attractiveness for these companies by removing bureaucratic barriers and investing in physical and human infrastructure.

3.1.2 Investment in technology in the trade and services industries

Encouragement grants for innovation and R&D that have positive external effects should contribute to labor productivity, but they may increase the price of R&D-wages for engineers and scientists-without increasing the quantity of R&D if there is a lack of experienced manpower (OECD, 2015), which may harm the potential for adopting innovation. Insofar as there is a continuing lack of engineers and experienced and complementary manpower in Israel, the encouragement of physical investment and R&D in the exporting manufacturing industries and in the software industries alone raises the costs of these means of production for the domestic industries, distorts their price ratios, and harms the domestic industries' ability to streamline and move to more capital- and innovation-intensive means of production. Figure 3.3 shows that Israel is an outlier in the distribution of workers in technological fields. The concentration of workers in the high-tech industries is exceptional compared to other countries, where many workers in these fields are also employed in industries that are not defined as high-tech. The importance of workers in the computer field for non-high-tech industries is in their ability to help companies in those industries adopt technologies from Israel and abroad. Israel excels in technological development, but lags behind other advanced economies in adopting technologies (Innovation Authority, 2019).



Expansion and streamlining that are too slow in industries geared toward the domestic market may have implications for the cost of living, well-being in the economy, and ultimately for the competitive ability of the exporting industries, which need input from the other industries. The Innovation Authority focuses mainly on supporting the manufacturing and software industries. It has recently begun encouraging Israeli high-tech firms to conduct experiments or samplings in Israel in order to increase their connection with the other industries in the economy. The unique characteristics of activity in the retail trade industry pose barriers for innovation, and action is necessary to overcome them. Such action has begun, for instance, in the European Union, where they have started to deal in depth with innovation in the retail trade industry (European Commission, 2014). The paradox presented by a team of experts on the issue is that this is an industry with strong competition, yet the incentive for innovation with competitive value is too low. This paradox is also relevant in the Israeli context. It raises the possibility that removing barriers to competition in the trade industry, and in domestic industries in general, will not ensure an increase in innovation or productivity, and we must examine whether there are other barriers to innovation. According to the team of experts, the narrow profit margins in the industry due to the fierce competition actually makes it more difficult to finance innovation projects, and present a higher risk than in other industry to losses very quickly.

The European Union team of experts outlined a number of characteristics that are unique to the innovation in the industry: The type of the businesses—small and medium—makes it difficult to conduct independent R&D; innovation requires change over the entire value chain; innovation in the industry can be either technological or nontechnological; innovation must be integrated into both goods and services; innovation is required in small processes, not in revolutions; the necessary innovation is difficult to protect with patent rights, because in many cases it is not formal; and the cost is less in development and more in implementation—particularly when the same chain has many branches.

These unique characteristics present give barriers to innovation facing the retail trade industry, particularly in Israel: 1. Financing constraints, particularly for the cost of implementation; 2. The availability of experienced manpower, knowledge, and human capital; 3. Risks concerning innovation, particularly the adaptation of information systems for all those concerned—the company itself, suppliers and customers, and the government; 4. Regulation; and 5. The lack of awareness of a variety of programs offers in the area of R&D, and the innovation possibilities that are unique to the industry. The problem of awareness may also exist in public entities that assist the industry.

A public committee for the economic advancement of the trade and services industries, appointed by the Minister of Economy and Industry, is currently active. The committee is expected to formulate recommendations on a variety of topics, including the issue of innovation in the trade and services industries. The insights and recommendations formulated in the committee's discussions may contribute to promoting a better balance in support of the various industries, led by the Ministry of Economy and Industry.

Recommended policy directions

- Adapting existing innovation encouragement programs to the trade and services industries, and adjusting their funding to the limitations of the industry.
- Making it easier to transfer knowledge, technologies, and human and physical capital by removing barriers and easing regulation, while supporting the implementation of advanced management processes that current exist elsewhere in the world. The emphasis need not be on the development of innovative technologies, since the trade and services industries are far from the global technological forefront, as opposed to export manufacturing.
- Establishing a team that will map the existing programs and make them accessible to the trade and services industries, and establishing an array of consultants that will examine each

of the barriers to integrating innovation in the company's work one by one and help it to remove those barriers.

- "Research coupons" A budgetary allocation to companies for cooperation with research institutes and universities in order to develop specific tools for innovation in a company.
- Advancing the insights and recommendations that arise from the discussions of the public committee for the economic advancement of the trade and services industry in order to create a better balance between the industries in the allocation of government support.

3.2 Physical infrastructure

This section discusses the main elements of physical infrastructure: transportation, communications, and energy.

3.2.1 Investment in transport infrastructure

High-quality transport infrastructure is an essential component to economic activity, and the development of such infrastructure is expected to contribute to the standard of living in general, and particularly through an increase in productivity. This issue, as well as the issue of communications infrastructure, is directly connected to the stock of physical capital, but the life cycle of assets of this type, as well as their contribution to growth, far exceed the contribution of physical assets that the business sector generally purchases.

Improvement of the transportation system will reduce the amount of time that people spend in traffic jams and the cost inherent in having employees travel to places of work. It will also expand the possible choices open to both employers and employees. The findings regarding the macro effects of transport infrastructure show that in general, such investments pay off. According to a study by the International Monetary Fund (IMF, 2014), an increase of one percent of GDP in public investment will lead to an increase of 1.5 percent in the GDP level within four years, and even greater in accordance with the efficiency of the investments.

A study conducted by the Bank of Israel (Tsur and Argov, 2019) on the policy factors that are correlated with productivity growth found that the marginal effect of investment in infrastructure is the strongest among the group of policy variables that were studied (government institutions, infrastructure, and education). An improvement of one standard deviation in the quality of infrastructure can lead to a jump of 0.2 to 0.3 percentage points in the growth rate of total factor productivity over an extended period of dozens of years. (Sharabani (2008) also found that infrastructure capital significantly increases productivity in the manufacturing industries in Israel.)

In recent years, there has been an increase in the use intensity of Israel's transport infrastructure. The number of people traveling to work has increased greatly due to the natural growth in population, its increasing geographical dispersion, and the impressive increase in the employment rate. As such, the burden on the infrastructure has increased, there is greater crowding, and congestion in Israel is excessively high compared with the OECD (Figure 3.4). However, this result may be due (at least partially) to the fact that the index presented takes into account only road length, and not road area. If roads in Israel are wider than in other OECD countries, then the actual relative crowding will be lower than presented.



Since the motorization level tends to increase with income (Figure 3.5), the number of vehicles is expected to continue increasing alongside the increase in the standard of living. This will make the congestion problem more serious over time. It is important to note that this comparison also holds true when taking into account that the population in Israel is relatively young and the standard of living is lower than in most other advanced economies (Figure 3.5).



Israel's modal split of journeys tends heavily toward the use of private vehicles, such that the rate of public transit use in major cities is lower than in similar developed cities abroad¹⁸ (the issue of congestion—in Israel and abroad—is mainly relevant for the large cities and access arteries to them) (Figure 3.6). These findings are not surprising in view of the slowness of public transit in the metropolitan areas in Israel relative to other countries (McKinsey, 2018), and the low accessibility of work places to public transit relative to private vehicles (Suhoy and Sofer, 2019). Therefore, it seems that there is a lot of room to reduce the use intensity of private vehicles. This will require a significant improvement in other means of transportation, chiefly public transit.

¹⁸ According to Bank of Israel (2018a), the rate of public transit use in the large cities in Israel is about 25–30 percent, similar to the average rate in European cities. These findings are based on data from the Central Bureau of Statistics Social Survey. The data presented here are based on new travel habit surveys that use GPS systems to document trips and means of transportation. The new habit surveys reported approximately 30 percent more trips per day per person, and this is apparently due to short private vehicle trips that are not normal commuting, and to surveyed individuals forgetting to report in standard surveys that did not include GPS (such as the Social Survey). Moreover, according to an analysis in the Bank of Israel Annual Report, despite the fact that the actual rate of public transit usage was no different than in European cities, the use intensity of public transit in the Tel Aviv district was lower than the fitted rates predicted according to various characteristics (demographic, geographic, and economic).



