

Bank of Israel



Research Department

**Developments in the Incomes and Employment of
Physicians in Israel Following the 2011 Wage Agreement**

Noam Zontag

Discussion Paper 2025.01

January 2025

Bank of Israel - <http://www.boi.org.il>

* Bank of Israel, Research Department Email: Noam.Zontag@boi.org.il

The author thanks Eyal Argov, Sefi Bahar, Shuli Brammli-Greenberg, Alon Eizenberg, Yoav Friedmann, Naomi Hausman, Tamar Ramot-Nyska, and Noam Zussman for their helpful comments and advice during the research process. Thanks to the Central Bureau of Statistics employees for making the data available for the study in the research room. Thanks to Ayelet Greenbaum-Arison, Rachel Brenner-Shalem and Alexey Belinsky of the Ministry of Health for their help in accessing the data and for their helpful advice.

**Any views expressed in the Discussion Paper Series are those of the author
and do not necessarily reflect those of the Bank of Israel**

**חטיבת המחקר, בנק ישראל ת"ד 780 ירושלים 91007
Research Department, Bank of Israel. POB 780, 91007 Jerusalem, Israel**

Developments in the Incomes and Employment of Physicians in Israel Following the 2011 Wage Agreement

Noam Zontag

Abstract

The wage agreement signed with the physicians in 2011 included significant incentives for physicians to move to outlying regions and encouraged residency in fields where there is a lack of specialists. This study reviews the developments in the employment and incomes of physicians in Israel since the 2011 wage agreement, with particular focus on the effectiveness of the incentives included in the agreement to encourage physicians to move to outlying regions. The identification strategy, using the Difference-in-Differences (Diff-in-Diffs) method, is based on disparities in the degree of exposure to the agreement's incentives among physicians from different specialties. The study's findings do not indicate that the economic incentives provided in the agreement had an impact on the likelihood of specialist physicians residing in outlying regions. However, they do highlight the importance of physicians being exposed to education or residence in outlying areas prior to choosing to work in these regions. There was only a moderate increase in the rate of physicians who chose to specialize in fields defined in the agreement as having a shortage of specialists. However, wage disparities between specialties may have hindered the increase in the number of specialists in some of these fields.

התפתחויות בשכר ובתעסוקה של רופאים בישראל בעקבות הסכם שכר 2011

נעם זונטג

תקציר

הסכם השכר שנחתם עם הרופאים ב-2011 כלל תמריצים ניכרים למעבר של רופאים לפריפריה ולעידוד ההתמחות במקצועות במצוקה, שבהם חסרים רופאים. המחקר סוקר את ההתפתחויות בתעסוקה ובשכר של הרופאים בישראל מאז הסכם שכר 2011, ובפרט את אפקטיביות התמריצים שנכללו בהסכם לעידוד מעבר רופאים לפריפריה. אסטרטגיית הזיהוי, באמצעות שיטת הפרש ההפרשים (Diff-in-Diffs), מתבססת על פערים במידת החשיפה לתמריצי ההסכם בין רופאים מתחומי התמחות שונים. ממצאי המחקר אינם מצביעים על השפעה של התמריצים הכלכליים שניתנו בהסכם על ההסתברות למגורי רופאים מומחים בפריפריה, אך הם מצביעים על חשיבות הלימודים או המגורים של הרופאים בפריפריה טרם בחירתם לעבוד באזורים אלה. נמצאה עלייה מתונה בלבד בשיעור הרופאים שבחרו להתמחות בתחומים שהוגדרו בהסכם כתחומים במצוקה. פערי השכר בין תחומי ההתמחות היו עשויים לעכב את הגידול במספר המומחים בחלק מהתחומים שבמצוקה.

1. Background and literature review

The wage agreements signed with Israel's physicians are of critical importance for the function of the public health system and its ability to provide good health services, while the physicians play a key role in providing the health services and in administering the health system. At the same time, their training is prolonged and the public cost of this training is high; and once they have qualified, the physicians' wage agreements may affect the incentives offered to them to remain and work in the public health system. The state seeks to use these wage agreements to address issues relating to the diversity, quality and geographical distribution of the health services. Accordingly, the wage agreements include incentives for allocating physicians among specialty fields and different geographical regions.

The wages paid to physicians are the highest in the public sector and in the entire labor market, and account for a substantial share of the health services budget. From the fiscal perspective, the physicians wage agreements are therefore extremely important. This paper examines developments in the employment and incomes of physicians in Israel in light of the wage agreement signed with the Israeli Medical Association in 2011, and looks at whether and to what extent the agreement succeeded in achieving its goals. Specifically, the paper focuses on the effectiveness of the incentives included in the agreement in attracting recently qualified physicians to specialize in disciplines with a lack of specialists and to move to outlying regions and remain there as a specialists. The paper also analyzes recent developments in key issues in the employment of physicians, and could therefore serve as a knowledge base for future wage agreements.¹

¹ On September 30, 2024, a new wage agreement was signed with the physicians. In practice this is an interim agreement, the main purpose of which is to compensate the physicians for the long delay in the signing of a new wage agreement. The previous agreement, signed in 2011, was relevant until 2019 so that the present agreement compensates the physicians for the period from 2020–2025. The agreement also includes a number of incentives and updates relating to the specialty fields that are particularly relevant for the treatment of war injuries ("national mission supplement") and other areas. Most of the research in this present study was conducted prior to the signing of this wage agreement, and its findings were presented to the relevant professional entities during the negotiations on the agreement.

1.a The physicians' wage agreement signed in 2011: details and implications

In August 2011, after a prolonged four-and-a-half month strike, a wage agreement was signed with the physicians. The new agreement was necessitated by the expiry of the previous agreement (signed in 2000) a year earlier, but other issues were also at the root of the 2011 strike besides wages (workload and work conditions, for example). Although the physicians' wages had risen in the years preceding the strike compared with wage increases throughout the economy, as demonstrated in the OECD data (Belinski et al., 2018), the wage agreement signed in 2011 addressed a whole range of employment issues: wages, incentives to encourage residency in fields with a shortage of specialists and encouraging physicians to work in outlying regions, overtime, the allocation of budgeted positions, social benefits, obligating the physicians to clock in, funding of conventions and in-house training, payment for on-call shifts, etc. Under the agreement, physicians at all levels received an across-the-board nominal wage increase of 32 percent, to be granted in several stages between 2011 and 2019. In addition to the percentage wage increase, all physicians received a shekel supplement of up to NIS 600 per month. Other clauses in the agreement—payment for overtime and on-call shifts, improved social benefits, study days as well as attending medical conferences and in-house training—also contributed to the physicians' improved employment conditions.

In addition to the wage supplements for all physicians, supplements were also given to certain groups of physicians in an effort to address the shortage of physicians in these groups ("the additional wage supplements"). The first group is physicians who work in the country's outlying region, specifically in the hospitals. This group received three key supplements under the agreement. The most significant was a percentage increase in physicians' wages in hospitals in outlying areas so that, after full implementation of the agreement, their wages were 17 percent higher than those of specialists in hospitals in the center of the country and 25 percent higher than the wages of medical residents.² It was also decided to give one-time bonuses of NIS 300,000 to doctors willing to move to outlying areas, and also to give preference to hospitals in outlying regions in the allocation of budgeted positions. This preference led to a sharper increase in the number of

² The supplement is computed relative to the wage paid to a physician with similar data working in a hospital in the center of the country.

budgeted positions at outlying hospitals than at hospitals in the center of the country. For example, between 2010 and 2018, the number of budgeted positions at hospitals in the center of the country increased by 14 percent, compared with a sharper increase of 25 percent in the number of budgeted positions at hospitals in outlying regions. More than 100 percent of the budgeted positions were filled in the center of the country (hospitals are able to fill more budgeted positions than the official number) and close to 100 percent were filled in outlying region hospitals (Markovitz et al, 2021). Under the agreement, general hospitals in the northern and southern districts were defined as outlying region hospitals, and this study maintains these definitions.

The second group awarded additional wage supplements was physicians who chose to specialize in fields with a lack of specialists, namely, in fields in which there was a shortage of physicians prior to the signing of the agreement. The agreement defined the following fields of medicine as those with a lack of specialists: internal medicine, geriatric medicine, general surgery, emergency medicine, pathology, pediatric hemato-oncology, rehabilitation, pediatric psychiatry, and nuclear medicine. Several other fields were defined as having an acute shortage of physicians: anesthesia, neonatology, and a number of areas within intensive care (general, respiratory, pediatric, and cardiac). The incentives for this group focused on residents and they were awarded a percentage supplement (during their residency period). As a result of the supplement, the wages of these residents, after the complete implementation of the agreement, were 37 percent higher than those of residents in fields with no shortage of physicians (prior to the agreement, the wage difference was 15 percent). The agreement also granted these physicians a shekel supplement of between NIS 400 and NIS 1,200, depending on the extent of the shortage in the particular field and the physician's stage of qualification (resident or specialist). It was also decided to grant a one-time bonus of NIS 300,000 to physicians who had begun to specialize in these fields. Physicians who chose to specialize in these fields at a hospital in an outlying region (a combination of the two groups who were awarded the supplements) received a bonus of NIS 500,000.³

³ The wage supplements for physicians in outlying hospitals and in fields with a shortage of physicians are detailed in the report prepared by the Department of Wage and Employment Agreements at the Ministry of Finance (Markovitz and Assif, 2021).

Although the period of the one-time bonuses for hospital physicians in outlying regions and in fields with a lack of physicians was defined in advance as 2011–2019, in practice it can be divided into two parts. Between 2011 and 2014, bonuses were given according to fixed criteria in the amounts defined in the agreement. In contrast, between 2015 and 2019, the state continued to grant bonuses, but such bonuses changed from one year to the next following consultation with the hospital directors, in an attempt to improve their effectiveness (Blank, 2024).

Key issues in the employment of physicians in Israel since the signing of the 2011 wage agreement

The following sections present the background conditions and key developments in the labor market for physicians in Israel since the signing of the 2011 wage agreement. These topics could be relevant to any future wage agreements that may be signed with the physicians.

Yatziv Reform (2019) - Accreditation of International Medical Schools

Most of the physicians who received licenses to practice medicine in Israel in the past few decades were trained abroad. An OECD report noted that in 2020, 58 percent of the physicians employed in Israel received their training outside the country (OECD, 2023)—an exceptionally high proportion compared with other countries. This group consists of new immigrants who came to Israel after completing their studies and Israelis who travelled abroad to study medicine. Medicine is also unusual in this respect when compared with other professions in Israel. The training in all medical schools in Israel is considered high quality and meets the needs of Israel's health system, whereas there is considerable variance in the quality of clinical instruction and training abroad. Some medical schools provide an adequate level of training, although in more than a few others training standards are significantly lower than in Israel.

This issue was addressed by the Ministry of Health's Medical Professions Licensure Department, under Professor Shaul Yatziv. In 2019, following a review of the curricula and quality of the various institutions, the Department defined which of the medical schools outside Israel provide adequate training, and decided not to allow medical students

graduating from faculties that were not of an adequate standard to take the licensing exams in Israel. From that year (2019), students who began their studies at medical schools that were not on the list of authorized institutions will not be permitted to take the Israeli licensing exams. This move is expected to reduce the number of new licenses granted to overseas graduates from 2026 onwards. Although the original intention of the reform was to raise the standard of the health services, particularly in outlying regions, in practice implementation of the reform is likely to exacerbate the shortage of physicians in those areas, given that many of the physicians trained in medical schools that are not in the aforementioned list work in Israel's geographic periphery (Shapiro et al., 2021). For example, 56 percent of the medical residents in the southern region in 2019 were trained in faculties that were disqualified in the reform (Samuel et al., 2022).

Inequities between the center of the country and outlying regions

One area that received a significant financial incentive in the 2011 wage agreement was the encouragement of residents and specialists to work in outlying regions, and particularly in hospitals in those regions. Despite Israel's small size, there are considerable inequities between different geographic areas in the ratio of physicians to population size, particularly between the center of the country and outlying regions. This disparity becomes even more acute when we consider criteria of quality and standard of training as well (e.g. specialists or physicians who are graduates of Israeli medical schools) (Figure 10). There are a number of reasons why physicians prefer the center of the country to the periphery. Employment in outlying regions is sometimes limited with respect to the options for professional development. For example, since most of Israel's principal, large hospitals are in the big cities, the more complex medical procedures tend to be performed in those hospitals. Another factor is that employment in the periphery might limit the possibility of daily professional contact with relevant colleagues, ties that are essential for physicians' professional development. In addition, employment in outlying regions is often perceived as being less prestigious. This issue also has family implications. Physicians in the periphery may encounter difficulty in finding suitable educational frameworks for their children or suitable employment for their spouses (Gamzu, 2022). Another possible reason for physicians preferring the center of the country over the periphery relates to the general shortage of physicians in Israel. This shortage creates competition for physicians between

the hospitals, and the professional and other advantages enjoyed by hospitals in the center of the country allow them to recruit more and higher quality physicians from the limited supply, at the expense of the periphery (Blank, 2024).

Despite the extensive treatment that this subject has received, it remains significant and relevant. One of the main challenges facing the health system both in Israel and in other countries is an adequate geographic distribution of physicians that will ensure the supply of high-quality medical services in both the center of the country and outlying regions (Stockton, 2021). An inequitable geographic distribution of physicians is one of the causes of disparities in the provision of medical services between center and periphery (Bowers and Chernichovsky, 2014). This subject was also discussed in the June 2023 OECD report, which addressed key issues in the training of physicians in Israel (OECD, 2023).

Residency in fields with a lack of physicians

Another area that received incentives in the 2011 wage agreement is encouraging physicians to choose to specialize in those fields in which there is a lack of physicians and specialists. The wage agreement listed the following fields in this category: geriatric medicine, anesthesia, physical medicine and rehabilitation, pathology, and other fields. The shortage of specialists in certain fields may be due to the fact that physicians perceive them to be less attractive.

According to the research literature, physicians tend to choose their specialization based on the extent to which the physician's preferences and interests coincide with his or her perception of the nature of that field, which may differ from the actual nature of the field (Naimer et al., 2018; Weissman et al., 2013). As we see in the literature, one of the physicians' key considerations in choosing a medical specialty relates to the work conditions in that field. For example, the degree to which employment in that field allows for a work-life balance, a consideration which is extremely important for female physicians (Goldacre et al., 2012), flexible work hours (Harris et al., 2005; Nakayasu et al., 2020), avoiding a specialization with irregular work hours and numerous on-call shifts (ibid.), etc. Another important group of considerations relates to the content of the work and the training process in the specialty field, such as interest and challenge (Weissman et al., 2013), prestige (Harris et al., 2013), and length of the training (Thornton & Exposto, 2003).

Another consideration mentioned in the literature relates to the type of patients in the field. For example, physicians tend to avoid medical specialties that involve treatment of the chronically ill and the elderly (Hauer et al., 2008). Another highly relevant consideration mentioned regarding the incentives given in the 2011 wage agreement is expected future income (Harris et al., 2013; Gagne & Leger, 2003; Zisk-Rony et al., 2023).⁴

As mentioned, the 2011 wage agreement contained significant financial incentives designed to encourage physicians to specialize in fields with a lack of specialists. The incentives focused principally on physicians during their residency training and less on qualified medical specialists. Two studies that examined the effectiveness of these incentives showed that they had little or no impact on the choice of the specialization (Ashkenazi et al., 2017; Markovitch et al., 2021). Like the results of these studies, the descriptive analysis in this paper also points to only slight changes in the distribution of the physicians' medical specialties between fields with a shortage of specialists and other specializations after the signing of the agreement (Figure 8).

In view of these findings, and despite the increase in the past few years in the overall number of physicians completing a medical specialty, it would appear that this subject will remain relevant for future wage agreements. This relevance becomes even clearer in the current period since some of the fields in which there is a shortage of specialist physicians, particularly the lower-paid fields, are highly relevant to the health system's ability to cope with the repercussions of the Swords of Iron War (such as psychiatry, physical medicine and rehabilitation) (Figure 7.B).

Dual Practice—physicians working simultaneously in the public system and private practice

Another feature that is unique to the medical field in both Israel and many other countries is dual practice—physicians working simultaneously in the public system and in private practice. Given that this situation has the potential to create distortions and raise issues of professional ethics (e.g. physicians referring patients from the public health system to their

⁴ Some of the studies cited here are based on Israeli data (Naimer et al., 2018; Weissman et al., 2013 and Zisk-Rony et al., 2023).

private clinics), the subject has been addressed in various parts of the world. Some countries place a blanket prohibition on the employment of physicians in both systems simultaneously. Others have applied various restrictions (such as a limit on the income from private practice or its share of the physician's total income), while yet other countries prefer not to intervene, and allow physicians to work in both systems simultaneously (Belinski et al., 2018).

Until quite recently, there were no particular restrictions in Israel on physicians practicing in the public and private realms simultaneously. In November 2017, "cooling off regulations" entered into force as part of the Public Health Regulations. These regulations stipulate that physicians who treat patients in the public health system shall not treat the same patients privately in the ensuing six months. The regulations were designed to prevent cases in which a patient would come for treatment in the public system (for instance through the HMOs) and the physician would then recommend continuing the treatment in his or her private clinic. Such a situation could lead to "cream skimming"—physicians mainly referring financially lucrative patients to their private practice. At the same time, the "arrangement-refund" reform was introduced, in which the insurance companies and supplementary health services (supplementary insurance through the HMOs) were obligated to pay only those surgeons who were listed in a formal arrangement with the insurance companies, and not on a refund basis in which insured patients could also choose an unlisted physician and be reimbursed for the surgery.

