START-UP NATION POLICY INSTITUTE

A decline in the number of new startups: Cause for concern or natural maturation?

 Authors
 Eran Igelnik and Assaf Patir, Start-Up Nation Policy Institute

 Editors
 Assaf Kovo and Elior Bliah, Israel Innovation Authority, Uri Gabai, Start-Up Nation Policy Institute

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Executive Summary

- A June 2021 report by the Israel Innovation Authority noted a concerning decline in the number of new startups, beginning in 2014. According to data from Start-Up Nation Finder, a similar trend can be noted: since 2017, 14% fewer startups have been launched year over year. The purpose of this study is to propose possible explanations for this phenomenon and its significance for the Israeli ecosystem.
- The first insight from the data is that the decline in the number of startups is not unique to Israel and is part of a global trend. An analysis of data on new startups worldwide points to an average annual decrease of 17% since 2017. Likewise, other innovation ecosystems comparable to Israel, such as London and Silicon Valley, recorded declines of 15% and 5%, respectively.
- A second insight from Start-Up Nation Finder data is that the decline in the number of new startups is limited to specific industries. We found that 70% of the decline in the number of companies established between 2014–2019 can be attributed to the Social Media and Advertising sector.

- winning ideas.

There are several possible explanations for this phenomenon:

1. The decline indicates an improvement in investors' ability to identify

- Some claim that the decline is simply a reflection of investors' improved discernment, and that the smaller pool of startups are of higher quality. To assess this claim, we used the portion of startups that succeeded in raising at least a seed round as a proxy for quality.

— The results of this analysis do not indicate a significant improvement in the overall quality of startups. For example, 52 weeks post-establishment, the differences in "quality" between startups launched in 2014 and startups launched in 2020 are relatively small. These results are consistent even when we changed the quality parameter from seed to series A.

2. The decline is due to shifting technological trends.

— In the global technology industry, one periodically notices large shifts in successful sectors. These changes may be reflected in the scale of new companies that are established. Therefore, the decline in the number of new technology companies may be due to an increase in sectors where greater resources are required, expressed either by larger startups or by a decline in the sectors that require fewer resources. This explanation is supported by the finding that the largest decline over the past few years was in the Social Media and Advertising sector. Startups in this industry are usually "pure software" and require less personnel and equipment than "heavier" industries like AgriTech or medical equipment, and even less than Fintech and Digital Health, that alongside technical knowledge also require expertise in complex regulation. The fact that the decline is mostly limited to this sector in other countries as well supports the hypothesis that the decline can be attributed to these changes.

3. The decline stems from increased competition between startups and established companies.

- Over the past decade, the number of Israeli growth companies as well as multinational corporations with a presence in Israel has increased significantly. These companies vie for the same resources as new startups across several areas:
- **Competition for human capital:** The large number of established companies in Israel offer an attractive alternative for potential entrepreneurs. These

companies offer high-paying, low-risk executive positions, making the highrisk, high-reward paradigm of entrepreneurship less appealing. For those who choose the path of entrepreneurship despite this, fierce competition over employees makes starting a company even more challenging. Indeed, startup founders must compete for employees with vastly better-resourced companies. The concurrent rise in employee wages only exacerbates the issue. Facing this difficulty, many would-be entrepreneurs simply join large companies instead of founding new startups. The rise in median seed and series A funding between 2014–2020 by 15% and 11% per year, respectively, further points to the increasing difficulty of launching a new startup.

Competition for financial capital: An additional explanation for the decline is that venture capital funds and other investors are now more focused on latestage investing, making it more difficult for new companies to raise earlystage capital. Yet despite a decline in early-stage investments starting in 2018, there are few indications to support this claim.

What can be done?