A change of this kind is expected to increase productivity, as found in the US (Chatman and Noland, 2014), where employment and population density increased in areas where there was improvement to public transit services, and this development led to an increase in employee wages.

The rate of investment in land transport infrastructure in Israel is about one percent of GDP, similar to the average investment rate in the OECD. But this rate is insufficient, for two reasons: (1) The population in Israel is increasing rapidly, so the investment required to maintain a specific level of infrastructure capital per capita must be higher than in other countries¹⁹; and (2) Since the stock of transport capital in Israel is lower than in the OECD, we need to maintain a higher investment rate in order to close the gap. Most of the gap in this stock is due to the state of public transit. To wit: The rail track and infrastructure inventory (as a share of GDP) is lower than both the average in the reference countries (South Korea, Germany, Austria, Denmark, UK, and Belgium) and the OECD average (McKinsey, 2018). In contrast, the state of the roads in Israel is better, and it is apparently also reasonable by international comparison. The inventory of road infrastructure is higher than the average in the reference countries (although it is lower than the OECD average) (McKinsey, 2018). The World Economic Forum's index of the quality of infrastructure shows a similar picture, wherein Israel is in the lower third in terms of efficiency of rail service, but in the center of the distribution of the quality of roads (Figure 3.7). Even so, investments in roads in the past twenty years has not been sufficient to stem the growth of crowding on the roads, in part because decisions to reduce taxation on new vehicle purchases and to moderately increase the tax on variable expenses (relative to the increase in income) contributed to an increase in the motorization rate (Bank of Israel, 2019d).

¹⁹ The increase in population erodes the size of the per capita stock of infrastructure capital over time, since current investment in infrastructure must serve a larger population in the future. The more rapid the rate of population increase is, the pace of such erosion is more significant. As such, in order to maintain a given level of per capita stock of infrastructure capital (or stock of infrastructure capital as a share of GDP), there must be a higher rate of investment insofar as the population growth rate is higher.



Figure 3.8 shows the development of the transportation budget in three items: road investment, public transit development, and public transit subsidies. Between 2006 and 2009, all three were budgeted to an almost equal extent, but between 2010 and 2015, a larger share of the budget was directed toward road investment. Between 2016 and 2017, this trend was reversed, which is a positive turnaround in view of the state of the infrastructure and the modal split of journeys, which, as stated, tends more toward the use of private vehicles.



Recommended policy directions

- Increasing the volume of investment in public transit infrastructure, with the aim of closing the gap in the infrastructure stock compared with other OECD countries. The investment in infrastructure in the large cities must take the high population growth rate into account, which makes the use of public transit that is underground or that has exclusive lanes that enable the massive use of mass transit preferable.
- Rapidly advancing the establishment of metropolitan transit authorities or other transit management mechanisms that will coordinate planning between the various local authorities and the variety of means of transport, and will be given decision-making authority at all stages of construction and operation as necessary.

3.2.2 Complementary policy steps to investment in transport infrastructure

Public transit is an essential solution in the long-term view, but it is just one of a variety of transport solutions. In contrast with the development of public transit that requires high costs and takes a long time, there are other solutions that are less expensive and faster, and are based on the more efficient utilization of the existing stock of infrastructure. It is important to emphasize that these means are not an alternative to public transit, but are complementary factors to its use, or temporary solutions until the investments bear fruit.

A variety of transport solutions are included under the definition of shared transport (Anti-Trust Authority, 2017). These means of transport fall between the rigid nature of traditional public transit and private vehicles that provide maximum flexibility at a relatively high price. This definition includes shared transport by online demand for private travel (such as Uber and Lyft,

but in Israel this service is restricted to special taxis only) or multi-user travel²⁰, as well as carpooling.

The development of these means will expand the variety of alternatives to travel by private vehicle, and it is likely that the use of online demand for multi-user travel and carpools will reduce the congestion on the roads and thereby contribute to increased productivity. However, in order for people to share room in their vehicles, they must be allowed to collect payment that will reflect their shadow cost. In view of the low volume of carpool use, it is doubtful whether the current expense refunds, which are limited to NIS 2 per kilometer, are sufficient to enable the development of this means of transport.

In terms of online demand for private transit, its use is expected to have contrasting effects on congestion, and at this stage, there are insufficient empirical findings to decide on the matter.²¹ As the possibilities for paid carpooling expand, it will be necessary to ensure that they are not used as cover for the commercial operation of taxis, whose contributions to congestion and traffic efficiency are, at best, unclear.

Another means of transport is organized transit provided by large employers, as is customary in many localities with a low socioeconomic background, and particularly in Arab society, where the quality of public transit service is low. According to Social Survey data, such organized transit enables workers to travel a greater distance in a given travel time than by public transit (Suhoy and Sofer, 2019). However, it is important to note that in the absence of alternatives, organized transit makes residents dependent on a few employers, and therefore does not constitute a full alternative to the development of an efficient public transit system that can expand the employment possibilities for workers.

In addition, the development of infrastructure intended for the use of microvehicles (bicycles, scooters, and so forth), which are important and less expensive complementary or alternative means, mainly for short distances, should be continued.

Beyond the development of various means of transport, another efficient solution is the imposition of a mileage tax—payment per kilometer of travel, which varies according to the level of congestion.²² Given that there is a shortage of transport infrastructure and that the use of that infrastructure is shared, the private use of roads creates a negative externality in the form of congestion that the individual does not take into account in his choice. As such there is clear economic justification for a congestion tax, so that the individual choosing to travel in his private vehicle will internalize the true cost of his choice. This will act to improve the allocation of transport infrastructure in the economy. A mileage tax takes into account the external costs of the use of a vehicle more precisely than the current excise tax on fuel, and the gap between the two taxation methods is becoming even more significant as the use of electric vehicles increases. Imposing a mileage tax is expected to reduce congestion by changing the travel patterns of private

 $^{^{20}}$ In some places in the world, there are means of transport that operate by online demand, and offer multi-user travel. Via Transportation Inc. operates a service using vehicles with 8–10 seats that travel at varying times, frequencies and routs that are determined in accordance with demand. Until recently, this service did not exist in Israel, but on April 15, 2019, a pilot of the service was launched in the Gush Dan area.

²¹ Even if this means of transport increases congestion, that does not mean that its use will reduce total well-being, since it is expected to lower the costs for uses and increase competition in the field of transportation.

²² In parallel with the imposition of a mileage tax on the use of vehicles, other vehicle taxes can be reduced. However, this has more to do with the political possibilities of implementing the process than with its efficiency. For more discussion on this matter, see Trajtenberg (2018).

vehicle users (change in travel times or cancellation of trips), primarily by transitioning these travelers to public transit, and to a lesser extent to shared travel. As such, in order to enable this change to take place at the required volume, and without harming economic activity, it is essential that this process be accompanied by a significant improvement in public transit that is relevant to the areas where there is heavy congestion.

Even though a continuous mileage tax is the most appropriate pricing method for regulating congestion, this model exists only in Singapore, while in other places (London, and cities in Sweden, Italy, and Norway) that have tried to deal with congestion, they used a daily congestion charge collected from vehicles entering certain areas. It is important to note that even though a congestion charge is less efficient than a continuous mileage tax, its implementation in various places has succeeded in reducing congestion (Moav and Schreiber, 2017), making this alternative also markedly preferable to the current situation.

Furthermore, for each of these alternatives, complementary policy regarding the pricing of parking is important (OECD 2019b), so that the external costs inherent in the use of public space for parking are imposed on users, and so that mileage that is devoted to the search for a parking space is reduced.

Since this is a service for which the public is not accustomed to paying, this kind of change generally encounters stiff public opposition, and as a result, various initiatives to apply congestion charges have failed in various places (such as in the Netherlands and in Scotland). Therefore, a limited time trial period was initiated in Stockholm, which was followed by a referendum once the public got to know the advantages (and disadvantages) of a congestion charge. According to Moav and Schreiber (2017), global experience shows that despite the lack of initial support, congestion charges could win public support after they are implemented in practice, particularly if they are accompanied by the promotion of viable alternatives to private vehicles.