Additionally, at the end of 2017, a plan for reducing waiting times was implemented. The main purpose of this plan was to strengthen public healthcare services in Israel by replacing privately funded surgery with publicly financed surgery in the form of support for the HMOs (Ash Committee Report, 2022). These three measures were aimed at diverting some of the private health system activity, and specifically that offered by the supplementary health services and insurance companies, to the public health system, thus limiting the options open to physicians working in both systems to direct patients from the public to the private system. This issue has relevance for the wage agreements with the physicians as it directly affects their income from public medicine, and may therefore affect how the physicians divide their time between public and private practice.

1.b Literature Review

There is limited global research literature on the effectiveness of financial incentives to encourage the movement and long-term relocation of physicians to outlying regions, and the conclusions of such research are not definitive. (Buylx, 2010; Verma et al., 2016; Wilson et al., 2009).⁵ Additional studies examined broader perspectives relating to the physicians' decisions regarding work in the periphery. These studies found that in addition to wages, other employment-related variables play a significant role in physicians' choice of work location—for example, variety of the work, workload, flexible work hours and the possibility of taking vacation, professional development, the intellectual challenge, and opportunities for family members to find work and educational frameworks (Abbiati et al., 2020; Holte et al., 2015; Lie et al., 2014; Yang, 2003).

In contrast, a relatively large body of literature discusses other factors correlating with the employment of physicians in outlying regions, particularly the extent of the physician's earlier exposure to such regions. For example, three studies that examined this issue in Australia found that physicians or their spouses who grew up in remote, rural areas were more likely than others to specialize and work in these areas (Gupta et al., 2014; McGrail et al., 2011; Stagg et al., 2009). Other studies found a positive correlation between the work of physicians who received all or part of their training in rural areas and specializing or working in such areas (Johnson, Wright, and Foster, 2018; Woloschuk and Tarrant, 2002). Interestingly, another study found a strong relationship between the study of medicine in outlying regions and subsequent medical practice in rural areas among physicians who were raised in urban areas (Chan, 2005).

Another interesting example of the connection between exposure to outlying regions while studying medicine and subsequent employment in these areas is the medical schools that operate special programs to train physicians for outlying regions. For example, such medical schools that can be found in the US, are generally situated in outlying areas, and include a curriculum adapted to medical services in those areas. Studies that focused

⁵ The relevant global literature uses the term rural or remote areas (rather than peripheral or outlying). In contrast, based on Israel's social and geographical background, the few studies that have addressed this subject in Israel focused on the disparities between the center of the country and peripheral, or more outlying, regions (e.g. Ashkenazi et al., 2017).

on these faculties found that their students were more likely than others to work in outlying areas after completing their medical training (Glasser et al., 2008; Rabinowitz et al., 2001).

A number of policy and research institutions in Israel have examined the effectiveness of the incentives in the 2011 wage agreement to encourage physicians to move to outlying areas. Two studies conducted by the Brookdale Institute examined this subject in two stages. The first study, published in 2017, was based on administrative data and a poll of 1,042 residents conducted by the institute which focused on the residency period. The study found that in the years following the wage agreement, the number of medical residents in outlying areas increased rapidly, while there was a more moderate increase in the center of the country, although the rapid increase in the periphery was attributed more to an increase in the number of budgeted positions that had been decided upon in the wage agreement and less to the financial incentives. Based on the background data of the medical residents in the periphery, the researchers estimated that most of the medical residents who received the benefits given for specializing in outlying areas would have gone to the periphery even without these benefits, so that the effectiveness of the incentives was low. The study also found a slight increase in the proportion of physicians who choose to pursue a specialization that was defined in the wage agreement as a field with a shortage of specialists. The researchers believe that the incentives had only a small impact, if at all, on the choice of the physician's field of residency (Ashkenazi et al., 2017).

The second Brookdale Institute study was published several years later (in 2022) and was based on a survey of 346 young medical specialists following completion of their residency (Samuel et al., 2022), and focused on whether the incentives managed to keep specialists in the periphery after completion of their residency. The findings emphasize the importance of the background variables of the physicians' exposure to the periphery prior to their careers (parents who live in the periphery, internship in the periphery, and particularly medical residency in the periphery). The study also found that the share of physicians who did their residency in the periphery and then remained in the periphery was lower than the share of physicians who did their residency in the center of the country and then remained in the center.

A study published by the Ministry of Finance Wage and Employment Agreements Department (Markovitch et al., 2021) focused on the impact of the incentives given in the 2011 wage agreement on the physicians' choice of residency location. The study was based on data for residents from government hospitals and those run by the HMOs, and its findings indicated a 7–8 percent increase in the likelihood that a physician would specialize in the periphery in the early years of the agreement (2011–2014). The study also found that these incentives were ineffective due to their high cost (NIS 1.5–1.8 million on average for one physician moving to the periphery). As for choosing a specialization in which there is a shortage of specialists, the study did not find that the wage incentives correlated with a greater probability that a physician would choose such a field.

Another recently published study was based on a poll of Israeli medical students in their last year of medical school. The poll included questions about preferred geographical location for residency and the extent to which different incentives might influence choosing to specialize in an outlying region. According to the study's findings, the most effective incentives were those relating to financial support for training and fellowships abroad, financial grants, and fewer on-call hours (Fried et al., 2024).

In view of the existing literature, this study examines whether and to what extent the incentives given in the 2011 wage agreement to encourage physicians to move to outlying regions increased the likelihood that specialists would reside in the periphery. Our study also examines the impact and importance of physicians being exposed to education or living in the periphery on the probability that they will live in these regions after completing their residency.

This study brings new input in relation to the existing literature on this subject in Israel from several perspectives. First, it is based on a rich, unparalleled data file containing administrative data about all physicians in Israel, residents and specialists, from the period prior to the signing of the 2011 agreement up to immediately prior to the signing of the following agreement (2024). This file makes it possible to conduct an in-depth analysis over time of the main changes in the employment of physicians since the 2011 wage agreement. Second, we used the Difference-in-Differences (Diff-in-Diffs) method to identify causal relationships between the incentives given in the wage agreement and

physicians who lived in outlying regions after qualifying. Third, we examine the long-term effect of the incentives on specialist physicians' place of residence, namely after completing (and not only during) their residency. As will be detailed later on this paper (Section 4.a, Methodology), the physicians' place of residence at this advanced stage largely reflects their place of residence in the long term. Fourth, the study examines the effects of the incentives with the focus on groups of high-caliber physicians, such as graduates of Israeli medical schools and those who were high achievers in the psychometric exam. This is an extremely important aspect since disparities in the medical services between the center and outlying regions are reflected not only in the number of physicians but also in their professional competence (according to observed data). This is evident, for example, in the high proportion of graduates from medical schools that were disqualified under the Yatziv Reform and are employed in hospitals in the periphery (Davidovitch et al., 2023). Finally, based on the global literature, the study examines the relationship between the study of medicine in medical schools in Israel's periphery (Ben-Gurion University of the Negev and the Faculty of Medicine in the Galilee (Safed)) and the probability that physicians will continue to reside in outlying regions even after completing their residency.

The structure of the rest of the paper is as follows: the next chapter, Chapter 2, reviews the data files on which the study is based. Chapter 3 discusses several key perspectives in the employment of physicians in Israel in view of the 2011 wage agreement. Chapter 4 presents an empirical analysis of the estimation of how effective the incentives provided in the wage agreement were in encouraging physicians to work in the periphery. This chapter has three parts: methodology, results of the empirical analysis, and discussion. The final chapter, Chapter 5, presents policy recommendations based on the study findings.

2. Data

This study was conducted in the research room of the Israeli Central Bureau of Statistics (CBS). It involves the merging of several administrative data files with a labor force survey. The files on which the study is based are: (1) Register of physicians, containing detailed variables regarding the training process of all physicians licensed to practice medicine in Israel as well as several demographic variables about the physicians; (2) Israel Tax Authority employer-employee file containing data on wages from salaried employment as well as data from the self-employed work of all physicians for each of the years between 2000 and 2021⁶; (3) A population registry file which enables the physicians' place of residence to be identified (at the sub-district level) over time, as well as their family status and additional variables; (4) A file containing the physicians' achievements in the psychometric exam; and (5) The labor force surveys for the period 2018–2023.

The data files on which the study is based offer several important advantages. First, the files contain administrative data relating to all physicians licensed to practice medicine in Israel. In this respect they provide an excellent representation of the population of physicians in Israel. Second, the data files cover a broad range of variables for each physician, enabling in-depth analyses to be performed while also considering a host of factors that could be significant. Additionally, since the data are fairly up to date, they allow us to analyze the effect of the incentives given in the 2011 wage agreement on the physicians place of residence even after completing their residency (and not only during the residency period). As detailed in the Methodology chapter, the physicians' place of residence after completion of their residency to a large extent reflects their place of residence in the long term. These advantages provide for an in-depth analysis of different trends in the employment of Israel's physicians in the past few decades, and specifically since the signing of the 2011 wage agreement.

However, notwithstanding these advantages, the data files also contain a number of drawbacks. One is the difficulty in distinguishing between wages from private practice and wages from employment in the public system. This is mainly due to the high percentage

⁶ Due to the COVID-19 pandemic and data limitations, the study focuses on the physicians' wages up to 2019 and not in 2020 and 2021.

of physicians employed by the HMOs on independent employment contracts so that they receive their wages from public sector employment but are registered in the Tax Authority data as self-employed physicians, similar to physicians working in private clinics. A second limitation is the constraint that relies on the physicians' place of residence rather than their place of work. This is because the employers' data fail to provide sufficient information for reliably defining the place of work of all the physicians. Another limitation is that the wage data are based on Tax Authority data, so they include all the taxable income for that year (from salaried and self-employed work), but not the earnings that physicians chose not to withdraw in that tax year (for example, profits retained at the end of the year in a personal service company). These amounts could be significant mostly for the 10–20 percent of highest-income physicians who, for various reasons, tend to leave part of their income in their personal service companies (PSC) (Belinski et al., 2018). To limit the possible skewing of data relating to retained earnings as much as possible, the development of physicians wages is assessed not only based on the average but also on the median, which is less influenced by the wage developments of the upper part of the wage distribution.

The data in the chapter describing the state of the physicians' employment (Chapter 3) are based on data for all physicians who worked in Israel in the 12 months in the relevant tax year. The data in the empirical part of this paper (Chapter 4) cover only physicians who received their license from 2003 onwards and completed their residency by 2021—a total of 7,039 physicians. The focus on physicians who completed their residency is due to the desire to focus on the impact of the wage agreement incentives on the long term and not only on the residency period. The sample is restricted to physicians who received their license in or after 2003 due to the desire in the analysis to address the physicians' place of residence prior to their medical studies, and the fact that the earliest data about the physicians' place of residence relates to 1995 (long-track medical studies, including internship, take 7 years until a license is received).⁷

⁷ An analysis conducted as part of this study revealed that the vast majority of licensed physicians are engaged in some form of medical practice or health-related field, such as health research. Consequently, we can infer that nearly all physicians who complete their residency go on to work in the healthcare industry.

3. The employment of physicians in Israel in view of the 2011 wage agreement

3.a Development of physicians wages between 2000 and 2019⁸

In Israel and many other countries, physicians' wages are significantly higher than the average wage across the labor market, and even exceed the wages of individuals working in other academic and managerial professions. Physicians earn high wages for a number of reasons. First, the demand for medical studies is significantly higher than the number of available slots for students in the medical faculties, so that the entry requirements are very high. As a result, physicians have much higher than average skills and qualifications. It is therefore reasonable to assume that even if they had chosen other professions their income would be high, in line with their qualifications. Second, physicians face a grueling training period which requires considerable effort and investment over many years. This investment must be reflected in their wages. Third, physicians are the most senior professional entity in the healthcare system and are therefore considered a key factor in the supply of the country's quality healthcare services. Fourth, physicians work longer than average hours compared with other professions, and their work frequently entails pressure and the need to make numerous critical decisions. Finally, the standards of training for Israel's physicians are high, with many of them also able to find employment abroad under excellent conditions. The high wages paid to Israel's physicians could reduce the likelihood of physicians relocating to other countries ("brain drain").

In the period of the agreement (2011–2019), the wages of specialist physicians rose relative to the average wage in the economy. According to OECD data, this ratio increased from 3.2 in 2010 to 3.6 in 2019. After this increase, in 2019 the ratio in Israel was the highest among the OECD countries for which data are available in both years, other than South Korea (Figure 1). We see a similar pattern when examining the development of the wages of specialists relative to per capita GDP. Between 2010 and 2019, this ratio rose in Israel from 3.6 to 3.8 (Figure 2).

⁸ Due to data limitations noted in Chapter 2, the wage analysis in this paper refers to the total income of physicians (i.e. income from both public and private practice).

Figure 1 | Ratio of Specialists' Wages to the Average Wage in OECD Countries, 2010 and 2019

(gross average annual wage from salaried and self-employed work)

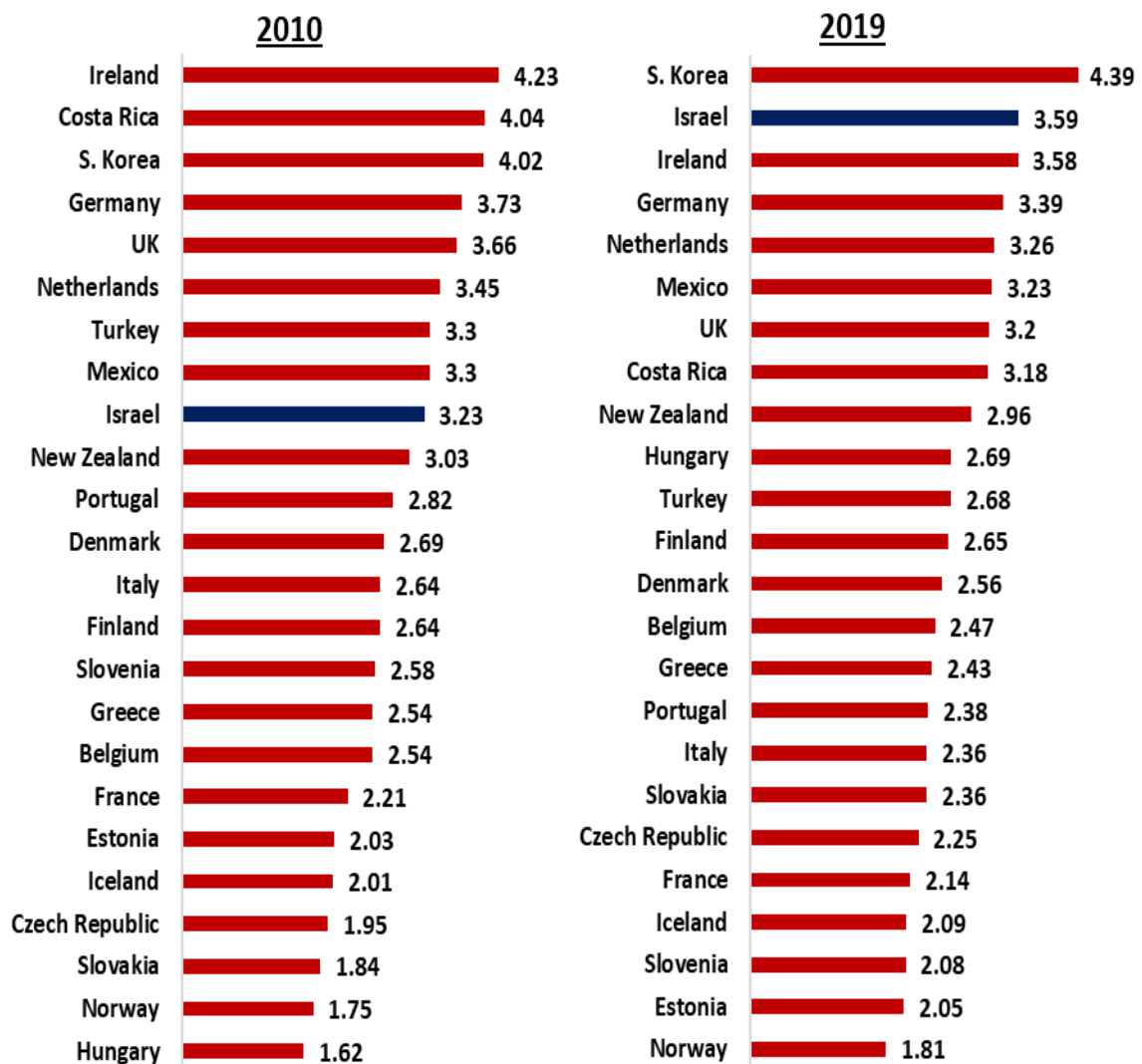
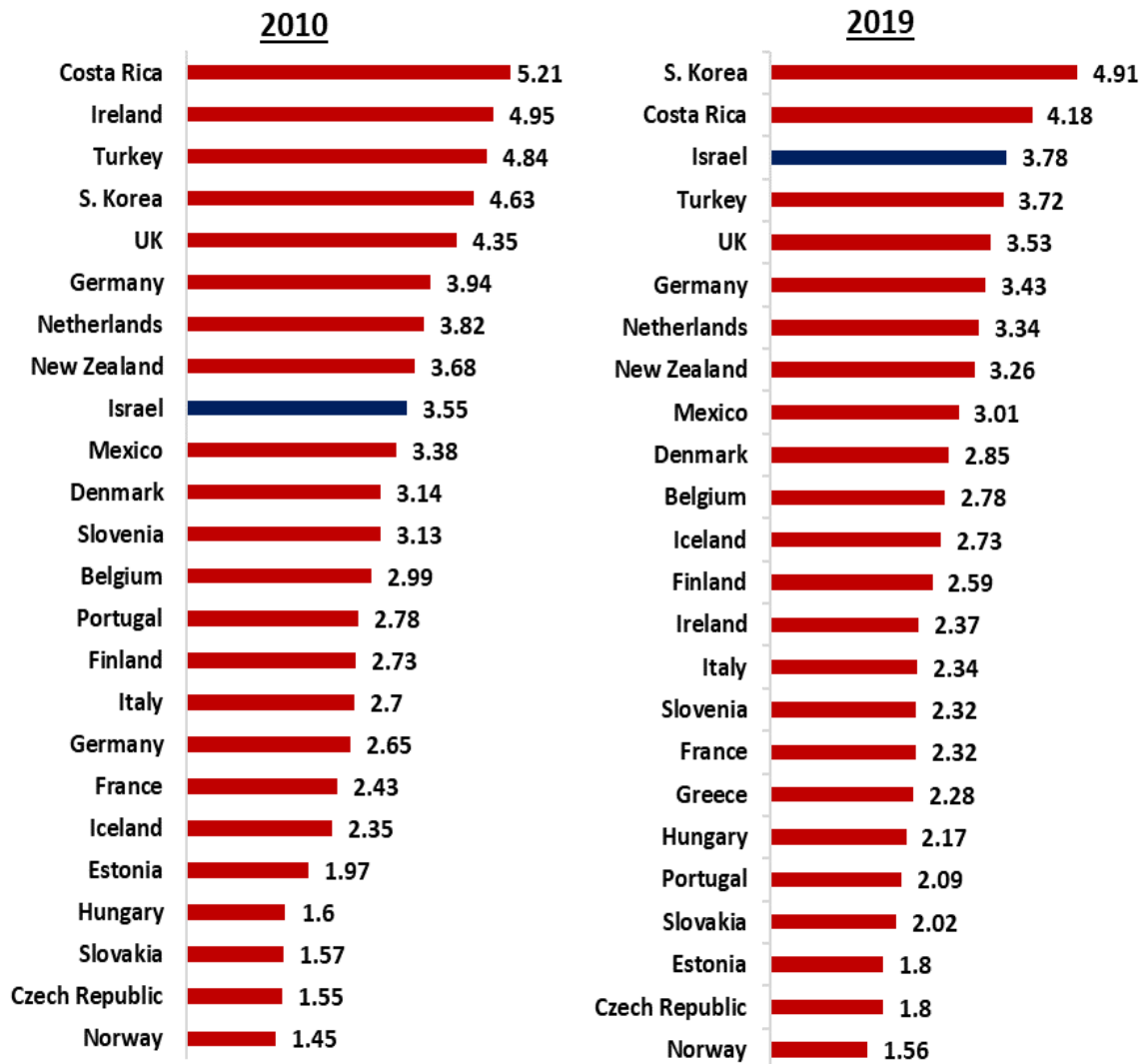