- The Israeli government recently announced its intention to significantly increase the number of employees in the high-tech sector. Doing so would require that Israeli companies employ individuals across a wide range of professions. On one hand, a larger number of startups increases the chance for the growth of a wider tier of established Israeli technology companies. On the other hand, one cannot ignore the chronic shortage of high-tech employees, especially software developers. Companies are increasingly competing for these employees, contributing to rising wages and indirectly impairing the prospects of existing startups to become established companies. Therefore, a larger number of companies is not always better and there may certainly be a situation where too many new startups indicate an inefficient allocation of the limited labor supply.
- Our analysis indicates that the decline is likely the result of two trends: (1) a decline in entrepreneurship due to the growth of the ecosystem and the many new lucrative employment possibilities, and (2) global technological changes that led to the decline of the Social Media and Advertising sector and the shift to more resource-intensive sectors. The relatively short period since the onset of the decline in the number of Israeli startups, along with the time-lag in receiving data and the anomaly of COVID, make it difficult to measure the relative contribution of each of these trends to the decline. Measurement is important, as an escalation

of the first trend – a decline in entrepreneurship motives – may lead to a situation in which government intervention is necessary.

— However, if the main cause of the decline is a shifting of innovation resources from the Social Media and Advertising sector to resource-heavy sectors, then we do not believe that government intervention is necessary. Instead, the decline represents a natural occurrence in a market adapting itself to global changes, and it could even benefit the Israeli economy. Furthermore, the fact that 70% of the decline can be attributed to the Social Media and Advertising sector decreases the gravity of the situation, as this sector is characterized by relatively low entry barriers and high mobility of resources (entrepreneurs, employees and investors).

____ In conclusion, we believe government intervention to correct certain trends in the ecosystem requires a high burden of proof. The relatively short time span since the decline began, the partial information on the extent of the problem and its source, and the fact that it is concentrated in a specific industry, lead us to conclude that we have not yet reached this threshold. That said, continuing to track entrepreneurship trends in Israel, along with the composition of new startups and their ability to raise initial funding is of critical importance for all stakeholders interested in maintaining Israel's technological edge.

Introduction

- Israel earned the moniker "Start-Up Nation" due to the success of Israeli startups that established their position in international markets by breaking new ground in a wide variety of fields. As a result, the number of exits and public offerings by Israeli startups reached unprecedented sums, with \$26.8 billion in equity investments in 2021, significantly higher than in 2020.
- Still, there are signs pointing to a concerning trend. A report by the Israel Innovation Authority published in June 2021 presented a decline in the rate of new startups, beginning in 2014. Start–Up Nation Finder data show a similar trend, but beginning in 2017, with an annual decline of 14% (Figure 1).
- The main goal of this paper is to propose possible explanations for this trend. In addition, we will discuss the significance of the phenomenon for the Israeli ecosystem and examine whether any government intervention is warranted at this stage.
- The first part of the study presents empirical data related to the decline in the number of new startups. We then discuss the definition of high-tech companies and several issues that result from data collection methodologies. We then discuss

different lenses with which the decline can be viewed and differentiate between sectors where this trend is more pronounced. We also compare the phenomenon to global markets to determine whether it is unique to Israel. At the end of this chapter, we test to see whether there are any indications for a change in the average quality of startups that can explain the lower rate of new companies established.





Source: Start-Up Nation Finder

- The second part presents the main hypotheses for the decline in the number of new startups that arise from the data presented in part I. We evaluate three hypotheses: (1) the decline indicates an increase in startup quality; that is, in the past, more companies were launched but with a lower average probability of success; (2) changing technological trends leading to the establishment of fewer but larger firms; (3) the proliferation of established Israeli tech firms and multinational R&D centers leads to fierce competition over resources, making it harder to launch new startups.
- Finally, we discuss whether the decline in the number of new startups is a cause for concern and offer recommendations for when and how decision-makers should respond.

6

Empirical data on the decline in the number of new startups

Methodological commentary

The research period: The current study focuses on the years 2014–2020. We did not include 2021, as the data for this year is still partial. We included 2020 despite being unusual due to the COVID–19 pandemic, as most of our analyses indicated that 2020 simply continued trends of previous years. Nevertheless, one should keep in mind that some of the observations for this year can be partially explained by the unusual circumstances.