In Israel, the "Going Green" experiment was conducted based on pricing of the external effect of travel, similar to a mileage tax. However, the core of the project is based on a subsidy and not on a tax. Drivers who choose to avoid traveling in defined areas or times of congestion will receive a monetary credit (for instance, through a discount on their vehicle license fee), after volunteering to have a monitoring device installed in their vehicle. It will be important to use the many insights from this experiment—including those learned on the technical side—when formulating the congestion charge program.

While a mileage tax works to reduce the use of private vehicles, certain wage benefits and employment terms incentivize the increased use of this means of transport. The Bank of Israel (2009) found that in the public administration and banking industries, where it is customary to provide a vehicle maintenance benefit, households tend to possess more vehicles than in the other industries. Moreover, in some of the arrangements in the economy, there are benefits that incentivize not only vehicle maintenance, but also increased mileage. Therefore, such incentives lead to an increase in crowding on the roads and have a negative impact on productivity.

Recommended policy directions

• Promoting cooperation between local authorities and employers in the operation of organized transit.

- Removing barriers that are delaying the use of multi-user travel, while granting access to preferential lanes for vehicles with a high occupancy coefficient, subject to the appropriate enforcement and accounting for the desired travel speed in the lane.
- Application of a mileage tax, alongside expanded public transit, combined with more precise pricing of the use of parking.
- Cancelling wage benefits and terms of employment that incentivize the use of private vehicles.

3.2.3 Communications infrastructure

One of the productivity challenges in Israel has to do with the existence and quality of communications infrastructure. The speed and service levels of data transfer are essential not only for improving quality of life, but also for employees' output. In addition, communications infrastructure is essential for implementing new technologies that can contribute, both directly and indirectly, to labor productivity: smart cities, autonomous cars, digital innovation, remote work, cloud computing, bringing the periphery closer, and more.

Landline infrastructure

The physical infrastructure in Israel currently makes it possible to meet the global market's rate of technological advancement. There is coverage through underground conduits owned by Bezeq for almost 100 percent of households and businesses, an exceptional achievement compared with most other countries in the world. The conversion of the landline infrastructure leading to households and businesses in Israel to fiber-optics is well underway. About 20 percent of households have fiber-optics access to the house, and steps are being taken to ease the continuation of this process. For example, the Ministry of Communications has made the physical infrastructure of all communications companies, including the Bezeq and Hot Telecom infrastructure companies (including the underground conduits, junction boxes, and tubes), accessible to any company that wishes to provide communications services using this infrastructure or to lay its own fiber-optics using these facilities.

However, the current structure of the Israeli market does not allow for the optimal utilization of this potential to improve the actual quality of communication, and may in the future create a lag. To illustrate, Figure 3.9 shows the rate of fiber-optics use in Israel compared with the other OECD countries. It shows that the connection rate of end users in Israel is far from what exists in most countries.



One of the main problems that apparently contributes to the lag in making fiber-optics accessible is the structure of competition in the physical infrastructure market, which gives an advantage to Bezeq in that it owns all of the conduits. As stated, the Ministry of Communications has made Bezeq's physical infrastructure (the underground conduits) accessible to any company that wishes to lay its own fiber-optics. As such, there is no need to deal with potential opposition on the part of the local authorities to further digging within their jurisdictions in order to lay fiberoptic lines (due to interference with routines while carrying out the work), and the significant establishment costs for market players is saved. However, the challenge in creating market conditions that will incentivize private companies to achieve maximal fiber-optic deployment with minimal government involvement remains strong. For now, the demand from Bezeq is to provide universal service, which requires full deployment of a fiber-optic network on a national scale. However, Bezeq is avoiding the completion of full deployment and provision of fiberbased service in areas where there already is deployment. In parallel, there are those who argue that despite the accessibility of Bezeq's conduits for other companies, the current structure still gives an advantage to Bezeq. A change is therefore necessary in the market structure to weaken Bezeq's control of the conduit infrastructure.

However, the market may not manage to lead to a satisfactory fiber-optic deployment even if the problem of market structure is solved, for two major reasons. First, the economic feasibility of reaching areas of low population density is limited. Second, in contrast with the relatively low costs of reaching structures with fiber-optics, the costs of vertical connection of the residences and offices themselves are high, and sometimes unprofitable for the suppliers. In this context, it should be noted that the situation is very serious with regard to private users—households—while for many offices, the optical network is already connected. The areas with limited feasibility for completing fiber-optic connections can be divided into areas where the connection

justifies the subsidy from an economic benefit standpoint²³ and areas where the connection justifies the subsidy only with regard to the social goal of equality. Moreover, there is an advantage to fiber-optic deployment of more than one company in some areas in order to increase the technological race between the companies, which would improve the penetration and quality of the technology. Regional mapping with this in mind is important for designing the appropriate policy for developing landline infrastructure.

Cellular infrastructure

The cellular market in Israel has in recent years been characterized by intensive competition, featuring six operators using three networks. This is reflected in low prices for consumers, since not all service providers internalize the cost of infrastructure to the same extent. There are those who argue that the high number of competitors is delaying the rapid increase in data transfer over 4G cellular networks and may lead to a delay in the assimilation of 5G cellular technology—which is essential for the use of innovative, reliable, available, and more continuous technologies. This is because the cost structure of the companies, alongside uncertainty regarding the return on investment in the new technologies, does not create an incentive to invest in the relevant infrastructure—expanded deployment of cellular units and adapting them to the new standard.

Another hurdle that must be overcome is the opposition of some local authorities to expanded deployment of antennas in their jurisdiction due to the alleged effect of nonionizing radiation on public health. But for the most part, these reasons are not based on research, and it has even been found through research that the antennas do not have an effect on real estate prices in areas where they are positioned (Demalach et al., 2016).

In a tender issued in July 2019, the Ministry of Communications proposed half a billion shekels in tools to incentivize operators, in order to overcome the potential market structure problem. The tools include a significant discount on the fees for using 5G frequencies, a monetary grant, and a reduction in the frequency fees on all frequencies allocated to operators, in accordance with meeting technological targets set by the Ministry in the form of competition, and a requirement that all operators participate in the cost of establishing the infrastructure of the network they use.

Recommended policy directions

- In the current structure of the cellular market, competition is mainly over price and not over service quality. Therefore, a policy must be adopted that will lead to a situation where all cellular service providers internalize the cost of infrastructure to the same extent. There should be a periodic examination of whether limited incentives are necessary to motivate the technological race and to increase competition over the quality of service.
- Making Bezeq's physical infrastructure more accessible to all operators in order to deploy parallel infrastructure more easily. The process exists, and it should be accelerated and streamlined. Increasing competition in the industry, with all of its components, is expected to accelerate the technological race and encourage the companies to reach broader areas horizontally. Incentives should be created that are based on market revenue in order to encourage operators to horizontally connect some of the areas where potential profit from private customers is low.

²³ Due to the advantage for other consumers from the connection of customers in these areas to the network. The subsidy in such a case should be based on the rate cost to all customers.

- A regulatory mechanism should be arranged that will enable the sharing of vertical communications infrastructure in order to save costs.
- Regulatory barriers preventing the deployment of infrastructure should be removed, and assistance should be provided in overcoming opposition from interested parties that are preventing the deployment of infrastructure due to narrow considerations (such as local authorities and others).

3.2.4 Energy²⁴

A reliable energy supply enables industries and households to plan their energy consumption efficiently and prevents interruptions in production. In this way, it increases productivity in the economy. The energy economy in Israel has advanced and developed tremendously in recent years, thanks to the natural gas reserves that have been discovered, technological developments, and the expansion of electricity production through renewable energy. These have been accompanied by regulatory adjustments to the new environment.

Despite the significant changes in the energy economy and the fact that it is an essential infrastructure for the country's economy, there remains no master plan for it, and the State Comptroller has commented a number of times to the Ministry of Energy regarding the need to formulate such a plan (for instance, State Comptroller, 2012). Such a plan will enable more efficient and transparent planning of the energy economy, which will also increase energy security in the Israeli economy thanks to advance planning, and will provide greater planning certainty to enterprises operating in this economy and to potential customers. There are many governmental bodies that have an impact on the establishment of infrastructure in the energy economy (Ministry of Energy, Ministry of Finance, Ministry of Environmental Protection, and more). A detailed, transparent master plan with schedules and targets will also enable them to synchronize and prepare in advance, and establish a basis for effective work processes. It is important that such a plan be based on a detailed economic examination of its components.