Figure 2 | Ratio of Specialists' Wages to the Per Capita GDP in OECD Countries, 2010 and 2019

(gross average annual wage from salaried and self-employed work)



SOURCE: OECD.stat

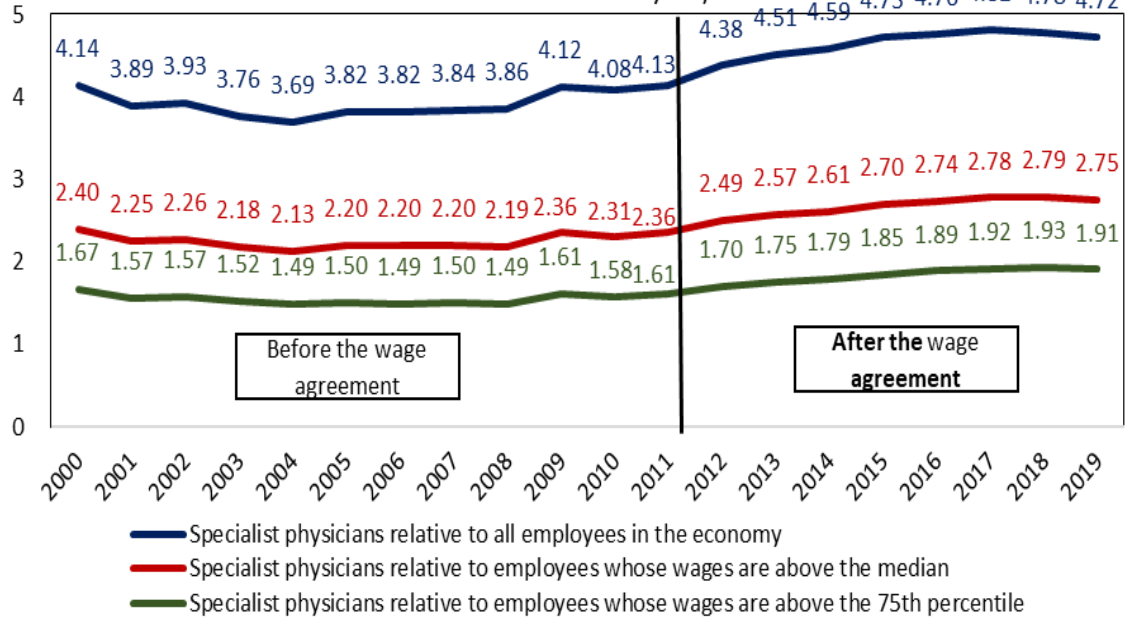
Figure 3 shows the development of the median wage of specialist physicians relative to the development of the median wage for all workers in the labor market and compared to that of relatively highly paid workers (employees earning more than the median wage and employees earning more than the 75th wage percentile).⁹ Like the OECD data, this figure too shows that in the years of the wage agreement (2011–2019), physicians' wages increased more rapidly than general wage growth in the economy and relative to the increase in the wages of employees in the upper levels of the wage distribution. After the rapid growth between 2011 and 2017, the wage disparities narrowed slightly in 2018 and 2019.

In view of the COVID-19 pandemic and limited data availability, it remains difficult to determine how physicians' wages developed after 2019, the last year of the 2011 wage agreement. Nonetheless, there are indications that physicians' wages increased more moderately in 2019–2021, thus reducing the ratio between the physicians' wages and the average wage in the economy. These indications are reflected in the 2021 report published by the Department of Salary and Employment Agreements at the Ministry of Finance (Ministry of Finance, 2023) and in the OECD data. According to the Ministry of Finance Salary Department, moderation of the wages could be attributable to an increase in the number of medical residents, whose wages are significantly lower than those of the specialists, to an increase in the overall number of physicians, which led to fewer on-call and duty shifts per physician, as well as to the fact that physicians' wages did not increase in these years, possibly as a result of the termination of the 2011 wage agreement period (ibid.).

⁹ To ensure that the benchmark groups correspond with one another, wherever possible, the median wage of the medical specialists in Figure 3 was examined relative to the median wage of the employees aged 40+, the age at which the physicians generally complete their residency.

Figure 3 | Ratio of Specialists' Median Wage to the Median Wage in the Economy, 2000–2019

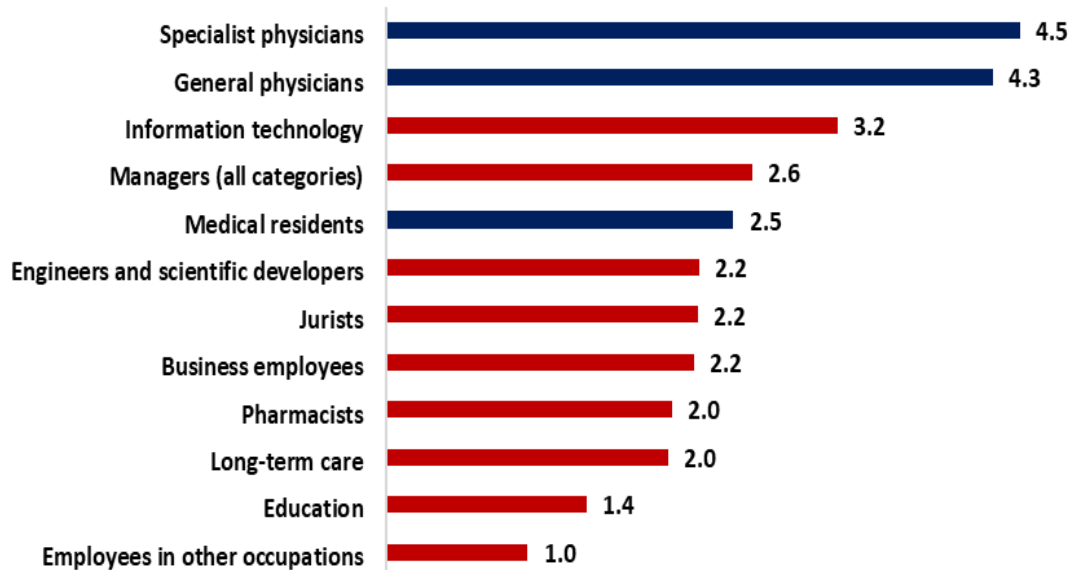
(gross annual wage, salaried employees aged 40+ throughout the economy who worked 12 months in the tax year)



SOURCE: Based on Israel Tax Authority employer-employee file.

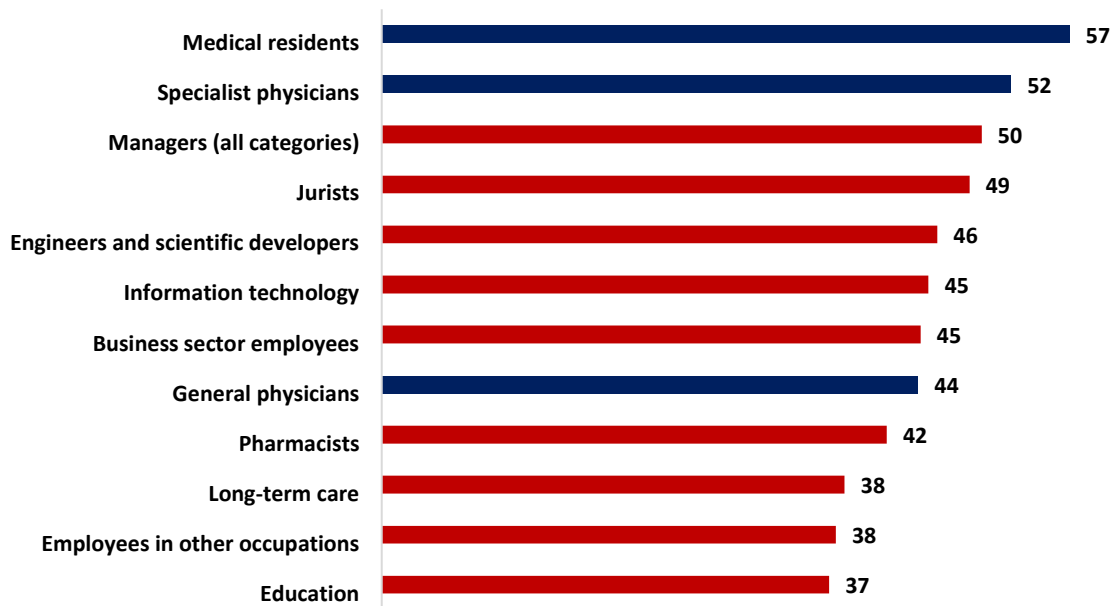
An analysis of the median wage of various academic and managerial professions in 2019 also indicates that the physicians were relatively well paid. In 2019, physicians earned the highest wages among the academic and managerial professions, and significantly higher than even wages in the high-tech sector (Figure 4). Figure 5 shows that one of the reasons for these high wages is the long hours worked compared with the other occupations.

Figure 4 | Median Wage of Physicians and Selected Academic and Managerial Professions Compared with Employees in Nonacademic and Nonmanagerial Professions, 2019



SOURCE: Based on Central Bureau of Statistics Labor Force Survey and Israel Tax Authority employer-employee file, 2019..

Figure 5 | Average Number of Work Hours per Week, Select Academic and Managerial Occupations, 2019



SOURCE: Based on report of weekly work hours, generally, in the Central Bureau of Statistics Labor Force Survey, and Israel Tax Authority employer-employee file, 2019.

3.b Specialty fields with a lack of physicians

Whereas some specializations are in high demand by physicians, others are much less popular. Since we have no information about the number of specialist physicians required in each field or the waiting times for different medical procedures, it is impossible to conduct a direct analysis and description of the disparity between the required number of physicians in a particular field and the actual number. Nonetheless, we can learn about this shortage indirectly by analyzing the differences in the share of Israeli medical school graduates in each field. Graduates of Israel's medical schools face a number of advantages in being accepted for residency. Although some of the foreign medical schools in which Israelis study are of a high standard and provide a high level of training, there is a professional gap in the level of training between Israel's medical schools and a large share of the foreign medical schools attended by Israeli students. The extremely high admission threshold for studying medicine in Israel also emphasizes the strong capabilities of Israeli medical school graduates. These students apparently enjoy a further advantage in being accepted for residency thanks to their prior acquaintance with the hospital physicians, who in many cases also lecture in the medical schools, as well as with the actual hospitals in which they do their clinical training, and the hospitals' work methods.

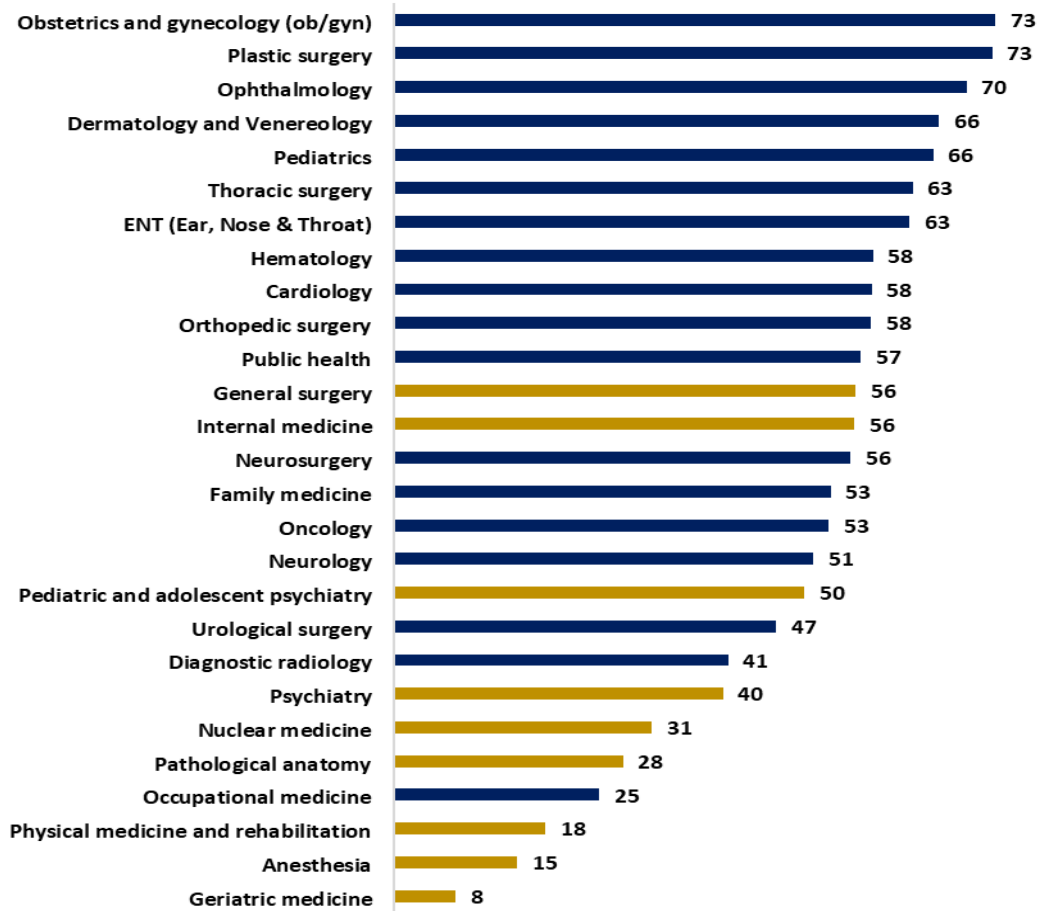
For the reasons described above, we can assume that from the perspective of Israel's hospitals, graduates of Israel's medical schools are considered preferred residents, and it is therefore easier for them to be accepted to the more popular specializations. Figure 6 shows Israeli graduates as a proportion of the specialists in each of the key fields. The large disparities in these rates between specializations seem to indicate gaps in the physicians' preferences and the ability of the hospital departments to choose residents with better training. The specializations marked in yellow are those defined in the 2011 wage agreement as fields with a lack of specialists. The figure clearly demonstrates that most of these specializations are concentrated at the bottom of the graph, implying that the proportion of medical residents in these fields who studied in Israeli medical schools is

substantially lower than in the other fields of specialization.¹⁰ The large disparities between fields with respect to the proportion of graduates of Israel's medical schools appear to indicate differences in their popularity among the physicians. These disparities might indicate two important points forming the background to the incentives given in the 2011 wage agreement aimed at encouraging specialization in fields with a lack of physicians. First, there is a strong possibility that it is difficult to recruit medical residents in some of fields of specialization, which may force the department heads to choose less suitable physicians or not to fill the budgeted positions at all (thus creating a shortage in the long term). Second, the disparities in the demand for specializations lead to disparities in the professional standards of the physicians between specialists in different fields, so that physicians in fields with a lack of specialists are of a lower caliber.

¹⁰ To examine whether the proportion of Israeli graduates in the different fields of specialization was significantly affected by the large wave of immigration from the Former Soviet Union (FSU) in the early 1990s, I conducted an analysis, similar to Figure 6, that included only physicians who completed their residency in or after 2005 (after the peak period of this immigration). The findings from this analysis are similar to those presented in Figure 6 – and specifically, in this analysis too, most of the specialty fields defined in the wage agreement as fields with a lack of specialist physicians were at the bottom of the table of the proportion of graduates of Israel's medical schools.