The definition of the high-tech industry: Lacking a standardized definition for a tech company, different entities use different definitions. In addition, there is often a delay in receiving information on the establishment of new startups, and therefore it is important to ensure that the decline is not a matter of changing definitions or a bias in the data. To test this, we considered several possible criteria and factored in the time-lag. As will be shown, the decline is evident under several alternative definitions.

Different methodologies for measuring the number of new startups

In this report, we will refer to companies that appear in the Start-Up Nation Finder database as the population of tech companies.¹ Despite different institutions using different definitions, the general trend of a decline in the number of new startups arises from both IVC data and data from the Central Bureau of Statistics.² In addition, since Start-Up Nation Finder criteria have been consistent over the years,³ the actual definition should have no impact on the trend.

¹ https://finder.startupnationcentral.org/glossary_page

² https://www.cbs.gov.il/he/mediarelease/doclib/2020/436/29_20_436t1.

³ https://finder.startupnationcentral.org/glossary_page

Similarly, the timing relating to the point at which an idea becomes a startup is open to interpretation. In many cases, entrepreneurs begin conducting business activity before registering with the Registrar of Companies. In order to supply as up-to-date a picture as possible, data collection for Start-Up Nation Finder is conducted with additional tools (i.e., LinkedIn) and not just by tracking the official Company Registry. This leads to a situation in which some startups on Start-Up Nation Finder are included before their official registration and they occasionally cease to operate before registering as well. Nevertheless, this distinction should not impact the overall trend: the rate of registered companies among all companies in Finder has remained constant (75%) over the years, and the rate of their decline is similar to the data presented above, as can be seen in Figure 2.



Figure 2 Founding of new startups with a company ID

Source: Start-Up Nation Finder

- ____ In addition, it is important to consider the delay in data collection. As mentioned above, data collection for the Finder database is based on several sources, and the information on the establishment of a new company is typically recorded in the database several months to years later (the average is 14 months, with a 6-month standard deviation). As a result, estimates of the number of companies established each year will be downwards biased. To correct for this issue, we



Source: Start-Up Nation Finder

adjusted the number of companies established each year by estimating the gaps from previous years' data (see appendix). Figure 3 shows that after this correction, the decline in the number of startups launched between 2017 and 2020 is indeed attenuated, standing at an average of 7% annually (compared with 14%) before the correction).

Analyzing the number of startups divided by sectors

- Startups represent a wide range of technologies and sectors. Accordingly, the startups launched every year were examined based on Start–Up Nation Finder's sector criteria. The database classifies Israel's technology industry into thirteen sectors according to the field in which companies operate and the products they develop (see appendix, Figure 11). When we examined the decline by sector, we found that it follows a similar trend in all sectors, except for two.
- The first sector is Social Media and Advertising (hereinafter, SMA), which was responsible for a quarter of new startups established in 2014, but has since been on the decline. As mentioned above, the trend was noted starting in 2014 (note that Start-Up Nation Finder started operating in 2014, thus information on earlier periods is partial), and while the general decline only began in 2017, in SMA it started two years prior. Examining a wider time frame showed 2014 to be a record year in the number of new companies established in this sector. Figure 4 shows the establishment of new startups in this sector over the years. When comparing the gap between the number of startups established in 2019 and the number established in 2014 (200), it appears that the decline in this sector accounts for 70% of the entire decline in those years (282). Figure 5 shows the decline described in this sector, compared with the decline in companies in all other sectors, with 2014 as the baseline year.









SMA, corrected for time-lag

SMA v. other sector Founding of new startups (2014=100)

The second sector with a more acute decline was Fintech and E-commerce, averaging 50% over the last two years. That said, the limited time period, as well as the aforementioned time-lag, makes it difficult to assess whether this is a real trend or an isolated phenomenon.