In the past two years, there has been significant progress in formulating a policy document that outlines long-term planning, including targets for the energy economy up to 2030, and principles for reaching those targets, have been set (Ministry of Energy, 2018a). It is important that these targets be ratified by the new government in order to create governmental continuity and enable the start of actions to support their achievement. The targets document that has been published includes discussion of the master plan for the production segment in the electricity economy, which was published by the Electricity Authority (Ministry of Energy, 2018b), which constitutes a first layer in the master plan for the energy economy. In addition, a development plan for the conduction system was presented. It is important to create parallel plans for the other segments of the electricity economy, and for the natural gas, fuel, and renewable energy markets. These plans, together with the statutory basis in National Outline Plan 41 after it is ratified, will provide a strategic framework that can be developed over the years, according to which the energy economy can be developed and advanced.

The largest component in the Israeli energy economy is the electricity market. As in the rest of the world, there is comprehensive regulation in this market in Israel, which is connected with the existence of economies of scale in segments of the production and conduction process, significant

²⁴ Since the focus of this document is labor productivity, we do not relate in this section to the issue of natural gas exports, even though it has a significant potential impact on the gas economy and on increased national revenue. For this reason, we also do not deal with the issue of the mix of various fuel taxes.

capital and land costs (which have declined over time), and the fact that this is a basic consumer good. As such, the State has set out a market structure for each segment in accordance with each segment's technological limitations and infrastructure characteristics. Some of the segments have been opened to competition, while others—management of the system and the conduction and distribution systems—remain monopolies held by government companies. In addition to regulation on the structure of the electricity market, price and quantity are regulated through supervision and quotas. The Electricity Authority sets out the price in this market on a regular basis, and issues licenses that serve as production quotas, thereby essentially setting potential supply. In recent years, the Authority has begun issuing licenses that set the quota, while the price of supply to the grid is set by market forces through a tender.

The intensive regulation in the electricity market, compared with other markets, requires knowledge of expected demand. In recent years, this need has been answered through a number of studies. Gallo (2017) built a long-term annual forecast of demand for electricity in the Israeli economy, which is based on initial estimates of the GDP forecast by Argov and Tsur (2019), and Suhoy (2018) built an hourly electricity consumption forecast.

The reform in the Electric Company that has come to fruition in recent years is a further reflection of the regulatory development in this market, in addition to progress in the context of the master plan. This reform makes an important potential contribution to efficiency in the electricity market, and it is therefore important to implement it diligently, alongside continuous documentation and assessment of its effects on the economy. This can be done through the development of a system management company that will include a unit for monitoring and analyzing the electricity consumption habits of households and industries, among other things.

In recent years, we have been witness to a global trend of increasing use of renewable energy, which has been accompanied by a decline in PV prices and in the use of fossil fuels. Alongside this trend, there are also forecasts for the development of significant electricity storage capacities, which may reduce the need to build new stations that are required today to back up solar energy when production is low. The technological advancement in these channels makes it necessary to be flexible in long-term planning in order to enable the optimal absorption of the technologies that will be developed.

The use of renewable energy may increase rapidly insofar as the process of imposing restrictions on the use of polluting energy is accelerated worldwide. The technological forefront in the energy field has come a long way in order to enable such progress. The prices of energy storage—the need to bridge the difference between production timing and consumption timing—have declined in recent decades at a rate of about 20 percent per year, and are expected to continue to decline, although at a more moderate rate (BloombergNEF, 2019). However, the conduction infrastructure and some of the production infrastructure in Israel are not appropriate for the broader conduction of renewable energy (Bank of Israel, 2015).²⁵ This is particularly the case since a significant share of potential renewable energy production in Israel is possible in the south of the country (photovoltaic) and possibly also in the north (wind), and there is a tremendous need for the transmission of electricity to main consumption areas.²⁶ It is therefore important to

²⁵ The policy worldwide is to develop a smart grid that provides information on consumption and production in real time, and in great detail at the levels of the consumer, geographic space, and time.

²⁶ Another issue that poses a challenge for the development of renewable energy production is the issue of land. For this purpose, it is important to continue advancing the approval of NOP 41, which offers solutions to this issue.

adapt the conduction and distribution network to the challenges facing the economy in the context of renewable energy and energy storage, and to take into account that these adjustments will be made under conditions of uncertainty. As such, it is important that renewable energy and storage be part of the master plan for the electricity economy, and that the master plan relate to the flexibility necessary for adapting to technological development.

The natural gas market in Israel is expected to change significantly in the coming years. At the end of 2019, the Leviathan reserve will be connected to the transmission network, and by 2021 the Karish and Tanin reserves will also be connected. The development of the additional reserves will enable increased competition with the entry of new participants and stronger consumer bargaining power, and will increase systemic redundancy, which will increase the economy's energy security. The current assessment is that the gas reserves that are currently known will provide for Israel's energy needs for the coming decades (as assessed by the "Adiri Committee" (Ministry of Energy, 2018c)). Since a significant portion of the energy consumed in the economy will be based on natural gas, it is important to advance the establishment of emergency gas reserves that will increase energy security and enable enterprises in the economy to lower their risk assessment and rely on a stable energy supply.

An important challenge in the natural gas market is the laying of pipelines from the reserves to the consumers. The first segment of the pipeline from the rigs is built at this stage on one gas pipeline, which increases the risk of systemic survival, but the connection of the additional gas pipeline at the end of 2019 will significantly improve energy security. The inland gas pipeline is comprised of a transmission network, which constitutes the main artery for conveying natural gas to the economy, and a distribution network, which is comprised of capillaries that have lower pressure flow capacities and are intended to supply the gas to the end customer who, for the most part, consumes the gas at low pressure. The Ministry of Energy has recently identified a series of factors that are delaying the process of laying the distribution network. A main reason that requires government intervention in this context is that the private market is not internalizing the economic benefit of laying distribution pipelines, particularly in view of the risks inherent in the transmission process, on the part of the distribution companies. The government chose to deal with these barriers through a subsidy to encourage demand, among other things. The Ministry of Energy also put into action a "stages program" to accelerate the deployment of the network by providing incentives to distribution companies to increase the pace of establishing distribution segments and connections to consumers. This policy is important at the stage where the economy begins using natural gas, but later on it could have negative external effects, such as encouraging overconsumption of energy based on the subsidy. Therefore, the possibility must be examined that after the distribution lines are laid, the subsidy for new consumers is halted.

Recommended policy directions

- Advancing a master plan for the energy economy in Israel in order to increase consumers' access to renewable energy, increase competition, and improve the energy security of the Israeli economy. The energy economy targets for 2030 published by the Ministry of Energy (Ministry of Energy 2018a), together with NOP 41, which is being advanced by the Ministry of Energy and the Planning Authority, are a significant and important step in advancing this master plan.
- The reform in the Electric Company must continue to be advanced and the implementation of its milestones must be monitored. In particular, it is important that there be continuous documentation and assessment of the reform's effects on the economy, including through the

development the system management company so that it will include a unit for monitoring and analyzing the electricity consumption habits of households and industries.

- The infrastructure in the Israeli energy economy, particularly the conduction infrastructure, must be adapted for the increasing transition to renewable energy. As part of this, action must be taken to prepare infrastructure that is appropriate for adopting energy storage technologies in Israel and to encourage appropriate regulation.
- A long-term development program must be prepared for the natural gas economy, including on the basis of the Adiri Committee's report (Ministry of Economy, 2018c) and on the basis of the timetables of the existing development plan for the natural gas reserves: completion of the connection of Leviathan, Karish, and Tanin, to the mainland. As part of this, the inland transmission infrastructure backup must be expanded, and the construction of gas reserves for use as emergency backup must be advanced.
- The need for subsidizing the connection of the natural gas pipeline should be re-examined after the distribution lines are laid and a sufficient number of consumers are connected.
- It is important to advance government investment in research and development regarding the implementation of innovative technologies in the Israeli energy economy.