Figure 6 | Proportion of Graduate Specialists from Israeli Faculties by Field of Specialization, 2021

(as a percentage of all specialist physicians in the field)



SOURCE: Based on Register of Physicians and Israel Tax Authority employer-employee file, 2021.

Figures 7a and 7b show the growth of the average wage between 2010 and 2019 and the median wage of specialist physicians in different fields in 2019, respectively. The data in these graphs include the total wage—namely, income from both public and private practice.¹¹ The graphs show that in general, the wages of specialists in fields where there is a lack of specialists grew more rapidly than in most of the other specializations, although the difference is not very significant. Accordingly, in 2019 extremely strong disparities between the specialty fields remained with respect to the median wage, so that in some of the fields with a lack of specialists, the specialists' wages are significantly lower than in those fields where there is no shortage of specialists.

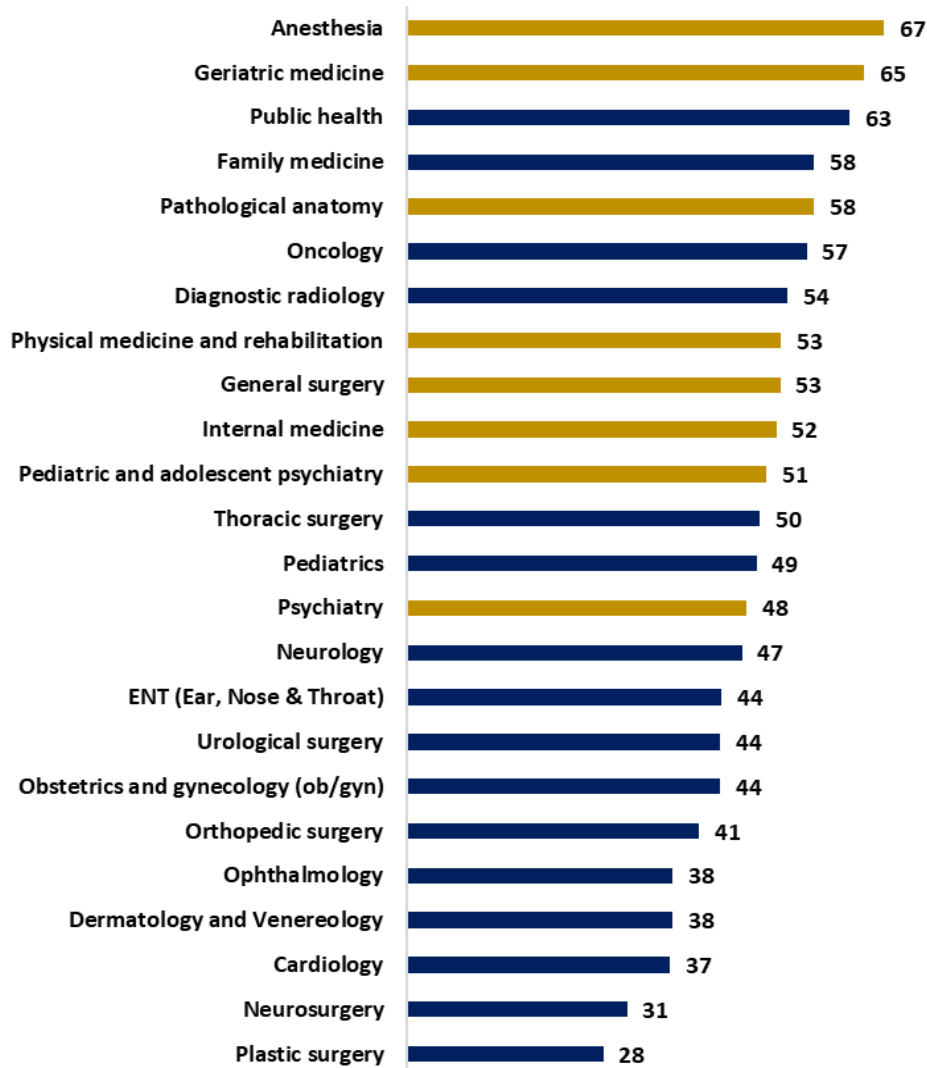
¹¹ As noted in the Data chapter, due to a large number of independent wage contracts in the HMOs, it is difficult to separate the data between wages in public healthcare and wages in private practice.

Another important point emerging from Figure 7b is that wages are relatively high in some fields with a lack of specialists. An excellent example of this is anesthesia in which wages are extremely high (probably due to the major shortage of anesthesiologists and the possibility of working in private hospitals that perform surgery). It therefore appears that in addition to the important consideration of wage level, there are other significant factors at play in the choice of specializations: work conditions, challenge, interest, prestige, and more. In view of the Swords of Iron War, it is also worth noting that the specialty fields most relevant to the treatment of those injured in the war (e.g. psychiatry and rehabilitation) are at the bottom of the scale of specialist physicians' wages.

The relatively moderate narrowing of the wage disparity between specializations between 2010 and 2019 is related to the fact that the incentives given to fields with a lack of specialist physicians in the wage agreement focused on the wages of the residents and not the wages of the specialists. (The graph presents the specialists' wages.) Although the focus on residents' wages directs the incentives to physicians soon after their decision on which specialization to choose, thus contributing to the effectiveness of the incentives, it can reasonably be assumed that when making their choice, the physicians also take into account their long-term potential earning capacity. It is also possible that development of the wages in these years can be attributed to other changes as well, unrelated to the incentives in the wage agreement: average number of work hours, seniority, developments in private medicine, etc.

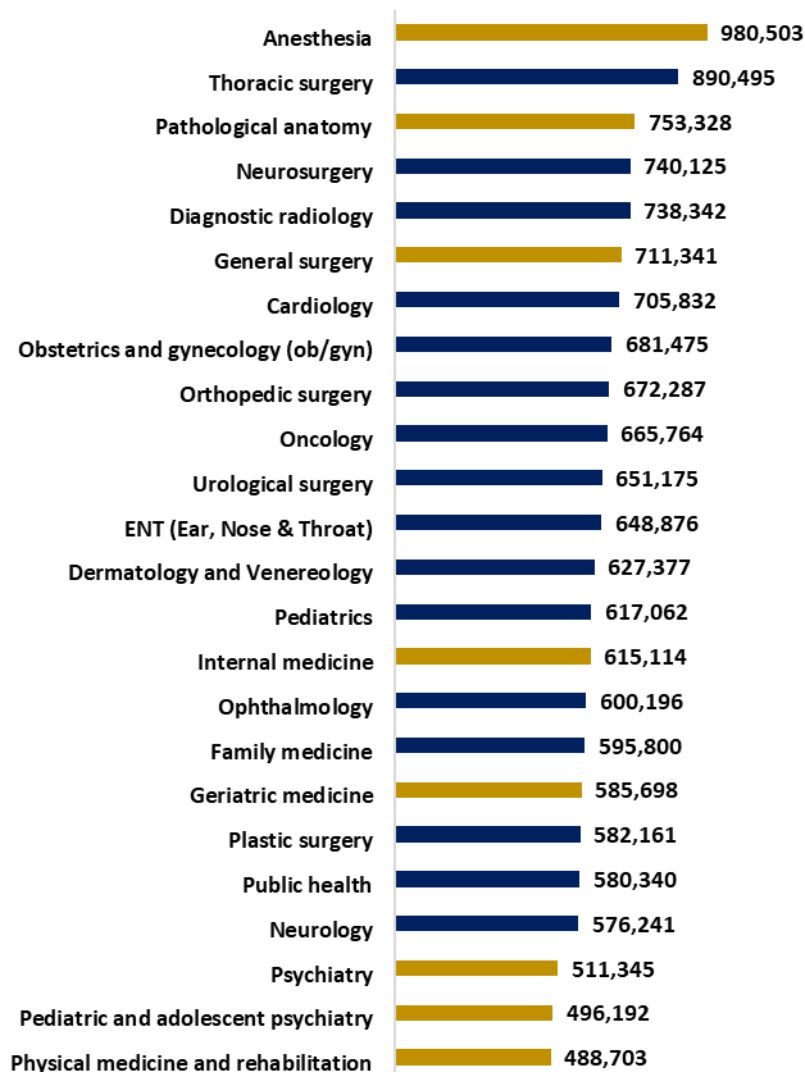
**Figure 7a | Growth of Average Wage of Specialist Physicians
from 2010 to 2019 by Field**

(gross nominal wage from salaried and self-employed work, percent)



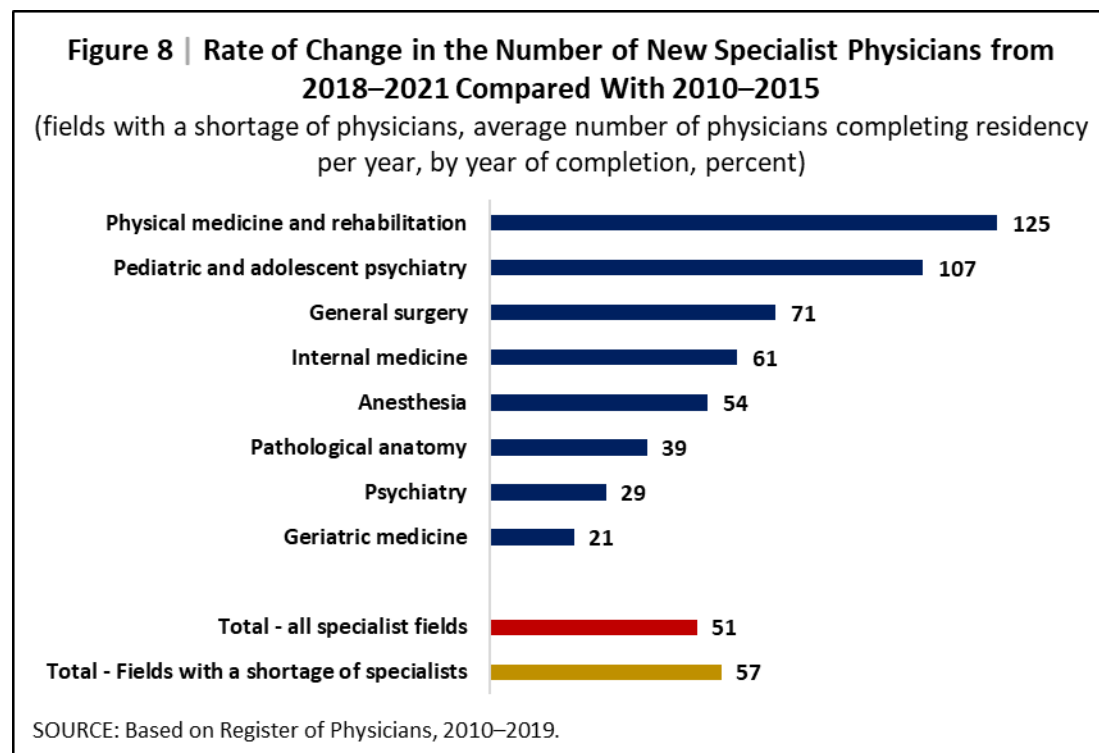
SOURCE: Based on Register of Physicians and Israel Tax Authority employer-employee file, 2010 and 2019.

Figure 7b | Median Wage of Specialist Physicians by Field, 2019
(gross annual wage from salaried and self-employed work, NIS)



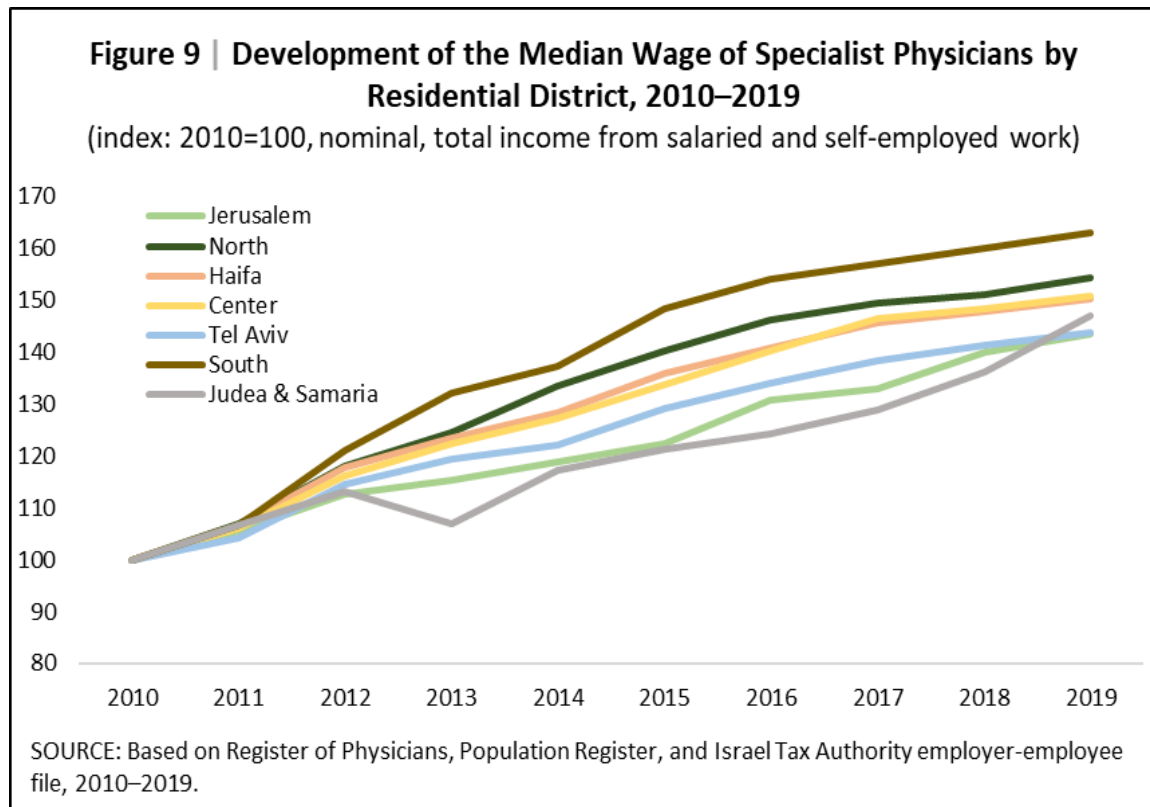
SOURCE: Based on Register of Physicians and Israel Tax Authority employer-employee file, 2010 and 2019.

Figure 8 describes the rates of change in the number of physicians completing their residency in fields with a lack of specialists in the periods 2010–2015 and 2018–2021 (average per year). Given that residency can last between 4 and 7 years, we can assume that physicians who completed their residency between 2010 and 2015 decided on their field of specialization prior to the 2011 wage agreement, whereas physicians who completed their residency between 2018 and 2021 made their decision after the signing of the agreement. Physicians who completed their residency in the period 2016–2017 were omitted from the graph since we cannot determine whether they started their residency before or after the signing of the agreement. The graph shows that in these years, the number of physicians completing residency in fields with a lack of specialists grew slightly faster than the overall number of physicians completing residency (57 percent compared with 51 percent), thus contributing to an increase of just one percentage point (37 percent to 38 percent) in the proportion of physicians who completed their residency in a field with a lack of specialists from among the all the physicians who completed their residency in that year. In contrast, there is a marked variance in the rate of increase among fields with a lack of specialists. In some fields (such as physical medicine and rehabilitation and pediatric and adolescent psychiatry) there was a sharp increase, while in other fields (such as geriatric medicine, psychiatry, and pathology) the increase was moderate and at a much slower pace than for residencies as a whole. The findings outlined in the graph, which are based on current data, correspond with the findings of previous studies that examined the effectiveness of the incentives included in wage agreements to encourage specialization in fields with a shortage of specialists, and which pointed to a relatively low degree of effectiveness (Markovitch et al., 2019; Ashkenazi et al., 2017). In this context it is worth noting that although the proportion of residents who specialized in fields with a shortage of specialists remained stable, there was a marked increase in the total number of new specialist physicians in those years.



3.c Center and periphery

The wage agreement offered significant incentives to physicians employed in hospitals in outlying areas, including a substantial percentage wage supplement that created a 17 percent disparity for specialists and 25 percent disparity for residents (compared with physicians with the same statistics employed in hospitals in the center of the country). Under the agreement, physicians who relocated to the periphery also received a lump-sum bonus, and hospitals in the periphery were given preference in the allocation of budgeted residency positions. Figure 9, which shows the development of the median wage of specialist physicians by their residential district, indicates that during the agreement period, the wages of physicians who lived in the periphery rose more rapidly than the wages of physicians in the other districts.