Global comparison

- An additional analysis was conducted to determine whether the decline in the number of new startups was unique to Israel. We chose two leading ecosystems for comparison Silicon Valley and London. As data from these markets is not available on Start-Up Nation Finder, we examined the companies' establishment dates on PitchBook. Figure 6 indicates a downtrend in both ecosystems, albeit at different rates: 5% in Silicon Valley and 15% in London (compared with 14% in Israel). It is important to note that due to the databases' differing methodologies, it is difficult to compare data in absolute numbers. Therefore, Figure 7 shows the data with 2014 as the baseline year. It is clear however that the decline in Israel is at least partially part of a global trend.
- Beyond the results from our sector analysis, it's necessary to assess whether the acute decline in SMA is also apparent outside of Israel. To enable a comparison of sectors between platforms, further data processing was required (see appendix).



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Figure 6 Founding of new startups in London and Silicon Valley

Source: PitchBook



- Our analysis of the data revealed the following:
- 1 The decline in SMA in these markets largely matches the trend in the Israeli ecosystem. Figure 7 presents the decline in this sector in all three markets, with 2014 as the baseline year.
- 2 The significant decline noted in Fintech and E-commerce is not seen in Silicon Valley and London.



Source: Start-Up Nation Finder & PitchBook

Quality measures of startups, by year of establishment

- We examined whether the decline in the number of new startups indicates an improvement in investors' capacity to identify successful ideas, and alternatively, to avoid less successful ones. While the best measure for the quality of a company is the return on investment (ROI), financial data for private companies is often unavailable, thus such a comparison is not feasible. Furthermore, for startups established several years ago, data related to profitability or market valuation is often overly influenced by market volatility and therefore is not useful for this comparison.
- As an alternative, we used the ability to raise funds (seed funding and above) within a given span of time as a proxy for success. In other words, for every point in time, we took the percent of companies within a cohort (based on year of establishment) that managed to raise such funding. This method gives us investors' subjective assessment of a startup's chances for success.
- Figure 8 presents the results. The x-axis shows time in weeks and the y-axis shows the proportion of companies in a cohort that succeeded in raising funds by that point in time (in other words, the cumulative percentage of companies that raised funds by that time).
- For example, if we look at the 52-week point on the x-axis, we can see that 14% of companies established in 2018 secured funding within a year of being

established, while 18% of companies established in 2014 managed to do so within the same amount of time. Another example is the point at which the distance between the lines is greatest. We found that after 80 weeks, while 24% of the companies established in 2014 succeeded in raising funding, only 18% of companies established in 2018 succeeded in doing so.





Source: Start-Up Nation Finder

Overall Survival: time until first investment (seed+)

- The main takeaway from this analysis is that no significant increase in the rate of fundraising was noted as the year of establishment progressed. Although there are some differences by years of establishment (whose size depends on the specific selection of a time frame, i.e., within 1 year, 2 years, etc.), they are small and do not indicate an observable trend over time. In other words, the data do not point to an increase in the quality of startups established in the past several years.
- We conducted the above analysis using other criteria for success, such as raising later funding rounds, but in all cases, we did not find significant differences between cohorts and the results were similar to what was shown above.

14

Main hypotheses for the decline in the number of new startups

Maturation of the ecosystem improved investors' ability to identify promising startups

- A common claim is that the vast experience gained by investors in the ecosystem improved their ability to identify ideas with a high likelihood of success. According to this claim, the decline in the number of new startups established in later years is actually a positive development, since it means resources that would have been expended on less successful projects end up being saved.
- If this claim was true, we would expect to see a more pronounced decline amongst "low quality" companies, and a less pronounced (or stable) decline amongst "quality" companies. However, the analysis presented in the previous chapter did not indicate any significant difference in quality (as measured by time to fundraise) between companies when analyzed by year of establishment. To summarize, we conclude that improvement in investors' discernment does not explain this phenomenon.