Chapter 4: Total factor productivity

General overview

Total factor productivity is a measure that reflects the contribution to growth of factors other than human capital and physical capital, such as technology and the background conditions in which the economy operates. These background conditions can include the quality of institutions, and particularly the quality of regulation and bureaucracy, and the quality of infrastructure, including the quality of transport and communications infrastructure that was discussed in the previous chapter.

Israel is highly inferior mainly in terms of human capital and physical capital (Hazan and Tsur, 2019). However, as we will see in this chapter, the factors affecting total factor productivity also apparently contribute to Israel's inferiority in labor productivity.

A long-term examination shows that the increase in total factor productivity in Israel has moderated since the mid-1990s. For instance, between 1970 and 1995, it increased at an average rate of 2.5 percent, while from 1995 to 2018 it increased at an average rate of 0.5 percent. In the past decade, total factor productivity has ranged around 1 percent (Figure 4.1).



The decline in the growth rate of total factor productivity took place alongside an increase in the high-tech industries' share of business activity during that period. The rate of those employed in the high-tech industries increased sharply from about 5.5 percent in 1995 to almost 10 percent in 2008 (and declined slightly in the past decade)(Figure 4.2). It therefore seems that causes other than high-tech industries' share of economic activity are important in determining the growth rate of total factor productivity and of GDP per worker in the economy.



4.1 Productivity aspects in the employment of foreign workers

About 8 percent of the Israeli labor force is comprised of non-Israeli workers, who come from two primary sources: Palestinian workers (two-thirds of non-Israeli workers), who began integrating into the Israeli economy in 1967, and workers fro mother countries, who began coming to Israel toward the end of the 1980s. The vast majority of the roughly 300,000 non-Israeli workers are defined as having low-level skills, with an emphasis on construction and agricultural workers, while a few are defined as having high skills and are employed as engineers, academics, athletes, and others.

The establishment of a cheap labor force by bringing in foreign workers provides a disincentive to adopt advanced technologies, and thereby for the labor productivity of the Israeli worker. Professional committees that have discussed the issue of the employment of non-Israelis have indicated the importance of reducing the number of foreign workers and equalizing the cost of their employment to that of Israeli workers, due to the negative effects that employing foreign workers has on productivity and on the wages of Israeli workers.

Foreign workers with high skills should contribute to the increase of investment in physical capital and to the advancement of innovation. Most legal skilled workers are currently allocated to restaurants, where it is doubtful whether they meet the earning conditions (which are twice the average salary in the economy). However, the potential exists for expanding the permits for skilled foreign workers to other industries as well, including manufacturing and high-tech industries. The main barriers to this are the bureaucracy that is currently required to bring in an expert worker, the level of fees required, and the lack of certainty regarding the employment horizon. In addition, for works in most areas of activity, other than high-tech and to a certain extent academia, there is significant difficulty in the possibility of employment for their spouse. It should be noted that the customary salary differs between the fields. The minimum salary was

adjusted for the manufacturing industry due to the adoption of the recommendations of government teams that recently examined the matter.

Recommended policy directions

- Maintaining the policy of reducing the number of foreign workers and increasing the costs of their employment, and creating a mechanism that limits the increase in quotas for various industries given the labor productivity data of each industry.
- Creating a "green line" for approval of employment of highly skilled foreign workers who meet the minimal wage conditions and are intended to work in fields that have been defined as lacking. Increasing certainty concerning the employment horizon and employment of spouses.
- Examining the level of the employment fees for highly skilled foreign workers with the aim of adjusting them to the cost of handling the requests.
- The minimal wage criterion should be adjusted to the wage that is customary in various professions, since in some industries, the customary wage is significantly higher than twice the national average, which makes it less possible to import workers who do not have special expertise.

4.2 The business environment – The efficiency of asset registration and tax payments

The efficient performance of administrative processes requires manpower that is appropriate in both quantity and quality, particularly in terms of its ability to deal with advanced technology to simplify the processes. In order to examine Israel's relative state in this regard, we used PIAAC data to analyze the relative computer skills of government service workers in Israel aged 25–64 compared with their peers in the business sector, and compared with workers in advanced countries similar to Israel: Belgium, Denmark, Netherlands, and Sweden. The ranking of these countries—particularly those of Sweden, the Netherlands, and Denmark—in the Doing Business indices is significantly higher than that of Israel, so they provide a good reference point.

We found that the skills of workers in the public sector in Israel is not lower than those of workers in the public sectors of the comparison countries. Moreover, we found that government workers in Israel are younger than in the public sectors of the comparison countries, and generally use Internet services (email and information searches) at their place of work more frequently than private sector workers in Israel and workers in the comparison countries. It therefore seems that the quality of the workers in Israel's public sector does not constitute a restriction to the adoption of advanced technologies in these bureaucratic processes. However, despite the fact that the potential of public sector workers in Israel makes them similar to their peers in the comparison countries, we cannot manage to provide efficient bureaucratic processes. In particular, Israel lags in the digitization of the public sector—including the transfer of information within the government—and the stock of information and communications services (ICT) of the public sector in Israel is 42 percent of the average in the advanced countries to which Israel is compared, according to Eckstein et al. (2019).

One possibility raised by the data is that the incentive mechanism in the public sector in Israel does not promote high-productivity work. It was found that relative to the comparison countries,
public sector workers in Israel are unusually compensated—more for their years of formal education and less for their abilities.²⁷ Thus, improvement of one standard deviation in the skills of a public sector worker in Israel will be translated to an increase of 3.7 percent in his income, while improvement of one standard deviation in his education will pay more than double that—about 7.5 percent. In contrast, public sector workers in the comparison countries are paid almost identically for improved abilities or increased formal education. It should be noted that the private sector in both Israel and the comparison countries shows a reverse trend: Workers are paid more for their abilities and less for their formal education.

Increasing the efficiency of the public sector is important for improving total factor productivity in Israel and for maximizing the potential of companies to increase their investment in physical capital and in advanced technologies. The Ease of Doing Business index, which ranks Israel quite low on the subindex of registering property, illustrates the improvement that is required in public sector efficiency. The subindex ranks the efficiency of the process of registering a property, including the cost of registration (Figure 4.3), the time required (Figure 4.4), the number of bureaucratic processes required, and the quality of the authority dealing with the process. Israel is ranked below the OECD average in all of these indices. In relation to the comparison countries, Belgium is similar to Israel, with both countries ranked at the bottom of the OECD, while the Netherlands, Sweden, and Denmark are ranked quite high. For instance, while the median time required to register a property in Israel is 37 business days, it takes between 2.5 and 7 business days in Denmark, the Netherlands, and Sweden.



²⁷ Based on a linear regression of the hourly wage log, separately for women and men, controlled for weekly work hours, years of schooling, family status, employment experience and its square, and problem-solving skills.



In terms of the factors affecting the long duration and efficiency of the registration process, we focused on the number of bureaucratic processes required to register a property and the level of digitization of these processes. We found that these two factors are significant in Israel's low ranking. For instance, while a property owner in Israel must undergo six separate bureaucratic processes, five are required in the Netherlands, three in Denmark, and just one in Sweden. The cost of registering a property in Israel as a percentage of the property's value is higher than in most of the comparison countries.

The Netherlands is a good example of the effect of digitizing the registration process. The entire process there has been digitized, in contrast with the situation in Israel, where just one-third of the processes are digital. Thus, despite the similar number of processes required in the Netherlands, the duration of the property registration process is significantly shorter. In Denmark, the registration process has been digitized, and two-thirds of the processes are digital. In Sweden, even though the process is not digital, the number of bureaucratic processes has been brought down to just one, which is sufficient to significantly improve the efficiency of the property registration process. The contribution of digitization to the property registration process reflects the potential contribution of adopting digitization in other fields where the government serves the business sector.

Recommended policy directions

• Expanding digitization of government services to the business sector, an in particular, shortening and streamlining the property registration process by cancelling excess regulation where it will make a difference, and consolidating and simplifying bureaucratic processes as much as possible.