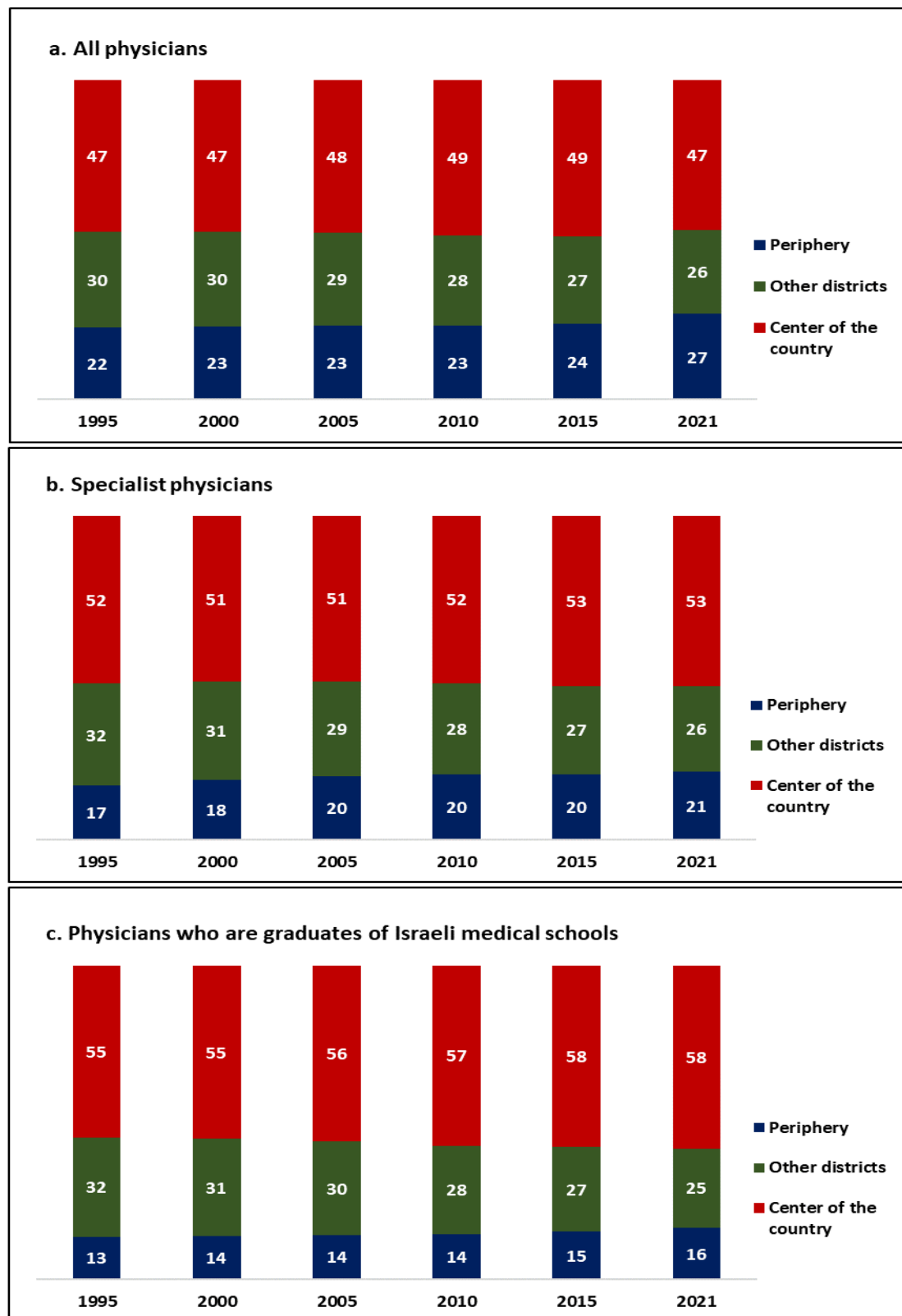


Between 2010 and 2021, the proportion of physicians residing in the periphery (out of all physicians) increased by 4 percentage points, which might have been attributable to the incentives provided for this purpose in the wage agreement. However, if we examine this increase exclusively among the groups of specialists or groups of physicians who are graduates of Israeli medical schools, the proportion of physicians residing in the periphery increased more moderately, by just 1–2 percentage points, mainly at the expense of the districts that are not Tel Aviv and the center (i.e. Jerusalem, Haifa, and Judea & Samaria). There are three possible explanations for the disparity between the distribution of all physicians and the distribution of specialist physicians. One is that many of the physicians in the periphery are still in their specialization period and if this is the case, an increase in the share of all physicians in the periphery will also be expressed in forthcoming years in an increase in the share of specialist physicians in the periphery. The second possibility is that although physicians choose to do their specialization in the periphery (perhaps thanks to the incentives provided in the 2011 wage agreement), after completing their residency they choose to return or move to the center of the country. A third explanation is that a

relatively high proportion of physicians in the periphery do not specialize and remain general physicians (nonspecialist physicians) (Figure 10).

Between 2008 and 2021, approximately 31 percent of all the country's medical residents lived in outlying regions (north and south), with slight changes over time. Due to the increase in the proportion of physicians residing in the periphery in recent years, these physicians accounted for 27 percent of all physicians in 2021, close to the proportion of the population living in the periphery (31 percent). Nonetheless, the share of specialist physicians or physicians trained in Israel remained significantly lower in the periphery relative to the size of the population in those areas. We can therefore say that although the disparities between the number of physicians in the center of the country and the periphery narrowed, significant differences remain in the quality of the physicians (on average) (Figure 10).

Figure 10 | Geographical Distribution of Physicians' Place of Residence, 1995–2021
(percent)



Periphery - north and south districts; Center of the country - Tel Aviv and center districts; Other districts - Jerusalem, Haifa, and Judea & Samaria districts.

SOURCE: Based on Register of Physicians and Population Register, 1995–2021.

In parallel with the incentives provided in the wage agreement, the number of new physicians who had grown up in the periphery increased around the period of the agreement. This trend began prior to the 2011 wage agreement, and there does not appear to be any connection between it and the signing of the agreement. Rather it appears to be related to the increase in the proportion of physicians trained abroad and the increase in the percentage of new physicians from the Arab sector, a high proportion of whom live in the outlying regions (Figure 11).

The research literature points to a strong correlation between the physician's exposure to the periphery prior to his studies and whether the physician chooses to work in the periphery later on. The question to be asked is whether the increase in the proportion of physicians residing in the periphery (Figure 10) is primarily attributable to the incentives provided in the wage agreement or to other factors, such as the increase in the proportion of physicians who grew up in the periphery (Figure 11). The next chapter in this paper examines this question empirically using a multivariable analysis based on the Difference-in-Differences (Diff-in-Diffs) method. This methodology allows us to identify the causal relationship between the wage agreement incentives and the increased probability that a specialist will reside in the periphery.

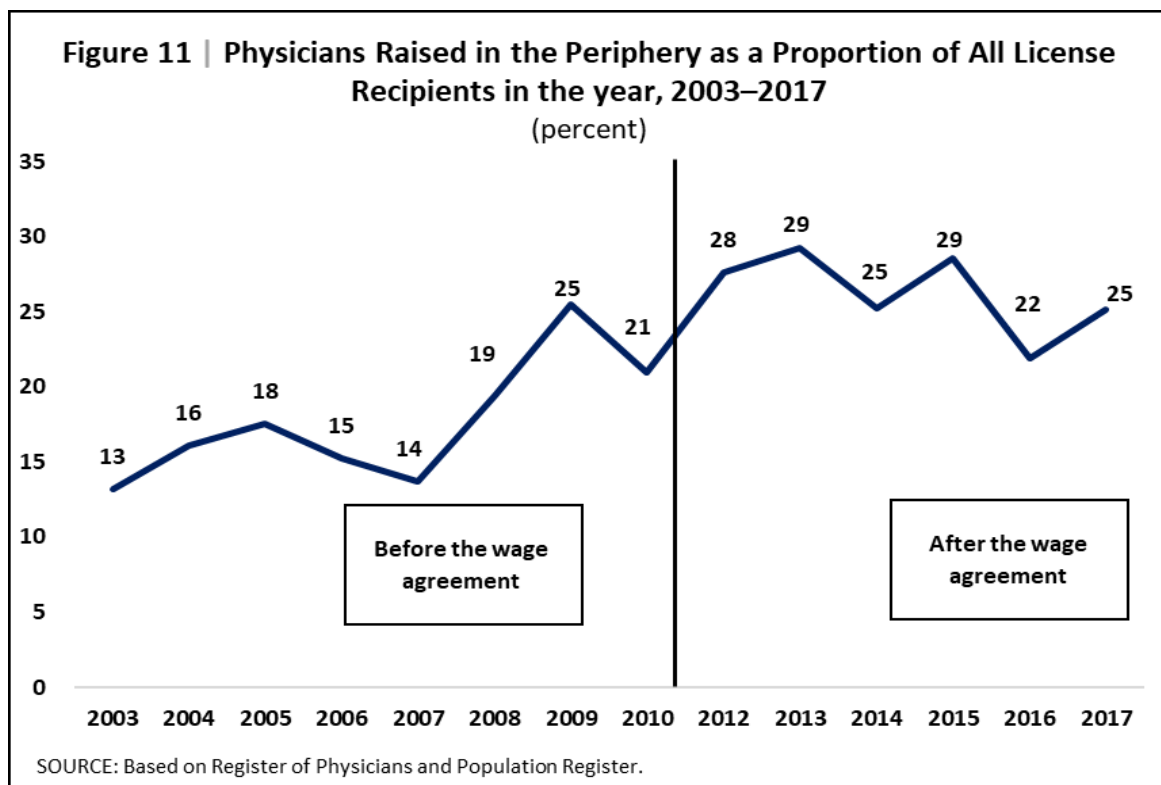


Table 1 presents the rates of movement between the center and the periphery and vice-versa during the different stages of a physician's training. The table clearly demonstrates that the highest rates of movement both from the center of the country to the periphery and vice-versa take place around the time students begin their medical studies, and during the transition between completing medical school and specialization. In contrast, after completion of residency the rate of those moving between the center of the country and the periphery is extremely low. This leads us to conclude that to achieve the goal of encouraging more physicians to move to the periphery, the focus must be on policy measures relating to the location of the medical school or the hospital at which the physicians specialize, since there appears to be little likelihood of encouraging physicians who live in the center of the country to move to the periphery after completing their specialization.

Table 1 - Rate of Physicians' Movement Between the Center and the Periphery (and vice-versa) between the Different Training Periods*

	Studied in the periphery	Specialized in the periphery	Worked as a specialist in the periphery
Raised in the center	19%	7%	8%
Studied in the center		15%	16%
Specialized in the center			3%
	Studied in the center	Specialized in the center	Worked as a specialist in the center
Raised in the periphery	78%	30%	33%
Studied in the periphery		70%	70%
Specialized in the periphery			9%

* Data on rates of movement between the region in which the physician grew up and the medical faculty in which s/he studied relate exclusively to physicians who grew up and studied in Israel. For example, only 19 percent of those who grew up in the center of the country studied at a medical school in the periphery, whereas the remaining 81 percent studied in the center of the country.

SOURCE: Based on data from the Register of Physicians and from the Population Register.

4. Econometric analysis for assessing the effectiveness of the incentives provided in the 2011 wage agreement to encourage the movement of physicians to the periphery

4.a Methodology

As mentioned, one of the main objectives of the wage agreement was to encourage physicians to move to outlying areas. The following analysis examines how effective the incentives in the 2011 wage agreement were in encouraging physicians to move to the periphery.¹² To answer this question, the analysis examines the probability that a physician will reside in an outlying areas one year after completing his specialization, and whether this probability changed in the period after the signing of the wage agreement. The purpose of focusing on this point in time (one year after completion of specialization) is to examine the long-term impact of the incentives, after the physicians have completed their residency. At this advanced stage, the physician has already found employment as a specialist and, to a large degree, his current place of residence reflects his place of residence in the long term.¹³

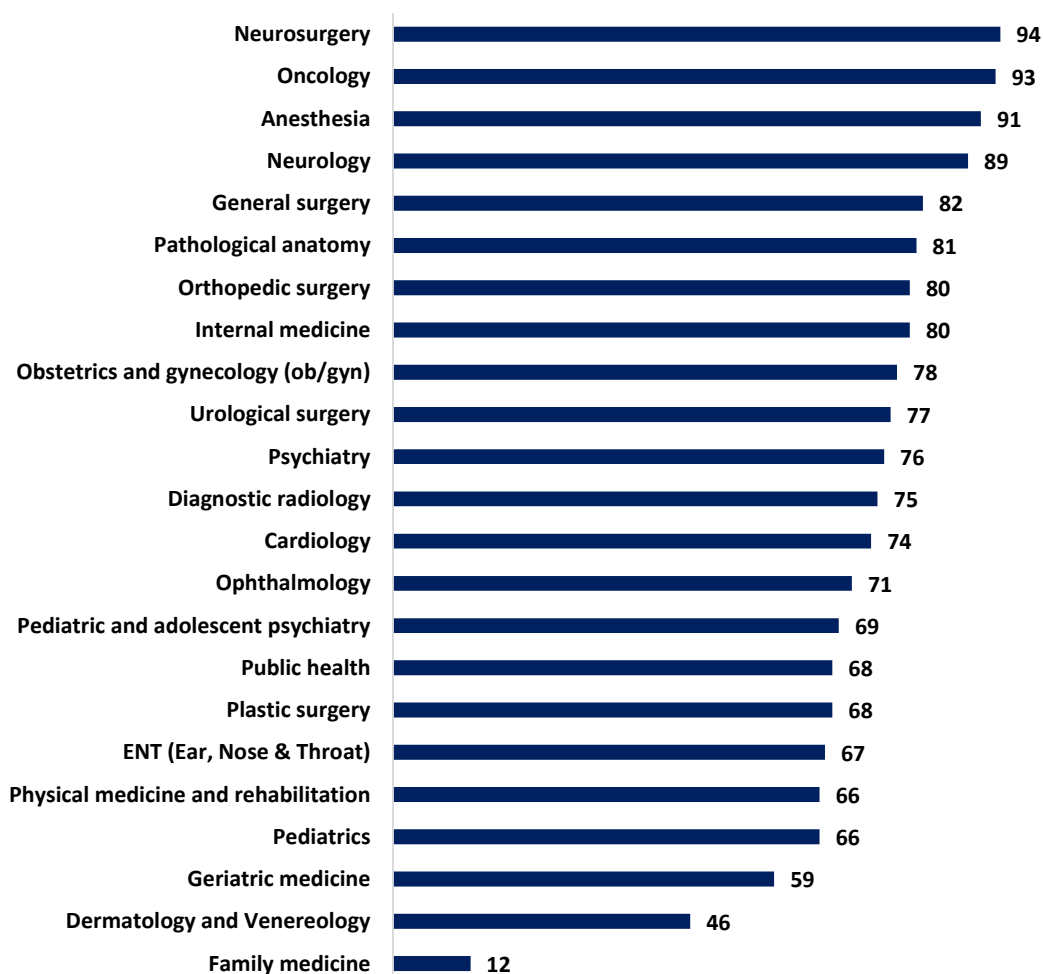
The econometric identification is based on the differences in the expected impact of the incentives in the wage agreement on specialists from different fields of specialization. The incentives provided to encourage physicians to move to the periphery were mainly focused on hospital doctors and not on physicians who worked in other settings (HMOs for example). Focusing the incentives on physicians who work in hospitals results in varying levels of exposure to the incentives between specialist physicians in different fields. For example, we can assume that anesthetists or surgeons will be more exposed to such incentives because a large percentage of physicians in these fields work in hospitals. In contrast, most of the work of specialist physicians in pediatric care or family medicine takes place in the HMO clinics. Such specialists are therefore less exposed to these

¹² In this paper, outlying areas are defined as the northern and southern districts. This definition is based on a list of the hospitals that were awarded incentives for the periphery in the 2011 wage agreement.

¹³ Physicians' rates of movement between the center and the periphery after completion of residency are extremely low. For example, an analysis of physicians' residential locations in the years following completion of residency shows that the probability that a physician who lives in the center of the country a year after completing his residency will live in the periphery 5 or 10 years after completing his residency is just 2 percent and 3 percent, respectively.

incentives. Figure 12 describes the proportion of specialist physicians with at least one place of work at a hospital, allocated by specialization. In this study, the allocation of the specialist physicians into two groups was based on the median. Half of the physicians were categorized in the group of specializations more likely to be employed in hospitals, while the other half were categorized in the group in which the specialist was less likely to be employed at a hospital. The sensitivity analyses performed included additional estimations where allocation into the two groups was made differently (and not based on dividing the sample around the median), as well as an estimation based on a continuous variable of the rate of employment in hospitals in each field of specialization. The findings in these estimations were similar to those in the estimations that were based on the median.

Figure 12 | Proportion of Specialist Physicians Employed in Hospitals, by First Field of Specialization, 2019
(percent)



SOURCE: Based on Register of Physicians and Israel Tax Authority employer-employee file, 2019.

Despite its advantages, the identification strategy has several drawbacks. One is the possibility that another factor, such as home prices, which rose more in the center of the country than in the periphery, is responsible for the movement of physicians to the periphery. However, the impact of housing prices is not expected to be different among physicians from different fields of specialization, particularly given the high average wage of specialists in all the fields, which is in the upper part of the wage distribution in the economy. Another weakness of this identification strategy is the inability to separate between the different policy measures defined in the wage agreement (percentage wage supplement, one-time bonus, differential increase of the number of budgeted positions). In practice, the empirical analysis examines the overall impact of all the policy measures on the likelihood that a specialist will live in the periphery.

A third weakness is the emphasis on the physicians' place of residence rather than on their place of work.. This is because in the data file, it is impossible to identify the geographical locations in which all the physicians work. However, a number of points are worth mentioning. First, the geographical distribution of the specialists' places of residence is no less important than the location of their workplace, since to a large degree, the residential locations represent the inventory of physicians in a particular geographical region. This assumes that physicians will generally prefer to work close to their place of residence, to the extent that they find a suitable position in that area. Second, notwithstanding the option of commuting, there is a strong correlation between the physicians' residential location and their work location, particularly for senior hospital physicians (specialists) who are required to be on call in close proximity to the hospital. This correlation was found in an analysis of the Labor Force Survey, which examined the physicians' primary work place relative to their place of residence and found that 95 percent of physicians work either in their residential district or in an adjacent district.. Based on this finding, and to limit the probability that commuting would skew the results, the sensitivity tests included an additional estimation which covered physicians living in the northern, central, Tel Aviv, and Jerusalem districts only (without Haifa, the south, and Judea and Samaria). This was to create a sample with large commuting distances between the nonperiphery districts and the northern district, making it unlikely that physicians would commute to the

periphery. The findings of this estimation were similar to the findings of the other estimations.