Technological advancements create a scale bias

— Technological breakthroughs (for example, the steam engine, cellular telephones, cloud technology) introduce innovation cascades and the proliferation of numerous

companies in the industry where the greatest technological advances are made. However, different industries require different resources, a fact that often influences the size of the companies established.

Online advertising, for example, relies primarily on programming (as opposed to physical equipment). Thus, an entrepreneur in this industry can establish a company with just a few programmers and very little equipment. On the other hand, AgriTech companies often require labs, farmland, and a variety of experts. As a result, one can expect that in periods where there are more opportunities for online advertising, a large number of smaller enterprises will be established. But in periods characterized by opportunities in resource-heavy sectors like AgriTech, we will see a smaller number of startups that employ more material and human resources.

— This explanation is supported by the aforementioned finding that most of the decline in recent years occurred in the SMA sector. The fact that a similar decline occurred in other ecosystems as well further solidifies the notion that it can be attributed to companies adapting their operations to global technological changes.

What happened in Social Media & Advertising?

2014 was a record year in the number of new companies in this industry, which rose in prominence starting around 2010. The opportunities for entrepreneurs in this sector were tremendous and led to the establishment of many startups in this sector. Around this time, smartphones and social media were gaining in popularity and the idea of "Web 2.0" created a market for targeted advertising, a goldmine for advertisers and brands who until then relied on television ads, newspapers and billboards to create brand awareness. Startups in this industry were characterized by relatively lower technological and financial barriers to entry, and in some cases managed to become profitable more quickly than in other sectors.

Eventually, government regulation and the rules set by companies controlling the digital domain entered in full force and changed it completely. One example is IAB Tech Lab (a nonprofit founded to regulate the online advertising space) that created several regulation initiatives for online advertisers. Companies like Facebook and Google imposed limitations on certain products (cryptocurrencies, some medications, etc.) and announced cuts to ad space in web pages. Initiatives like the EU's GDPR, Apple's move to iOs 14, and the reduced use of cookies increased users' control over their data. These and many other changes brought about a significant rise in entry barriers (knowledge, technology and capital) and limited the number of new startups established in this industry.

16

Competing with larger companies for resources

- Over the past few years, we have seen a rise in the number of Israel growth companies and the number of multinational R&D centers established in Israel. Between 2014 and 2020 alone, over 200 multinational corporations established a presence in Israel. These companies compete, to a large extent, over the same scarce resources required by startups (namely, human and financial capital). This is why it is only natural to expect that a greater number of large companies in the ecosystem will adversely affect entrepreneurs' will and ability to establish new startups.

Competing for human capital

- The shortage of employees with relevant skills is a known challenge in the high-tech industry, a fact that has led to the steep rise in wages (for further information, see the High-Tech Human Capital report.)⁴ The high salaries and additional benefits in the industry disincentivize the establishment of startups, both by changing entrepreneurs' risk-reward calculation and by increasing the costs associated with establishing a new company.
- Growth companies as well as multinationals attract potential entrepreneurs to high-paying, low-risk positions, thus reducing their motivation to establish their own companies. In addition, the steep rise in the valuation of technology companies

in recent years stymies the departures of many potential entrepreneurs, for whom a significant part of their compensation comes from vested options.

- in recent years.

⁴ https://innovationisrael.org.il/sites/default/files/2020%20High-Tech%20Human%20Capital%20Report%20-%20English%20Version_0.

Empirical support for this claim can be found in an analysis conducted on data from the National Council of Economics. The research, analyzing differences in the tendency to establish new companies, found that employees in multinational R&D centers founded new companies at less than 60% the rate of their counterparts in local companies (while controlling for other aspects of employment, such as wages) In addition, it was found that working in a company with a larger number of employees negatively impacted the likelihood of becoming an entrepreneur.