- Continued digitization of property registration processes. In particular, setting targets in wage agreements for the adoption of digital processes connected with businesses and companies.
- Adoption of a digital signature process that will obviate the need to physically come to government offices to conduct various processes.

4.3 The business environment – Contract enforcement

Israel is ranked 28th out of the 34 OECD member countries in terms of the ease of doing business (the World Bank's Doing Business index) (Figure 4.5). Israel is ranked particularly low in three subindices: the ease of registering properties, the simplicity of paying taxes, and the extent of contract enforcement. It is ranked in relatively reasonable spots in obtaining credit and in handling bankruptcies.



The contract enforcement index weights the time to file a suit, the time of the judgement, and the time of enforcing a judgement. In addition, it rates the cost of lawyers, court fees, and fees for enforcing the judgement or collections. It also includes an index of the quality of the judicial system that is based on the extent to which the state adopts a series of good practices that advance the quality and efficiency of the judicial system: the structure of the courts and hearings, case management, automation, and alternative litigation solutions.

In a focused empirical study conducted by the Bank of Israel as part of the analysis, the contract enforcement section was found to be correlated with labor productivity. This finding is consistent with empirical studies from other countries (such as Nunn, 2007), which emphasize the importance of economic arrangements within the country. In terms of the section's components, we found a negative correlation between the existence of a dedicated court and the duration of enforcement of judgement. In countries where there is a dedicated court, enforcement duration is about 40 percent less (statistically significant to a level of 5 percent) than in countries where

there is no such court. The dedicated courts for economic mattes may create judgements the enforcement of which is more realistic (realistic judgement level that does not encourage evasion, mapping the debtor's assets, reducing the incentive to appeal, and so forth).

In 2018, steps were taken in the right direction. The Haifa District Court established an economic department, and the number of judges in the economic department in Tel Aviv was increased. It is recommended that additional actions in this direction be taken. Studies have shown that improvement in the area of contract enforcement is particularly important in increasing the level of productivity per worker. The finding emphasizes the importance of the enforcement of economic laws, and of strictness regarding intellectual property.

The cost of fees (to the courts and to enforcement of rulings) in Israel is similar to the average in developed countries, and Israel receives reasonable scores in the areas of case management, automation, and alternative litigation solutions in the index of court quality. In contrast, two main points have a negative impact on Israel's rating in the area of contract enforcement: Duration of contract enforcement—which in Israel is the highest among the advanced countries; and the lack of courts for commercial matters, or sufficient departments dedicated to this area within the courts.

Recommended policy directions

- Adding a dedicated court for commercial matters, similar to the special courts for labor, transport, youth, local matters, family, and small claims.
- A regular annual publication of enforcement and collections performance indices:
 - The number of files closed (due to full payment) relative to the number of files opened.
 - $\circ~$ The average duration from opening a file to closing it (due to full payment) by debt amounts.

4.4 Improving the quality of regulation

The regulatory processes in Israel require improvement. The PMR index by the OECD measures the extent of excess regulation in the goods markets, and shows that Israel's regulation is excessive relative to the average among the OECD countries. Despite improvement efforts made in recent years, the existing regulations are characterized by strict demands that make it difficult for businesses without sufficient economic justification.

Regulation in "excelling" countries uses an infrastructure of professional knowledge and international standards (adjusted to the unique local characteristics) in order to attain the optimal balance between regulatory benefit and the economic cost imposed on the businesses. In contrast, in Israel, the regulator sets out requirements independently, without relating to comparison countries and with an insufficient research basis. Combined with the increased risk aversion of the Israeli regulator, a situation has been created in which regulation in Israel is more strict than in other advanced countries. This is reflected, for instance, in the adoption of stricter standards than in other advanced countries. Standards in many areas in Israel (such as environmental protection, health, and more) are very strict compared to the rest of the world, which has a negative impact on the competitiveness of Israeli businesses.

Another difference between Israel and the other countries is in the required balance between the business sector's need for certainty in regard to the regulation applied to it (particularly in relation to areas that require long-term investments) and the need for regulatory flexibility in adjusting

regulation to changes and developments. Frequent changes in requirements and lack of stability are common in Israel at all regulatory levels, from the legislation and regulations level to the level of granting a license to an individual business. The changes are often made with no advance warning that could help the businesses prepare accordingly. As a result, businesses find it difficult to do any long-term strategic planning and make additional investments, and are forced to bear the high costs of adapting to each new regulation.

This lack of imbalance in Israel also creates greater ambiguity in the business sector. The multiplicity of "gray areas" and the lack of clarity in the text of the requirements makes it difficult for businesses to make informed decisions, and exposes them to the arbitrariness of the officials that are implementing the regulations. This situation is caused due to the insufficient use of procedures and of uniform and clear requirements that form the basis of the instructions to the specific business (standards, specifications, and so forth).

In addition, there is a gap in the synchronization between various entities and various ministries dealing with areas that are relevant to several of them. For instance, the area of food is exposed to regulation on the part of the Ministry of Health, the Ministry of Agriculture, the Ministry of Environmental Protection, and more.

Beyond all this, Israel generally makes little use of digital means. While there has recently been a significant improvement in the entry of digital processes in the private individual's connection with the government, it has barely been integrated in the business-to-government relationship.

Recommended policy directions

- Increasing certainty for businesses by minimizing the changes in the rules that apply to them, while increasing the transparency and clarity of regulatory processes.
- Establishing an intraministerial mechanism to create modes of action for properly working with regulations. Among other things, it is recommended to methodically and vigorously examine where existing regulation can be reduced (further to the important work done by the Regulation Policy Division at the Prime Minister's Office in this regard), and to make sure that procedures are not casually added, but only through a proper Regulatory Impact Assessment (RIA) process—a process that is already being implemented in many parts of the government's work.
- Improving the handling of cross-ministerial issues by expanding cooperation between the ministries.
- In order to remove barriers to easing the bureaucratic burden in government offices connected with employees' opposition to adopting new technologies, these targets should be included in public sector wage agreements, and wage incentives should be designated for achieving these goals.
- A legislative amendment is necessary to shorten the approval processes necessary for businesses, together with a declaration by them that procedures are being adhered to. However, this process must be done together with increased post-facto supervision that the procedures are being adhered to, while ensuring that the mechanisms overseeing the supervisory processes are budgeted at a level that will enable effective enforcement and proper service.
- In this context, personal responsibility for the realization of any risk concerning the areas under regulatory supervision must be removed from public sector workers, except for cases of extreme negligence.

4.5 Openness to imports

There is a broad consensus regarding the advantages of openness to international trade. It enables specialization in the production of goods and services in accordance with efficiency relative to the world, and the purchase of goods and services produced efficiently in other places. It thereby improves well-being and increases productivity (Bank of Israel, 2019e). In contrast, increasing Customs fees leads to a negative impact on well-being and a decline in GDP and in productivity (Furceri et al., 2018).

Over the years, the volume of global international trade has increased, and trade barriers have gradually been lowered. However, since the Global Financial Crisis, there has been a significant slowing of, and even some retreat from, the process of globalization. Israel is not immune to these processes, while there are other factors delaying the development of trade in Israel. World Bank data show that the import process to Israel is longer and more expensive than to other OECD countries, such that simplifying it may contribute to the realization of Israel's trade potential. Moreover, there are more than 600 different import standards in use in Israel, many of which are unique to the country. In the past, representatives of industrialists used to participate in setting the standards, and there are those who argue that this increased protection for domestic products (Bank of Israel, 2019e).

Today, there is a committee in Israel that reviews all the official standards and cancels the addenda that are unique to Israel (unless it is approved by the committee, the Minister of Finance, and the Prime Minister). In 2018, the implementation of a reform regarding the approval of standards for imported products was also started, as part of which international standards were adopted and barriers to the activity of private standards laboratories were removed. In this way, the reform simplifies the import process for those who do not hold an exclusive concession. Another reform currently enables private imports through the Internet, while receiving an almost complete exemption from meeting the import standard. The Bank of Israel Annual Report for 2018 (Bank of Israel, 2019e) contains more details on this.