The final weakness relates to the possibility that the geographical distribution of the physicians' residential location correlates largely with the allocation of budgeted positions. In other words, residential location is dictated by the job opportunities. Here it is worth noting that despite the importance of the number of budgeted positions, this is only one of a number of factors affecting the geographical distribution of physicians. The number of budgeted positions is relevant mainly for hospitals, and has no relevance for a large proportion of the physicians' labor market—HMOs and private medicine. Even with respect to nonprivate hospitals, there are frequently significant disparities between the number of budgeted positions allocated to hospitals and the actual number of physicians in the hospital. This is partly because some hospitals are able to fund beds from other sources, so that the actual number of beds in those hospitals may be much higher than the number of beds in the budgeted allocation. In contrast, other hospitals do not necessarily fill all the budgeted positions allocated to them.¹⁴

The study findings also point to the limited ability of the allocation of budgeted positions to dictate the geographical distribution of the physicians. The empirical analysis in this study examines the effect of all the measures introduced in the 2011 wage agreement to encourage physicians to move to the periphery. In addition to financial incentives, the measures included giving preference to hospitals located in the periphery in the allocation of budgeted positions. Since the study findings do not show that the range of incentives offered in the wage agreement influenced the likelihood that physicians would reside in the periphery, it appears that the ability to influence the geographical distribution of physicians through the allocation of budgeted positions is limited.

The analysis consists of two parts. The first part includes several estimations based on the OLS method, which describe the correlative relationships between different relevant

¹⁴ For more information about the disparity between the number of hospital beds in the standard and the actual number of beds in the hospitals, see "Financial Report of the General Public Hospitalization System 2020-2021", Ministry of Health, September 2023, Page 5. <https://www.gov.il/he/pages/fospitalization-report-general-public-hospitalization-system-2020-2021> (in Hebrew).

variables and the specialist's residential location.¹⁵ The principal explanatory variable in the analysis is a dummy variable, which compares physicians who received their license after the signing of the 2011 wage agreement, and were therefore aware of the incentives in the agreement when deciding where to do their residency, with physicians who received their license before the wage agreement was signed. To ensure that the estimations are as accurate as possible, physicians who received their license in 2011 were omitted from the sample, since it is impossible to determine whether they received their license before or after the signing of the wage agreement. In addition to the principal explanatory variable, and based on the research literature, the study focuses on two additional variables that describe the extent to which the physician was exposed to the periphery prior to his or her work. The first variable is the physician's place of residence before his or her studies, particularly if at that stage he or she lived in one of Israel's outlying areas. The second variable is the location of the medical school at which the physician studied (if located in Israel's periphery). The analysis in this part helps us to identify the principal correlative relationships between the variables, and serves as a preliminary analysis to the second part, which focuses on the attempt to identify causal relationships.

The basic regression for this section is:

$$(1) \quad Y_i = \alpha + \beta post_i + \gamma X_i + T_i + \varepsilon_i$$

where:

Y_i is a dummy variable that is given the value 1 if physician i lives in a region defined as the periphery a year after completing his or her residency;

$post_i$ is a dummy variable that is given the value 1 if the physician received his or her license after the signing of the wage agreement (and was therefore aware of the incentives approved for the periphery when choosing his or her place of residency), and 0 if he or she received the license before the agreement;

X_i is a set of personal characteristics for physician i (the list appears after Equation 2);

and T_i is dummy variables for monitoring the year in which the license was granted.

¹⁵ To ensure that the findings in the analysis remain unchanged even when it is performed using a methodology adapted to binary dependent variables, in addition to the OLS regressions presented below, parallel logistic regressions were also performed for each of the estimations that appear in the paper. The findings of the logistic regressions closely resembled those of the OLS regressions.

The second part of the study uses the Difference-in-differences (Diff-in-diffs) method in an effort to identify causality between the incentives provided in the wage agreement to encourage physicians to move to the periphery and the probability that specialists would actually live in the periphery.

In the analysis in this section, the treatment group was defined as the group of specialist physicians in fields with a high proportion of hospital physicians (specialty fields that are more exposed to periphery incentives), and the control group is the specialists in fields with a low proportion of hospital physicians. Two options were defined in relation to the time dimension, which are differentiated with respect to the stage of the physician's training, and which formed the basis for dividing the physicians into groups of before and after the signing of the wage agreement. The first option compared physicians who received their license after the signing of the wage agreement with those who received their license before the signing of the agreement. As noted, we assumed that physicians who received their license after the agreement were aware of the incentives it contained to encourage employment in the periphery when they decided on the location of their residency. The advantage of this option is that at the point in time between completion of their studies and starting their residency, the rates of movement of physicians between the center of the country and the periphery are relatively high (as shown in Table 1), so that the causal effect of the incentives, if there is any, is more likely to be found at this point in time. However, this option might suffer from methodological weakness since the incentives given in the wage agreement could influence not only the choice (and location) of the hospital at which the physicians will specialize, but also their field of specialization, and therefore the allocation of the physicians between the treatment group and the control group.

To address this weakness, we applied the second option which compares physicians who completed their residency after the signing of the wage agreement with physicians who completed their residency before the agreement. To focus exclusively on physicians who chose their field of specialization before the agreement, so that their choice of field was not influenced by the incentives, the sample on which this option was based was limited to physicians who completed their residency by 2015 so as to include only those physicians who chose their specialization before the signing of the 2011 wage agreement (given that

residency generally lasts at least 4 years). The incentives in the wage agreement aimed at encouraging physicians to work in the periphery were also given to specialists who had completed their specialization (and not only to physicians in residency), and this option mainly estimates the effect of these incentives. Despite the methodological advantages, this option also has a certain weakness, in that at this advanced stage of the training, after completion of the specialization, the rates of movement of physicians between the center of the country and the periphery are extremely low (Table 1), so that even if there are causal relationships, the chances of identifying them here are low.

The model regression in the second part is based on the Diff-in-Diffs methodology.

$$(2) \quad Y_i = \alpha + \beta \text{post}_i + \delta \text{treatment}_i + \lambda(\text{post}_i \times \text{treatment}_i) + \gamma X_i + T_i + \varepsilon_i$$

where, in addition to the components defined in Equation 1,

treatment_i is a dummy variable that is given a value of 1 if the specialist physician's field is one with a high rate of hospital employment (specialty fields that are more exposed to encouraging work in outlying areas).

$\text{post}_i \times \text{treatment}_i$ is the interaction between residency in a field with a high rate of hospital employment and physicians who received their license (or finished their residency) after the 2011 wage agreement.

The control variables

X_i : The analysis includes two variables that express the extent of the physician's exposure to outlying areas prior to specialization. The first variable is the physician's place of residence before his or her medical studies. This variable was defined as the physician's residential location in 1995 (the earliest year for which information is available). To define the physician's residential location in this year as the place of residence before their studies, the sample was limited to physicians who received their license from 2003 onward, so that in 1995 they had not yet started their medical studies. (The long track for medical studies until a license is received is 7 years.)

The second variable that expresses the extent to which physicians are exposed to outlying areas is the location of the university they attended. Two of Israel's medical schools are located in outlying areas: Ben-Gurion University of the Negev in Be'er Sheva and the Faculty of Medicine (part of Bar-Ilan University) in Safed, which was opened in 2011, so that its first graduates received their license around 2016 (a four-year program for first degree graduates). Consistent with global literature, our study examines the correlation between the physician's studies in the periphery and the likelihood that he or she will live in the periphery as a medical specialist. This relationship, which has been studied in a number of papers in the global research literature, is examined in Israel for the first time in this study.¹⁶

Other than the variables of exposure to outlying areas, the analyses contain additional independent variables that may correspond with the likelihood of living in the periphery, such as gender, the physician's family status when receiving the license (which is the time when the physician chooses the location of his or her residency), whether he or she studied medicine in Israel or outside Israel, country of birth, age at which the license was received, and ethnicity. One of the models we tested also included the interactions between a license received after the signing of the wage agreement and two variables that reflect the extent of the physician's exposure to outlying areas. To monitor the trends over the sample period, all the estimations included a fixed effect per year (dummy variable for each year).

4.b The results

4.b.1 – Variables that correlate with specialist physicians' residential location in outlying areas

Table 2 presents the results of the estimation according to Regression 1, and examines the correlations between a range of relevant explanatory variables and the likelihood of specialist physicians residing in the periphery. The first column describes a model with basic variables only, excluding the variables relating to physicians' exposure to outlying

¹⁶ A study conducted by the Brookdale Institute in 2017 (Ashkenazi et al., 2017) examined the correlation between medical studies at Ben-Gurion University and specialization in the periphery, but not between studying in the periphery and remaining in the periphery after completion of residency as a specialist physician.

areas (location of the university at which they studied in the periphery and residing in the periphery prior to their studies) and excluding the ethnicity variable, which correlates strongly with the exposure variable of residential location in the periphery before studying. The second column presents an estimation that includes the exposure variable of the place of studies, and the third column presents both exposure variables.

The findings in all three estimations show that there is no significant difference between the likelihood of physicians who received their license prior to the signing of the 2011 wage agreement and those who received their licenses after the signing of the agreement residing as specialists in outlying areas. These findings therefore do not point to a correlation between the financial incentives given in the 2011 wage agreement and the likelihood of physicians residing in outlying areas after completing their specialization. In contrast, significant positive correlations were found between the variables relating to the exposure of physicians to the periphery prior to their work and the likelihood of residing in the periphery as a specialist physician. According to the estimation, the likelihood that physicians who lived in the periphery before their studies (and probably also grew up there) will reside in the periphery after completing their specialization was almost 50 percentage points higher than that of physicians who grew up in the center of the country. Similarly, the likelihood that physicians who studied at a medical school in an outlying area will live there after completing their specialization is 14.6 percentage points higher than that of physicians who studied in the center of the country. Physicians who studied abroad are also significantly more likely to reside in outlying areas than physicians who studied in the center of the country, although in this case the coefficient is significantly lower than for physicians who studied in the periphery. These findings are even more pronounced in view of the marked disparities in R^2 between the estimations, and specifically in view of the weak explanatory strength of the estimation that did not include the exposure variables compared with the estimations that did include these variables.

Table 2 - Findings of the Regressions for Estimating the Likelihood of Specialist Physicians Residing in Outlying Areas

	(1)	(2)	(3)
License received after the 2011 wage agreement	0.031 (0.05)	-0.058 (0.05)	-0.068 (0.04)
License received at age 30+	-0.127*** (0.01)	0.009 (0.01)	0.006 (0.01)
Gender (female physician = 1)	-0.109*** (0.01)	-0.013 (0.01)	-0.017* (0.01)
Married relative to single (in year of receiving the license)	0.011 (0.01)	0.051*** (0.01)	0.047*** (0.01)
Divorced relative to single (in year of receiving the license)	0.088** (0.04)	0.073** (0.03)	0.052* (0.03)
Unknown family status relative to single (in year of receiving the license)	0.058 (0.05)	0.051 (0.04)	0.015 (0.04)
Country of birth that is not Israel or FSU (relative to born in Israel)	-0.115*** (0.02)	-0.046*** (0.02)	-0.081*** (0.02)
Born in FSU relative to born in Israel	0.046*** (0.02)	0.133*** (0.02)	0.066*** (0.02)
Arab		0.486*** (0.02)	0.250*** (0.01)
Studied medicine at a university in Israel's periphery (Be'er Sheva or Safed) vs studies in the center of the country (other medical schools)		0.183*** (0.02)	0.146*** (0.01)
Studied medicine abroad relative to studies in the center of the country		0.054*** (0.01)	0.036*** (0.01)
Resided in an outlying area in 1995 relative to residing in the center of the country			0.486*** (0.01)
Resided outside Israel in 1995 relative to residing in the center of the country			0.147*** (0.02)
Dummy variable for each year	V	V	V
Constant	0.338*** (0.02)	0.081*** (0.02)	0.030* (0.02)
Number of observations	7,039	7,039	7,039
Adjusted R^2	0.05	0.203	0.365

In addition to the main findings, additional findings emerge from the analysis. Female specialist physicians are less likely to reside in outlying areas than male specialist physicians; physicians who were single (unmarried) when they received their license are less likely to reside in outlying areas than physicians who are married or divorced, and

physicians who were born abroad (other than in the FSU) are less likely to reside in the periphery than Israeli-born. In contrast, a higher proportion of physicians who were born in the FSU resided in outlying areas than those born in Israel. A significant positive coefficient (25 percentage points) was found among Arab physicians and the likelihood of their residing in the periphery as specialists. This finding seems to be associated with the geographical distribution of Israel's Arab population, which is concentrated in outlying regions.

Table 3 presents findings from analyses similar to the analysis in the right column of Table 2 for specific samples. The first two columns show the findings emerging from the samples that focused on groups of physicians considered to be high-caliber: physicians who studied in Israeli medical schools and physicians with high results in the psychometric exam (overall score of at least 680).¹⁷ The two estimations attempt to assess the effectiveness of the incentives to encourage physicians to work in the periphery with respect to groups of high-caliber physicians. The findings in the third column of the table focus on physicians who resided in Israel's central areas before their medical studies. This estimation is mainly intended to examine the correlation between the variable of exposure to studies in the periphery and the choice to work in the periphery in a focused manner, with regard to physicians who did not grow up in the periphery.

Like the findings in Table 2 relating to all physicians, the findings in Table 3 also do not show any significant correlation between physicians who received their license after the wage agreement and specialist physicians residing in outlying areas. In contrast, the coefficients for both exposure variables were significant in these estimations as well, in the same direction and of a similar scale to the third estimation in Table 2 regarding all physicians. These findings imply that the incentives given in the wage agreement do not correlate with an increase in the relative share of groups of physicians in outlying areas who are considered to have a high level of training.

¹⁷ Although, as mentioned above, the group of physicians trained abroad are characterized by considerable variance with respect to level of training, and some of them have excellent training, nevertheless physicians who graduated in Israel are generally considered to be better qualified, on average. This is particularly the case due to the extremely high threshold for acceptance to medical school in Israel. Psychometric test achievements, which in themselves do not necessarily attest to the quality of the physician, nevertheless provide an indication of ability, and it can be assumed that they will be more consistent with the physician's professional standard.

Another important finding from the third estimation in Table 3 is the significant correlation between studying at a medical school located in Israel's periphery and the likelihood of working in the periphery as specialist physicians, even when the estimation covers only those physicians who did not reside in the periphery prior to their studies. This finding is consistent with the findings of research literature from other parts of the world, which point to a relationship between physicians' exposure to the periphery during their training and the likelihood that they will choose to work in the periphery as specialists (for example, Gupta et al., 2014). Since this finding might indicate a connection between geographical distribution at the different stages of the training process and the geographical distribution of the specialist physicians, we may be able to learn about a number of policy measures that could help increase the number of physicians in outlying areas. This subject is discussed in greater detail in the discussion chapter and in the policy suggestions chapter.

Table 4 also presents findings from analyses that are similar to those in the right column in Table 2, which, in addition to the variables in Table 2, contain interactions between the exposure variables for physicians in the periphery and receiving a license after the signing of the wage agreement. Both the interaction variables in the estimations were found to be significantly positive. In contrast, the coefficient for the main explanatory variable, receiving a license after 2011, was found to be negative in these estimations, with a low level of significance. These findings might indicate that the incentives, which were not found to correlate with a greater likelihood that all the specialist physicians would reside in the periphery, actually increased the probability that physicians who have been exposed to the periphery (namely, lived in outlying areas in their childhood or studied medicine there) would reside there as specialist physicians.

Table 3 - Findings of the Regressions for Estimating the Likelihood of Specialist Physicians Residing in Outlying Areas, Specific Samples

	Studied at Israeli medical schools	At least 680 in psychometric exam	Grew up in nonoutlying areas in Israel
	(1)	(2)	(3)
License received after 2011 wage agreement	-0.025 (0.08)	-0.02 (0.10)	-0.061 (0.06)
Country of birth that is not Israel or FSU (relative to born in Israel)	-0.009 (0.02)	-0.009 (0.02)	-0.004 (0.02)
Born in FSU relative to born in Israel	0.011 (0.03)	0.006 (0.03)	0.0005 (0.02)
Studied medicine at a university in Israel's periphery (Be'er Sheva or Safed) vs studies in the center of the country (other medical schools)	0.151*** (0.01)	0.144*** (0.01)	0.148*** (0.01)
Studied medicine abroad relative to studies in the center of the country		0.035 (0.02)	0.015 (0.01)
Resided in an outlying area in 1995 relative to residing in the center of the country	0.362*** (0.02)	0.363*** (0.02)	
Resided outside Israel in 1995 relative to residing in the center of the country	0.095*** (0.04)	0.111* (0.07)	
Demography: age, gender, ethnicity, family status	V	V	V
Dummy variable for each year	V	V	V
Constant	0.045** (0.02)	0.048** (0.02)	0.061*** (0.02)
Number of observations	3,774	3,584	4,006
Adjusted R^2	0.306	0.299	0.04

Table 4 - Findings of the Regressions Estimating the Likelihood of Specialist Physicians Residing in Outlying Areas, Including Interactions

	(1)	(2)	(3)
License received after 2011 wage agreement	-0.077* (0.04)	-0.074* (0.04)	-0.085* (0.05)
Country of birth that is not Israel or FSU (relative to born in Israel)	-0.080*** (0.02)	-0.079*** (0.02)	-0.079*** (0.02)
Born in FSU relative to born in Israel	0.066*** (0.02)	0.065*** (0.02)	0.065*** (0.02)
Studied medicine at a university in Israel's periphery (Be'er Sheva or Safed) vs studies in the center of the country (other medical schools)	0.119*** (0.02)	0.147*** (0.01)	0.121*** (0.02)
Studied medicine abroad relative to studies in the center of the country	0.033** (0.01)	0.034*** (0.01)	0.031** (0.02)
Resided in an outlying area in 1995 relative to residing in the center of the country	0.487*** (0.01)	0.448*** (0.02)	0.449*** (0.02)
Resided outside Israel in 1995 relative to residing in the center of the country	0.147*** (0.02)	0.151*** (0.02)	0.148*** (0.02)
<u>Interactions</u>			
After 2011 * medical school in periphery	0.066** (0.03)		0.065** (0.03)
After 2011 * medical school abroad	0.007 (0.02)		0.007 (0.02)
After 2011 * resides in periphery		0.075*** (0.02)	0.075*** (0.02)
After 2011 * resides abroad		-0.006 (0.02)	-0.003 (0.03)
Dummy variables for each year	V	V	V
Demography: age, gender, ethnicity, family status	V	V	V
Constant	0.033* (0.02)	0.034* (0.02)	0.038** (0.02)
Number of observations	7,039	7,039	7,039
Adjusted R^2	0.365	0.366	0.366

4.b.2 – Causal effect of the wage agreement – estimation using the Difference-in-Differences method

Although the estimations in Section 4.b.1 identified important correlations, for methodological reasons they are unable to point to a causal relationship. In an effort to identify causality between the incentives provided in the wage agreement and the residential location of specialist physicians in outlying areas, I performed three estimations using the Difference-in-Differences (Diff—in-Diffs) method. The estimations in Section 4.b.1 did not indicate significant correlations between the wage agreement incentives and the likelihood of specialist physicians residing in an outlying area. Nonetheless, dividing the physicians into two groups by their degree of exposure to the incentives (based on their field of specialization) might identify a causal relationship that is not expressed in the estimations of Section 4.b.1, which related to all the physicians as a single group.