Alongside disincentivizing potential entrepreneurs from starting companies, high wages in high-tech also makes establishing a startup less financially attractive. The main expense of a typical early-stage startup is of R&D employees with high technical skills; these are the same employees whose wages rose the most

Competing for financial capital

- Although it seems unlikely that startups compete for investments with more established tech companies, this may indeed be the case to a certain extent. And although financial capital is market and often sector agnostic, unlike with human capital, nevertheless, many tech investments come from investors who are experts in their fields. It is therefore likely that there is some competition between startups and established companies for financial capital as well.
- It has been recently claimed that venture capital funds and other investors are focusing more on late-stage investments, and this makes it more difficult for companies to raise capital in their early stages. Indeed, an investment culture in which the market value of tech companies is tied to their revenue multipliers more than to their profits creates incentives to prioritize late-stage investments.
- Empirically, it is hard to either prove or disprove this claim. Although some decline in the number of early funding rounds (pre-seed and seed) beginning in 2018 is apparent (see Figure 10) it cannot be determined whether there are fewer investments because there are fewer startups, or the other way around.
- To summarize, it may certainly be the case that the investor composition of the market is responsible for the underinvestment in startups over the past few years, but additional evidence is required to support this claim.



Figure 9 Number of investment rounds over the years

Source: Start-Up Nation Finder

Policy recommendations

- The years 2017–2020 in which the decline in the number of startups occurred were among the best years for Israel's tech industry and included a record number of investments and public offerings of Israeli companies. This raises the question: should the decline concern policymakers, and if so, what should they do?
- Our findings point to two sources of the decline: the maturation of the ecosystem, reflected by the steep competition for resources, especially human capital, and shifting global trends alongside a decline in the SMA sector. Accordingly, two different reasons may be cause for alarm: The first relates to the composition of new startups (and accordingly, the composition of Israel's future innovation ecosystem), and the other relates to their overall number.

Startup composition: Should the decline in SMA startups worry decisionmakers? This industry is characterized by fierce competition alongside relatively low technological entry barriers (most companies in this industry rely on existing technologies, rather than on technological breakthroughs). In addition, the overwhelming majority of startups in this industry are built on "standard" software (web pages, social networks, mobile apps, etc.) and therefore there is great mobility between it and other industries. An entrepreneur or programmer in a social media company can easily switch to fields like Fintech, Cybersecurity, and others. It is therefore unlikely that employees in these fields will encounter difficulty finding employment as a result of a decline in this sector.

- sector.

The number of new startups: Addressing the question of whether a decline in the overall number of startups is worrying necessitates a discussion, if only in principle, on the question of the "optimal" number of new startups. This question is of course meaningless, since it is not clear what "optimal" means, and to whom. Nevertheless, it is important to examine the ecosystem in the face of the objectives set by the government in recent months – first and foremost the objective to increase the number of high-tech employees. Whether the target is 15% of the workforce or one million people – one fact is clear: it requires the

Likewise, we assume that the number of entrepreneurs whose ideas are limited to this industry is small. Regarding investors, we also believe that the decline of this sector does not take away resources from Israeli technology, and it is doubtful whether there are investors who specialize only in SMA. The other side of this mobility is that an increase in demand for this industry in the future will prompt the transition of many entrepreneurs, human capital, and financial capital back to this industry, relatively seamlessly.

— The above analysis would be very different if the decline in the number of new companies occurred in industries with low mobility requiring specialized expertise, like life sciences or semiconductors. The loss of entrepreneurial capital in such industries would present a much greater risk to them, as opposed to the SMA proliferation of growth companies – large Israeli technology companies employing many employees in diverse professions.