Proposed policy directions

- The in-depth examination of modes of operation that are customary in leading countries in the area of regulation of all import categories should be continued, and those modes should be adopted in Israel, unless there are special circumstances that justify not adopting them.
- The involvement of domestic manufacturers in setting standards should continue to be reduced, so that the decision in this matter are made without the involvement of interested parties and without concern of conflicts of interest.
- We recommend moving to a mechanism of declarations as an alternative to examinations, while increasing enforcement in the markets in parallel, all with the assurance that the mechanisms responsible for the supervision processes are budgeted at a level that enables effective enforcement.
- The specialization of government workers regarding the customary modes of operation in the various import worlds should be increased, including by allocating manpower to designated teams for each content world.

4.6 Vacation days in Israel

The gap between the number of vacation days for students in the Israeli education system and the number of vacation days for Israeli employees (hereinafter: the vacation day gap) is very large by international comparison.

The large vacation day gap in Israel is not because the number of schools days is low by international comparison. It is to a large extent due to the fact that the education system in Israel operates six days a week, in contrast with the five-day work-week that is customary in most work places in Israel and in education systems in other countries. However, teaching days on Sunday-Thursday during vacations are "deducted" against teaching days that take place on Fridays.

The large vacation day gap has negative implications for the work arrangements of working parents, and therefore negative implications for labor productivity in the economy. Some parents are forced to supervise their children on their own during those days instead of going to work, or to take their children with them to their workplace, which has a negative impact on their output.

The vacation day gap problem has gotten worse over time due to the welcome increase in women's labor force participation rate, which has taken place in most countries in the world, and which was more rapid in Israel than in other countries. In addition, the burden on Israeli parents is greater than in other industrialized countries, partly because the birthrate in Israel is significantly higher (about 3 children per woman compared with about 2 children in the other countries). As such, the burden of the vacation day gap in Israel in each family may continue over a greater number of years—until the youngest child is old enough. This is reflected in the fact that the rate of families with children aged 3–12 in Israel—28 percent of households—is much higher than in other advanced countries.

Beginning in 2014, the government has been operating "summer schools", and from 2018, "holiday schools", which together reduce the vacation day gap among children aged 3–12 by about one-sixth compared with the original gap (Figure 4.6).



However, the vacation day gap in Israel can be reduced by another 60 percent, bringing Israel to a situation that is parallel with other countries, by synchronizing the work week with the school week: cancelling studies on Fridays and transitioning the education system to a five-day work week, with teachers working four days a week instead of the current five. At the same time, the teaching hours from Friday would be returned to the system through additional school days between Sunday and Thursday in place of current vacation days (Figure 4.6).

Such synchronization is expected to lead to a direct increase in GDP estimated at NIS 1 billion per year at least (in 2019 terms). This increase is obtained from reducing the vacation days gap by 20 days, multiplied by additional daily GDP of about NIS 60 million (see the calculation in Appendix A3).

Alongside the increase in GDP, the cancellation of summer school and holiday school on those days would create a budgetary saving of NIS 500 million. In accordance with the government's priorities, this amount can be earmarked for budgeting voluntary enrichment and extra-curricular programs that would be operated on Fridays, while maintaining the budgetary neutrality of the programs.

Recommended policy directions

• Reducing the vacation day gap in Israel by: 1) cancelling classes on Fridays and transitioning to a 5-day school week; and 2) returning the teaching hours from Fridays by adding school days between Sunday and Thursday in place of current vacation days.

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Appendices Table A1: Estimated costs and benefits of the policy measures proposed in the report

Human capital - Total of all measures16.6°Medium to very longEarly childhoodBuilding scholastic arrays to optimize daycare staff trainingHiring additional daycare staff and improving its quality0.05Very longIncreasing access for children from low socioeconomic background0.05Very longQuality of teaching in the 12-year system Upgranding digital technology available for teaching and improving teachers' physical working conditions0.1°LongEducational gaps0.1°LongEducational gapsFormulating management and performance assessment tools for schools, taking into account the starting point of their populations. schools that receive a high assessment, and administrative independence of schools that receive a bigh assessment sol for weak backgrounds, and improving training for teachers is such schools.0.4°Medium to longThe Hared isector encreasing the administrative independence of schools that receive a bigh assessment sol for schools, taking into account the starting point of their populations. they low assessments.0.4°Medium to longThe Hared isector to enable principals of schools, taking and preventives to divert high-quality teacher assessment systems in order to enable principals of schools in the actar to point teachers who want to join them0.3°1°LongIncreasing encode assurement to study subjects that are relevant to the labor market0.3°1°LongIncreasing conciptiones training programsMedium to enable principals of schools frameworks, and diversifying women's training programsMedium to ang		Cost (percent	Benefit of GDP)	Time range to results ^a
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	to Arab schools, particularly in order to improve			

the use of the resources allocated for the study of core subjects and computers.						
Science and technology studies in secondary						
schools						
Increasing exposure and access to basic						
technology, computers, and programming studies						
existing framework and without allocating						
incremental hours	~0		Medium			
Increasing the incentive to matriculate in	C C					
computer sciences, particularly among girls	~0		Medium			
More accurately reflecting the level of difficulty in						
the bonus system for the various matriculation						
exams when registering for institutes of higher	. 0					
Vocational and technological training in secondary	~0					
and post-secondary schools	~0					
Diverting resources intended for vocational						
training to affirmative action for learning basic						
skills, and concentrating vocational training in the	0					
post-secondary frameworks	~0		Medium			
study tracks for students from weak backgrounds	~0 ⁱ		Medium			
Making sure that the number of financed students	Ū		mouldin			
in each college can grow in closer correlation						
with its success. Implementation of the"						
Employment 2030 Committee" report						
recommendations concerning research-guided	0					
The measures to improve human capital are	~0					
expected to contribute to increased incentive to						
expected to contribute to increased incentive to invest in physical capital, so that the stock of						
expected to contribute to increased incentive to invest in physical capital, so that the stock of capital will increase more quickly.		2	Medium			
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	Investment should be made in subterranean urban public transit or exclusive lanes that allow massive mass transit			
	Establishing metropolitan transit authorities	~0		Medium
	Congestion charges / parking taxes	~0		Immediate
Р	hvsical capital - communications ⁿ	0.01	2.7°	Short to medium
-	Building mechanisms that will encourage			
	Defining communication infrastructure as			
	essential infrastructure in order to overcome			
	Set up a regulatory mechanism that will enable sharing vertical communication infrastructure in order to save costs			
	Advance a master plan for the energy economy in Israel in order to increase competition and			
	increase the Israeli economy's energy security.		~0 ^p	
	Electric Company reform: the reform should be			
	its milestones should be monitored in accordance			
	with our previous recommendation			
	After completing the initial stage of connecting			
	customers, examine the need to continue			
	subsidizing the connection.			
Т	otal factor productivity - sum of all measures	0.2	2.1	Short to long
Т	he business environment	0.2 ^q	2 ^r	
_	Establishing a designated court for commercial			
	matters or designated economic departments			Medium
	Setting targets in wage agreements for digitization in the government's contacts with			
	companies and suppliers			Medium
	Amending legislation to enable retroactive			
	declaration and supervision instead of a priori			
	exactness for certain permits, and allocation			Medium
	Establishging intraministerial mechanisms to			Weardin
	implement modern practices of regulatory			
	application			Medium
	various ministries to efficiently handle cross- ministerial regulation			
	Integrating targets for lowering the bureaucratic burden and working according to the RIA in the wage agreements.			
V	acation days	~0	0.1	Immediate
	Narrowing the vacation day gap by cancelling			
	school on Fridays and moving the education			
	Operating Friday schools to offer enrichment and			
	extra-curricular groups			
Т	otal			
	Total - base scenario	1	5.5 ^s	
	Total - Bevond the base scenario	2.3	14.7	
	T ()			
	i otal - all measures	3.3	20.2	

Initial results. Ranges: Immediate – up to one year; Short – up to 5 years; Medium – up to 10 years; Long – up to 20 years; Very long – up to 30 years.