Figure 13 provides a descriptive presentation of the proportion of specialist physicians residing in the periphery one year after completion of their specialization, divided into two groups—specialists in fields with a high rate of hospital employment (the treatment group) and specialists with a low rate of hospital employment (the control group)—and by year of receiving their license. Overall, physicians who received their license up to 2010 in both groups demonstrate similar behavior. However, after the wage agreement, commencing in 2013, there was a certain divergence between the two groups. Specialists in fields with a higher rate of hospital employment displayed a slightly greater tendency to reside in outlying areas than their peers. The Diff-in-Diffs analysis examines whether this divergence between the two groups reflects causality, in other words—the effect of the incentives on specialist physicians residing in the periphery.

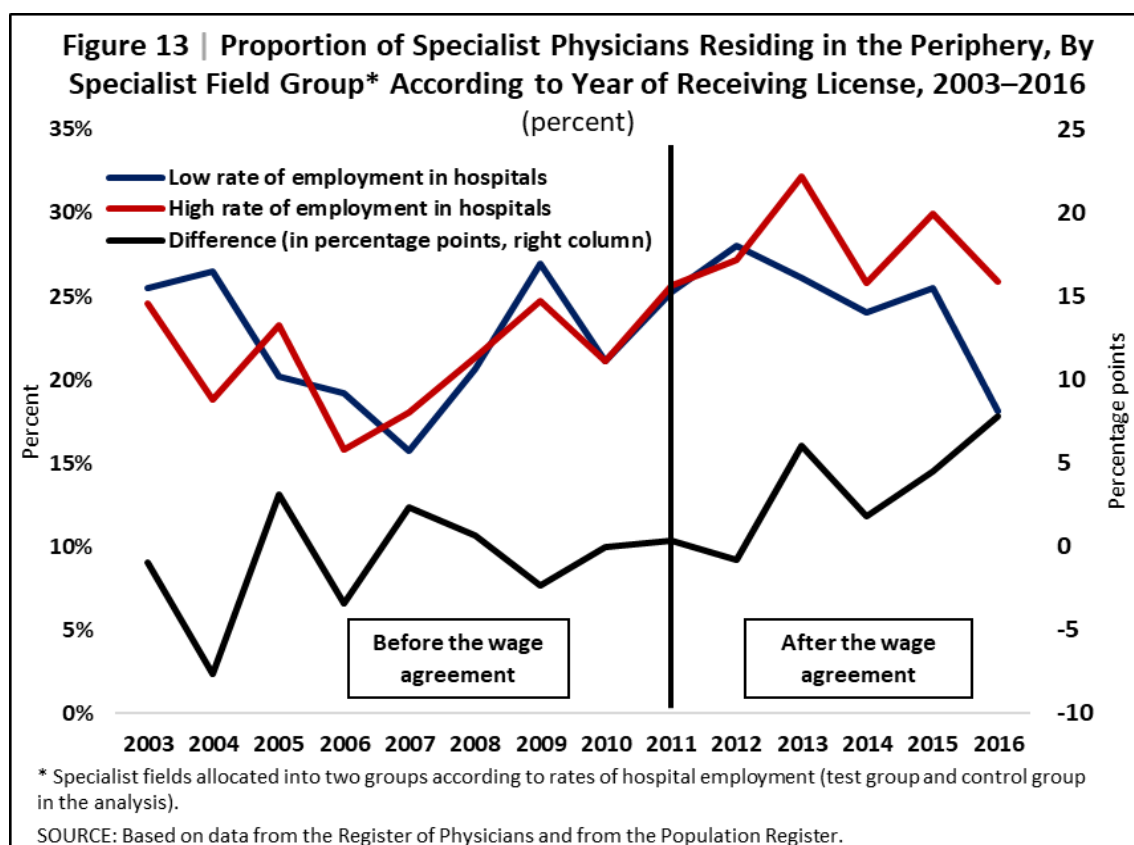


Table 5 presents findings from estimations that differ from one another at the training stage and that form the basis for allocation of the physicians in two groups at the time of the wage agreement (before and after signing of the agreement). Like the estimations in Section 4.b.1, the first two columns examine the disparities between physicians who received their license after the signing of the wage agreement and physicians who received their license before the agreement. The first column examines the entire sample and the second column examines only graduates of medical schools abroad. In contrast, the third estimation compared physicians who completed their specialization after the signing of the wage agreement with physicians who completed their specialization before the agreement was signed.

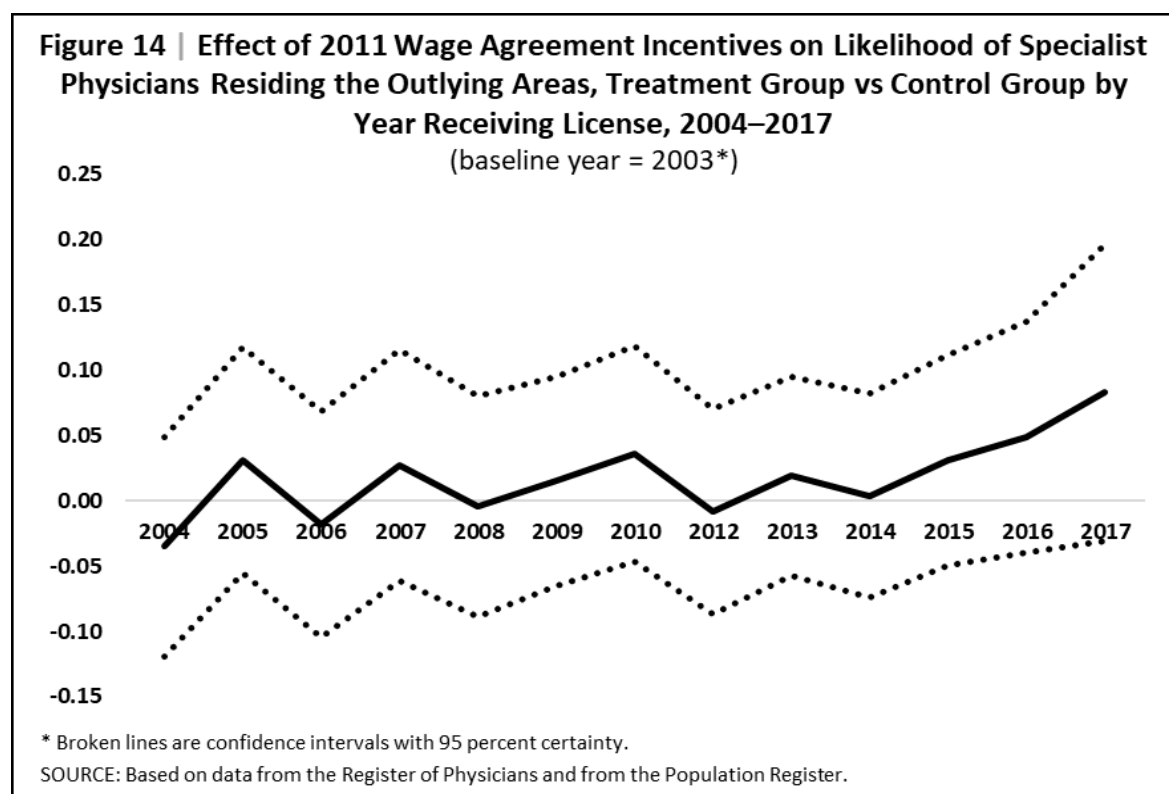
Table 5 - Findings of the Difference-in-Differences Analysis for the Likelihood of Specialist Physicians Residing in Outlying Areas

	By year of receiving license – entire sample	By year of receiving license – studied abroad	By year of completing specialization
	(1)	(2)	(3)
Specialty fields with a high rate of hospital employment	-0.030*** (0.01)	-0.038** (0.02)	-0.047* (0.03)
License received / specialization completed after the wage agreement (2011)	-0.072* (0.04)	-0.049 (0.05)	-0.05 (0.04)
Interaction – after 2011 * specializations with a high rate of hospital employment	0.012 (0.02)	0.019 (0.02)	0.006 (0.03)
Country of birth that is not Israel or FSU (relative to Israeli-born)	-0.081*** (0.02)	-0.128*** (0.03)	-0.038 (0.03)
Born in FSU relative to Israeli-born	0.069*** (0.02)	0.063** (0.03)	0.138*** (0.03)
Studied medicine at a university in Israel's periphery (Be'er Sheva or Safed) vs studies in the center of the country (other medical schools)	0.146*** (0.01)		0.147*** (0.02)
Studied medicine abroad relative to studies in the center of the country	0.036*** (0.01)		0.006 (0.02)
Resided in an outlying-area in 1995 relative to residing in the center of the country	0.486*** (0.01)	0.654*** (0.02)	0.415*** (0.02)
Resided outside Israel in 1995 relative to residing in the center of the country	0.147*** (0.02)	0.216*** (0.03)	0.112*** (0.03)
Dummy variable for each year	V	V	V
Demography: age, gender, ethnicity, family status	V	V	V
Constant	0.046** (0.02)	0.033 (0.03)	0.002 (0.34)
Number of observations	7,039	3,265	2,619
Adjusted R^2	0.365	0.425	0.283

In this analysis as well, the findings in the three estimations did not point to a casual relationship between the variables (the interaction variables). However, the findings do point to another aspect relating to the disparity between the two groups. In all three estimations we found significantly that physicians in those fields with a greater tendency to hospital employment are less likely to reside in outlying areas. This is reasonable when considering that specialist physicians who are mostly employed in hospitals will prefer to

reside in central regions and in close proximity to the large hospitals, as well as close to Israel's private hospitals. In contrast, physicians whose employment is mostly in the community, which is characterized by a broad geographical distribution, are less sensitive to the need to live near large hospitals, and the percentage of such physicians residing in outlying areas is therefore higher. Perhaps for this reason, the wage agreement focused on hospital physicians since the lack of relevant specialists was felt more strongly in the periphery.

To examine whether we can point to a causal relationship in at least some of the years, Figure 14 presents an estimation that examines the interaction variables for the treatment group (compared with the control group) for each year separately. As the graph shows, the findings of this estimation also did not point to a causal relationship in any of the years.



Sensitivity tests: In addition to the estimations presented in Tables 2-5, I also conducted a number of sensitivity tests for various examinations and to reinforce the findings. One group of sensitivity tests included estimations based on the Diff-in-Diffs method, applying different criteria when separating the treatment group from the control group—for example, investigating specialists in family medicine, or in dermatology and venereology,

two specialty fields with a much lower rate of hospital employment than the other fields—relative to specialists from other fields. In addition, I estimated a Diff-in-Diffs regression based on a continuous variable for the rate of hospital employment in each of the specialty fields. I also estimated the upper quartile of the rate of hospital employment compared with the lowest quartile, omitting the second and third quartiles.

Another sensitivity test examined the possibility of bias in connection with the limitation of data—the use of the physician’s residential location rather than place of work. To compensate, to the extent possible, for the likelihood of commuting between the place of work and place of residence, this estimation only covered physicians who reside in the north, central, Tel Aviv, and Jerusalem districts (excluding the south, Haifa, and Judea and Samaria). Since the journey between the central districts and the Jerusalem and Haifa districts is relatively long, it is less likely that a significant number of physicians will make this journey on a regular basis.¹⁸ The findings of all these estimations were similar to the findings of the estimations presented in Tables 2–5, and they did not produce any additional significant findings.

To ensure that the findings emerging from the OLS regressions remain in place even when the analyses are performed using a methodology adjusted to dependent binary variables, I ran parallel logistic estimations for all the OLS estimations presented in the paper. The findings of the logistic estimations closely resembled those of the presented OLS analyses. (The results of the sensitivity tests do not appear in the paper.)

4.c Discussion

The 2011 wage agreement with the physicians contained three incentives aimed at increasing the number of physicians in the periphery: a significant percentage wage supplement for medical residents and specialists working in hospitals in outlying areas, lump-sum bonuses for physicians who would move to the periphery, and a differential allocation of budgeted positions in favor of hospitals in outlying areas. (Details about these three incentives appear in Chapter 1.a.) In some specializations, physicians are often

¹⁸ As noted, the Labor Force Survey data show that 97 percent of the physicians work in their residential district or in a district adjacent to their residential district.

required to wait for a certain period of time before they can begin their residency in the field. The purpose of the differential allocation of budgeted positions in favor of the periphery was partly to reduce the waiting time, thus encouraging specialist training in outlying areas. However, despite the generous incentives, it appears that their overall impact did not significantly increase the number of specialists in the periphery. None of the estimations performed showed causality or a significant positive correlation between receiving a license after the wage agreement and the likelihood of specialist physicians working in outlying areas. Although there is no way to determine with any certainty what would have happened had the incentives not been given, it is possible that the proportion of physicians who would have chosen to reside in the periphery would then have been even lower. Nevertheless, the trend prior to the signing of the agreement (Figure 13) and the fact that around the period in which the agreement was signed no other event occurred that might have motivated physicians to prefer the center of the country over outlying areas—in addition to the results of the empirical tests—all imply that the incentives had no significant impact in this context.

The low level of effectiveness of the wage agreement incentives was reflected not only in the lack of significance of coefficients but also in additional points arising from the findings. For example, in Table 2 the estimation that did not include variables for physician's exposure to the periphery (the estimation in the left column) on its own provides only a weak explanation and is significantly lower than the estimations that did include these variables (based on the marked differences in R^2 between the estimations). Furthermore, a significant negative relationship was found in some of the estimations, and in any event, the coefficients were not close to having any positive statistical significance, even at a lower significance level. This finding is consistent with the research literature on the subject, which failed to reach definitive conclusions regarding the contribution of economic incentives to encouraging physicians to move to outlying areas (Buylx, 2020; Wilson et al., 2009; Verma et al., 2016).

Even the estimations that examined specific groups of physicians, considered to be of relatively high caliber, such as graduates of Israeli medical schools and physicians with high psychometric scores, did not produce significant findings. It therefore appears that the incentives provided in the wage agreement failed to make any significant contribution to

increasing the number of physicians in the periphery or to improving their average quality.¹⁹

In contrast, the study findings point to the considerable importance of physicians being exposed to outlying areas before they start working, on their choice to work in the periphery. This exposure was also examined on the basis of the physician's residential location prior to his or her studies (which in many cases was also the area in which the physician grew up) and on the basis of the location of the medical school he or she attended and whether it is in Israel's periphery. All the coefficients in this context were found to be consistently statistically significant and of a substantial size. In the model that included interactions between the exposure variables and receiving a license after the signing of the 2011 wage agreement, the interaction coefficients were found to be significantly positive. This finding might indicate the possibility that the incentives, which according to our findings had no impact on the general body of physicians, did in fact affect those who were exposed to outlying areas in their childhood or during the course of their medical studies.

One of the points examined in this study for the first time in Israel is the correlation between studying at a medical school located in Israel's periphery and the physician's choice of working as a specialist in an outlying area and remaining there in the long term, even if they did not grow up in the periphery. The coefficient of the location of the medical schools was consistently found to be positive, significant, and of a substantial size, and it shows a disparity of 15 percentage points between physicians who studied in outlying areas and physicians who studied in the center of the country with respect to the likelihood of working in the periphery as specialist physicians. Even in the estimation which included only physicians who did not grow up in Israel's outlying areas (right column in Table 3) this coefficient was found to be statistically significant and positive with a similar size to the estimations that covered all the physicians. This finding does not necessarily

¹⁹ It is important to emphasize that it is extremely difficult to define and measure the quality of the physicians since it is affected by numerous variables, some of which are not included in the data files and some of which cannot be estimated at all. The findings in this section are therefore based on the definitions examined in the study: physicians who studied at Israeli medical schools and physicians with high psychometric scores (two groups that, as noted above in Footnote 18, can be assumed to have, on average, a high standard of training or at least strong ability relative to the other physicians).

indicate causality, and there may be a correlation between physicians who studied in the periphery and those who planned to live there in advance (even if they grew up in the center of the country). However, given the extremely high threshold for acceptance to medical studies in Israel and the difficulties facing candidates applying for medical school in general and a medical school close to their home in particular, it is fair to assume that a substantial share of physicians who grew up in the center of the country but studied medicine in the periphery were in fact “forced” to study there after they were not accepted by other medical schools.²⁰ Against this background, and in light of the consistent and significant size of the coefficient, we can reasonably assume that there is a causal relationship between medical studies in outlying areas and working as a medical specialist in the periphery. It follows that we can assume that increasing the student quota in outlying medical schools could support an increase in the number of specialists who will work in the periphery.