- From this perspective, startups are potential growth companies. Therefore, a large number of new startups every year increases the prospects for the emergence of a wider tier of mature Israeli technology companies. Given that many startups fail and close after a few years, the decline in the number of new companies will negatively impact the potential for the creation of established companies.
- That said, it is important to consider the chronic and acute labor shortage in the high-tech sector, especially of software developers. Unlike financial investments that can double in size from year to year, the number of potential tech employees grows at a slow rate of just a few percentage points per year. Therefore, too many startups (most of which will not grow to become established companies) increases competition over a small pool of employees, driving up wages and (indirectly) impeding startups' ability to develop into large companies.
- The "correct" number of new startups and the answer to the question should there be concern over the decline in the number of new startups – should take into account both of the above considerations. We do not believe that more startups automatically results in a stronger ecosystem. That said, we believe it is imprudent to ignore warning signs relating to a continuous decline in the establishment of new startups. Should the government act to increase their number to offset the trends we pointed to in this study? We certainly think there is room to prepare such an occurrence, but interventions beyond the standard

- the actual decline.

support from the Israel Innovation Authority are premature in our opinion. As our research has shown, one industry accounted for the majority of the decline, and a similar decline was also noted abroad. As the decline in this sector does not pose serious harm to entrepreneurship, its impact on the ecosystem is limited.

— The longer the trend of the decline in entrepreneurship and the rise in resources required to establish new startups continues, Israel's technology industry could find itself at risk of losing its ability to produce a substantial number of growth companies. It could be that these trends are early signs that we need to prepare for a structural change in the technology market in the near future (especially when considering the lack of any indication that the average quality of startups has increased, alongside the decline in their number). It should be noted that the unprecedented success of the Israeli high-tech sector that we are currently experiencing mainly reflects the quality of startups established before the decline analyzed in this study.

In general, we think active government intervention to correct negative trends in the ecosystem (beyond generic involvement based on known market failures) requires a relatively high threshold of understanding the problem and its causes, as well as high conviction regarding the efficacy of an intervention.

The relatively short span of time since the beginning of the decline and the partial information on the scope of the problem (especially due to the delay in receiving complete data on the number of new startups), alongside COVID-19, make it difficult to identify the relative contribution of each of these trends to



That said, we believe that even though it is too early for immediate action, the number of new startups should be closely tracked, as well as their ability to raise early funding rounds. In addition, more research should be conducted regarding the decline in the number of new startups with an emphasis on the decline in the proclivity towards entrepreneurship.

21

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— The Israel Innovation Authority is a statutory public agency in charge of Israel's innovation policy, established in 2016 based on the activity of the Chief Scientist at the Ministry of Economy. The authority advances innovation as a lever for sustainable and inclusive economic growth out of a view that innovation is the most significant engine of growth for the Israeli market. The authority works to strengthen the infrastructure of Israel's economy of knowledge, while continually examining the obstacles and opportunities presented by Israel's innovation ecosystem. The authority gives entrepreneurs and innovation-leaning companies in Israel a variety of funding and other instruments to help them deal with the changing needs of the modern world of innovation. The social-public department in the authority leads activity to increase the size of human capital available for the tech industry.



— Start-Up Nation Policy Institute is an independent think-tank that works to strengthen the Israeli innovation ecosystem through research and policy recommendations. The Institute works in partnership with the public sector and the high-tech industry to advance policies that maintain Israel's technological edge and expand Israeli innovation to all areas of its economy & society. The Institute is part of the Start-Up Nation Central group and is fully funded by philanthropy.

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Appendices

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Appendix 1: Calculating the correction for the time of "discovering" new companies

This section details the calculations used for correcting the lag in discovery of new startups. Suppose that a firm is established at (calendar) year t. We assume that the probability that the firm is discovered by the Finder database at calendar year t + $\tau = 0, 1, \dots$ is $p\tau$, independent of t. Also denote by $p\tau | \sigma$ the probability that the firm was discovered at year τ after its establishment conditional on that it was discovered not later than year σ) $0 \le \tau \le \sigma$). The actual data includes firms established since 2014 and discovered up to 2021. Denote by *Nt*, τ the number of firms in the data established at year t and discovered at year $t + \tau$ ($\tau = 0, 1, ...$). Using all firms established at year 2014 and discovered until 2021, we define an estimator for $p\tau$ |7:

$$\hat{p}_{\tau|7}^{2014} = \left(\sum_{\sigma=0}^{7} N_{2014,\sigma}\right)^{-1} N_{2014,\tau}.$$