- About 2 percent of the result is from an improvement in the years of schooling of *Haredi* Jews and Arabs, and about 3 percent of the result is from an improvement in the quality of education. 0.4 percent of the benefit is deducted in respect of the years of investment prior to attaining the benefit. Over 15 years, 15 percent of GDP will be invested without attaining a benefit in labor productivity. Assuming that the investment will continue and generate a benefit in the 40 years thereafter (working years in the primary working ages), we divide the earlier cost by 40 and deduct 0.5 percent of the benefit of each year in the long term. Assuming that increasing per student expenditure to the OECD average level to cover the measures recommended here, and the implementation of the other measures, these together will bring the average achievement scores in Israel to the OECD average level. According to the growth model, such an improvement in the quality of education is expected to contribute about 3
- b percent to the per worker GDP level in the long term.
 Most of the effect will be achieved by designating a larger portion of the wage increment to the new teachers, and the cost is derived from compensation that will be apparently be necessary
- in order to obtain the agreement of the veteran teachers.
 The budget for teachers' wages in Israel is about 4 percent of GDP. The wages of teachers in the lower half of the socioeconomic background ranking will increase by 20 percent, so the
- ^d budget will increase by 0.4 percent of GDP per year.
 The additional cost of 0.3 is calculated thus: Per student expenditure in *Haredi* education is 25 percent lower than in State religious education, due to the lack of core curriculum studies. The education budget is 4.3 percent of GDP, and the *Haredi* students will constitute about one-fifth
- of total students, according to the average forecast horizon. 0.2*4.3*(1-(1/0.75))=0.29~0.3. The increased study of subjects relevant to the labor market will graudally raise the number of effective years of schooling (in the labor market) of *Haredi* men. In 2030, their average number among the primary working-age population will be one-and-a-half years higher. This is also
- f expected to contribute to the quality of human capital.
 Per student expenditure in the Arab education system is 15 percent lowre than in the Public Jewish system, the education budget is 4.3 percent of GDP, and Arab students make up about
- ⁹ one-fifth of all students: 0.2*4.3*(1-(1/0.85))=0.15. The recommended measures will gradually increase the number of years of schooling for Arab men and women. In 2030, their average number among the primary working-age population will be one-and-a-half years higher. This is also expected to contribute to the quality of human ^h capital.
- As part of the budget to divert high-quality teachers to schools in the lower half of the distribution.
- The investment will increase by 1 percent of GDP, and productivity per worker will increase by 4 percent.
- 0.8 percent of the benefit is deducted in respect of the years of investments prior to the attaining the benefit.
- 1 percent of GDP in order to maintain our relative position, and 1 percent of GDP in order to
- ¹ improve our relative position to the OECD average.
- ^m All of the measures are intended to maintain Israel's relative position (which is currently high). Reflects maintaining Israel's high rating in the field compared with a decline to the 2th
- ⁿ percentile wihtout adopting the recommended measures.
- ^o Necessary for the continued proper functioning of the economy.
- ^p The possible cost of financing manpower and process resources.
- Reflects an increase to the median value of the ranking of countries in the field.
 At least one percent of GDP is required in order to maintain the current level of infrastructure,
- r particularly in the transportaiton fields.

Appendix A1: Estimating the productivity gap between the *Haredi* and non-*Haredi* Jewish population

In order to estimate the implications of these gaps on labor productivity in the economy, we must examine the productivity of each population group. In the absence of a productivity measurement at the individual level, we use the individual's wage as an estimate of his labor productivity.

The average (gross) monthly wage of *Haredi* men is about 60 percent lower than that of non-*Haredi* men. Even after accounting for the volume of work hours, the wage per work hour is about 33 percent lower. The wage gap remains similar even after controlling for standard characteristics such as age, marriage, and residential district.

About two-thirds of the wage gap is explained by the most recent educational certification of the individuals. While about 34.2 percent of non-*Haredi* Jews have an academic degree (Bachelor's, Master's, or Ph.D.), and another 12.8 percent have another higher education certificate (nonacademic post-secondary completion certificate), just 6.7 percent of the *Haredi* population have an academic degree and a further 7.1 percent have a nonacademic certificate. In other words, most of the (hourly) wage gap between *Haredi* men and non-*Haredi* Jewish men can be attributed to not obtaining an education that is appropriate for the labor market. About half of the remaining wage gap (about 12 percent) is explained by the low basic skills of the *Haredi* population, even when comparing between the *Haredi* and non-*Haredi* Jewish men with similar scholastic certification. In other words, the problem is not just in the choice of educational institution, but also in what it or the environment provide to the *Haredi* students. A similar analysis is obtained even when additionally controlling for economic industry. The *Haredi* population is overrepresented in the education industry "at the expense" of more business oriented industries such as manufacturing and business services, and even public administration.

A simulation carried out using the long-term growth model constructed at the Bank of Israel shows that given the trends of *Haredi* workers entering the labor market, if the quality of education of *Haredi* men would currently be equal to 12 years of schooling instead of 10, average labor productivity in the economy would be 2.5 percent higher.

The average (gross) monthly wage of *Haredi* women is about 40 percent lower than that of non-*Haredi* Jewish women. The vast majority of the gap (about two-thirds) is due to the prevalence of part-time jobs among *Haredi* women, such that the hourly wage gap is estimated at about 14 percent. This gap is entirely explained by the most recent educational certification. In other words, there is no hourly wage gap between *Haredi* women and non-*Haredi* Jewish women at a given educational level. By also accounting for their skills, the wage gap moves to favor the *Haredi* women (about 3 percent).

Appendix A2: Estimating the productivity gap between Arabs and the non-Haredi Jewish population

The average (gross) monthly wage of Arab men is slightly more than 50 percent lower than that of non-*Haredi* Jewish men. Up to half of this gap is explained by the most recent educational certification of the individuals and their basic skill level. In other words, even after all these controls, we see that the wage of Arab men is 25 percent lower than that of the non-*Haredi* Jewish population. This remain true even when controlling for the industry of employment. These significant wage gaps may attest to the low quality of formal learning in the Arab sector, which causes large wage gaps even for a given educational certification; or it may indicate the existence

of discrimination in the labor market, such that Arabs receive a lower wage even for a given educational level, skill level, or industry.

The picture differs slightly for Arab women. While the gross wage gap is similar—about 50 percent—some of it is explained by the low average number of work hours (among those who are employed). Formal educational certification explains 40 percent of the hourly wage gap. In contrast with Arab men, basic skills among Arab women are lower (even after controlling for educational level), which explains some of the hourly wage gap. After controlling for all the variables, the wage gap among Arab women is 15 percent.

Appendix A3: Estimating the direct growth of GDP as a result of synchronizing the work week with the school week

The synchronization program narrows the vacation day gap by 28 days among all children aged 3–12 in a structured manner (redistribution of school days by about 37 short Fridays and about 28 longer school days between Sunday and Thursday). To measure the reduction in the actual vacation day gap, we must compare the synchronization program with existing programs—the summer school and holiday school programs. These are operated for a total of 25 days during the year, but only partially among children aged 3–9. Weighting the participation rate of children in these programs as a share of total children aged 3-12 leads to an estimated narrowing of the vacation day gap by about 8 weighted days, compared with the synchronization program.

The growth in daily GDP is obtained from the cost of one day of vacation gap, which is estimated at about NIS 60 million. This estimate is obtained from two components among households where both parents are employed. The first component is the cost of a work day among parents who are forced to stay at home with their children (according to our estimate, one of the parents in about one-fifth of households in the non-*Haredi* and non-Arab sector, hereinafter the "other" sector, about 6 percent of households in the *Haredi* sector, and about 2.5 percent of households in the Arab sector). This cost is obtained by processing data from the Central Bureau of Statistics Household Expenditure Survey, according to which the average monthly wage (for a parent with children aged 3–12, whose wage is lower) is NIS 9,990 in the "other" sector, and NIS 6,455 in the *Haredi* and Arab sectors. The second component is the attribution of the alternative cost for 5 hours per day, based on the cost of afternoon care of NIS 935 per month—the maximum cost set out in the law.

According to the methodology used, from the obtained amount of NIS 1.3 billion, we must deduct the wage cost of households where both parents work on Fridays (the wage cost of the lower wage earner in the household).