The findings emerging from this study regarding the correlation between physicians who were exposed to outlying areas during their training and the likelihood that they will work in the periphery as a specialist correspond with the findings on this subject in the research literature (Johnson, Wright, and Foster, 2018; Woloschuk and Tarrant, 2002). The findings therefore support policy measures to widen the geographical distribution of the physicians’ training process, including increasing the number of students in outlying medical schools, establishing additional medical schools in outlying areas, differential allocation in favor of the periphery at the internship stage, or as was the case in the 2011 wage agreement, differentially increasing the number of budgeted positions for specialization in favor of the periphery. On the other hand, an excessively wide geographical distribution of the various stages of medical training might undermine the benefits of agglomeration—the advantages of geographical concentration that enhance the effectiveness of the training. In this context, it is worth reiterating the particular

²⁰ Conditions for acceptance by Israel’s medical schools vary from one faculty to another, with respect to both the entrance exams and the weight attributed to each exam. The conditions of acceptance to the 6-year program also differ from those for the 4-year program for first-degree graduates, which are based mainly on the degree achievements. It is generally accepted that the threshold for acceptance to medical schools in the periphery is lower than for those not in the periphery, but even if we do not make this assumption, the variation in the conditions for acceptance between the medical schools in many cases creates a situation in which an applicant who is only accepted by one medical school is “forced” to study there.

importance of the geographical distribution of physicians in order to provide an equitable supply—in both quantity and quality—of medical services in all parts of the country. An adequate number of physicians in a region is essential (although insufficient) for providing its residents with quality medical services. In this respect, physicians are comparable with teachers, social workers, and other professionals who provide public services, and whose geographical distribution is necessary for social reasons. However, unlike teachers and social workers, Israel has a flourishing private medical system that operates in parallel with the public health system, which affects the physicians potential earning capacity. This potential is high in the center of the country, thus creating a strong incentive for physicians to live outside the periphery (Gamzu, 2022).²¹

5. Summary and policy recommendations

The wage agreement signed with the physicians in 2011 had several goals. First and foremost, to determine the employment conditions and pace of increase of physicians' wages in the public system. Additionally, it provided incentives to encourage physicians to engage in specialty fields with a shortage of specialists and in geographic areas suffering from a shortage of physicians in general and high-quality physicians in particular. This paper examines the extent to which the 2011 wage agreement managed to achieve these goals, and based on its findings, recommends policy measures that might be effective in achieving these goals.

The recommendations can be divided into two parts. The first discusses the measures relating to increasing the number of physicians in outlying areas, and the second discusses the measures for increasing the number of physicians in the fields with a shortage of specialists. Since the wage agreements directly affect the wages and employment conditions of public system physicians, another important subject that is relevant for the wage agreements is the development of the relationship between public and private medicine. Despite the importance of this subject, it was not addressed in this study due to a paucity of data (detailed in the chapter on data) and our recommendations therefore do not relate to it.

²¹ Although teachers and social workers also have an option to work in the private sector, the potential earning capacity of physicians in the private sector is much greater than in those professions.

Policy measures for increasing the number of physicians in the periphery and improving their average training level

According to the findings of the empirical analysis, the incentives provided in the 2011 wage agreement did not significantly, or in any way, affect the likelihood of specialist physicians residing in outlying areas. In contrast, statistically significant coefficients of substantial consistency and size were found for the correlation between exposing physicians to outlying areas prior to working and choosing to live and work in these regions as a specialist. These findings support policy measures that focus on increasing the number of physicians who were raised or lived for several years in the periphery, and also on increasing the physicians' exposure to the periphery during the course of their training.

Possible measures in this direction may include programs to encourage talented young people from the periphery to study medicine. Such programs would include the granting of stipends and loans with favorable terms, support and assistance during the training period (mentoring), the study of disciplines associated with the healthcare system in outlying areas, etc. Affirmative action could also be considered for candidates whose achievements are close to the threshold for acceptance to medical school for applicants who were raised in the periphery or lived there for several years. Additionally, we recommend formulating a set of specific incentives for the physicians in these programs, to encourage them to choose to specialize in the periphery and then work there as specialist physicians, such as providing financial incentives or an exemption from the repayment of loans given as part of the program for physicians who remain and work in the periphery for a significant period. Since 2022, most of these measures have been implemented as part of the "Ilanot – Medical Interns" program managed by the Ministry of Health..²²

Additional measures that may be effective in increasing the number of physicians in outlying areas involve increasing physicians' exposure to such areas during their training. For example, the number of students in the outlying medical schools (Be'er Sheva and Safed) can be increased, or additional medical school can be opened in the periphery, so

²² As part of the Ofakim program run by the Ministry of Health, which provides loans to students going abroad to study medicine in approved institutions, it was decided to grant physicians who choose to work in the periphery for an extended period an exemption from repaying the loans they receive.

that a higher percentage of physicians will be trained in these areas. Similarly, the percentage of intern positions in outlying areas could be increased and, as in the 2011 wage agreement, the percentage of budgeted positions for specialization in outlying hospitals should be increased. Providing physicians with greater exposure to outlying areas during their training must be done in an appropriate measure, taking into account the advantages of agglomeration, and supporting a geographical concentration of the training process in favor of optimizing the process. Furthermore, among the obstacles preventing physicians from specializing in outlying hospitals is the fact that these hospitals are mostly small, and the more complex and less common medical procedures are not performed in them. To overcome this obstacle, the outlying hospitals need to collaborate with the larger hospitals in the center of the country so that residents from hospitals in the periphery can come to the larger hospitals for period of time to see and learn these procedures. In parallel, medical residents in the center of the country should be required to spend a period of time during their specialization in the outlying hospitals (Blank, 2024).

Policy measures for increasing the number of specialist physicians in fields with a shortage of specialists

Since the signing of the 2011 wage agreement, there has been a negligible increase in the proportion of physicians (from among all medical residents) who have chosen to specialize in fields with a shortage of specialists. One possible explanation for the low effectiveness of the incentives is their focus on residents rather than on specialist physicians. Although there is some logic in focusing the incentives on the residents, since this stage is closer to the time of the physician's decision regarding his or her specialty field, we can assume that one of the physician's key considerations in choosing a specialty field is its long-term earning capacity. In the years following the wage agreement, there was a marked increase in the number of new specialists who completed their specialization each year (the total number of new specialists in all specialty fields). This increase should have contributed to increasing the number of new specialist physicians in fields with a shortage of specialists, even though their share of the total number of new specialist physicians did not change significantly in those years.

An analysis of the breakdown of specialist physicians' wages by field shows that there are two groups of specializations with a shortage of specialists. The first comprises a number of fields, such as psychiatry, rehabilitation, and geriatric medicine for example, in which wages are significantly lower than in most other specializations. It is likely that one of the key factors underlying the low number of physicians who choose to specialize in these fields is the relatively low wages they offer. It therefore appears that without significantly reducing the wage disparities, it will be difficult to increase the number of specialists in these fields. Additionally, the work conditions in some of the departments in these fields may be particularly difficult, and here, too, improvement is required. Furthermore, in view of the Swords of Iron War, it is worth noting that some of the specialties with a shortage of specialists are at the bottom of the wage distribution for specialist physicians who are essential for treating the war injured (e.g. psychiatry and rehabilitation). The wage agreement signed with the physicians on September 30, 2024 included supplements for these specialty fields.

The second group comprises specialty fields with a shortage of specialists, in which the wages are not considered low relative to other specializations. One good example of this is anesthesia. Anesthetists' wages are in the upper part of the wage distribution of specialist physicians. In this group, it can be assumed that the shortage is not primarily due to low wages, but to other factors such as work conditions, lack of professional interest, lack of perceived prestige, other preferences, etc. Consequently, to increase the number of specialists in these fields, further studies of the shortage are required to identify the reasons for the shortage and suggest effective policy measures to help resolve the problem.

References

in Hebrew:

- Ash, N. (Chair) (2022). *Report of the Committee to Strengthen Healthcare Services in Israel and Regulate the Private Healthcare System (Ash Committee)*. Israel Ministry of Health.
- Ashkenazi, Y., B. Rosen, M. Gordon, and A. Yankellevich (2017). *Attracting Medical Residents to the Periphery and to Medical Specialties in Crisis following the 2011 Collective Agreement*. Myers JDC Brookdale Institute.
- Bowers, L. and D. Chernikhovsky (2016). *Your Place in Line: Waiting Times in Israel's Public Hospitals*. Taub Center for Social Policy Studies in Israel.
- Belinski, A., G. Ben Naim, and J. Hecht (2018). *Wages of Government Hospital Physicians in Public and Private Medicine – Findings and Trends*, Department of the Chief Economist, Ministry of Finance.
- Blank, R. (2024). *Effectiveness of the Grants Program to Encourage Work and Specialization by Physicians in the Periphery, 2011–2019*, Knesset Research and Information Center.
- Gamzu, R. (2022). *Long-term Planning of the Physician Workforce in Israel [Gamzu Committee]*. The Israel National Institute for Health Policy Research.
- Davidovitch, N., N. Lev, and B. Levi (2023). *The Healthcare System in Israel: Between the New Normal and the Old Normal*. Taub Center for Social Policy Studies in Israel.
- Markovitz, R., S. Assif, and N. Har-Tuv (2021). "Review of the Effectiveness of the Medical Residents Agreement in the Periphery and in Disciplines with a Shortage of Specialists", in: Ministry of Finance, Salary and Employment Agreements Department, *Report on Payroll Expenses in the Civil Service and Defense Entities for 2019*, February 2021, p. 119.
- Ministry of Finance (2023), *Report by the Head of Payroll Expenses in the Healthcare System – Public Hospitals, for 2021*. Salary and Employment Agreements Department.
- Ministry of Health (2023), *Financial Report of the General-Public Hospitalization System 2020-2021*. <https://www.gov.il/he/pages/fospitalization-report-general-public-hospitalization-system-2020-2021>
- Ministry of Finance, *Physicians Wage Agreement, 2011*.
- Samuel, H., A. Meshulam, Y. Ashkenazi, R. Maoz Breuer, and A. Rose (2022). *Young Specialists in the Periphery and Center: The Transition from Resident to Board-Certified Specialist*, Myers JDC Brookdale Institute

Shapiro, N., O. Kayam, I. Kovatz, A. Belinski, and R. Brenner-Shalem (2021). *Number of Physicians in Israel: Trends and Policy Proposals*. Ministry of Health - Financial and Economic Planning Administration.

In English:

Abbiati, M., G. L. Savoldelli, A. Baroffio & N. M. Bajwa (2020). "Motivational factors influencing student intentions to practise in underserved areas", *Medical Education* 54(4), 356–363. <https://doi.org/10.1111/medu.14063>

Buykx, P., J. Humphreys, J. Wakerman & D. Pashen (2010). "Systematic review of effective retention incentives for health workers in rural and remote areas: towards evidence-based policy", *The Australian Journal of Rural Health* 18(3), 102–109. <https://doi.org/10.1111/j.1440-1584.2010.01139.x>

Chan, B. T., N. Degani, T. Crichton, R. W. Pong, J. T. Rourke, J. Goertzen & B. McCready (2005). "Factors influencing family physicians to enter rural practice: does rural or urban background make a difference?", *Canadian Family Physician Medecin de Famille Canadien* 51(9), 1246–1247.

Fried, S., O. Zloto, A. Doron et al. (2024). "Attracting medical school graduates to residency programs in remotely located hospitals: the challenge lies beyond financial incentives", *Isr J Health Policy Res* 13, 40 <https://doi.org/10.1186/s13584-024-00629-5>

Gagne, R & P.T. Leger.(2005). " Determinants of Physicians' Decisions to Specialize", *Health Economics* 14(7):721-735

Glasser, M., M. Hunsaker, K. Sweet, M. MacDowell & M. Meurer (2008). "A comprehensive medical education program response to rural primary care needs", *Academic medicine: Journal of the Association of American Medical Colleges* 83(10), 952–961. <https://doi.org/10.1097/ACM.0b013e3181850a02>

Goldacre, M. J., R. Goldacre & T. W. Lambert (2012). "Doctors who considered but did not pursue specific clinical specialties as careers: questionnaire surveys", *J R Soc Med* Apr;105(4):166–76. doi: 10.1258/jrsm.2012.110173.

Gupta, T.S., T. Woolley, R. Murray, R. Hays, and T. McCloskey (2014). "Positive Impacts on Rural and Regional Workforce from the First Seven Cohorts of James Cook University Medical Graduates", *Rural and Remote Health*, 14(1): 182–184.

Harris J. E., B. González López-Valcárcel, V. Ortún & P. Barber (2012). Specialty choice in times of economic crisis: a cross-sectional survey of Spanish medical students. *BMJ Open* 2013 Feb 12;3(2):e002051. doi: 10.1136/bmjopen--002051.

- Hauer, K. E., S. J. Durning, W. N. Kernan, M. J. Fagan, M. Mintz, P. S. O'Sullivan, M. Battistone, T. DeFerM. Elnicki, H. Harrell, S. Reddy, C. K. Boscardin & M. D. Schwartz (2008). Factors associated with medical students' career choices regarding internal medicine. *JAMA* 300(10), 1154–1164. <https://doi.org/10.1001/jama.300.10.1154>
- Holte, J. H., T. Kjaer, B. Abelsen & J. A. Olsen, (2015). The impact of pecuniary and non-pecuniary incentives for attracting young doctors to rural general practice. *Social Science & Medicine*, 128, 1–9.
- Johnson, G. E., F. C. Wright & K. Foster (2018). "The impact of rural outreach programs on medical students' future rural intentions and working locations: a systematic review", *BMC Medical Education* 18(1), 196. <https://doi.org/10.1186/s12909-018-1287-y>
- Li, J., A. Scott, M. McGrail, J. Humphreys, & J. Witt (2014). "Retaining rural doctors: doctors' preferences for rural medical workforce incentives", *Social Science & Medicine* (1982), 121, 56–64. <https://doi.org/10.1016/j.socscimed.2014.09.053>.
- McGrail, M. R., J. S. Humphreys. & C. M. Joyce (2011). "Nature of association between rural background and practice location: a comparison of general practitioners and specialists", *BMC Health Services Research* 11, 63. <https://doi.org/10.1186/1472-6963-11-63>
- Nakayasu, A., Kido, M., Katoh, K., & Homma, Y. (2020). "Survey on Specialty Preference and Work-Life Balance among Residents of Japanese Red Cross Hospitals". *JMA journal*, 3(2), 118–124.
- Naimer, S., Press, Y., Weissman, C., Yaffa Zisk-Rony, R., Weiss, Y.G. & Tandeter, H. (2018). "Medical students' perceptions of a career in family medicine", *Isr J Health Policy Res* 7, 1 (2018). <https://doi.org/10.1186/s13584-017-0193-9>
- OECD (2023). Medical education and training in Israel: Towards a better governance structure for health workforce planning and policy-making in Israel - June 2023.
- Ono, T., M. Schoenstein & J. Buchan (2014). "Geographic Imbalances in Doctor Supply and Policy Responses", *OECD Health Working Papers* No. 69, OECD Publishing, Paris.
- Rabinowitz, H. K., J. J. Diamond, F. W. Markham & N. P. Paynter (2001). "Critical factors for designing programs to increase the supply and retention of rural primary care physicians", *JAMA* 286(9), 1041–1048. <https://doi.org/10.1001/jama.286.9.1041>
- Sen Gupta, T., T. Woolley, R. Murray, R. Hays & T. McCloskey (2014). "Positive impacts on rural and regional workforce from the first seven cohorts of James Cook University medical graduates", *Rural and Remote Health* 14, 2657.

- Stagg, P., J. Greenhill & P. S. Worley (2009). "A new model to understand the career choice and practice location decisions of medical graduates", *Rural and Remote Health* 9(4), 1245.
- Stockton, D. A., C. Fowler, D. Debono & J. Travaglia (2021). "World Health Organization building blocks in rural community health services: An integrative review", *Health Science Reports* 4(2), e254. <https://doi.org/10.1002/hsr2.254>
- Thornton, J. & F. Esposito (2003). "How important are economic factors in choice of medical specialty?. *Health Economics* 12(1), 67–73.
- Verma, P., J. A. Ford, A. Stuart, A. Howe, S. Everington & N. Steel (2016). "A systematic review of strategies to recruit and retain primary care doctors", *BMC Health Services Research* 16(1), 1–25.
- Wilson, N. W., I. D. Couper, E. De Vries, S. Reid, T. Fish & B. J. Marais (2009). "A critical review of interventions to redress the inequitable distribution of healthcare professionals to rural and remote areas", *Rural and Remote Health* 9(2), 1060.
- Weissman, C., H. Tandeter, R. Y. Zisk-Rony, Y. G. Weiss, U. Elchalal, A. Avidan & J. E. Schroeder (2013). "Israeli medical students' perceptions of six key medical specialties", *Israel Journal of Health Policy Research* 2(1), 19. <https://doi.org/10.1186/2045-4015-2-19>
- Woloschuk, W. & M. Tarrant (2002). "Does a rural educational experience influence students' likelihood of rural practice? Impact of student background and gender", *Medical Education* 36(3), 241–247. <https://doi.org/10.1046/j.1365-2923.2002.01143>.
- Zisk-Rony, R. Y., Weissman, C., & Avidan, A. (2023). "Does examining job market awareness among medical students provide insight into the specialty selection process?", *Annals of Medicine*, 55(1). <https://doi.org/10.1080/07853890.2023.2201012>