By assumption, the distribution of $p\tau | 7$ is Binomial with parameters, $\left(\sum_{\sigma=0}^{7} N_{2014,\sigma}, p_{\sigma|7}\right)$, therefore an estimator for the variance of $p\tau | 7$ would be:

$$V\left(\hat{p}_{\tau|7}^{2014}\right) = \left(\sum_{\sigma=0}^{7} N_{2014,\sigma}\right)^{-1} \hat{p}_{\tau|7}^{2014} \left(1 - \hat{p}_{\tau|7}^{2014}\right)$$

Using firms established at 2015 and discovered until 2021, we can define similar estimators for $\hat{p}_{\sigma | 6}^{2015}$. Note that:

$$p_{6|7} = p_{6|6} \left(\sum_{\sigma=0}^{6} p_{\sigma|7} \right) = p_{6|6} \left(1 - p_{7|7} \right)$$

Therefore, we can combine the 2014 and 2015 firms to construct a better estimator for p6|7:

$$\hat{p}_{6|7} = \frac{w^{2014} \hat{p}_{6|7}^{2014} + w^{2015} \hat{p}_{6|6}^{2015} \left(1 - p_{7|7}^{2014}\right)}{w^{2014} + w^{2015}},$$
$$w^{2014} = V \left(\hat{p}_{7|7}^{2014}\right)^{-\frac{1}{2}},$$
$$w^{2015} = \left[V \left(\hat{p}_{7|7}^{2014}\right) + V \left(\hat{p}_{6|6}^{2015}\right)\right]^{-\frac{1}{2}}.$$

where

Similarly, we can combine $\hat{p}_{5|7}^{2014}$, $\hat{p}_{5|5}^{2014}$, $\hat{p}_{5|6}^{2015}$ and $\hat{p}_{6|7}$ to construct an estimator for $\hat{p}_{5|7}$ and then, consecutively, estimators for all $p\tau$ / p arameters for $\tau = 0, ..., 7$.

The estimators found were:

	0	1	2	3	4	5	6	7	
$p\tau 7$	0.371	0.358	0.131	0.062	0.038	0.018	0.013	0.005	
<i>Vp</i> τ 71/2	0.007	0.007	0.005	0.004	0.003	0.003	0.003	0.022	

Finally, we use these estimators to calculate the expected value of firms that will be discovered from each cohort in future years and its standard deviation. The results are presented in Fig. 3 on page 4.

Appendix 2: Coordinating sectors between PitchBook and Start-Up Nation Finder

- In order to compare existing sectors in Start-Up Nation Finder and PitchBook optimally, we made some processing to the division according to sectors in PitchBook. For this, we used verticals that serve as labels for different startups. A given startup can be in more than one vertical and some startups were in no verticals whatsoever.
- First, it was assumed that startups in no verticals are divided normally in each of the years, and therefore they were disregarded when dividing by sectors. Secondly, in order to avoid counting a given startup more than once, a "table of importance" was created in which verticals were rated according to importance. For example, if a certain startup is in two verticals, adtech and gaming, since the latter received a higher rating, only it would be considered to be the company's vertical. In the third and last stage, each vertical in PitchBook was linked to industries in the Finder, and thus a maximal match was ensured.

Appendix 3: The number of new startups by sector









by the data team of Start–Up Nation Finder. It should be noted that no correction has been made to the number of startups launched according to this division, as was done regarding the overall number earlier in the study.

Appendix 4: The number of startups in the world

Fig. 12 shows the details of new startup launches around the world as they are given by PitchBook. As was mentioned in the study regarding Silicon Valley and London, it is impossible to make an absolute comparison of the number of companies between platforms, due to differences in defining the threshold criteria of each platform.



Figure 11 Number of new startups, globally

Source: Pitchbook



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